



# UNPACKING THE SECTORAL INCOME EFFECTS OF NATURAL DISASTERS: EVIDENCE FROM THE 2010-11 QUEENSLAND FLOODS

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**Mehmet Ulubasoglu and Muhammad Habibur Rahman**

Deakin University

Bushfire and Natural Hazards CRC

Corresponding author: [Mehmet.ulubasoglu@deakin.edu.au](mailto:Mehmet.ulubasoglu@deakin.edu.au)





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## ABSTRACT

The past few decades witnessed a rapid increase of researches that rigorously investigated the nexus between economic performances and natural disasters. However, the rise of the interest in studying this nexus is not surprising provided that natural disasters trigger severe destruction in capital stocks and incur disruption in income flows. As such, the focus of many the studies is on demonstrating disaster shock impacts on outcomes such as agricultural output, industrial output, labor productivity, energy demand, health, conflict, and economic growth, among others (Dell M. et al, 2014). This paper estimates the impact of the 2010-11 Queensland Floods on sectoral income level using the Australian Census Longitudinal Dataset (ACLD), which brings together a nationally representative 5% sample from the 2006 Census with records from the 2011 Census of Australia. In our empirical setting, we treat the 2010-11 Queensland floods as a natural experiment by treating the flood-affected group of individuals as the treatment group, while treating the rest of the Queenslanders remains as the control group. This approach enables us to compare the economic differences in before (2006 Census) and after (2011 Census) the event between the group of flood-affected individuals and their counterfactuals. Our estimates indicate that the 2010-11 Queensland floods incident has no bearing on overall gross state product (GSP), but it adversely affects individuals working in construction, and accommodation and food services. However, Queenslanders working in retail trade, transport, postal and warehousing, and rental, hiring and real estate services cashed in opportunities brought by this catastrophic event. In addition, we find that the 2010-11 Queensland floods hit the lower income-group the hardest in terms of their loss in annual income. Our findings have several policy implications in that government's budgetary allocations related to disaster risk reduction programs should vary across sectors and group of individuals in accordance with their potential disaster effects.



## INTRODUCTION

Natural disasters are natural in terms of their origination in physical environment, but their consequences on economic sphere are often obscure. According to the standard neoclassical growth theory, natural disasters destroy capital that leads to lower output. That is, natural disasters may cause a decline in gross domestic product (GDP) of a country. On the contrary, capital destruction may also allow the economy to replace the out-dated equipment and structures, which can shift the PPF outward boosting economic performance (Caballero and Hammour, 1994).

Empirical findings echo such double-edged theoretical arguments. For example, Cavallo et al. (2010), Cuaresma et al. (2008), Leiter, Oberhofer and Raschky (2009), Noy (2009), and Strobl (2012) indicated that natural disasters mark a downturn in the economy, while several scholars (e.g., Skidmore and Toya, 2002; Leiter, Oberhofer and Raschky, 2009; Loayza et al., 2012; and Fomby et al., 2013) document an upturn income effect of natural disasters. A few studies (e.g., Caselli and Malhotra, 2004; Albala-Bertrand, 1993; Cavallo et al., 2014) bring more ambiguities in this vein indicating that natural disasters have negligible or even no impact on countries' development trajectories.

One of the primary reasons of observing such contradictory findings is the application of different empirical strategies under different country settings for different time periods. Many studies take cross-country approaches using panel datasets, while several studies carry out country-specific analyses either using time series or survey datasets (see Felbermayr and Gröschl, 2014; Masters and Mcmillan, 2001; Loayza et al., 2012; Keefer, Neumayer and Barthel, 2011; Roger, 2007; Cuñado and Ferreira, 2011). In addition, some studies (see Kousky C., 2014) investigate all types of natural disasters in a single platform as if they are identical what they actually are not in term of their bearings on economic indicators. There are a few studies that investigated a single disaster type but allow multiple events over a given period (see Loayza et al., 2012). One caveat with this approach is that even a same set of disasters may vary in terms of their magnitude or intensity that tends to affect economic performance differentially (see Loayza N. V., et al., 2012). Above all, most of the extant studies suffer from having no counterfactuals, that is, what could happen with economic performance in the absence of such natural disasters.

The core objective of this paper is to extend this line of research by systematically investigating the impact of 2010-11 Queensland floods incident on sector-disaggregated economic outcomes using a Difference-in Differences (DID) technique at the individual level.

## METHODOLOGY

We use the Australian Census Longitudinal Dataset (ACLD), 2006 and 2011, which brings together a nationally representative 5% sample from the 2006 Census with records from the 2011 Census administered by the Australian Bureau of Statistics. This is a unique and extensive dataset to facilitate the sectoral impact of a devastating natural disaster in Australia. The availability of such rare data lays the ground of conducting a natural experiment to explore how Australian citizens are truly affected due to the 2010-11 Queensland floods.

