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Economic effects of COVID-19 vaccination campaigns

The relationship between speed of vaccination campaigns and economic recovery across developed and developing countries

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1. INTRODUCTION

COVID-19 has created a global crisis in many aspects, including social, political, and economic. Such has been the impact of this unprecedented pandemic that the differences that already existed between developed and developing countries have come to grow and the gap that exists between these categories has become, in some sense, bigger than ever. The question on whether developing countries will be able to exit the vicious cycle they have entered with the presence of the corona virus remains to be seen. The purpose of this work results interesting as not only does it focus on a problem that has been going on for years, mainly since the independence of former colonies, but also because it relates this issue to a very present factor, COVID-19. Developing countries seem to be much more affected than developed countries when faced with big challenges, such as this pandemic, as they do not count with an established structure or order to provide solutions and minimize the adverse effects. This work pretends to show us the already existing differences between developed and developing nations and how these can be accentuated in events such as COVID-19 where the virus is non-discriminatory and affects all countries. Nonetheless, and despite the fact that this virus has been non-discriminatory in the sense that it has not only chosen rich or developed countries but has also been present in poorer and developing nations, it has undoubtedly affected developing countries much more than its counterparts. This work will analyze the existing differences between developed and developing economies through previously published articles, and it will relate these differences to COVID-19 and how the pandemic and the vaccination campaigns related to it have had an effect, or not, on the economic recovery of countries.

The reason for this work is, mainly, to understand that we still live in an unfair world where some countries lack what others possess in abundance. This will be depicted in terms of very recent events, such as COVID-19, and in particular the effect of economies on the effective development of vaccination campaigns. It will be interesting to observe how, depending on the background of certain countries in economic terms, the effectiveness of vaccination campaigns is affected in a positive or negative way. For instance, it is more likely that a country that is economically poor does not possess the sufficient resources to combat a pandemic such as COVID-19, and thus isn't able to provide the essential supplies to fight against COVID-19 and provide a long-term solution. Vaccination campaigns aren't easy to conduct because they require many actions that, if not

properly carried out, can hinder the effectiveness of the program. Developing countries encounter many difficulties when carrying out said programs because, to begin with, they do not own the required resources or services to effectively carry out vaccination campaigns, nor does their economy permit them to acquire said resources in order to do so. This is mentioned by Glatman-Freedman and Nichols (2012) who state that «historically, financial resources for vaccines in low-income countries have been limited and inconsistent» (2012, p. 295). Developed countries, on the other hand, possess the resources and services needed to carry out said campaigns, and we can even say that in some cases they possess such resources in abundance that they could provide it for another entire country, or several other countries in desperate need of them. Again, according to Glatman-Freedman and Nichols (2012) «a disease that may seem trivial in developed countries with ample resources, can result in devastating outcomes in developing countries where nutrition and access to healthcare are lacking» (2012, p. 297). This is also clearly expressed by the World Health Organization, which states that «in areas of high vaccine coverage, there have been massive reductions in serious disease, hospitalization, and death, but, globally, vaccine access is highly inequitable with coverage ranging from 1% to over 70%, depending largely on a country's wealth» (2021, p. 2). Not only this, but the vicious cycles where we can find some developing countries in prevents them further from taking a step forward to tackle the negative effects of COVID-19 and properly fight against it to protect their population and their country not only in economic terms, but also in the social and health department. This does not mean, however, that there is a direct relationship between the economic situation of a country and the effectiveness of vaccination campaigns. It is natural to think that a poor economic situation will hinder the effectiveness of vaccination programs, mainly due to a lack of resources and inability to obtain them. However, there are many other factors that play an important role in said campaigns. This can be proved by the fact that not all developed economies have achieved the same level of success in their vaccination campaigns.

This work looks to highlight, mainly, the relationship between the effectiveness or rapidity of COVID-19 vaccination campaigns and the economic recovery of both developed and developing countries. It will do so with a brief exposure of published articles that talk about the already existing differences between developed and developing economies, especially in matters of access to healthcare systems and to resources to carry out said campaigns. Although developing countries

do present a very big and profitable opportunity for developed economies – and according to Hickel (2017) using the information provided by research in the US-based Global Financial Integrity (GBI) and the Centre for Applied Research at the Norwegian School of Economics «the flow of money from rich countries to poor countries pales in comparison to the flow that runs in the other direction» (Hickel, 2017), they are also portrayed as a nuisance to developed economies when a crisis such as COVID-19 hits all countries at an international level. The monopolization of vaccines by high-income countries has already been given in the past, thus impeding developing countries to obtain equal access to the former. As mentioned by Abila, Dei-Tumi and others (2020) «a potential risk as observed during the 2009 influenza A/H1N1 pandemic is where high-income countries negotiated large advanced orders for the vaccine, leaving out low-income countries» (2020, p. 2). It also looks to highlight that the vicious cycle where developing economies may find themselves in, especially when faced with events such as COVID-19, can provoke a rebound effect on all other economies around the world, both developed and developing. It is important to understand that despite there being a drawn division between what we categorize as developed and developing economies, it is key that countries and international organizations look to collaborate altogether so that crises such as the coronavirus pandemic can be tackled more efficiently and more rapidly and thus avoid a bigger issue that could put the international community as a whole in danger.

2. STATE OF THE ISSUE

2.1. COVID-19 at a sanitary and economic level

For the purpose of this work, it is essential to understand the impact of coronavirus at a general level. As stated in Açıkgöz and Günay (2020) «the Coronavirus disease (Covid-19) is a new strain that was discovered in China in 2019 and has not been previously identified in humans and earth. As of 7 April 2020, the Covid-19 had infected more than 1.2 million people, killed more than 72 thousand and spread all over the world» (2020, p. 520). Whilst this data is from 2020, it clearly shows the massive effect that COVID-19 has had on our lives at a sanitary level, where millions of individuals have been affected by the same disease despite their different locations in the world. As of 2022 and according to the latest information provided by the World Health Organization (WHO) Dashboard in relation to COVID-19, there have been globally a total of 476,374,234 confirmed cases and a total of 6,108,976 deaths (World Health Organization, 2022). This updated

data provided by the World Health Organization shows how much more the coronavirus pandemic has taken a toll on people's lives at a sanitary level, causing several casualties and many more infections due to a completely unprecedented event. Although it is true that COVID-19 has mainly affected elder people and individuals with previous health conditions, it has also touched upon completely healthy individuals that have died or have suffered extreme adverse effects. This has not only been due to the unexpected rise and spread of this virus, but it has also been due to the fact that governments around the world have not been quick enough, or have not been prepared enough, in the implementation of appropriate health policies to tackle the adverse effects of the pandemic. This is mentioned by Balogun (2020) in his commentary *COVID-19: Lessons from a delayed response* where he states that «the inconsistent application of national health policies has been the bane of African nations» (2020, p. 20). Balogun (2020) also blames the lack of financial support in the effective implementation of restrictions and support towards the healthcare sector, as «the support would allow governments to quickly address immediate health care challenges and the rapidly escalating economic fallout» (2020, p. 20). What has started as a sanitary problem has become something much bigger, touching upon different sectors, such as the economic and social.

According to Gómez and Favorito (2020) «the COVID-19 pandemic represents a sanitary, social and economic challenge at a global level» (2020, p. 3). Moreover, this global spread of the virus has contributed to countries implementing very similar measures at the same time including lockdowns, restrictions, and isolations so as to reduce the rate of infection and the death rate, as well as to prevent the health system from collapsing completely (Gómez and Favorito, 2020, p. 3). Faced with the rapid spread of the coronavirus and the high rates of infection that countries were dealing with back in 2020, governments had to enforce very strict measures that meant affecting many sectors in their economies provoking a large crisis, both at the sanitary, social and economic level. COVID-19 has touched upon almost all areas of countries as it has been a virus that has caught all of us by surprise, for which governments in most countries have not been able to properly respond to protect their economies. The prioritization of health when faced with the coronavirus has led to enhanced restrictions and lockdowns where businesses have not been able to operate for a while nor have individuals been able to consume as much as they did before, except online or e-commerce. As shown by Gómez and Favorito (2020) «lockdown measures have led to the cessation of industrial and commercial production in most sectors, with job reductions and

layoffs» (2020, p. 3). Moreover, and according to Pak and others (2020) «significant economic impact has already occurred across the globe due to reduced productivity, loss of life, business closures, trade disruption, and decimation of the tourism industry» (2020, p. 1). Countries have been affected at a sanitary, social and economic level as a result of COVID-19, but it is also important to take into account whether this effect has been bigger or smaller depending on the economies they were dealing with previous to the outburst of the virus.

2.2. The economic status of countries and COVID-19

The coronavirus pandemic has indeed impacted communities at an international level, and not only has it provoked a global health problem, but it has also greatly impacted economies, and according to Gupta and others (2020) «experts predicted that COVID-19 will lower global gross domestic product by one-half a percentage point for 2020 (from 2.9% to 2.4%) » (2020, p. 1). This means that what happens in one place can have profound consequences on other parts of the world, and therefore countries should be aware of the implications of this virus and on the importance of helping one another to overcome an issue that affects the international community. Despite the division of categories between developed and developing countries, not even this distinction has caused differences as to where the virus chooses to spread or not, which again shows the importance of international cooperation in tackling global issues as it is the easiest solution to overcoming the repercussions that something as a deadly virus may have on everyone and everything. Although the coronavirus has not and continues to not discriminate against where it spreads and who gets infected by it, perhaps another question that should be asked is whether the previous economic status of countries has had an impact on the rate of spread of COVID-19, the infection rates, and the death rates. Moreover, how the economic status of countries may have affected the effective carrying out of vaccination campaigns to fight against COVID-19.

Developed countries have registered more effective responses in tackling the consequences of COVID-19 than developing countries have, mainly due to the availability of resources in their nation to do so and their ability to provide for the majority of the population in tackling the numerous effects of COVID-19. Despite globalization and the need for a collective response in fighting against global issues and threats such as has been and still is the coronavirus pandemic, some countries have been able to face the latter much better than others. Developed economies

have been able to better face the consequences of COVID-19 due to stronger health systems with the ability to fight against these types of diseases, however, developing economies with rather vulnerable health systems have not been able to tackle the adverse effects of the pandemic as well as the former, especially since their health systems are rather weak and thus not prepared to encounter a pandemic as big as COVID-19 has been and continues to be. According to Pak, Adegboye and others (2020) «although the majority of developed countries, predominantly Europe and North America, have strong real-time surveillance and health systems to manage infectious disease spread, improvements in public health capacity in low-income and high-risk countries – including human and animal surveillance, workforce preparedness, and strengthening laboratory resources – need to be supported by using national resources supplemented with international donor funding» (2020, p. 1). The weakness of health systems in developing nations not only has impacted their ability to tackle the negative effects of the pandemic but has also prevented them from effectively carrying out vaccination campaigns to obtain the so-called *herd immunity*. The need for international cooperation in this context is essential due to inequitable access to the necessary resources to fight against a pandemic that has affected us all equally. This same article written by Pak, Adegboye and others (2020) highlights the significance of this and mentions the Coalition for Epidemic Preparedness Innovations (CEPI) as a «global partnership launched in 2017, which has tracked efforts in COVID-19 vaccine development activity and is advocating for strong international cooperation to ensure that vaccines, when developed, will be manufactured in sufficient quantities and that equitable access will be provided to all nations regardless of ability to pay» (2020, p. 2).

There are many conditions that have made countries vulnerable to the effects of the coronavirus pandemic. Whilst it is a fact that a global economic contraction has taken place as a result of the virus and the impact of the latter in all countries, some countries have been more vulnerable due to different reasons or factors that may include restrictions and lockdowns, dependence on certain factors that have been deeply affected by COVID-19 such as tourism and trade, or pre-existing conditions at an economic, social, and political level. For instance, and according to Tandon, Roubal and others (2020) «some countries in the Asia and Pacific region are far more vulnerable to the economic contagion from COVID-19 than others» (2020, p. 3). This is mainly due to the economic problems countries in these regions may be facing, and according to the same article,

two economic vulnerabilities that are key in the context we are living in today are «the degree of external integration with the global economy (e.g., dependence on commodity and other exports, tourism, foreign investments, etcetera) and the degree to which countries are fiscally vulnerable (e.g., have low revenues, high debt levels, high inflation, etcetera) » (2020, p. 3). According to World Bank, several countries in the Asia and Pacific region have been affected by the consequences that have come as a result of COVID-19, «countries such as Cambodia, Fiji, Maldives, Thailand and several PA countries – all with tourism revenues greater than 10 percent GDP in recent years – are facing challenges. Levels of external debt (both public and private) are high in Lao People’s Democratic Republic, Mongolia, and Papua New Guinea. Large balance of payment deficits – that is, countries that are importing goods, services, and capital more than they are exporting – increase vulnerabilities for Cambodia, Fiji, Lao People’s Democratic Republic, and Mongolia. Overall, countries with the highest levels of external vulnerability across several of the abovementioned dimensions include Cambodia, Fiji, Mongolia, Solomon Islands, and Thailand» (Tandon, Roubal & others, 2020, p. 3). The levels of health investment in these regions also varies; most countries in these regions find themselves below the established benchmark in health spending, which is below 5% of their national GDP, and the funds that they get to invest in the health sector come mainly from external sources such as external financing and Out of Pocket (OOP) financing as well (Tandon, Roubal & others, 2020, p. 3). The already pre-existing vulnerabilities in specific regions of the world, particularly countries in Asia and the Pacific region as the document mentions, have seen themselves affected further by the presence of COVID-19 as well as by the implementation of strict measurements to fight against it. Despite this low financing in the health sector, the article states that efforts have been made to progress towards improved health systems with enhanced access to the necessary funds and countries such as Afghanistan, Bangladesh and Nepal have progressed on this field. The problem is that COVID-19 has stopped the progress made in these regions due to the adverse effects it has come with, and the responses of governments in trying to handle it; lockdowns, multiple restrictions, insufficient funds, etcetera.

