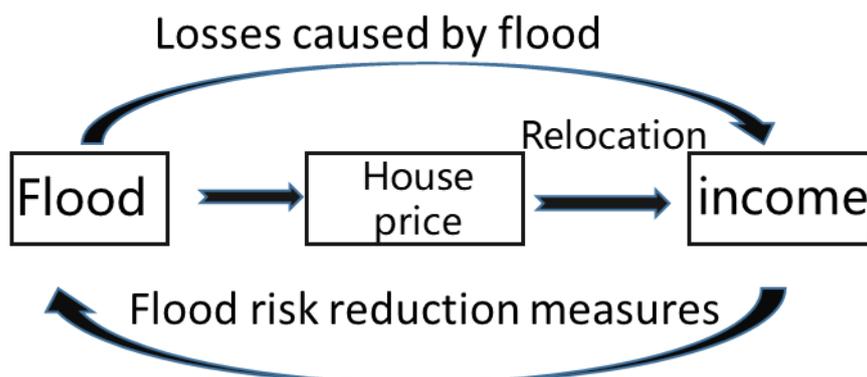


Dear 2 anonymous referees and the editor,

I would like to thank your valuable comments. I had posted my responses right after your comments. In order to make it easier to read, I put my revised responses in the following tables.

Here, I would like to explain in general how the topic of this paper and the major conclusion can be made. According to the literature, there are three kinds of effects between income and flood. Those three effects may make rich people live in low flooding risk areas. The first one which is income affected by flood is not the case. In my response to Referee #1's first comment, words written in italic type, the losses caused by floods are unlikely to affect residents' income even by an extreme typhoon, such as Typhoon Morakot. The second one is by relocation which makes the poor move to higher flood risk areas due to the lower real estate price. Our original manuscript used the income growth rate (see page 7 line 173-180) to explain that this is not the case. Therefore, in order to further avoid another way around effects, whether 2006 income affected flood probability during 2009 and 2010 was tested in this paper.



Three kinds of mechanisms that make rich people live in the low flood risk areas are considered in this study. The first one is that the democratic process sets the priority of flood reduction budget to more populated areas since there will be more votes. The second one was called cost-benefit analysis (CBA) in my response to referees. I may change that if CBA makes confusion. A method called hedonic price method evaluating the benefit of reducing flood risk by calculating the real estate price difference in various flooding probability areas. If this method was adopted, that may divert the flood reduction budget into the areas where high price buildings are located. This method can be further elaborated in the content. Therefore, the population and the house price of the community were adopted as confounding variables in the Propensity Score Matching, and that makes rich and non-rich communities become no significant difference in those two aspects. The third one was called rent-seeking become the most possible mechanism. If the areas where

richer people (10%) reside get priority and reduce the probability of being flooded, the benefit is the reduced expected losses. The most concerning issue of suggesting rent-seeking mechanism is that we don't have the flooding probability before 2006. The reason is that we have to get a large sample size to do this empirical study but the wide spread flooding events seldom happen and the affected regions were not the same except from 2009 Typhoon Morakot and 2010 Typhoon Fanapi. However, whether we have the flooding probability before 2006 may not be an issue as well. The Project was the first project funded by the central government to reduce the flood risk in rivers managed by local governments and before the Project started in 2006 all local governments in Southern Taiwan did not have enough flood reduction budget (see page 1 line 54-60). That is another reason why this study should be published. After this eight-years project started in 2006, a series of huge budget flood reduction plans kept conducted but the budget allocation is still mysterious. In order to avoid misunderstanding that this result had been proven as a long-term phenomenon, the topic of this paper can be changed to 'Are the Rich less Prone to Flooding during Typhoon Morakot and Typhoon Fanapi in the Southern Taiwan?'

Other issues had been proposed by reviewers including what type of construction in the project, the definition of flooding, the luxury dwellings during inundations in Taiwan, introducing hedonic price method on flood reduction benefit assessment, the motivation of rich people to reduce flood loss will be added, further explain or revise in the main content.

