

CoronaNet

Research Project

Researchers' Working Paper Series
No. 03/2021

Mask Independency: Taiwan's response to mask shortage in the COVID-19 pandemic

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Suggested Citation:

Meichle, N. K. & Torres Lajo, M. "Mask Independency: Taiwan's response to mask shortage in the COVID-19 pandemic." Working Paper No. 03. CoronaNet Research Project. <insert doi>



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CoronaNet is part of the PERISCOPE Consortium, a project funded by the European Commission under the Horizon 2020 Research and Innovation programme (Agreement No. 101016233)

Mask Independency: Taiwan's response to mask shortage in the COVID-19 pandemic

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Publication Date: <date>

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Leibniz Research Alliance 'Crises in a Globalised World'

CoronaNet is part of, and has received substantial financial support through, PERISCOPE, a consortium of 32 universities and research institutes across Europe, investigating the behavioral and socio-economic consequences of COVID-19 to increase resilience and preparedness for future pandemics and other large-scale risks. PERISCOPE has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101016233. Additional funding support has been provided by the Chair for International Relations (Prof. Dr. Tim Büthe) at the *Hochschule für Politik* (HfP) at the Technical University of Munich (TUM), NYU Abu Dhabi, the National Council for Eurasian and East European Research (NCEEER), the Peace Research Institute Frankfurt (a member of the Leibniz Research Alliance Crises in a Globalised World), the Data4COVID19 Africa Challenge, and the Just One Giant Lab OpenCovid19 Initiative.

The CoronaNet Researchers Working Paper Series

The CoronaNet Working Paper Series encourages CoronaNet researchers, who are mostly students volunteering their time, to go beyond the crucial work of gathering and coding information about COVID-19-related policies and hone their research and writing skills by conducting their own analyses inspired by the CoronaNet data. The working papers are the capstone of a program which offers research assistants the opportunity to explore research topics of genuine interest to them, acquire and practice the requisite skills to analyze the CoronaNet data, learn more about the dataset to which they have contributed, practice their academic writing skills, and collaborate with their peers in research and writing. To this end, the program entails seminars on research methods and academic writing, detailed introductions on the publicly released CoronaNet data structure, and tutorials on conducting quantitative analyses of the data. In addition, CoronaNet principal investigators provide oversight and feedback on paper drafts while Working Paper Series coordinators organize the program series. The papers in this series are thus *not peer-reviewed* but provide an opportunity to learn about preliminary findings that arise out of the CoronaNet database.

CoronaNet Research Project

The CoronaNet Research Project (<https://www.coronanet-project.org/>) gathers, systematically codes, and makes publicly available information about government policies put in place in response to COVID-19. It is led by researchers at the Chair for International Relations at the Hochschule für Politik at TUM and TUM School of Management, NYU Abu Dhabi, University of Southern California, Nazarbayev University, Universidade Brasilia, the Hertie School and the Fors Marsh Group. The project relies on the help of experienced staff researchers who serve as regional and country coordinators, and is made possible by more than 500 volunteer researchers from around the world.

Abstract

In the beginning of the Covid-19 pandemic, most territories worldwide suffered from face mask shortages, given its huge demand and limited production capacity. However, Taiwan faced such a shortage only briefly due to their ability to swiftly increase local production of face masks. This not only allowed them to guarantee local supply for all their citizens but also to export them for profit at a later stage. In this paper, we argue that several reasons led to the success of Taiwan's mask independence. First, its previous experience with the 2003 SARS epidemic that subsequently led to institutional and legal changes, an increased awareness in the population about PPE and hygiene, and experienced technocrats. Also, the developmental state model offers the basis for a quick change of the national market and an increased cooperation between the private sector and the government.

Keywords: COVID-19 pandemic, face mask production, SARS epidemic, developmental state

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Introduction

In early 2020, the SARS-CoV-2 virus spread swiftly throughout the world. The resulting COVID-19 pandemic took most countries by surprise, particularly during its first months, leading them to take severe measures —like lockdowns, quarantines, and border closures (Cheng et al., 2020)— in an attempt to contain the spread. One of the most critical issues for almost every country was the shortage of Personal Protective Equipment (PPE), especially face masks—considered an essential protection item against the new virus—for health professionals and citizens alike. This scarcity had various reasons behind it, being the increasing worldwide demand just one of them (Wu et al., 2020a).