2.3. Developing countries and prospects against COVID-19

Poverty famously characterizes many developing countries as it is a factor that hampers their development and their ability of shifting categories, that is, from a developing to a developed country. The measures that have been taking place before the development of effective vaccines

against COVID-19 involved lockdowns and restrictions including stay-at-home policies, which may not have affected countries around the world equally. According to Bargain and Aminjonov (2020) «unlike richer parts of the world, the effectiveness and socio-economic consequences of stringent confinement policies are largely being questioned in the context of low-income countries» (2020, p. 2). Poor countries are characterized by a population that, in order to receive some type of income in their households, provide physical work or manual labor as they have not been educated in other fields to provide any other type of service. This, in turn, means that it is much harder for the population in these developing countries to maintain the restrictions established by governments and international organizations as they require this type of labor under any circumstance. So not only may the economic status of a country affect the effective development of vaccination campaigns, but it also affects the ability of people to follow the restrictions imposed. According to the article written by the previously mentioned authors Bargain and Aminjonov (2020) «unless proper safety nets are ensured, poor people in developing countries cannot afford to stay at home and to follow confinement policies simply due to the urgency to feed themselves and their families» (2020, p. 2). This same article talks about the relationship that exists between low-income regions and work mobility, where, despite the announcement in March 2020 from governments and international organizations calling for tougher restrictions and confinement, low-income countries did not comply as much due to the danger that this could mean for them. Developing countries are more vulnerable to such drastic changes, especially when most of the population in these regions work to meet, in most cases, essential needs and services, and look for any type of income to obtain access to basic and essential services as well as food and water. It is therefore very important that governments really do contribute to the measures needed to tackle COVID-19, and if vaccination campaigns cannot yet be carried out due to different reasons, they must «accompany stringent lockdown policies with appropriate support in the form of combined healthcare efforts and consumption support, either through transfers in cash if food markets are working or in kind if they are not» (2020, p. 14).

Whilst developing countries can find more difficulties following the restrictions mentioned above in order to prevent further infections and the consequences that come with them, vaccines and, more specifically, vaccination programs can help countries remove the restrictions more rapidly by achieving *herd immunity*. This is explained by Fu, Jin & others (2022) where they mention that

«as the COVID-19 spreads across the world, many nations impose lockdown measures at the early stage of the pandemic to prevent the spread of the disease. Controversy surrounds lockdown as it is a choice between economic freedom and public health. The ultimate solution to a pandemic is to vaccinate a massive population to achieve herd immunity» (2022, p. 1). COVID-19 is a pandemic with a deadly virus that concerns the worldwide population and thus requires mass vaccination in order to put an effective stop to it. According to Gianfredi, Pennisi and others (2021) the main objective of mass vaccination is «to accelerate disease control through a rapid increase in vaccination coverage, achieving immunity levels essential to meet international goals for mortality reduction, and eventually allowing the ease of NPI», also known as non-pharmaceutical interventions (2021, p. 2). It is therefore very important that all countries around the world attempt to comply not only with the regulations developed to reduce infections and death toll but also with the vaccination procedures to obtain group immunity and put a stop to coronavirus for future generations as well. The time and costs of developing new vaccines are long and numerous, but once developed, what should really be taken into account should be the access to these vaccines at an international level, touching upon each and every country. According to Mahoney and Maynard (1999) the figures related to the time that it takes to develop vaccines and the costs that this means do not, however, consider «the time and costs involved in bringing these vaccines to the majority of the world's population; those who live in developing countries under economically disadvantaged conditions» (1999, p. 646). In fact, and according to the article on *The introduction of vaccines into developing countries*, Mahoney and Maynard (1999) state that it may take an additional 10-15 years to introduce a vaccine in developing countries' national immunization programs, and that this time-scale can become one of 20-30 years with the multiplier effect (1999, p. 646). This data shows the inequitable distribution of vaccines as well as of vaccination programs to effectively immunize a population from a deadly virus, and that this situation is given mainly due to the economic status of developing countries. Whilst an easy solution to this would be, amongst others, innovation in the health sectors of developing countries, it is not as easy as it sounds. Developing countries do not have the sufficient funds and resources to improve their health sectors, and this creates yet another vicious cycle where the lack of funds and resources prevents them from protecting their population at a sanitary level and maintains poverty overall in their region. According to Glennerster, Kremer and Williams (2006) improving healthcare systems in poorer countries also requires «tackling a host of complex issues» (2006, p. 68). Vaccines are, in

fact, a promoter of better health systems in poor countries as they are the «paradigmatic example of a cheap, easy-to-use technology that can have tremendous health impacts even in poorer countries with weak healthcare infrastructures» (Glennerster, Kremer and Williams, 2006, p. 69). Vaccines can therefore be taken as an opportunity for poorer countries to improve their health systems by providing their population with access to said cheap and easy-to-use treatments to protect them from deadly virus and avoid shocks in the production that drives their economy.

2.4. Growth in developing economies after COVID-19

Developing economies have had to face numerous challenges when faced with COVID-19 and with the implementation of restrictions and regulations, as well as of vaccines. However, it is also important to mention what the crisis provoked by the coronavirus pandemic has created in terms of post-crisis growth for low to middle-income countries. It is interesting to investigate whether the economic situation of these countries has changed or has remained still, and the explanations behind this outcome. Growth in economic terms in developing economies can be seen as more challenging than in developed economies due to the fact that, and as explained by Djankov and Panizza (2020) «developing and emerging market countries differ from advanced economies in both the structure of the economy and the tools that can be used to implement macroeconomic policies aimed at reducing the amplitude and economic costs of recession associated with the pandemic» (2020, p. 9). Moreover, and when in crisis, advanced economies can borrow at almost no cost or very reduced cost, whilst this is not the case for developing economies due to their overall volatility. Following the COVID-19 shock and its effect on all countries, Djankov and Panizza (2020) highlight the likelihood for emerging markets to expect «the same wave of bankruptcies, corporate defaults, and massive unemployment that are currently afflicting advanced economies to different degrees. Debt overhang and hysteresis are the very likely outcomes (Cerra et al. 2020), with deflation risk being much bigger than inflation risk in both sets of countries» (2020, p. 329). The pandemic has undoubtedly posed numerous challenges in financial terms to all types of economies; however, these have been stronger in emerging countries with previous unattended crises of their own. Whilst growth in developing economies after COVID-19 is a must for international order to be re-established, we should expect a long timeline for this to happen.

According to an event brought by the World Bank, and in particular World Bank Group President David Malpass, «GDP will return to pre-pandemic levels in many emerging and developing economies, but per capita income will take more time to reach 2019 level» (Malpass, 2021, World Bank Live). Whilst the fact that GDP may return to pre-pandemic levels in both emerging and developing countries is a rather positive aspect, the World Bank Group's President also emphasizes that with COVID-19 and its adverse effects, poverty has increased and the gap between poor and wealthy has become wider (Malpass, 2021, World Bank Group). This last remark can be interpreted with numbers, where «whilst the incomes of the top 40% have rebounded quickly, the recovery has not started yet for the bottom 40%» (Malpass, 2021, World Bank Live). This reveals a significant increase in poverty levels, where a substantial number of individuals have seen themselves living in extreme poverty as a result of COVID-19. As previously mentioned, vaccines and the number of individuals around the world vaccinated is of utmost importance as it will enable the world to go back to normality, or at least to a new normality that allows them to carry on with work and obtain some type of income so as to make a living. It is therefore essential that not only governments, but also international organizations see this inequality between the struggles of countries when faced with COVID-19, mostly economic and social, and thus take action to reduce the negative effects that may come up. Moreover, with the implementation of lockdowns and restrictions, the digital era has risen to levels where people have shifted the way they work and the way they carry out simple daily tasks. Whilst life before COVID-19 was focused on personal, one-to-one interactions and involved people being physically at their workplace, the presence of COVID-19 and the need for people to social distance has allowed these practices to move to the digital world, where people can carry out daily tasks in the comfort of their own home whilst ensuring public safety.

In order to aid emerging economies and developing countries in their economic situation after COVID-19, David Malpass (2021) considers a list of measures as essential in order to achieve said objective, including «charting a gradual path toward consolidation, one that keeps the welfare of citizens as the guiding principle. Enhancing and simplifying tax structures while eliminating wasteful public expenditures, increasing the efficiency of service delivery and reallocating resources toward their most productive uses» (Malpass, 2021, World Bank Live). This transition, as proposed by President Malpass, can be rather effective when considering each country's

conditions concerning monetary and fiscal policy, and risks and opportunities of that region in particular. Although both advanced, middle-income, and low-income economies have been affected at an economic level by the pandemic, Carmen Reinhart (2021) expresses that the situation is different for developing countries as «those that are among the low-income countries that entered with a lot of vulnerabilities already pre-existing are finding themselves already in debt distress» (Reinhart, 2021, World Bank Live). It is for this reason that it must be imperative for the World Bank Group and other international institutions to focus their objectives on aiding middle to low-income economies in preventing the shocks experienced by COVID-19 from becoming a serious financial crisis. The push for a higher rate of vaccination should not be the only objective of said institutions and governments, but contributions between international institutions and poor countries must also remain a rather important objective as it will allow the latter to progress and exit their vulnerable situation, especially after the pandemic. Moreover, and taking advantage of the digital shift that we have all experienced in the past year, international organizations should push for this transformation in developing economies as well, with the aid of loans and investments, so that they also profit from this shift. This way, the gap that has been widened between developed and developing economies with COVID-19 may start to narrow over the upcoming years. Whilst the path to sustaining a virus such as COVID-19 is, mainly, to research and implement vaccines such as Pfizer, AstraZeneca, Moderna or Janssen, economic policies are also important in preventing countries and individuals from entering a crisis that they may not be able to get away from for several years. According to Furman, Geithner and others (2020) «economic policies can play an important role in protecting people from the suffering associated with the reduction in aggregate demand, limiting “second round” damages that spillover into sectors that were not directly affected by the virus, and putting the economy in a better position to recover more rapidly as the virus-related limits on economic activity lessen and, hopefully, go away entirely» (2020, p. 2). Hence, it is important that international organizations and governments not only prioritize vaccination among their population, but also take economic measures to prevent countries from entering serious crises.

3. THEORETICAL FRAMEWORK

3.1. Economic growth in developed and developing countries

We live in an era where there is still a deep stratification between developed and developing countries and differentiates, mainly, the economies of these countries according to numerous determinants such as macroeconomic or microeconomic indicators. It is important to continue to distinguish between developed and developing countries as it enables not only citizens but governments and international organizations to know where to allocate more resources or more help as to achieve a more egalitarian world and equal human rights for all. According to Civaregna, Lopez and Kundu (2014) «the literature on institutions illustrates that emerging markets differ from developed economies because they suffer from institutional weaknesses and market failures» (2014, p. 916). This short but self-explanatory definition portrays two of the main factors that differentiate developed and developing countries so much from one another. Developed countries and so to speak developed economies are built on a solid institutional basis, where the former is created to provide better services and quality of said services to its people through different means, and therefore avoid market failures that could lead to an overall wider failure of the country involved. The situation in developing countries can be compared to that of vicious cycles, where extreme poverty in developing countries can lead to dangerous vicious cycles where high levels of poverty and inequality result in slow growth while slow growth, at the same time, causes poverty and inequality to perpetuate. In academic language, this can be referred to as *poverty traps*, defined by Kraay and McKenzie (2014) as «a set of self-reinforcing mechanisms whereby countries start poor and remain poor: poverty begets poverty» (2014, p. 127). This situation is seen in low-income countries, where «due to high uninsured risk exposure, households may adopt low-risk, low-return strategies for using productive assets, reducing the likelihood that they can accumulate the assets needed to escape poverty through autarkic savings and investment» (Barnett, Barrett & Skees, 2008, p. 1766). The same happens in developed economies where a vicious cycle exists that prevents them from regressing to living in circumstances that could be characteristic of developing countries and therefore allow it to continue holding the title of a developed country.

There is no consensus on the factors that increase or hinder economic growth in both developed and developing countries. In line with Chirwa and Odhiambo (2016) and within the framework of economic growth theory, «there have been two important novelties that have spearheaded much of the existing discussion on economic growth. These include neoclassical growth theory and

endogenous growth theories» (2016, p. 33). Economic growth factors may include state factors where we can find physical and human capital, as well as efficiency factors and legal, political, social, economic, and cultural factors. It is rather important to take as many factors into account when analyzing the economic growth of countries as the lack of one or a few of these factors may prove to be the reason that explains the high or, on the other hand, the poor position that said country holds in the ranking of developed and developing countries. The neoclassical growth theory focuses on exogenous factors whereas the endogenous growth theories, as the name shows, focus on the more internal factors of a country that influence its economic growth. There is a generalized belief that with abundant information on as many determinants of economic growth as possible comes detailed information on specific country analyses, however, it is important to consider that each country is different and so is their economic situation. For instance, some determinants may have a bigger effect on developing countries than on developed ones due to their necessities or their way of living, and vice versa. It is therefore important to differentiate and consider economic growth in developing countries and developed countries as two separate analyses.

