Abstract of Thesis

Name (Prospere Dilou)	
Title	Natural Disasters and Economic Development （自然災害と経済発展）

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Overview

Natural disasters remain durable threats to economic development and are part of the existential threats to developing countries, specifically those with less coping capacities. Hurricanes, floods, droughts, and earthquakes are the most common and inflict substantial damage to households, firms, public infrastructures, and the agricultural sector. As corollaries of human activities to fulfill their needs, climate change is mainly responsible for accelerating and intensifying the magnitude of natural disasters. It is primarily associated with CO2 emissions and the tiny particles produced by incomplete burning particles commonly called "greenhouse gases" (GHGs) that come mainly from the most industrialized countries.

Efforts have been made to contain the problem since the first COP meeting in Berlin, Germany, in 1995 until the recent COP27 in 2022 and under the Paris Agreement in 2015. According to the United Nations, the Paris climate agreement intends to strengthen the global response for all by increasing the adaptation and ability to build resilience and reduce vulnerability to contribute to sustainable development and hold the average global warming below 2 ˚C on the one hand and to 1.5˚C. In addition, invest 100 billion per year in international climate finance.

While those objectives are noble, if the parties do not speed up the contention against climate change, it might wipe out shortly some developing countries as they bear the cost of natural disasters. For instance, according to the United Nations, the Caribbean region experienced

between 1979 to 2019 hurricanes that killed 11,152 people and caused between 594 million and 125 billion dollars in damages. About 130 thousand lives were taken in 2008 by a cyclone in Myanmar in addition to the physical destruction. This situation is asymmetrical to the poverty reduction of the Sustainable Development Goals (SDGs) of the United Nations and the reduction of hunger and food insecurity.

Meanwhile, climate-driven disasters frequently damage their economy; some developing countries must deal with earthquake risks that are also existential threats to them since the quality of their infrastructure does not usually meet the standards. Their unpredictability character makes them difficult to be contained. Although their occurrence is less than climate-driven disasters, the damages caused are generally vast and impossible to neglect. For example, in 2008, an earthquake of magnitude 9.1 on the Richter scale plus a tsunami killed about 226 thousand people in Indonesia, India, Sri Lanka, Thailand, and nine other countries. In 2010 an earthquake in Haiti destroyed about 30 thousand commercial buildings and deteriorated production capacities, not to mention 300 thousand deaths left behind, affecting thereby physical and human capital crucial for economic progress. However, at the same time, they are sources of creative destruction and natural selection (Ono et al., 2014), as lessons learned can help shape the future better.

To be able to do so, studies on natural disasters are essential to help understand their impacts mechanism and the best way to alleviate their effects on human and physical capital. The rest of the dissertation is organized as follows: Chapter 2 studies the impact of climate change and poverty reduction for movers to urban areas in Indonesia, Chapter 3 analyzes the role of remittances on poverty alleviation after an earthquake in 2010 in Haiti, Chapter 4 scrutinize the food insecurity behaviors of households under the climate change in Haiti.

Summary of the chapters

The second chapter, *Does climate change decelerate poverty reduction in urban areas? Evidence from Indonesia* empirically analyzes the effects of climatic risks on the probability of escaping from poverty. Using the five waves of longitudinal data from Indonesia Family and Life Surveys with a two-way fixed-effects panel regression model, I find significant negative correlations between extreme rainfalls, high flood risks, and the probability of being non-poor. They significantly reduced the chance of upward mobility for households moving to urban areas. The effects are worse for the large Metro area, although they offer better access to economic opportunities. The findings underscore the need to enhance resilience among the urban poor, especially those in large and risky urban areas.

The third chapter, *The role of remittance in poverty alleviation after a natural disaster: Evidence from the 2010 earthquake in Haiti*, empirically analyzes the remittance responses to the earthquake damages that struck Haiti in 2010 and appraises how remittance contributes to reducing poverty after the quake. I adopt a difference-in-differences (DID) approach using two repeated cross-section household surveys— "enquete sur les conditions de vie en Haiti (ECVH)[1]" and "enquete sur les conditions de vies des menages en Haiti (ECVMAS)[2]" carried out in 2001 and 2012 respectively. After dividing the sample into areas with and without the metro areas, I found that international remittances significantly increased by 21.7% after the earthquake for the sample with metropolitan areas and 10.5% for the restricted ones. I did not observe any spatial pattern of remittance as a function of the spatial distribution of the earthquake intensity. Also, the contribution of remittance to poverty reduction after the earthquake was marginal.

