Getting Ready for Disaster: Exploring Gender Differentials in Disaster Preparedness in Brazil and Thailand

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Abstract

Disaster preparedness – measures taken to prepare for the impacts of disasters – is a key strategy to disaster risk reduction. Identifying factors underlying disaster preparedness thus is crucial in designing policy intervention to promote disaster readiness. Indeed, previous studies have shown that demographic and socioeconomic characteristics, such as age, education, ethnicity/race, marital status and homeownership, are associated with disaster preparedness given differential levels of risk perception. Accordingly, it is highly likely that gender also plays a key role in determining disaster preparedness. However, to date, it remains unclear how gender influences disaster preparedness since although women are more likely to be risk averse (and consequently are more willing to prepare for a disaster) than men, they are also more likely to have less access to preparedness enabling resources. To this end, this study aims to empirically explore gender differences in disaster preparedness based on the survey data for two emerging economies: Brazil (2015/16) and Thailand (2013). We further test whether the effect of disaster experience and individual education vary by gender. For Thailand, women generally have higher level of disaster preparedness than men, particularly women with higher level of education. For Brazil, whilst there is no gender difference in the likelihood of preparedness amongst those who have never experienced a disaster, amongst those with disaster experience, women are significantly more likely than men to prepare for a disaster. Our findings reflect the gendered-nature of vulnerability to natural disasters and how country-difference in gender role and relationship influence disaster preparedness.

Introduction

The idea of focusing on gender outcomes after a shock may be seem, at first, as a mislaid priority by part of the general public and the disaster preparedness academic and policy community. This is because it is usually assumed that natural disasters are

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exogenous events that do affect individuals in an equal manner. However, a new bunch of research has been challenging this assumption and demonstrating that disasters are extremely gendered events, in both of their impacts and the responses to them (Shah et al. 2013; Juran and Trivedi 2015). Therefore, authors argue that gender is a distributive system, being men and women differentially empowered before, during, and after disasters (Enarson and Scanlon 1999).

In this direction, it is argued that the achievement of Sustainable development is not possible without considering that disasters are somehow influenced by the political, economic and socio-cultural contexts, and, hence, mainstreaming gender into disaster risk reduction policies is key for policy making (Valdés 2009). The importance of women in building resilience to risk has been incorporated, for example, into the Sendai Framework for Disaster Risk Reduction 2015-2030 (United Nations 2015). However, men should also be part and considered in disaster response and preparedness, because, indeed, they are also impact by the loss of family, neighbors, assets, livelihoods and income and emotional trauma (Mishra 2009)

Recent empirical studies have investigated the hypothesis of gender differentials in disaster preparedness. Authors show that, before climate disasters, women are more prone to be responsible for the practical preparation of the household, informing family members, storing food and water, and protecting family belongings (Speis et al. 2019). Differently, men are more likely to engage with post-disaster efforts, for example, by interacting with government officials, prepare the outsides of buildings, make decisions regarding evacuation and timing, manage water resources, distribute emergency relief, and receive and disseminate early warnings to the community (Lane and McNaught 2009). In this sense, provided the existence of different roles for males and females in disaster preparedness, mitigation and response, studies predict that climate change is likely to have a significant effect on the gap among female-headed households and dual-parent or male-headed households (Flatø, Muttarak, and Pelser 2017).

Even though most studies predict a deterioration of gender equality outcomes during disasters, especially undermining the economic well-being of women, it is important to mention that some studies also acknowledge women's potential and capabilities to prepare, confront, and recover from disasters. Also, some scholars argue that gender-related disaster research must shift from a limited preoccupation with women

alone towards a more complex understanding of gendered relation, as, for instance. men and boys, like women and girls, may also be vulnerable to climate change (Mishra 2009).

Provided this background, the use of a gender sensitive framework in Disaster Risk Reduction policies has been increasingly encouraged. The importance of women in building resilience to risk has been incorporated, for example, into the Sendai Framework for Disaster Risk Reduction 2015-2030 (United Nations 2015). However, some authors argue that, provided the complex nature of individual risk perceptions, policy makers have to consider the sociocultural context in which the meanings of gender and risk are constructed (Morioka 2015), and for that more attempts are needed to fully address natural hazards from a gender perspective.

Given this gap in literature, this paper aims to test for gender differentials in the likelihood of flood preparedness for two development countries, Brazil (2015/2016), and Thailand (2013). Besides drawing on rich survey data, our approach is novel because it tests whether gender differentials in preparedness may be explained by heterogeneity between women and men in their education profiles and the past exposure to floods. We employ regression adjustment to control for observable confounders in the relationship between gender and preparedness.

We expect with this study to learn whether there are differential roles of women and men in emergency management planning, drawing from the case of Brazil and Thailand, and whether education and previous disaster experience may explain those differentials. If gender differentials are persistent, regardless of education levels and pre-exposure, then it should be recommended more research on gender roles in flood preparedness, including more in-depth qualitative or mixed methods research, in order to disentangle the factors that drive differentials in readiness by gender. Also, this research may shed light on strategies to empower women and men, by promote the genders working together harmoniously to better prepare and to also overcome gender stereotypes in disaster preparedness.

