**In government we trust? Micro-business adaptation to climate change in four post-colonial and transitional economies of China**

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Abstract

Public expectations of government influence private action for managing climate change risks. Institutional neglect or incompetence result in a loss of trust in public institutions, consequently discouraging the public from taking added responsibility for risk management. This has been explained in terms of social contract, but evidence suggests that a politics of distrust can reinforce alternative social drivers of action, rather than displacing action. This is empirically confirmed by the present study, which examines the tendencies for adopting private protective measures across a gradient of institutional trust. Surveys were conducted in four jurisdictions within China that operate under two different political-economic systems, namely, Hong Kong and Macao (liberal market economy), and Zhuhai and Sanya (socialist market economy). Structured interviews were conducted with 569 business operators to explore how their stated adaptation practice is related to institutional trust and social capital. We found that trust predicted action only in Sanya, which is characterized by a high level of public confidence in authorities. In places of lower institutional trust, social capital became a salient and powerful driver of action. The weakening of the social contracts in Hong Kong and Macao turned their people to alternative social mechanisms. We explain the results in terms of the development trajectories, socio-political norms and institutional settings of these jurisdictions. This study provides insights into how adaptation practice can be mediated by the consequences of a change in political leadership, policy, or governance arrangements that alters the relationship of trust.

Keywords: climate change adaptation; institutional trust; social capital; business; public confidence; China

**Introduction**

Institutions mediate vulnerability to climate change through systems of rules, norms and incentive frameworks that condition private and collective action for hazard risk management (Adger, 2000a; Agrawal, 2010; Paavola, 2008). The willingness of the public to take responsibility for risk-mitigating action is influenced by their perceptions of the institutions that establish the terms of social cooperation in risk management (Adger et al., 2016, 2018; Adger et al., 2013). Trustworthiness is an important quality of institutions. This article investigates how trust in public institutions drives business action, and how the changing levels of trust influence the significance of social capital in driving action.

Transformational adaptation to climate change requires a process of change that involves both citizens and governments making efforts in risk mitigation. This process is embedded into the political and economic structures that define their responsibilities and rights, and shape citizens’ expectations of government. Failures of the institutions, policies and processes in which these structures are manifest often lead to a renegotiation of these responsibilities and rights, which include those affecting the capacity for adaptation (Christoplos et al., 2017; O'Brien et al., 2009; Pelling, 2011; Pelling and Dill, 2010; Zografos, 2017). The metaphor of ‘social contract’ has been used to explain declines in the willingness of individuals to adopt adaptive measures when hazard management authorities do not live up to their expectations (Adger et al., 2016, 2018). There are calls for a society-wide deliberation on state-citizens relationship in terms of justice, obligations and legitimacy, an important process in the transformation of existing political and economic structures in response to climate change (O'Brien et al., 2009; O’Brien, 2012).

The ongoing scholarly discussion has focused more on the normative dimensions of public expectations of government than their cognitive dimensions. These expectations involve expressions of calculative trust, which is based on judgements of competence and likelihood of an action to be taken (Earle, 2010). Citizens evaluate public institutions not only in terms of fairness in their past interventions (Adger et al., 2016), but also of institutional competence and willingness to make the best efforts. The latter require an investigation, because perceived effectiveness of institutional interventions can reduce, rather than increase, private action for hazard risk management (Grothmann and Reusswig, 2006; Terpstra, 2011).

In addition, the ways in which relations of trust moderate the effects of social capital on hazard risk management remain unclear. Social capital is a key determinant of vulnerability and resilience to environmental change (Adger, 2000b, 2003; Pelling and High, 2005). However, the mobilization of social capital to achieve goals can substitute for contractual control through formal institutions (Nooteboom, 2007). When formal institutions become fragile or lose credibility, people could respond by carefully building a balance of mutual dependence in individual relationships, upon which informal institutions are formed or strengthened to regulate collective and individual action (Nooteboom, 2007). Thus, the breaching of a social contract by a government may reinforce the social conditioning of individual action through strengthening interdependencies and interpersonal norms. The shift to a different social group of reference could render the linkages between expectations of government and citizens’ intention to act obscure. The falling back on the institutional fabric of smaller communities could also raise questions about the perverse implications of social capital in the renegotiation of social contracts with public authorities towards transformational adaptation.

The present research examines the effects of calculative trust on climate change adaptation, and clarifies the relationship between trust and social capital as drivers of action. The research questions are whether institutional trust drives private action for risk management, and whether attributes of social capital produce consistent effects across a gradient of institutional trust. Empirical evidence was solicited from four jurisdictions within the People’s Republic of China, which practice two substantially different political-economic systems and have experienced uneven impacts of climate change, both resulting in sharp differences in institutional trust. The research will shed light on the social basis for adaptation by exploring the mechanisms through which people respond to climate change risks in times of crisis met with institutional neglect or incompetence. The findings can inform debates on the implications of public perceptions of institutions for adaptation.