Before the pandemic, China produced 50% of the global mask supply (Wu et al., 2020a). But when the first outbreak severely hit the city of Wuhan (China), the local authorities soon implemented a mask export ban (DW, 2020) to comply with local demand that could not be satisfied under the scenario that the whole population —around 1 400 million, the biggest in the world (Worldometer, 2021)— had to change the face mask daily. The fact that the outbreak occurred during the Chinese New Year was also a contributing factor to the shortage of face masks since most factories were closed, and many of its employees were away on vacation (Wang et al., 2020), meaning that it was not possible to increase production immediately.

The impact of China's face mask export ban was felt by almost all countries, especially those in the Global North, strongly reliant on global supply chains for acquiring face masks (Zhou, 2020). Because of the low supply, Taiwan, Thailand, Russia, Germany, the Czech Republic, and Kenya, among others, also stopped exporting masks (McMahon et al., 2020, p.1) to meet local needs. The high demand even led to forms of modern piracy: for example, some countries offered more money on an airport's tarmac to divert a plane bound for a particular territory to another one (Okello, 2020; Gehrke, 2020).

Even though mask production is not very skill-intensive, producing masks on a national level proved to be challenging due to the provision of raw materials, particularly melt-blown fabric and re-tooling machines (Yen, 2020). In spite of that, and amid the discontent of the local population, some leaders from advanced economies rushed to announce they would be bringing

back local production of PPE, at least to a certain extent. For instance, Germany's Ministry of Health, Jens Spahn, announced in April 2020 that, starting in August 2020, around 50 million face masks per week will be produced locally (Betzholz, 2020).

However, not all advanced economies had to wait months to produce face masks locally on a large scale. For example, Taiwan, a high-income economy (World Bank, 2021) of almost 24 million inhabitants (Worldometer, 2020), was able to do so within one month, securing internal supply for all its citizens. This was a feat that other countries like China, that shares with Taiwan a common view of mask-wearing as a result of their experience with the 2003 SARS epidemic (Hiestand & O'Neill, 2020) and a large production sector (responsible for 46.8% of its GDP), were not able to achieve (Stasavage, 2020; Sawe, 2017).

In this article, we aim to describe how Taiwan was able to take swift decisions to revert their productive efforts towards the manufacturing of face masks in an attempt to guarantee local supply for all their citizens and keep the contagion rates low through mask policies. The characteristics of its legislation, heavily altered after their harrowing experience with the 2003 SARS outbreak, jointly with its developmental state model (Taiwan CDC, 2020a; Chen et al., 2005), might have played a crucial role in its outcome, as well as its citizen's trust in their government. It is relevant to know as well whether other economies can take this approach in the eventuality of a new pandemic. Preparedness for future similar events is critical, given that recent research has shown that its occurrence is set to rise due to, among others, Global Warming and the increased interaction of humans with nature as a result of environmental destruction (Commission on Global Health Risk, 2016).

Taiwan and the 2003 SARS outbreak: lessons learned for the future

Before the SARS-CoV-2 virus appeared and caused a worldwide pandemic, a previous coronavirus, the SARS-CoV, caused one, mainly in East Asia: it began in Guangdong, mainland China, in late 2002, and it reached Taiwan in early 2003. This territory was severely hit, with most cases coming from health workers that got infected with the virus inside hospitals (Lin, et al., 2020). The SARS pandemic in Taiwan highlighted two major problems: the lack of adequate protective gear for health professionals and the little knowledge of what kind of exposure could lead to a SARS infection (Lin, et al., 2020). Additionally, Taiwan was not prepared to detect and track the positive cases, allowing the virus to spread. From March 14th

to July 30th, 2003, 668 people were tested positive for SARS, out of which 181 people died, which equals to 27% of total infections (Chen et al., 2005), making it the highest SARS mortality rate in the world (Ul Khaliq, 2020). This explains why there was a general panic among Taiwan's citizens at that time (Yen, 2020).

Taiwan not only designed a strategy to contain the SARS spread—something eventually achieved in July 2003—, but also during the epidemic, it started to take measures to prevent a future health crisis having such a dramatic effect on the territory. Perhaps the most relevant one was establishing the National Health Command Centre (NHCC) and revising the Communicable Disease Control Act — the CDC Act— (Taiwan CDC, 2020a; Lin et al., 2020). In case of a public health emergency, the NHCC acts as the command point and contains an essential subunit, the Central Epidemic Command Centre (CECC), which is a multidisciplinary group of experts. Meanwhile, the revised CDC Act enables the government to react faster to health crises and assign the necessary resources where needed (Yen, 2020; Taiwan CDC, 2020a).