Previous studies

In the investigation of flood-disaster preparedness, literature has well established the role of education (Muttarak and Lutz 2014; Hoffmann and Muttarak 2017), risk behavior, perceived effectiveness of the protective action and opportunity costs (Guedes, Raad, and Vaz 2015).

Gender as a variable of inquiry in flood-disaster research does not differ from the other disciplines. As argued by some scholars, gender issues are not usually the primary social facts on the ground nor are these ever in play in isolation from other determinants of social process. On the other hand, gender is also never irrelevant and, therefore, should be examined and reflected in practice, for men and boys as much as women and girls (Mishra 2009).

Recent case studies have, indeed, proven the relevance of including the gender dimension in flood-disaster analysis. For instance, in Bangladesh, evidence shows that, because of cultural norms, women were prone to not leave their houses during floods. An even in the case that they did leave, they were not able to swim (Brody, Demetriades, and Esplen 2008). In Serbia, during a major 2014 flood event, women were found to be particularly affected as they were weakly represented in the flood-planning response and overall decision-making processes. Also, women argued that information did not reach them adequately, thus exposing gaps in risk communication (Cvetković et al. 2018). For Brazil, Guedes and colleagues have investigated how inhabitants from Governador Valadares prepare themselves towards risk in response to climate change (Guedes, Raad, and Vaz 2015; Araujo, Guedes, and Loschi 2019), but gender issues were not explored in detail. In the case of Thailand, it was found that, although a higher proportion of women in a community is negatively associated with disaster preparedness, the higher the proportion of highly educated women, the larger the odds of preparation (Muttarak and Pothisiri 2013). In a micro-level study, however, another study using Thailand data found no association between gender and disaster preparedness (Hoffmann and Muttarak 2017).

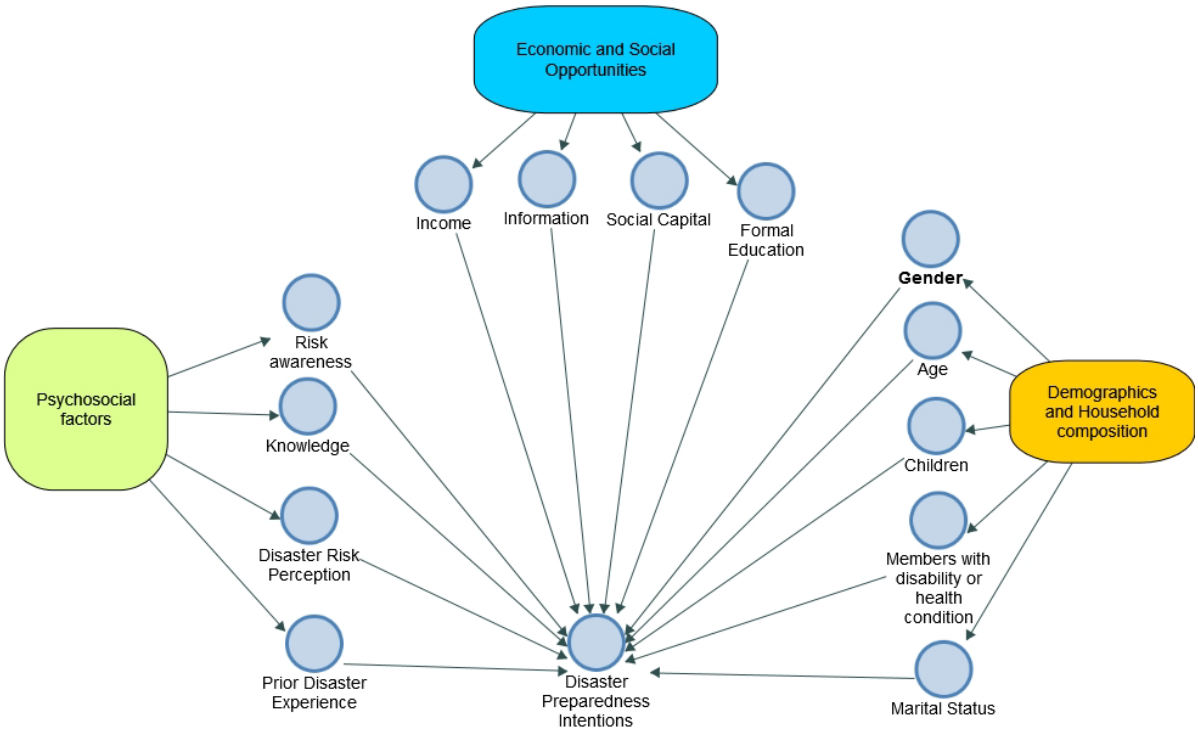
Although there are researchers already devoted to the issue of gender and floods, there is an increasing need for more gender-focused and comparative case studies research to contextualize gender discrepancies in more depth and at a local scale.