The next section elaborates on the concepts of social contract, trust and social capital, and their relationships. We then describe our empirical study, which involves structured interviews with 569 business operators based in climate-sensitive tourist destinations, and compare the results from the four study areas. We show that social interdependencies become an important driver of private action in situations of lower institutional trust, and discuss how the changing conditions of the political economy have shifted the social basis of action.

**2. Institutional trust and individual response to climate change risks**

2.1 Social contract and private action for risk management

Dramatic transformation in response to global climate change involves a fundamental change to system functioning that seeks to overcome structural problems associated with existing development pathways (Kates et al., 2012; Marshall et al., 2012; O’Brien, 2012; Pelling, 2011). Pelling et al. (2015) argue that such a transformation is indicated in a rebalancing of rights and responsibilities between actors, notably between the citizens and the state, which specify the contributions expected of each actor (e.g. taxes) and the constraints on freedom they have to accept (e.g., laws), and in return, the services, security, or power to be provided by the other actor. The metaphor of the social contract describes a real or ideal agreement between the contracting parties that offers some form of mutual benefit and imposes some mutual obligations (Adger et al., 2016, 2018; Adger et al., 2013; Christoplos et al., 2017; Lacey and Lamont, 2014; O'Brien et al., 2009; Zografos, 2017).

A social contract in the context of climate change adaptation requires the state to protect its citizens from the dreadful consequences of extreme weather and the citizens to take action for reducing their risks. An extreme weather event that results in massive losses and disruptions may expose the state’s failures in protecting its citizens. The ensuing public outcry and questioning of the status quo put the existing social contract into a test, potentially opening a political space for renegotiating the implicit contractual arrangements that condition the behaviour of the state and citizens (Pelling, 2011; Pelling and Dill, 2010). This may result in a weaker social contract, as Adger et al. (2013, 2016, 2018) have found in Ireland, where members of the community were disappointed at the Irish government and therefore became less willing to engage in flood protection. The sense of personal duty diminished as the government was deemed to be under-performing and falling short of public expectations. In contrast, their counterparts in England, who believed that public authorities did all they could to help the public following a devastating flooding event, tended to take on added responsibility in dealing with future flood risks.

An alternative theory is articulated by Chamlee-Wright and Storr (2010), who indicate that the motivation to act can be reduced by a positive expectation of government’s capability and intension. They have investigated whether local residents returned to New Orleans or relocated elsewhere in the aftermath of Hurricane Katrina, and suggested that those who believe that government can and will provide adequate levels of support will likely to “wait on the sidelines until the expected support materializes” (Chamlee-Wright and Storr, 2010, p. 259). Similarly, Grothmann and Reusswig (2006) and Terpstra (2011) have shown that a positive belief in the effectiveness of public measures for flood protection could discourage citizens from making preparation. A strong sense of security reduces the incentives to privately mitigate risks, illustrating the notion of ‘moral hazard’ (Kriesel and Landry, 2004; Raschky et al., 2013). The two strands of empirical research discussed above have engaged in two different dimensions of public perceptions of government.

2.2 Public expectations of government: virtues and prospects

Adger et al. (2013, 2016, 2018) address the *normative* dimension by articulating public expectations in terms of perceived fairness of government response to flooding. Specifically, their research involves an evaluation by their respondents of past institutional interventions in terms of distributive and procedural justice, which are virtues of a course of action. Despite focusing on fairness, Adger et al.’s (2016) analysis also includes the perception of government capacity, which is compatible with the *cognitive* dimension of public expectations.

 Adger et al. (2013, p. 78) have suggested that “social contracts involve expectation of other parties”. Such an expectation influences the contracting parties’ decision to follow the rules or norms by taking an agreed course of action at their cost (Lacey and Lamount, 2014). The entering into a social contract is therefore a risk-taking activity that requires the citizens to accept vulnerability and uncertainty, on the basis of positive expectations of the intention or behaviour of another party (Earle, 2010; Rousseau et al., 1998). This psychological process is mediated by trust. As Gibbons (1999, p. 11) has described, social contract is “an arrangement built on trust which sets out the expectations of the one held by the other”. Trust can facilitate cooperation by promoting a positive evaluation of the prospects for a course of action to be taken by the other party (Rousseau et al., 1998; Earle, 2010).

We argue that articulating public expectations in terms of prospects may have different implications for climate change adaptation. van Valkengoed and Steg (2019) differentiate between trust in measures implemented by the government and trust in the government itself. Consistent with Adger et al. (2016), their meta-analysis shows that “stronger trust in the government was associated with more adaptive behaviour” (van Valkengoed and Steg, 2019, p. 158). However, trust in government measures has mixed effects on adaptive behaviour, depending on the types of measures and adaptive actions (van Valkengoed and Steg, 2019). Negative effects have been documented by Grothmann and Reusswig (2006) and Terpstra (2011). For example, trust (confidence) in the strength of flood defences and the skills of flood risk managers reduces citizens’ intentions to prepare for floods (Terpstra, 2011). In these studies, institutional interventions were evaluated in terms of perceived effectiveness.

