



The impact of earthquakes on demographic changes in Italy. A comparison between L'Aquila and the Emilia Romagna's cases

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Abstract. This paper analyses the environmentally-induced migration and displacement resulting from two earthquakes: Abruzzo (2009) and Emilia Romagna (2012). After a general critical overview of the social science literature on this topic, the main changes in the two migration systems are analysed looking at the different roots and trajectories of the forced human displacement that followed the two earthquakes. Additionally, we look at the long-run effects of earthquakes on population density growth across Italian municipalities affected by earthquakes during the period of 2002–2017.

Moving from the fact that similar events may occurring in different contexts, may have different outcomes according to the specific vulnerability experienced by the territory, we assess the pre-disaster context and recovery period with the aim to offer a comparative analysis of the challenges related to post earthquake demographic movements and post-disaster resettlement.

The goal of our paper is twofold: first, we aim to understand how the two migration systems have been influenced by the pre-existent vulnerabilities and pre-quake social and institutional backgrounds before and after the hazard. Second, we investigate the long-run effects of earthquakes on population density growth in Italy applying spatial regression models. In the analyses we will take into account the main economic trends in the earthquake's area. Relying on ISTAT data on the internal migration in Italy, we finally offer a general model of how environmental disaster might affect displacement and suggest the main challenges related to the post-disaster governance.

Keywords: Environmental Disaster, Migration, Displacement, Population density, Spatial analysis

1 Introduction

The primary focus in migration research has traditionally been labor migration. However, the relevance of

environmentally-induced migration and displacement, including those resulting from disasters and natural hazards, have increasingly drawn attention from academia and policy makers [1]. The reasons behind this increasing attention are included and not limited to the growing ‘environmentalization’ that has characterized both social science and the public debate in the past three decades, a period marked by a huge number of environmental global disasters that can be narrow down in three main fields:

- natural disasters (such as the 2004 South-east Asian tsunami, the 2009 L’Aquila earthquake, the 2012 Hurricane Sandy in the United States);
- human induced disasters (such as the 1986 Chernobyl nuclear disaster in the former USSR and the 1984 Bhopal disaster in India);
- and mixed disasters (such as the 2005 Hurricane Katrina that resulted in flooding when the levee collapsed in New Orleans).

Events like these have entailed a wide range of social, economic and demographic consequences, especially as concerns the rising phenomenon of the Environmentally-Induced Displacement, namely, the rapid, unforeseen option of last resort for those affected by an environmental hazard.

Over the last decade, at least ten key disasters had a significant long-term impact on the dynamics of long-lasting displacement. According to the estimates of international organizations, more than 1,7 million people were forced to displace following the Asiatic tsunami of December 2004. In August 2005, as a result of the Hurricane “Katrina” over the Gulf of Mexico, over 300,000 people were resettled, while the disaster caused losses estimated at over 86 billion dollars. In February 2010 more than 1,5 million people have been displaced in the aftermath of destructive 8.8 magnitude earthquake in Chile. 2011’s earthquake in Haiti has deprived more than 1 million residents of homes. Furthermore, Japan’s March 2011 earthquake, with its 9 magnitude and accompanying tsunami wave, had a significant impact on the dynamics of internal migration for Japanese nationals. According to the United Nations, a total of 590,000 were evacuated or displaced as a result of the quake and tsunami disaster, including more than 100,000 children [2].

In the last decade, geographical research into the causation of the disaster-related displacement, began to involve multi-scalar analysis with an emphasis on interaction across multiple spatial-temporal scales. This particular approach called for a rethinking of disasters from a political economic perspective, based on the high correlation between disaster predisposition, low local income and under-development, and leads to the conclusion that the root causes of disasters lay more in society than in nature.

In this theoretical approach the concept of “vulnerability” is crucial because it allows to go in the depth in the understanding of disasters, recognizing that disasters are not caused by a single agent but by the complex interaction of both environmental and social features and forces.

Although part of the research has been focused mainly on disaster and displacement, it is important to keep in mind that disasters do not affect all individuals, households and communities equally, and environmental hazard is not faced in the same way everywhere and by everyone [3]. Events that are rooted in nature such as earthquakes or tsunami, if they are of identical intensity, can produce diverse outcomes according to the characteristics of the communities and of the territory where they take place.

Differently from the wide literature that analyzes the role played by environmental disasters in shaping population movements in under-developed countries, this paper analyses the environmentally-induced migration and displacement resulting from two earthquakes occurred in the context of a developed country: more specifically, in the Italian regions of Abruzzo (2009) and Emilia Romagna (2012). The analysis will be lead at municipalities’ level. After a general critical overview of the social science literature on this topic, the main changes in the two migration systems are analysed looking at the different roots and trajectories of the forced human displacement that followed the two earthquakes. Additionally, we look at the long-run effects of earthquakes on population density growth across Italian municipalities affected by earthquakes during the period of 2002–2017.