The article published by Chirwa and Odhiambo (2016) highlights the key determinants of economic growth in developing countries compared to those in developed countries. For the purpose of this study, it is important to understand the difference between these determinants to explain how countries have stayed behind whilst others have progressed economically and socially, mainly. It is also important, for the purpose of this study, to highlight the importance of economic growth factors in both developing and developed countries to understand the impact that a pandemic such as COVID-19 and the effectivity of vaccination campaigns can have on them at different levels. Some of the determinants of economic growth included in the study by Chirwa and Odhiambo (2016) include human capital, investment, budget surplus, openness to trade, foreign aid, political stability, and institutional quality, among others (2016, p. 37). This is a general trend and not country specific as each region has a different situation and what may work in one may not work in the other for cultural, social, political, geographical, or climatic reasons. For instance, whilst life expectancy can be considered a positive aspect with direct positive impact on economic growth, it may also be considered as a negative aspect that hinders economic growth due to an overpopulation and the inability of the state to provide for the whole population in a fair

and organized manner. There is also a section dedicated to the key determinants of economic growth in developed countries, and it is equally important to mention them for the purpose of this essay. Chirwa and Odhiambo (2016) highlight the importance of key economic growth factors such as productive government or fiscal expenditure, human capital development, investment, years of schooling, rule of law index, and international openness, among others (2016, p. 38). The determinants of economic growth in both developing and developed countries are not too different from each other, however, there are some determinants that make a big difference in them achieving a high level of economic growth or not. Life expectancy or a high population growth rate which may be considered as a positive in developing countries can hinder their economic growth due to governments not being able to take on such a big population because of lack of resources. In developed countries, where we can find numerous cases of developed countries with a very high life expectancy, this factor is not considered as a main promoter of economic growth as it can slow down productivity and thus hinder economic growth. High population growth rates are more typical of developing countries due to the lack of education and the inadequate use of contraceptives as a result of the former.

According to the World Economic Situation and Prospects published annually by the United Nations, and focusing in the year 2021 for this study, there is a clearly stated difference between three types of economies in the world; developed countries, developing countries and economies in transition. However, the term “transition economies” is no longer used so the classification of countries according to their basic economic conditions can be categorized as either developed or developing regions. According to the regions that are assigned as either developed or developing we can group as developing countries «the entire of Africa, Latin America and the Caribbean, as well as most economies in Asia, except Israel and Japan, and of Oceania, except Australia and New Zealand» (United Nations Conference on Trade and Development, 2021). On the other hand, we can group as developed countries «Northern America and Europe, Israel and Japan, as well as Australia and New Zealand» (United Nations Conference on Trade and Development, 2021). There is a report published by the United Nations every year that shows the classification of each country according to whether they are developed or developing and attributes them a specific code as well. This distinction between developed and developing is important to understand different levels of economic growth and easier accessibility to resources in several countries as compared

to others. Economic growth is necessary for evolution and to improve the wellbeing of the human race. Today, technological advances have created a more pronounced gap between developed and developing countries and have turned their objectives into an uphill struggle. If developing countries have suffered access to basic resources for a long time, they are now faced with the challenge of accessing a tool that has become essential to carry on with life and that is technology. There can be no single answer when listing the determinants of economic growth as any factors can play a role in promoting or hindering it, however, as time goes by, the number of factors influence economic growth multiply and it becomes harder for developing countries to challenge their condition and improve it.

3.2. Sanitary access in developing and developed economies

It is no secret that poorer countries are at a disadvantage when it comes to access to basic resources than middle or upper-income countries. According to Peters and others (2008) «people in poor countries tend to have less access to health services than those in better-off countries, and within countries, the poor have less access to health services» (2008, p. 161). As we were mentioning vicious cycles before in poorer countries, a clear example of how this work is that most of the governments in poor countries do not focus their efforts on aiding the poor and providing easier and more egalitarian access to basic resources and thus the poor continue to be poor, and the situation of the country does not improve. Another vicious cycle relating health access with poverty is also portrayed in this article where «when health care is delayed or not obtained, people's health worsens, which in turn leads to lost income and higher health care costs, both of which contribute to poverty» (Peters & others, 2008, p. 161). So not only does the relationship between health access and poverty go on one, which is due to the lack of financial resources or information provided to improve the sector and its accessibility by the population. Health is a basic service, like food and water, however it is not easily accessible in developing countries. It should also be one of the main objectives of governments in said countries to improve health systems as, when abundant, they reduce the severely ill population of a country that cannot work or produce and therefore would increment productivity, increasing the GDP and promoting economic growth. Health systems, or the lack of them, also explain a wider spectrum of why developing countries continue to be classified as such due to their inability to exit a variety of vicious cycles that continue leading to poverty. An example of this is the lack of overall education in sexual education

matters, for instance, where the disinformation and the lack of contraceptives or measures to reduce or eliminate sexually transmitted diseases (STDs) lead to an overgrowth of the population. This overpopulation hinders the practice of governments in attempting to reduce inequalities and provide better access to basic resources to all its citizens.

On the other side are the more developed countries, known for having an easier access to basic resources including health systems. According to Doorslaer, Masseria and Koolman (2006) «the member states of the Organization for Economic Cooperation and Development (OECD) represent the wealthiest and healthiest countries in the world» (2006, p. 177). This mention clarifies that countries members of the OECD are ensured access to health systems and prove to be healthier than others not only due to their membership but also because they are characterized for being part of the healthiest countries in the world. Their access to health systems is made not on a basis of ability to pay but on a basis of need, that is, it is a fact that individuals need access to health systems so as to prevent or combat any illness they might have (Doorslaer, Masseria and Koolman, 2006, p. 177). Developed countries are much wealthier than those classified as developing, which means that their access to basic resources required on the basis of need but also access to resources that are not considered as a need but more as a wish or want can be and will be available at any time. Most of these countries «finance the great majority of their essential health services from public sources and endorse the equity principle that these services ought to be allocated on the basis of need and not willingness or ability to pay» (Doorslaer, Masseria and Koolman, 2006, p. 177). The difference between developed and developing countries when it comes to access to health and availability of health systems comes in the gap that exists between the public financing of said service; this financing will be much more common in wealthy countries where citizens can afford to pay taxes for a service they know they need and know is a basic human right than in developing countries, where citizens lack overall education and do not prioritize health over everything else.

Access to health systems is essential not only to combat extreme poverty in developing countries and help them exit that situation as quickly as possible but it is also important to avoid any not only national but also global danger from existing. A deadly virus such as the recent COVID-19 that only started in 2020 has become a global problem that not only has affected our health but has also impacted our countries' economies as it has touched upon many other sectors that have been

left without business for a definite or indefinite period of time. In a sense, we could say that the gap that divides developed from developing countries and the gap that exists between them in terms of access to services can create a wider problem that affects us all, not only in economic or sanitary terms.

3.3. COVID-19 and its effect on economies

The pandemic brought on by the coronavirus in 2019 has impacted the world at very different levels, including sanitary, social, political, and economic levels. Although not in the same magnitude or depth, both developed and developing countries have been affected by it and have seen important recession in their economies. To understand the effect of said virus on countries around the world, it is important to briefly mention what this virus is and how it has affected our lives during the past years. According to Debata, Patnaik and Mishra (2020) «COVID-19 is a respiratory infection caused by one of the largest Ribonucleic Acid (RNA) virus. In human, corona viruses can range from mild to fatal» (2020, p. 1). The virus, with its first registered case in Wuhan, China, has spread around the world from the beginning with such rapidity that it has surprised countries in a negative way, as they were not ready to face the many adverse effects linked to this virus. Although science has developed many treatments and vaccines to fight against sicknesses of all types, viruses such as COVID-19 are still unprecedented and can still surprise us, including the most renowned scientists or virologists on Earth.

The sudden appearance of COVID-19 and the rapidity with which the virus has spread to all parts of the world has led to the impossibility of countries to deal with the adverse effects linked to it, especially in economic terms. Although developed and developing countries have suffered the negative effects brought on by the virus in numerous sectors, the impact has not been the same. According to Debata, Patnaik and Misha (2020) «the COVID-19 pandemic represents an unprecedented disruption to the global economy as production and consumption are scaled back» (2020, p. 3). Indeed, the negative effect of COVID-19 on all economies around the world scales back the global economy, as lockdowns and business closures reduce significantly global production and consumption. The same article written by Debata, Patnaik and Misha (2020) make a special mention to India as a developing country and states that such countries «are not immune to such external shocks and are likely to witness slowdown in economic growth» (2020, p. 3).

Despite the fact that no country is really prepared to combat the consequences that a deadly virus such as is COVID-19 can bring, developing countries are much less prepared to face the adverse effects due to a variety of reasons, including less access to basic services, and will see their economies much more affected than developed countries. Moreover, it is also possible to say that the recovery phase for developing countries affected by COVID-19 will be much longer and slower than for developed countries. A reason for this, aside from reduced access to basic resources, may be the availability of vaccines and vaccination campaigns in developing countries. Vaccines such as Pfizer, Moderna, AstraZeneca and Janssen, to mention a few, are not offered freely but rather countries must pay massive amounts of money in order to purchase said vaccines and carry out vaccination campaigns to start tackling the problem with what we call *herd immunity*. According to Randolph and Barreiro (2020), *herd immunity* «stems from the effects of individual immunity scaled to the level of population. It refers to the indirect protection from infection conferred to susceptible individuals when a sufficiently large proportion of immune individuals exist in a population» (2020, p. 737). The unavailability of enough vaccines in developing countries and the resulting ineffective vaccination campaigns can create yet another vicious cycle where even if a small part of the population is vaccinated against COVID-19, it is not enough to refer to it as *herd immunity* and will therefore cause the virus to affect the country at all levels, including at the economic level.

When faced with COVID-19, both developed and developing nations have been affected by it and still are today. However, and although each impact can be experienced differently by nations, developed countries such as the United States, the United Kingdom, China, and countries in Europe such as France and Germany, to mention a few, with developed healthcare systems can combat this virus more effectively. On the other hand, developing nations such as the majority of African countries have much weaker healthcare systems and thus cannot face the adverse effects of COVID-19 as well or as much as developed economies (Lone & Ahmad, 2020, p. 1302). In fact, and according to Lone and Ahmad (2020) «the limited testing capacity, shortage of trained staff required for diagnostics and intensive care units (ICU), inadequate ventilators and ICU facilities (needed in severe cases of COVID-19), lack of personal protective equipment (PPE) for healthcare workers and scarcity of funds for the health sector, are some of the continent's core healthcare related issues, which make it more susceptible to the COVID-19 pandemic» (2020, p. 1302).

Not only in the healthcare sector but developed and developing countries have suffered big losses at an economic level when faced with a big reduction in the activity in sectors such as tourism, or in the shifting of budgets to prioritize the healthcare sector when faced with a global pandemic. According to the article written by Lone and Ahmad (2020) which looks to analyze the COVID-19 pandemic at an economic level and particularly from the African perspective, area of developing countries, there are seven major factors that are related to COVID-19 and affect the African economy. As said by Lone and Ahmad (2020) these seven major factors are «the reduction of importation of Chinese goods which will in turn increase the prices of local commodities; decreasing oil consumption brought by border closures, lockdowns and social distancing; African industry affected by the inability of top investors such as China to travel to the country and thus dismissing thousands of people that work in said industry; a reduction in tourism which will widely affect African countries such as South Africa, Ethiopia, Kenya and Tanzania where tourism is a major economic sector; the withdrawal of investors; the shift of budgets from others sectors to the health sector in a timely need; and, a lower revenue which will reduce tax rates and badly impact on fiscal revenues of poor countries in Africa» (2020, p. 1305). Although developed countries have been and are still affected by the adverse effects of COVID-19, the resources they own to combat them are much larger than those of developing countries. Furthermore, the previous situation of countries also affects the way in which nations deal with COVID-19; developing countries are much less likely to benefit from their previous situation when facing the pandemic since they already lack on several basic resources and cannot allow themselves to invest more money in something unprecedented such as the corona virus.

3.4. COVID-19 vaccination campaigns over the world

Vaccination campaigns have been carried out over the past year to create the previously mentioned *herd immunity* and reduce the virulence of COVID-19 and its effect on individuals at an international level. Apart from the participation of everyone in actions such as lockdowns, social distancing, the wearing of a face mask in open and/or closed spaces and hand hygiene, to mention a few, have reduced the transmission of the virus. Nonetheless, with the successful elaboration of multiple vaccines, governments all over the world have turned to them to attempt to put an end to COVID-19. In order to obtain a more detailed overview of the carrying out of vaccination

campaigns and the number of vaccines administered to the worldwide population, it is necessary to take all countries into account so as to obtain comparable data between them. The “Our World in Data COVID-19 vaccination dataset”, relied upon by the World Health Organization (WHO), provides us with a public and global database with information on the vaccines that have been registered in the respective countries. This comparable data allows us to understand not only the vaccination roll-out at an international level, but also help us compare which countries are putting more effort in working towards a full vaccination of its population compared to those that aren’t or, for circumstances affecting their country, cannot afford to carry out said vaccination campaigns as much. To the effects of this paper, this dataset will help us see the inequalities that exist between countries in vaccines’ access and vaccination campaigns.

According to Mathieu, Ritchie, and others (2021) this database shows major inequalities in global vaccine access, where although most high and middle-income countries have begun with their vaccination campaigns, most low-income countries have not and do not provide data of it (2021, p. 948). The map that is offered in the article shows that most regions filled with developed economies have received much larger vaccine doses than regions where developing countries are more predominant. There are large differences in the vaccination rates of countries where «as of 7 April 2021, the cumulative number of doses administered per 100 people ranges from 118 per 100 in the case of Israel, to less than 0.1 doses per 100 countries that have just begun their vaccination campaigns, such as Mali, Namibia, and Brunei» (2021, p. 948). These numbers portray the huge difference that exists between developed and developing countries when dealing with vaccination campaigns. This situation in developing countries can be given by the lack of resources that they have as well as their poor status, which disables them from accessing the correct number of vaccines to allow their population to receive the corresponding doses, the first and the second. We can therefore suggest that the economic situation of a country has a direct effect on the availability of vaccines and on an effective vaccination rollout.