The cognitive dimension addressed by these studies involves judgements of competence and likelihood of a preferred action to be taken. These judgements characterize a specific form of particularized trust, i.e. calculative trust, which is based on personal assessment of the behaviour of the other party in terms of abilities to act and constrains on action (Earle, 2010). It is essential for self-interested, rational individuals to intentionally enter into social contracts and create institutions that regulate everyone’s action in order to secure and promote social stability (Misztal, 1996). An adequate level of calculative trust can be expressed as confidence, which connotes a sense of security and control in the outcomes of action, reducing the perceived necessity for making additional efforts. This underlines Chamlee-Wright and Storr (2010)’s view that disaster victims tend to adopt tentative strategy (i.e. waiting) if they are optimistic about the government’s capabilities and intentions to help.

2.3 Weak institutions, lack of trust, and social capital

Addressing the cognitive dimension of public expectations through the perspective of trust is important for understanding the role of social contract in adaptation to climate change. The mandate of the social contract requires the citizens to recognize that there is a right thing for the state to do *and* the state will and can do it. Furthermore, when the state withdraws its primary responsibilities or is no longer trusted, the citizens may turn to informal, collective arrangements and rely on elements of social capital that facilitate the formation of, and access to, these arrangements. Both of these can substitute for the loss of state planning (Adger, 2003). Such a state-society substitution has also been articulated by Nooteboom (2007).

The importance of interpersonal connections and networks of reciprocity for individual adaptation increases when formal institutions do not meet public expectations and the people seek alternative ways for accessing resources and regulating behaviour. As Nooteboom (2007, p. 47) explains,

if a nationwide ethic [of proper conduct] is lacking, people fall back on loyalty within smaller communities of tribes, clans, religious groups, (extended) families, or highly localized networks.

The formation and development of these ‘smaller’ communities and networks require connections and restraints. One option for self-interested, rational individuals is to strengthen and attend to the inter-dependent relationships with other individuals and the norms that govern their interactions in order to protect collective and individual interests, consequently providing conditions for informal institutions to form and function. The relational and normative components of social capital therefore can play a decisive role in substituting contractual control through formal institutions and compensate for institutional weakness (Nooteboom, 2007). Nooteboom (2007) argues that this is particularly important in developing countries with weak institutions. Adger (2003) has expressed a similar view by suggesting that adaptation strategies that are based on localized networks and social capital could become more prevalent and necessary for marginalized communities, such as those in Vietnam, where governments lack resources or frameworks to protect them from environmental change.

 The views of Nooteboom (2007) and Adger (2003) have broader implications for understanding how different forms of political economy determine adaptive capacity. In places where a culture of trusting the authorities exists or a moment of satisfactory practice is detected, the citizens are likely to take responsibility for risk management. In contrast, where trusting the authorities is not widespread or institutional trust is dampened by poor authority performance, alternative mechanisms, such as those that require mobilization of localized networks and social capital, may play a more important role. Therefore, the trust perspective can illuminate the ways in which private action for risk management is influenced by the consequences of a change in political leadership, policy, or governance arrangements that distorts the relationship of trust, through the reinforcing or deactivation of such social mechanisms.

 Our research addresses the two issues discussed above. We ask how private action is related to the cognitive dimension of public expectations of government, and whether the attributes of social capital produce consistent effects across a gradient of institutional trust. These issues are explored in a natural setting involving four culturally connected cities of China.

1. **Study areas**

The four Chinese cities are located at the southern coasts of the country to the north of South China Sea. They consist of predominantly ethnic Chinese communities with numerous cultural linkages and shared traditions. While both Zhuhai and Sanya have been Chinese territories for centuries, Hong Kong and Macao were under colonial rule for more than a hundred year (Table 1).

 A city of China’s Guangdong Province, Zhuhai shares its borders with Macao and includes many small islands off its south-eastern shore that are closer to Hong Kong than the city’s mainland (Figure 1). Sanya was administered by Guangdong Province until 1988, when the Hainan island was designated as a separate province. Located at the southern end of Hainan Province, Sanya is branded as ‘China’s Hawaii’ and an international tourist city, offering a selection of tropical attractions and fine resorts. Like the rest of the Mainland China, Zhuhai and Sanya have been ruled by the Communist Party of China since 1949 and form a part of the Chinese ‘socialist market economy’. Direct popular elections are restricted to the lowest administrative levels. Governments at the city and higher levels practice authoritarian rule and have not introduced multiparty electoral competitions.

