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MINIMIZING THE SOCIAL DILEMMA: TAIWAN'S UNEXPECTED ACHIEVEMENT IN FIGHTING THE COVID-19 PANDEMIC

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ABSTRACT

Countries around the world find themselves trapped in a social dilemma amid the COVID-19 pandemic when most mitigation policies require sacrificing individuals' interests for collective well-being. By examining Taiwan's policy responses, this paper finds that while the cooperation for collective action does play a role, the main ingredient for its unexpected success is minimizing the grand-scale social dilemma, rather than fighting it head-to-head, through a set of carefully-designed measures. This paper further argues that Taiwan's strategies are made possible by three underlying conditions that help to solve a series of collective action problems: The institutionalization and capacity building before the pandemic, the social coordination since the outbreak, and the political pressure from China.

Keywords: Taiwan, COVID-19, social dilemma, collective action problem, information.

JEL Classification: B5, D7, I18, O53.

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MINIMIZANDO EL DILEMA SOCIAL: EL INESPERADO ÉXITO DE TAIWÁN
EN LA LUCHA CONTRA LA PANDEMIA COVID-19

RESUMEN

El mundo se encuentra atrapado en un dilema social dentro de la pandemia COVID-19 cuando la mayoría de las políticas de migración requieren el sacrificio de los intereses individuales para el bienestar colectivo. Mediante el examen de las respuestas de política de Taiwán, en este artículo argumentamos que mientras la cooperación para la acción colectiva desempeña un papel, el principal ingrediente del éxito inesperado de este país es la minimización del dilema social de gran escala, más que la lucha directa contra la pandemia, a través de un conjunto de medidas diseñadas de forma cuidadosa. Argumentamos, además, que las estrategias de Taiwán son posibles debido a tres condiciones subyacentes que contribuyen a resolver una serie de problemas de acción colectiva: la institucionalización y la construcción de capacidades ante la pandemia, la coordinación social desde la irrupción de ésta y la presión política de China.

Palabras clave: Taiwán, COVID-19, dilema social, problema de acción colectiva, información.

Clasificación JEL: B5, D7, I18, O53.

1. INTRODUCTION

Starting from Wuhan, China, the COVID-19 pandemic has pushed policy makers around the world to consider a series of tough questions, such as whether or when to lockdown/quarantine, to limit the freedom of mobility, how to establish a system of testing and tracing, how to convince people to wear masks and keep physical distances, etc. While these policies may help to slow the spread of the coronavirus and benefit the society, they also impose costs on individuals such that the conflicting interests may hinder collective actions. In other words, governments around the world find themselves trapped in the social dilemma, or the collective action problem, in fighting COVID-19.

When all countries are facing this social dilemma, the relative success of Taiwan in handling both health and economic challenges comes as a complete surprise. Given its close geographical proximity and economic tie

with China, experts had forecasted a severe outbreak in Taiwan (Gardner *et al.*, 2020). Yet, in contrast to these forecasts, Taiwan has only 937 cases (more than 90% of them are imported) and 9 COVID-related deaths as of February 15th, 2021¹, and the annual growth rate of Gross Domestic Product (GDP) in 2020 is estimated to be 2.98% (Directorate-General of Budget, Accounting and Statistics, DGBAS, 2021), which is almost the same as its growth rate in 2019. Importantly, these outcomes are achieved through policies that have been less stringent even compared to South Korea, New Zealand, or Vietnam which also managed the crisis well². How did Taiwan manage to solve the social dilemma and avoid a major outbreak?

In explaining why some countries have performed better despite the challenging social dilemma, two types of explanations emerge in the literature. The first is the orientalist explanation which acknowledges the existence of social dilemma but suggests that certain “oriental” cultures, particularly conformism when discussing the cases of Asian countries, to be the key (Alsan *et al.*, 2020; Bazzi, Fiszbein, and Gebresilashe, 2020; Frey, Chen, and Presidente, 2020; Huynh, 2020; Zhu *et al.*, 2020). While this approach correctly identifies the difficulty in solving the social dilemma, picking an oriental culture as the overreaching answer is not very convincing. Countries and regions that have managed the crisis relatively well, including New Zealand, South Korea, Vietnam, and regions like the state of Vermont in the U.S., show vast diversities in their cultures and histories, which is hardly consistent with this orientalist explanation. More importantly, this approach offers only a rough correlation across countries and cultures but fails to provide a detailed analysis on how a certain culture supports policies in a specific country.