Determinants of disaster preparedness

Drawing on literature, we identify at three sets of factors that influence disaster preparedness: *psychosocial factors* (prior disaster experience, risk perception, knowledge and risk awareness); *economic and social opportunities* (education, income, access to information, social capital) and *demographics* (individual and household characteristics, such as age, gender, marital status, number of children and elderly in the household). Those factors influence disaster preparedness in terms of attitudes and behavior, as well

as by the adoption of protective measures. Figure 1 displays the main variables that determine flood-disaster preparedness. According to this, gender has been integrated into disaster preparedness as a demographic variable or personality trait and not as the basis for a complex and dynamic set of social relations.

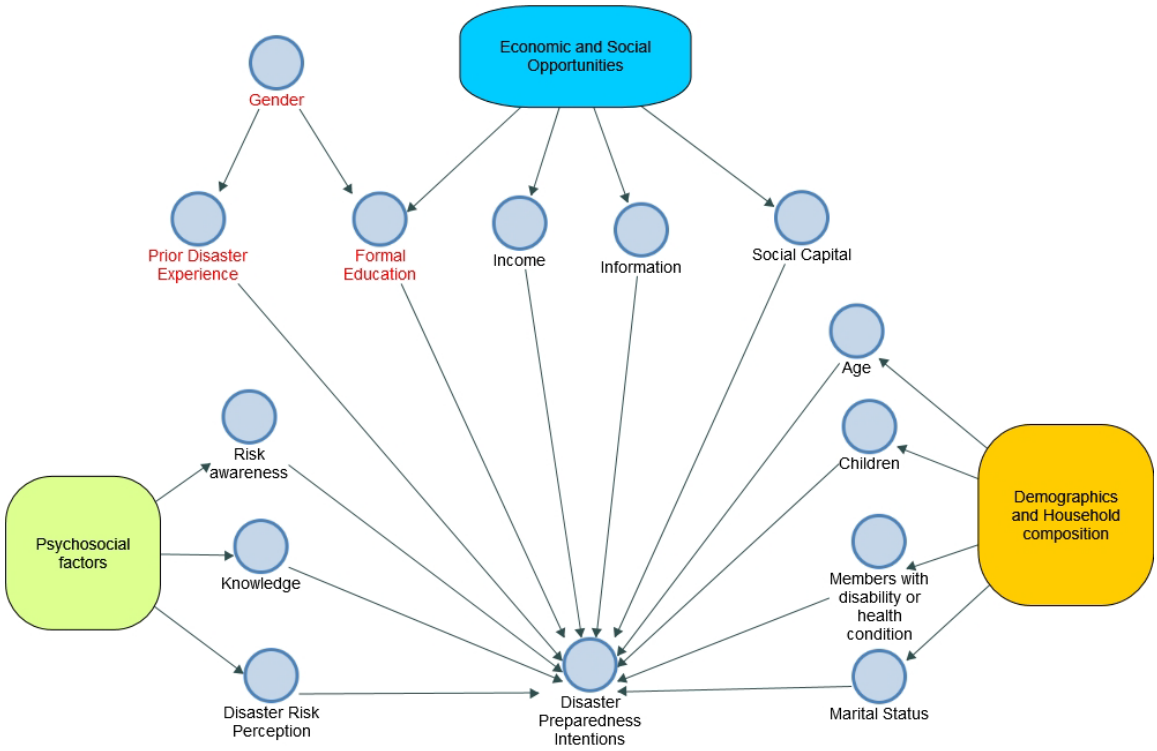
Figure 1: Traditional framework for the study of disaster preparedness intentions. Gender as a covariate.



Source: Authors elaboration based on literature and nodes from a NVivo structured literature review.

Our hypothesis is that there is an interaction between gender, education, and previous exposure to risks, so they have different impact on measures taken against risk beforehand. This modified conceptual framework is illustrated in Figure 2.

Figure 2: Proposed conceptual framework for the study of disaster preparedness intentions. Gender as a meaningful process.



Source: Authors elaboration based on literature and nodes from a NVivo structured literature review.