Sincerely yours,

The corresponding author

Anonymous Referee #2	Authors
<p>Like the previous reviewer, I don't understand the connection between the results obtained and the conclusions made by the authors. How can they be certain that lower flooding probability for high-income groups can be attributed to budget priorities for a flood risk reduction project that was launched in 2006? Like the previous reviewer mentioned, this conclusion could only be supported with additional analyses for floods that occurred before 2006.</p>	<p>It is intuitive that the motivation is the flood risk reduction in their residing areas when the local governments decided the priority and the allocation of public flood protections. However, <u>the advantage of high income people and their political power is difficult to prove because that works under the table. We can only prove that through the outcome. We used the lowest administrative entity (villages) during extreme typhoon cases to have the data</u></p>

<p>Furthermore, the relationship between income and political power/motivation/advantage has not been proven in this context.</p>	<p><u>on residents' income and large sample size. Since we need widespread flooding to do this empirical study, the non-extreme typhoon cases are not suitable. Extreme cases seldom happen.</u></p> <p>Currently, we did not have the flooding probability of villages before the project. However, this study did proof that those 2006 high income (10%) villages had less flooding probability than 2006 non-high income villages during 2009 and 2010 typhoons in Southern Taiwan. Therefore, <u>the topic of this paper can be changed to 'Are the Rich less Prone to Flooding during Typhoon Morakot and Typhoon Fanapi in the Southern Taiwan?'</u>. I may point out this research limitation at the end of this paper.</p>
<p>It is not clear at all from the text what type of construction work the flood risk reduction project entailed, and therefore how it may have differed in effectiveness between different income groups.</p>	<p>The budget was mainly for structural flood protection, such as levees, pumping stations, and detention ponds. Almost all rivers already had some sort of levees before the project. Due to the Project, the local governments decided the priority and the allocation of enhancing levees and building detention ponds. The decision process had been described in the manuscript. The content of the Project can be added to the manuscript.</p>
<p>The study is missing an investigation of the correlation between house price and income. I note that the propensity scoring matching exercise quantified house prices per ping; this approach will mask overall differences in house prices due to different house sizes. If significant correlation between the</p>	<p><u>In Taiwan, the flooding is mainly inundation which is caused by extreme rainfall and insufficient drainage rather than river flooding.</u> Even during extreme typhoons like Morakot and Fanapi, most of the casualty was not from flooding (mainly because of landslides). In Taiwan, seismic safety is</p>

<p>variables is found (which I suspect will be the case), this poses a significant issue: a. The authors mention in line 125 of page 4 that “the higher the average house price of a village, the less likely that it will be flooded”. So, perhaps higher income areas are less prone to flooding simply because of features directly related to their higher house prices (e.g., better quality construction) rather than any additional flood risk reduction measures implemented in 2006?</p>	<p>emphasized in the commercials of high price buildings rather than flood prevention because <u>the drainage is managed and regulated by the government.</u></p> <p>We put the house price in the model and the hypothesis of that is negative because the house price is usually adopted to measure the benefit of public flood protection measures called the hedonic price method. It is a mechanism of cost-benefit analysis which leads public flood protection to the areas where high price buildings are located. Since the risk reduction efforts toward more population and high real estate price areas are democratic and economic (cost-benefit analysis) mechanisms, respectively, rent-seeking is the most possible mechanism.</p>
<p>The assumptions of the methodology are not well explained. Flooding is represented as a binary variable, such that very different levels of inundation would be treated identically. This feature is not necessarily a problem, but the authors should address the simplified nature of this assumption and the fact that areas with higher probabilities of flooding are not necessarily those that will experience the most amount of flood damage. Furthermore, no definition of flooding is provided in the text – what is the minimum level of water depth treated as a flood, how is flood depth/extent measured in each village, is there any subjectivity in its</p>	<p>The data sources of flooding investigations of those two typhoons were stated in the manuscript. <u>The process of flooding investigation is that the flooding locations (point) were reported by residents and then the investigation team of each city/county went to check and plotted the flooding area. However, since each team had a different format of records, the flood depth was not recorded in some cities/counties (only areas). The minimum recorded flood depth is 20cm from the team that recorded flood depth. The recorded flood depth will be added to the manuscript. In line 107 of page 4, all villages in Pingtung county,</u></p>

<p>measurement? How many high- and low-income villages are captured in the analyses? What were the criteria for inclusion of a certain village in the analyses? The answers to these questions should be provided in the text, to understand the reliability of the underlying analyses.</p>	<p><u>Kaohsiung city, and Tainan city were adopted in this study. There is no criteria for the inclusion of villages.</u> The altitude (elevation) and slop were adopted to control the nature of villages.</p>
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