# TESTING DURING THE COVID-19 PANDEMIC: HOW GOVERNMENT POLICIES CHANGED OUR BEHAVIOUR

By

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I, the undersigned Timur Naushirvanov, hereby declare that I am the sole author of this thesis. To the best of my knowledge this thesis contains no material previously published by any other person except where proper acknowledgement has been made. This thesis contains no material which has been accepted as part of the requirements of any other academic degree or non-degree program, in English or in any other language.

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## Abstract

Improving healthcare systems is one of the key policy priorities for governments around the world, and medical testing is an integral part of building a well-working healthcare system. As the COVID-19 pandemic showed, possible testing policies can vary from country to country: in Austria, especially in Vienna, it was widely accessible and free of charge, while in Switzerland, for a long period of time, it was the opposite. As a result, these different approaches could lead to differences in people's response in mobility and social activity. The purpose of this thesis is to understand the impact of varying testing policies on human behaviour, and more specifically, on humans' social activities. To do so, I apply statistical analysis and investigate this relationship during the fourth wave of the COVID-19 pandemic in Austria, Denmark, and Switzerland. My results suggest that government policies promoting widespread and accessible testing may to some extent prevent a reduction in the level of social engagement and help to decrease the associated costs of testing. This knowledge may further help policy-makers with formulating testing policies in similar situations, as well as researchers with understanding the human behavioural response to different testing policies.

# Table of Contents

# List of Figures



# List of Tables

# 1. Introduction

Improving healthcare systems is one of the key policy priorities for governments around the world, and the most recent COVID-19 pandemic proved it. As the most recent analysis of Goal 3 from the United National Sustainable Development Goals states, "the pandemic has demonstrated the importance of universal health coverage and multisectoral coordination for health emergency preparedness" (United Nations 2021).

Medical testing plays an integral role in building a well-functioning healthcare system, because it allows to evaluate a person's health conditions at early stages and to implement specific measures aimed at improving them and/or preventing others from being affected further. During the COVID-19 pandemic, the relevance of testing increased globally since it was widely considered as a way to prevent the spread of coronavirus SARS-CoV-2 (further referred as "coronavirus" or "COVID-19") and its negative consequences, including deaths or hospital overload (Bevan et al. 2021).

Medical testing policies during the COVID-19 pandemic differed in various countries and even among regions in one country. For example, in Austria, mass antigen testing began on December 2, 2020, and has been freely available since then for all residents (Pollak, Kowarz, and Partheymüller 2021a). Furthermore, on March 26, 2021, a special campaign promoting free PCR testing "Alles gurgelt" ("Everything gurgles") was introduced in Vienna (Pollak, Kowarz, and Partheymüller 2021b). In Germany, free-of-charge antigen testing has been available since March 6, 2021, although these capacities were rather limited: for instance, each German citizen had a right to only one free test every week, with a few exceptions (European Consumer Centre France 2021). The availability of free PCR tests was also limited there.

If initially testing was proposed as a voluntary measure for people to take care of themselves, their relatives and friends, the introduction of COVID-19 passes and rocketing numbers of infected people due to new variants forced governments to make antigen and PCR testing mandatory for the people who wanted to be more engaged in social life, in some countries and regions even for those with booster shots. In Austria, the so-called "3G rule" (tested, vaccinated, or recovered) was in effect for gastronomy and the leisure sector starting on May 19, 2021 (Pollak, Kowarz, and Partheymüller 2021c). In Germany, the same policy was enacted on August 23, 2021 (Bundesregierung 2021).

This variety of testing strategies may have had different consequences for people and their social behaviour. On the one side, as research shows, a widespread testing could allow

people to participate more actively in different social activities (Denford et al. 2021; Zhang et al. 2021). On the other side, there is also evidence showing that testing could also create additional costs that make it less desirable for many people (Bevan et al. 2021; Hafer 2021). This gap in our understanding leads to the **research problem** that lies in the uncertainty regarding possible impact of various testing approaches on people's social activities and behaviour. To my knowledge, this is the first work that tries to look at cross-country and cross-regional variation in COVID-19 testing policies and relate it to the social mobility data.

In this thesis, I am analysing the potential impact of these different testing policies on varios human mobility trends and social engagement. Therefore, my **research question** is: How have different testing policies during the COVID-19 pandemic affected people's behaviour and their engagement in social activities? A clear understanding of this relationship is relevant for policy-makers in the field of public health who propose to adopt testing policies and want to ensure that they can be successfully implemented, without any strong negative side effects. Furthermore, this thesis contributes to studies of the consequences of testing for human behaviour and social activities.

The main **hypothesis** of my thesis states that policies promoting a widespread and cheap COVID-19 testing will not have a significant effect on people's social activities compared to places where testing is less common. In order to test this hypothesis, I will apply a statistical toolkit and analyse the differences in people's mobility trends in regions of three countries: Austria, Denmark, and Switzerland. Despite having relatively subtle differences in terms of their socio-economic and political background, these countries followed different testing policies and had different testing rates. I am using these differences in order to track possible effects and significant relationships between testing and mobility indicators. The main time span of my interest is between July 2021 and March 2022, a period before, during, and after the fourth wave of the COVID-19 pandemic, which coincided with different policy changes related to this development.

This thesis has six chapters. In the second chapter, I will conduct a literature review and propose my theoretical argument with a behavioural model explaining the impact of testing on an individual's behaviour. In chapter 3, I describe the research design of this study, including the case selection and identification strategy. In chapter 4, I conduct an empirical analysis, and then critically discuss its results in chapter 5. Finally, this thesis ends with concluding remarks and recommendations for policy-makers.

# 2. Literature Review and Theory

In this chapter, I am providing an overview of existing literature on the effects of the COVID-19 pandemic and testing policies on different aspects of human lives, as well as presenting theoretical grounds of this thesis. I first start with discussing the impact of COVID-19 on social norms and institutions. Then, I present empirical and theoretical evidence on COVID testing, including the motivations to take it and further consequences of this decision. Finally, I build my theoretical argument on the impact of COVID testing policies on human social activities, which further guides analysis in the next chapters.

## *2.1. The COVID-19 pandemic, social norms, and institutions*

The COVID-19 and response measures affected people's daily lives in many different ways. Following hygiene rules more thoroughly, spending time in isolation during lockdowns, working and studying distantly, - all these peculiarities of the COVID time impacted the individual human perception of life and shattered people's social norms.

Social norms are "the informal rules that govern behaviour in groups and societies" (Bicchieri, Muldoon, and Sontuoso 2018). Social norms can be established during group interaction, when some group members observe the others' actions or opinions and start following them (Neville et al. 2021). Depending on the social group type and the role of influential actors with their exemplary behaviour, people who identify themselves with this group repeat the corresponding actions, which then form social norms. Overall, social norms play an important role in determining people's attitudes and actions and shaping their behaviour (Neville et al. 2021; Smith and Louis 2009).

Social norms and their perception can be affected by individual and collective actors. Neville et al. (2021) highlight the role of leadership: group leaders can define group values and specify them further. As a result, they can shape the perception of social norms and influence the public willingness to follow them. For instance, during the COVID pandemic, the prime minister of New Zealand, Jacinda Ardern, successfully encouraged the country's population to adhere to the lockdown measures by pointing out the values of mutual aid and collective resilience. In contrast, the United Kingdom's prime minister Boris Johnson and his chief adviser Dominic Cummings demonstratively violated similar restrictions, which negatively impacted public trust and willingness to follow approved norms (Ibid.).

Different institutions, such as government policies, regulations, laws, and traditions, may also contribute to the development of social norms. Public institutions use social norms

for different purposes: they can be willing to correct erroneous health perceptions and behaviour, resolve existing societal problems, or push people to follow the implemented formal regulations in a less coercive way (Cucchiarini et al. 2021). While the Japanese government has not introduced a formal lockdown and simply asked people to follow the preventive health guidelines, the German government was much tougher in its preventive policies (Schmidt-Petri et al. 2022). The fact that Japan already faced pandemics previously might have created the social norms of strictly following preventive measures, which rendered an adoption of severe limitations unnecessary. On the other hand, this experience was relatively new for modern Germany and its population, who had to rely more heavily on restrictive policies to change existing social norms.

Before going further in understanding the impact of different institutions on behaviour during the pandemic, it is fruitful to remind what the institutions are. Douglas North defines them as "the humanly devised constraints that structure political, economic and social interaction" (1991, p.97). Researchers usually differentiate between two types of institutions: formal and informal. Following North's interpretation, formal institutions can be further conceptualised as formal rules of the game (or formal constraints) that are determined by official entities with the authority to establish and enforce these rules. Informal institutions imply culture and traditions that affect interactions between people in a society (Alesina and Giuliano 2015).

There is no consensus on whether institutions and social norms are similar concepts or not. Both social norms and institutions are rules that guide people in their interactions with each other in a society, and both can be formal, or imposed by formal bodies, and informal, or derived from cultural conventions or informal agreements. One difference can be that some institutions are self-enforceable, so there is no need for some external power that has to guarantee their functioning, while social norms are always associated with the external pressure from other individuals or society (Dequech 2006). This understanding of social norms and institutions depends also on the academic field. As David Dequech's comparison shows (2006), in sociology, many researchers equate institutions and social norms more often than in institutional economics, where social norms are perceived as one part of institutions. In this thesis, I continue with the institutional tradition and assume that social norms, together with formal constraints, form institutions.

Returning to the impact of institutions on people's behaviour, the coronavirus itself was not able to change people's behaviour and social norms. However, the way different stakeholders reacted to it largely contributed to our perception of this infection and its danger.

For example, governments in many countries introduced different anti-covid measures, including lockdowns, closures of places for entertainment and recreation, as well as educational institutions, encouraging people to avoid public gatherings and take vaccines. Other stakeholders, such as media, international organisations, and civil society organisations, were also involved in raising awareness, slowing down the disease's spread and easing its impact on the people.

The government policies, which were adopted to minimise the effects of the pandemic, are formal institutions: they represent specific rules and constraints decided and agreed upon by elected public bodies and established as mandatory rules for the whole society, with specific legal mechanisms aimed at enforcing and monitoring their implementation. Different government policies can be introduced with the objective to change existing social norms and achieve desirable policy outcomes. Existing research shows that formal institutions do have an effective impact on people's behaviour and attitudes. For example, Lee et al. (2021) in their literature summary report focused on various behaviours which can reduce COVID-19 transmission: maintaining physical and social distancing, wearing masks, getting tested, and self-isolating when feeling unwell, and home office. The authors also argued that national governments are the key institutions that can enable these behavioural changes through fiscal and legislative measures, improved communication, service provision and planning. OECD (2020) praises government actions taken to collect behavioural insights and then use them for bringing behavioural changes: after analysing cases of ten countries that did it during the early stages of the pandemic, it shows significant improvements in crisis response management.

However, the sole existence of formal institutions is not enough in ensuring changes in public behaviour and attitudes, since they should have enough formal capacities to affect humans. The government and its strength in terms of implementing policies are important formal institutions that affect the success or failure of the proposed measures. Moreover, in many situations, it is necessary to keep in mind informal institutions in place that can impact potential abidance by the rules. Lee et al. (2021) lists several informal institutions which can influence the relationship between formal anti-COVID policies and people's behaviour, such as trust in the authorities, social inequality and general socioeconomic situation, history (including past experience of dealing with pandemics), health literacy, shared culture and values. These informal institutions may help different governments in promoting their policies. If people are literate, socially and financially secured, and highly respect and trust their government, then they are more likely to follow formal scientific recommendations and

implemented policies. However, these formal institutions can also create additional difficulties for governments' policies, especially if people struggle with their lives and doubt governments' motivations and honesty.