Research Sites

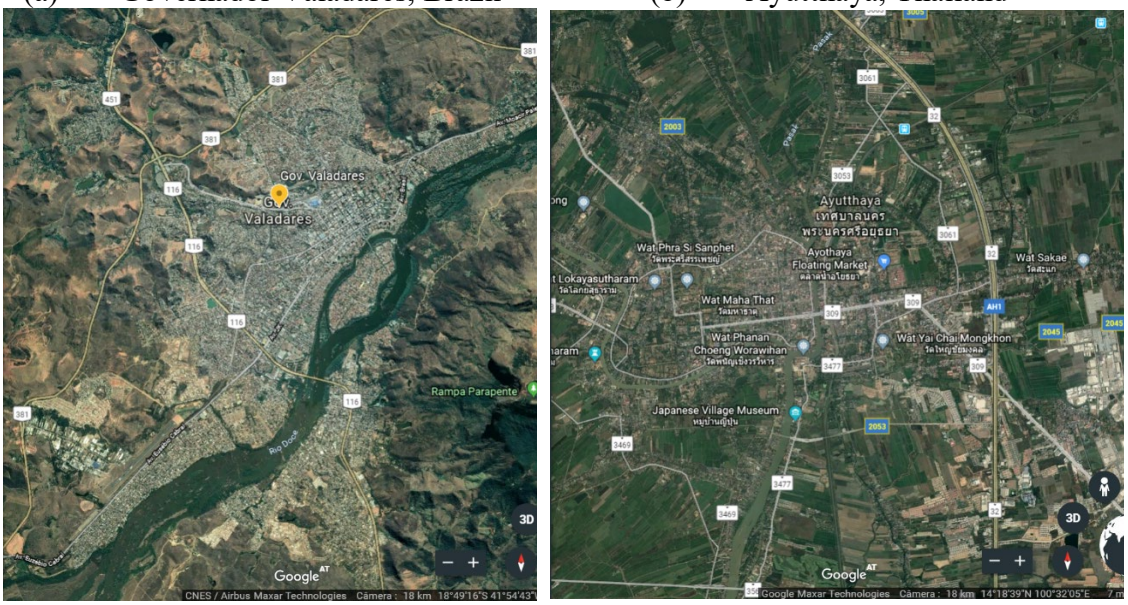
For Brazil, we draw on the study of Governador Valadares in the eastern region of Minas Gerais state (Figure 3a). The city is bathed by Doce River, and it is one of the largest urban cities in the region, with 263,689 inhabitants in 2010 and approximately 112 habitants per square kilometer, according to the last Demographic Census. Governador Valadares has an average altitude of 170 meters and is characterized by warm weather (annual average temperature of 24.5ºC). It is considered among the cities with high level of well-being. The Human Developing Index for Brazilian Municipalities (HDI-M) for the city is 0.727, being ranked 1107st among the 5,565 Brazilian municipalities[6]. However, Governador Valadares, as for the other Brazilian cities, is recognized by its social inequality: its Gini Index coefficient was 0.52 in 2010, being larger than those observed in Brazil in 2011 (0.483). Floods often occur in Governador Valadares in the rainy season – at least 13 percent of the respondents in the survey declared to be exposed to at least one flood episode in the city

[6] In this ranking, the highest HDI-M is 0.862 (São Caetano do Sul – State of São Paulo) and the lowest is 0.418 (Melgaço – State of Pará) (PNUD, FJP, and IPEA 2013).

In Thailand, data was collected for three sites. The city of Ayutthaya, in Thailand (Figure 3b), was destroyed by the Burmese in the 18th century and remains until nowadays characterized by the reliquary towers and gigantic monasteries. It is one of the World Heritage Sites according to UNESCO. In 2014, its population was 52,952 with 3,600 inhabitants per square kilometer, according to the last Demographic Census. As it is in the central plains of the country, the rainy season goes from June to October, with the temperature ranging between 24-34ºC. In 2011, flood episodes heavily affected the Ayutthaya Historic City World Heritage site. In partnership with the Asian Development Bank (ADB), UNESCO launched a flood risk mitigation plan for the city. The province of Phang Nga (Figure 3c) is located along the Indian Ocean coastline and was strongly affected by the 2004 Asian Tsunami, accounting for 78% of the death toll from the 2004 tsunami in the country. Finally, the province of Kalasin (Figure 3d) is in the northeast of the country and is particularly prone to drought but floods and windstorms are also not uncommon.

Figure 3: Satellite images for the research sites.

(a) Governador Valadares, Brazil (b) Ayutthaya, Thailand



(c) Phang Nga, Thailand (d) Kalasin, Thailand

Source: Google Earth. Accessed in 27 september 2019.

Data

For the Brazilian case study, survey data comes from a research project entitled Migration, Vulnerability, and Environmental Change in the Rio Doce Valley. The project was carried out in the urban area of Governador Valadares in 2014/2015 by Professor Gilvan Guedes and collaborators. The sample design employed a multi-stage clustered sampling by neighborhood, sex and age-groups, that resulted in 1,164 households (3,085

individuals). Only adults aged 18-78 were interviewed. The results are, thus, representative of the women and men aged 18-78 in the urban area of the city. It is important to establish that, for Brazilian data, the questionnaire provides a measure of the *likelihood of disaster preparedness*, and not the flood preparedness per se, as per data availability. It is possible from the survey to identify actual measures taken to reduce the damage caused by flooding by households that have been affected by them.

In the Thailand case, we draw on household survey representative data from May/August 2013. The survey design was conducted based on a stratified two-stage sampling design, being villages and housing blocks primary sampling units. In stage two, a random sample of 25 percent of districts in the selected provinces, 25 percent of villages in the selected districts and 25 percent of households in the selected villages was drawn for interview. Interviews were conducted face-to-face with one male or female member aged 15 or above from each household. The number of participants is 1,310 respondents. Several studies that employed this survey data from Thailand are already presented elsewhere (Muttarak and Pothisiri 2013; Basten, Muttarak, and Pothisiri 2014; Hoffmann and Muttarak 2017).

