DOKUZ EYLUL UNIVERSITY
GRADUATE SCHOOL OF SOCIAL SCIENCES
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ECONOMICS (ENGLISH) PROGRAM

MASTER'S THESIS

CAUSALITY RELATIONSHIP BETWEEN DEATHS FROM COVID-19 AND ECONOMIC ACTIVITIES IN OECD COUNTRIES

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İZMİR-2023

MASTER THESIS APPROVAL PAGE

DECLARATION

I hereby declare that this master's thesis titled as "Causality Relationship between Deaths from Covid-19 and Economic Activities in OECD Countries" has been written by myself in accordance with the academic rules and ethical conduct. I also declare that all materials benefited in this thesis consist of the mentioned resources in the reference list. I verify all these with my honor.

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ABSTRACT

Master's Thesis

Causality Relationship between Deaths from Covid-19 and Economic Activities in OECD Countries

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This study undertakes an in-depth exploration of the social and economic impacts of historical pandemics, culminating with the COVID-19 crisis. Initially, the influence of previous pandemics was examined, emphasizing the significance of such health crises on economic and social landscapes. Concurrently, an extensive literature review was conducted to gain a comprehensive understanding of COVID-19, particularly noting various perspectives on its economic repercussions and its parallels with historical pandemics.

For the empirical aspect of this study, daily data from 35 OECD member countries was collected between February 15, 2020, and August 14, 2021. Key indicators such as Google mobility data, COVID-19 mortality rates, and the Stringency Index were utilized in this comprehensive dataset. Granger-Causality tests were conducted between these variables. The objective was to ascertain the influence of the pandemic on these economic markers, aiming to shed light on the broader socio-economic implications of such crises. According to the findings, governments took serious actions which restricted economic life during the early stages of the pandemic. Nevertheless in the late phases of the pandemic, although economic restrictions are more effective measures against the spread of Covid-19 virus, governments take restrictive actions in terms of social life rather than economic restrictions.

The thesis concludes with an evaluation of the findings, outlining the limitations of the study, suggesting potential avenues for further research.

Keywords: Covid-19, Pandemics, OECD Countries, Mortality Rate, Google Mobility, Stringency Index, Granger-Causality

ÖZET

Yüksek Lisans Tezi

OECD Ülkelerinde Covid-19 Kaynaklı Ölümler ve İktisadi Faaliyetler Arasındaki Nedensellik İlişkisi

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Sosyal Bilimler Enstitüsü

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Bu tez, tarihi pandemilerin sosyal ve ekonomik etkilerini derinlemesine inceleyerek COVID-19 krizine kadar uzanmaktadır. İlk olarak, geçmiş pandemilerin etkisi incelendi ve bu tür sağlık krizlerinin ekonomik ve sosyal manzaralar üzerindeki önemi vurgulandı. Ayrıca, COVID-19 hakkında kapsamlı bir fikir edinmek için geniş çaplı bir literatür incelemesi gerçekleştirildi, özellikle ekonomik sonuçları üzerine çeşitli bakış açılarına ve tarihi pandemilerle olan paralelliklerine dikkat çekildi.

Çalışmanın ampirik yönü için, 15 Şubat 2020 ile 14 Ağustos 2021 tarihleri arasında 35 OECD üye ülkesinden günlük veriler toplandı. Google hareketlilik verileri, COVID-19 ölüm oranları ve Sıkılık Endeksi gibi önemli göstergeler bu kapsamlı veri setinde kullanıldı. Bu değişkenler arasında nedensellik testleri gerçekleştirildi. Buradaki temel amaç, pandeminin bu ekonomik göstergeler üzerindeki etkisini belirlemek ve bu tür krizlerin daha geniş sosyo-ekonomik sonuçlarına ışık tutmaktı. Elde edilen bulgulara göre, pandeminin ilk dönemlerinde hükümetler ekonomik hayatı kısıtlayan önlemler almışlardır. Ancak, pandeminin ilerleyen dönemlerinde, ekonomik hayatı kısıtlayan önlemler daha faydalı olmasına karşın, hükümetler sosyal hayatı kısıtlayan aksiyonlar almışlardır.

Tez, bulguların değerlendirmesiyle sona ererken, çalışmanın sınırlamaları belirtilerek, daha fazla araştırma için potansiyel yollar önerilmektedir.

Anahtar Kelimeler: Covid-19, Pandemiler, OECD Ülkeleri, Ölüm Oranı, Google Hareketlilik, Sıkılık Endeksi, Granger-Nedensellik

CAUSALITY RELATIONSHIP BETWEEN DEATHS FROM COVID-19 AND ECONOMIC ACTIVITIES IN OECD COUNTRIES

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ABBREVIATIONS

ADF	Augmented Dickey-Fuller
AUS	Australia
AUT	Austria
BEL	Belgium
CADF	Cross-Sectionally Augmented Dickey-Fuller
CAN	Canada
CHE	Switzerland
CHL	Chile
CIPS	Cross-Sectionally Augmented Im-Pesaran-Shin
CPI	Consumer Price Index
CZE	Czech Republic
DEU	Germany
DNK	Denmark
ESP	Spain
EST	Estonia
FIN	Finland
FRA	France
GBR	United Kingdom
GDP	Gross Domestic Product
GRC	Greece
HUN	Hungary
IMF	International Monetary Fund
IRL	Ireland
ISR	Israel
ITA	Italy
JPN	Japan
KOR	South Korea
LTU	Lithuania

LUX	Luxembourg
LVA	Latvia
MEX	Mexico
NLD	Netherlands
NOR	Norway
NZL	New Zealand
OECD	Organisation for Economic Co-operation and Development
OxCGRT	Oxford COVID-19 Government Response Tracker
POL	Poland
PRT	Portugal
SVK	Slovakia
SVN	Slovenia
SWE	Sweden
TUR	Turkey
USA	United States of America
USTR	Office of the United States Trade Representative
WHO	World Health Organization

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INTRODUCTION

The novel coronavirus, Covid-19, which emerged in the last days of 2019 in Wuhan, China, radically changed the lives of people all over the world for several years, and caused at least 7 million people to die. As the virus spreading the world, it deeply affected not only people's individual lives, but also how the society operates and socio-economic relations. Both the presence of the virus and the measures taken against it have caused unprecedented damage to the global economy. The new paradigm caused by the coronavirus also laid the groundwork for the discussion of rules, principles and relations that have been unquestioned in economic life for a long time. This thesis explores the relationship between the Covid-19 pandemic and economic activities, focusing on countries within the Organization for Economic Co-operation and Development (OECD).

The economies of OECD member countries, which constitute approximately 63% of the world GDP and 75% of the world trade volume despite having 18% of the world's population, were deeply affected by the epidemic and the developments caused by the epidemic (USTR, 2023). The pandemic has damaged all economic institutions and economic growth, from the employment rate, the supply chain, global trade, fiscal and monetary policies. Not only has Covid-19 forced the closure of countless businesses, but it has also compelled a dramatic rethinking of economic operations, pushing governments and businesses to navigate a new landscape of uncertainty and instability.

The first visible effect of Covid-19 on the economic structures of OECD member countries was a serious decline in their economic performance. Many of these countries have experienced more severe GDP declines and unemployment increases than they have experienced in their recent past. However, it is not possible to say that the economic performances are similar in all OECD member countries. Factors such as the countries' Covid-19 measurements, the condition of their health systems and the robustness of their economy caused the economies of the member countries to diverge. This thesis examines

[*] I would like to thank TÜBİTAK for providing scholarship support within the scope of 2210 Domestic Graduate Scholarship Programs in my graduate education.

these variations and their underlying causes, providing an in-depth analysis of the economic impacts of COVID-19 on different OECD countries.

Understanding the relationship between the COVID-19 pandemic and economic activities in OECD countries is vital for multiple reasons. First, it gives us a basis on the different economic consequences of different measures taken against Covid-19. Second, it provides information on how economies can be prepared for future shocks. Lastly, it helps us in terms of economic recovery and the new economic paradigm.

However, the long-term economic effects of the pandemic seem uncertain at the moment. In the light of past pandemics, changes in consumer behavior, market structure, and most importantly, business structures and working types that Covid-19 can create will also be examined. However, it should be kept in mind that the pandemic has still not disappeared with all its consequences, and it is possible to reach different results in the light of newly developing situations. Nevertheless, given the current situation, it is important to examine the short and long-term economic consequences of the pandemic in OECD member countries.

In the first chapter, I will primarily focus on major pandemics that occurred throughout history, from the ancient times to the 20th century, particularly, the economic and social impacts of these pandemics will be examined. The second chapter will review the existing literature on COVID-19, taking into account different approaches. An overview will be presented, reviewing applications of variables that I will also be using, as well as different studies on the economic devastation of COVID-19 and the similarities established with historical pandemics. The third chapter will examine the datasets to be used in the empirical analysis, individually displaying the performance of the 35 OECD member countries in these areas on graphs and providing comments on each country or group of countries. Also, the methodology will be presented in this section. In the fourth chapter, the data will be subjected to empirical analysis, the results will be evaluated, and a discussion will be conducted. In the final chapter, the conclusions reached will be assessed, highlighting key findings, addressing limitations encountered during the research, suggesting areas for further investigation.

CHAPTER ONE
PANDEMICS THROUGHOUT HISTORY

Pandemics are not just a public health crisis but also significant economic events, as they simultaneously disrupt supply and demand, destabilize markets, and reduce consumer and business confidence. The economic effects of pandemics are complex, multifaceted, and enduring, with the potential to change the trajectory of economies for decades. This thesis investigates the economic impacts of major historical pandemics, seeking to understand the patterns that emerge across these events and the lessons they provide for building future economic resilience.

Throughout its history, humanity has had to deal with many epidemics that spread rapidly and did not distinguish between people. These epidemics led to many diseases and mass deaths. Epidemics that emerged in almost every known period of history led to significant social, economic and political changes in the short and long term, shaking the established system. The major epidemics throughout history are summarized in Table 1.

Table 1: Major Pandemics in History

Name	Death Toll	Date	Origins	Affected Places	Vector/Source
Plague of Athens	~75,000-100,000	430-426 BC	Athens, Greece	Athens and Eastern Mediterranean	Unknown (speculated to be typhus or measles)
Antonine Plague	~5 million	165-180 AD	Likely Near East	Roman Empire	Unknown (speculated to be smallpox or measles)
Plague of Justinian	~25-100 million	541-542 AD	Egypt	Eastern Roman Empire, Mediterranean Basin	Rats & fleas (Yersinia pestis bacteria)

Name	Death Toll	Date	Origins	Affected Places	Vector/Source
The Black Death (Bubonic Plague)	~75-200 million	1347-1351	Asia	Europe, Asia, Africa	Rats & fleas (Yersinia pestis bacteria)
New World Smallpox Epidemic	~56 million	1492-onwards	Europe	Americas	Human transmission (Variola virus)
Third Cholera Pandemic	~1 million	1846-1860	India	Worldwide	Contaminated water (Vibrio cholerae bacteria)
Spanish Flu	~20-150 million	1918-1920	Unknown	Worldwide	Believed to be avian or swine origin (H1N1 virus)
Asian Flu	~1-2 million	1957-1958	East Asia	Worldwide	Avian origin (H2N2 virus)
HIV/AIDS	~40 million (ongoing)	1981-present	Central Africa	Worldwide	Non-human primates (HIV virus)
COVID-19	~7 million (ongoing)	2019-present	Wuhan, China	Worldwide	Suspected to be bats and/or pangolins (SARS-CoV-2 virus)

1.1. PLAGUE OF ATHENS

The first recorded epidemic in history, was the “Plague of Athens” that started in 430 BC. The epidemic that took place in Athens during the Peloponnesian War, killed more than a quarter of the city's population. Although the source of the disease or what exactly causes the disease is unknown, typhoid fever is considered to be a leading candidate (Huremović, 2019: 11).

The record of the epidemic in history was thanks to the famous Greek historian and general Thucydides. Thucydides was not only a distant witness of the war and epidemic period, but also survived the disease and was at the head of the army as a general in the first years of the war. Thucydides was exiled after losing the war to the Spartans in the "Battle of Amphipolis" and wrote his book about the war and the epidemic in exile.

Thucydides claims that the epidemic started in Ethiopia and states that piles of corpses formed in Athens, and that the city was extremely helpless and hopeless (Thucydides, 1985:152). Thucydides expresses the effect of the epidemic on people and society as follows; “For the catastrophe was so overwhelming that men, not knowing what would happen next to them, became indifferent to every rule of religion or of law.” (Thucydides, 1985: 155). Due to the epidemic, there was no legal or religious rule left in the society, people completely ignored the concept of honor and tried to maximize the pleasure of every moment before death came. In addition, although we cannot argue that plague has a direct impact on the course of the war, as it was in the first years of the Peloponnesian War, which lasted for 30 years, it was one of the contributing factors on the result of the war since Athens lost its leader Pericles and many of its soldiers in the plague.

1.2. ANTONINE PLAGUE

The second major epidemic known in history was the "Antonine Plague". This epidemic is also known as "Plague of Galen" because it was described in detail by the famous physician Galen. The plague took place especially within the borders of the

Roman Empire between 165-180 years, during the initial years of the epidemic, Galen was in Rome and took care of the patients. It is thought that he was called back to Rome when the epidemic broke out again in 169 (Galen, 1991: 11). Although it is thought that Hippocrates treated patients during the epidemic period, there is no evidence for this.

It is considered that the plague had originated from smallpox virus and spread by soldiers returning from Seleucia. Due to the wide borders of the Roman Empire and the increased economic and political integration, it spread over a much wider geography, unlike the "Plague of Athens". A third of the population in the region where it spread and most of the Roman Army, as well as the emperor Marcus Aurelius, died in this plague. Accordingly, the economic and political dominance of the Roman Empire was severely damaged and signs of cultural and religious change emerged. New religions such as Christianity began to spread among the people, and the void was filled in this way. The epidemic was, in a sense, an important factor that played a role in the collapse of the Western Roman Empire in 476 (Huremović, 2019: 12).

1.3. THE JUSTINIAN PLAGUE

The Justinian Plague is the first known major epidemic. The first wave of the epidemic took place within the borders of the Byzantine Empire, especially in the capital Constantinople between 541 and 543. The plague lasted for two centuries with 8-12 year intervals and killed between 25 and 100 million people according to estimates. The epidemic is thought to have spread to the entire empire, starting from Egypt. Due to the advanced bureaucracy, well-functioning trade network and military operations of Byzantium, the epidemic spread rapidly. As a result of the samples taken from the dental pulp, it was determined that the pathogen causing the epidemic was the bacterium Yersinia Pestis (Piret and Boivin, 2021: 3).