Trust is the one of the most important informal institutions that plays a role in ensuring successful implementation of policies. In the case of governments, when they introduce certain measures, their actual implementation depends on the level of trust that residents have towards their authorities. If many people believe that their government is not capable of taking care of them, then they have fewer incentives to follow the introduced measures. Another type of trust concerns scientific knowledge: if people for some reason do not believe in what researchers and scientists say, then it may also weaken public willingness to follow policies that the scientific community supports. This was partly the case during the COVID-19 pandemic when many preferred to believe in conspiracies rather than scientific facts. However, not only is trust in government and science important, but also between-person relations within the society: if people care about their family members and neighbours and trust them, then they will also have more incentives to follow the prescribed measures that prevent the disease's spread. People will only have enough motivation to care about each other if they are confident that they will not be somehow tricked or abandoned.

Another informal institution that was relevant for implementing preventive measures during the COVID-19 pandemic is the past experience of dealing with similar outbreaks, or the 'history of pandemics'. In countries and societies that experienced similar diseases before (for instance, South Korea and Japan), the public attitude toward many anti-disease practices, such as mask-wearing, was more amenable (Joung, 2020). These practices have been already ingrained in the public culture as effective ways to protect the health of the other people, but also to avoid micro dust or just to hide a face; therefore, chances were lower that the majority of people in these places would deviate when the mandatory mask-wearing is introduced.

A broader social perception and social attitudes are also important in ensuring the success of formal institutions. For instance, evidence from Indonesia suggests that people are more likely to adhere to public health safety rules, such as social distancing and mask usage, when they see others following these rules (Indrayathi et al. 2021). Moreover, it also shows that women tend to have a higher level of adherence, which may be related to the fact that females have generally more intentions to take care about their health (Amodan et al. 2020).

Interactions between formal and informal institutions are complex. In some situations, they can enforce one another, while in other circumstances, they can prevent potential effects from each other. Alesina and Guiliano (2015) believed that this interaction should be

described as institutional coevolution and mutual reinforcement: for instance, the higher reinforcement capacity of a state is connected with a higher level of public trust in democratic societies, and vice versa.

The analysis by Bentkowska (2021) proves the importance of this coevolution through a better understanding of informal institutions for ensuring the effectiveness of the formal ones. When designing policies, their successful implementation usually requires being able to predict possible societal responses and, consequently, implement specific measures that mitigate potential resistance and rejection to accept the new regulations. In Germany, France, and Denmark, both COVID-19 restrictions and the subsequent residential reaction were relatively strong, while in Poland, Hungary, and Italy, despite having similarly stringent government policies, the residential reaction was weaker (Ibid.). This may imply that national governments in the latter countries were not able to identify informal channels that could have encouraged people to follow newly introduced policies more conscientiously, and the fact that people in these countries have lower levels of all the forms of trust supports this. Therefore, a comprehensive analysis of public behaviour, including measurements of government trust, willingness to follow rules, perceptions of risks, susceptibility to misinformation, and identification of different social groups, plays a vital role in the preparation of specific measures and rules that can be indeed enforced by the government toolkit.

To sum up, the COVID-19 pandemic had many implications on social norms and institutions all over the globe. Many formal and informal institutional transformations, which were implemented or just happened in response to the pandemic, have changed social norms shared by societies. Some of these changes, such as mask-wearing and self-isolation, may only be temporary, but others can have a long-lasting effect and even cause more radical transformations. Further discussion will be focused more on testing policies and their impact on human lives and behaviour, which is relevant for my theory and empirical analysis.



### *2.2. Testing policies and human behaviour*

A successful implementation of testing policies and anti-coronavirus strategies potentially depend on a number of other formal and informal institutions, which have been discussed in the section above. Here, I would like to focus more on existing theoretical and empirical evidence describing the impact of the COVID-19 testing on humans' behaviour and vice versa.

Throughout the pandemic, the general public experienced many issues related to testing, from dealing with the associated social, psychological, and economic costs, to

familiarising itself with constantly changing options and legal procedures (Bevan et al. 2021). Moreover, the testing landscape also varied greatly between different countries and even regions. For example, mass antigen testing in Austria began on December 2, 2020, and was freely available for all residents after that, while the free-of-charge antigen testing in Germany was introduced four months later, with more limited capacities: each German citizen had the right to only one free test every week, with a few exceptions (European Consumer Centre France, 2021; Pollak et al., 2021).

Differences in the testing landscape also include differences in testing options and practices. The two most common testing methodologies are reverse transcription polymerase chain reaction (RT-PCR) and Rapid Antigen Detection Tests (RADT) (Gandhi et al. 2020). Even though both methods use specimens from the same body regions (nasal, throat, nasopharyngeal), the former should be sent to specialised laboratories for storage and testing, with the results becoming available overall around 1-7 days, while the latter can be done on-site, with the results appearing in 30-60 minutes (Ibid.). The sensitivity rate of RT-PCRs is higher compared to RADTs, which means that PCRs are more likely to detect true positive results. Based on these characteristics, we can expect that differences in testing options and methodologies can also lead to different behavioural responses.

In the context of COVID-19, both of these testing methodologies have played an important role in stopping the disease's uncontrollable spread and helping public health systems. Rapid antigen tests, despite their lower sensitivity, made the process of testing easier and more available, because many people were able to make them even at home and receive results relatively shortly (Hafer 2021). PCR tests with their accuracy that approaches 100% allowed to diagnose COVID-19 with a high level of precision, although it took some time (Ibid.). In some regions, governments applied innovative approaches to testing, in order to make it both very accurate and fast: for instance, the special campaign called "Alles gurgelt" ("Everything gurgles") that promoted free PCR tests through supermarkets and drugstores was introduced in Vienna (Pollak, Kowarz, and Partheymüller 2021b). This system allowed to reduce the waiting time for test results to 12-24 hours, what allowed people to know their precise COVID status sooner.

Testing affects humans in several ways (Hafer 2021). First, it leads to self-isolation and quarantine not only if the test results are positive but also when an individual has COVID-like symptoms and should wait for the test results before continuing his social activities. Secondly, it requires some private information from individuals, from their contact data to biological specimens, and any potential misuse of this information may have dramatic

consequences for people's safety and their trust in the public health system. Thirdly, these privacy concerns also lead to issues with communication: for instance, the existence of social stigma around testing may discourage people from receiving it.

While testing is associated with the aforementioned costs, it is usually not so obvious to individuals what benefits they can have in return (Bevan et al. 2021). Mass testing is effective for public health purposes since it allows to detect disease earlier and to implement necessary precautions. However, as for individual users who usually bear the majority of costs, these benefits are not so obvious. In some circumstances, when an individual needs to visit his or her elderly relatives, the necessity of testing becomes clearer, because it is reasonable to assume that this individual does not want to harm the health of their relatives. Apart from similar situations, people need to be guided by a strong sense of social engagement and responsibility in order to calculate the potential benefits of testing and get tested regularly.

As research shows, many people wilfully ignore medical and health risk information (Nordström et al. 2020; Thunström et al. 2021). It implies that not many people may want to do testing regularly unless there is some clear motivation to get it. Using survey data from the United States, Thunström et al. show that people who worry about their health, who have more regular social contacts, and who are insured are more likely to take a test (2021). They also find healthy young people to be more willing to test compared to healthy old people. At the same time, factors such as the individual's financial situation, a need to self-isolate at a special facility, prior testing experience, or having children with underlying health conditions, are not significant in changing individual preferences in favour or against testing.

Slightly opposed to the previous study, empirical evidence from Indonesia demonstrates that people who had previously taken a COVID-19 test were more compliant with public safety health regulations compared to those who did not have it (Indrayathi et al. 2021). At the same time, it proves that factors like perceived health-related benefits and risks contribute to following recommended health regulations. Another study from the United States also indicates significant correlations between being better aware of COVID-19 risks and sociodemographic characteristics and a higher probability of showing preventive behaviour and getting tested (Li et al. 2020).

In line with the impact of informal institutions on improving formal regulations and guidelines, a study conducted by Watson et al. (2021) provides more evidence emphasising the role of trust and communication in ensuring larger engagement with the COVID-19 testing programme in Southampton, United Kingdom. The three most important factors that

contributed to people's participation in the programme were open and transparent communication from programme implementers, a shared sense of community, and programme convenience in terms of registration and instruction simplicity and the availability of drop-off points. According to the respondents who participated in this study, building a higher level of trust, providing extra support for those who tested positive, and increasing accessibility could have improved the programme realisation. This shows that similar informal channels together with improved communication of the formal ones can increase people's willingness to participate in testing.

In an overview study summarising different research articles on COVID-19 testing, Bevan et al. (2021) identified the following impacts of testing. Firstly, in terms of mental health and wellbeing, most researchers showed that testing helps manage anxiety, especially if an individual receives negative results. At the same time, test unavailability may have a negative impact on an individual's mental health. Secondly, in terms of adherence to guidelines, most people are ready to follow protective health measures if they receive a positive test result, and they would not change their behaviour in case of being tested negative. Moreover, two articles that were included in this overview claimed that individuals reported their readiness to engage in riskier behaviour after receiving a negative test result.

The unavailability of testing is associated with a significantly higher intention to engage in risky behaviours facilitating viral transmission, and individuals with a negative test demonstrate the highest readiness to engage in similar behaviours (Zhang et al. 2021). The same study also shows that women and individuals with a poor health status are less likely to engage in risky behaviour. Denford et al. support the finding that receiving negative test results enables more active participation in different daily and festive activities (2021). The researchers also found positive consequences of the confirmed COVID-19 status: for instance, people felt more reassured, which helped their mental health.

One of the most important limitations of almost all aforementioned studies is that they rely heavily on survey and self-reporting data from respondents recruited through online platforms. While asking people directly about their preferences sounds plausible, in fact, people can still be biased and hide their real preferences and intentions, and the resulting studies should be perceived with some criticism. In contrast to these surveys, data that I use in this thesis to study the impact of testing on human behaviour is less subjective, since it is automatically recorded by independent means (mobile phones and other electronic devices) and reflects people's actual presence in different settings in a more precise way. Therefore, my findings may have a higher validity.

In conclusion, we see that testing during the COVID-19 has been an important and complex tool that affected human lives in many different ways. On the one hand, it is an important tool in policy-makers' hands that potentially enables protection from the uncontrollable disease spread. On the other hand, it potentially imposes many costs on the population, and its potential intention to be tested regularly depends on numerous factors. As a result, public health authorities need to understand these factors and implement testing policies in a way that encourages massive public participation in testing. Building trust and open communication, spreading trustworthy information, facilitating a sense of community are key elements that can help engage more people.

### *2.3. Theoretical argument*

Anti-COVID preventive strategies and testing policies should lead to efficient societal outcomes by controlling transmissions, monitoring incidence and trends over time, mitigating the impact of COVID-19 in healthcare settings, rapidly identifying all clusters or outbreaks in specific settings, and preventing reintroduction in countries and regions with sustained control of the virus (European Centre for Disease Prevention and Control 2020). However, due to the unpredictability of the pandemic development, finding a perfect policy that could possibly lead to this equilibrium was challenging for governments and policy-makers worldwide. As a result, we saw many different approaches, from China's zero-COVID to Sweden's policy aimed at leaving large society segments open, with some variations occurring even between regions of more decentralised countries (Yan et al., 2020; Pashakhanlou, 2021; Song, 2022).

All testing policies, which were introduced by the governments, are arising from the changes in formal institutions and are affected by existing social norms and perceptions. If new and unexpected changes are introduced, which make testing mandatory for visiting specific settings and engaging in risky behaviour, then these changes can overcome cultural norms against testing, especially if existing institutions are strong enough to enforce them. However, if testing is proposed to the population as a voluntary choice, then this policy development will interact with the culture of testing and trust in government, which will affect the final policy outcome. These different testing approaches and their impacts on people's social behaviour are at the core of my thesis' focus.