The fourth chapter, *Rural Households and their food insecurity behavior responses to climate change: Evidence from Haiti* sheds light on the effects of climate change on the food insecurity behaviors of households using data from Haiti—households survey data, climate data, and

[1] Haiti living condition surveys
[2] Haiti living conditions of household's surveys

agricultural production data. I estimated zero-inflated negative binomial regression models with logit inflation that fits the climate shocks proxy variable, namely the SPEI and its lag on the household's behaviors measured by the components of the standard food insecurity indicators developed by FAO, the so-called reduced Coping Strategy Index (rCS). The behaviors are identified for seven days before the survey day. I find that the climate shocks increase the number of days out of 7 that the households had food insecurity behaviors by less than one day. However, the lag of the climate shock rises to more than one day the household food insecurity behaviors. That confirms the hypothesis that the effects of the lag of the shock affect the households more strongly, given that in rural Haiti, households use agricultural production mainly to smooth the food consumption of households over one year, the harvest year, and the year after. Besides, the effects are heterogenous and higher for the poorest regarding the interaction between the household wealth quartile and the climate shocks. Agricultural production approximated by the Normalized Difference Vegetation Index (NDVI) is identified as the primary mechanism through which climate change affects households. Its improvement decreases the number of days the household had food insecurity behavior by about three days.

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論文審査の結果の要旨及び担当者

氏　名　（ Dilou Prospere ）		
	（職）	氏　名
論文審査担当者	主 査　教授	大槻 恒裕
	副 査　准教授	石瀬 寛和
	副 査　准教授	鎌田 拓馬
	副 査　教授	小原 美紀

論文審査の結果の要旨

自然災害、とりわけ洪水、干ばつ、台風のような気候変動から起こる災害や地震のような大規模災害は、インフラや生産環境を破壊するため、貧困な国の経済発展にとって重大な脅威である。本論文は、序章と終章を含む5つの章から構成され、開発途上国における自然災害と貧困の関係について実証的解明を行うものである。

第2章「Does climate change decelerate poverty reduction in urban areas?」は、インドネシアにおける気候リスクが居住者の移動による都市部の貧困の回避に与える影響を実証的に検証したものである。5回のIndonesia Family and Life Surveysからロンジチューディナルデータを構成しパネル分析を行い、貧困回避確率が災害級の大雨や洪水のリスクと有意に負の相関関係にあることが示された。さらに、その負の相関関係は、大都市など、大きな都市ほど大きくなることが示された。これらの結果から、大都市の貧困層の対災害回復力を高める政策が必要であることを示唆している。

第3章「The role of remittance in poverty alleviation after a natural disaster: Evidence from the 2010 earthquake in Haiti」はハイチにおける2010年に発生した大地震後の送金行動の変化と送金による貧困削減効果について実証的に検証したものである。2001年と2012年にハイチ全域で実施されたLiving Condition Surveysを用いて差の差（Difference-in-Differences）の分析を行い、被害を受けなかった地域に比べ被害を受けた地域では平均21.7%の送金の有意な増加があったことが示された。ただし、最も被害の大きかった大都市部のサンプルを除くとこれら地域の差は有意でなくなることも示された。さらに、送金の貧困削減効果に対する影響の分析では、有意な効果が示されなかった。

第4章「Rural Households, and their food insecurity behavior responses to climate change: Evidence from Haiti」は、ハイチにおいて気候変動が家計のfood insecurityに与える影響を実証的に検証するものである。本研究では、ハイチのHousehold Survey of Climate , and agricultural productionデータを用い、zero-inflated negative binomial modelにより分析を行い、気候ショックは1週間のうち1日以下の家計のfood insecurityを増加させたことが示された。一方で、農業生産は気候ショックを最も受けやすいことも示された。

本論文の主要な貢献として、先行研究では人口移動は主に農村部から都市部に起こるものと想定されていたのに対し気候変動による災害を考慮するとその逆の人口移動が起こることを示したこと、また、先行研究で大規模自然災害後の貧困悪化を回避するのに送金が有効と考えられてきたのに対し地震の場合は送金の効果は限定的であることを示したこと、さらに、food securityの分析が集計データで行われるのに対し家計データを用いて分析を行ったことなどが挙げられる。このように、様々な自然災害が個人や社会の貧困に及ぼす影響を体系的に分析する論文として、先行研究を発展させるものと思われる。よって、審査委員会は一致して本博士論文は博士（国際公共政策）の学位を授与するに値すると認定した。