The other is the technocratic explanation which abstracts from the social dilemma and emphasizes a list of policies as common ingredients for success. Most reports about “what some countries did right” on this and that policies fall into this category (Wang, Ng, and Brook, 2020). This approach provides valuable information for the public but

¹ Data is obtained from Taiwan’s CDC website on February 15, 2021.

² According to the OXFORD COVID-19 Government Response Stringency index (Hale *et al.*, 2020), Taiwan’s policies are among the least stringent in the world.

obscures the fact that handling a pandemic is not rocket science, and many countries, including ones that are hit very hard in the current pandemic, do have the knowledge, experience, and plans to deal with a pandemic³. This approach omits deeper institutional pre-conditions of recommended policies and therefore helps little to understand why some countries successfully adopted the recommended policies while others did not.

Focusing on the case of Taiwan, this paper adopts an alternative approach. I explain the real challenge of the social dilemma amid a pandemic and show that Taiwan's relative success comes less from solving the grand-scale social dilemma directly based on any single factor or policy, but more from dividing and minimizing the dilemma through a set of carefully designed policies. I then review the design and the implementation of these policies and how these policies are made possible by a set of pre-conditions that helps to solve several collective action problems before and during the outbreak.

Thanks to its early warning and response, and border quarantine strategies, Taiwan has managed to keep most cases away from the general population. As the main cost of border quarantine falls on a relatively small and well-defined group, the burden on everyone else to take collective actions is greatly reduced and the social dilemma is minimized. Taiwan then can solve a smaller-scale dilemma by detailed epidemiological investigation and mobilizing civil participation and cooperation for the remaining cases.

Moving beyond specific policy measures, this paper finds that Taiwan's strategy is made possible by three conditions. First, the institutionalization of preparation and capacity building before the pandemic. This creates a set of contracts and norms that settle down the potential conflicts among players within government, market, and civil society. Many of these efforts were driven by the lesson of the 2003 epidemic of the severe acute respiratory syndrome (SARS) in Taiwan (Chen *et al.*, 2005). Second, a set of strategies fostering cooperation among government,

³ For example, the US government laid out a National Pandemic Influenza Plan in 2005 and kept updating it through 2017. The US government also had directly helped foreign countries, including Taiwan, to handle outbreaks.

market, and civil society after the outbreak began in China, which can be traced partly to the tradition of industrial policy and the democratization process in Taiwan. Third, an early recognition of the threat due to the political pressure from China and the continuing isolation from most international organizations. This pushed Taiwan to move quickly and swiftly by reducing the uncertainty regarding the existence and seriousness of the threat and eliminating any possibility of free riding on other countries' actions.

An important implication emerges from these analyses. While Taiwan's relative success depends on several conditions specific to Taiwan, these conditions are not irreplicable. All of them were created in Taiwan through a learning process which can very likely happen in other societies. To the extent that these conditions and policies are also feasible in other countries, Taiwan's experience suggests that the pandemic can be contained rather than just be mitigated.

This paper makes two contributions to the literature. First, a recurring theme in the policy discussion is that public health policies aiming to suppress the transmission of coronavirus will inevitably hurt the economy. While this trade off argument sounds intuitive, several recent studies have challenged this argument by showing that the decline of economic activities is not the result of the government's social distancing and shutdown orders, but of people's voluntary responses due to the fear of infection (Bartik *et al.*, 2020; Forsythe *et al.*, 2020; Goolsbee and Syverson, 2020; Lin and Meissner, 2020; Chetty *et al.* 2020). In line with these recent studies, Taiwan's experience analyzed in this paper, and the cross-country pattern shown in Hasell (2020), suggest that countries which managed to keep the death rate low indeed show stronger economic resilience. From this perspective, therefore, the best economic policy to address the impact of the pandemic is to contain the pandemic itself.