 Hong Kong and Macao are adjacent to Guangdong Province and largely composed of migrants from Guangdong and their descendants (Figure 2). The imperial China lost the sovereignty of Hong Kong to Great Britain in the 19th century, and ceded its control over Macao to Portugal in 1887. The sovereignty of the British and Portuguese colonies was returned to China in 1997 and 1999 respectively. Both cities are established as a Special Administrative Region (SAR) of China and formally demarcated from their Mainland counterparts by adopting a unique governance arrangement known as ‘One Country, Two Systems’. This arrangement has enabled the SARs to enact a separate quasi-constitution, hold multiparty elections, and maintain their independent judiciary, legislative and administrative systems. The Chinese central government retains control over government leadership, defence, and diplomatic issues.

 Hong Kong and Macao are highly developed, liberal market economies inheriting their colonial privileges, whereas Zhuhai and Sanya are developing economies undergoing a process of market liberalization following the nationwide political-economic transition since 1978. The Western-style democratic politics of the two SARs has nurtured a tradition of contesting and questioning their local governments, especially in Hong Kong, where a decline in trust in government is detected in recent years, due to poor governance and Beijing’s tightening control (Fan, 2019). Public scepticism has escalated also because of the higher international exposure and fewer restrictions on freedom of press and speech. On the other hand, Mainland cities including Zhuhai and Sanya have not empowered their citizens to elect government leaders, but there is a higher level of trust in government across the country than the SARs. The successful transition of China from a planned economy in crisis to a thriving market economy has stabilised its citizens’ confidence in the state. Although there are signs of change (Li, 2013, 2020), the ruling party’s carefully crafted communication strategies and the ability to mobilize popular patriotism have consolidated the public support.

 Our study involves questionnaire surveys at various locations listed in Table 2. The surveys were administered to operators of micro and small businesses, because their business pragmatism and focus on immediate economic interests is conducive for testing the effects of calculative trust, which emphasizes instrumental relationships with authorities. We selected retail businesses from tourist destinations in order to control sample variations in business type and customer base, thereby increasing consistency. These businesses operated in central urban suburbs in Macao and Sanya, and island rural communities at the territorial edges of Hong Kong and Zhuhai. The differences in tourism style and scale are outlined in Table 2, which shows a balance of geographical and economic characteristics between the SARs and the Mainland cities. All of them are located in a hazard-prone region off Luzon Strait, exposed to unstable systems of tropical cyclone and storm surges exacerbated by climate change.

The two SARs are victims of recent extreme weather events. Typhoon Hato and Typhoon Mangkhut, both catagorized as Signal 10 (the highest intensity in the SARs’ typhoon warning systems), severely impacted the cities. Typhoon Hato devastated Macao in August 2017, bringing storm surges and creating a 2.25 m flood in downtown Macao (Takagi et al., 2018, 2019). The city of 0.67 million people was unprepared for the disaster, which eventually claimed 10 lives and is remembered as the most severe typhoon that Macao had encountered in more than 50 years (Ng, 2017). The public was outraged by the incompetence of the Macao government, prompting an independent investigation into bureaucratic mismanagement (Chan et al., 2018; Takagi et al., 2019). Typhoon Hato and earlier extreme events (e.g., Typhoon Hagupit in 2008) have proven the outlying islands of Hong Kong to be highly vulnerable to climate change impacts (Environment Bureau, 2015). In low-lying locations such as Tai O, the recurrence of coastal inundation has caused considerate damage and disruptions, and public officials have come under criticism (Chan et al., 2013).

The outlying islands of Zhuhai are also natural targets of high-intensity cyclones and storm surges (Yin et al., 2012), but their sparse population and low economic output have limited their losses from the two Signal-10 typhoons. Sanya has found many tourism establishments along Sanya Bay, but the impacts of recent extreme weather events were modest. The divergence in socio-political setting, government response, and extreme weather experience has translated into a steep gradient of institutional trust.

1. **Research instrument**

Based on Section 2, we hypothesized that protective measures are more likely to be adopted when the level of trust in public institutions is higher. Also, we expected the attributes of social capital to have a significant effect on action in places characterized by weaker institutional trust.

A structured questionnaire was designed for the study. It included a number of questions about the protective measures that the respondent had adopted to prepare their business for an extreme weather event, notably strong typhoon, storm surges and/or severe flooding. Survey items were constructed based on a livelihood framework, which classifies coping and adaptation strategies into four analytical types: mobility, storage, diversification, and communal pooling (Agrawal, 2010; Agrawal and Perrin, 2009). For the present study, we turned ‘storage’ into ‘risk transfer’ to recognize other widely adopted strategies that spread risks over time, such as purchasing insurance. Another way for transferring risk over time is to secure back-up resources in advance, a form of self-insurance that requires present investments to reduce damage in foreseeable future. The functions and examples of the four types of actions are displayed in Table 3. Each of them was elicited by four questions that probed whether the respondent had performed a particular action for their business.