During the new wave of the pandemic in autumn 2021, after vaccines became sufficiently widespread in Europe, many countries reintroduced regulations on social activities. At that time, if a person wanted to participate in a social activity, this person needed to be vaccinated, recovered, or tested. In the very end, his/her participation in a social activity

depended on the costs of testing and/or willingness to participate in a social activity. If testing costs were relatively low, which implies that the testing sites were largely available and the procedure was free, then a person could be tested easily and engage in any activities of his or her choice. On the other side, if for some reasons testing was not available, people would either become less socially active or needed to find possible ways to trick the law-enforcement system.

However, any types of testing create additional costs that further affect people's social activities. Even if a government tries to make the procedure as simple as possible, people may still need to spend time visiting testing sites or waiting for test results, especially in the case of PCR tests, not to mention additional psychological costs. As a result, people may prefer avoiding social activities if they require additional testing. Another possibility is that individuals may be afraid of receiving positive test results before some important events, such as a cross-border flight, because it usually creates additional risks and costs of cancelling the trip, self-isolation, and treatment. Therefore, the introduction of widespread and cheap testing can still decrease people's engagement in such activities, especially if they a priori have some prejudices toward testing or can rationally calculate their future costs and benefits and decide that it is better to abstain.

This thesis poses the research question of how different testing policies during the COVID-19 pandemic affected people's behaviour and their engagement in social activities, and a review of existing research shows that the answer is uncertain. Collected evidence shows that, on the one side, mandatory and regular testing creates more costs for individuals, which may discourage their social activities; on the other side, being clear about their COVID-19 status gives more certainty and increases the likelihood of risky social behaviour. Based on this uncertainty, I would argue in my main **hypothesis** of this thesis that policies that promote a widespread and cheap COVID-19 testing will not have a significant effect on people's social activities compared to places where testing is less common. In the next section, I present a behavioural model that describes possible human behaviour before and after the testing process and makes several predictions related to the hypothesis.



### *2.3.1. The behavioural model*

*Before testing: estimating its costs and benefits*

Before taking a decision about testing, a person needs to calculate its possible costs and benefits. At some specific point in time, an individual has two options: to get tested or to ignore it. A choice between these two decisions depends on associated costs. An individual

will prefer testing if the perceived benefits from it are higher than potential costs and risks: for instance, if it is required by law, and deviation leads to financial or psychological penalties (e.g., a need to self-isolate or to miss some interesting events), or if there is a widespread societal consensus encouraging testing with the possibility of social contempt for those who deviate. An individual may also prefer testing if he is risk-averse and/or has more altruistic attitudes towards people around him because he cares about his health and wants to prevent the disease from spreading further and harming other humans, especially during its large outbreaks. At the same time, if the aforementioned conditions are not met, then an individual will prefer to ignore testing, since its costs for him exceed possible benefits.

When costs of testing decrease, it is reasonable to expect that more people will prefer to get tested. The same outcome can be achieved if people have a better perception of testing benefits. Thus, *government policies providing these two preconditions for testing should logically lead to a higher level of testing*.

If testing is mandatory for people who want to participate in some activities, then costs of deviating behaviour increase, and testing can become more preferable. If testing is additionally widely accessible, then its costs decrease, and it can become even more advantageous. In these conditions, even some people with initially less developed pro-social preferences will do testing, because it may allow them to avoid associated penalties.

An individual usually has some expectations about what test results should be received, and these expectations can intervene in his willingness to participate in testing. For instance, a patient with flu-like symptoms is more likely to test, because he perceives these symptoms as a proof of infection. However, in some cases, individuals who believe that they may have an infection would prefer to avoid testing due to possible quarantine costs or other reasons. As a result, he can continue his participation in social activities, and there will not be any impact on recorded behavioural patterns.



*After testing: knowing COVID-19 status*

Knowing the COVID-19 status is the next step in understanding the risky behaviour of a person. After testing, an individual can receive either positive or negative results. If he receives a negative test, then he is not going to have any additional costs and the testing process at this point is over. He can further participate in any social activity. Conversely, if his test results are positive, then additional costs may arise. In this case, an individual must self-isolate, should reveal his status, recommend his contact persons to get tested, and should be ready to undertake additional financial costs related to treatment and food delivery. Since

there was presumably a reason to be tested, such as visiting a public space or meeting with relatives or friends, these plans will also have to be cancelled.

Some additional factors may also intervene in a testing process between taking a sample and having a test result, especially in the case of PCR tests, and make a testing status unclear. For instance, a test sample may have been taken incorrectly and the received test outcomes are unclear and invalid, or, due to logistical reasons, test results were received much later than it was expected. As a result, some additional psychological and financial costs may appear. It is less of an issue with antigen tests, since their results can be received relatively fast in the same setting, but because of the differences in test sensitivity, some anti-COVID policies were explicit in accepting only PCR-test results.

If an individual has a negative test result, he is expected to behave riskier and engages in social activities more actively. He knows his COVID-19 status and can care less about its potential transmission, even though he is still exposed to being infected if other people do not take tests and do not know their health status. Therefore, *an individual with a negative test will participate more in different social activities*, unless he is extremely risk-averse and afraid of potential consequences of getting the disease.

*People who are demotivated by testing*

The question that arises further is how many people are demotivated from engaging in social activities because of perceived costs of testing and have no opportunities to overcome it. This understanding is important because it can potentially help to measure the cumulative effect of testing on social activities. There are usually people in the society whose perception of the COVID-19 is controversial ('the COVID sceptics') and who would prefer to try to find other ways or just ignore social activities. However, this percentage cannot be too high, otherwise governments would not impose restrictions and measures that cause massive hostility and cannot be effectively ensured due to negative social perception.

The percentage of demotivated people is also a country- or even region-specific number and depends on many formal and informal institutions that were outlined in the previous sections, including trust in the government, past experience of pandemics, and communication transparency. Lower trust and vague communication lead to an increase in this number, since people become more sceptical. As a result, if there are many citizens who are sceptical about COVID-19 and related policies, then the authorities will not impose hard restrictions or mandatory testing policies, because it will not be effectively implemented due to grassroots resistance. However, if the majority believes that these policies are essential for

safeguarding public health, then governments have more freedom in their policies, and willingness to deviate from the formally-recommended behaviour will be less.

Summarising the aforementioned arguments, we can expect that widespread testing policies will not affect social activities, especially in countries with a higher level of trust in the government, since fewer people will be ready to ignore testing, but predominantly negative results will motivate the majority of them to be more socially active. If there is no widespread testing in a country or region with a high level of trust, we can expect that people there may be on average more careful and avoid public gatherings.

# 3. Research Design

In this chapter, I provide an overview of this thesis' research design. In order to test the proposed theory and hypothesis, I use regression analysis on panel data from three countries that followed different policy approaches towards the COVID-19 testing: Austria, Denmark, and Switzerland. These three countries are relatively similar from socio-economic and cultural perspectives, and I assume that existing differences between them are not strong enough to explain the impact of implemented testing and anti-COVID policies on people's behaviour. The first section describes the case selection process in greater detail. After this, I also explain my statistical identification strategy, which is followed by the data description.

## *3.1. Case Selection*

The three cases of my interest are Austria, Switzerland, and Denmark. While comparing them, I am assuming that there are no differences between them that can potentially affect the results of policy differences in testing. The most noticeable difference between Switzerland and two other countries is ethnic fractionalisation – Switzerland is much more diverse. It also looks richer due to a much higher size of GDP per capita and net income after taxes. Switzerland also has the highest trust in the government, while Denmark has the highest level of interpersonal trust. In other aspects, these countries look more or less similar: they all have a very high HDI, low levels of income inequality, high levels of government effectiveness, rule of law and trust in police (see Table 1). Another important political factor, which is not listed in the table, is the fact that all three countries are democracies, and Austria and Switzerland are also federations, which means their regional governments have more autonomy in policy-making than the regional governments in Denmark.

The varying types of communication between society and respective governments in these countries can also play a role in defining different testing policies. Switzerland is a country where practices of direct democracy are much more widespread compared to Austria and Denmark, and its federalism is stronger than in Austria (Feld and Kirchgässner 2000; Helms, Jenny, and Willumsen 2019). Swiss citizens participate in referenda on different policy issues several times per year and have a more salient voice in forming the country's decision-making. Therefore, the government's decisions in Switzerland are influenced by citizens to a greater extent compared to Denmark or Austria. However, these differences between countries are not relevant for explaining possible behavioural outcomes of different testing policies. Even though some people in Switzerland may feel higher responsibility, its referenda' outcomes on coronavirus policies show approximately the same number of people

who are in favour and against existing COVID-19 measures as in Austria and Denmark (Hoepke 2021; Waal 2021; Bundeskanzlei BK 2022).

**Table 1.** *A comparison of countries.*

| Indicator | Austria | Switzerland | Denmark | Source |
|---|---|---|---|---|
| Government Effectiveness (-2.5 – 2.5) | 1.66 | 2.02 | 1.89 | WGI (2020) |
| Rule of Law (-2.5 – 2.5) | 1.81 | 1.83 | 1.86 | WGI (2020) |
| Trust in government, % | 62.62 | 84.63 | 71.58 | OECD (2020) |
| Trust in police (0-10) | 7.2 | 7.4 | 7.9 | Eurostat (2013) |
| Interpersonal trust (0-10) | 5.9 | 6.4 | 8.3 | Eurostat (2013) |
| GDP per capita, current US $ | 48,586.8 | 87,097.0 | 61,063.3 | World Bank (2020) |
| Net income after taxes (US $, PPP) | 43,125.7 | 63,769.56 | 42,067.1 | OECD (2020) |
| GINI index | 30.8 | 33.1 | 28.2 | World Bank (2018) |
| Human Development Index | 0.922 | 0.955 | 0.940 | UNDP (2019) |
| Ethnic Fractionalisation, % | 10.68 | 53.14 | 8.19 | World Population Review (2022) |

*Source:* Author's calculations.

Despite the absence of strong differences, stringency and containment and health policies introduced by these countries varied (see Figure 1). During almost all period, except May – September 2020, Austria had the strictest regulations. Denmark and Switzerland changed their position several times, Denmark was the second strictest country almost all times until the summer 2021, when Switzerland took over.