Second, by highlighting the social dilemma in fighting a pandemic, this paper introduces a useful framework to analyze the functions and conditions of different factors and policies. As Bowles and Carlin (2020) point out, a framework integrating the interactions among government, market, and civil society is needed to analyze the responses to the pandemic and to avoid various reductionist explanations whether they are based on culture, government decrees, or market incentives. By focusing on the social dilemma, this paper applies the framework proposed by

Bowles and Carlin (2020) to the case of Taiwan and analyzes how different policies are related with factors and processes that help to solve collective action problems before and during the outbreak.

In the remaining of this paper, Section 2 explains the social dilemma brought by the pandemic. Section 3 briefly overviews the three parts of strategies adopted in Taiwan. Section 4 analyzes the three conditions underlying Taiwan's strategies and how these conditions help to solve a set of incentive and information problems. Section 5 concludes with an outlook of on-going challenges.

2. THE SOCIAL DILEMMA IN FIGHTING COVID-19

2.1. Barriers to social cooperation

Once the outbreak begins, a human-to-human transmission (HHT) disease like COVID-19 is difficult to be contained unless the public is persuaded to change habits or strict restrictions are implemented effectively. Unfortunately, as many non-pharmaceutical interventions in this context involve limiting personal freedom in one way or the other, individuals have an incentive to prioritize personal gain at the expense of the collective welfare.

Numerous studies and reports have documented instances of this social dilemma at various levels. For example, desperately trying to halt the COVID-19 surge, the U.S. Centers for Disease Control and Prevention (CDC) had urged people to stay at home and avoid traveling for Thanksgiving (CDC, 2021). Yet, more than 55 million of Americans ignored the advice, and the number of travelers is estimated to be 2.9% higher than last year, partly fueled by lower prices of gas and airline tickets (Hall, 2019). Frequent instances of COVID-19 clusters in workplaces, such as nursing homes (Bion, 2020), meat packing plants (Waltenburg *et al.*, 2020), and warehouses (Soper, Day, and Bloomberg, 2020), suggest that not only individuals but also business organizations have incentives to get around safety measures for their own interests.

In the literature of social dilemma, several mechanisms have been found to be able to foster cooperation, such as reciprocity, trust, communication, punishment, pro-social preferences, social norms, and local institutions. However, many of them are infeasible or seriously limited

in a pandemic due to the anonymity of interactions, lack of accountability, the heterogeneity among the large number of actors, the lack of consensus of the threat and its consequences, the spatial and temporal distances, and the high degrees of uncertainty and complexity involved (Jagers *et al.*, 2020).

Take staying at home and/or self-isolation as an example. Reciprocity will not work because between anonymous players, there may not be much to reciprocate with, and defecting by not staying at home is not a credible threat to the violator. Trust and communication are difficult to achieve among such a large number of heterogeneous actors, and social preferences and beliefs do not change quickly. Voluntary punishment works poorly since violators might be just too many, not to mention that many of the violators are simply not able to afford to stay at home and distance from others without public assistance including temporary housing and the provision of paid leave (Belluz, 2020).

Given these difficulties, analysts often call for the intervention of a third party. There is no question that a large-scale social dilemma generally can not be solved without the intervention of a benevolent social planner. The real issue, however, is that under what conditions such an intervention can be provided and sustainable. Although a benevolent social planner is often assumed to be at place in theoretical analyses, it is actually a public good that can be readily supplied only by solving another set of collective action problems in advance. Good leaders can sometimes tilt people's decisions toward certain directions, but even the most trustworthy leader can do little help if various institutional conditions are not already in place.

In the example of the self-isolation policy, to successfully implement this policy, the authority needs to quickly identify the target, call for social cooperation from the targeted person, provide support for the quarantiners, and prepare to deal with violators. As will be shown in Section 3 and 4, self-isolation requires a set of carefully designed policies and institutions that can not be created overnight, partly because this policy posts legal, political, and technical challenges for a society. When a centralized quarantine is not feasible or optimal, some forms of self-isolation at home will need to be implemented, which is even more challenging since it requires extremely detailed planning and high diligence of all participants.