Institutional trust was gauged by two questions. Respondents indicated if they believed that the government is able and willing to help them reduce the impacts of extreme weather. These questions sought comments on location-specific bodies and authorities, namely, the SAR administration and local council (Hong Kong and Macao), and provincial and municipal governments (Zhuhai and Sanya). Furthermore, six survey items were constructed to capture the key attributes of social capital, especially social norms and relationships (Pretty and Ward, 2001; Putnam, 1995). They were divided into two groups, measuring the strength of normative effects on the respondent’s action for hazard risk management, and the quality of social relationships, respectively. Each group was measured by three questions. The exact wording of the above survey questions and response options can be found in the Appendix.

Several items were included to control for confounding factors. We accounted for business type because relatively more capital-intensive businesses, such as restaurants, have more or larger mechanical or electrical equipment on site and are therefore more likely to suffer from functional breakdowns and incur greater physical damage than others in the event of an inundation. Business size was included as a proxy for general capacity to cope with hazards. To account for hazard experience, one additional item asked if the business operator had recorded any economic damage from the last extreme weather event (i.e. typhoon and/or severe flooding). Risk perception was measured by an interaction term between perceived likelihood and perceived severity of extreme weather event. Another item recorded the respondent’s highest level of educational attainment as an indicator of capabilities.

4.2 Fieldwork

We interviewed operators of micro- and small businesses who were involved in everyday business decision-making and coping with extreme weather, and located in tourist destinations and hazard-prone coastal areas. Many of those in Hong Kong and Macao have recorded considerable damage from past flooding events, whereas a number of those in Zhuhai and Sanya have experienced interruptions and losses of business income during typhoon seasons. Many of them were proprietary hospitality businesses, such as restaurants, snack takeaways, and souvenir shops with only a handful of employees.

The number of business establishments in each survey location ranged from approximately 50 – 200. The small population size allowed an extensive but manageable data collection strategy that sought to engage nearly all operating businesses. In the small island communities of Hong Kong and Zhuhai, our research assistants approached all of those who were present on a working day and invited them to participate in a short interview. The surveys in Macao and Sanya adopted the same strategy but were concentrated in selected suburbs or main scenic areas. In Macao, we selected 12 streets and lanes within the Inner Harbour region which suffered the greatest impacts of Typhoon Hato (Takagi et al., 2019). In Sanya, we visited beachside establishments around Sanya Bay and Dadong Sea, including Tianya-haijiao, Haipocun, and Donghai Road, which are exposed to coastal hazards.

The surveys were implemented between mid-2016 and early 2018 and involved multiple visits to each location spread across the period of survey (Table 2). The structured questionnaire used was identical in all locations, with minor differences in location-specific languages and names. There was a maximum of one interview per establishment, which lasted for 20-30 minutes each on average. We also carried out qualitative, open-ended interviews with a small number of business operators. All interviews were conducted in either Mandarin or Cantonese.

1. **Results**
	1. Key response items

A total of 569 business operators completed the questionnaire, equally split between the SARs and Mainland. Response rates ranged from about 50% in Sanya to 85% in Zhuhai. Restaurants, snack takeaways and grocery stores were the main respondent groups in all jurisdictions (Appendix Table A1). Some business types were more common in one study area than others, such as dried food or seafood retailers in Tai O (Hong Kong), guesthouses in Wailingting and Dong’ao (Zhuhai), and farm produce shops in Sanya. More than half of the respondents in the rural island communities of Hong Kong and Zhuhai were over 40 years old, but only less than one-third of those in the urban Macao and Sanya aged 40 or above. In the two SARs, female respondents accounted for over 50% of the sample, while the numbers in Zhuhai and Sanya were 41.4% and 65.4% respectively. In Hong Kong and Zhuhai, 82.8% and 87.5% of respondents, respectively, had only received primary or secondary education. In Macao and Sanya, nearly 30% or more were educated to tertiary levels.

The main descriptive statistics are displayed in Table 4. A composite index was created by combining the 16 responses about coping and adaptation strategies. Respondents in both Zhuhai and Sanya have made greater efforts than those in the SARs (Figure 3). Despite the timing of the survey, a significantly lower score was recorded in Macao than in Mainland (p < 0.01). Statistically significant disparities were also evident between Hong Kong and Macao, but not between Zhuhai and Sanya. The Cronbach’s alpha values reached or nearly reached the usual benchmark of 0.70, indicating scale reliability. Mobility and pooling strategies, such as developing a plan for removing inventories and sharing supplies, were commonly adopted or being considered by these business operators. There were fewer attempts to transfer risks through insurance and early purchases, and diversify incomes through other investments. Comparing with the SARs, the Mainland businesses possessed greater adaptive capacity across all of the four strategies, with only one marginal counter-example (Diversification – Macao and Sanya) (Table 4).