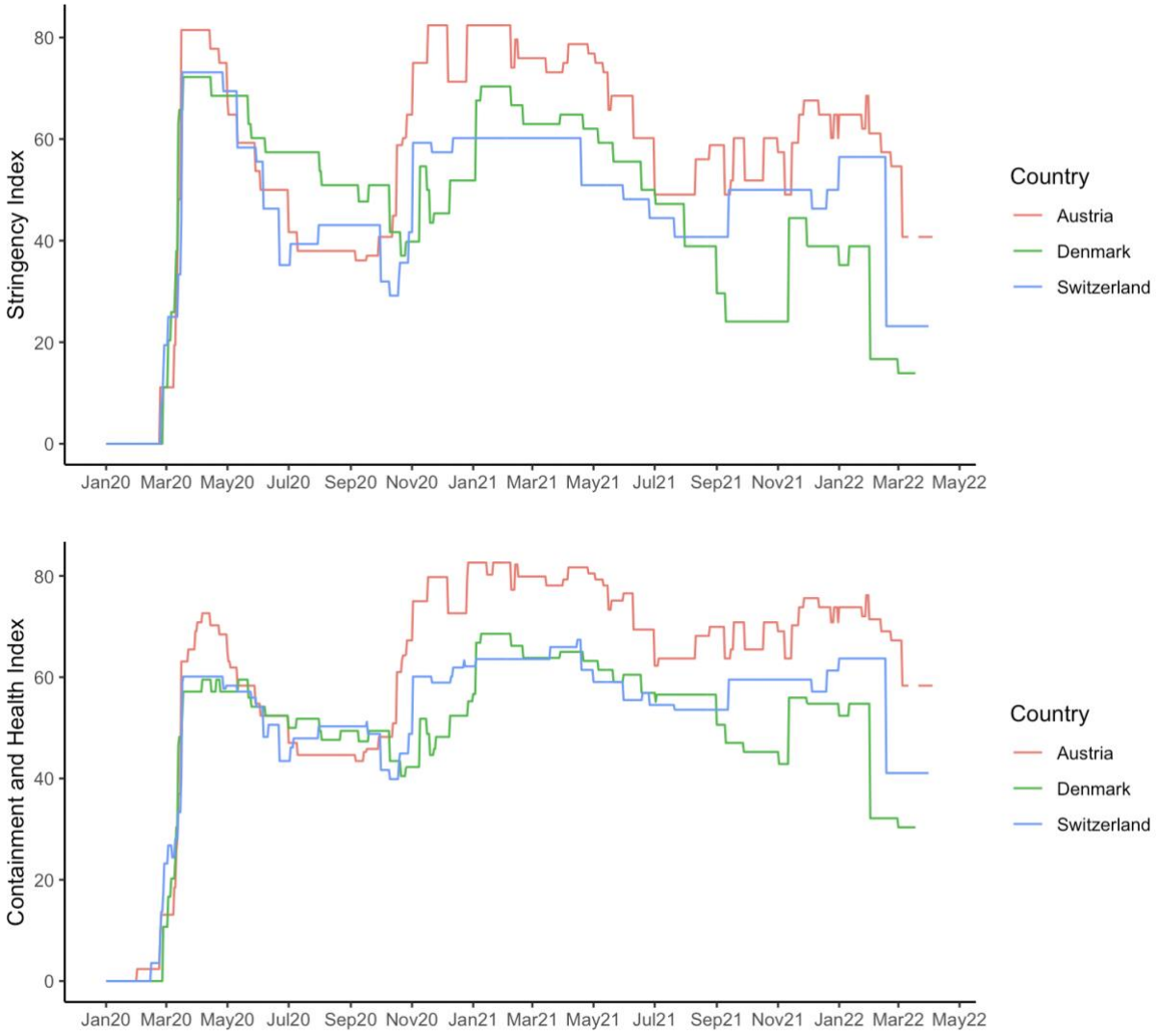


**Figure 1.** Stringency and Containment and Health Indices across three countries. Author's images based on Hale et al. 2021.

The testing rate between countries also varied greatly (see Figure 2). Approximately until May 2021, Denmark was a leading country as per the number of tests per capita, with Austria following after. After this, Austria became a stable leader in testing, reaching its peaks in December 2021 and February 2022. During the whole period, Switzerland had the lowest number of tests per capita. Denmark was several times close in reaching Switzerland, first in August – October 2021, and then in March 2022.

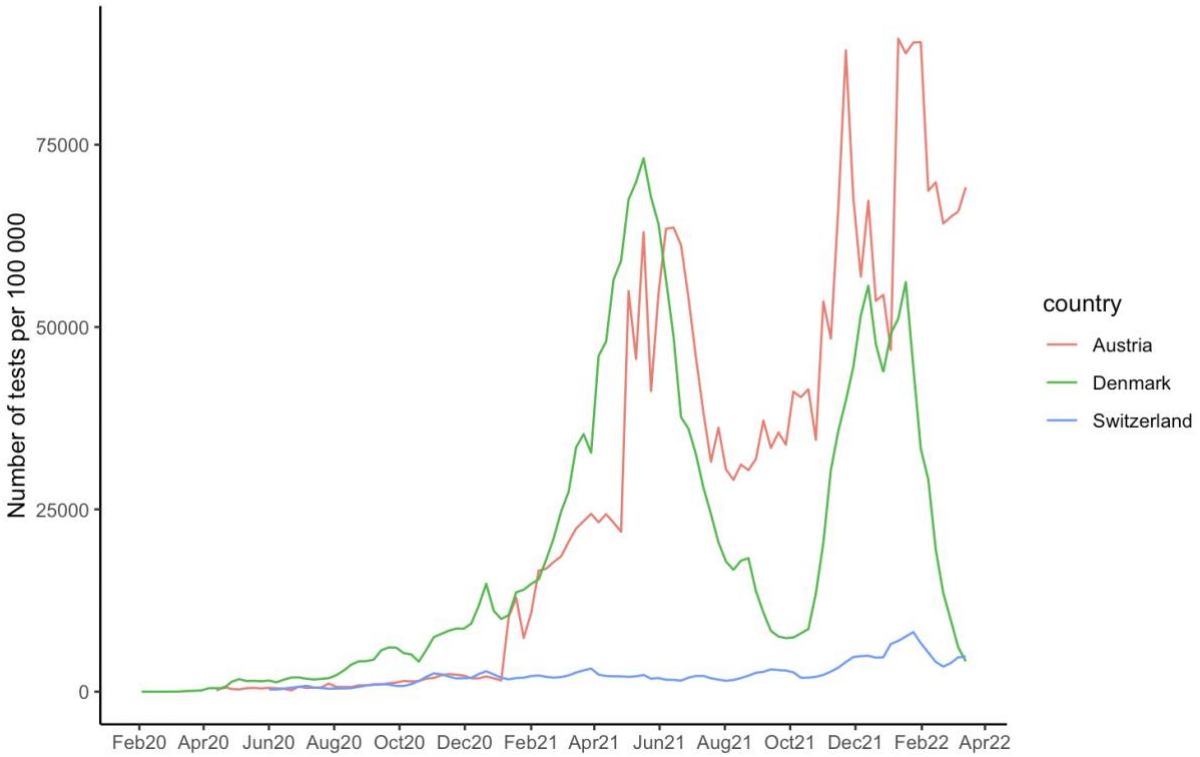


**Figure 2.** Testing rate across countries. Author's image based on European Centre for Disease Prevention and Control 2022.

To sum up, I argue that existing cross-country differences are not powerful enough to change people's potential behavioural responses to government policies in a completely distinct manner. Many people in these countries share trust in public authorities and are likely to follow their guidelines and regulations. Moreover, as I show in next chapters, the majority of population in all countries supported the introduced protective measures, so it is unlikely to observe strong deviation or massive resistance. At the same time, we also see different trends in testing that allow to notice its possible effects on public behaviour. In the next section on identification strategy, I describe my statistical analysis in greater detail.

### *3.2. Identification Strategy*

During the fourth wave of the pandemic (approximately October – December 2021), Austria, Switzerland, and Denmark reintroduced stricter anti-COVID policies. In Austria and Denmark, this period also coincided with skyrocketing testing numbers (Figure 3), which was a result of these tightened policies.

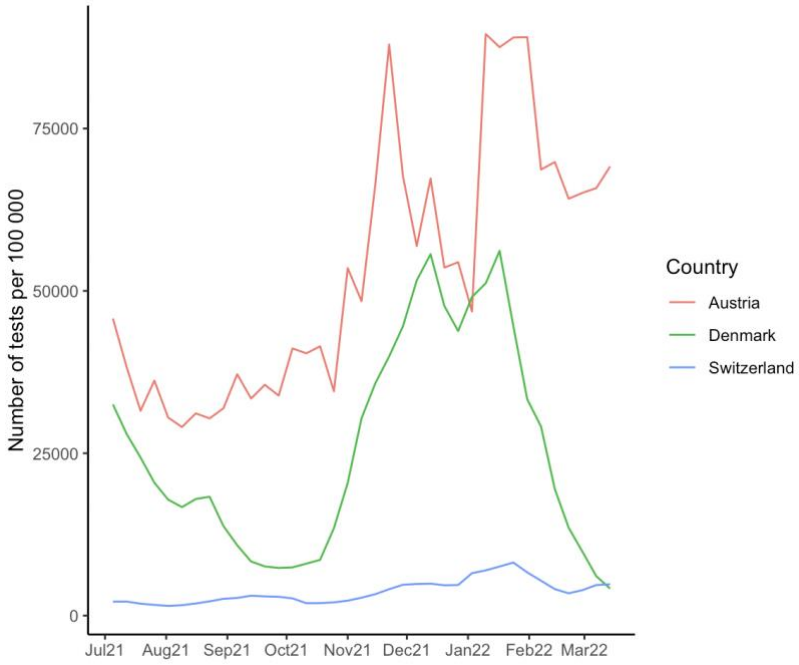


**Figure 3.** Testing rate across countries, from 1 July 2021. Author's image based on European Centre for Disease Prevention and Control 2022.

As the behavioural model suggests, changes in testing variables should lead to changes in people's behaviour and social activities. To measure the latter, my dependent variables are different indicators of human mobility from Google Mobility Data. They help with evaluating changes in people's mobility patterns across regions: whether they are using recreational areas or public transport more often compared to the pre-pandemic level, or whether they prefer visiting parks and staying at home. Originally, this data was recorded on a daily basis, but it was transformed to vary across weeks.

The time period of my main analysis is from 1 July, 2021 to 15 March, 2022, although sometimes I focus on narrower spans. Firstly, this is the period when vaccination has become widely available to all those interested in being vaccinated. Secondly, green passes in different European countries were introduced around this time (European Commission 2021). Finally, this is the period just before, during, and after the fourth wave of the COVID-19. The unit of analysis are regions of the analysed countries, the time unit is weeks.

In this thesis, I am also exploring the effects of a more stringent policy change, which is the period of time when the anti-COVID-19 regulations were hardened and different "G" rules were introduced: in Austria – 8 November 2021 – 5 March 2022 (except Vienna, where the time period was 1 October 2021 – 15 March 2022); in Switzerland – 20 December 2021 – 17 February 2022; in Denmark – 12 November 2021 – 31 January 2022. More of this is described in the section on empirical analysis.

Three other independent variables are the testing rate, the percentage of PCR tests, and the positivity rate. The testing rate indicates the number of tests conducted every week per 100 000 inhabitants, the percentage of PCR shows the percentage of these tests among all, and the positivity rate shows the percentage of all tests with positive results. All these variables were converted to a weekly basis.

The regression model includes several control variables. From 22 November to 12 December 2021, there was a nationwide lockdown in Austria, and I included it as a control due to its obvious impact on the behavioural patterns of Austrians. Another control variable is the percentage of fully vaccinated people. Since government policies were designed in a way to encourage vaccination, its increasing rate should have a positive impact on mobility trends. The third control variable is the stringency index: although my formal treatment is the same for all three countries, in reality, its "toughness" varies, and this control can help with tackling existing cross-country differences in these adopted measures. Unfortunately, both vaccination rate and stringency index were available only at the country level, and they do not reflect possible cross-regional differences in trends.

I additionally included three fixed effects: time, countries, and regions. The time fixed effect helps to control time-varying unobservables that affect all countries and regions, while the country fixed effect – cross-country time-invariant unobservables. Since two of the countries are federations (Switzerland and Austria), it is natural to expect them to have some regional-varying unobservables which can be addressed by adding a regional fixed effect.



The regression model 1:

$$\gamma_{w,c,s} = \beta_0 + \beta_1 * testing\ rate_{w,c,s} + \beta_2 * PCR\ percent_{w,c,s} + \beta_3 * positivity\ rate_{w,c,s} + \beta_4 * controls_{w,c,s} + \beta_5 * time\ FE_w + \beta_6 * country\ FE_c + \beta_7 * regional\ FE_s\ ,$$

where $\gamma_{w,c,s}$ – behavioural changes in a week $w$ in a country $c$ in a region $s$, $testing\ rate_{w,c,s}$ – a number of tests per 100 000 inhabitants in a week $w$ in a country $c$ in a region $s$,

$positivity\ rate_{w-1,c,s}$ – a percentage of positive test results in a week *w* in a country *c* in a region *s*, $time\ FE_w$– time fixed effect (controlling for time-variant unobservables on a national level), $regional\ FE_s$ – regional fixed effects (controlling for region-specific unobservables), $country\ FE_c$ – country fixed effects (controlling for country-specific unobservables). One included control variable varies by week *w*, country *c*, and region *s*, while two others vary only by week and country. Standard errors should be clustered at the time and country levels in order to alleviate problems related to serial correlation.