For instance, the CDC Act allows to set "up a disease control network by dividing the country into regions; establishing a centralised platform to command and coordinate agencies' actions" (Lin, et al., 2020, p. 256). This improves the communication between the state and the community, as well as the coordination between national and subnational governments (Yen, 2020). It furthermore allows to "share information and respond to inquiries; integrating personnel, facilities and resources in preparation for outbreaks; issuing voluntary and mandatory isolation orders; and implementing border restrictions" (Lin, et al., 2020, p. 256) as well as the legal basis for the CECC to penalise citizens violating mandatory measures (Yen, 2020).

As it can be seen, the revised CDC Act grants executive agents a greater range of authority to implement measures to overcome future threats to public health like pandemics and epidemics (Lin, et al., 2020). Through Article 8 of the revised CDC Act, the Ministry of Health and Welfare and especially the Centre of Disease Control (also known as CDC) gain authority to decide what falls under the definition of a public health emergency (Lin, et al., 2020). This stabilises further the trust and legal power of Taiwan's technocrats in the fight against a public health crisis (Lin, et al., 2020). Taiwan especially depends on doctors as medical experts, who are seen as prestigious and trustworthy in policymaking (Lin, et al., 2020). To maximise the

authority of the CECC in the case of a public health crisis, it was established on the ministerial/executive level (Yen, 2020; Lee, 2020).

Also, the Taiwanese government founded the Communicable Disease Control Medical Network (CDCMN) to improve the management of medical resources through centralisation and optimisation. This led to known infection hospitals being assigned as the centre of treatment and resource mobilisation (Lin, et al., 2020). The CDCMN also made it easier to expand negative-pressure-isolation rooms with 1,100 beds and isolation rooms with 21,000 beds. The system and methodology of the CDMN "for prioritisation are predominantly based on biomedical models and medical resources rationing" (Lin, et al., 2020, p. 264).

The developmental state

The aforementioned laws that were passed during and following the SARS outbreak in 2003 were possible because of Taiwan's developmental state. This can be described as:

"a form of government involving direct, concerted, and sustained intervention in national economic development through industrial policies such as export-led growth and labour control. The term is generally applied to East Asian countries such as Japan, South Korea, and Taiwan where, in the late XX century, technocrats and planners were responsible for strategically shaping those countries' economies rather than just regulating them indirectly" (Oxford Dictionary of Human Geography, 2013).

In place since the post-war era, it has played a critical role on its industrial policy (Yen, 2020, p.460), with the government playing an active role in the economy, keeping a close relationship with the private sector while maintaining its autonomous policymaking (Evans, 1995). Contrary to a planned economy that forces production on the private sector, an economy like Taiwan has its state guiding the private sector to a specific goal through provisions and/or compensations like "tax incentives, knowledge transfer, capital investment" (Yen 2020, p. 461; Lee, 2020). Furthermore, the government of a developmental state supports research and development (R&D) to facilitate industrial upgrading by building a bridge for knowledge exchange between research institutes and the industry (Haggard, 2018). Another typical characteristic for a developmental state that can be seen in Taiwan is the importance of experts and technocrats in the policy making process (Lin, et al., 2020), such as the reliance on doctors.

All of this explains why the legal frameworks put into place after the 2003 SARS outbreak ensured that the state could take over key areas in the event of, for example, a health crisis.

Face mask production, for instance, was regarded a high priority, given its importance as a PPE. As a result, it was not left entirely to the private sector; instead, the government took a key role to ensure enough production of this critical good.

Face Masks: production, distribution and wearing

Taiwan is a high-income economy, with a GDP per capita of USD 28 371 in 2020 (National Statistics, 2021). The services sector is responsible for most of its GDP, around 61.5% (Statista, 2021). The manufacturing sector is also relevant, comprising 36.8% (Statista, 2021), with a particular relevance to the semiconductor industry. The medical industry represents around 5.2% of the output of its economy (Market Prospects, 2021), including high-end devices and the production of PPE such as face masks. Before the COVID-19 pandemic and under normal conditions, Taiwan produced an average of 1.88 million face masks per day for national use, with a maximum capacity of 2.44 million masks. However, that is not enough: for all its medical supply necessities, Taiwan had to import the difference, with 40% coming from, as stated before, mainland China (Su et al., 2020; Kuo et al., 2020). Like many others, Taiwan is not the only economy that relies on imports to supply its local necessities of PPE; it has been reliant on global supply chains prior to the pandemic for, at least, the last two decades (Bamber, Fernández-Stark & Taglioni, 2020).

Given the experience with SARS in 2003, when the first cases were reported in Wuhan (China) on December 31st, 2019, Taiwan reacted immediately and enacted policies. Starting that day, everyone coming from Wuhan had to undergo a health screening at the airport; however, most policies taken (around 53%) were only recommendations i.e. voluntary (Cheng et al., 2020). This was done with the objective of being prepared for potential cases and, should they appear in Taiwan, to keep them to a minimum.