While the epidemic killed 40% of the Byzantine Empire population, this rate is thought to exceed 50% in the capital. The epidemic obviously had negative effects for the empire. The strong structure of Byzantine Empire gradually weakened since revenues were greatly decreased since trade was halted and the population that could be taxed

decreased considerably. In addition, the epidemic has had important religious and cultural consequences. The ability of nomadic Arab societies to move freely in sparsely populated lands also set the stage for the spread of Islam (Huremović, 2019: 14).

1.4. THE BLACK DEATH

The Black Death, which took place between 1347 and 1351, cost the lives of 30% of the European population. This first wave was followed by new waves over the years. The disease, which reached Europe by land and maritime route from Asia, continued at regular intervals until the 19th century and caused the death of a total of 200 million people. As in the “Justinian Plague”, the “yersinia pestis” bacterium is responsible for the disease. During the epidemic period, different measures such as quarantine and camps were tried to be taken to prevent the spread of the disease, since there was no known cure for the disease (Piret and Boivin, 2021: 3). But while preventing the spread of the disease has been somewhat successful, the disease has resurfaced in new waves in different cities. The re-emergence of the disease at certain intervals is explained by the fact that the bacterium somehow remained alive in reptiles or by new waves coming from Asia. The numbers given by Daniel Panzac in his book "La Peste dans l’Empire Ottoman" for different European cities in the 17th and 18th centuries due to "The Black Death" are given in Table 2 as follows.

Table 2: Deaths from the Black Death in European Cities (17th-18th Centuries)

City	Year	Population	Deaths from Plague	Death %
Lyon	1628	100,000	50,000	50
Milan	1630	130,000	60,000	46
Verona	1630	53,000	30,000	57
Venice	1631	141,000	46,000	33
Barcelona	1651	44,000	20,000	45
Naples	1656	300,000	150,000	50
Genoa	1657	100,000	60,000	60
Marseille	1720	100,000	50,000	50
Messina	1743	40,000	28,000	70

Source: Panzac, 1997: 185

This table shows us that although these European cities had the most developed health institutions at that time, half of their population was killed due to plague-related deaths during the 17th and 18th centuries. For example, the population of Italy decreased from 13 million 100 thousand to 11 million 400 thousand between 1600 and 1650. This situation led to changes in Christianity, or at least laid the groundwork for it. Martin Luther developed an understanding of communicating directly with God without the mediation of the useless and powerless church, and argued that unlike the Catholic Church, the plague killed people indiscriminately. The Catholic Church, on the other hand, declared Luther's hometown, Germany, the source of the plague. While the plague caused a change in Christianity in a sense, it also became an area where religious propaganda wars were waged (Özdemir, 2010: 26-27).

While opinions differ on the long-term economic effects of the "Black Death", the short-term effects are certain. With the death of the majority of the population, labor shortages arose and real wages increased. This meant very high purchasing power, consumption level and standard of living for the survivors.

However, different opinions should be mentioned in terms of the duration and effects of this plague. According to Clark (2016: 161), the high productivity and standard of living, achieved in England in 1450 had no lasting impact. Although high economic performance existed for survivors after the Black Death, productivity declined with the re-population after 1500, and high salaries were not supported by technological innovations. In fact, according to Clark, the economic situation would have been the same in 1600, even if the Black Death had never occurred and the dramatic population decline had never occurred.

Nevertheless, there are many scholars who argue that the Black Death had long-term and devastating effects. For example, Pamuk and Shatzmiller (2014: 221-223) argue that this situation cannot be explained by a simple population cycle. After the deaths caused by the Black Death, population recovery has been slow due to both recurrent epidemics and institutional changes and low fertility rates. Although real wages began to decline with the increase in population over time, it had long-term effects on the economic structure and economic agents.

In another article, Pamuk (2007: 311-313) made a comparative analysis of the European economies after the Black Death. Although Pamuk admits that there were institutional differences before the epidemic, he claims that with the epidemic, this difference widened in favor of northwestern Europe. In the new post-Black Death era, northwestern Europe, with its more robust and flexible institutions, quickly adapted to the changes, while southern Europe did not. As labor-saving technologies gained importance as a result of the labour scarcity and increasing cost of the labour, the economies of northwestern Europe were more successful than the south in producing these technologies and renewing their institutional structure. According to Pamuk, although technological innovations and salary increases in the 15th and 16th centuries were not as dramatic as after the Industrial Revolution, the main factor explaining why northwestern Europe was ahead of the south in the 17th century is the process of adaptation to new technologies after the Black Death. It can also be claimed that this situation paved the way for the pre-Industrial Revolution environment.

Besides its economic effects, the Black Death deeply affected the social order and relations. With the decrease in the labour force and the increase in real wages, the land became relatively worthless and feudal relations were shaken. While the bargaining power of the serfs increased, the feudal principalities began to weaken and eventually became one of the factors that played a role in the overthrow of the feudal system.

1.5. SMALLPOX

Smallpox is a highly contagious disease caused by the Variola virus that first appeared in America in 1492 and continues to this day. Although the roots of the disease go back to the Old World, the epidemic spread very quickly among the indigenous population, who were not immune to this disease, when the Europeans set foot in America. The epidemic spread rapidly in different parts of the American continent at different times, causing the death of most of the local population, it is thought to have cost the lives of 56 million people in total.

Diamond (2010: 270-271), in his famous work "Guns, Germs and Steel," stated that Eurasian microbes are far more deadly to the Native American people than guns and swords. It was thanks to this virus, that Cortes and 600 Spaniard soldiers conquered the Aztec Empire in 1520, or Pizarro and his 168 men conquered the Inca Empire in 1531. The epidemics that took place before these places were captured caused a great loss of population and destroyed the morale of the people. For example, in 1618, Mexico's population of 20 million declined to 1.6 million, mostly due to smallpox.

Likewise, Europeans who set foot on the continent 50 or 100 years after the discovery of Columbus in 1492 saw no resistance, only villages destroyed by the epidemic. For example, when Hernando de Soto embarked on his Mississippi expedition in 1540, it was the vanished villages he encountered. The expeditions of the French in the 17th century resulted in a similar way. The belief that North America is home to about 1 million natives has also proven wrong. As a result of later research, it is thought that approximately 20 million people lived when Europeans set foot on the continent. 95% of this population died due to other diseases that they were not immune to before, such as smallpox, measles, influenza, and typhus brought by Europeans. For instance, in 1837, a steamboat from St. Louis introduced smallpox to the Mandan tribe in the Great Plains, reducing a village's population from 2000 to fewer than 40 in just a few weeks (Diamond, 2010: 270-273).

1.6. THE THIRD CHOLERA PANDEMIC

Cholera, an acute and severe intestinal infection caused by the bacterium Vibrio cholerae, typically results in violent diarrhea. It led to epidemics in various parts of the world such as Japan in 1817, Moscow in 1826, Berlin in 1831, and Turkey in 1912-1913 when the Ottoman Empire was struggling with the Balkan Wars (Türkiye Bilimler Akademisi, 2020: 39). The primary loss during the Balkan Wars was due to epidemic diseases mainly cholera, which significantly contributed to the fall of the empire in World War I. Out of the 33,000 lives lost, 19,000 deaths were attributable to these widespread

diseases (Dağlar Macar, 2009: 244). However, out of seven cholera pandemics, the third one is definitely the deadliest.

The Third Cholera Pandemic is an epidemic that started in India and spread all over the world in a short notice, especially between 1846 and 1860. In a short time, the epidemic spread from India to Africa, Europe, North America and East Asia. Considering that the previous epidemics occurred only in the Old World or only in the New World, it is also important that it is the first epidemic in the worldwide in almost the same years. In the first years of the epidemic, 23,000 people in Russia and more than 15,000 people in Mecca died. In a short time, 52,000 people died in England and Wales between 1848 and 1849. In the same years, the epidemic spread from eastern Africa to the whole continent. In 1849, due to Irish immigrants, the epidemic killed 150,000 people in North America. In those same years, the epidemic was reaching the coast of South America. In the years when more than 236,000 deaths were reported in Spain, more deaths than this occurred in the lands of South America where the Spaniards landed. In the later years of the Third Cholera Pandemic, the epidemic moved eastward, severely affecting East Asian countries. It was responsible for the deaths of approximately 200,000 people in Tokyo (Ramamurthy et al., 2021: 111).

Unlike previous epidemics, cholera was not experienced intensely in a particular region, but less densely throughout the world. In addition, the era of modern states had begun when cholera occurred. Accordingly, cholera did not create profound social, economic, or political changes like previous epidemics. However, some economic consequences of cholera can be mentioned apart from the short-term labor shortage and the stagnation of trade due to quarantine measurements. The epidemic created a significant shift in the public expenditures, and the share of health expenditures increased. Also, since the epidemic was transmitted through the drinking water system, investments in this area also increased. Although short-term economic costs are high, it can be said that it produces healthier and more productive populations and provides economic benefits in the long run.

1.7. THE SPANISH FLU

"The Spanish Flu", which took place between 1918 and 1920, is undoubtedly one of the biggest epidemics in human history. The epidemic is responsible for the deaths of between 20 and 150 million people, according to estimates. It is also known for its ability to quickly lead to multiple organ failure and death, especially in young and healthy individuals. Although its name is Spanish Flu, the epidemic did not originate in Spain, nor is it most effective in Spain. The reason why it is named like this is because the time of the outbreak coincided with the First World War. During the war years, the epidemic could not be reported because there was no freedom of the press on both sides of the war, and Spain, which was neutral in the war, was the first country to report this because there was relatively more freedom of the press (Trilla et al., 2008: 668). The Spanish news agency, Agencia Fabra, cabled Reuters in London, "A strange form of disease of epidemic character has appeared in Madrid. The epidemic is of a mild nature, no deaths having been reported.", and this first message is the probable reason why this disease is called the "Spanish Flu" or the "Spanish Lady." (Davies, 2020: 59).

Unfortunately, it is not possible to understand the economic effects of the Spanish Flu during the WWI period. It is very difficult to separate the effects of these two events due to the war in almost every part of the world during the Spanish Flu. For example, it may be thought that the economic impact of the disease could be more severe due to the fact that it chose especially young and healthy individuals, but in the war also, young and healthy individuals lost their lives in the same way. On the other hand, studies have been carried out especially in the USA regarding the measures taken against the epidemic. The USA is a suitable example for this study, as there is no war on its territory, although it is a party to WWI. In addition, Non-Pharmaceutical Intervention (NPI) measures diversified for the first time in this epidemic, going beyond practices such as quarantine and camps.

For example, Barro (2020: 8-9) examined measures taken during the Spanish Flu, such as school closures, bans on public gatherings, and isolation. Although Barro admits that NPI implementations in this period were not successful enough, he claims that they failed not because they were useless, but because they were incompletely implemented.

For example, school closures lasted an average of 36 days, and practices such as quarantine took an average of 18 days. According to Barro, the length required for these applications to be successful is much more than a few weeks.

There are also studies on the long-term comparative economic effects of school closures in the USA. For example, Ager et al. (2020:16-17) examined the long-term performance of absentee students during the time of school closures. According to the 1940 census data, the author, who examined the long-term educational and market performance results of students, could not detect a significant difference in the performance of those who could not go to school in this period. In addition, no short or long term variation was found in the performance of students of different race, socio-economic group, or parental origin. On the other hand, when Almond (2006: 708) examined the long-term economic consequences of individuals caught in the womb, he encountered a different picture. Accordingly, although the effects were not immediately noticed, these individuals were adversely affected and exhibited poor long-term economic performances. According to Almond, public policies regarding health should be reviewed with this issue in mind. Therefore, the epidemic affects long-term economic performances even through unborn individuals.

1.8. THE ASIAN FLU

The Asian Flu was the last known major influenza epidemic caused by the H2N2 virus that emerged after the Second World War. The epidemic, which started in China in the winter of 1957, spread to the whole world in a short time by ship, plane and train. Due to the relatively low number of deaths, the measures taken and the interest in the disease were not very high. Nevertheless, the epidemic claimed the lives of more than 1 million people. So much so that even at the peak of the disease, there was no headlines about social distancing or the disease in the media, while the Sputnik satellite sent by the Soviet Union adorned the headlines. Overall, the government's position has not been much different. In the UK, the Ministry of Health has allowed it to maintain its normal course, rather than preventing the virus. Although it was not given much importance during the

epidemic, The Asian Flu resulted in the death of at least 1 million people, including 20,000 UK and 80,000 US citizens in total (Honigsbaum, 2020: 1824-1826).

There are also puzzling data about the economic consequences of this epidemic. In the 30-year period from the Second World War to the 1973 Oil Crisis, the largest recession the USA has experienced was the 1958 recession. The increase in health expenditures, the decline in trade volume and the decrease in labor productivity may have played a role here. However, Henderson et al. (2009: 7) states that when the epidemic peaked in the USA in 1957, the epidemic did not have a significant effect on economic performance. Nevertheless, as the economic recession occurred in 1958, there was no pandemic reported this time. However, studies show that even though there was no pandemic alarm in 1958, excess death numbers are much higher than usual. This implicates us that the epidemic continued to spread among the people without being named and was one of the factors of the 1958 recession, causing both deaths and productivity declines due to disease.

1.9. THE HIV/AIDS PANDEMIC

The HIV/AIDS, which has cost the lives of approximately 40 million people since its first diagnosis in 1981, continues to be an important health problem worldwide. As of the end of 2021, there are approximately 38.5 million people living with this virus, of which 25.6 million people, about two-thirds, are in Africa. In 2021 alone, there were 650,000 deaths from HIV, while 1.5 million people were newly infected. Although there is still no known definitive treatment, with the developments in the field of health, those who carry this virus can live a long and healthy life. World Health Organization (WHO) aims to end the HIV pandemic by 2030 (WHO, 2023). The HIV pandemic has had severe economic impacts, particularly in Sub-Saharan Africa where it has drastically reduced life expectancy and labor force participation. The epidemic has slowed economic growth, increased healthcare expenditure, and created a large population of orphans, straining social services.

CHAPTER TWO
LITERATURE REVIEW

2.1 STUDIES ON COVID-19

When Covid-19 started to make itself felt all over the world by increasing its impact in the spring of 2020, the economic effects of the measures taken to stop the virus were inevitable. Therefore, scholars working in the field of economics, as well as scientists working in the field of medicine, have started to work intensively on Covid-19. In the early days of Covid-19, studies in the literature were mostly based on predictions, models and assumptions. On the other hand, academic researches have been concentrated on the previous pandemics, especially the Spanish Flu, and parallels have been tried to be established, and policy recommendations have been made regarding the economic and social consequences of the epidemic. Undoubtedly, in the later stages of the epidemic, due to the formation of concrete figures related to both the disease and economic data, academic studies in this field have also settled on a more real basis. In this section, I will review the literature on the economic effects of Covid-19, which is still very young. In particular, data such as Covid-19 measurements, people's mobility, economic performance of countries, which have an important place in my own work, will be examined and how they are used in academic studies and what results are obtained.