The regression model 2:

$$\gamma_{w,c,s} = \beta_0 + \beta_1 * policy\ change_{w,c,s} + \beta_2 * testing\ rate_{w,c,s} + \beta_3 * PCR\ percent_{w,c,s} + \beta_4 * positivity\ rate_{w,c,s} + \beta_5 * controls_{w,c,s} + \beta_6 * time\ FE_w + \beta_7 * country\ FE_c + \beta_8 * regional\ FE_s\ ,$$

where the only new variable is a $policy\ change_{w,c,s}$ – dummy variable with 0 when anti-COVID measures were not tightened due to the fourth wave and 1 when they were, in a week *w* in a country *c* in a region *s*.

In several sections, I add interaction terms between some characteristics of the testing process and countries or regions, since there was a cross-country and cross-regional variation in terms of how their anti-COVID strategies were designed and implemented. It can help to test the behavioural model, since some of the countries had less costly testing policies, and their comparison with other states may show changing behavioural patterns predicted by the model. For this reason, I also focused on a more limited time span (1 October – 1 December 2021) and a more limited geographical span (regions of Austria).

### *3.3. Data*

In this work, I am relying on five datasets:

- Public health data on COVID-19 from the European Centre for Disease Prevention and Control and the Swiss Federal Office of Public Health. It has national and subnational data on daily infection rates, hospitalisations, deaths, testing, and so on.
- Google COVID-19 Community Mobility data, which contains 6 mobility indicators at national and subnational levels varying on a daily basis: grocery and pharmacy, parks, transit stations, retail and recreation, residential areas, and workplaces. This dataset records people's presence and their mobile activity in these areas. The baseline equals 100

and represents a median value during the 5-week period between 3 January and 6 February 2020.

- COVID-19 Government Response Tracker data with different indicators showing how national governments reacted to the pandemic. It varies daily. There are five aggregated indices: government response, containment and health, stringency, economic support, and risk of openness.
- A global database of COVID-19 vaccinations from Our World in Data contains, among other things, variables that show changes in the numbers of fully vaccinated people on a weekly basis in different countries.

All data was preliminarily processed and prepared in R statistical software. Some variables were transformed to present observations on a weekly basis instead of daily. Table 2 shows descriptive statistics of key variables.

**Table 2.** *Descriptive statistics.*

| Variable Name | N | Mean | SD | Min | 25% | 75% | Max |
|---|---|---|---|---|---|---|---|
| Testing rate | 1332 | 14189.83 | 21838.488 | 549.458 | 2506.023 | 13470.946 | 147471.371 |
| Positivity rate | 1332 | 15.938 | 17.248 | 0 | 2.294 | 23.916 | 68.7 |
| Fully vaccinated, % | 2128 | 65.306 | 11.566 | 34.69 | 58.35 | 74.84 | 82.52 |
| Stringency index | 2119 | 42.06 | 12.974 | 13.89 | 37.304 | 50 | 67.59 |
| PCR tests, % | 1480 | 62.403 | 24.055 | 0.38 | 49.127 | 80.814 | 99.36 |
| Retail and recreation | 1965 | -5.15 | 16.563 | -84 | -14.714 | 4.065 | 54.771 |
| Grocery and pharmacy | 1899 | 11.667 | 13.975 | -91 | 4.208 | 18.143 | 70.286 |
| Parks | 1763 | 51.825 | 72.401 | -68.5 | 7.576 | 77.548 | 592.143 |
| Transit stations | 2091 | -12.809 | 16.128 | -53.429 | -23.143 | -5.143 | 78 |
| Workplaces | 2128 | -17.917 | 10.521 | -65.24 | -22.571 | -11.2 | 7.857 |
| Residential areas | 1907 | 4.138 | 3.576 | -7.143 | 1.8 | 6.143 | 17.8 |

*Source:* Author's calculations.

# 4. Empirical Results

This chapter aims to provide an empirical analysis of the impact of COVID-19 testing on people's social behaviour. I start by looking at the testing rate and mobility trends. After this, I introduce a treatment effect based on changing government policies caused by the new wave of the pandemic in autumn-winter of 2021-2022. Then, I focus my analysis on a limited time span, 1 October, 2021 – 1 December, 2021, to see estimates during the most changing times. Finally, I limit my analysis further by looking only at differences among Austrian regions.

## *4.1. Testing rate and mobility trends*

As my theoretical argument and hypothesis suggest, in countries and places with widely accessible testing, more people should get them, which further encourages people to remain at the same level of social activeness. In Austria, especially in Vienna, testing was made cheaper around the summer of 2021: all residents could be tested for free in different accessible areas, and the testing rate was higher than in Switzerland and Denmark. Therefore, it is possible to expect different mobility trends between them, which are represented in Figure 4.

I start by using three variables from the Google mobility tracker: residential areas, retail and recreation facilities, and workplaces. In my view, these indicators may potentially reflect people's social activities in the most appropriate way: when fewer people want to engage with others, their preference is to stay home; when they want to be more socially active, they visit different retail and recreational facilities; finally, going to workplaces reflects whether people are ready and allowed to visit these facilities and spend more times with their colleagues.

As Figure 4 shows, in autumn 2021 and winter 2022, there was an increase in the number of people staying at home across all three countries. Fewer people visited recreational areas and facilities, especially in Austria. This period coincided with an increase in COVID-19 cases and the reintroduction of protective measures, described in the following section on treatment, which certainly played a role in shaping these trends.

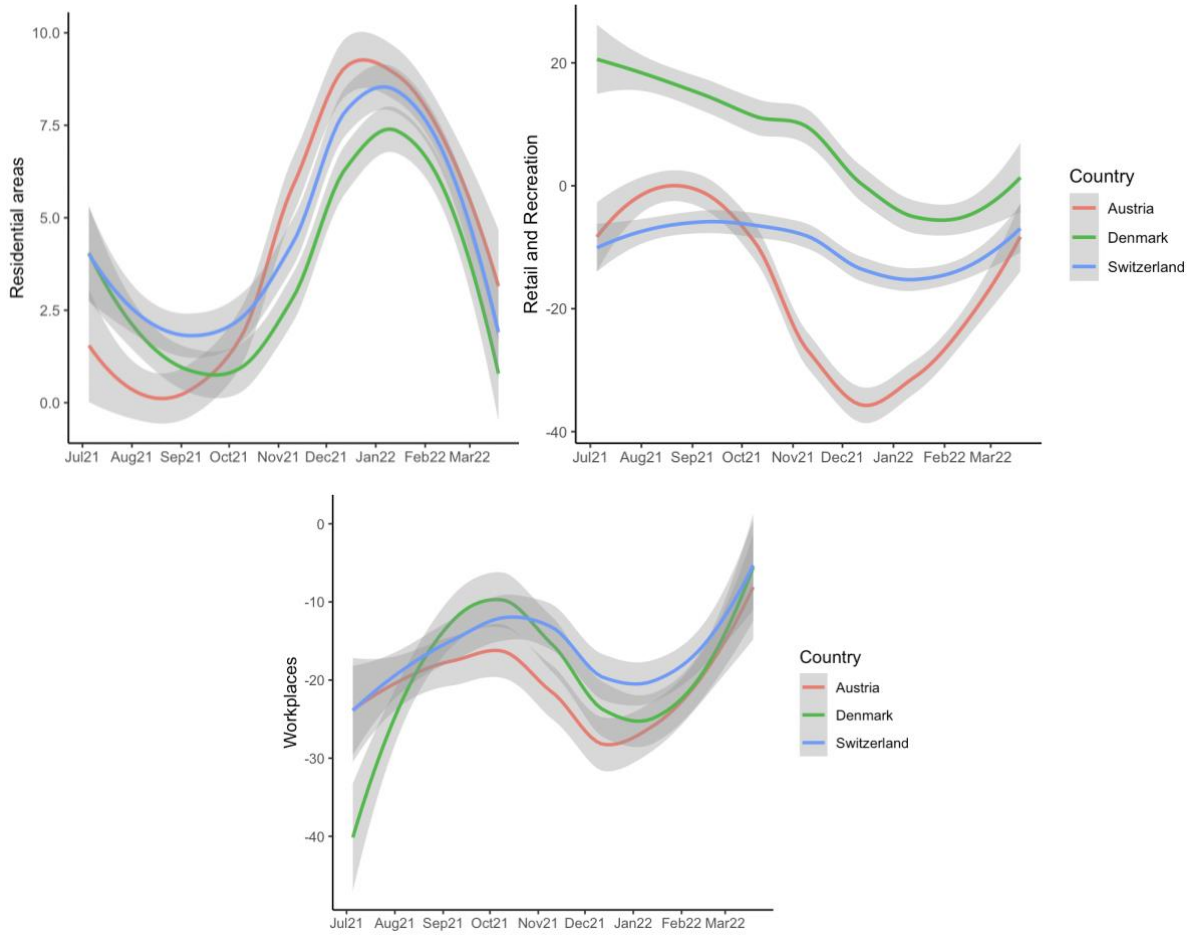


**Figure 4.** Smoothed mobility trends across three countries. Author's images based on Google 2022.

I used statistical analysis to identify possible relationships between mobility trends and COVID testing indicators. The percentage of PCR tests has a positive relation with human presence in residential areas, which is shown in Table 3. Model 1 indicates this positive relation, and it can be explained by the fact that people need to spend more time at home while waiting for their PCR test results. The only significant indicator in all three models presented in this Table is a lockdown that is associated with decreased human presence in retail facilities and workplaces, and increased presence in residential areas.

**Table 3.** *Testing rate and mobility trends.*

| | Model 1 | Model 2 | Model 3 |
|---|---|---|---|
| Dependent V: | Resident areas | Retail & Recreation | Work |
| Testing rate | 0.000 | 0.000 | 0.000 |
| | (0.000) | (0.000) | (0.000) |
| PCR percent | 0.016* | -0.012 | 0.013 |
| | (0.003) | (0.037) | (0.028) |
| Positivity rate | 0.001 | 0.150 | -0.043 |
| | (0.014) | (0.106) | (0.053) |
| Lockdown | 5.113* | -40.260* | -10.415* |
| | (0.729) | (5.772) | (2.045) |
| Fully vaccinated | -0.037 | -0.398 | 0.483 |
| | (0.049) | (0.390) | (0.239) |
| Stringency index | 0.052 | 0.136 | -0.099 |
| | (0.025) | (0.086) | (0.110) |
| Observations | 1141 | 1198 | 1326 |
| R2 | 0.932 | 0.804 | 0.857 |
| R2 Adj. | 0.927 | 0.791 | 0.848 |
| R2 Within | 0.398 | 0.278 | 0.161 |

+ p < 0.1, * p < 0.05, ** p < 0.01, *** p < 0.001

All models contain fixed effects on countries, regions, and weeks. Standard errors in parentheses are clustered on countries and weeks.

*Source:* Author's calculations.

In Table 4, I additionally include interaction effects with countries, since there still exists potential country-level differences in particular policies and trends that I want to examine. In this case, it is interesting to note that the percentage of positive test results is positively associated with people staying at home more often in Austria, with this relationship being less strong in Denmark and Switzerland. At the same time, there are no similar correlations between retail facilities and workplaces. While the positive relationship between positive tests and staying at home has a theoretical ground and was discussed before, it is not clear why it was significant enough only in Austria. All countries had regulations that obliged individuals who tested positive to self-isolate at home, but it appears that the Austrian regulations were perhaps more effective, and people were more willing to follow them.

Another statistically significant association in the case of Switzerland exists between the percentage of PCR tests and more people staying at home, as well as fewer people visiting retail and recreational areas (compared to Austria). As in the previous case, even though this relationship has already been identified and theoretically described, it is unclear why this effect is significant in Switzerland and not significant in two other countries.