Moving from the fact that similar events may occurring in different contexts, may have different outcomes according to the specific vulnerability experienced by the territory, we assess the pre-disaster context and recovery period with the aim to offer a comparative analysis of the challenges related to post earthquake demographic movements and post-disaster resettlement.

The goal of our paper is twofold: first, we aim to understand how the two migration systems have been influenced by the pre-existent vulnerabilities and pre-quake social and institutional backgrounds before and after the hazard. Second, we investigate the long-run effects of earthquakes on population density growth in Italy applying spatial regression models. In the analyses we will take into account the main

economic trends in the earthquake's area. Relying on ISTAT data on the internal migration in Italy, we finally offer a general model of how environmental disaster might affect displacement and suggest the main challenges related to the post-disaster governance. It reviews the main socio-demographic and economic tendencies, with the aim to understand how the natural disaster shaped them and their impact on population growth and density.

2 Data and methods

We use Istat data referred to all the Municipalities which were hit by the earthquakes in Abruzzo and Emilia Romagna, respectively in 2009 and 2012. These municipalities are 57 in Abruzzo and 54 in Emilia Romagna. The L'Aquila earthquake of April 6 2009 killed 309 people. The earthquake of May 2012 hit an extensive area of Emilia Romagna.

For the demographic indicators we use data of Population registers for the period 2002-2017. For every year, we consider population at 1.1.t and some structure indicators, such as the proportion of 65 old people. Furthermore, we consider the population evolution in each municipality: natural increase and international and internal net migration, by distinguishing between Italians and foreigners' migration. We include also Istat data about the economic conditions.

A descriptive analysis is conducted to observe and describe the trends of demographic dynamics, in particular migration, in the territories which experienced the earthquake.

At a later stage, we exploit a spatial model based on the formulation proposed by Wang [4]. Through this model we aim to investigate about the effects of earthquakes on population density growth in these territories, by looking at the difference between the periods before and after the earthquake. The application of a spatial model permits to take into account the influence that space can have on some not observable variables which influence demographic events. Demographic and economic variables are inserted in the model as other factors which can affect population distribution beyond a natural disaster as the earthquake. Indeed, we hypothesis that demographic, social, economic factors are interrelated with change in population distribution before and after the earthquake. Population structure affect demographic and social trends. Also pre-existing in-flow and out-flow towards specific territories can shape migration movements also after the earthquakes. Regarding migration, we expect also that internal migration of Italians and foreigners follow different trajectories and evolution, connected also with reconstruction.

3 Preliminary results

Italy is one of the most earthquake-prone countries in the world. The L'Aquila earthquake destroyed a large part of the built environment, as well as essential infrastructure networks. The earthquake and the relief and recovery operations have changed the territories. In this area, the earthquake exhausted populations which were already experiencing demographic and economic challenges [6]. The Emilia Romagna earthquake hit a densely and wealthy populated area. These municipalities represented one of the most productive areas in Italy, contributing in a significant way to regional and national economy.

The L'Aquila earthquake has changed the demographic distribution across the territories which were hit by damages and losses, but these changes are complex and multifaceted. After the L'Aquila earthquake, no massive movements occurred across the municipalities. Part of L'Aquila population was resettled in other crater' municipalities, which indeed recorded a positive net migration (both internal and international) in the period after the earthquake. However, as outlined by Petrei & Petrei [5], people may have chosen to keep their administrative residence in L'Aquila even if they moved to another municipality, in order to receive benefits connected with the recovery measures prepared by the Italian government. Indeed, aids are allocated to the people on the basis of their administrative residence. The recovery period is characterized by a strong increase of out-flows from the analyzed municipalities to municipality of other provinces, within the Abruzzo region and outside the Abruzzo region. In the period after the disaster, a slight increase of in-flows in some municipalities occurred.

After the earthquake in Emilia Romagna, movements from hit municipalities toward Lombardy and

Veneto regions increase. Movements from municipalities located in Modena province towards municipalities located in other provinces (outside and inside Emilia Romagna region) decrease. The earthquake has partially affected the population of these municipalities determining few changes and challenges connected with change in population distribution.

The analysis conducted at municipality level show different evolutions according both to the population dimensions and the impact of the earthquake. The spatial analysis at this level permits to summarize different evolutions and aspects of these changes, pointing out homogenous territorial areas, by controlling for the spatial autocorrelation effect.

Preliminary results outlined that similar events may have different consequences across various spatial context. Pre-existing characteristics of the context can affect the consequences of a natural disaster such as an earthquake. Indeed, demographic and economic vulnerability of a territorial context may contribute to shape different trajectories of displacement following natural disaster.

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