In their study Akoğul and Filiz (2021) examined the number of cases with one-year mobility data between March 2020 and March 2021. They employed a negative binomial regression model to investigate the relationship between COVID-19 case numbers in Turkey and Google's community mobility data. The findings revealed that increases in mobility related to retail, recreation, markets, and pharmacies decreased case numbers, while increases in mobility in parks, public transport, workplaces, and residences led to a rise in cases. According to the authors, the findings support the view that human mobility, particularly within residences, contributes to virus transmission. Measures to control identified mobility types could aid in pandemic management.

Ünüvar and Aktaş, (2022), in their article examining the economic performance of countries in Turkey and the world, state that the United Kingdom is the worst affected country as of 2020, while they state that even though the virus originated from China, China was not adversely affected. In the case of Turkey, the impact of Covid-19 on the economy was quite dramatic initially. During the second quarter of 2020, a stringent lockdown led to a substantial contraction of the economy by 10.4%. However, Turkey managed to rebound in the third and fourth quarters, experiencing positive growth. In the second quarter of 2021, a significant growth of 21.7% was reported, a considerable improvement compared to the same period in the previous year. The macroeconomic indicators show that inflation rates in Turkey remained unaffected by the pandemic. On the other hand, trade data revealed that 2020, the year the pandemic hit hardest, saw the worst export figures compared to the years 2018, 2019, and 2021. The lockdown also led to a decline in employment, but with controlled easing of restrictions, employment rates have returned to their previous trajectory. The rise in unemployment rates due to the pandemic was relatively low, primarily because high unemployment rates already existed in Turkey since 2019 and before. Consequently, according to the authors, the advent of the pandemic in 2020 did not significantly alter this pre-existing trend, but it did not affect so much since the economic parameters were already not great, even before the pandemic.

Bošković et al. (2021) examined the sectoral-based effects of Covid-19. According to the article, the COVID-19 pandemic has significantly affected the economy of many countries. Services and industries predominantly oriented towards the international market were especially affected. International tourism is a typical example of a negative economic effect. The results achieved in 2020 show quite worrying trends. The authors state that the fall in international tourism by 73.9%, the estimated direct loss of 1.3 trillion dollars, confirms previous pessimistic views and even goes beyond that.

In their article, Spelta and Pagnottoni (2021) aimed to achieve economic results on a daily basis in the light of the mobility data provided by Facebook and Google. According to the authors, while decisions about public health are made in the light of data on the rate of spread of the virus, policy makers may ignore the economic dimension because economic data cannot be produced on a daily basis. Therefore, while the authors are aware

of possible limitations, they are able to make daily predictions regarding both the spread of the virus and the economic productions, in light of the mobility data provided by Google and Facebook. Thus, policy makers will be able to make decisions by taking into account the economy, as they can see the economic data instantly. In a sense, Spelta and Pagnottoni tried to generate instantaneous data on economic production and the spread of the epidemic in order to assist policy makers in their decision-making processes.

In their article, Camba and Camba (2020), compared the mobility data provided by Apple and Google with the number of new cases between February and September 2020 in the Philippines. The authors, while using paired correlation and robust least square regression, a weak positive and negative correlation was identified between new daily COVID-19 infections and both Apple and Google mobility indicators. According to the article, the authors compared different types of mobility data with the number of new cases. According to the findings, staying-at-home was the strongest measurement preventing the spread of the virus, subsequently followed by less transit stations, less public transport use, less amount of walking and less workplace presence. Only, less driving has no significant effect on the spread of virus.

Yılmazkuday (2021) also reached similar results in his article. Examining the data in 130 countries between February 15, 2020 and May 2, 2020, Yılmazkuday (2021) found that a weekly increase of 1% in residential place caused a decrease of 70 in the number of new cases per week and a decrease of 7 in deaths. Stating that the change in other mobility data also had significant effects, the author concluded that the most effective measurement was stay-at-home.

Nouvellet et al. (2021), in their article, they examined the spread rate of epidemic and mobility data in 52 countries where the Covid-19 epidemic is severe. The authors found a significant link between a decline in mobility and the rate at which the virus spreads, similar to what has been seen in the literature before. The authors state that the use of such a technology is pivotal due to the use of real-time data. Also, the authors claim that its usage may contribute to more accurate forecasting in the future.

Mandel and Veetil (2020) modeled the economic consequences of lockdowns in their work in the early days of the pandemic. Their research employs an agent-based model

to assess the economic cost of the COVID-19 lockdowns, and their preliminary estimates suggest a 9% reduction in global GDP, assuming an average lockdown duration of 50 days and this cost would rise with extended lockdowns.

Ke and Hsiao (2022) studied the economic effects of Hubei Province's lockdown policy during the COVID-19 pandemic, using an evaluation approach. According to their findings, although the measures taken in the Hubei region, which includes the city of Wuhan, the ground zero of the epidemic, had temporary economic effects, the economic structure remained unchanged. Hubei, which experienced a 37% loss in GDP in the first quarter of 2020, recovered quickly after the lockdown measures were lifted and managed to exceed 90% of its projections. According to the authors, with the effect of the right policies and support of the government, the decline in the economy of the region was temporary and the economy was back on track with the control of the virus. Briefly, their study indicates that while a strict lockdown can cause considerable economic loss during a pandemic, the loss can be temporary and controllable if the outbreak is quickly contained.

Fernández-Villaverde and Jones (2020), in their study, integrating GDP, unemployment, Google's COVID-19 Community Mobility Reports, and COVID-19 fatality data, they have explored the pandemic's macroeconomic effects. In their study of various countries and regions, the authors grouping countries in terms of GDP losses and deaths from COVID-19 and found a positive correlation between the two, not a trade-off relationship. In general, countries either performed well in both areas or failed in both, while only examples such as Sweden and California deviated from this trend. Although it is difficult to draw firm conclusions since it was in the first year of the epidemic, the authors argue that the way to stop the decline in GDP is to control the virus. They consider countries without any loss of GDP as outliers, such as Sweden, with high mortality rates.

Finally, I would like to refer to two articles that are not conclusive in terms of the long-term effects of Covid-19, but that need to be evaluated in terms of long-term effects. Agostinelli et al. (2020) addressing the possible long-term effects of school closures, Juhász et al. (2020) examines innovations in working life and its possible lasting effects. First, Agostinelli et al. (2020) states that the “great equalizers” role of schools is under

threat during the period of closures. According to the authors' findings, students in more disadvantaged areas have less chance of participating in remote education and cannot receive enough support from their parents because they have less chance of working from home. This situation greatly reduces the long-term success chances of students and the possibility of catching students in an advantageous areas. Juhasz et al. (2020), on the other hand, draws parallels between this period and the Industrial Revolution, and argue that while factory-based production was started at that time, reverse working from home could be adopted in this period. Stating that this is a cost-benefit calculation and that it may happen gradually, not all of a sudden, the authors claim that this new type of work may be beneficial for companies in many fields and may spread to other fields with a spillover effect.

CHAPTER THREE
DATA AND METHODOLOGY

3.1. DATA

In this thesis, the datasets of 35 OECD member countries were examined. As of 15 February 2020, when daily data began to be collected in the pandemic, only Iceland was excluded among the 36 member OECD countries as it did not have mobility data. In addition, Colombia and Costa Rica, which were admitted to membership during the pandemic, are not included in the research. Daily data on Covid-19 were taken for 35 countries for a period of 547 days, from February 15, 2020, when the pandemic began in OECD member countries, to August 14, 2021, when the vaccine became effective. With the vaccine being effective, it will not be a meaningful effort to compare data such as mobility, death numbers or stringency index with the pre-vaccine period. In addition, these data are aggregated quarterly for comparison with economic indicators, and aggregated for six quarters from the first quarter of 2020 to the second quarter of 2021. In the third quarter of 2021, Covid-19 measures have been eased considerably, especially for those who have been vaccinated.

Economic data is also taken for 35 OECD member countries. While taking the quarterly data, 12 quarters of time were taken from the first quarter of 2020 to the last quarter of 2022. The main purpose here is to see the effects of post-pandemic recovery or other effects that may occur after the pandemic. In the indicators where there is no quarterly data, it is aimed to determine the changes before and after the pandemic, albeit limited, by taking annual data.

The data sets used in this thesis were obtained from different sources. While data on government total debt, Gross Domestic Product (GDP) per capita, Consumer Price Index (CPI), and employment rate are obtained from the OECD, data on government spending are from the IMF, and data on the share of services, agriculture and industry in GDP are from the World Bank. In addition to the economic indicators, the mobility data

is obtained from Google, while all of the data on Covid-19 is from Our World in Data, which was founded by researchers at the University of Oxford.

When the economic data used in the analysis are examined, the government's total debt and government expenditure data are considered as the ratio of GDP. While CPI and GDP per capita numbers were calculated as an index, the year 2015 was accepted as 100. The employment rate is obtained by dividing the number of employees by the population of working age (15-64). Lastly, data on GDP components from the World Bank indicate the proportion of each sector in GDP.

In the following sections, the data used in the empirical analysis is explained in detail.

3.1.1. Mobility in Workplaces

Google has started sharing data on mobility since the early days of Covid-19 and stopped sharing them on October 15, 2022. By examining the mobility of the people who shared their location information, Google shared the variation of this mobility in six different areas according to base time, for each country and even for each region, province or district. The six main topics determined by Google are retail and recreation, groceries and pharmacies, parks, public transport stations, workplaces and residential. Table 3 shows in which places these headings measure the mobility. Google considered the dates January 3 - February 6, 2020 as the base time, and the median value for each day of the week on these dates was considered normal activity. The numbers used in the thesis show us the change in mobility compared to the day that is considered normal.

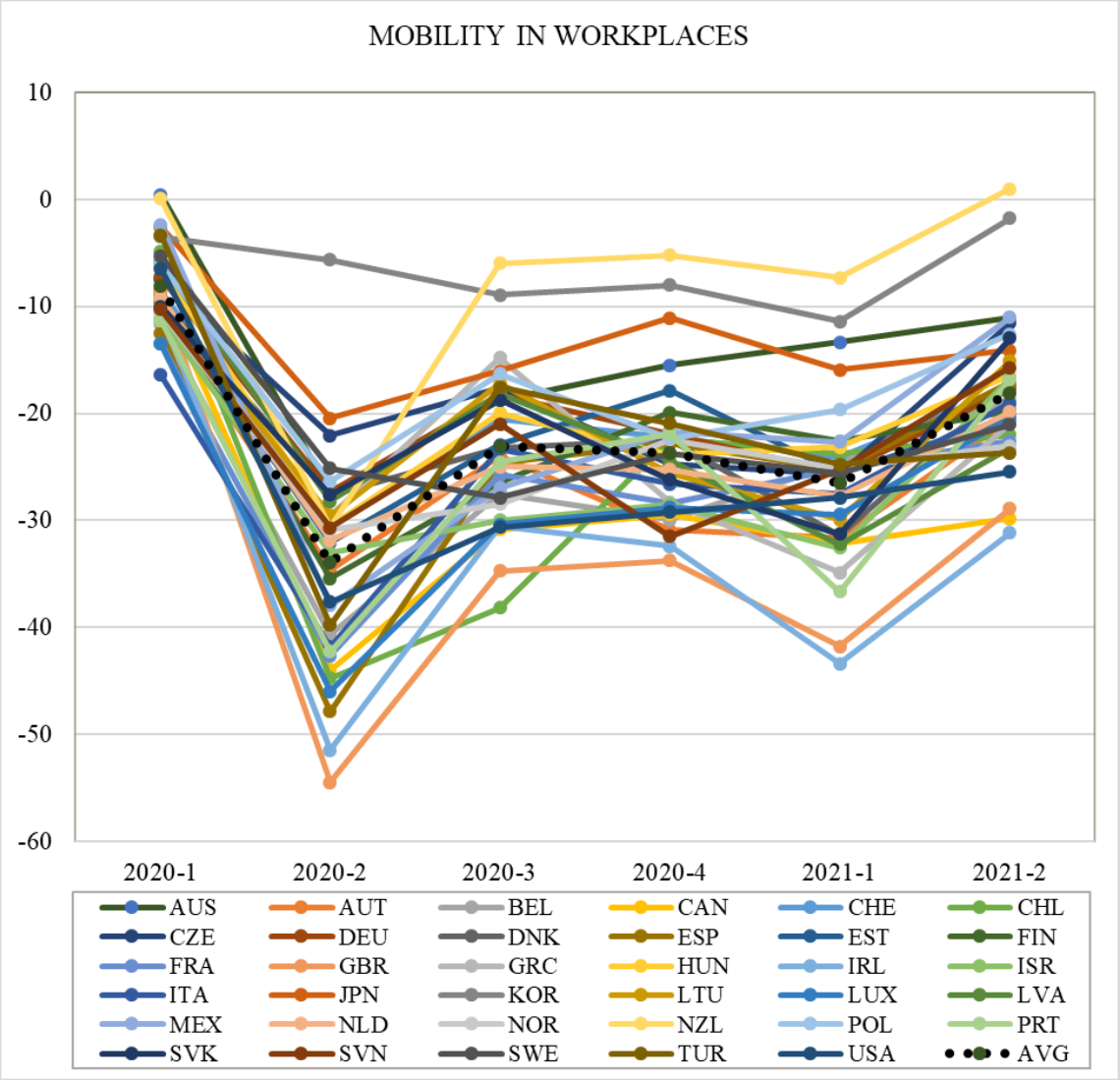
Table 3: Google Mobility Data Categories and Measured Locations

Google Mobility Categories	Examples of Measured Locations
Retail & Recreation	Restaurants, cafes, shopping centers, theme parks, museums, libraries, movie theaters
Grocery & Pharmacy	Grocery markets, food warehouses, farmers markets, specialty food shops, drug stores, pharmacies
Parks	National parks, public beaches, marinas, dog parks, plazas, public gardens
Transit Stations	Public transport hubs such as subway, bus, and train stations
Workplaces	Places of work
Residential	Places of residence

Source: Google Mobility Reports

Google mobility data in workplaces during the Covid-19 period is aggregated quarterly for 35 OECD member countries in Figure 1. This method was used to compare quarterly economic data with daily mobility data. Since the first 5 weeks of 2020 are accepted as base time by Google, it has been accepted that there is no change in mobility on those dates. Data are calculated from the first quarter of 2020 to the second quarter of 2021. Since the vaccine is effective by the third quarter of 2021, it would not be very meaningful to compare the analysis in this period with the pre-vaccine period.