Variables

In this subsection we describe the variables included in our analysis. Besides having many similarities, there are some differences in Brazil and Thailand's questionnaires. We present in this subsection these differences. For Brazil, the questionnaire measures *the likelihood that the respondent will adopt measures that aim to reduce environmental risks from a flood*. If an individual responded that he/she was likely or very likely to adopt at least one measure, he/she received value one for a disaster-preparedness dummy, and zero otherwise. These variables were already tested and validated in other studies (Terpstra and Lindell 2013; Guedes, Raad, and Vaz 2015).

For Thailand, the questionnaire asks on the *actual adoption of strategies to prepare for a flood-disaster*. As for the Brazilian case, individuals that responded that they did at least one measure to prepare for a disaster received value one for a disaster-preparedness dummy, and zero otherwise. As for Brazil, this variable was already tested and validated elsewhere (Hoffmann and Muttarak 2017). The measures captured in the questionnaires of Brazil and Thailand are displayed in Box 1.

Box 1: Variables that describe actions to reduce environmental risks – Brazil and Thailand

Construct	**Brazil's Questionnaire**	**Thailand's Questionnaire**
EMERGENCY_KIT	Assemble an emergency kit (including food, water, radio, flashlight, etc.)	Prepare materials Prepare medical supply Prepare sufficient food Store water
INFORMATION	Search for or have information about the consequences of flooding (for example, time until the water arrives)	N/A
EMERGENCY_PLAN	Make a list of what to do if you must leave your house quickly because of the flood (emergency plan of the house).	Emergency plan Move to place of safety
SOCIAL_NETWORK	Combine with family, relatives, friends and neighbors on how to help each other in case you must leave your house quickly because of the flood.	Help each other to prepare for events
CONTAINERS	Have sandbags and other materials (barriers, wooden beams) to contain the water	Move productive assets to safer places
INSURANCE	Buying life/house insurance	N/A
HEALTH	N/A	Buy pesticide

Source: Authors' elaboration based on Brazil and Thailand's questionnaire.

The effect variable of interest is the gender of the respondent. Also, as per our research question, we want to understand the interactions between gender, education and previous flood experience. For this, we test for the statistical significance and magnitude of the interactions between gender and education level (measured by a dummy variable that indicates if the individual has secondary education or more) and prior disaster experience (measured by dummy variable that indicates if the household in which the individual lives was previously affected by floods).

In the regression models, and provided the conditional independence assumption for interpretation of causal effects, we might control in the analysis for confounders in the relationship between gender and disaster preparedness, which we grouped into the constructs defined by the literature review. Box 2 displays these variables.

Box 2: Control variables for the relationship between disaster preparedness and gender – Brazil and Thailand

Group	Brazil	Thailand
Demographics and Household Characteristics	NYEARSLHH number of years living in the same household WORKING = 1 if individual is currently working MARRIED = 1 if individual is married NUMINHH = number of individuals living in the household PCHHNUMUNDERSIX = percentage of household members under six years old PCHHNUM65ANDOVER = percentage of household members aged 65 years or more	GOODHEALTH = 1 if individual reports being in good health conditions NYEARSLHH number of years living in the same household WORKING = 1 if individual is currently working MARRIED = 1 if individual is married NUMINHH = number of individuals living in the household PCHHNUMUNDERSIX = percentage of household members under six years old PCHHNUM65ANDOVER = percentage of household members aged 65 years or more PCHHNUMSECONDARYUP = percentage of household members with secondary education or more
Socioeconomic status	OWNHOUSE = 1, if individual owns the housing	OWNHOUSE = 1, if individual owns the housing OWNLAND= 1, if individual owns the land
Flood exposure	NEAR_RIVER = continuous variable with the minimum linear distance from the household to the Doce River	NEARRIVER = 1, if individual lives near river NEARSEA = 1, if individual lives near the sea
Regional dummy	N/A	AYUTTHAYA = 1, if individual lives in Ayutthaya.

Source: Authors' elaboration based on Brazil and Thailand's questionnaire.

Model

For the estimation of the causal relationship between gender and disaster preparedness, as well as its interactions with education and prior disaster experience, we employ a quasi-experimental research design based on regression adjustment. Regression models are appropriate to compare regression models compare individuals from treatment and control conditions (in this case, same gender, education and disaster experience), and that have the same observed characteristics. In this framework, we assumes no selection bias on unobservables, conditional on observables (Angrist and Pischke 2014; Gertler et al. 2016).

Hence, we estimate standard logistic regression models for a disaster preparedness dummy. We estimate nested models including, first, our impact variables, one by one – gender, education, previous experience with disaster, and their interactions. Then we estimate the full model, that includes the controls reported on Box 2. For Thailand data, we report robust standard errors by the village level. For Brazil, estimation was carried out using complex survey design. We use Stata 16 for the statistical analysis.