**Table 4.** *Testing rate and interactions with countries.*

| | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 | Model 6 |
|---|---|---|---|---|---|---|
| | Resident areas | Retail & Recreation | Work | Resident areas | Retail & Recreation | Work |
| Testing rate | 0.000+ | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| PCR percent | 0.009 | 0.028 | -0.035 | -0.082 | 0.006 | 0.009 |
| | (0.004) | (0.011) | (0.064) | (0.071) | (0.018) | (0.043) |
| Positivity rate | 0.370+ | 0.017 | 0.394 | 0.005 | -0.086 | -0.068 |
| | (0.093) | (0.007) | (1.156) | (0.096) | (0.250) | (0.043) |
| Positivity rate × Denmark | -0.295+ | | -0.941 | | -0.336 | |
| | (0.082) | | (0.951) | | (0.153) | |
| Positivity rate × Switzerland | -0.346+ | | -0.311 | | 0.003 | |
| | (0.086) | | (1.040) | | (0.243) | |
| PCR percent × Denmark | | -0.022 | | -0.075 | | -0.065 |
| | | (0.012) | | (0.057) | | (0.025) |
| PCR percent × Switzerland | | -0.027* | | 0.227+ | | 0.032 |
| | | (0.006) | | (0.068) | | (0.031) |
| Observations | 1141 | 1141 | 1198 | 1198 | 1326 | 1326 |
| R2 | 0.936 | 0.934 | 0.812 | 0.814 | 0.861 | 0.858 |
| R2 Adj. | 0.931 | 0.930 | 0.799 | 0.801 | 0.852 | 0.849 |
| R2 Within | 0.433 | 0.420 | 0.305 | 0.314 | 0.185 | 0.169 |

+ $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

All models contain fixed effects on countries, regions, and weeks. Standard errors in parentheses are clustered on countries and weeks. The following control variables are also included: Lockdown, Fully vaccinated, and Stringency index.

*Source:* Author's calculations.

The percentage of PCR tests compared to the total number of tests in Austria, Denmark, and Switzerland was quite diverse, as Figure 5 shows. Switzerland looks the most stable case: it had lower variations, starting at approximately 50% and rising to 80%, while Austria rocketed from around 10% to 60%, and Denmark fluctuated between 30% and almost 100%. It is also important to remember that the overall testing rate in Switzerland was significantly lower compared to Austria and Denmark, as it was presented in Figure 3. This Figure 5 may help to explain the Swiss relationship between more PCRs and staying at home: since this country constantly had a stable and huge amount of collected PCRs (more than 50%), many tested people had to wait for the results in isolation. In two other countries, especially in Austria, the percentage of PCRs during many weeks was lower than 50, so more people got antigen tests and were able to receive results quickly.

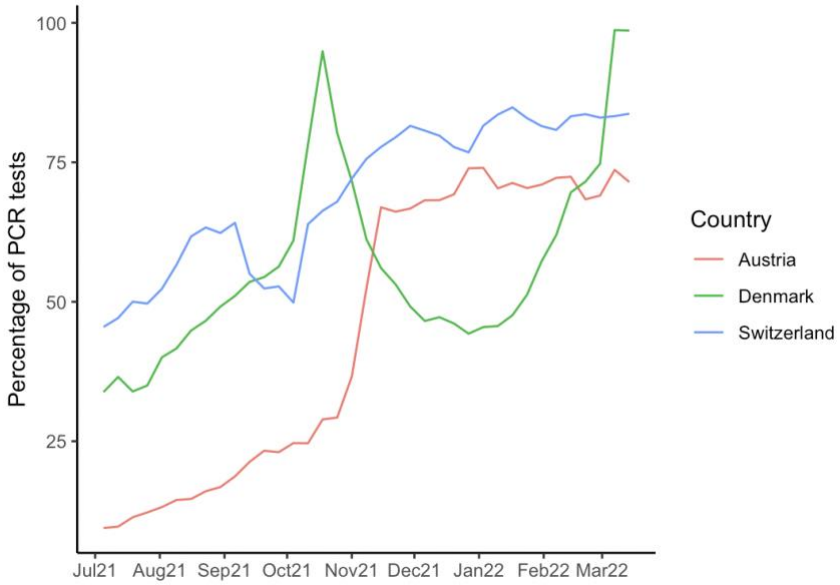


**Figure 5.** Percentage of PCR tests across countries. Author's image based on European Centre for Disease Prevention and Control 2022.

### *4.2. Introducing a policy change*

In this section, I add a treatment effect, which is related to the new anti-COVID measures that were reintroduced in the countries due to increasing COVID-19 cases in autumn 2021. Since the countries implemented their own policies, the exact time period of this treatment varies between countries and even between regions. These differences may help to see potential changes in people's activities before and after introducing these policies.

In Austria, the government announced its plans to prevent further increases in COVID-19 cases and hospitalisations with a more stringent policy on entering some designated public spaces in November 2021. This policy was called the "2G" rule and originated from the two German words Genesen (recovered) and Geimpft (vaccinated), which meant that only those people who had valid proof of recovering from the COVID-19 or being vaccinated could have access to gastronomy, cultural and leisure sectors, care and sports facilities. This rule was introduced country-wide on 8 November. A similar policy for night gastronomy and large events has already been introduced solely in Vienna on 1 October 2021, with the "2.5G" rule applied to other sectors (in addition to vaccinated and recovered, people who made a PCR test within 48 hours and had valid negative results could have access to these facilities, too). During events with more than 25 people, as well as in the night gastronomy, Vienna demanded a "2G+ rule": in addition to being vaccinated or recovered, a person should provide an additional PCR test (Kurier 2021). Moreover, on 15 November, the country-wide lockdown (all-day curfew) for unvaccinated people came into force. One week later, on 22 November, the country-wide lockdown for all people began and lasted until 12 December. This lockdown is included as a control variable. From 19 February 2022, all areas with the "2G" rule could switch to the "3G" (vaccination, recovery, and either PCR or antigen testing). Many other restrictions fell on 5 March 2022 (Reuters 2022), with Vienna as the only exception, which continued to follow the "2G" rule for some time (ORF 2022).

In Switzerland, the Federal Council decided that, starting from 20 December, 2022, the "2G" rule will be used in almost all areas (The Federal Council of Switzerland 2021). In settings where masks could not be worn or where it was not possible to eat or drink while sitting, the "2G+ rule" had to be applied. These measures were in power until 17 February 2022, when almost all anti-COVID measured were cancelled (The Federal Council of Switzerland 2022).

Denmark lifted all anti-COVID restrictions on 10 September, 2021. However, due to a new infection wave and rapidly rising numbers, the Danish authorities announced on 8 November that they would follow other governments in reintroducing mask-wearing and

vaccine and immunity passports, although they agreed on the "3G" rule only (Berliner Zeitung 2021). The new measures came into force on 12 November and lasted until the end of January, when the government announced their cancellation (NDR 2022).

Introducing this policy change in regression models does not show any significant associations between this treatment and the mobility variables of interest. Table 6 shows regression models with the treatment effect which is classified in a time frame explained above. However, while introducing interactions with countries, we see that, compared to Austria, treatment in Denmark was significantly correlated with a lower presence in residential areas, and treatment in Switzerland was significantly correlated with a much higher presence near retail and recreation facilities. This implies that tightening policy changes in Denmark motivated fewer people to stay at home, as compared to Austria and Switzerland. At the same time, compared to Austria, significantly more people in Switzerland were able and preferred to visit retail and recreation facilities, and Denmark's mobility trends were closer to those in Switzerland.

**Table 5.** *Policy changes introduced.*

| | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 | Model 6 |
|---|---|---|---|---|---|---|
| | Resident areas | Retail & Recreation | Work | Resident areas | Retail & Recreation | Work |
| Treatment | -0.458 | -3.651 | 2.599 | 0.443 | -9.364 | 2.311 |
| | (1.038) | (4.079) | (1.402) | (0.619) | (4.363) | (2.233) |
| Testing rate | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| PCR percent | 0.017+ | -0.007 | 0.010 | 0.006 | 0.044 | 0.000 |
| | (0.004) | (0.028) | (0.027) | (0.004) | (0.021) | (0.025) |
| Positivity rate | 0.003 | 0.164 | -0.050 | 0.010 | 0.079 | -0.082 |
| | (0.016) | (0.103) | (0.045) | (0.020) | (0.103) | (0.030) |
| Treatment × Denmark | | | | -1.539* | 7.190 | -1.923 |
| | | | | (0.627) | (2.630) | (2.568) |
| Treatment × Switzerland | | | | -1.013 | 8.894+ | 2.367 |
| | | | | (0.863) | (2.916) | (0.871) |
| Observations | 1141 | 1198 | 1198 | 1141 | 1198 | 1326 |
| R2 | 0.932 | 0.806 | 0.806 | 0.935 | 0.810 | 0.860 |
| R2 Adj. | 0.928 | 0.792 | 0.792 | 0.930 | 0.796 | 0.851 |
| R2 Within | 0.403 | 0.283 | 0.283 | 0.424 | 0.298 | 0.180 |

+ p < 0.1, * p < 0.05, ** p < 0.01, *** p < 0.001

All models contain fixed effects on countries, regions, and weeks. Standard errors in parentheses are clustered on countries and weeks. Control variables Lockdown, Fully vaccinated, and Stringency index are also included.

*Source:* Author's calculations.

### *4.3. Reducing the time span*

In this section, I decided to focus more precisely on periods with one of the most significant changes in testing among the analysed countries: from 1 October, 2021 to 1 December, 2021. This is the period when new policies were introduced, and when the new wave of COVID-19 was raging. Figure 6 shows changes in testing rate.

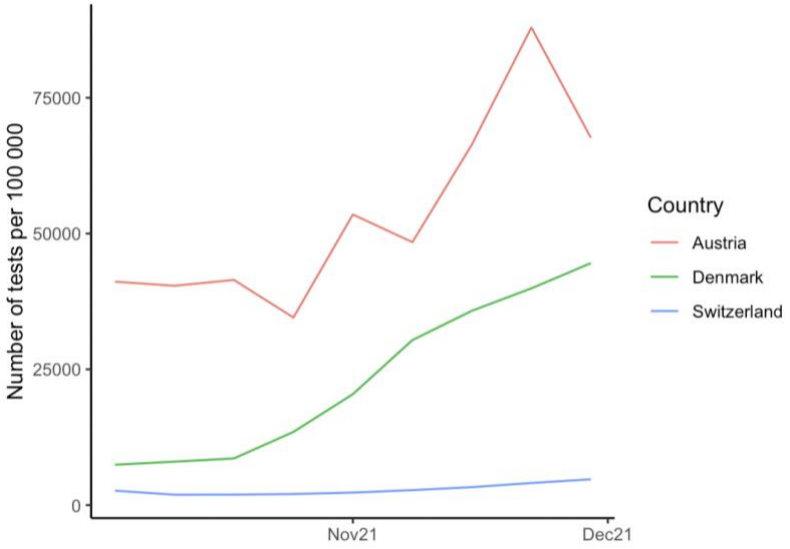


**Figure 6.** Testing rate on a reduced time span. Author's image based on European Centre for Disease Prevention and Control 2022.

Table 6 presents several interesting results of this more focused regression analysis. Compared to Austria, where a higher positivity rate was associated with lower activities near workplaces, in Denmark and Switzerland, it was not the case. At the same time, the relationship between this rate and activities near retail and recreational facilities were significantly lower in Denmark, while in Switzerland it was similar to Austria. A higher positivity rate implies that fewer people are tested negative, and fewer people are encouraged to be socially active, and these results were stronger in Denmark, where an increase in testing was the largest. Another relationship between the percentage of PCR tests and increasing activities in residential areas in the case of Switzerland has been already identified in Table 4.