The levels of trust in public institutions were significantly higher in Mainland than in the SARs (Figure 4), corroborating the results of the Asia Barometer Surveys presented in Table 2. The highest level was recorded in Sanya, thanks to the effective early warning systems established by the authorities. In contrast, the urban businesses in Macao expressed the lowest level of trust. This is consistent with our expectations, as the survey was implemented a few months after Typhoon Hato shocked the city and the public had fresh memory about the government’s incompetence. Statistically significant disparities were evident between Zhuhai and Sanya, but not between Hong Kong and Macao.

All other variables and their average values are listed in Table 4. Despite the clear tendencies discussed above, Macao and Sanya did not show significant differences in social expectation and social relationship (p > 0.05). The surveyed islands of both Hong Kong and Zhuhai were rural areas, but their scores in these social capital items were the lowest and highest respectively (p < 0.01). A clear urban-rural split on these items was only found between Zhuhai and Sanya (p < 0.01).

The majority of businesses experienced economic damage from the previous flooding or typhoon event. In Macao, over 90% of those surveyed were impacted, whereas in Hong Kong, only 62% suffered a loss (p < 0.01). Similarly, Macao and Hong Kong recorded the highest and lowest levels of hazard risk perception respectively (p < 0.01). The average values for Zhuhai on both the damage and risk perception items were not different from Sanya (p > 0.05), but were significantly lower than those of Macao (p < 0.01).

Therefore, most of the results presented in Table 4 do not show a consistent pattern of disparity between the SARs and Mainland, with those of Macao being very close to, or higher than, Zhuhai or Sanya. Clear tendencies are detected in adaptation practice and institutional trust (Figures 3 and 4).

* 1. Regression analysis

We included eight variables in the regression analysis in order to ensure statistical power. The sample size of the Hong Kong survey is the smallest among the four study areas. It gave us a reasonable chance (at least 80%) of detecting a medium effect size of 0.15, given a conventional level of alpha (0.05) and 8 predictors. The Variance Inflation Factors of all models presented fell below the conventional rule of thumb of 5 and the values of Tolerance reached above 0.20, thus clearing any concerns about multicollinearity among the predictors.

The results indicated marked differences among the four jurisdictions. In the two SARs, the adoption of protective measures was not related to institutional trust (Table 5). In Macao, social expectation and social relationship had opposite effects. In Hong Kong, only social expectation created a significant positive impact, implying that the stronger the expectations of friends, family and other members of local community, the more likely the respondent would take action. Both regression models explained more than 20% of variations in the dependent variable.

Contrasting results were found in the two Mainland cities (Table 6). Only in Sanya, institutional trust was related to the adoption of protective measures. There was a greater tendency for respondents to take on responsibility when they believed that the authorities could and would help residents reduce the impacts of extreme weather. The effects of social expectation and social relationship lacked significance. In Zhuhai, social relationship was positively associated with action, suggesting that the quality of relationships with friends, family and other members of community would contribute to the willingness to take responsibility for risk management. This stands in contrast with Macao, where a significant negative relationship was found.

To further examine the trust effects, we conducted an extended analysis using a combined sample of Hong Kong, Macao, and Zhuhai. As shown above, there was no significant relationship between institutional trust and adoption of protective measures across the three cities. Two separate regression models were constructed and presented in Table 7. The original variable of institutional trust was used in the first model (left), whereas an interaction term of institutional trust was used in the second model (right). Only the interaction term indicated a significant positive effect. This suggests that institutional trust was associated with action, but only among those who were highly confident in the authorities.

These results show a systematic tendency. In Sanya, where the authorities were believed to be competent and willing to help, institutional trust was the only predictor of action (besides a control variable). As the level of trust decreased, the effects of trust on action diminished, but those of social relationship became noticeable, as demonstrated by Zhuhai. As the level of trust further decreased, social relationship lost impact while social expectation gained significance, as demonstrated by Hong Kong. Both social expectation and relationship were strong predictors of action in Macao, whose local authorities received the poorest evaluations. Thus, social capital replaced public expectations of government as a driver of action as we moved from higher to lower levels of institutional trust. Figure 5 summarizes these results.

1. **Discussion**

The results indicate a complex relationship between public expectations of government and adaptation practice. In our surveys, institutional trust is articulated in terms of a calculative judgement on the prospects for government action, rather than a moral judgement. This is supported by a sample of individuals responding in the capacity of business operators. We find that these individuals would accept greater responsibilities for managing the risks of extreme weather if they trust the government. Such a positive relationship is also demonstrated by Adger et al. (2013, 2016, 2018), but not Grothmann and Reusswig (2006), Chamlee-Wright and Storr (2010), and Terpstra (2011).