In our DID setting, we treat the 2010-11 Queensland floods as a natural experiment by treating the flood-affected group of individuals as the treatment group, while treating the rest of the Queenslanders remains as the control group. This approach enables us to compare the economic differences in before (2006 Census) and after (2011 Census) the event between the group of flood-affected individuals and their counterfactuals (i.e., group of Queenslanders residing in flood un-affected areas). We ensure comparability conditions between our treatment and control groups by matching individuals in terms of their level of incomes, employment status in the same economic sector, while also controlling for their ages and education attainment levels. This strategy is novel in that it pins down the causal income effects of the QLD floods 2010-11 at individual level (see Figure 1 that depicts the estimation method).

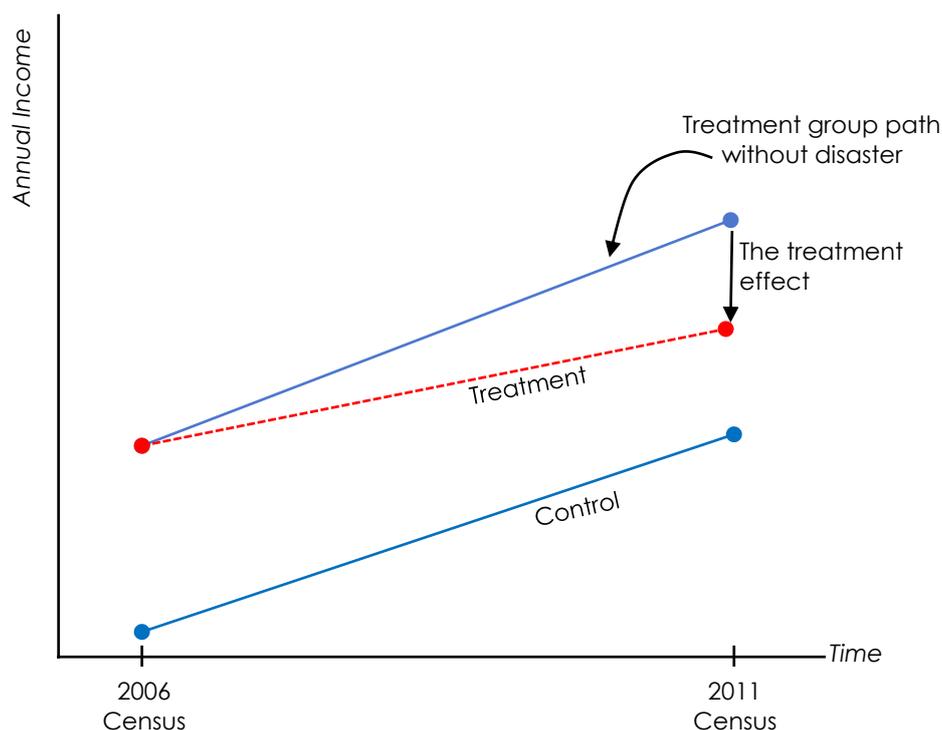


FIGURE 1 - DISASTER IMPACT ASSESSMENT METHOD

Besides our novel approach in estimating the causal impact of the 2010-11 Queensland floods, this paper extensively analyses several factors that might cause bias the findings. For example, floods may force some individuals to migrate from flood-ravaged areas to unaffected suburbs; This may contaminate our post-disaster control cohorts. To clear out such doubts, we empirically check whether individuals'



migration decision is a function of flood severity, and find no evidence for such hypothesis.

In this strand of research, no paper—to our knowledge—has hitherto estimated the spillover effects of natural disasters. To shed some lights on this, we split our control areas into two groups: the adjacent control areas that might have experienced some effects of the Queensland floods, and the distant control areas that are unlikely to expose any flood spillovers. We compare our treated cohorts first with the adjacent control cohorts and then with the distant control group. The difference is likely to uncover the spillover effect of such peril (if any).



## KEY RESULTS

Our findings indicate that the 2010-11 Queensland floods incident has no bearing on overall gross state product (GSP), which is consistent with the extant literature. When we disaggregate our sample by economic sector, we find that individuals working in construction, and accommodation and food services lost their annual income by around AUD 779 and AUD 1198 on average, respectively. However, Queenslanders working in retail trade, transport, postal and warehousing, and rental, hiring and real estate services cashed in opportunities brought by this catastrophic event. In particular, workers in the rental, hiring and real estate services became the most beneficiary group; they earned approximately AUD 2617 more than what they could have earned in the state of no disaster. Finally, we find that the 2010-11 Queensland floods hit the lower income-group the hardest in terms of their loss in annual income.



## CONCLUDING REMARKS

The findings of this paper have several policy implications. The policies that matter the most are those that bear directly on resource allocation—by both federal and state governments—across sectors and different individual groups. That is, policies related to sectoral development should not be generic in terms of addressing disaster risks. Disasters affect several economic sectors as well as different cohorts of population differentially; some experiences negative gains while a few even find positive gains. Hence, budgetary allocations related to disaster risk reduction programs should vary across sectors and group of individuals in accordance with their potential disaster impact.



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