Figure 1: Mobility in Workplaces



Source: Google Mobility Reports

When the Google mobility data in workplaces for 35 member countries are examined, it is seen that the period when the mobility in the workplaces decreased the most was the early stages of Covid-19, namely the second quarter of 2020. On average in 35 countries, workplace mobility decreased by 34% compared to base time. In both subsequent quarters of 2020, activity was 17% higher than in the second quarter of 2020. Even in the first quarter of 2021, when Covid-19 caused the most deaths in OECD

countries, workplace mobility was 11% higher than in the second quarter of 2020. Then, as we can clearly see in the employment and GDP data, the second quarter of 2020 was the time period that left the most economic impact. This is also supported by workplace mobility data.

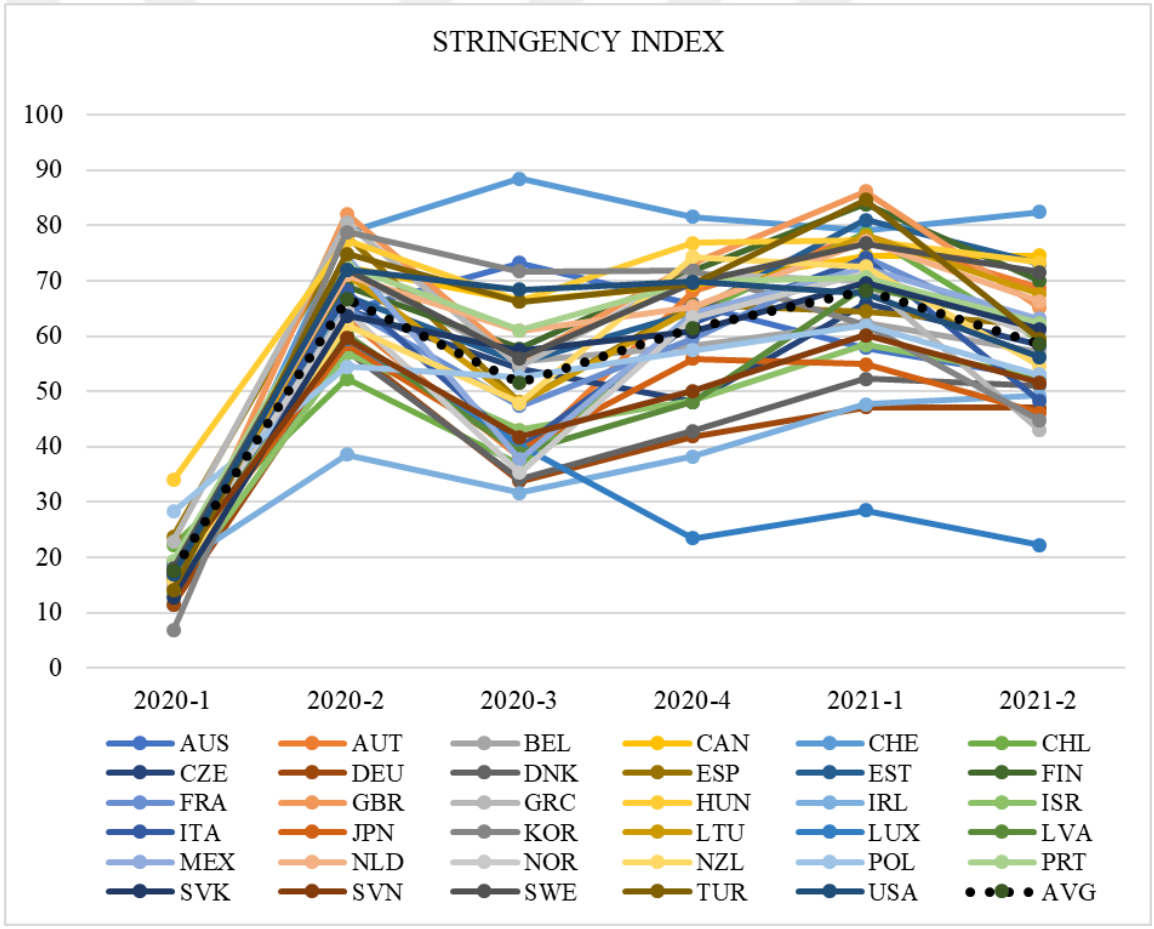
However, as can be seen from the Figure 1, although workplace mobility across countries acted similarly, there were also variations. While the period of minimum workplace mobility in 26 of 35 countries was the second quarter of 2020, while in 7 countries, it was the first quarter of 2021, when Covid-19 caused the most deaths in OECD countries. Exceptionally, in Slovenia in the last quarter of 2020, and in Sweden in the third quarter, mobility has reached its minimum. The result is as expected, as Sweden tried the herd immunity model in the beginning of the epidemic and then gave up on it to a certain extent. In Slovenia, in the last quarter of 2020, when deaths from Covid-19 peaked, the mobility results were very close to the second quarter of 2020. In general, it can be said that the second quarter of 2020, when the first shock was experienced, caused the greatest decrease in workplace mobility due to the effect of obscurity, although there were not many deaths.

3.1.2. The Stringency Index

The Stringency Index is part of The Oxford COVID-19 Government Response Tracker (OxCGRT) project, which measures how strict governments are implementing lockdown measures. Stringency Index mainly measures under the following nine headings; school closures, workplace closures, cancellation of public events, restrictions on public gatherings, closures of public transport, stay-at-home requirements, public information campaigns, restrictions on internal movements, and international travel controls. The Stringency Index gives a score between 0 and 100, taking these nine titles into account. The 100 is the strictest score and these index scores can vary daily according to changes in policy. It should also be noted that the Stringency Index does not take into account the effectiveness of the implemented policies, only the strictness of policies is measured (Hale et al., 2021).

The Stringency Index was also calculated by aggregating daily data into quarterly data. Calculated for the period from the first quarter of 2020 to the second quarter of 2021 for 35 OECD member countries. Since the Stringency Index results by the third quarter of 2021 are calculated by separating the vaccinated and unvaccinated, they are not included in the calculation as it does not allow comparison. The change in the Stringency Index is presented in Figure 2.

Figure 2: Stringency Index



Source: Mathieu et al. (2020)

The Stringency Index is unsurprisingly inversely similar to workplace mobility data, as it calculates constraints, as can be seen in the chart below. However, it is not possible to say that this data acts exactly the same as the mobility data. When we look at

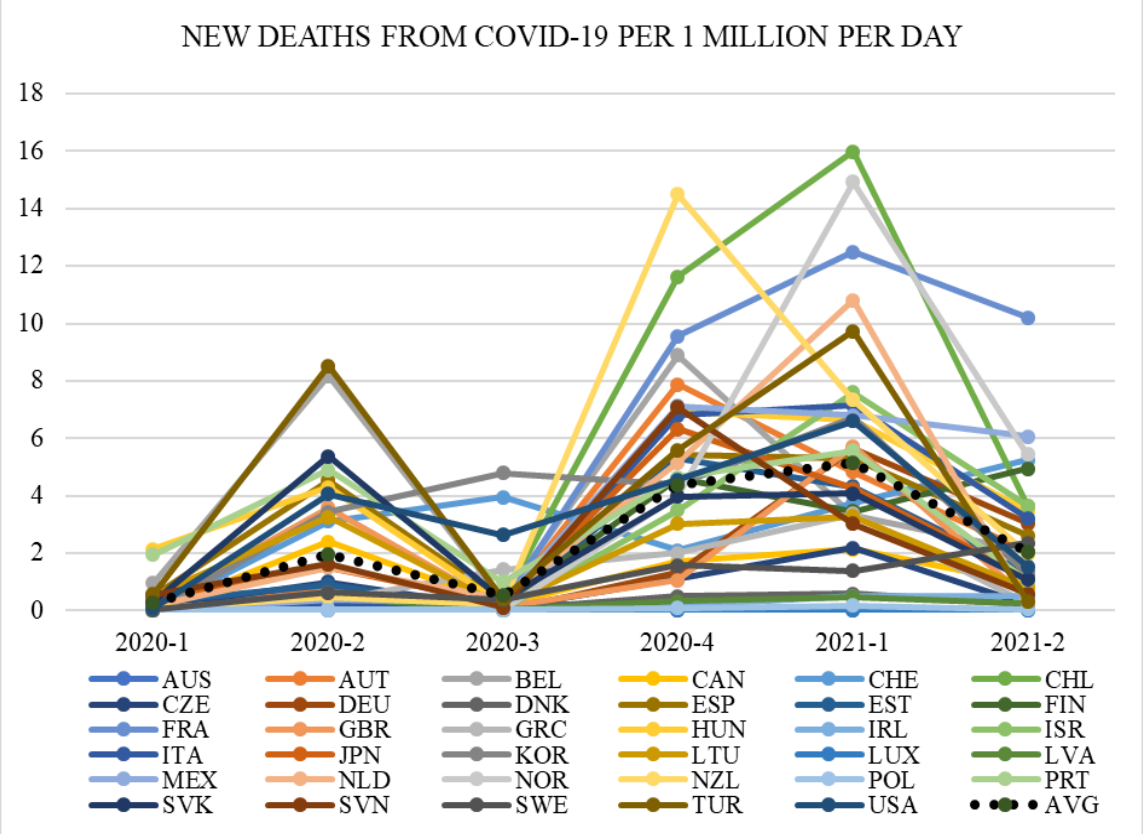
the averages, the quarter in which the Stringency Index reached its maximum was the first quarter of 2021, unlike mobility. While workplace mobility was 11% higher in the first quarter of 2021 compared to the second quarter of 2020, the index score was 2 points higher in the Stringency Index, unexpectedly. This shows us that, unlike in the early phases of Covid-19, governments tried to prevent the spread of Covid-19 through different restrictions instead of closing their workplaces. So much so that although there was more mobility in the workplaces, the scores of the restraint indexes were also higher. However, as we will see when the death numbers are examined, its successes are also controversial.

When the performances of countries are examined in the context of the Stringency Index, similar results are obtained. Of the 35 countries, 19 reached the maximum restriction in the first quarter of 2021, while only 11 countries reached the maximum in the second quarter of 2020. Two countries each reached a maximum in the third quarter of 2020 and in the second quarter of 2021, while only one country faced the most severe restriction in the last quarter of 2020. Putting aside the first quarter of 2020, when Covid-19 was not fully felt, it seems that the third quarter of 2020 was the period when the measures were the lowest in the context of the Stringency Index. So much so that 27 of 35 countries had the lowest index scores in this period. Subsequently, in parallel with the increasing deaths in the last quarter of 2020 and the first quarter of 2021, index scores entered a rapid increase, while a similar decrease in workplace mobility was not observed. In addition, while workplace mobility increased very rapidly in the second quarter of 2021, when deaths decreased, a more cautious approach is seen in the Stringency Index. While workplace mobility reached its maximum in 28 of 35 countries, only 6 countries reached its minimum value in the Stringency Index in the same period. This shows us that after the economic contraction in the second quarter of 2020, when states take Covid-19 measures, workplaces are the last thing that comes to mind, but when the measures are lifted, workplaces are the first to be considered.

3.1.3. New Deaths from Covid-19

When we examine the data from Covid-19, the number of new cases, the number of new deaths and the number of new hospitalizations indicate the number of people per 1 million, according to the population for each country. In the chart below, the daily new death numbers are aggregated and calculated as a quarter. The main purpose here, as in previous data, is to make comparisons with quarterly economic data. The numbers in the chart indicate the average new deaths from Covid-19 per 1 million people per day in the quarter indicated in each country. The change in new deaths from Covid-19 for 35 countries is depicted in Figure 3.

Figure 3: New Deaths from Covid-19 per 1 Million per Day

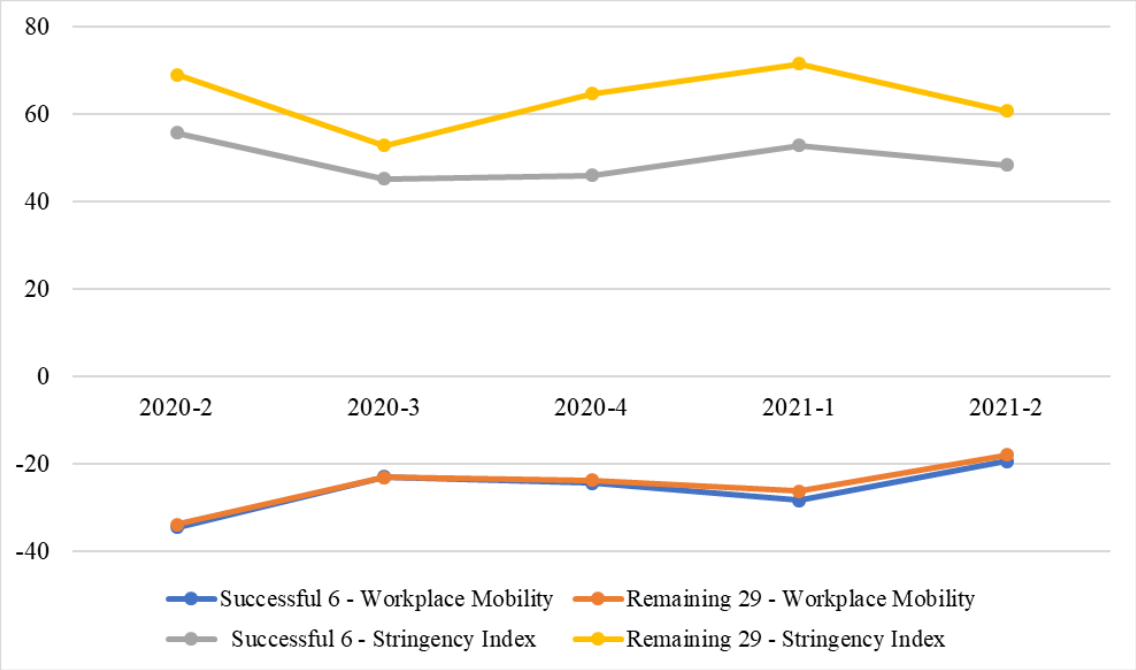


Source: Mathieu et al. (2020)

As can be seen in Figure 3, the new death numbers due to Covid-19 do not comply with the mobility and Stringency Index data and economic data. In the second quarter of 2020, when Covid-19 affected the economic and social life the most, it is actually far from reaching the peak in terms of new cases and deaths. So much so that the average daily number of new deaths is more than doubled in the last quarter of 2020 compared to the second quarter of 2020, and nearly tripled in the first quarter of 2021. In fact, even more deaths occurred in the second quarter of 2021, when the end of the epidemic began, the measures were eased, and life partially returned to normal. There were more deaths in the second quarter of 2020 than in the next period alone. From this point of view, the second quarter of 2020, which is the peak point in terms of the economic and social effects of the epidemic, is far from this point in terms of public health. From a medical standpoint, Covid-19 peaked at the end of 2020 and the beginning of 2021.