On January 24th, 2020, only three days after the first case was reported, the Taiwanese government banned the export of medical masks to avoid panic buying and mask hoarding, similar to what was seen in the 2003 SARS epidemic. Given the scenario where almost every citizen (24 million) had to wear one, and with export restrictions already put in place in mainland China, the fastest way to ensure short- and long-term supply was to produce it locally. Therefore, the government invoked Article 54 of the CDC Act in order to increase the national

production capacity of face masks (Chiang et al., 2020; Lee, 2020; Lin, et al., 2020, 2020; Su et al., 2020; Yen, 2020). The article states that,

"During the period the central epidemic command center is in existence, government organizations at various levels, in accordance with instructions of the commanding officer, may expropriate or requisite private land, products, buildings, devices, facilities, pharmaceuticals and medical devices for disease control practices, facilities for the treatment of contamination, transportation means, and other designated disease control resources announced by the central competent authority, and adequate compensations shall be made to appropriate parties. Operational procedures, methods of compensation and other matters to be complied with for the expropriation and the requisition mentioned in the preceding Paragraph shall be decided by the central competent authority." (Ministry of Justice, 2019).

As such, in early February, the government announced a programme with a budget of NT\$200 million (US\$6.6 million) to build 60 face mask production lines within a month. 15 private firms, like the Taiwan Mask Corporation in Paoshan Hsiang, would be responsible for the manufacturing, committing themselves to produce 72 million face masks for the government in exchange for the machinery, which was locally assembled. The project was completed by early March, taking only 25 days—5 days ahead of schedule— (Teng, 2020). This allowed an increase in production to 10 million per day by mid-March (Teng, 2020), and by 16 million per day at the end of that month (Chiang et al., 2020; Yen, 2020).

Also, in February, the Industrial Development Bureau of the Ministry of Economic Affairs (MOE) and the Taiwan Textile Research Institute—an institution funded by the Taiwanese government R&D for the textile industry—summoned various facemask industry-related manufacturers, like raw material and machine tool providers and downstream face mask producers, to a meeting where they all agreed on a face mask plan, coordinated by the government to increase production (Yen, 2020). Considering the mentioned programme and other announcements made later, until the end of March 2020, the Taiwanese Government had aided the facemask market with 9.6 million USD to build 92 new mask production lines in only two months. Out of the 92 lines, two focused on surgical bandage masks and 90 focused on conventional masks (Yen, 2020; Sui, 2020, cited in Wu et al., 2020b). As a result, by the end of May 2020, the production capacity was almost 20 million face masks a day (BBC Future, 2020).

But guaranteeing enough local production was only one part of the plan. Given the initially limited supply of face masks, the government also introduced a rationing plan to guarantee universal access to face masks and avoid panic buying, announcing that with every increase of

the local production, the maximum number a person can buy will also increase. The first plan, the 1.0, was announced on 6th February 2020. This new, name-based rationing plan allowed medical staff to purchase 1-2 medical face masks a day and regular citizens 3 face masks per week in a pharmacy, under the condition that these masks could only be purchased by presenting a National Health Insurance Card (Tai et al., 2021; Huang, 2020a; Chiang et al., 2020). In addition, to avoid agglomerations and shorten waiting queues, the Ministry of Health also established a real-time mask map website that allowed access to information about mask availability in pharmacies (Tai et al., 2021; Huang et al., 2020a).

The 2.0 version of the plan introduced new features like a new mobile mask app that made it possible to make mask reservations in convenience stores (Tai et al., 2021). In addition, the digital mask map was upgraded. It now offered more information about the pharmacy and the mask stock like the pharmacy's name and address, the available amount of adult-size or children-sized masks, opening hours, and phone number (Tai et al., 2021).

On April 9th, 2020, the 3.0 plan got introduced when production levels were already at a high, adults were allowed to buy nine masks every two weeks, and children were allowed to purchase ten masks every two weeks (Tai et al., 2021). Furthermore, the Taiwanese government set up an online mask purchasing platform that allowed people to acquire masks online. Additionally, people were able to purchase masks through mask machines in convenience stores (Tai et al., 2021).