Unfortunately, due to the lack of preparation and other institutional limits, self-isolation in most countries does not break the within-household transmission and therefore the community transmission, because the infected person still lives with other family members during the quarantine while these family members still need to go out for work or shopping. Even when a strict quarantine is ordered, since the government and health agencies do not have enough capacity to monitor the behaviors of such a large number of individuals, the success of the policy ultimately relies on the voluntary cooperation from the public. This shows that a third party's intervention cannot work without various institutional supports.

In sum, although government interventions are clearly needed to solve the social dilemma, successful government interventions require certain conditions that do not come overnight. This is why many countries that had shown good leadership, trust, and civil participation in other aspects have intervened yet without much success.

2.2. Information problem

Independent of the social dilemma issue, Gans (2020) argues that the primary obstacle to deal with pandemics is to figure out who is infected, who has been infected, and who has not. If countries can obtain this information through mass testing (testing aiming at most of the general population rather than just the high-risk targets) and contact tracing, they can isolate the infected and reopen their economies sooner. Otherwise, physical interactions remain unsafe and all interventions will be very costly and inefficient.

While this information gap is important and testing and tracing do help to reduce the gap, however, several characteristics of the virus and the mass testing technique make it difficult to eliminate the gap. First, many viruses cause asymptomatic infection, such as influenza, West Nile, Zika and Dengue. In the case of the coronavirus, a significant fraction of the infected show no symptom throughout the process (Oran and Topol, 2021), and the lack of symptoms does not motivate people to get a test voluntarily. For those who do show symptoms, the symptoms usually appeared several days after the person contracted the virus, giving them time to transmit it to others. These facts suggest that when

a case is tested positive, the patient likely has been spreading the virus in the community for some time. This also implies that testing is more a measure of mitigation rather than a complete containment.

Second, in addition to the issue of time lag, mass testing comes with additional issues that are not easy to solve⁴. Based on the Bayesian theorem, when the virus is not widespread in the community, mass testing is counter-productive for it will have a low rate of precision and create a large amount of false positive results (Lieberman, Lieberman, and Bourassa, 2020; Woloshin, Patel, and Kesselheim, 2020). This is the main reason why Taiwan CDC rejected the proposal of mass testing when there are only a handful local cases. Besides, in Taiwan, any positive cases will be sent to hospitals and treated in isolation, regardless of how ill or symptomatic they are. In this case, the false positive cases generated by mass testing when the virus is not widespread in the community will quickly drown the medical system. On the other hand, when the virus is widespread in the community, mass testing may suffer from a higher false negative rate (Lieberman, Lieberman, and Bourassa, 2020; Woloshin, Patel, and Kesselheim, 2020). Even when mass testing may be beneficial in certain cases, it will generate a large number of confirmed cases that need to be quarantined and/or treated. This brings us back to the previous discussions about the difficulty of government interventions and suggests that the issue of social dilemma cannot be easily avoided.

Third, contact tracing is used to identify the precise chain of transmission so that the origin and all likely infected persons can be isolated, and the chain of transmission can be broken. Since the carrier may likely contact not only family members and friends but also anonymous persons in public spaces like hospitals, restaurants, and buses, contact tracing in this case may involve collecting personal information of all individuals who have shown up in those places at certain points of time. This brings us back to the social dilemma again. Another related issue is that, although frequently mentioned together with mass testing, contact tracing is simply not feasible when the virus is widespread in the

⁴ Here I assume that mass testing is feasible. In reality, no country ever got close to testing 100% of its population. Even Iceland has tested only 55% of its population, as of the late November 2020 (Scudellari, 2020).

community where mass testing is likely to be called for. Because when the virus is widespread in the community, by definition, many cases are infected by unknown sources that cannot be identified with any methods.