Similar results are obtained when the number of new deaths is analyzed by country. The number of new deaths peaked in the second quarter of 2020 in only 3 of 35 countries. It peaked in the first quarter of 2021 in 19 countries, in the last quarter of 2020 in 9 countries, and in the second quarter of 2021 in 3 countries. Although countries reach their peak in different periods, it cannot be said that Covid-19 has caused a similar death rate in every country. While there were 6 new deaths per 1 million population per day in the quarters where the Covid-19 was most severe in 35 countries, the average number of deaths in 6 countries did not exceed 0.6 in any quarter. These countries were Luxembourg (0.04), Poland (0.18), Australia (0.33), Latvia (0.48), Ireland (0.51) and Denmark (0.59), respectively. In the remaining 29 countries, on average, at least 2 people per 1 million died in at least one quarter. While these 6 countries, which differed from other countries in terms of death numbers, were slightly more restrictive than other countries in terms of workplace mobility, they experienced a serious divergence in the Stringency Index and left them much freer. The average of the performances of 6 successful countries and the average of the performances of the remaining 29 countries are shown in comparison in Figure 4.

Figure 4: Comparison in Terms of Mobility and Stringency Index

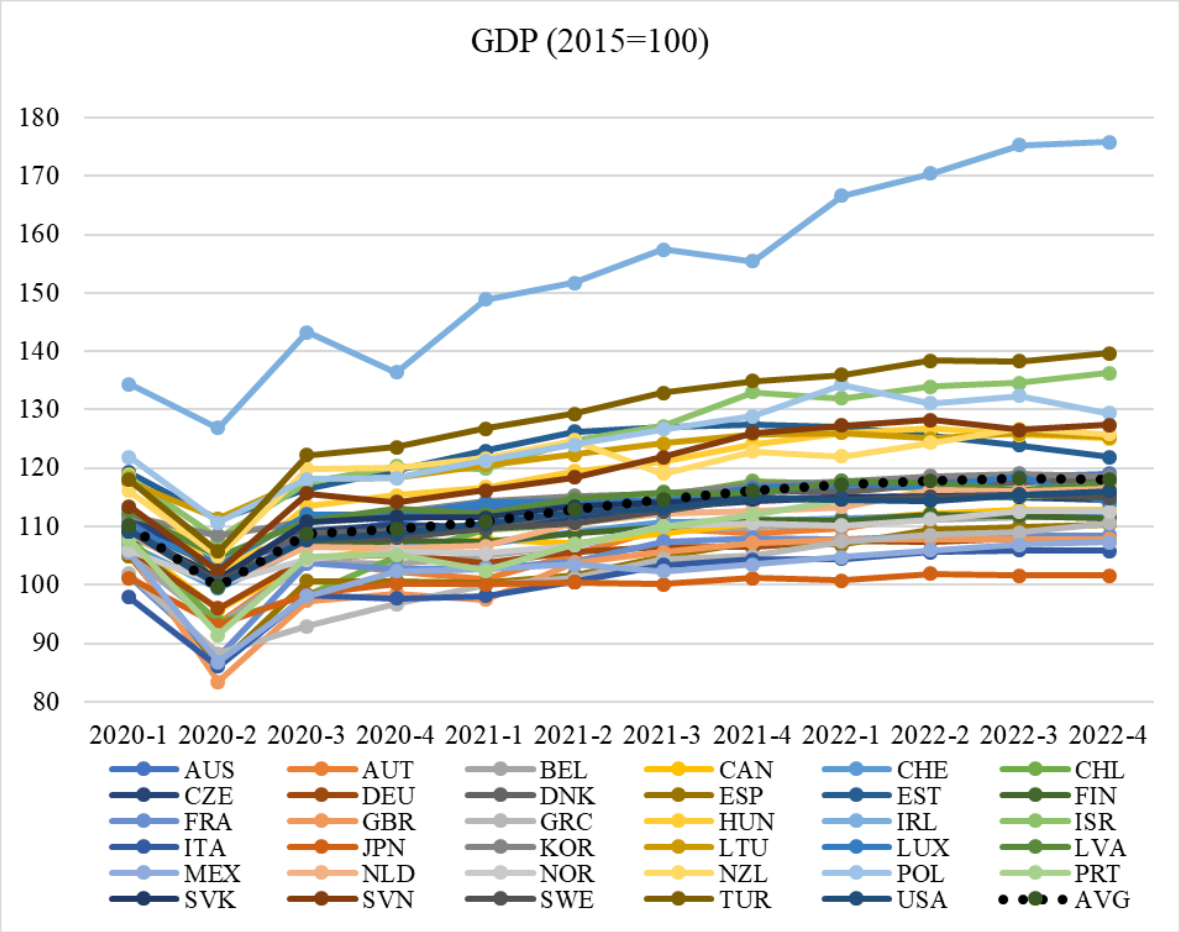


Source: Google Mobility Reports and Mathieu et al. (2020)

3.1.4. Real GDP per Capita

Real GDP per capita data is obtained from the OECD (2023a). In the data showing the Real GDP per capita, the year 2015 has been accepted as 100 for each country. Data for 35 countries from the first quarter of 2020, when the pandemic started, to the last quarter of 2022, are shown in Figure 5. As can be clearly seen in the chart, the second quarter of 2020 has been a period of economic collapse for every country in the chart. The average loss in GDP per capita was 9.7% during this period, when all countries, without exception, experienced a serious decline. So much so that the average GDP per capita, which was 110.3, declined to 99.6, falling below the 2015 level. However, the quarterly economic decline cannot be said to be permanent. OECD countries, which grew by 9.1% in the next quarter and reached 98.6% of GDP in the first quarter of 2020. They also slightly exceeded the pre-pandemic period in the first quarter of 2021.

Figure 5: GDP per Capita



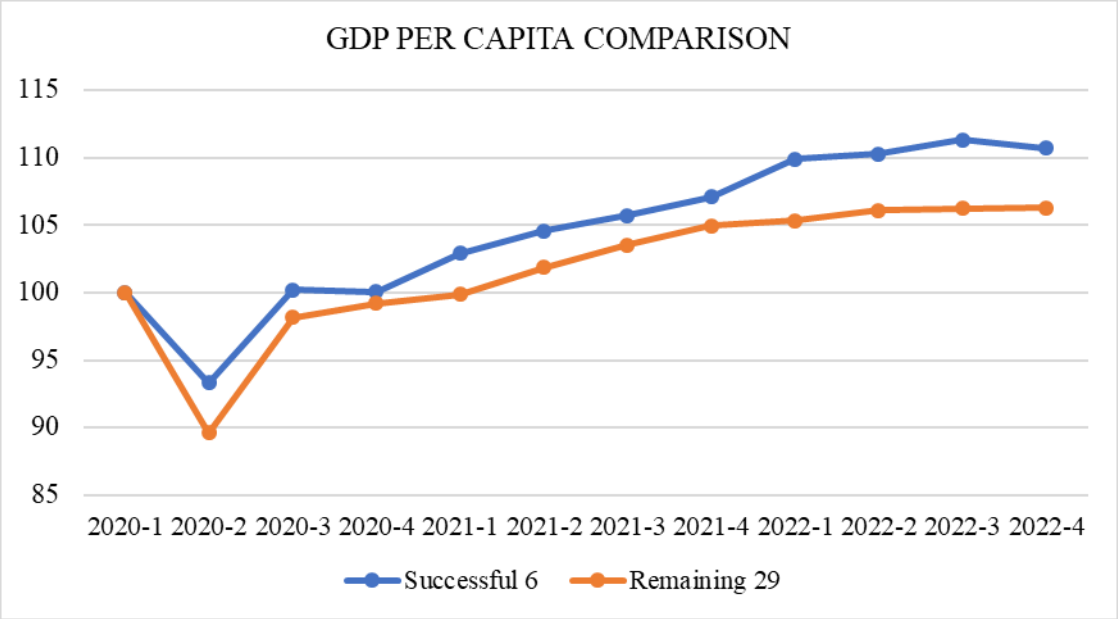
Source: OECD (2023a) - Quarterly GDP

The economic recovery in the times when the pandemic peaked and most people lost their lives is remarkable. This is actually confirmed by workplace mobility data. Nevertheless, with the easing of the pandemic, there was an average increase of 5.7% in the first quarter of 2022 compared to the same period of the previous year. As can be seen from the chart, there has been no long-term impact on countries in terms of GDP per capita. Countries have re-entered their growth paths.

When we look at the economic performances of individual countries, it is seen that the recovery is not at the same pace for every country. While 8 out of 35 countries reached their level in the first quarter of 2020 in the third quarter of 2020, 6 countries each reached

this level in the last quarter of 2020, the first quarter and the second quarter of 2021. When we come to the third quarter of 2021, when the effect of the pandemic has decreased, 5 more countries have reached the performance in the first quarter of 2020, and a total of 31 countries have reached the pre-pandemic period. Of the remaining countries, Spain, the United Kingdom and Japan also reached the pre-pandemic stage in 2021, while only Mexico reached it in the second quarter of 2022. In addition, Figure 6 compares 6 countries that performed well in terms of deaths from Covid-19 with the remaining 29 countries.

Figure 6: Comparison in Terms of GDP per Capita



Source: OECD (2023a) - Quarterly GDP

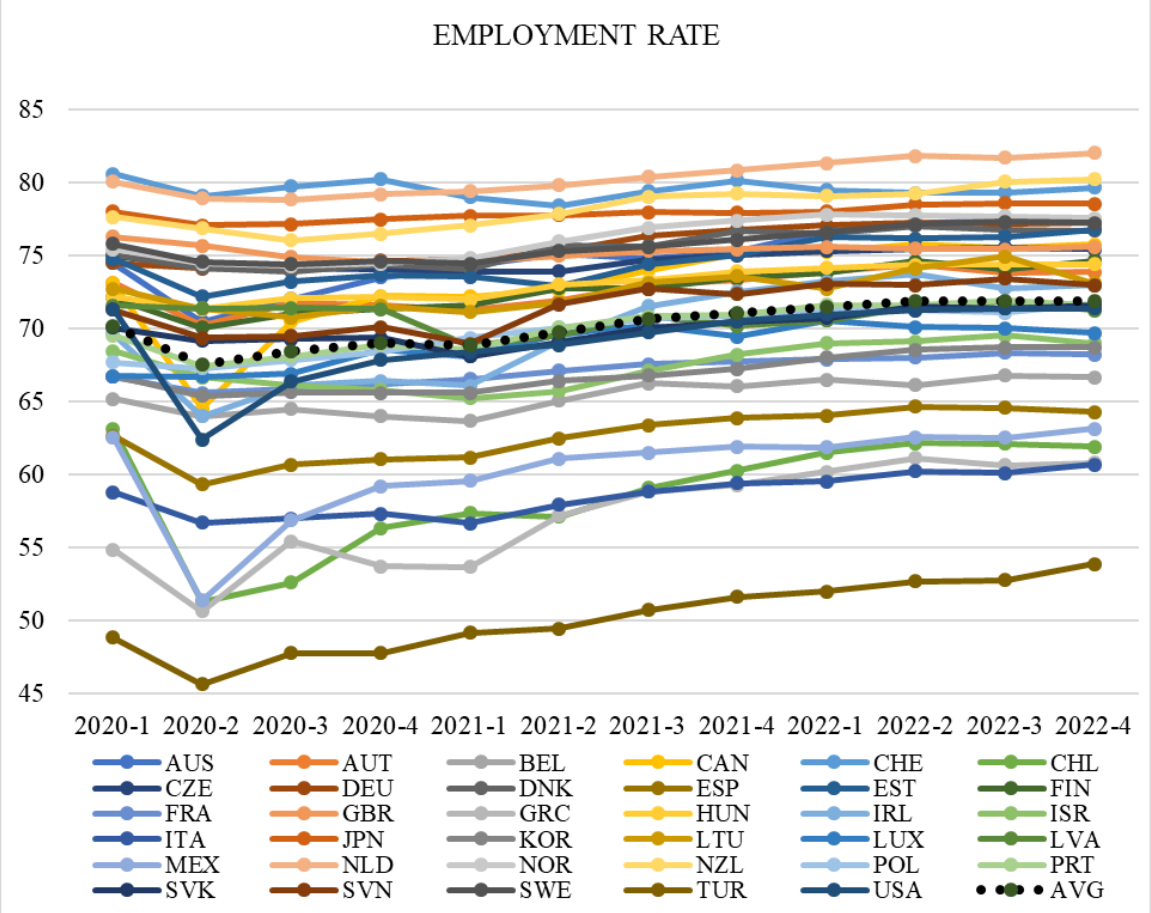
In the graph, the average GDP per capita of both groups is assumed to be 100 for the first quarter of 2020. In this context, the change in GDP per capita of the two groups during the pandemic has been shown comparatively. Here, constraints such as the limited number and timeframe of observations and Ireland's high-growth economic performance must be taken into account. Nevertheless, it can be said that 6 countries that have achieved

the pre-pandemic economic situation in the first three quarters, have performed better in terms of GDP compared to the others.

3.1.5. Employment Rate

Employment rate data is obtained from the OECD by dividing the number of employees by the working age population (OECD, 2023b) . The working age population is accepted as 15-64 by the OECD. Figure 7 shows the employment rate for 35 OECD countries.

Figure 7: Employment Rate



Source: OECD (2023b) – Employment Rate

As can be seen in the graph, employment data did not decrease as sharply as in other indicators. Employment has remained flat in the majority of countries. The average decrease in the employment rate was only 2.5 percentage points. It can be observed that this does not match with workplace mobility and GDP per capita data. The key element here is governments' efforts to maintain the employment rate through layoff bans and various incentives. However, despite the small decline compared to GDP per capita, it took longer to recover and only reached pre-pandemic levels in the third quarter of 2021, with the easing of the pandemic.

When the individual numbers of countries are considered, one group differentiates greatly from the others. The situation in all four members of the OECD in the Americas is very different from the other 31 countries. While the average employment rate decrease in four countries in the Americas was 10.2 points in the second quarter of 2020, this rate was 1.6 points on average in other countries. Respectively, while employment losses were 8.5 points in Canada, 9 points in the United States, 11.2 points in Mexico and 11.9 points in Chile, Ireland was the closest (5.6 points) among the remaining countries, other countries did not even exceed 4 points. The main difference here, of course, is not related to the devastating course of the pandemic in these countries or the restriction measures taken. This situation arises from the difference between the liberal economy-based state structures of the countries in the Americas and the social states in other regions. As a result of the layoff bans applied in other countries and the incentives provided, there were no significant decrease in the employment rate. Although this situation makes it difficult to reveal and compare the effects of Covid-19, it is important in terms of revealing the results of two different state structures.