Preliminary Results

Descriptive statistics for both samples show that there are more females in the sample in both countries: the proportion of female respondents was 0.54 (S.E. 0.044) in Brazil and 0.53 (S.E. 0.014) in Thailand. We report on Table 1 descriptive statistics on the control and impact variables by gender and country. It is possible to verify that the percentage of individuals with at least secondary education is greater from Brazil than for Thailand. However, per the disaster analysis, a larger percentage of individuals was affected by floods in Thailand when compared to Brazil. Other important patterns emerge in the descriptive analysis: the large percentage of both individual under six years old and of individuals aged 65 years or more in the household for Brazil.

Table 1: Descriptive statistics: means and standard deviations by country and gender

Variable	Brazil		Thailand	
	Women	Men	Women	Men
If the individual has at least Secondary education	0.61 (0.029)	0.64 (0.028)	0.35 (0.476)	0.38 (0.487)
If the individual was affected by disasters	0.12 (0.020)	0.15 (0.021)	0.69 (0.461)	0.66 (0.475)
Self-reported health = good	- -	- -	0.56 (0.496)	0.63 (0.483)
Length (years) living in household for respondent	13.05 (0.946)	12.33 (0.829)	26.87 (18.634)	23.34 (17.432)
If the individual is currently working	- -	- -	0.78 (0.414)	0.88 (0.328)
If the individual is married	0.49 (0.021)	0.53 (0.031)	0.70 (0.457)	0.81 (0.396)
Number of individuals in the household	3.28 (0.081)	3.29 (0.072)	4.00 (1.899)	3.66 (1.749)
Percentage of individuals under six years old in the household	14.19 (1.774)	11.18 (1.616)	3.48 (10.825)	2.22 (9.035)
Percentage of individuals aged 65 or more in the household	27.38 (3.261)	20.79 (2.660)	2.44 (11.749)	4.57 (17.267)

Variable	Brazil		Thailand	
	Women	Men	Women	Men
Percentage of individuals in the household with more than secondary education level	-	-	21.47	19.85
	-	-	(29.923)	(30.178)
If the individual owns the house	0.01	0.01	0.89	0.87
	(0.003)	(0.004)	(0.313)	(0.333)
If the individual owns the land	-	-	0.58	0.64
	-	-	(0.495)	(0.480)
If the household is located near the river (0-200m)	-	-	0.23	0.23
	-	-	(0.422)	(0.423)
If the household is located near the sea	-	-	0.08	0.10
	-	-	(0.273)	(0.301)
Ayutthaya	-	-	0.34	0.27
	-	-	(0.475)	(0.445)
Minimum linear distance to the river (meters)	1383.76	1388.41		
	(44.057)	(50.823)		

Obs.: Standard errors between parenthesis.
Source: Authors own elaboration based on Brazil and Thailand data.

As per our research questions, this study aims to empirically explore gender differences in disaster preparedness. We estimated several logistic regression models to test whether the effect of disaster experience and individual education vary by gender. Results are presented in Table 2 for Thailand and in Table 3 for Brazil. We report six specifications of the regression, starting from the naïve effect of gender on disaster preparedness (Model 1), and we include, one by one, interactions for education (dummy for at least secondary education level) and previous disaster experience. In the full model (Model 5), we include several control variables. Results are reported as odds-ratios (exponentiated coefficients).

For Thailand, women generally have higher level of disaster preparedness than men, particularly women with higher level of education (Table 2, Model 6, odds-ratio for the interaction between female and secondary education or more). For Brazil, whilst there is no gender difference in the likelihood of preparedness amongst those who have never experienced a disaster (Table 3, Model 6, odds-ratio for female), amongst those with disaster experience, women are significantly more likely than men to prepare for a disaster (Table 3, Model 6, odds-ratio for the interaction between female and a dummy for previous disaster experience).

Table 2: Results of the Logit Model for the Odds-Ratio of Disaster Preparedness for Thailand (2013)

	(1)	(2)	(3)	(4)	(5)	(6)
Female	1.271+	1.291+	0.951	0.938	0.993	1.011
	(0.166)	(0.175)	(0.185)	(0.180)	(0.227)	(0.200)
Secondary education or more		1.450*	0.949	1.072	1.078	1.004
		(0.213)	(0.207)	(0.243)	(0.239)	(0.195)
Female * Secondary education or more			2.179**	2.164**	2.139**	2.198**
			(0.608)	(0.594)	(0.578)	(0.532)
Affected by flood				2.145**	2.229*	1.694+
				(0.585)	(0.755)	(0.497)
Female*Affected by flood					0.931	1.016
					(0.239)	(0.236)
Controls						
Self-reported health = good						1.077
						(0.177)
Length (years) living in household for respondent						0.991
						(0.006)
If the individual is currently working						0.745
						(0.147)
If the individual is married						1.278
						(0.273)
Number of individuals in the household						0.959
						(0.046)
Percentage of individuals under six years old						0.999
						(0.006)
Percentage of individuals aged 65 or more						0.999
						(0.005)
Percentage of individuals with more than secondary education level						0.997
						(0.002)
If the individual owns the house						1.140
						(0.302)

If the individual owns the land						1.282
						(0.229)
If the household is located near the river						1.064
						(0.212)
If the household is located near the sea						6.634***
						(1.708)
Ayutthaya						1.614+
						(0.449)
N	1286	1286	1286	1286	1286	1197

Robust SE in parenthesis, clustered on neighborhood level.