3. TAIWAN'S RESPONSES

The Taiwanese government started to roll out various policies and measures on December 31, 2019, three weeks before its first confirmed COVID-19 case was reported on January 21, 2020⁵. Taiwan's strategy comprises three key elements: Border quarantine, target-based measures (such as testing and contact tracing), and population-based measures (such as physical distancing and wearing masks). While the last two types of measures are widely implemented by almost all countries, border quarantine is considered to be the most critical element of Taiwan's strategy.

Border quarantine refers to a set of measures to ensure that all travelers from abroad, citizens or not, follow the mandate of the 14 days quarantine. At first, this was applied to travelers from Wuhan, China (1/23/2020), but soon expanded to all travelers from abroad (3/19/2020). While many countries also issued quarantine mandates to travelers, Taiwan issued this mandate very early on, and adopted multiple measures to ensure the mandate is strictly followed upon entry and through the whole mandated period.

Incoming travelers need to report health status and travel history and who show symptoms are required to undergo a test⁶. Before they could leave the airport, passengers had to register and ensure they can be contacted and tracked through cell phones. From the airport to the quarantine facility, which can be the home, hotels, or government-managed quarantine facilities, the quarantined personnel are required to use specially arranged taxi or bus, rather than any type of public transportation⁷. People under quarantine are closely monitored using mandatory cell phone surveillance. Any abnormality in cell phone signals will trigger

⁵ This paper does not try to document all measures. For a more comprehensive account, please see Lai *et al.* (2020).

⁶ From December 1, 2020, all incoming travelers, including citizens, are required to present a negative PCR (polymerase chain reaction) test result within three working days before boarding.

⁷ Many travelers documented the experience.

police inspection immediately. Quarantined personnel receive phone calls two or three times a day from local authorities to check on their health conditions and essential needs. Breaking quarantine can result in huge fines (up to 1 million New Taiwan dollars, or 33 thousand US dollars), while citizens and Alien Resident Certificate (ARC) holders are eligible for quarantine compensation after completion.

The second type of measures, the target-based measures, include mainly testing and contact tracing to identify potential cases. Taiwan CDC's laboratory started developing a test-kit in early January and produced an upgraded 4-hour test-kit for COVID-19 by January 12, 2020. Laboratories in Taiwan continued to increase the capacity and speed of testing from 500 cases per day in January to more than 9000 cases per day in November 2020 (Ministry of Health and Welfare, 2020).

While elevating the testing capacity, Taiwanese authorities firmly rejected the proposal of mass testing, as mentioned briefly in Section 2. Instead, Taiwan carefully established reporting criteria and conducted targeted tests for whoever meets the criteria⁸. All confirmed cases were followed by contact tracing, which is a thorough epidemiology investigations tracing the case's detailed activities and contacts in the past two weeks. For each confirmed case, the epidemiological investigator in Taiwan on average traces more than 300 contacts which then need to be isolated and tested⁹. Taiwan also actively implemented retrospective screening aiming to identify persons who had influenza-like COVID suspected symptoms in the previous 14 days, which is made possible by the comprehensive National Health Insurance (NHI) database.

Combining targeted testing, retrospective screening, and contact tracing to identify potential cases, which are enhanced by the use of multiple databases¹⁰ and a professional team of epidemiological investigators, Taiwan managed to actively identify everyone at the risk of exposure and testing them.

⁸ The criteria evolve in accordance with the growing understanding of the virus. See Huang, Lee, and Hsueh (2020) for details.

⁹ As of January 25th, 2021, there are 889 confirmed cases and 341,689 persons have been tested in Taiwan.

¹⁰ Including the NHI database, travel history data from the National Immigration Agency, cell phone geo-location data provided by local telecommunication companies, etc.

Population-based measures aim to mobilize the general public to follow behavioral guidelines such as wearing masks, physical distancing, keeping personal hygiene, etc. Although the experience of previous outbreaks, such as SARS in 2003 and H1N1 in 2009, make the population-based measures relatively well received by the public, there are still several bottlenecks needed to be overcome, such as providing personal protective equipment (PPE) and communicating effectively. As will be shown in Section 4.2, the government made serious efforts to coordinate actors in the private market and the civil society to ensure the timely provision of masks.