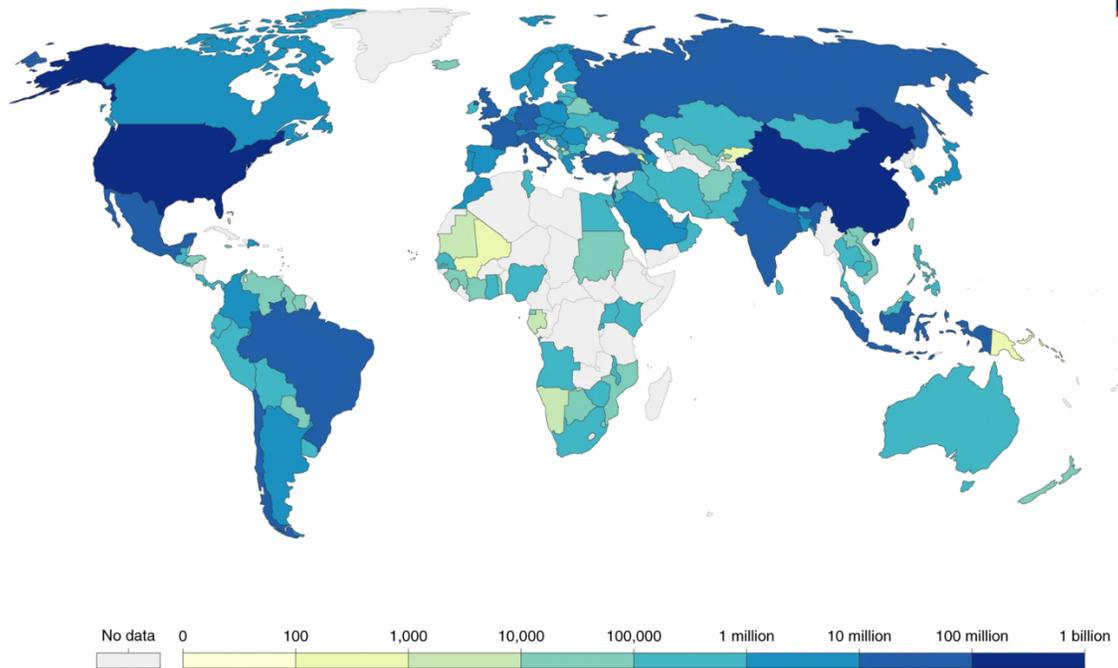


Figure 1 Cumulative number of COVID-19 doses administered by country as of 7 April 2021. (2021). Source: A global database of COVID-19 vaccinations

It is a fact that putting an end to a pandemic will regenerate the world's economy and attempt to get it back to the point it was at before the spread of the corona virus. However, and as long as developing nations do not obtain any type of access to vaccines and carry out campaigns to protect their population against the adverse effects of the virus, the pandemic will never be solved, and neither will the economic problems lurking the international scenario. According to Sheikh, Pal, and others (2021) «the majority of the developing countries who do not have the financial and technological capabilities to develop novel vaccines may have to purchase these vaccines from open markets» (2021, p. 431). However, «a large part of the global vaccine availability has been purchased by wealthier nations pushing the developing world to the back of the queue regarding vaccine supply and delivery» (2021, p. 431). Not only does the previous poor economic situation of developing countries affect the availability of vaccines in their nation, but the wealth and power of developed economies that seek to purchase bulks of vaccines to assure the correct number of vaccines for the entire population portrays even more difficulties to developing countries in the international quest for vaccines to combat COVID-19. This statement can be proved with numbers where «high-income countries represent only 16% of the world's population, but they have purchased more than half of all COVID-19 vaccine doses» (2021, p. 431). Moving on from the

availability of vaccines in both developed and developing nations, the latter is also faced with the challenge of knowing how to administer those vaccines, who to administer the vaccines to, where to keep the vaccines to secure their proper functioning, and many other important factors that need to be considered to make sure that vaccines are correctly administered to the entire population of a country.

The access of developing nations to vaccines is much harder than that of developed nations, mainly due to their economic status. Moreover, there has been a large international competition for the purchase of vaccines to secure the right number of doses to be administered to each individual in their population. Developing nations also lack important vaccine back-ups such as healthcare systems where they do not count with the necessary materials and resources to keep vaccines at the right temperature so that they can be injected into individuals with no problem whatsoever. The sum of these problems that affect developing nations in the world difficult the rollout of vaccination campaigns in their countries and thus impede them from reaching a minimum amount of fully vaccinated people to combat the pandemic and contribute to the *herd community* effect. International organizations must ensure a fair and equitable access to vaccines for both developed and developing nations as it will benefit the entire world's population in the long-term. According to Sheikh, Pal, and others (2021) «an alliance of 190 nations led by international organizations such as CEPI (Coalition for Epidemic Preparedness Innovations), GAVI (Gavi, the Vaccine Alliance), UNICEF (United Nations Children's Fund) and WHO (World Health Organization) has been set up to improve global vaccine access» (2021, p. 431). With the help of international organizations seeking to provide a fair and equitable access to vaccines that fight against COVID-19, developing nations may have a chance in developing effective vaccination campaigns and improve their economies overall.

3.5. Relationship between vaccination and economic benefits

There is a high level of investment associated with the purchase of vaccines and the implementation of successful vaccination programs to make it available for the entire population of a country. There are, however, economic benefits associated with the implementation of vaccination programs especially when faced with such deadly virus such as the coronavirus. According to Rodrigues and Plotkin (2020) the reduction in morbidity and mortality brought by

vaccination programs contribute to reduced infection of the disease as well as the related treatments to cure people (2020, p. 8). This, in turn, «potentially leads to economic growth, with less money spent owing to the costs averted through fewer medical tests, procedures, treatments and less time off work by patients/parents» (2020, p. 8). We could say that there is, in fact, a relationship between vaccination rates and economic growth, or that numerous economic benefits are given as a result of high vaccination rates. There is also a relationship between health and economic growth, as Rodrigues and Plotkin (2020) mention where «the relationship between health and the economy is bidirectional, whereby economic growth enables funding in investments that improve health; and a healthy population contributes to and enhances an economy» (2020, p. 9). The development of effective vaccines to fight against COVID-19 and the successful development of vaccine programs does contribute to an improvement in the economic status of a country, a healthy population can do much more than an unhealthy one can. According to Wan, Fan and others (2021) «vaccine is supposed to be the most effective means to prevent COVID-19 as it may not only save lives but also reduce productivity loss due to resuming pre-pandemic activities» (2021, p. 1).

4. DATA AND METHODOLOGY

To carry out a proper analysis that shows the relationship that there is between the rate of vaccination campaigns and the economic recovery of countries, several data will be taken into consideration and will be mapped out to better portray the results and whether there exists a relationship between the two variables. The data that will be considered will be the following: the percentage of vaccinated population and the growth of industrial production for each country, with a quarterly frequency. In order to compare the data, the analysis will begin from the first quarter of the year 2019 until the fourth quarter of the year 2021, with the exception of vaccination percentages that will only be available from the first quarter of the year 2020. As a general view of the overall development of vaccinations worldwide, and according to Our World in Data (2020) «64.5% of the world population has received at least one dose of COVID-19 vaccine. 11.29 billion doses have been administered globally, and 18.7 million are now administered each day. Only 14.5% of people in low-income countries have received at least one dose» (Ritchie, 2020). To begin, we will look at the evolution of vaccination campaigns on a quarterly basis, from the first month and year available with the information found on the website *Our World in Data*, in the category *Coronavirus (COVID-19) Vaccinations*. Data on the share of vaccinated people against

COVID-19 will be taken from December 31, 2020, on a quarterly basis, until the last data available which is March 31, 2022. In order to carry out the comparison between the share of COVID-19 vaccinated population and the economic recovery of countries, data on the industrial production of countries will also be taken, on a quarterly basis, starting from the year 2019 to take into account the economic situation of countries before the pandemic, until the last data available in the fourth quarter of 2021. The information on the industrial production of countries, both before, during and after the pandemic, will be taken from *International Financial Statistics*, by International Monetary Fund (IMF). The following maps will aid us to envisage in a clearer way if there exists a relationship between these two, the rate of vaccination campaigns and the economic recovery of countries, and the type of relationship that it is. Before moving on to place the maps retrieved from the data provided on these sites, it is necessary to mention that the data is not complete for all countries to explain the sudden absence of data in certain countries over the years.

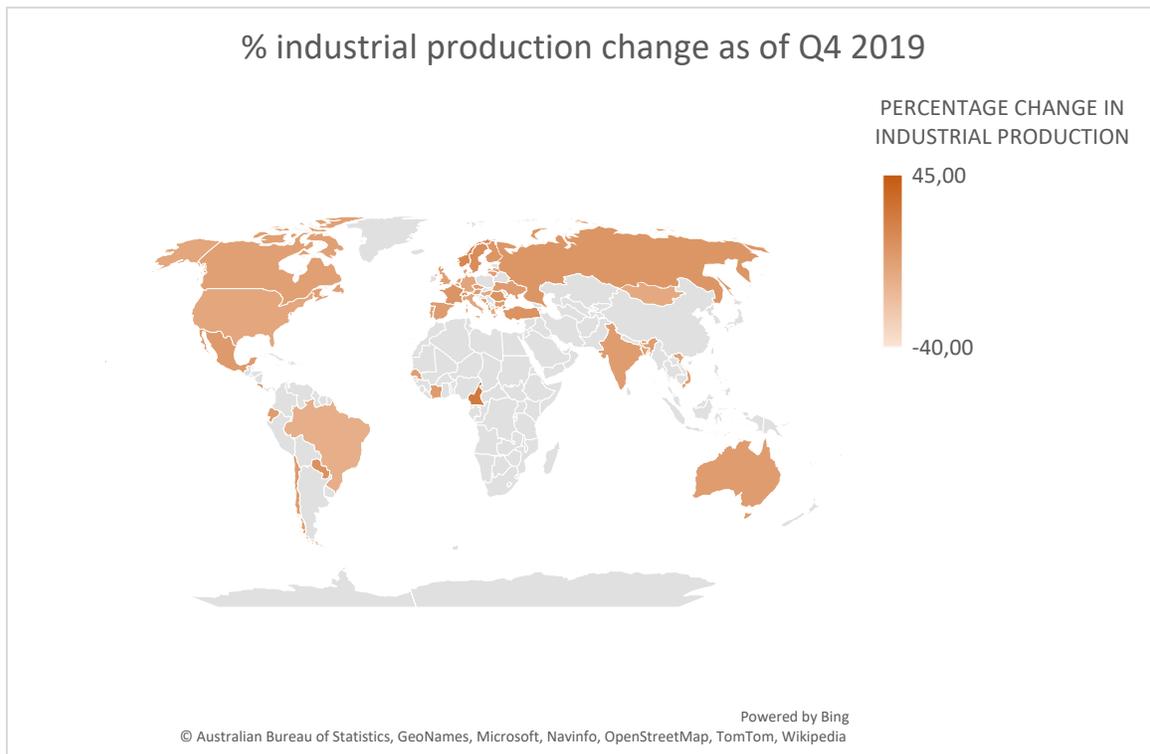


Figure 2 Percentage in industrial production change during the fourth quarter of 2019. Source: *International Financial Statistics (2019)*

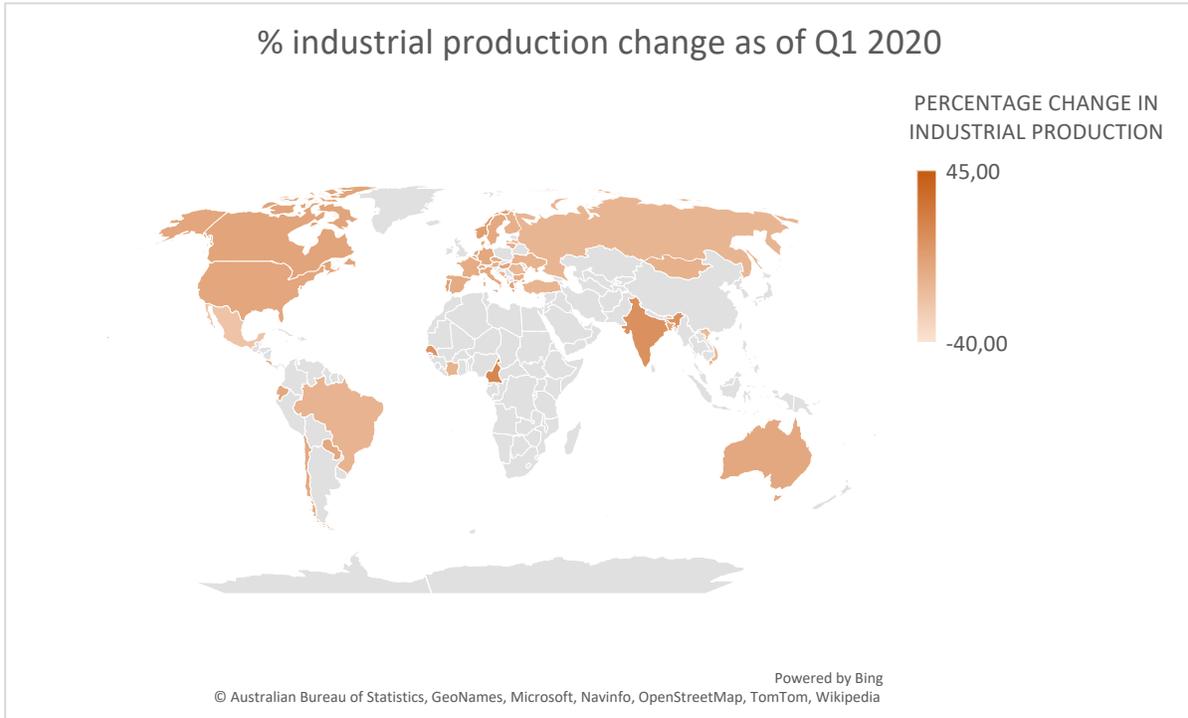


Figure 3 Percentage in industrial production change during the first quarter of 2020. Source: International Financial Statistics (2020)