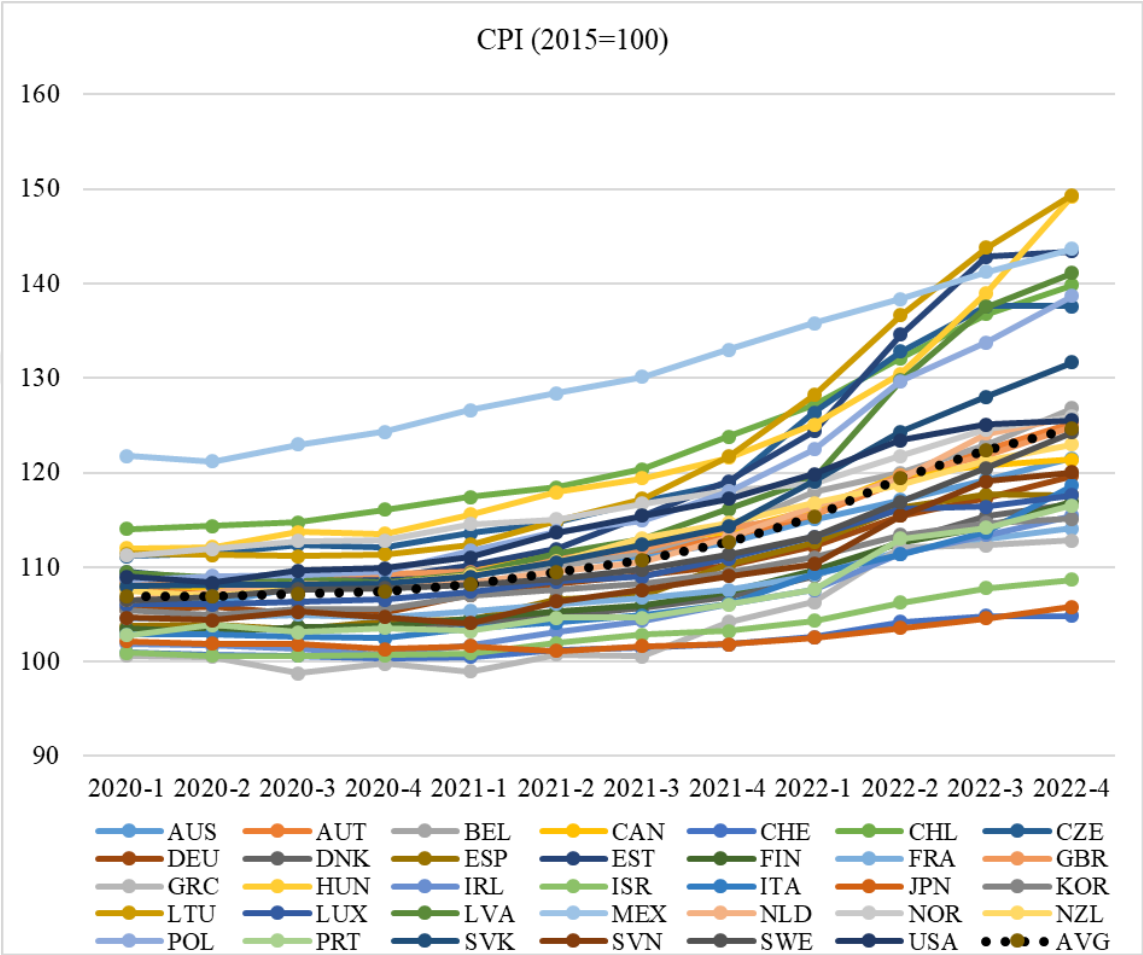
Moreover, the recovery in employment rates in both groups was much slower compared to GDP per capita. In the countries of the Americas, the pre-pandemic period was reached in the second quarter of 2022, while in the others it was reached in the third quarter of 2021, with the easing of the pandemic. There was a different situation than the numbers in GDP per capita, and employment could be saved after GDP. Even, full recovery is not possible in a few countries. In Switzerland, Chile and the United Kingdom, the numbers in the pre-pandemic period still could not be reached, and in five countries it

was reached only in 2022. After the decline in the second quarter of 2020, most of the OECD countries (20 out of 35) surpassed the pre-pandemic period in terms of GDP per capita within three quarters, while only four countries (Germany, Luxembourg, Poland and Turkey) achieved this in employment rate. Confusing performances were also displayed in the 6 successful countries where deaths from Covid-19 were low. Of these, Luxembourg and Poland quickly recovered in the first quarter after the pandemic, becoming the first countries among OECD members to achieve this. Although Australia and Denmark also recovered before the average time, Latvia's recovery reached the third quarter of 2022, much longer than the average span. Ireland, which experienced the largest decline in employment among non-American countries, recovered in average time. However, it should be reminded again that due to different economic structures and government policies, it is not easy to reach a generalization based on Covid-19 from this data.

3.1.6. Consumer Price Index (CPI)

Consumer Price Index (CPI) data is obtained from OECD (2023c). The quarterly data for 34 OECD member countries from the first quarter of 2020 to the last quarter of 2022 are shown in Figure 8. 2015 was accepted as the base year for each country and was considered as 100. Turkey is not included in the chart due to being an outlier. The inflationary environment that existed in Turkey before Covid-19 has accelerated especially recently and has caused the country to become an outlier in terms of CPI. When we examine the remaining 34 countries, on average, no significant change was observed during the pandemic period. Contrary to some past pandemics, there was no significant break in price stability and supply-demand balance. In the second quarter of 2020, when the pandemic started, there was a very small decrease of 0.1% on average, and then there were small increases until the second quarter of 2021. After the regression of the pandemic, CPI entered a rapid upward trend in all countries except Japan and Switzerland. Apart from the increased government expenditures and transfers during the pandemic period, many factors such as the Russia-Ukraine war can be mentioned.

Figure 8: Customer Price Index (CPI)



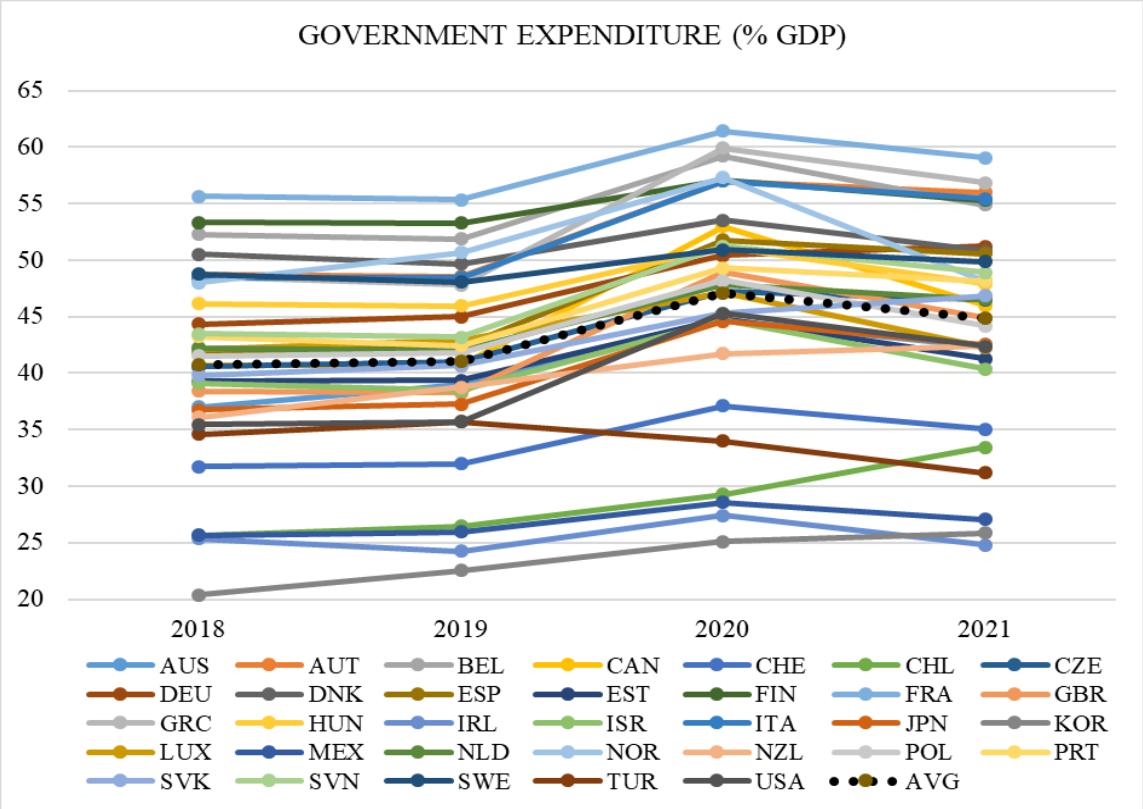
Source: OECD (2023c) – CPI

Of course, CPI is not only about Covid-19, but it is important that the CPI, which was stable during the pandemic, rose rapidly after the pandemic. It should also be noted that half of the countries (17 out of 34) in this figure use the same currency as they are in the Eurozone, and the economies of all countries here are closely related. So, although this of course does not mean the exact same results, it does mean that it is difficult for countries to diverge, and countries have naturally followed a similar path. Even Switzerland and Japan, which did not experience rapid increases, have increased in CPI considering their own standards.

3.1.7. Government Expenditure and General Government Debt

Government expenditure data is obtained from the IMF (2023). The data published annually covers four years from 2018 to 2021 and is intended to show the changes during the pandemic period. Since Lithuania and Latvia are not included in the data set, 33 OECD countries are included in the figure. In Figure 9, government spending is shown as a percentage of GDP.

Figure 9: Government Expenditure (% of GDP)



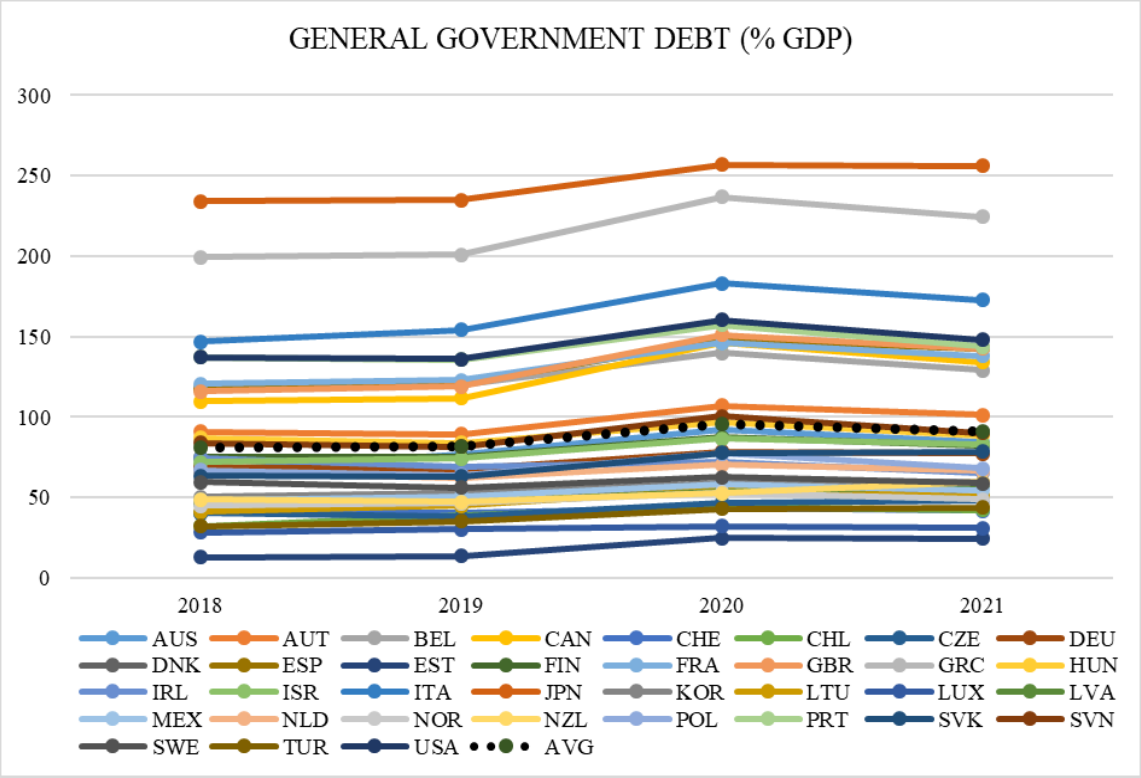
Source: IMF (2023)

While government spending remained flat in the two years before the pandemic, it increased rapidly in 32 of 33 countries in 2020, as expected. Only in Turkey, government expenditures decreased in 2020 compared to the previous year. In 2021, government spending declined in all countries, with a few exceptions. On average, government

spending increased from 41% in 2019 to 47% in 2020 and fell to 44.8% the following year. While the increases were quite small in Germany, South Korea, New Zealand and Slovakia, where government expenditures continued to increase in 2021, only Chile experienced a sharp increase in 2021. However, it should be noted that Chile is the OECD country with the most deaths from Covid-19 in a quarter relative to its population, and this was in the first quarter of 2021. (16 per 1 million per day) So, with few exceptions, all countries followed a similar path, experiencing a rapid rise in 2020 and a smaller decline in 2021 compared to this rise.

The general government debt dataset was taken from the OECD (2023d). Data covering the four-year period from 2018 to 2021 is published annually. It covers all of the 35 member countries in the study. In Figure 10, the general government debt of countries is shown as the ratio of GDP.

Figure 10: General Government Debt (% of GDP)



Source: OECD (2023d)

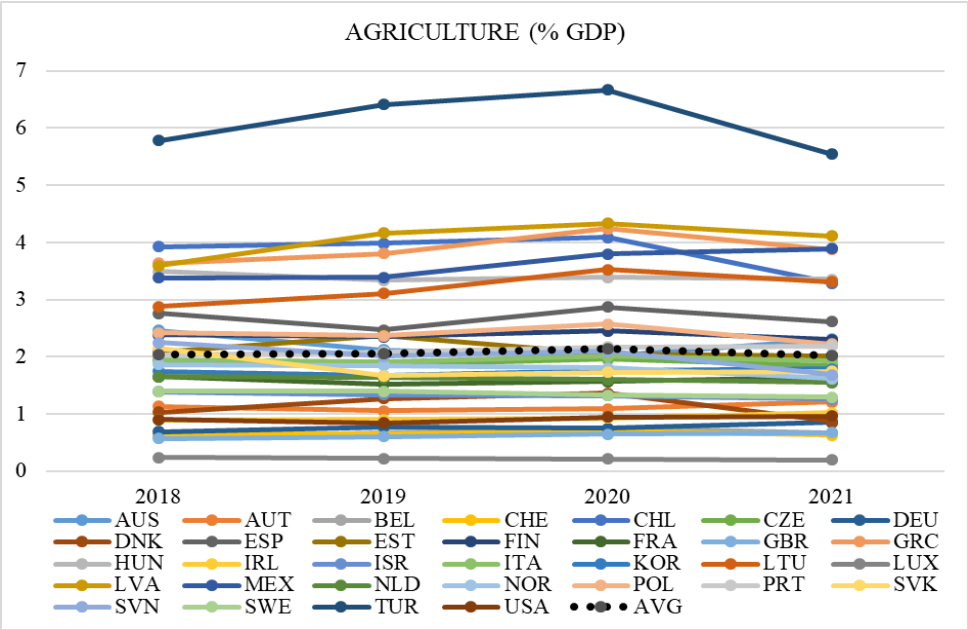
As expected, it shows a similar trend with the government expenditure figure. Debt, which remained flat between 2018 and 2019, increased from 81.4% to 96% in 2020, and declined to 91% the following year. On average, similar results were obtained with the government expenditure data. When countries are analyzed individually, general government debt increased in all 35 countries in 2020. In 2021, while 29 out of 35 countries experienced a decrease, only the Czech Republic, South Korea, Latvia, New Zealand, Slovakia and Turkey continued to increase. Of these countries, only New Zealand experienced a significant increase. New Zealand's government spending has increased steadily from 2018 to 2021, and again it should be noted that New Zealand is the OECD country with the most deaths from Covid-19 in a quarter in 2020. (14.5 per 1 million per day in the last quarter) As a result, a similar trend was observed for government expenditures in terms of general debt. With few exceptions, the debt situation of countries experienced a sharp rise in 2020 and a smaller decline in 2021.