According to the analyses by Ng *et al.* (2020), compared to target-based measures, population-based measures are more important in reducing the local transmission after the virus is introduced into the society. Border quarantine, however, plays a more fundamental role in determining how many cases are introduced into the society. If the introduced cases increase beyond a threshold, the effectiveness of population and targeted-based measures will both decline dramatically. As of January 10, 2021, more than 90% of the confirmed cases in Taiwan (772 out of 828) are imported and captured by border quarantine. Even with stringent border quarantine, of course, there are still cases of transmission either because the virus has entered Taiwan before the border quarantine was issued, or due to leaks and unexpected events. This is where the effective target-based and population-based measures can stop the spread.

4. THREE UNDERLYING CONDITIONS

4.1. Condition 1: Institutionalization and capacity building after the 2003 epidemic of SARS

While theory has made it clear that the intervention of the third party, or the government, is critical to solve a large-scale social dilemma, there is no guarantee that such intervention can be readily supplied when needed. Complicated incentive and information problems within the public good provision systems need to be solved and institutionalized before public health policies can be rolled out efficiently.

The institutionalization and capacity building after the 2003 epidemic of SARS, which caused 73 deaths in Taiwan, lay the foundation

for Taiwan's responses to COVID-19. During the 2003 SARS epidemic, government officials, medical professionals, and citizens at various levels had engaged in various "uncivil" behaviors against the public interest (Tsai, 2012), including:

- Government officials:
 - The disease-control measures taken by the government were not well-planned and often suffered from miscalculations and social/political pressures.
 - The central government, local government, and healthcare system failed to coordinate and often divided along political lines.
- Medical professionals:
 - The management of hospitals covered up cases to keep business and were reluctant to accept SARS patients transferred from other hospitals.
 - Medical professionals were required to treat SARS patients without careful triage procedures, training, and adequate protective equipment.
 - Nurses and doctors in a designated hospital resigned for refusing to care for SARS patients.
 - One third of local clinics in one county decided to close to keep themselves safe.
- Citizens:
 - Ordinary citizens defied the order of home quarantine and failed to report their contact and travel history.
 - Local residents and politicians had blocked the ambulances carrying SARS patients from entering their district, protested against the incineration plant in their neighborhood processing any SARS-related medical waste, or against the opening of a designated SARS treatment center in their district.

It is not difficult to see that many of these behaviors are related to the conflict between private and public interests and play into the social dilemma as described in Section 2. The traumatic consequences of these behaviors on public health, economy, and social/political psychology triggered comprehensive and painstaking reforms since 2003, and the reform process was continued through outbreaks of other diseases since then (Yeh and Cheng, 2020). Among these post-SARS reforms, the

reconstructions of the command system and the medical system are probably the two most crucial ones.

During the 2003 SARS outbreak, the decision-making process was fragmented by the departalism of each government agency and by the conflicts between local and central governments. The reform set up a command center to resolve the failure from decentralized decision making not through vertical integration, but by breaking up the regular bureaucratic hierarchy and installing a war-time command system across government agencies. When the command center, led by the minister of health and welfare, is activated, the officials of disease control can discuss issues with officials from various government branches directly and issue orders quickly without going through usual administrative procedures. Before the reform, the officials of disease control needed to visit different departments to discuss policies before issuing any request for cooperation. After the reform, officials from all other departments are required to attend the meeting convened by the command center and follow the decision made in the meeting (Yang, 2020). This reform does not just reduce the coordination failure due to the private interest of individual agencies, but also reduces the information gap between the top and the bottom of the regular bureaucratic hierarchy.

Before the reform, Taiwan's CDC was structured according to the type of disease and each division was responsible to detect the outbreak of its type of disease and implement the following response policies as well. This made the division reluctant to report initially minor risks to avoid any mistakes that might increase its own burdens. To solve this incentive problem, the reform also set up an independent unit of epidemic intelligence to collect information from all sources and alert potential outbreaks (Yang, 2020).