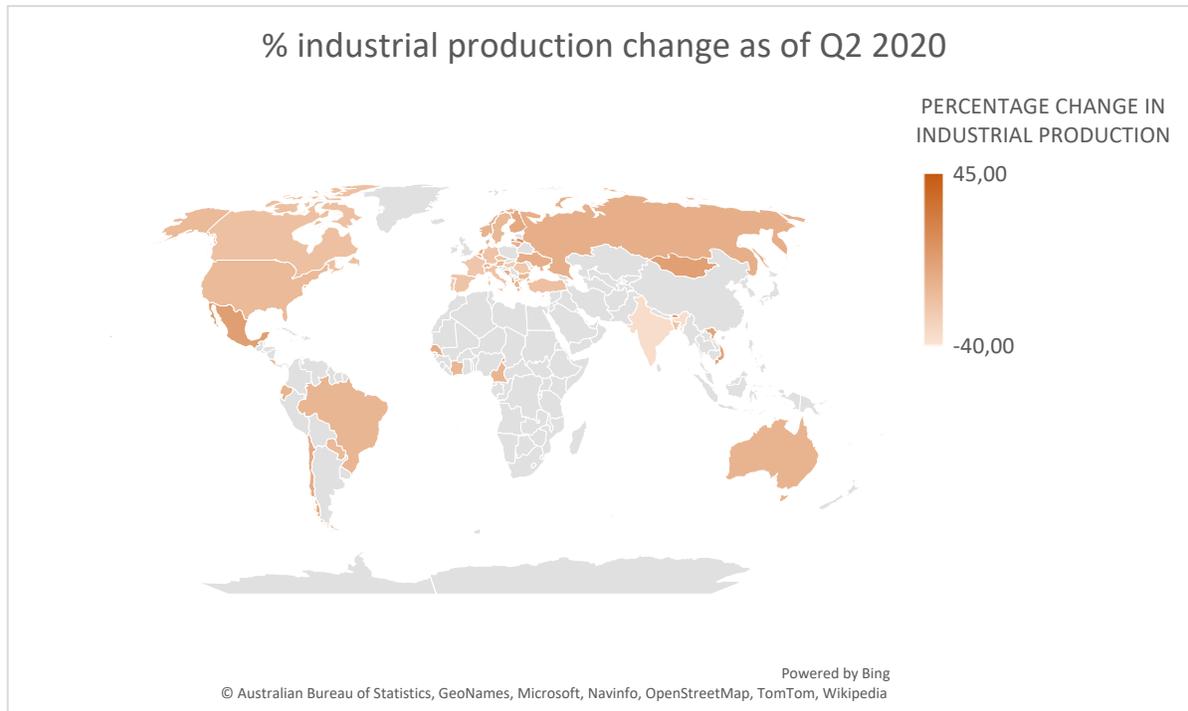


Figure 4 Percentage in industrial production change during the second quarter of 2020. Source: International Financial Statistics (2020)

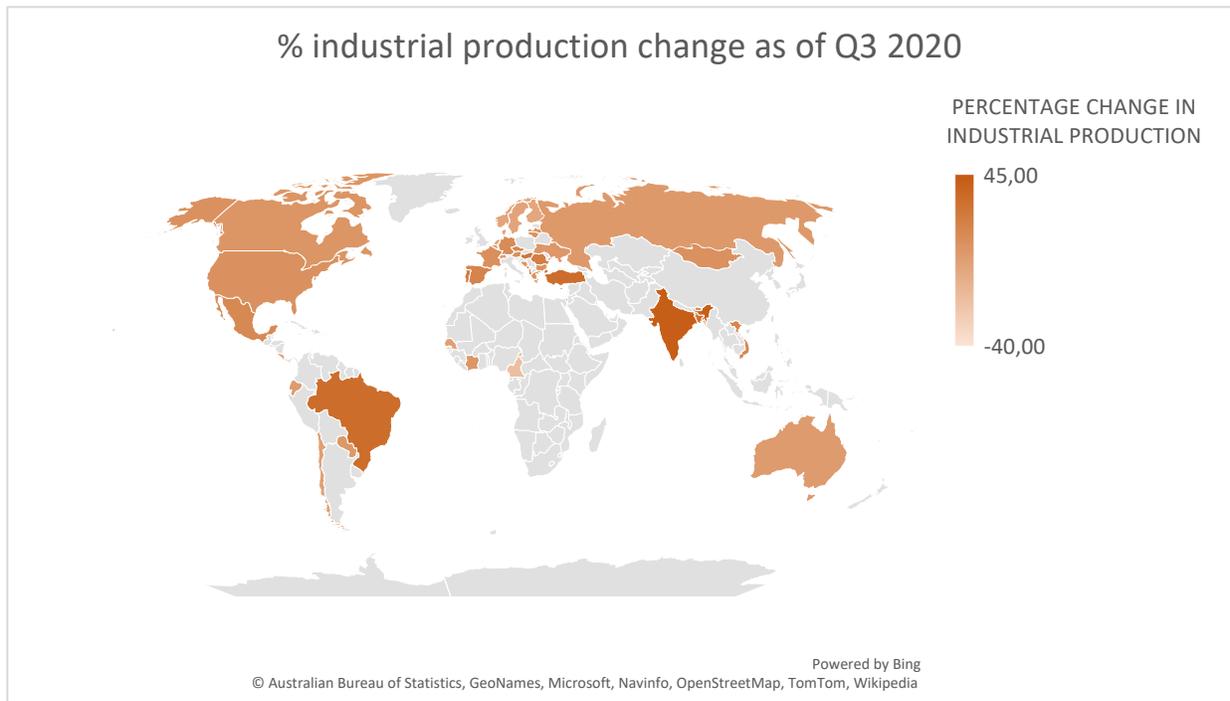


Figure 5 Percentage in industrial production change during the third quarter of 2020. Source: *International Financial Statistics (2020)*

The maps shown above, as mapped through the tool “Maps” in Excel sheets reveal the percentage in industrial production change at an international level using the data offered by *International Financial Statistics*. It is important to understand each of the indicators found on these maps to better appreciate or acknowledge the presence of some countries and not others and the changes in the colors according to the barometer, for example. In order to obtain this information, we have accessed the website of *International Financial Statistics* and selected the category “Query”, what has allowed us then to make a selection of the indicators we were interested in to obtain the correct data for the purpose of this work. The main indicators are three: the timeline, the countries selected and the principal indicator. First, the timeline extends from the fourth and last quarter of 2019 to have some perspective as to the economic situation in terms of industrial production in countries before the pandemic hit, until the last quarter of 2021 which is the last available data. This is an important factor as it will then allow us to compare results with the percentage of industrial production during and after vaccination campaigns. Second, the countries selected were all countries in the world and which the site allowed us to select. Third, the principal indicator is the percentage change in industrial production as compared to the previous year. These three factors were selected on the site and exported to Excel sheets to map the information out.

The first element that stands out when exporting this information is the lack of data in many countries in terms of their industrial production. For this reason, the list of countries with information on the percentage change in industrial production will be included to have a better insight on the information we can count on for this work. The list of countries from which we have collected data is the following: Albania, Australia, Austria, Bangladesh, Belgium, Bhutan, Bosnia and Herzegovina, Brazil, Bulgaria, Cameroon, Canada, Chile, Costa Rica, Côte d'Ivoire, Croatia, Cyprus, Czech Republic, Denmark, Ecuador, Estonia, Finland, France, Germany, Greece, Hungary, India, Israel, Italy, Korea, Latvia, Lithuania, Luxembourg, Malta, Mexico, Mongolia, Montenegro, The Netherlands, North Macedonia, Norway, Paraguay, Poland, Portugal, Romania, Russia, Senegal, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey, Ukraine, United Kingdom, United States, Uzbekistan and Vietnam. Whilst it is clear that data is missing from numerous countries, what most stands out is that most of the countries missing may be considered to be in the “developing country” category, as opposed to the others. The barometer in the maps, located on the upper right side, takes 45 per cent as the maximum percentage in industrial production change and 40 per cent as the minimum. These numbers have been carefully selected by ensuring that no data in any of the timelines selected surpasses 45 per cent or falls below 40 per cent. This also ensures that the above maps show the data according to the same maximum and minimum, so that the information is more trustworthy and better visualized. The grey areas on the map show that there is no data registered for those countries, which can mostly be found on some of the countries in the Latin American continent, most of the African continent, and countries located in Southeast Asia. The lack of data in these regions will impede us from a successful comparison between the rate of vaccination campaigns and economic recovery in both developed and developing countries, mainly because there is more information on one than the other and the comparison will therefore not be effective. The color scheme on the barometer shows that the lighter the orange, the lower the percentage change in industrial production, and that the darker the orange, the higher the percentage change in industrial production.

The percentage change in industrial production from the last quarter of 2019 to the first quarter of 2020 does not change much. These two periods, and especially the last quarter of 2019, do not portray the pandemic situation entirely which may explain the minimal change that we can

visualize between these two maps on countries' percentage change in industrial production. Whilst the first case of Covid-19 was registered in December of 2019 and further cases were registered in January and the following months, it wasn't until the month of March, and specifically, on 11 March 2020, that «the rapid increase in the number of cases outside of China led the WHO Director-General to announce that the outbreak could be characterized as a pandemic. By then more than 118,000 cases had been reported in 114 countries, and 4291 deaths had been recorded» (World Health Organization, 2022). We can say that the month of March in 2020 was the turning point as the number of Covid-19 registered cases grew exponentially and spread to all parts of the world, making Europe the center of the epidemic. This leads us to explain the third map shown above, which represents the second quarter of 2020 in relation to the percentage change in industrial production. There is a big change in the color scheme between the map portraying the first quarter of 2020 and the map showing that of the second quarter. The orange is much more faded, especially in the regions of Europe and North America. This can be directly related to the spread of the coronavirus pandemic onto countries in Europe and in North America, specifically, the United States and Canada. India, for example, is another country that registered a negative percentage change in industrial production between the first and second quarter of 2020, whereas the first quarter registered a total of 11,50%, the second quarter registered a total of -35,16%. The negative shift between these two digits in India, but also in Europe and North America show the drastic change suffered by industrial production following the breakout of the coronavirus pandemic. Due to the tough measures needed to stop the spread of the Covid-19 virus, Abodunrin, Oloye and Adesola (2020) argue that «countries and world capital have been put under strict lockdown, bringing a total halt to major industrial production chains» (2020, p. 20). According to them, and although this information cannot be corroborated with the maps due to the lack of data in this country, «in China, where the coronavirus first appeared, industrial production, sales and investment all fell in the first two months of the year, compared with the same period in 2019» (2020, p. 20). Industrial production has unquestionably been impacted by the coronavirus pandemic at a national and international level, and whilst not all data is available on all countries as can be seen on the maps, there is a general view that portrays the important cut in industrial production as the virus spreads further.

Moving on to the third quarter of 2020 and comparing it to the previous maps in this work, it seems as though there is significant growth in industrial production change as compared to the second and first quarter of the same year. All countries on the map shown in Figure 5 present a much darker orange, therefore representing a higher and positive percentage change in industrial production in comparison to the previous period. Taking the example of India, which reached negative levels of -35,17% in the second quarter of 2020 bounced back to 42,48% in the third quarter of the same year. Although with different results, we can find the rest of the countries in similar positions marked by a possible catch-up. This can be explained by the passage of time and the resulting easing of restrictions and lockdowns as countries mold themselves to the so-called “new normality”. In fact, numerous countries and areas recorded economic growth during the third quarter of 2020. According to Bilek-Steindl (2020) and due to this easing of restrictions «a rebound was recorded in both Austria and the euro area in the third quarter of 2020» (2020, p. 115). To provide a more detailed explanation for the economic catch-up of countries during this period, Bilek-Steindl (2020) goes on to explain that «in the U.S.A, industrial sentiment improved in October according to the purchasing managers’ index (ISM) and consumer confidence (according to the Conference Board and University of Michigan). In the euro area and in Germany, however, the picture is less clear: while the leading indicators point upwards, those for private consumption and services reflect a restrained development» (2020 p. 116). The easing of measures taken to fight against the spread of the coronavirus outbreak motivated private households to consume again and industrial activity also showed signs of recovery as a consequence. Although the article mainly mentions the euro area and the United States, similar situations may apply elsewhere as Figure 5 shows that other regions also experienced a rebound effect at an economic level. In more developing countries such as India the debate lies on whether to continue industrial production and allow people to work to not only avoid dying of coronavirus but also of hunger if they cannot bring income into their home. India’s large population and the need for the latter to work in order to perceive an income may have been one of the reasons to explain the rise in industrial production change. According to Chaudhary, Sodani and Das (2020) «fifty per cent of the Indian households still depend on agriculture either directly or indirectly» (2020, p. 177). This means that it is rather necessary for restrictions and lockdowns to be alleviated in poorer countries to allow people to work and provide for their family in terms of food and essential services.

Following the analysis of Figures 2, 3, 4 and 5 portraying the percentage in industrial production change from the last quarter of 2019 to the third quarter of 2020, the following figures will not only show the follow-up on industrial production change until the last available data, but they will also show the rate of vaccination campaigns worldwide in the same time periods to make a better comparison. In this case, maps showing the percentage in industrial production change will be shown alongside maps showing the rate of vaccination campaigns during the same period. It is important to note that, as mentioned before, the available data on *International Financial Statistics* regarding the industrial production change at an international level was not complete which will affect the effective comparison of both maps in each quarter.