3.1.8. GDP Components

Datasets on the components of GDP were obtained from the World Bank. There are 32 OECD member countries as Canada, Japan and New Zealand are missing in the dataset. It covers 4 years from 2018 to 2021. It has been used to detect the decline or rise that may occur in certain sectors of the economies during the pandemic period.

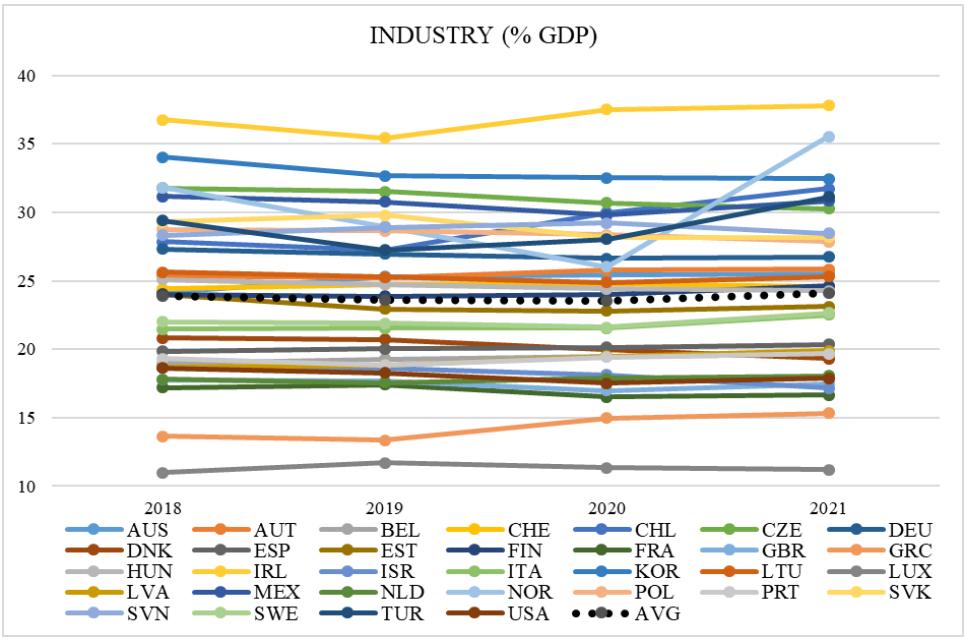
Figure 11, Figure 12 and Figure 13 show the shares of agriculture, industry, and services sectors in GDP for 32 countries, respectively.

Figure 11: Agriculture (% of GDP)



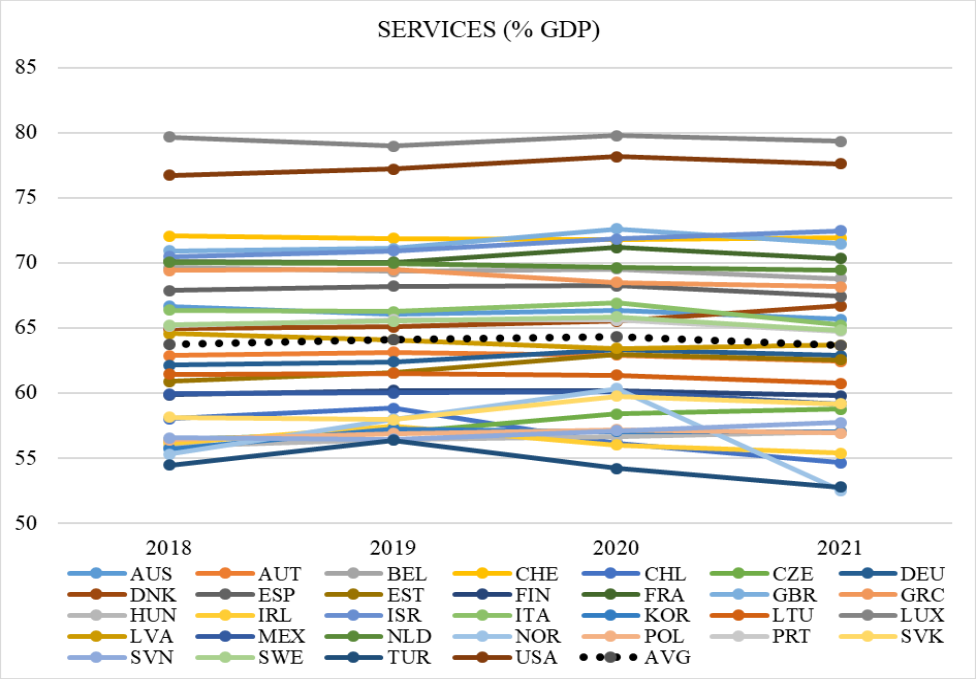
Source: The World Bank (2023a)

Figure 12: Industry (% of GDP)



Source: The World Bank (2023b)

Figure 13: Services (% of GDP)



Source: The World Bank (2023c)

On average, we cannot talk about a dramatic decline or rise for the industry and services sectors. Only Norway experienced a sharp decline in the services sector and a sharp rise in the industry sector in 2021. However, since there were drastic changes between GDP components in Norway before the pandemic, it would not be accurate to directly connect it to Covid-19. In addition, there has been no such activity in other countries. Only the average share in the agriculture sector has experienced an increase of 4.5%, from 2.05% in 2019 to 2.15% in 2020. However, this was not permanent, and the share of agriculture sector decreased to 2.01% in 2021. There was a 6.3% decrease compared to 2020 and a 2% decrease compared to the pre-pandemic period. However, considering the fluctuations in agricultural product prices in the world, this is not an abnormal situation and cannot be associated only with the pandemic. In short, leaving Norway aside, it will not be possible to talk about a temporary or permanent change in GDP components in OECD countries.

3.2. METHODOLOGY

In this section, the methodologies that will be used for the econometric analysis will be explained in detail. Firstly, the cross-sectional dependence analysis will be covered. Next, brief information about the unit root tests will be provided. Lastly, Dumitrescu-Hurlin panel causality test will be explained.

3.2.1. Cross-Sectional Dependence Analysis

The application of statistical methods that address cross-sectional dependence and heterogeneity holds significant importance in the analysis of panel data for uncovering valuable insights, making informed decisions, and ensuring the validity and robustness of our findings in panel data analysis. Cross-sectional dependence refers to the interdependence or correlation between the error terms across different units in the panel. If cross-sectional dependence exists, it can lead to biased and inefficient estimates, undermining the validity of the regression analysis. Thus, as the first step of empirical research, cross-sectional dependence is tested.

The Breusch-Pagan Lagrange Multipliers (LM) is named after Trevor S. Breusch and Adrian R. Pagan (1980), who proposed it as an extension of the classical Breusch-Pagan test for heteroscedasticity in time series models. This test is highly important in linear regression models, particularly when analyzing the panels and testing for cross-sectional dependence. The hypotheses of Breusch-Pagan (LM) are:

$$H_0: \rho_{ij} = \rho_{ji} = 0 \ (There\ is\ no\ cross - sectional\ dependence)$$
$$H_1: \rho_{ij} = \rho_{ji} \neq 0 \ (There\ is\ cross - sectional\ dependence)$$

Based on the given null hypothesis (H_0), Breusch and Pagan (1980) demonstrate that the Breusch-Pagan test statistic can be calculated using Equation 1.

$$LM = T \sum_{i=1}^{N-1} \sum_{j=i+1}^{N} \hat{\rho}_{ij}^2 \quad (1)$$

Where $\hat{\rho}_{ij}$ represents the pair-wise correlation of the units i and j by using Ordinary Least Square (OLS). In the context where N represents the sample size and T represents the time period, in the fixed N case and as T approaches infinity, the LM test can be employed to assess cross-sectional dependency in heterogeneous panels (Behera and Mishra, 2020: 248). Under the given H_0, LM is chi-square distributed with $N(N-1)/2$ degrees of freedom. However, it is important to note that the Breusch-Pagan LM test may not perform efficiently when the sample size (N) increases and when the number of time periods (T) is relatively small.

To come up with the weakness of LM, Paseran (2004) proposed a scaled version of the test which is shown in the Equation 2.

$$PES_{LM} = \sqrt{\frac{1}{N(N-1)} \sum_{i=1}^{N-1} \sum_{j=i+1}^{N} (T\hat{\rho}_{ij}^2 - 1)} \quad (2)$$

Under the null hypothesis (no cross-sectional dependency), the author showed that the PES_{LM} is asymptotically distributed as N(0,1) with $T \rightarrow \infty$ and $N \rightarrow \infty$. However, Paseran (2004) mentioned that when T is finite, the expected value of $(T\hat{\rho}_{ij}^2 - 1)$ does not converge to zero asymptotically. This lack of convergence leads to distortions. To address this issue, the author proposed an alternative test statistic based on the mean of cross-sectional correlation coefficients$(\hat{\rho}_{ij})$. The test statistic is given in the Equation 3.

$$PES_{CD} = \sqrt{\frac{2}{N(N-1)}} \sum_{i=1}^{N-1} \sum_{j=i+1}^{N} T_{ij}\hat{p}_{ij} \quad (3)$$

Like PES_{LM}, PES_{CD} is asymptotically distributed as N(0,1), under the null hypothesis with $T \rightarrow \infty$ and $N \rightarrow \infty$.

3.2.2. Unit Root Tests

The concept of stationarity is the stability of various statistical properties of a series, such as the mean, variance, and autocovariance, over time. It is essential to assess the stationarity of data before conducting regression analysis, as using non-stationary data can yield unreliable test outcomes. By ensuring the validity of results and avoiding issues like spurious regression, it becomes crucial to ascertain the stationarity of the data. To determine whether a series exhibits stationarity, unit root tests are one of the most widely adopted methods. These tests help establish the stationarity of time series data before undertaking any statistical analysis. Consequently, unit root tests play a fundamental role in examining the time-dependent stationarity of variables within the context of statistical analysis of time series data.

Studies on panel unit roots have been divided into two groups as the first and the second-generation tests, can be seen in Table 4. The first generation of tests assumes that cross-section units are independent from one another, whereas the second generation of panel unit root tests challenges this assumption by accommodating cross-sectional dependence (Zhang et al., 2020: 610).

Table 4: Panel Unit Root Tests

First Generation		**Second Generation**	
Nonstationary tests	**Stationarity tests**	**Nonstationary tests**	**Stationarity tests**
Im et al. (2003)	Hadri (2000)	Pesaran (2007)	Bai and Ng (2005)
Levin et al. (2002)		Moon and Perron,(2004)	Harris et al. (2005)
Choi (2001)		Bai and Ng (2004)	
Breitung (2000)		Chang (2002)	
Maddala and Wu (1999)			

Source: (Tugcu, 2018:258)

The majority of panel unit root tests have developed with a focus on the equation for the ADF unit root test which was developed by Dickey and Fuller (1979) (Lau et al., 2019: 107). Pesaran (2007) proposed an alternative approach to address the issue of cross section dependence. Instead of using deviations from estimated factors for unit root tests, they enhance the standard ADF regressions by including the cross-section averages of lagged levels and first-differences of individual series. The authors suggest that panel unit root tests can be based on the simple averages of individually cross-sectionally augmented ADF statistics (referred to as CADF). The CADF statistics is calculated by using Equation 4 and Equation 5 (Pesaran, 2007: 269).

$$\Delta y_{it} = a_i + b_i y_{i,t-1} + c_i \bar{y}_{t-1} + d_i \Delta \bar{y}_t + e_{it} \quad (4)$$

$$\Delta y_i = (\Delta y_{i1}, \Delta y_{i2}, \dots, \Delta y_{iT})', y_i, -1 = (y_{i0}, y_{i1}, \dots, y_i, T-1)' \quad (5)$$

The hypotheses for CADF unit root test are as follows:

$$H_0: b_i = 0 \qquad (not\ stationary)$$
$$H_0: b_i < 0 \qquad (stationary\ for\ at\ least\ one\ variable)$$

To calculate the test statistics of CADF, Equation 6 is used.

$$t_i(N,T) = \frac{\Delta y_i' \bar{M}_w y_{i,-1}}{\sqrt{\hat{\sigma}_i (y_{i,-1}' \bar{M}_{w y_{i,-1}})}} \quad (6)$$

After estimating the CADF regression for each cross-section, Pesaran (2007) suggests that the CIPS statistic can be calculated by taking the average of the t-statistics (Equation 7).

$$CIPS = \frac{1}{N} \sum_{i=1}^{N} CADF_i \quad (7)$$

To test the stationary hypotheses, the CADF and CIPS test statistics are compared with critical table values which were calculated by using Pesaran's Monte Carlo simulation. If the absolute values of the CADF and CIPS test statistics are greater than the critical table values, the null hypothesis is rejected.