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

Table 3: Results of the Logit Model for the Odds-Ratio of Disaster Preparedness for Brazil (2015/2016)

	(1)	(2)	(3)	(4)	(5)	(6)
Female	1.005	1.001	0.995	1.017	0.876	0.834
	(0.224)	(0.223)	(0.248)	(0.254)	(0.230)	(0.231)
Secondary education or more		0.846	0.841	0.862	0.850	0.862
		(0.122)	(0.177)	(0.182)	(0.179)	(0.187)
Female * Secondary education or more			1.010	0.999	1.021	1.092
			(0.300)	(0.301)	(0.313)	(0.355)
Affected by flood				1.788**	1.046	1.112
				(0.361)	(0.281)	(0.306)
Female*Affected by flood					3.249*	3.358*
					(1.769)	(1.980)
Controls						
If the individual is married						0.780+
						(0.115)
Number of individuals in the household						1.038
						(0.058)
If the individual owns the house						1.796
						(1.327)
Percentage of individuals under six years old						0.997
						(0.002)

	(1)	(2)	(3)	(4)	(5)	(6)
Percentage of individuals aged 65 or more						1.001
						(0.002)
Lenght (years) living in household for respondent						0.994
						(0.006)
Minimal distance to the Doce river (in meters)						1.000*
						(0.000)
N	1087	1087	1087	1081	1081	928

Exponentiated coefficients. Standard errors calculated using complex survey design.

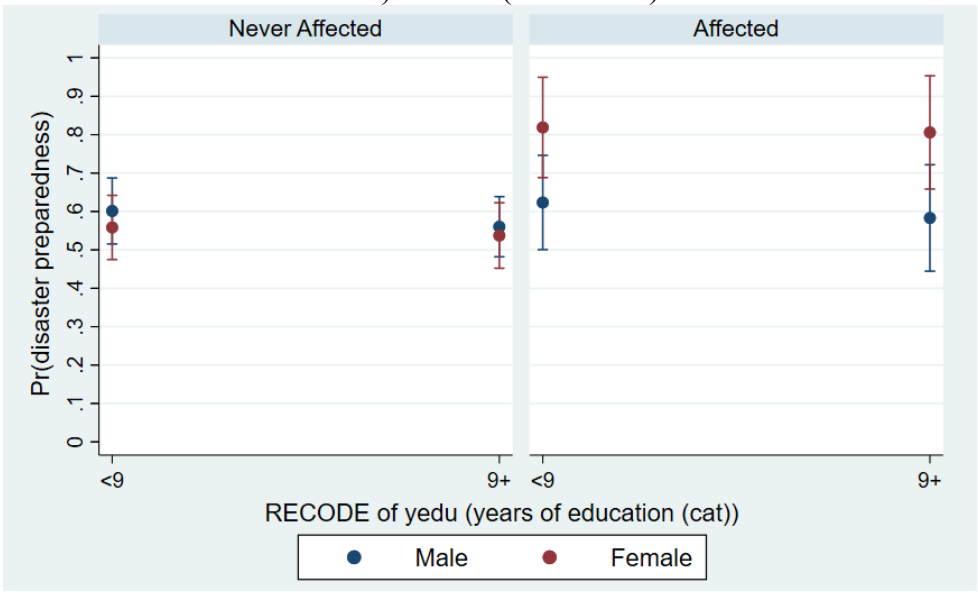
+ p<0.1, * p<0.05, ** p<0.01, *** p<0.001

We also report on Figure 4 marginal effects estimated after logit for the full model (controlling for observed characteristics) for the effect of gender on the probability of disaster preparedness according to previous experience (affected by floods or not affected by floods). For Brazil, as per the previous analysis, gender effects are found only for affected individuals, and, among this group, the females are more likely to adopt disaster preparedness measures, and the magnitude does not vary by education level. This result may be result of the lack of education training on disaster preparedness in traditional curricula, which reinforces the arguments for the role of education to reduce vulnerability (Lutz, Muttarak, and Striessnig 2014; Muttarak and Lutz 2014).