The reform of the medical system is more far-reaching and complicated. First, through a set of legislatures and an interpretation made by the constitutional court (Constitutional Court, 2009), Taiwan re-defined the line between individual rights and public obligations and strengthened the legal authority of the government on limiting individuals' freedoms, including medical professionals and the general public, to contain an outbreak. The legal reform also increased the central government's power over local governments to rule out spaces for potential conflicts and opportunistic behaviors.

Second, Taiwan set up a network of designated (mostly public) hospitals as the first responders, and conducted regular exercises helping to establish norms of cooperation and trust. The central government also started to recruit professional disease control doctors and added disease control-related training into the evaluation of medical programs and hospital management. These measures aimed not only to improve the abilities and awareness of medical professionals but also to create a team which is able and willing to take the lead.

4.2. Condition 2: Social coordination

Social coordination refers to the interactions among government, market, and civil society once the outbreak begins. One example that has attracted much attention is the coordination to produce and distribute masks. After the 2003 SARS epidemic, hospitals and health authorities in Taiwan are required to keep sufficient amounts of disease control materials and equipment for medical professionals. To fight the COVID-19 pandemic, however, everyone in the country suddenly needs to wear a mask, and this urgent demand dwarfs Taiwan's production capacity. In normal times, Taiwan produces only 1.8 million masks per day, which is nowhere close to satisfying the demand of its 23 million people in the face of coronavirus.

Back in January 2020, this gap was unlikely to be filled by the free market (Subramanian, 2020). China, which accounted for more than half of the world's facemask production, was hit by the virus first and stopped exporting masks. Existing domestic manufacturers, whose capacities were far from enough to meet the demand, could increase production to some extent in responding to the surging price. Everyone had expected the surging demand to be a short-term phenomenon, however, as suggested by the 2003 SARS experience, so once China recovers from the initial outbreak and lifts the export ban, cheap masks would soon flood the market. Therefore, no other company had strong incentives to jump in and build additional production facilities.

To fill that gap, starting in the late January 2020, the Taiwanese government intervened to assemble a task force made up of dozens of private companies, including machine tool manufacturers, raw materials providers, and facemask producers, to build new production lines and

expand the supply. Within two months, 92 new production lines were built and the capacity was increased to 20 million masks per day by May 2020, enabling Taiwan not only to satisfy domestic needs but also to donate or export face masks and production machines to other countries.

A part of the success can be traced back to the tradition of industrial policy in Taiwan (Wade, 2004). Instead of taking over the production directly, the government incentivizes or nudges private companies to participate in the task force through several measures that reduce transaction costs and the uncertainty about future profitability, including providing direct funds to build new production lines, setting up a purchasing price structure, transferring the ownerships of the production lines to private manufacturers once certain conditions are met, a guarantee of fixed-amount purchases after the pandemic, allowing exports for higher profits once the export ban is lifted (Yen, 2020).

The other part of the face mask policy involves building a distribution system through cooperation with private companies and civil society participants. To prevent panic buying and hoarding, Taiwan started a name-based rationing system for purchases of masks at the early February 2020, under which people could only purchase a fixed amount of masks per week at fixed prices from government-contracted pharmacies using their NHI cards or other IDs (Taiwan Centers for Disease Control, 2020). Due to the lack of public information about the stocks in each store, long waiting lines started to appear at some pharmacies, while surplus masks piled up at others. To facilitate the distribution process, the government started to share data of mask sales with groups of civic hackers to develop digital maps tracking the inventory of masks in each store (Leonard, 2020).

4.3. Condition 3: The political pressure from China

In addition to the conflict of interests between individuals and the society, the difficulty of the collective action problem in fighting COVID-19 is compounded by the uncertainty and misinformation around the disease particularly at the beginning. The early and swift action turns out to be absolutely critical so that Taiwan can contain rather than just mitigate the disease. When most countries remained uncertain about what was going on in China, how did precaution overcome uncertainty in Taiwan and triggered actions?