3.3.3. Dumitrescu-Hurlin Panel Causality Test

The Granger causality test is a widely employed technique in applied econometric research to establish the presence and direction of causal connections between time-series variables. In a seminal article, Granger (1969) pioneered a methodology for analyzing the causal relationships between time series. Let's assume that x_t and y_t represent two stationary time series. The Equation 8 can be used to test whether x causes y.

$$y_t = \alpha + \sum_{k=1}^{K} \gamma_k y_{t-k} + \sum_{k=1}^{K} \beta_k x_{t-k} + \varepsilon_t \qquad with\ t = 1, \dots, T \quad (8)$$

In summary, if past values of x are statistically significant indicators of the present value of y, even when the influence of past values of y is considered, we can infer that x has a causal effect on y (Lopez and Weber, 2017:973). Using the equation, the causality can be investigated by applying an F test with the null hypothesis (there is no causality).

$$H_0: \beta_1 = \cdots = \beta_K = 0$$

An extension for Granger's causality is developed by Dumitrescu and Hurlin (2012) to detect causality in the panel data. The regression is given in the Equation 9.

$$y_{i,t} = \alpha_i + \sum_{k=1}^{K} \gamma_{ik} y_{i,t-k} + \sum_{k=1}^{K} \beta_{ik} x_{i,t-k} + \varepsilon_{i,t} \qquad \begin{matrix} with\ i = 1, \dots, N\ and \\ t = 1, \dots, T \end{matrix} \quad (9)$$

$x_{i,t}$ and $y_{i,t}$ are the observations of two stationary variables for individual i in period t. Individuals are permitted to have varying coefficients (indicated by the subscript i), but these coefficients are assumed to remain constant over time. The lag order K is assumed to be the same for all individuals, and the panel of data must have an equal number of observations for each individual (Lopez and Weber, 2017:973).

The hypothesis for Dumitrescu and Hurlin is given below:

$$\begin{aligned} &H_0: \beta_{i1} = \cdots = \beta_{iK} = 0 && \forall i = 1, \dots, N \\ &H_1: \beta_{i1} = \cdots = \beta_{iK} = 0 && \forall i = 1, \dots, N_1 \\ &\beta_{i1} \neq 0 \; or \; \dots or \; \beta_{iK} \neq 0 && \forall i = N_1 + 1, \dots N \end{aligned}$$

Here, H_0 states that there is no causal relationship between the variable y and the variable x for all units; H_1 states that there is a causal relationship between the variable y and the variable x for some units. To test the null hypothesis, the simple average of individual Wald statistics is used. This test statistics is given in the Equation 10.

$$\bar{W}_{N,T} = \frac{1}{N} \sum_{i=1}^{N} W_{i,T} \tag{10}$$

$W_{i,T}$ represents the individual Wald statistic for each cross-section, which corresponds to the individual test of $H_0: \beta_i = 0$. The authors have investigated the asymptotic distribution of the $\bar{W}_{N,T}$ under the null hypothesis when $T \to \infty$ and $N \to \infty$. The standardized test statistic, which has an asymptotic distribution, is represented by the following equation.

$$\bar{Z} = \sqrt{\frac{N}{2K}} \times (\bar{W} - K) \qquad \frac{d}{T, N \to \infty} \to \quad N(0,1) \tag{11}$$

If the calculated value of $\bar{Z}$ is greater than the critical values at the given significance level, the null hypothesis is rejected. Dumitrescu and Hurlin, (2012) introduced a panel Granger causality test that yields reliable outcomes even in panels

comprising a limited number of units. Moreover, it can be applied to panels characterized by varying lag lengths.

CHAPTER FOUR
EMPIRICAL ANALYSIS

Google has published its mobility data under six main headings: “Retail & Recreation”, “Grocery & Pharmacy”, “Parks”, “Transit Stations”, “Workplaces” and “Residential”. Since the biggest measure taken regarding Covid-19 is isolation, mobility data can be a good starting point to control the spread of the disease. However, regression analyzes show that activity in any of the titles, except Workplaces and Residential, is not significantly associated with new Covid-19 cases. In addition, although Residential has a significant relationship, since it actually means inactivity and isolation, there is a negative relationship with the number of new cases. There is only a positive significant relationship between “Workplaces” mobility and the number of new cases. This, while revealing the main issue of this study, pushed the direction of the study to the relationship between Covid-19 and economic life, causing it to focus here. In addition, the Stringency Index, which can mean the whole of the mobility data here, will also be included in the study as another variable by measuring the constraints in all areas of life, not only business life. In the following section, the application of panel data analysis will be conducted. Then the results obtained will be discussed.

4.1. APPLICATION

Causality analysis will be conducted on a panel dataset consisting of a total of 19145 observations covering 35 OECD member countries and a period of 547 days from February 15, 2020 to August 14, 2021. First of all, it will be determined whether there is a causal relationship between workplace mobility and then the Stringency Index with new cases. To detect this, first of all, it will be investigated whether there is a cross section dependency in the dataset. In this respect, three different tests were performed for two different data and the results are shown in Table 5.

Table 5: Cross-Sectional Dependency Analysis

	Breusch-Pagan Lagrange Multiplier Test	Pesaran's Lagrange Multiplier Test	Pesaran's Cross-sectional Dependence Test
Mobility in Workplaces	68246.45***	75352.607***	231.82***
Stringency Index	78161.84***	53441.89***	224.61***

Note: *** denotes significance at the 1% level.

Since the null hypothesis that assumes cross section independence was rejected for both variables in all three tests, it can be said that there is cross section dependency for both variables.

In order to determine whether the data are stationary or not, the Cross-sectionally Augmented Im-Pesaran-Shin (CIPS) test was applied to both the independent variables and the number of new cases as the dependent variable, and the results are shown in Table 6.

Table 6: Cross-Sectionally Augmented Im-Pesaran-Shin (CIPS) Test Results

	CIPS Score
New Cases	-3.516***
Mobility in Workplaces	-4.260***
Stringency Index	-3.019***

Note: ******* denotes significance at the 1% level.

The null hypothesis, which assumes the non-stationary situation, was rejected at all significance levels for all three variables, and it was revealed that the data were stationary. After that, the existence of causality can be determined by applying the Dumitrescu-Hurlin Panel

Causality Test. The results of this test for Z and Z tilde are also presented in Table 7 for two different panel data analysis.

Table 7: Dumitrescu-Hurlin Panel Causality Test Results

	Z Score	Z-Tilde Score
Mobility in Workplaces	27.3869***	26.597***
Stringency Index	2.3742**	2.2369**

Note: ******* denotes significance at the 1% level.

Note: ****** denotes significance at the 5% level.

The null hypothesis, which assumes that there is no Granger causality, is rejected at 5% significance for both variables, and 1% for mobility in workplaces only. This means that at 5% significance both mobility in workplaces and Stringency Index are Granger-cause to new cases, while at 1% significance it is only mobility in workplaces Granger-cause new cases. When estimating the number of new cases, in the context of Granger-causality, mobility in workplaces can be said to be a better estimator than the stringency index.

While this reveals one side of the relationship, it will also be necessary to examine how recent deaths affect economic life. For this, the effect of new death numbers on mobility in workplaces will be subjected to causality test. For this, first of all, cross section dependency analysis and then unit root test will be done, and finally it will be determined whether there is granger causality. The necessary tests for this analysis are set out in Table 8.

Table 8: Test Results for Cross-Sectional Dependency and Unit Root

Test Method	New Deaths
Breusch and Pagan Lagrangian Multiplier	57146.61***
Pesaran's Lagrange Multiplier	27322.06***
Pesaran's Cross-sectional Dependence	224.51***
Cross-sectionally Augmented IPS (CIPS)	-4.26***
Dumitrescu-Hurlin Panel Causality - Z Score	7.8888***
Dumitrescu-Hurlin Panel Causality - Z-Tilde	7.6077***

Note: *** denotes significance at the 1% level.

Similar to the results in the previous section, even at 1% significance level, cross section dependency was detected, the data was found to be stationary, and then it was revealed that the new death numbers does Granger-cause mobility in workplaces. This situation reveals the effect of the increase and decrease in the number of new deaths in the context of Granger causality on economic life. However, another issue that needs to be raised is whether the new death numbers cause a greater change in mobility or Stringency Index. For this, various lags were tried and regression analysis was performed in lag 10, where it had the greatest effect. The results of the regression analysis and the tests performed before it are presented in Table 9.

This table covers cases where the independent variable is new deaths and the dependent variable is Stringency Index and mobility in workplaces. Before performing the regression analysis, Hausman test was performed and it was revealed that the random effect model would give more accurate results for both datasets. According to the results in the table, although new deaths are effective on both variables, it can be said that the effect on the Stringency Index is much higher. While new deaths are a better descriptor

for changes in Stringency Index, it has a significant effect on mobility, but lacks explanatory power.

Table 9: Panel Regression Results for Stringency Index and Workplace Mobility

Variables	t-score	Coefficient	R Square	Hausman Test
Stringency Index	15.43***	1.802253	0.1845	0.6512
Workplace Mobility	-2.82***	-0.5263305	0.0078	0.211

Note: *** denotes significance at the 1% level.

4.2. DISCUSSION

While mobility in workplaces was used to explain economic life in the Covid-19 period, Stringency Index was used for social life. The rate of spread of Covid-19 is represented by New Cases and New Deaths. According to the 547-day daily data set for 35 OECD member countries, mobility in economic and social life causes the spread of the disease, while economic and social life-restricting measures are applied to reduce the spread of the disease. What is interesting at this point is that more serious measures are taken to cut down on social life instead of curbing economic life. However, there is no evidence to suggest that these measures are more beneficial, and moreover, in the early stages of the epidemic, during periods of uncertainty, measures related to economic life were taken more drastically. In order not to repeat the economic collapse experienced at that time, it can be thought that the measures related to the epidemic were shifted to less beneficial social life. In addition, as explained in the previous dataset, it should be kept in mind that while countries that have been successful in combating the epidemic reduce mobility in workplaces, albeit slightly, they are much freer in the context of social life. In the light of this information, social life was chosen as scapegoat in the fight against the virus and sacrificed regardless of whether it was beneficial or not in order not to touch the economic life.

CONCLUSION

In this study, primarily past epidemics from ancient times to the 20th century were examined together with their economic and social effects. The literature on Covid-19 has been reviewed and the main studies in this area have been discussed. Then, the daily data on Covid-19 were aggregated and made quarterly, thus visualizing these data, at the same time, it was presented on the same plane with the quarterly economic data, showing both ease of observation and how it moves with economic data.

In the empirical analysis part of the study, causality analysis was performed on the panel data set consisting of 35 countries and 547 days. Accordingly, mobility in workplaces data showing economic life and Stringency Index data showing socio-economic life cause Granger-causality in the spread of Covid-19. However, the rise in deaths due to Covid-19 also prompts government officials to take action, leading to another kind of causation. As the number of deaths increases, governments restrict social and economic life, leading to a related causality. However, it should be noted that although governments took freezing measures in the first period of Covid-19, they gave up these attitudes in the following periods and focused on measures that touched economic life less but affected social life. The effectiveness of these measures is highly doubtful.

First, no mobility data outside of Workplaces has been identified as having a significant impact on the spread of Covid-19. This applies to places where people spend time for leisure, to be outdoors, or even to public transport, where they attend for short periods of time, even indoors. Likewise, none of the markets, pharmacies, entertainment venues, parks and beaches appeared to play a role in the spread of Covid-19. Covid-19 is spreading through workplaces where people spend long and possibly indoor time. In addition, causality analysis seems to support these results. Mobility in workplaces data has been a much better predictor than the Stringency Index in terms of Granger causality.

In addition to these, the performances of six countries that have been very successful in combating Covid-19 and have experienced much fewer deaths compared to other countries support these results. These six countries, which restricted economic life slightly more, followed much more liberal policies in social life. It should also be kept in

mind that, since these countries did not experience many deaths, the governments chose not to take measures that restricted the social life, which does not make much sense. However, when other countries are examined, they felt the need to take action in different policies in order not to make such a restriction once again, as cutting down the economic life caused a great downturn in the economies of the countries as seen in the early stages of the epidemic.

In addition, evaluations were made on the graphs of quarterly and annual data. First of all, the Covid-19 data, aggregated quarterly for visualization purposes, shows that there is no serious restriction in mobility in workplaces in the last quarter of 2020 and the first quarter of 2021, when the most deaths occurred. Only the Stringency Index experienced a significant increase in this period, leaving even the first periods of Covid-19 behind. This is also included in the study as another data supporting the previous arguments. Also, supporting this, GDP per capita only experienced a serious decline in the second quarter of 2020, after which it quickly recovered and did not experience another economic contraction. The movements in the employment data were explained depending on the differences in the economic structures of the countries and it was evaluated that it would be misleading to accept it as an economic indicator. In addition to these, the increase in the expenditures and debt situations of governments during Covid-19 and the increasing CPI in the post-Covid-19 period were also evaluated, and finally, the change in GDP components seen in the literature were shown in the graphs, but it was revealed that there was no significant composition difference.

In this study, both analysis was made on graphs and causality analysis based on data from 35 countries and 547 days. It is important in terms of separating the measures taken as economic and social measures. Although an opportunity cost between the economy and the spread of the epidemic was mentioned in previous studies in the literature, the measures taken in this study were separated within themselves. It has been possible to conduct a study in this context on both the different mobility headlines of Google and the differences between the Stringency Index and workplaces mobility trends. According to the findings, it has been shown that the measures that restrict social life are less important than those that restrict economic life and that a deeper analysis is possible

by separating the measures within themselves. In addition, the length of the daily data and the use of 35 OECD countries with relatively robust data were another important issue, and robustness was tried to be increased by applying different methods during the causality analysis.

However, it should be acknowledged that this study has some limitations. First of all, we do not have the opportunity to observe and discuss the long-term economic effects that we can observe and discuss in other epidemics, or the effects that we can see in working life. It is not possible to say today whether the epidemic will have a long-term effect. In addition, it should be kept in mind that since Covid-19 is for a process that we have experienced very recently and that affects our lives, we may move away from objectivity while giving too much value to this epidemic and making evaluations about the epidemic. So much so that most of the evaluations and predictions made in the early days of the epidemic in the literature never materialized and they attributed too much meaning to the epidemic.

In addition to these, the time dimension of the epidemic also caused some limitations. Although there is no lack of observations in daily data, quarterly or annual economic data does not provide us with a long-term observation opportunity in terms of time. The epidemic made its effects felt mainly in the second quarter of 2020, and started to disappear from the third quarter of 2021 due to the effectiveness of the vaccine. Of course, it is not possible to talk about a total extinction, but in the context of economic and social effects, the epidemic has moved away from being a matter of daily life. Finally, it should be noted that only OECD member countries are included in this study. OECD member countries, which are preferred due to the robustness of the data on the epidemic, are countries at a certain level in economic terms and their economies are highly dependent on each other. Therefore, it may be misleading to draw a worldwide conclusion by considering the results of these countries.

Nevertheless, this study may be a source that further studies can benefit from in the light of new data to be generated in the future. With future studies, changes in the economic structure caused by Covid-19, if any, can be observed. For example, by observing the permanent increase in the rate of e-commerce or the permanent increases in

the working from home system, it can be determined that Covid-19 is a breaking point. In addition, by increasing the time dimension, it can be observed whether it has a long-term effect on economic indicators. In addition, it is possible to compare the effects of the epidemic in other parts of the world by increasing the number of countries or by studying different groups of countries.

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