 However, the strong linkage between trust and action is limited to Sanya. Kettle and Dow (2016) have defined trust in government in terms of abilities and intentions. They found a positive relationship between trust and people’s support to climate change adaptation, which is significant only in Maryland, where trust in government is the highest among three U.S states. Feedback from our respondents indicates that most of the Sanya businesses surveyed received localized support and information from the management authority of the scenic areas they work in and from local public bodies, reflecting their long experience in coping with typhoons as well as the strategic importance of these tourist destinations. Also, the Sanya authorities issued warning signals every two hours before a typhoon made landfall, inspected trees and hanging structures at risk of falling, and patrolled the main streets beside the sea to alert residents and visitors. Although Sanya Bay is prone to typhoons, the economic damage from recent typhoon landfalls was milder than the other three jurisdictions, and people have not experienced a life-threatening cyclonic event in the past decade. Thus, local businesses are satisfied and confident in the risk management measures implemented by the authorities. As a strategic tourism city, Sanya has received adequate protection and support from the authorities, which remain untested by a catastrophic weather event. In such a productive authoritarian environment, the high institutional trust has strengthened a sense of responsibility for hazard risk management. The social contract for risk management continues to hold.

 The social contract is weaker in the Zhuhai islands, which are characterized by their peripherality and development marginalization. Cook and Dimitrov (2017) have argued that the prevailing social contract between the Chinese state and its citizens is economically driven. State policies and practices are implemented to advance the economic interests of some sections of society in order to legitimize social control and maintain stability (Zhong, 1996). Although the citizens remain trusting their government (Li, 2020; Lo and Cheung, 2016; Lo et al., 2016; Zhen et al., 2019), the fragility of this social contract is exposed when the electorally unaccountable government is unable to fulfil its economic promises, especially in areas of declining prosperity that are stricken by natural perils.

Wailingting, Dong’ao, and Guishan Islands are examples. They are small and peripheral rural communities overshadowed by the rest of Zhuhai, which is a core city of the fast-growing Pearl River Delta. Our interviews indicate that the recent super-typhoons have not met with a timely response, and business operators have not received a post-disaster relief from the government, leading to disappointments and grievances. Unlike Sanya, which has a high potential for growth and strong political patronage, the Zhuhai islands have passed their booms capitalized on fisheries and underground industries, such as gambling and prostitution (Wang and Bennett, 2020). The ongoing attempts to rejuvenate the local economies are impeded by their remote location and intense competition from fine-crafted tourism destinations in the region. The struggles in transition are reflected in the reducing business incomes of some of our interviewees. These changes and challenges have begun to destabilize the conditions for fully trusting the state. Despite the varying confidence, there is no difference between Zhuhai and Sanya in the intensity of adaptation practice. Instead of a reverse of the social contract, we found an activation of other social mechanisms, further evidenced in the two SARs.

 Hong Kong embraces a more liberal form of governance and more recently a culture of civic confrontation. The transfer of sovereignty to China has found this former British colony struggling in contested issues about national identity, economic development, and governance. These tensions have eroded the basis of trust between citizens and government inherited from colonial era. Some of these issues are manifest in the fishery town of Tai O, which accounts for 65% of our Hong Kong respondents. Many local residents see the authorities and the local council as falling short of expectations, both in their incremental responses to Typhoon Hagupit (2008) and Typhoon Hato (2017), and in their poor communication and citizen empowerment in the regional planning process, which aims to turn the hazard-prone village into a lucrative tourist destination (Lo et al., 2019; Lo et al., 2020). Although this has put the social contract at risk, Tai O has a long history of mobilizing social capital to safeguard itself from storm surges (Chan et al., 2013). Commonly found in such small and peripheral communities, networks of sharing, reciprocity and common resources for coping with extreme weather become important when public institutions shift their responsibility to the community or their capabilities are inherently limited (Maru et al., 2014; Petzold, 2017).

Zhuhai and the two SARs have demonstrated the idea that social capital can improve small business resilience (Biggs et al., 2012; Parsons et al., 2018; Torres et al., 2019). In Zhuhai, adaptation practice was predicted by general social relationship. In Hong Kong, the key factor was social expectations, which were expressed in the context of hazard risk management specifically and explained a larger share of statistical variations in the dependent variable, implying that the impact of social capital was more salient than in Zhuhai. The more established culture of questioning the state and the rolling back of the social contract have opened an alternative pathway for mediating private action.

 Macao witnessed the breaking down of the social contract in the aftermath of Typhoon Hato. The casino city has experienced spectacular economic growth since gaming liberalization in 2002 and the influx of Chinese tourists. The strong growth has substantially improved residents’ incomes and GDP, which are the main rewards for giving consent to tighter social control and political conformity. The Macao SAR government managed to stabilize the society until recently coming to realize the city’s vulnerability to external shocks and fluctuations, such as economic recession and a change of Mainland China’s policies (Sheng, 2016; Sheng and Wan, 2017; Sheng and Gu, 2018). In 2017, the former Portuguese colony was caught in a governance crisis triggered by Typhoon Hato, impoverishing the strategically managed relation of trust between the government and its citizens.