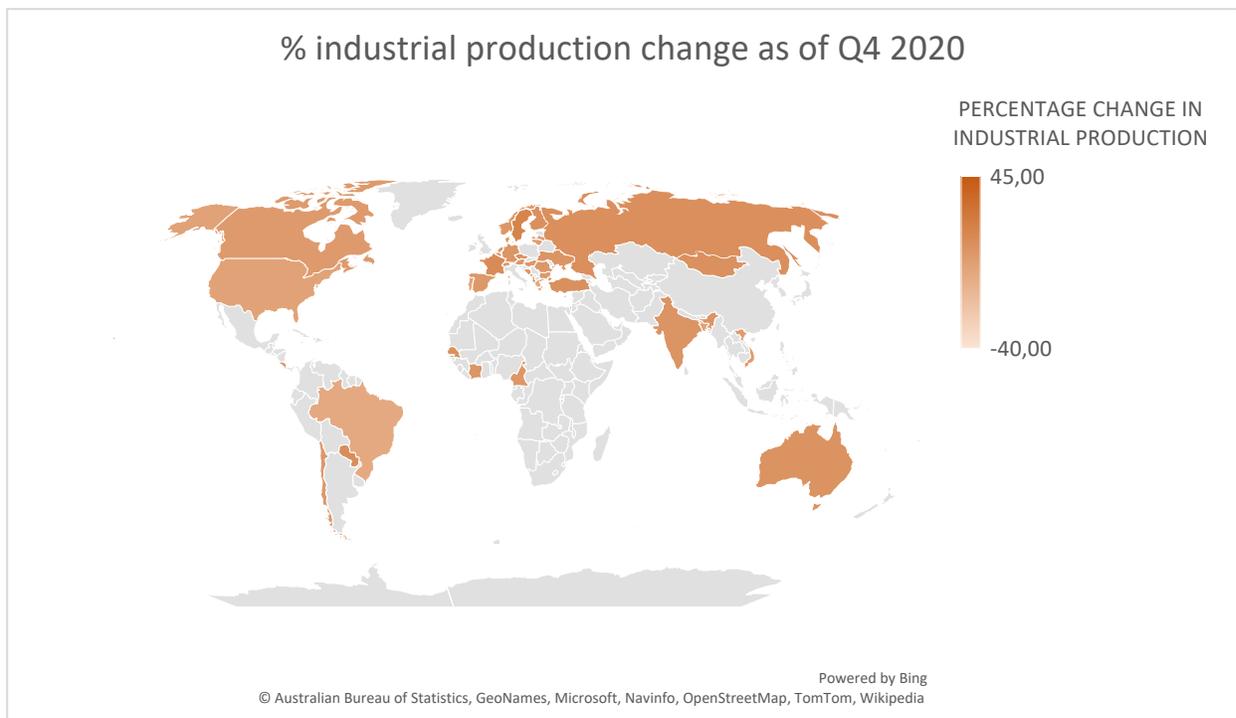


Figure 6 Percentage in industrial production change during the fourth quarter of 2020. Source: *International Financial Statistics*

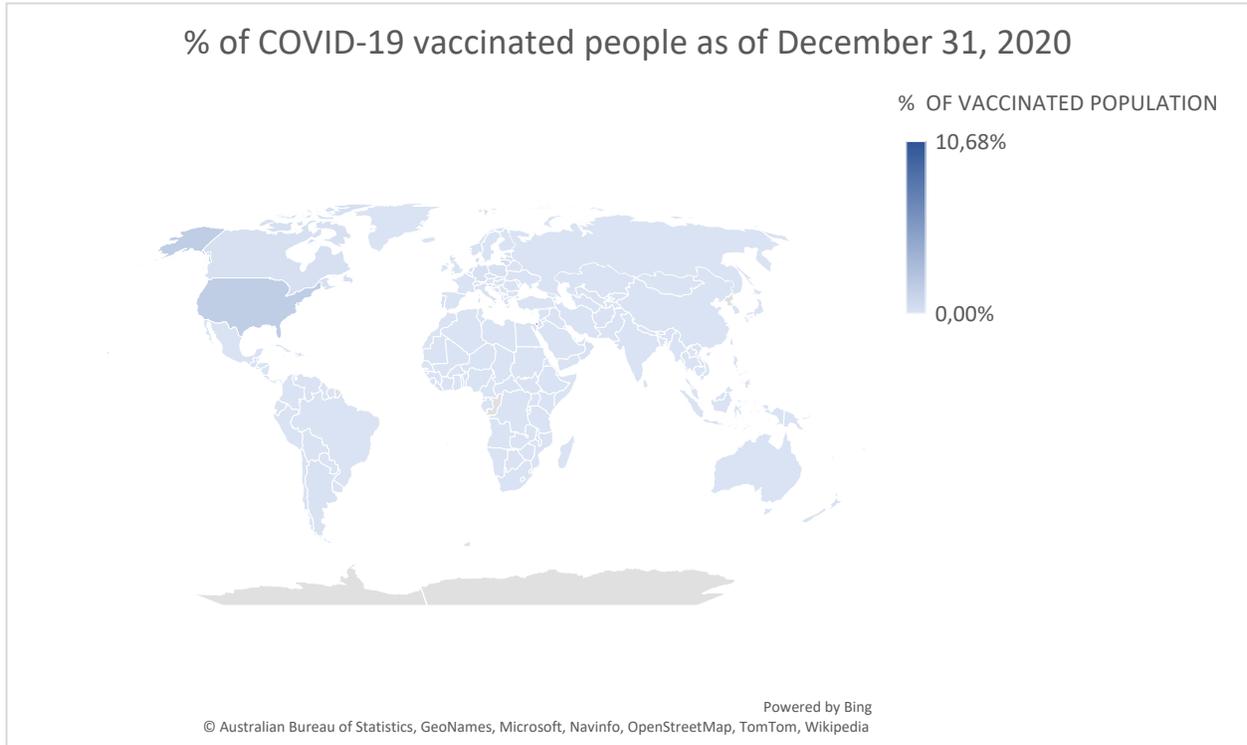


Figure 7 Percentage of vaccinated people worldwide as of December 31, 2020. Source: Our World in Data

Figures 6 and 7 show, simultaneously, the percentage change in industrial production and the percentage rate of vaccinated people worldwide during the same period, in the fourth and last quarter of 2020. Whilst the percentage change in industrial production in the fourth quarter of 2020 still shows stronger figures than those registered in the first and second quarter of the same year, they are lower than those registered in the third quarter, possibly due to the rise in incidences related to the coronavirus and its new variants. The rate of vaccinated people in that same period is not too high; although vaccinations were being administered at the end of 2020, this administration results rather minimal when compared to the number of vaccines administered over the course of 2021. Figure 7 shows the highest registered figures in darker blue and in lighter blue, those with lower percentage of vaccinated people; in this case, the highest registered percentage are found in Israel (10,68%) and United States (1,66%), mainly.

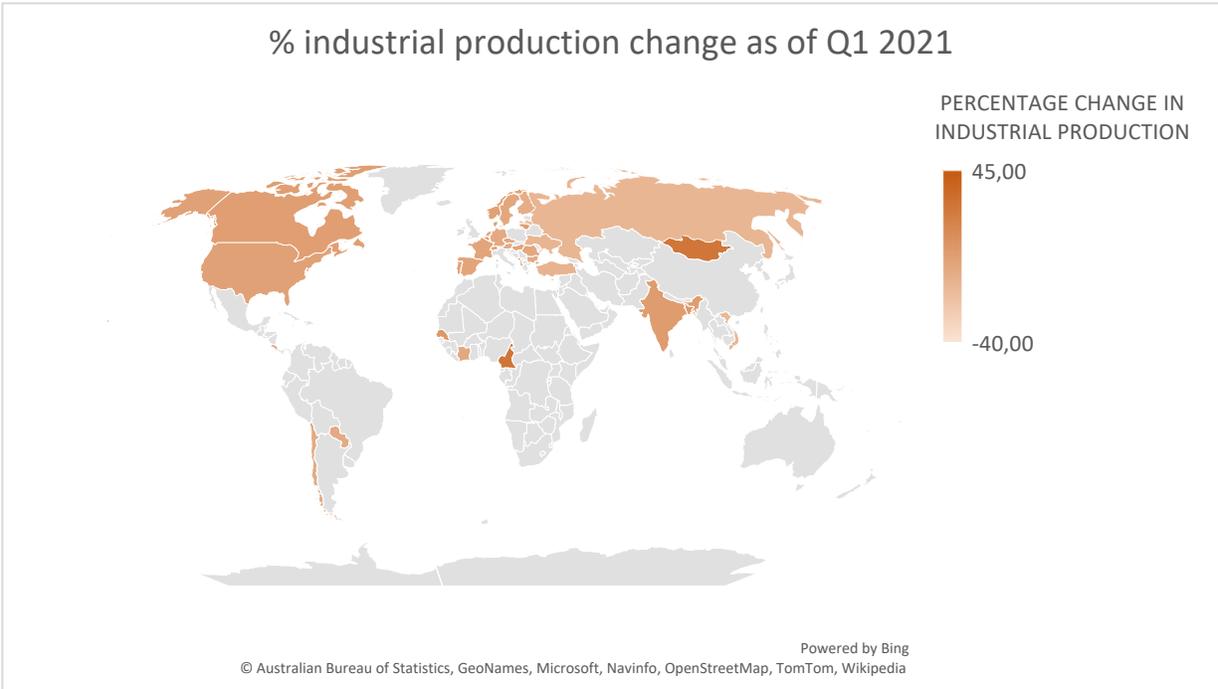


Figure 8 Percentage in industrial production change during the first quarter of 2021. Source: International Financial Statistics

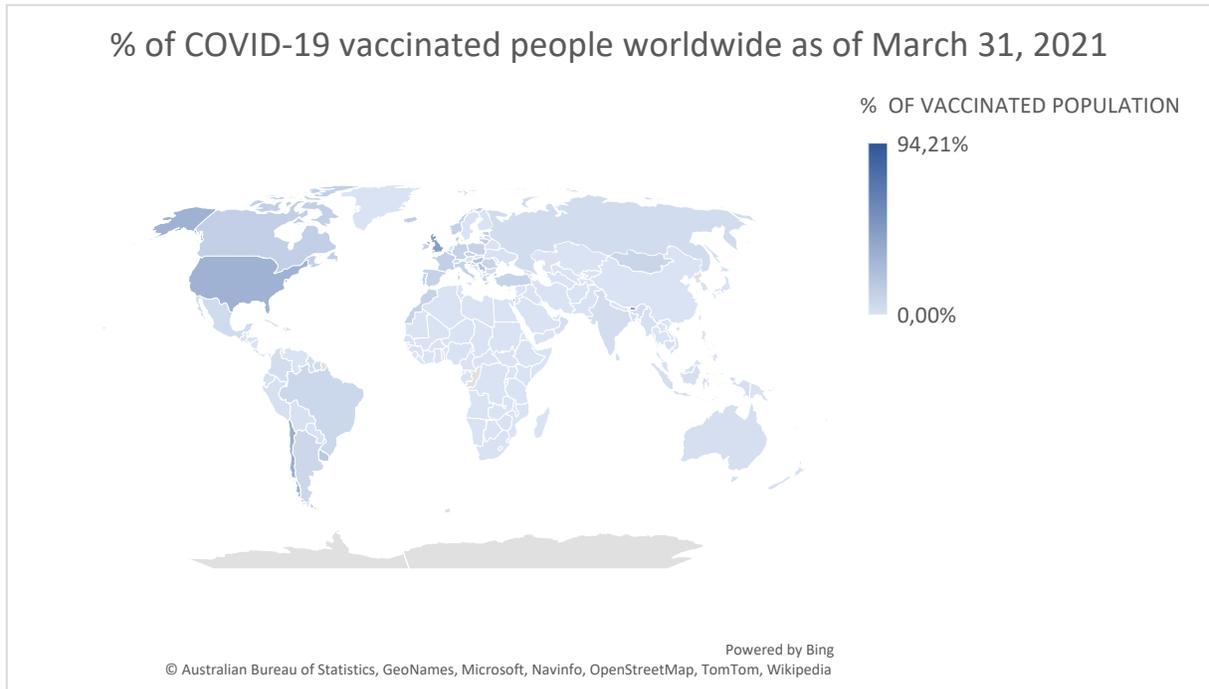


Figure 9 Percentage of vaccinated people worldwide as of March 31, 2021. Source: Our World in Data

Figures 8 and 9 show the same two indicators during the first quarter of 2021. Whilst the percentage change in industrial production seems to continue to reduce as compared to the map in Figure 6, the percentage of vaccinated people around the world increases with time. The major

increases that we can see taking place in Figure 9 are located in North America, the euro area, Russia, Israel and some countries in South America. We can see that where there is higher industrial production registered, the percentage of vaccinated people also turns out to be higher than in other parts of the world. North America and the euro area, mainly, show signs of higher industrial production than other regions of the world which in Figure 9 translate to higher registered percentages of vaccinated people. However, this comparison is not and cannot be complete due to the lack of data on most developing countries in maps portraying the percentage change in industrial production. The most significant registered figures as to the percentage of people vaccinated in the first quarter of 2021 include the regions of Gibraltar (94, 21%), Israel (56, 66%), Bhutan (50,62%), the United Kingdom (45,67%), Chile (35,48%), the United States (32, 62%), and the euro area accounts for over 100% if we add up the percentage of vaccinated people in each of these countries. However, whilst a positive figure of 4,67% is recorded in India as change in industrial production regarding the previous year, the percentage of vaccinated people stands only at 4% during the same period. This is interesting to see because if we compare it to the case of Russia, which achieves a negative percentage change of -11,29% in industrial production but registers a higher percentage of vaccinated people, concretely, 4,80%. Although there are exceptions to the rule, the general rule seems to be that the more developed nations or areas seem to be related with a higher percentage of vaccinated people, for now.