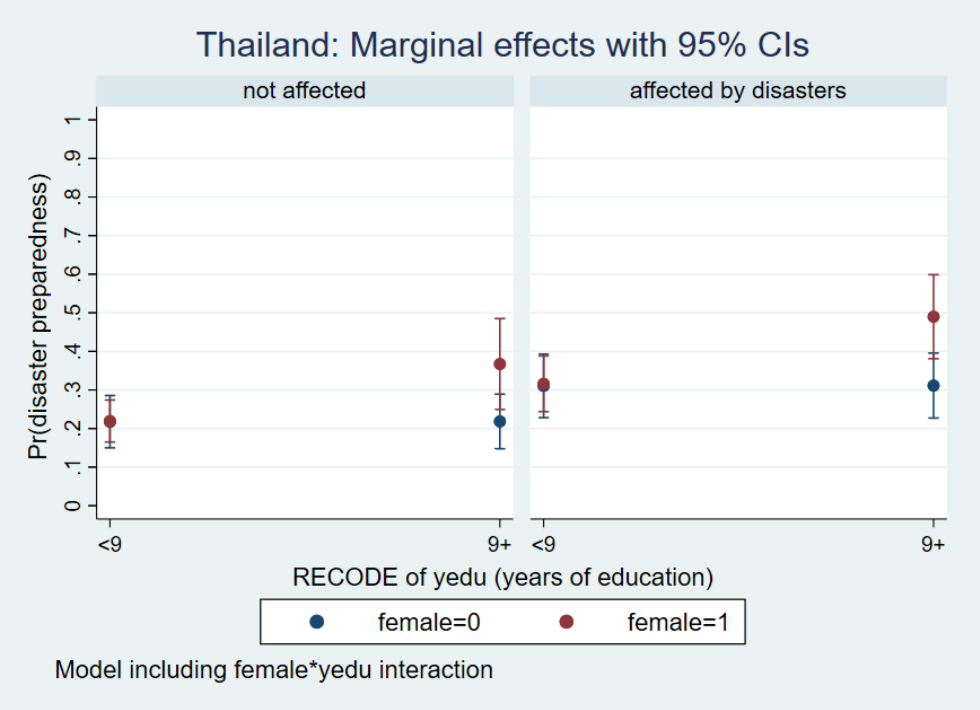
On the other hand, for Thailand, gender effects on disaster preparedness are found regardless of the previous disaster experience, but only for highly educated females. Although it is documented that curricula in Thailand does not include specific content on preparedness (Hoffmann and Muttarak 2017), there is evidence of articulation between government, NGOs, UNESCO and schools that might have affected the content knowledge available (Siripong 2010). Also, the magnitude of the probability of readiness is higher for those affected by floods, being consistent with findings of the relevance of previous experience in shaping preventive behavior (Cassar, Healy, and von Kessler 2017).

Figure 4: Marginal effects after the logit model for disaster preparedness dummy for Brazil (2015/2016) and Thailand (2013).

a) Brazil (2015/2016)



b) Thailand (2013)



Source: Authors own elaboration based on Brazil and Thailand's data.

Our findings suggest, therefore, the gendered-nature of vulnerability to natural disasters and how country-differences in gender role and relationship influence disaster preparedness, consistently with other results in the literature (Sultana 2010; Cvetković et al. 2018; Fothergill 1996).

Preliminary conclusions

This study aimed to contribute to current literature on the determinants of disaster preparedness by analyzing gender differentials in readiness to floods in two different research sites from the developing world: Brazil and Thailand. Drawing on rich datasets for both countries, and on regression adjustments to control for selection bias in the analysis, we found striking results on the relevance of gender analysis, which is in line with a policy claim to the use of a gender sensitive framework in Disaster Risk Reduction policies.

Our empirical evidence demonstrates that, for Thailand, women generally have higher level of disaster preparedness than men, particularly women with higher level of education. For Brazil, whilst there is no gender difference in the likelihood of preparedness amongst those who have never experienced a disaster, amongst those with disaster experience, women are significantly more likely than men to prepare for a disaster. Our findings, therefore, reflect the gendered-nature of vulnerability to natural disasters and how country-difference in gender role and relationship influence disaster preparedness.

Based in the results of the research, and if it is that there are different disaster prevention strategies according to the gender, then emergency management agencies and policy makers should account for these differences. In other words, policy makes must ensure that both women and men should combine complementary strengths to maximize preparedness to floods. In this sense, the strengthen of a gender-related dialogue that aims to leverage the respective strengths of women and men in the context of disaster research will be intended to progressively empower women to take leading roles in building disaster resilience.

As argued by specialists for Nepal and other countries, and if women are found to be amongst the vulnerable individuals, they should be included in the decision-making process in other to obtain better disaster response (Keating et al. 2016). On the other hand, women's local community knowledge, strong social networks, key roles in families, and active work roles would make them resourceful social actors in disaster preparedness. In other words, policy makes must ensure that both women and men should combine complementary strengths to maximize preparedness to floods.

We must acknowledge that, at the current stage, this research is not able to disentangle the decision-making process within households regarding preparedness. For example, there might exist heterogeneity between husbands' and wives' views on the person in a couple who should be responsible for preparing for floods. In this case, whether the varying levels of

agreement reached by husbands and wives regarding this responsibility are associated with actual preparedness behaviors in Brazil is an open research question.

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