 Social contracts are tested in times of disaster (O’Brien et al. 2009; Pelling and Dill, 2010). The scale and speed of urban inundation caused by Typhoon Hato were unprecedented in Macao’s recent history. The fatal event exposed the institutional incompetence and arbitrary decision-making of the Meteorological and Geophysical Bureau of Macao (Chan et al., 2018). Because the Bureau issued warning signals late, most Macao residents were unaware of the impending hazards and did not evacuate before the rapid inundation (Takagi et al., 2019). Consequently, many respondents to our post-disaster interviews have lost confidence in the government’s action for managing future extreme weather: “*no, the government won’t help. They are opportunistic and only care about money*” (#4, restaurant owner, Male, 60s). This indicates the prevailing social contract predicated upon material benefits is called into question.

The behavioural linkage between trust and action dissolved in situations of lower trust. Adger et al.’s study (2016, p. 13) indicates that the perceptions of government response had limited impacts on individual willingness to act in Ireland, in which the relationship of trust was weaker than in the UK. Kettle and Dow (2016) have provided similar evidence from Alaska and Florida, in which people were more critical of the government than in Maryland. Rather than withdrawing personal responsibility, the heightened sense of helplessness among the outraged public enabled a social mechanism to partially substitute the role of formal institutions immediately after the disaster event. In response to the lack of prompt institutional action, a number of resident-volunteers came to help those in need: “*We helped ourselves. There were volunteers on the street. The government wasn’t helpful.*” (#18, retailer, Male, 40s). Many civil society organizations, such as the União Geral das Associações dos Moradores de Macau (a large residents’ association), played an important role in emergency response and recovery (#13, boutique operator, Female, 50s). As Nooteboom (2007) has suggested, informal networks and institutions are often mobilized to assume some of the functions of formal institutions when social contractual control is no longer effective or recognized. Based on a case study of Vietnam, Adger (2000a) has expressed a similar view that the declining influence of the state can be offset by the reemergence of civil institutions. Likewise, the erosion of trust in the state in the aftermath of a Turkish earthquake opened a political gap in which the civil society was mobilized to help survivors (Pelling and Dill, 2010).

Our comparative study empirically confirms that social interdependencies and norms are particularly salient and powerful in driving action in situations of lower institutional trust. The greatest reaction is found in Macao, demonstrated by the statistical significance of both social capital items and our first-hand interview records. Nonetheless, there is possibly a tipping point at which social interdependencies and norms become an impediment. In contrast with Zhuhai, stronger social relationships in Macao reduced, rather than increased, the willingness to take private action. This implies that a close relationship with people who are able to offer critical support in the event of a crisis might create a sense of security and perverse incentives for less preparation for disasters, a recipe for moral hazard (Lo, 2013a; Lo, 2013b; Paul et al., 2016).

The deterioration of public confidence in Macao’s authorities is believed to be responsible for accelerating the move towards these social mechanisms. The sharp contrast is not only related to the timing of the survey, but also the tensions and unsettling public sentiments in navigating through the fragile mono-structured economy and increasingly constrained liberal politics of post-colonial Macao (Sheng, 2016; Sheng and Wan, 2017). A similar political-economic trajectory in post-colonial Hong Kong is also believed to be enabling or strengthening those social mechanisms. The shifting political and economic conditions have weakened the basis for the social contract for risk management and make it vulnerable to new shocks, while enabling non-state, socially organized initiatives to emerge. Constraints on liberal politics that result in deterioration of public confidence may therefore offer explanations for the shift in the social basis for adaptation.

1. **Conclusions**

Private action for managing climate risks is a function of trust in public institutions when the level of trust is high. Sanya, a blessed city of Mainland China, provides a case for strengthening social contract for risk management. However, poor government performance reduces public confidence, prompting the people to seek alternatives and reinforcing the social conditioning of individual action through strengthening interdependencies and interpersonal norms. In Macao and Hong Kong, the social contracts have lost momentum, turning their people into alternative social mechanisms. The shift towards these mechanisms is accelerated by an emerging politics of public scepticism or distrust exacerbated by the untimely occurrence of a crisis or catastrophe.

Adaptation to climate change requires a transformation of existing systems and structures, which will involve a renegotiation of social contracts. But the success of contractual control is constrained by the political, economic and social contexts in which climate change impacts are manifest (O’Brien et al., 2009; Pelling, 2011; Adger et al., 2018). An important insight from this study is that, in political economies that struggle to navigate a culture of institutional distrust and the enormous consequences of climate change and non-climatic transformations, the propensity to assume personal responsibility for risk management is likely to be driven by the institutional fabric of smaller communities and informal networks more than those of formal public institutions. The unsettling processes of societal change and transformation shift the locus of the discourse through which individuals makes sense of adaptation and engage them with a different social group of reference, e.g., from the state to social networks. The discursive shift is influenced by government performance and the changing public expectations of government, contextualized by development trajectories, socio-political norms and institutional settings.

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