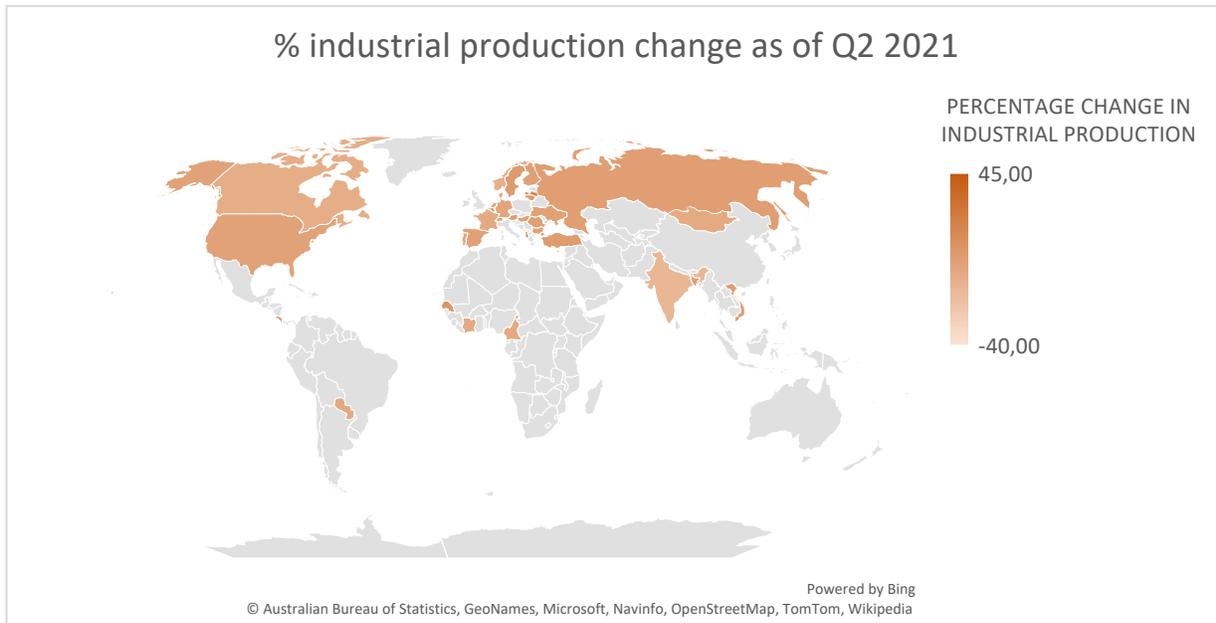


Figure 10 Percentage in industrial production change during the second quarter of 2021. Source: International Financial Statistics

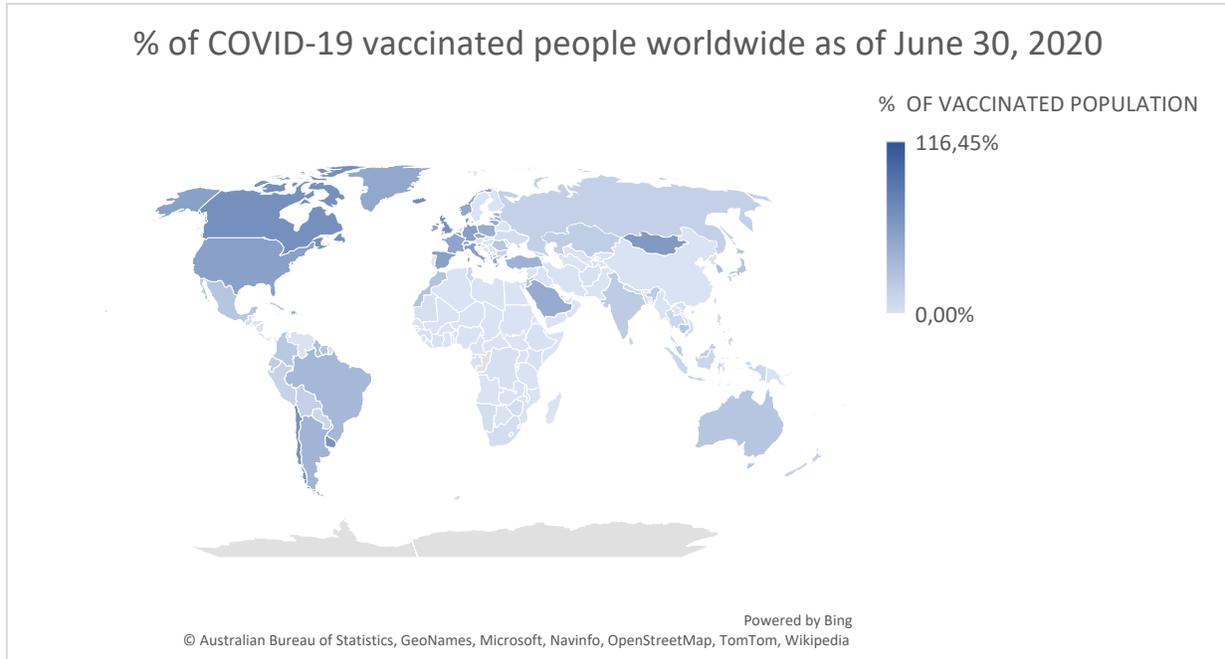


Figure 11 Percentage of vaccinated people worldwide as of June 30, 2021. Source: Our World in Data

Figures 10 and 11 show the evolution of both indicators, the percentage change in industrial production and the percentage rate of vaccinated people worldwide, during the second quarter of 2021. Again, a great deal of data is missing from Figure 10, as it does not provide much information on the percentage change in industrial production in many developing countries. Figure 11, on the other hand, portrays the evolution of the coronavirus vaccination rates around countries over the world and what is most clear from a simple observation at the map is that most countries and regions considered to be developed are the ones advancing the most as to their percentage of vaccinated population. We also see that there is a significant advance in countries located in South America as well, especially Brazil, Chile, Argentina, and Uruguay, among others. According to Bárcena and Etienne (2021) countries in Latin America and the Caribbean are «characterized by structural conditions of inequality, inequity, vulnerability and social exclusion that are combined with and perpetuated by informal and precarious forms of employment, weak social protection systems and poorly integrated production structures with a limited capacity to maintain sustainable levels of growth» (2021, p. 3). It is therefore necessary to understand why countries in this region have experienced higher rates of vaccination campaigns than others located elsewhere, considering the situation stated by Bárcena and Etienne. For instance, the availability for developing nations to access vaccines has seen itself hindered due to various factors, including the need to import these vaccines from developed nations and the hoarding of the latter to ensure

their own supply of vaccines (Bárcena and Etienne, 2021, p. 7). Whilst the countries above mentioned in the region have reached a target higher than 20%, it is true that there are still many other Latin American countries that have not yet reached this target and face difficulties in doing so. The rate of vaccination campaigns in this area cannot be compared to that of percentage change in industrial production due to the lack of data. In North America, for instance, we see that whilst Canada experienced a negative percentage change in industrial production (-6,10%), it registered a very positive vaccination percentage rate with a total of 67,89% of its population vaccinated. Similar situations to the one in Canada in Figures 10 and 11 are found in Mongolia, with -4.36% change in industrial production faced against a positive 60,72% rate in vaccinated population. India also registers a negative percentage change in industrial production during the second quarter of 2021 (-11,67%), however it manages to evolve in its rate of vaccinated population (19,48%). Even countries with negative percentage changes in industrial production, especially those developed, are able to register rather positive figures in the percentage of vaccinated people in their region. On the other hand, and if we look at it the other way round, we see that despite registering high rates of total vaccinated people in their nation, some countries still experience negative rates of change in industrial production.

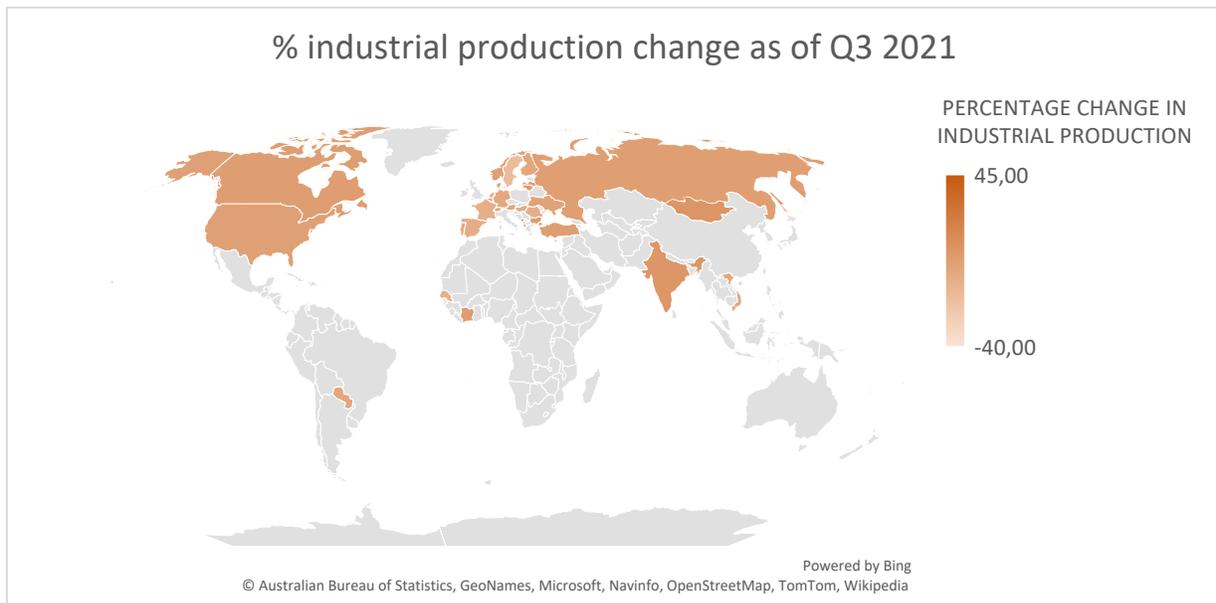


Figure 12 Percentage in industrial production change during the third quarter of 2021. Source: International Financial Statistics

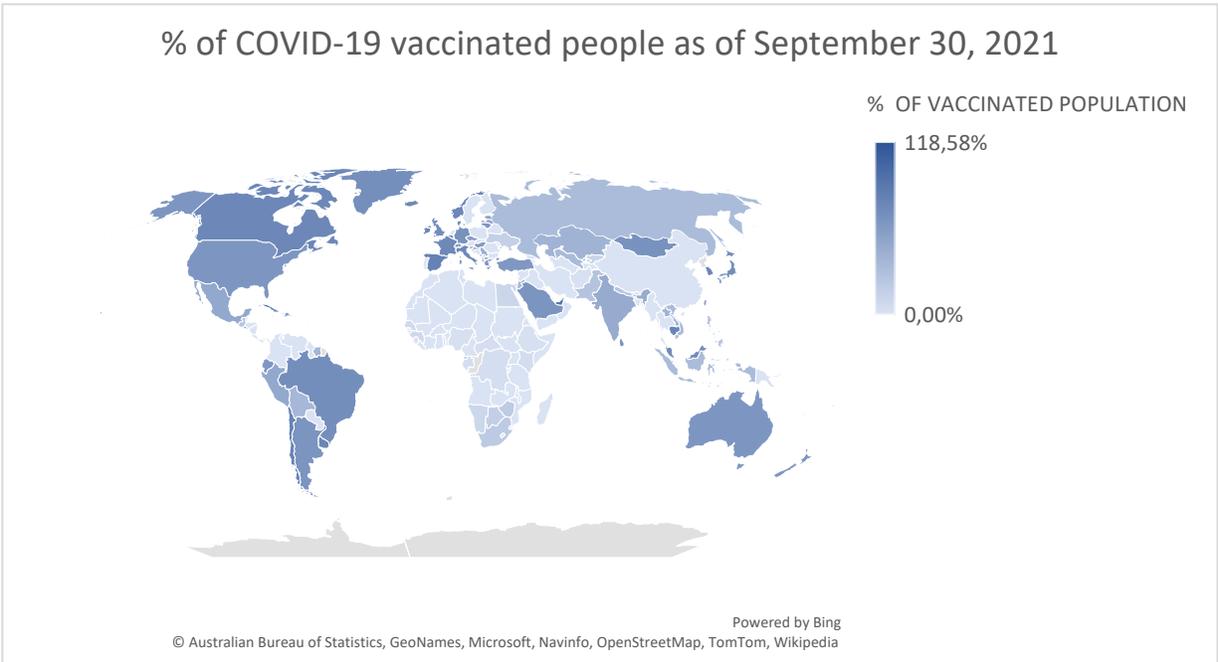


Figure 13 Percentage of vaccinated people worldwide as of September 30, 2021. Source: Our World in Data

Figures 12 and 13 portray the same two indicators during the third quarter of 2021, ending on September 30, 2021. Whilst data continues to miss as to the industrial production change, especially in most developing nations, the percentage of vaccinated population at an international level continues to evolve positively. Figure 13 shows most of the American continent in the dark blue shade, representing high levels of vaccination people in their countries. So do countries located in the euro area, as well as Oceania and a few other countries such as Russia, Mongolia, and Saudi Arabia, for example. As compared to the map shown in Figure 11, this last map shows that developing nations located in Asia and Africa are also starting to increase their rates of vaccinated people, therefore allowing the international community, step by step, to achieve the desired *herd immunity*. Looking at both maps in Figures 12 and 13, we see that where there is highest registered percentage of vaccinated people, there is highest registered industrial production change in comparison to the previous year. This is especially true for countries located in North America as well as Russia and Mongolia. Countries in the euro area, Portugal, Spain, France, and Germany for instance, registered negative results of industrial production change, -3,33, -5,67, -6,94 and -2,50 respectively, and despite this they continued to show positive results in the percentage of vaccinated population in their corresponding countries. The situation registered in North America and that registered in Europe give very opposing ideas; whilst it appears that positive figures of industrial production change in North America are influenced by the positive

rates of vaccinated people in said region, it is not the case in the euro area. In the case of developing countries, such as the result recorded by Côte d'Ivoire in the third quarter of 2021 (3,21%), there is no evidence or no indications as to the evolution of the rate of vaccinated population, and if there is, it appears to be standing at 0%.