When compared to other advanced economies that struggled with production issues, like the USA (Gereffi, 2020), it might seem impressive what Taiwan was able to achieve. Even though some of those advanced economies can also invoke laws that enable them to mandate the production of certain goods, the existence of the developmental state in Taiwan goes beyond a simple mandate. As we saw here, the state participated in the production in partnership with the private sector. Concerns regarding the long-term economic profitability of investing heavily and the exponential increase in the production of face masks, or the purchase of large amounts of raw materials were addressed by lowering the transaction and coordination costs between companies and intervened in the companies' production line to coordinate it directly (Yen, 2020). Additionally, the government of Taiwan assured the private sector that when the export ban is lifted, it could again export and earn a profit (Yen, 2020). The ban was lifted on 1st June 2020 (Zhang, 2020), and some of the production has been exported since then (Strong, 2020).

The international experience has shown that the widespread use of face masks is a key factor in containing the SARS-CoV-2 virus spread (WHO, 2020). The fact that Taiwan was able to achieve supply for all of its population played a significant role in keeping the transmission of the virus low and avoiding the scenario of the 2003 SARS epidemic. Another crucial part was compliance from the citizens: most of them followed the mask policies with little to no rejection, even when new mandates were instated a year after the beginning of the pandemic (Huang, 2020b; CDC, 2020b) when in other parts of the world protests were beginning against face mask mandates (Philipose, 2020).

Research shows that following the implemented rules like mask-wearing is strongly connected to trust in the national government (Han et al., 2020). While it is possible that trust in governments can be positively correlated to higher levels of GDP per capita (Torres Lajo, Messerschmidt & Bütke, 2021), people's attitude of trusting those in charge (and even trusting one another) also plays a role. As of 2019, the Taiwanese population had a confidence in their government of 2.5, from a scale out of 4 with 1.0 being the highest level, according to the World Values Survey (EVS/WVS, 2021). This would mean that Taiwanese citizens have middle levels of trust in their government. However, the same WVS survey found that, when asked about government responsibility, Taiwanese citizens replied that both the people and the government should take responsibility and do their part (score: 5.5 out of 10, where 10 means "government should take more responsibility"), which was seen during the pandemic: the government took action, and the people complied.

Levels of citizens' trust in their government seemed to be already high in 2020 (Huang, 2020c), but a round of in-depth interviews with Taiwanese citizens conducted by one of the authors in 2021 seem to confirm an increased level of trust (Meichle, 2021). The majority of the interviewees stated they trusted the national government and confirmed the perception that the government was taking all the possible measures to ensure their wellbeing, which resulted in them complying with policies like mask mandates. None of the interviewees rejected the implemented measures by the government, with only a very small minority raising concerns regarding the accuracy of the governments' data. When asked about the reasons behind their trust in their government, many interviewees affirmed that the government proved itself organised and competent in the pandemic; for example, by providing vast and daily COVID-19 information to their citizens in daily briefings (Meichle, 2021). All of these beliefs certainly played a role in ensuring the whole system worked properly: the masks produced on the swiftly

built production lines were adequately distributed to all citizens, who in turn complied with the policies and wore them, not only in the early stages but also in the long term.

Conclusions

Taiwan was one of only a few countries that were able to keep the infection and death rate proportionally low. This was mainly possible based on its preventive measures. As described by Chen et al. (2005), Taiwan's protocols implemented during its SARS epidemic in 2003 are similar to those currently in use in this pandemic: quarantines, RT-PCR tests, contact tracing, the importance of face masks to prevent infections, etc. This means that its previous experience gave the government, and its technocrats, an advantage in reacting to the new SARS-CoV-2 virus. For instance, the previous experience for face masks use led the government to react quickly and increase local production to guarantee that every citizen had access to this PPE item. This was possible because of the legal and institutional basis created after the SARS epidemic, as well as due to the support of Taiwan's developmental state model. It was also aided by the fact that most people trusted that their government was doing its job to keep them as safe as possible.

Some of Taiwan's political and economic actions to increase local mask production could be replicated in Western economies and are, in fact, encouraged. As a fact, in 2020, the OECD's suggested governments to take an active role to solve the shortage of face masks, such as through government planning, firm incentives to switch production and to take care of inputs (raw material) to avoid price speculation (OECD, 2020, p.10). As shown before, this is something that Taiwan successfully did, and that was already incorporated in its legislation after 2003. This is what made the difference compared to Western countries, which did not have the same comprehensive framework to do so in such a short period of time. Even though it cannot be said for sure that countries can take over Taiwan's approach, they can learn from it and improve their prophylactic measures to be better prepared for the next pandemic, which, unfortunately, is likely to arrive sooner than we expect.

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ISSN: XXXX

CoronaNet is an international research collaboration between the Chair of International Relations at the HfP/Technical University of Munich (Prof. Dr. Tim Büthe), New York University Abu Dhabi, Nazarbayev University, Universidade de Brasilia, the University of Southern California, the Hertie School and the Fors Marsh Group.

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