When China tried to downplay the outbreak in the early days of the pandemic (Ruan, Knockel, and Crete-Nishihata, 2020), the Taiwanese government was not better at collecting such local, scarce, and uncertain information than any other governments around the world. The very first alert the health official of Taiwan received about this novel virus came from a young doctor, X, who posted the information on a bulletin board system (BBS) on December 31, 2019. The information she posted included the message sent by Dr. Li Wenliang and other frontline health workers in Wuhan just one day before but quickly banned in China. Other users quickly responded to the post and shared it widely to increase the visibility of the post. On the same day, Taiwan CDC officials read the post in the morning, sent emails to China CDC for clarification and to World Health Organization (WHO) to alert it at noon, and activated a series of response measures, including boarding on planes to access passengers and starting testing and tracing, by evening.

The tension with China played an important role in this chain of actions of day one. A painful experience Taiwan gained from the 2003 SARS outbreak is: Taiwan could not get critical information (like the virus strain) about SARS in 2003 and other help from WHO due to the pressure from China (Cyranoski, 2003). In 2003, the Chinese government had tried to cover up the outbreak similarly in the early days (Richburg, 2020). Based on these experiences, Taiwan has been very cautious toward China and planning and practicing response strategies without the help from WHO in the past 17 years. As China became more aggressive in suppressing Taiwan's independence with diplomatic and economic means in the recent decade, this distrust of China is clearly shared among the participants of civil society. The young doctor X had explained that she was able to notice the messages from the whistleblowers in Wuhan, because she had learned a hard lesson from China's crackdown on Hong Kong protesters so that she kept watching the situation in China.

Because there is still a big population in Taiwan preferring a closer tie with China, Taiwan's early response when almost all other countries remained inactive¹¹ had attracted lots of criticism. Nonetheless, as the

¹¹ A notable exception is Vietnam which is also driven by its distrust of China (Pham and Murray, 2020).

current administration which is pro-Taiwan independence was just re-elected in January in a landslide victory, the cautiousness toward China and the rising Taiwanese identity behind it helped to outweigh the criticism and to promote cooperation between government and civil society from day one (Election Study Center, 2021).

5. CONCLUSION AND ON-GOING CHALLENGES

This paper focuses on the challenges brought by the social dilemma in fighting a pandemic. By examining Taiwan's strategy, this paper finds that the main ingredient for its unexpected success is minimizing the grand-scale social dilemma through a set of carefully-designed policies. As government intervention is not a guarantee for success, this paper argues that Taiwan's strategies are made possible by three underlying conditions, including the institutionalization of preparation and coordination before the pandemic, a set of executive strategies fostering social cooperation among government, market, and civil society, and the long-term tension with China and the re-election of the pro-independence administration.

Looking forward, Taiwan is not exempt from on-going challenges. The first challenge is the inflow of capital that pushes up the exchange rate and asset prices. With the outbreak beginning in early 2020, central banks and fiscal authorities around the world have adopted expansive policies to sustain the economy, which led to a flood of capital into Taiwan. This capital inflow, combined with the continuing growth of the export of high-tech products during the pandemic, has pushed up the exchange rate by more than 5% between January 2020 and January 2021. Various asset prices including stock and real estate prices went skyrocketed. As a result, while the general unemployment rate remained stable, employment in construction, real estate, high-tech manufacturing, and finance sectors has expanded, but employment in most other sectors has declined. This has exaggerated the long-term unevenness among sectors and its consequences, such as the decline in small manufacturers in traditional sectors, the increase in housing prices, and the rise in inequalities, may be difficult to solve.

The second and perhaps bigger challenge is the rising power of China. As China recovered and put the outbreak under control ahead of the west, it is no secret that China is trying to leverage its success for

greater geopolitical influences (Yan and Friedberg, 2020). During the pandemic, China intensified military pressure and information attacks on Taiwan (Lee, Lague, and Blanchard, 2020; Tseng and Shen, 2020), when it also tightened the controls of Hong Kong and Xinjiang and engaged in conflicts with India and other countries. This has added into Taiwan's long-term geopolitical risk and is expected to only aggravate in the foreseeable future. ◀

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