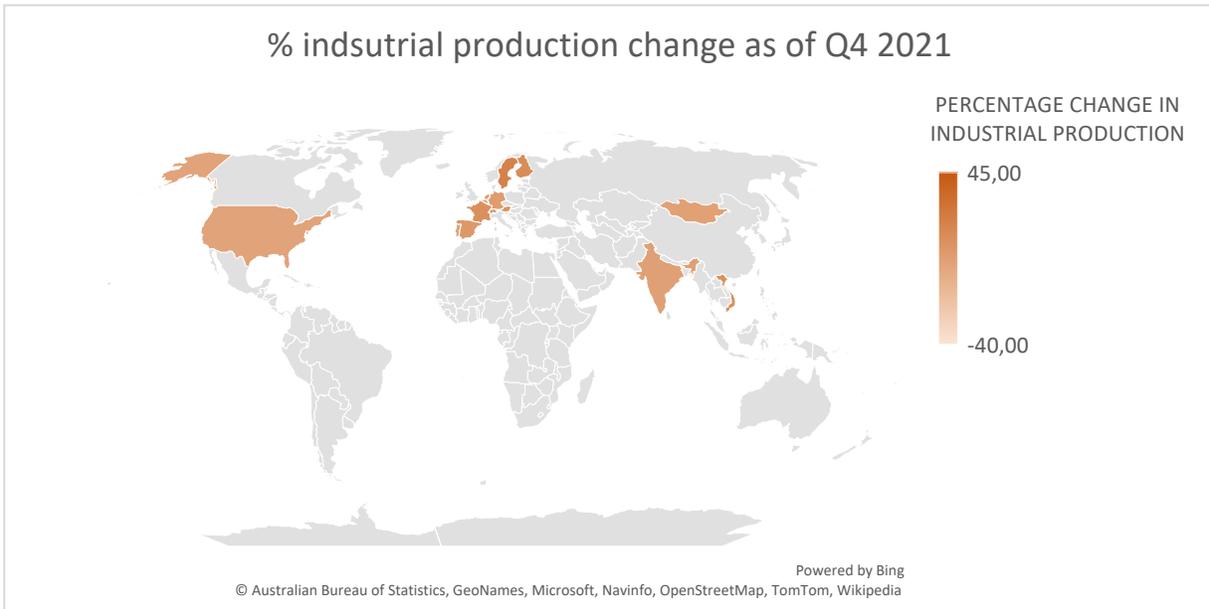


Figure 14 Percentage of industrial production change during the fourth quarter of 2021. Source: International Financial Statistics

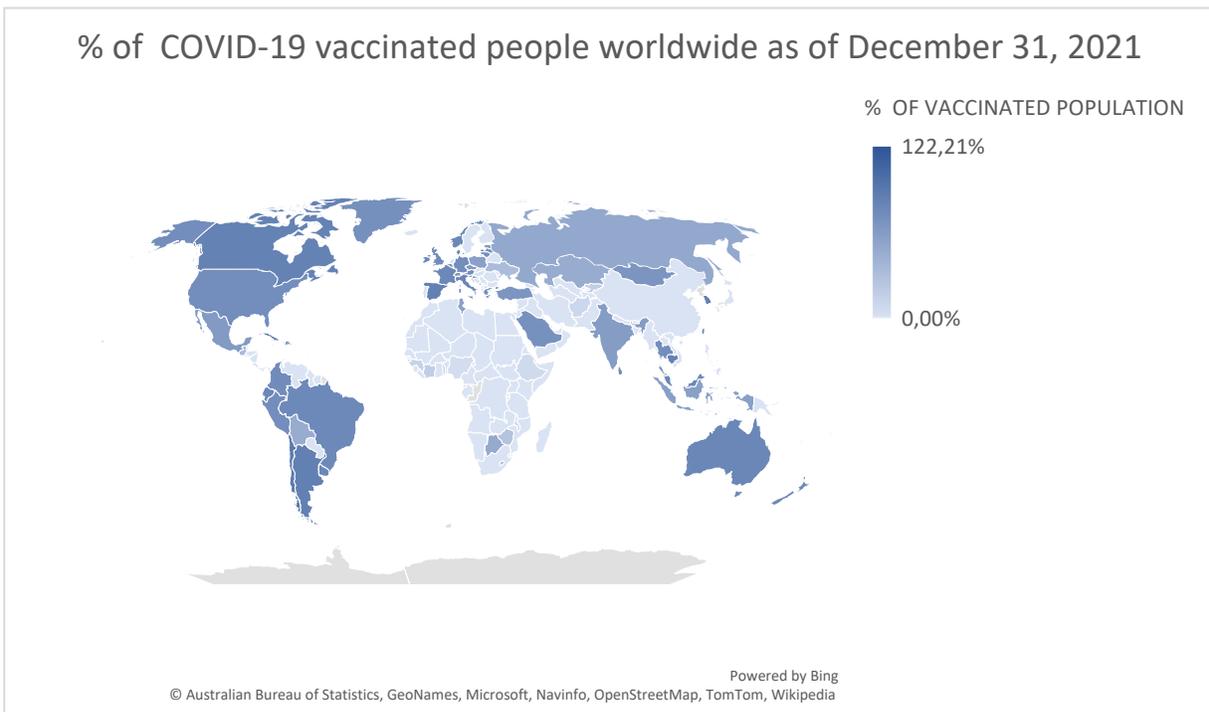


Figure 15 Percentage of vaccinated people worldwide as of December 31, 2021. Source: Our World in Data

As we can see from Figures 14 and 15, whilst the global percentage of vaccinated people around the world continues to increase in most regions of the world, there is much less information on the percentage change in industrial production during this quarter of the year, with a significant decrease on the data available in each country. Although the comparison between the rate of vaccination campaigns and that of industrial production change has not been orderly due to the lack of information in the latter, the case is much more pronounced as seen in Figures 14 and 15. This is mainly because there is only available data on the percentage of industrial production change in the United States, India, Mongolia, and the euro area among others. It is for this reason that an effective comparison between both indicators is rather difficult; whilst we see that the percentage rate of vaccinated people at a global level continues to increase, with most countries categorized as developed display a much darker shade of blue, and those categorized as developing display a lighter shade although with higher percentages than the ones registered in Figure 13. The only pattern that can be effectively taken out from the comparison between the two figures above is the direct relationship that there seems to be between the areas shaded in the darker orange and those shaded in the darker blue; the United States, Mongolia, India, and the euro area which score positive rates of industrial production change seem to be between the most advanced in their vaccination campaigns as a result of the percentage of their population that is vaccinated.

While it would seem that the higher the amount of Covid-19 vaccinated people in a country would naturally lead to a higher rate of industrial production, it does not appear to be the case as seen with the data portrayed in the previous figures and the different situations that have been given over time. Numerous situations have been given that prevent us from making such a statement as to the relationship between the two indicators; developed countries with rather positive vaccination population numbers have still recorded negative industrial production rates, developing countries such the above-mentioned Côte d'Ivoire with negative or standstill vaccination rates have recorded positive industrial production rates. These are not the only conditions that have been given, as developed countries with positive vaccination rates have also led to positive industrial production rates in some instances, whilst developing countries have not been able to advance their rate of industrial production. This analysis has been negatively affected by the lack of data, especially in the rate of industrial production change in most developing areas excepting Latin America. This has hampered the effective comparison between the two indicators and may not allow us to provide

a strong answer to whether there is a direct relationship between vaccination rates and the economic recovery of countries dealing with Covid-19.

5. CONCLUSION

5.1. Discussion

This work focuses on the impact of Covid-19, and especially the vaccination campaigns that fight against it, on developed and developing economies. The reviewed literature tells us that Covid-19 has provoked a sanitary, social, and economic crisis that has proven to hit all countries at an international level due to its non-discriminatory character. Nonetheless, the effect that it has had across countries has been asymmetric, with differing impacts according to their economic status and whether they are developed or developing economies. Whilst developed countries have been better off due to their accessibility to funds to provide for their population, especially in the health sector, and their easy access to the necessary resources, this has not been the case for emerging countries. Developing economies, who were already facing several issues at an economic level, were faced with an unprecedented pandemic that caused further economic problems, especially due to government measures involving restrictions and lockdowns. The lack of effective health systems in developing countries made it harder for them to offer the necessary services to fight against the pandemic, and in turn, negatively impacted their ability to carry out the essential vaccination campaigns needed to achieve *herd immunity*. Moreover, the reliance of developing countries on international donor funding hampered their situation to a greater extent. During the start of 2020 and until a little into 2022 all countries around the world have focused domestically on themselves to fight against the effects of the pandemic and provide for the population so they can achieve *herd immunity* and return to normality again, allowing the population to work normally. This may have affected the ability of developed countries in aiding emerging economies as a race to purchasing a great number of vaccines took place between the former to ensure that their population could effectively be vaccinated. This, in turn, impeded developing economies from accessing the right number of vaccines at the right time, and slowed down the process in carrying out the campaigns. Although it is expected for all countries to recover from this crisis, some sooner than others, David Malpass (2021) clearly stated in the World Bank Live event that, as a result of the pandemic, poverty had increase and the gap between the rich and the poor had definitely widened (2021, World Bank Live).

This work clearly stated the differences that exist between developed and developing economies, investigated the relationship between the rate of vaccination campaigns and the percentage change in industrial production over the pandemic. It seeks to understand whether the category of a country, developed or developing, plays a critical role in their ability to carry out effective vaccination campaigns and on whether the percentage change in industrial production is directly related to the latter. Vaccination campaigns are fundamentally organized to achieve the desired *herd immunity*, which in turn allow individuals to carry on normally with work and the percentage of industrial production in all sectors of the economy to continue at the normal rate or grow. Moreover, an international *herd immunity* allowed economies to return to normality, or the so-called new normality, and freed countries from border restrictions, for example. However, not all countries had the same ability to achieve said immunity, mainly due to their economic status and their access to essential resources to fight against the pandemic. Developed countries, able to achieve higher rates of vaccination amongst their population, experienced higher percentages of industrial production change than developing economies would.

5.2. Conclusions and improvements of the study

The study showed a visual representation, through maps, of the relationship between the percentage rate in industrial production and the percentage of vaccinated people in each country during the same periods of time. The percentage change in industrial production, as provided by *International Financial Statistics*, showed development over the years, both positive and negative taking into account the time of the pandemic. However, the information was not complete due to lack of information on many countries, especially those that are in the developing economy category. As we can see in the maps, all countries colored in orange are the ones that provide data on the percentage of industrial production change over the periods of time selected, and the main regions that are shaded orange include North America, the euro area and selected countries such as India and Mongolia, for instance. The information on the percentage of total vaccinated people in each country, on the other hand, is much more complete as provided by *Our World in Data*. This is shown by the maps shown in the blue shade, where the lightest shade represents lower percentages and the darker one represents higher percentages. Although there is information of almost every country in the map regarding the percentage of vaccinated people, there isn't on the

percentage of industrial production change, which hinders the comparison or the relationship that this study looks to make between both indicators.

Whilst the lack of information prevented this study from carrying out an effective comparison between the two indicators, especially taking into account developed and developing economies, there are some interesting results which can be taken from the maps that helps us in our investigation and in its analysis. We see the levels of industrial production change before the pandemic are rather high, mainly due to all sectors in industrial production working normally before the unprecedented crisis. Around March 2020, which is the time where the pandemic hit hardest at an international level, there is a much lighter shade of orange to show the low or negative levels of industrial production change as a result of the measures imposed by national governments and international organizations such as restrictions and lockdowns. The third quarter of 2020, as compared to the first and second quarter, registered much higher rates of industrial production change as a result of increased consumption by private households and countries' adaptation to the new normality and to new regulations. By the time we reach the fourth quarter of 2020, there is already available data on the percentage of vaccinated people around the world, which allows there to be an effective comparison between the data in both indicators. We see that whilst there is no data on most developing economies in the percentage change of industrial production, the maps showing the percentage of vaccinated people portray much darker shades of blue in the developed economies of the world; these areas include North America, Oceania and the euro area, mainly, but there are also high rates registered in several countries of Latin America, as well as Mongolia and India. At first glance, it can be said that developed economies experience higher levels of recorded vaccinated people that developing countries. Nonetheless, this does not mean that these positive numbers in vaccinated people directly translate into positive numbers in industrial production change. This study shows that there are cases where developed countries such the United States and Canada in North America, registering high percentage of vaccinated people, register positive percentages of industrial production change. However, there are also cases where this situation is reversed and developed countries, such as those located in the euro area, have high percentages of vaccinated people however continue to register negative rates of industrial production change. Moreover, another case that has been mentioned in the analysis is the one of

Côte d'Ivoire, where the country has registered positive industrial production change rates with a total of 0% vaccinated people, as shown in Figures 12 and 13.

There is no clear conclusion to this analysis, besides the fact that developed countries have experienced and continue to experience much higher rates of vaccinated people than developing economies. However, it is important to mention the fact that there is missing data on industrial production change in most developing countries which shows that it is probable that these register much lower rates than developed countries and do not have the ability to register them. It also shows that despite high rates of vaccinated people, there may be negative rates of industrial production change in that same period of time; this can mean that the relationship between both indicators may not be too clear. In order to achieve a better response to whether there exists a relationship between the speed of vaccination campaigns and the economic recovery of countries, it is essential that information on the percentage in industrial production change is recovered from all countries, including developing economies. In order to do so, more information may be recovered from other reliable sources to complement the study and complete the maps with the correct shades of orange. This would be an important step to improve this work as it would enable us to effectively compare the situation in each country in relation to both indicators, and whether the percentages of industrial production change in developing economies are much lower than those registered in developed countries, even if both are negative.

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