**Table 6.** *Reduced time span.*

| | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 | Model 6 |
|---|---|---|---|---|---|---|
| | Resident areas | Retail & Recreation | Work | Resident areas | Retail & Recreation | Work |
| Testing rate | 0.000 | 0.000 | 0.000+ | 0.000 | 0.000 | 0.000 |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| PCR percent | 0.020 | 0.016 | 0.019 | -0.129 | -0.019 | -0.007 |
| | (0.010) | (0.019) | (0.084) | (0.053) | (0.067) | (0.062) |
| Positivity rate | 0.483 | -0.034 | -2.686+ | 0.149 | -2.163 | -0.098 |
| | (0.270) | (0.035) | (1.548) | (0.229) | (1.620) | (0.068) |
| Positivity rate × Denmark | 0.771 | | 3.092** | | -6.039*** | |
| | (0.702) | | (0.953) | | (1.028) | |
| Positivity rate × Switzerland | -0.508 | | 2.902* | | 2.057 | |
| | (0.267) | | (1.423) | | (1.648) | |
| PCR percent × Denmark | | 0.068 | | 0.069 | | -0.295 |
| | | (0.054) | | (0.232) | | (0.221) |
| PCR percent × Switzerland | | -0.012 | | 0.251** | | 0.037 |
| | | (0.019) | | (0.023) | | (0.085) |
| Observations | 279 | 279 | 290 | 290 | 324 | 324 |
| R2 | 0.893 | 0.903 | 0.939 | 0.940 | 0.796 | 0.807 |
| R2 Adj. | 0.871 | 0.882 | 0.926 | 0.928 | 0.756 | 0.769 |
| R2 Within | 0.631 | 0.663 | 0.642 | 0.650 | 0.313 | 0.348 |

+ p < 0.1, * p < 0.05, ** p < 0.01, *** p < 0.001

All models contain fixed effects on countries, regions, and weeks. Standard errors in parentheses are clustered on countries and weeks. Control variables Lockdown, Fully vaccinated, and Stringency index are also included.

*Source:* Author's calculations.

### *4.4. Reducing the geographical span*

In addition to limiting the time span, here I will discuss exclusively the regions of Austria. Since Austria is a federation and its regional governments can introduce their own legislation, it may be fruitful to see differences in regional responses due to the COVID-19 pandemic. The government of Vienna in this case is the most interesting case, since it introduced policies that were different from other Austrian regions.

In Vienna, a region with the most accessible testing options, fewer people stayed at home and significantly more visited their work places than in other Austrian regions (see Table 7). A higher percentage of PCR tests was associated with more people staying at home and fewer of them visiting their workplaces, which is in line with previous results. A positivity rate was negatively associated with human mobility near workplaces and retail and recreational facilities, which also meets my theoretical expectations.

**Table 7.** *The regions of Austria.*

| | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 | Model 6 |
|---|---|---|---|---|---|---|
| | Resident areas | Resident areas | Retail & Recreation | Retail & Recreation | Work | Work |
| Testing rate | 0.000* | 0.000** | 0.000** | 0.000 | 0.000** | 0.000*** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| PCR pct | 0.000 | 0.026*** | -0.123** | -0.094 | -0.040** | -0.207*** |
| | (0.003) | (0.004) | (0.033) | (0.108) | (0.009) | (0.038) |
| Positivity rate | -0.189 | 0.003 | -23.235*** | -23.021*** | -5.910*** | -7.134*** |
| | (0.134) | (0.201) | (2.779) | (2.581) | (0.980) | (0.630) |
| Vienna | | -2.699*** | | -3.004 | | 17.219** |
| | | (0.392) | | (10.130) | | (4.012) |
| Observations | 54 | 54 | 54 | 54 | 54 | 54 |
| R2 | 0.969 | 0.978 | 0.764 | 0.764 | 0.751 | 0.815 |
| R2 Adj. | 0.960 | 0.972 | 0.702 | 0.695 | 0.685 | 0.760 |
| R2 Within | 0.035 | 0.335 | 0.494 | 0.494 | 0.290 | 0.472 |

+ p < 0.1, * p < 0.05, ** p < 0.01, *** p < 0.001

All models contain fixed effects on weeks. Standard errors in parentheses are clustered on weeks.

*Source:* Author's calculations.

# 5. Discussion

The empirical analysis allowed to make the following three takeaways. First, the testing rate does not show any direct impact on people's mobility activities. Across all presented models, it was either statistically insignificant or had a negligible size of impact, which implies that, on average, testing rate was not the most important factor in explaining differences in people's social activities.

Secondly, the effects of other testing variables, such as the number of PCRs or positivity rate, showed different correlations in the three countries of interest. For instance, a higher percentage of PCR tests was positively associated with people staying at home in Switzerland in comparison to Austria. This positive correlation also existed when the analysis was focused exclusively on Austrian regions. This relationship has theoretical grounds: when an individual performs a PCR test, he needs to wait some time until he gets the results, and he is expected to self-isolate at home while waiting. At the same time, the fact that this relationship has not been noticed in the case of Denmark requires further exploration.

A positivity rate was positively associated with activities near residential areas in Austria but not in Switzerland and Denmark. As in the previous case, this relationship has theoretical and empirical grounds: a higher positivity rate implies that more people receive positive test results, so fewer people can be socially active and more of them need to spend time at home. However, this was the case only in Austria. After reducing the time span, it became possible to identify additionally a negative relationship between the positivity rate and human activities near workplaces, but again only in Austria. In Denmark, there was only a strong negative relationship between the positive rate and human presence near retail and recreational activities.

Finally, the introduction of policy changes due to rising COVID-19 numbers in autumn-winter 2021-2022 resulted in different outcomes across countries. For example, it was associated with lower human activities near residential areas in Denmark, as compared to Austria or Switzerland. It was also associated with a higher human presence near retail and recreational activities in Switzerland and Denmark, compared to Austria. This means that the effect of protective measures and policies in Austria was slightly stronger than in Denmark and Switzerland, which could have been the result of a better law enforcement system, higher readiness of people to follow the guidelines, generally stricter and punishing policies, or a mixture of these factors.

When focusing only on Austria during the same period, Vienna had a noticeable decrease in activities near residential areas and their similar level near retail and recreational facilities, compared to other Austrian regions. At the same time, it is interesting to see a high level of human presence near working places in Vienna. The city's government started to introduce its tightened policy earlier and promoted widely accessible testing options throughout the city. This policy may have contributed to enabling people to visit their working places while also protecting the safety of colleagues and friends.

Based on this summary of my results, my hypothesis is partly confirmed. Policies that promote a high level of testing do not impact people's social activities in retail and recreational areas, although the same is true for locations with a more limited access to testing. As the case of Vienna shows, a testing policy promoting a higher level of cheap and accessible testing may have allowed more people to work from their workplaces. As an additional result, we also see that an increasing percentage of PCR tests and a higher positivity rate on some occasions leads to more people staying at home.

The control variables seem to be quite robust across the models. For instance, the associations with lockdown were significant and led to increased human presence near residential areas and decreased human presence near retail and recreational facilities and job places. The stringency index was not significant all the time, but its estimates did not vary greatly and were usually positively associated with an increased human presence near residential areas and, surprisingly, near retail and recreational facilities.

Despite my attempts to provide as relevant and rigorous evidence as possible, this study has a number of limitations. Firstly, it focuses only on three countries: Austria, Switzerland, and Denmark. Therefore, its results can be valid only for countries that share similar characteristics. Secondly, even though I tried to use regional-level data, some of the included variables varied only across countries, and a deeper analysis of regional legislations and preventive measures is needed, especially in the case of Austria and Switzerland. Thirdly, due to the quantitative nature of this research, it is not always possible to evaluate precisely which factors led to different human mobility responses to the introduced policy changes. Moreover, this thesis is mainly of descriptive nature and does not argue for strong causal effects. Finally, comparing the COVID-19 statistics of different countries is a complicated matter: countries have a different quality of recording, different testing and healthcare capacities, or different policy priorities (Höppner 2022). As a result, some additional variables should be taken into account, such as health spending and reporting quality.

# 6. Conclusions and Recommendations

In this thesis, I investigated the relationship between different testing policies and their impact on people's social activities. My key results suggest that government policies promoting widespread and accessible testing may to some extent prevent a reduction in the level of social engagement, even though the testing rate as such is not associated with any changes in human mobility trends. A widespread and accessible testing helps to decrease the associated costs of testing for people, and more of them may be ready to undertake their procedures. As a result, it allows individuals to continue their social activities on a similar scale as before because they can be certain about their COVID negative status and tend to behave in an even riskier way, although it does not lead to significant increases in activities since some people also need to wait for testing results, and some people are tested positive and have to self-isolate.

Based on this thesis and its results, the following recommendations for policy-makers in the field of public health can be proposed in order to improve the government response in case of future pandemics and similar healthcare emergencies:

1. Before introducing any healthcare policies, governments need to conduct a comprehensive evaluation of public behaviour, which includes the measurements of government trust and willingness to follow introduced rules.
2. In case of future COVID-like pandemics, governments can make testing widely accessible if they are interested not only in controlling the spread of a disease but also in avoiding contractions in social activities, since they may have a negative economic impact.

Despite identifying the relationship between testing policies and people's activities, future research is needed in order to evaluate the scope of various factors that could potentially contribute to the effects of different testing policies on social mobility and activity. Since testing policies are formal institutions, their implementation is significantly affected by other formal and informal institutions, such as government effectiveness and the law-enforcement system, public trust and public risk perception, along with past experiences of pandemics. This thesis was focused on countries with a relatively high level of trust and a developed system of governance, but results may be different in other circumstances. Furthermore, the outlined behavioural model can be further improved and then used in future analysis of human response to testing.

# References


Alesina, Alberto, and Paola Giuliano. 2015. "Culture and Institutions." *Journal of Economic Literature* 53 (4): 898–944. https://doi.org/10.1257/jel.53.4.898.

Amodan, Bob O., Lilian Bulage, Elizabeth Katana, Alex R. Ario, Joseph N. Siewe Fodjo, Robert Colebunders, and Rhoda K. Wanyenze. 2020. "Level and Determinants of Adherence to COVID-19 Preventive Measures in the First Stage of the Outbreak in Uganda." *International Journal of Environmental Research and Public Health* 17 (23): E8810. https://doi.org/10.3390/ijerph17238810.

Bentkowska, Katarzyna. 2021. "Response to Governmental COVID-19 Restrictions: The Role of Informal Institutions." *Journal of Institutional Economics* 17 (5): 729–45. https://doi.org/10.1017/S174413742100028X.

Berliner Zeitung. 2021. "Nach zwei Monaten Pause: Dänemark führt wieder Corona-Beschränkungen ein." *Berliner Zeitung*, August 11, 2021. https://www.berliner-zeitung.de/news/nach-zwei-monaten-pause-daenemark-fuehrt-wieder-corona-beschraenkungen-ein-li.193760.

Bevan, Imogen, Mats Stage Baxter, Helen R. Stagg, and Alice Street. 2021. "Knowledge, Attitudes, and Behavior Related to COVID-19 Testing: A Rapid Scoping Review." *Diagnostics* 11 (9): 1685. https://doi.org/10.3390/diagnostics11091685.

Bicchieri, Cristina, Ryan Muldoon, and Alessandro Sontuoso. 2018. "Social Norms." In *The Stanford Encyclopedia of Philosophy*, edited by Edward N. Zalta, Winter 2018. Metaphysics Research Lab, Stanford University. https://plato.stanford.edu/archives/win2018/entries/social-norms/.

Bundeskanzlei BK. 2022. "Volksabstimmung vom 28.11.2021." January 6, 2022. https://www.bk.admin.ch/bk/de/home/politische-rechte/pore-referenzseite.html.

Bundesregierung. 2021. "Videoschaltkonferenz Der Bundeskanzlerin Mit Den Regierungschefinnen Und Regierungschefs Der Länder Am 10. August 2021 (Videoconference of the Chancellor with the Heads of Federal Regions on August 10, 2021)." https://www.bundesregierung.de/resource/blob/974430/1949532/d3f1da493b643492b6313e8e6ac64966/2021-08-10-mpk-data.pdf.

Cucchiarini, Veronica, Laura Caravona, Laura Macchi, Federico L. Perlino, and Riccardo Viale. 2021. "Behavioral Changes After the COVID-19 Lockdown in Italy." *Frontiers in Psychology* 12. https://www.frontiersin.org/article/10.3389/fpsyg.2021.617315.

Denford, Sarah, Alex F. Martin, Nicola Love, Derren Ready, Isabel Oliver, Richard Amlôt, Lucy Yardley, and G. James Rubin. 2021. "Engagement With Daily Testing Instead of Self-Isolating in Contacts of Confirmed Cases of SARS-CoV-2: A Qualitative Analysis." *Frontiers in Public Health* 9. https://www.frontiersin.org/article/10.3389/fpubh.2021.714041.

Dequech, David. 2006. "Institutions and Norms in Institutional Economics and Sociology." *Journal of Economic Issues* 40 (2): 473–81. https://www.jstor.org/stable/4228270.

European Centre for Disease Prevention and Control. 2020. "COVID-19 Testing Strategies and Objectives." Stockholm: ECDC.

———. 2022. "Download COVID-19 Datasets." European Centre for Disease Prevention and Control. 2022. https://www.ecdc.europa.eu/en/covid-19/data.

European Commission. 2021. "EU Digital COVID Certificate." Text. European Commission - European Commission. 2021. https://ec.europa.eu/info/live-work-travel-eu/coronavirus-response/safe-covid-19-vaccines-europeans/eu-digital-covid-certificate_en.

European Consumer Centre France. 2021. “Covid-19 Testing: Where to Be Tested in Europe?” July 1, 2021. https://www.europe-consommateurs.eu/en/travelling-motor-vehicles/covid-19-testing-where-to-be-tested-in-europe.html.

Feld, Lars P., and Gebhard Kirchgässner. 2000. “Direct Democracy, Political Culture, and the Outcome of Economic Policy: A Report on the Swiss Experience.” *European Journal of Political Economy* 16 (2): 287–306. https://doi.org/10.1016/S0176-2680(00)00003-3.

Gandhi, Darshan, Sanskruti Landage, Joseph Bae, Sheshank Shankar, Rohan Sukumaran, Parth Patwa, Sethuraman T V, et al. 2020. “Clinical Landscape of COVID-19 Testing: Difficult Choices.” arXiv. http://arxiv.org/abs/2011.04202.

Google. 2022. “COVID-19 Community Mobility Report.” COVID-19 Community Mobility Report. 2022. https://www.google.com/covid19/mobility?hl=en.

Hafer, Nathaniel. 2021. “What’s the Difference between a PCR and Antigen COVID-19 Test? A Molecular Biologist Explains.” The Conversation. November 8, 2021. http://theconversation.com/whats-the-difference-between-a-pcr-and-antigen-covid-19-test-a-molecular-biologist-explains-170917.

Hale, Thomas, Noam Angrist, Rafael Goldszmidt, Beatriz Kira, Anna Petherick, Toby Phillips, Samuel Webster, et al. 2021. “A Global Panel Database of Pandemic Policies (Oxford COVID-19 Government Response Tracker).” *Nature Human Behaviour* 5 (4): 529–38. https://doi.org/10.1038/s41562-021-01079-8.

Helms, Ludger, Marcelo Jenny, and David M. Willumsen. 2019. “Alpine Troubles: Trajectories of De-Consociationalisation in Austria and Switzerland Compared.” *Swiss Political Science Review* 25 (4): 381–407. https://doi.org/10.1111/spsr.12364.

Hoepke, Simone. 2021. “profil-Umfrage: Jeder Dritte will sofortigen Lockdown für Ungeimpfte.” November 6, 2021. https://kurier.at/politik/inland/profil-umfrage-jeder-dritte-will-sofortigen-lockdown-fuer-ungeimpfte/401796628.

Höppner, Stephanie. 2022. “Why It’s so Difficult to Compare COVID-19 Statistics | DW | 26.01.2022.” *DW.COM*, January 26, 2022. https://www.dw.com/en/why-its-so-difficult-to-compare-covid-19-statistics/a-60563984.

Indrayathi, Putu Ayu, Pande Putu Januraga, Putu Erma Pradnyani, Hailay Abrha Gesesew, and Paul Russel Ward. 2021. “Perceived Social Norms as Determinants of Adherence to Public Health Measures Related to COVID-19 in Bali, Indonesia.” *Frontiers in Public Health* 9. https://www.frontiersin.org/article/10.3389/fpubh.2021.646764.

Joung, Madeline. 2020. “Face Mask Culture Common in East, New to West.” VOA. February 4, 2020. https://www.voanews.com/a/science-health_coronavirus-outbreak_face-mask-culture-common-east-new-west/6186770.html.

Kurier. 2021. “In Wien kommt „2-G-plus“ in der Nachtgastro und bei Events,” November 12, 2021, sec. Chronik/Wien. https://kurier.at/chronik/wien/wien-drittstich-nach-vier-monaten-2-g-plus-wird-teilweise-pflicht/401804347.

Lee, Jong-Koo, Chris Bullen, Yanis Ben Amor, Simon R. Bush, Francesca Colombo, Alejandro Gaviria, Salim S. Abdool Karim, et al. 2021. “Institutional and Behaviour-Change Interventions to Support COVID-19 Public Health Measures: A Review by the Lancet Commission Task Force on Public Health Measures to Suppress the Pandemic.” *International Health* 13 (5): 399–409. https://doi.org/10.1093/inthealth/ihab022.

Li, Siyue, Bo Feng, Wang Liao, and Wenjing Pan. 2020. “Internet Use, Risk Awareness, and Demographic Characteristics Associated With Engagement in Preventive Behaviors and Testing: Cross-Sectional Survey on COVID-19 in the United States.” *Journal of Medical Internet Research* 22 (6): e19782. https://doi.org/10.2196/19782.

NDR. 2022. “Dänemark hebt Corona-Beschränkungen trotz vieler Infektionen auf,” January 27, 2022. https://www.ndr.de/nachrichten/schleswig-holstein/coronavirus/Daenemark-hebt-Corona-Beschraenkungen-trotz-vieler-Infektionen-auf,daenemark1316.html.

Neville, Fergus G., Anne Templeton, Joanne R. Smith, and Winnifred R. Louis. 2021. “Social Norms, Social Identities and the COVID-19 Pandemic: Theory and Recommendations.” *Social and Personality Psychology Compass* 15 (5): e12596. https://doi.org/10.1111/spc3.12596.

Nordström, Jonas, Linda Thunström, Klaas Van ’t Veld, Jason F. Shogren, and Mariah Ehmke. 2020. “Strategic Ignorance of Health Risk: Its Causes and Policy Consequences.” *Behavioural Public Policy*, January, 1–32. https://doi.org/10.1017/bpp.2019.52.

North, Douglass C. 1991. “Institutions.” *Journal of Economic Perspectives* 5 (1): 97–112. https://doi.org/10.1257/jep.5.1.97.

OECD. 2020. “Regulatory Policy and COVID-19: Behavioural Insights for Fast-Paced Decision Making.” https://www.oecd.org/coronavirus/policy-responses/regulatory-policy-and-covid-19-behavioural-insights-for-fast-paced-decision-making-7a521805/.

ORF. 2022. “CoV-Gipfel: Große Lockerungen mit 5. März.” *news.ORF.at*, February 16, 2022. https://orf.at/stories/3247635/.

Pashakhanlou, Arash Heydarian. 2021. “Sweden’s Coronavirus Strategy: The Public Health Agency and the Sites of Controversy.” *World Medical & Health Policy* n/a (n/a). https://doi.org/10.1002/wmh3.449.

Pollak, Markus, Nikolaus Kowarz, and Julia Partheymüller. 2021a. “Chronology of the Corona Crisis in Austria - Part 4: Lockdowns, Mass Testing and the Launch of the Vaccination Campaign.” January 3, 2021. https://viecer.univie.ac.at/en/projects-and-cooperations/austrian-corona-panel-project/corona-blog/corona-blog-beitraege/blog100-en/.

———. 2021b. “Chronology of the Corona Crisis in Austria - Part 5: Third Wave, Regional Lockdowns and the Vaccination Campaign.” May 28, 2021. https://viecer.univie.ac.at/en/projects-and-cooperations/austrian-corona-panel-project/corona-blog/corona-blog-beitraege/blog112-en/.

———. 2021c. “Chronology of the Corona Crisis in Austria - Part 6: A ‘Summer like It Used to Be’, the Way to the Fourth Wave, Another Lockdown and a Vaccine Mandate.” December 17, 2021. https://viecer.univie.ac.at/en/projects-and-cooperations/austrian-corona-panel-project/corona-blog/corona-blog-beitraege/blog135-en/.

Reuters. 2022. “Austria to Lift Most COVID-19 Restrictions by March 5.” *Reuters*, February 16, 2022, sec. Healthcare & Pharmaceuticals. https://www.reuters.com/business/healthcare-pharmaceuticals/austria-lift-most-covid-19-restrictions-by-march-5-2022-02-16/.

Schmidt-Petri, Christoph, Carsten Schröder, Toshihiro Okubo, Daniel Graeber, and Thomas Rieger. 2022. “Social Norms and Preventive Behaviors in Japan and Germany During the COVID-19 Pandemic.” *Frontiers in Public Health* 10. https://www.frontiersin.org/article/10.3389/fpubh.2022.842177.

Smith, Joanne R., and Winnifred R. Louis. 2009. “Group Norms and the Attitude–Behaviour Relationship.” *Social and Personality Psychology Compass* 3 (1): 19–35. https://doi.org/10.1111/j.1751-9004.2008.00161.x.

Song, Wanyuan. 2022. “China: Why Is the WHO Concerned about Its Zero-Covid Strategy?” *BBC News*, May 17, 2022, sec. Reality Check. https://www.bbc.com/news/59882774.

The Federal Council of Switzerland. 2021. “Coronavirus: Federal Council Introduces Tighter Measures.” December 17, 2021. https://www.bag.admin.ch/bag/en/home/das-bag/aktuell/medienmitteilungen.msg-id-86544.html.

———. 2022. “Coronavirus: Federal Council to Lift Measures – Mask Requirement on Public Transport and in Healthcare Institutions and Isolation in the Event of Illness to Remain until End of March.” February 16, 2022. https://www.bag.admin.ch/bag/en/home/das-bag/aktuell/medienmitteilungen.msg-id-87216.html.

Thunström, Linda, Madison Ashworth, Jason F. Shogren, Stephen Newbold, and David Finnoff. 2021. “Testing for COVID-19: Willful Ignorance or Selfless Behavior?” *Behavioural Public Policy* 5 (2): 135–52. https://doi.org/10.1017/bpp.2020.15.

United Nations. 2021. “Goal 3 | Department of Economic and Social Affairs.” 2021. https://unstats.un.org/sdgs/report/2021/goal-03/.

Waal, Joel Rogers de. 2021. “One Year on: Global Update on Public Attitudes to Government Handling of Covid.” YouGov. November 19, 2021. https://yougov.co.uk/topics/international/articles-reports/2021/11/19/one-year-global-update-public-attitudes-government.

Watson, Daniella, Natalia Laverty Baralle, Jawahr Alagil, Krithika Anil, Sandy Ciccognani, Rachel Dewar-Haggart, Sarah Fearn, et al. 2021. “How Best Do We Engage the General Population in Testing for COVID-19?” https://doi.org/10.1101/2021.01.29.21250730.

Yan, Bo, Xiaomin Zhang, Long Wu, Heng Zhu, and Bin Chen. 2020. “Why Do Countries Respond Differently to COVID-19? A Comparative Study of Sweden, China, France, and Japan.” *The American Review of Public Administration* 50 (6–7): 762–69. https://doi.org/10.1177/0275074020942445.

Zhang, Justin C., Katherine L. Christensen, Richard K. Leuchter, Sitaram Vangala, Maria Han, and Daniel M. Croymans. 2021. “The Role of Testing Availability on Intentions to Isolate during the COVID-19 Pandemic: A Randomized Trial.” https://doi.org/10.1101/2021.03.22.21251380.