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Natural disasters, growth and institutions: A tale of two earthquakes

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ABSTRACT

We examine the impact of natural disasters on GDP per capita by applying the synthetic control approach and using a within-country perspective. Our analysis encompasses two large-scale earthquakes that occurred in two different Italian regions in 1976 and 1980. We show that the short-term effects are negligible in both regions, though they become negative if we simulate the GDP that would have been observed in absence of financial aid. In the long-term, our findings indicate a positive effect in one case and a negative effect in the other, largely reflecting divergent patterns of the TFP. Consistent with these findings, we offer further evidence suggesting that a quake and related financial aid might either increase technical efficiency via a disruptive creation mechanism or reduce it by stimulating corruption, distorting the markets and deteriorating social capital. Finally, we show that the bad outcome is more likely to occur in regions with lower pre-quake institutional quality. As a result, our evidence suggests that unanticipated local shocks are likely to change long run growth rates, exacerbating territorial disparities.

1. Introduction

Large-scale natural disasters regularly affect societies in all corners of the globe. The immediate consequences, thanks to massive media coverage, are clear to all: deaths, displacement of people, damage to physical capital and infrastructure. As time passes, attention diminishes and long-term consequences become less clear. However, understanding a disaster's impact on later economic growth and how local institutions and economic actors react is crucial to better assess the costs of a disaster and design financial aid programs. At the same time, a disaster represents a natural experiment that allows testing whether unanticipated shocks have long-lived effects, eventually moving the affected local economy towards a different long-run equilibrium.

The available literature regarding the economic impact of natural disasters is still scant and inconclusive. Some studies report negative effects on economic growth, while others indicate no, or even positive, effects.[1] Moreover, many existing studies have a number of limitations that make their conclusions less than convincing. First, and most important, the effects of natural disasters are typically geographically concentrated while most of the existing studies adopt a cross-country approach. This does not allow capturing the local nature of the economic effects and may translate, by construction, into an attenuation bias. Moreover, cross-country evidence is based on natural disasters that differ substantially in terms of type (from climatic to geological) and magnitude and that occur across countries exhibiting very different levels of economic development. Data are often not equally comparable across countries, adding further bias to estimates. Second, the GDP dynamics follow-

[1] The first attempt to empirically assess the economic effects of natural disasters was by Albala-Bertrand (1993) who used a before–after statistical analysis and found positive effects on the GDP. Similar results have been found using a wider temporal perspective and a larger panel by Skidmore and Toya (2002). Loayza et al. (2009) and Noy (2009) argue that heterogeneous effects, either positive or negative, are observable depending on the type of disaster and the level of socio-economic development of the country. Finally, Cavallo et al. (2013) critically review previous empirical strategies and, by adopting the synthetic control approach, find that disasters do not significantly affect economic growth. See also Cavallo and Noy (2011) for a review of the literature.

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ing a quake can be largely affected by the amount of post-quake financial aid, a variable that has been rarely taken into account in existing studies. Third, there are also econometric concerns regarding the difficulty of constructing appropriate counterfactuals. Indeed, rather than simply relying on a before–after analysis, one should compare the path of the GDP with that which would have been observed in the absence of the natural disaster (Cavallo et al., 2013).

Even less is known about *why* we observe heterogeneous long-term effects of natural disasters. Indeed, in the aftermath of a quake, the local economy typically receives a second large shock – a storm of public transfers – that plays a crucial role in the recovery period because it positively affects the GDP in the short run. However, the long run effects are uncertain and depend on the quality of the outlay. For example, the construction of better infrastructures to replace those that are old and damaged might increase the potential output of the economy. On the other hand, if public resources are misallocated and diverted due to rent-seeking behaviors, this may distort the markets and corrupt the economy and, ultimately, reduce the potential output. This clearly points to the mediating role of local institutions in shaping the final outcome.

In this paper we examine the economic impact of natural disasters by using, unlike the previous literature, a within-country perspective and a richer dataset. We investigate the consequences of two almost contemporaneous earthquakes that occurred in Italy: "Friuli" quake in 1976 and "Irpinia" quake in 1980. We compare the observed GDP per capita after the quake (which is an exogenous and largely unanticipated shock by definition) in each area with that which would have been observed in the absence of the natural disaster. We carry out this comparative analysis using a rigorous counterfactual approach, the synthetic control method, proposed by Abadie and Gardeazabal (2003) and Abadie et al. (2010).

According to our findings there are no significant effects of the quake in the short term. However, this result can be largely attributed to the role of financial aid in the aftermath of the disaster. Using different assumptions regarding the magnitude of the fiscal multiplier, we estimate that the yearly GDP per capita growth rate in the five years after the quake, in the absence of financial aid, would have been approximately 0.5–0.9% points lower in Friuli and between 1.3 and 2.2 points lower in Irpinia. In the long term, we find two opposite results: the quakes yielded a positive effect in Friuli and a negative one in Irpinia. In the former, 20 years after the quake, the GDP per capita growth was 23% higher than in the synthetic control, while in the latter, the GDP per capita experienced a 12% drop. After showing that in both cases, the dynamics of the GDP per capita largely mirrors that of the TFP, we provide evidence that the institutional quality shapes these patterns. In the bad-outcome case (Irpinia), in the years after the quake fraudulent behaviors flourished, the fraction of politicians involved in scandals increased, and the civic capital deteriorated. Almost entirely opposite effects were observed in Friuli. Since in Irpinia the pre-quake institutional quality was 'low' (with respect to the national average) while in Friuli it was 'high', we argue that the pre-existing local economic and social *milieu* is likely to play a crucial role in the sign of the economic effect of a natural disaster. Consequently, our results also suggest that disasters may exacerbate differences in economic and social development.

This paper is related to three strands of literature. The first is the literature on the economic consequences of natural disasters, with respect to which it adds in several ways. Our empirical strategy is similar to that of Cavallo et al. (2013), who used the synthetic control approach with cross-country data. They found that even large disasters do not significantly affect the economy unless they are followed by radical political revolutions (as Iran 1979 and Nicaragua 1979). However, we believe that both our data and the adoption of a within-country perspective have some advantages over the work of Cavallo et al. (2013).[2] First, we can correctly define the geographical area affected by the quake. For instance, the impact of the Friuli quake – which Cavallo et al. (2013) define as a severe disaster – is significant at the local level (resulting death toll and homelessness accounted for approximately 18% of the regional population) and negligible at the country level (0.4% of the national population). Second, the within-country perspective mitigates the role of unobserved confounders that might affect the outcome dynamics between the treated and control units and which cannot be credibly controlled in a cross-country approach. Moreover, the (Italian) regions are much more comparable to each other than different countries (which have different institutional regimes and may be in various stages of development) are. This increases the similarity among the treated regions and the set of donors and, therefore, the reliability of the construction of the synthetic control. Third, we use data that are much more susceptible to comparison – being drawn from the same national sources – and are much richer than those available in a cross-country context. Indeed, we have data on financial aid – that allows us to estimate the short-term impact on the GDP while applying different assumptions regarding the fiscal multiplier – and on (time-varying) indicators of institutional quality.

Besides data and empirical issues, a further element of novelty of this paper is that we shed light on *why* certain outcomes arise. As far as the short term is concerned, we analyze the expanding role of public spending. As to the long run outcome, we highlight the transmission mechanism from the quake to the GDP per capita by examining the mediating role of institutions: their quality might affect the ability to deal with the recovery process and we show that institutions themselves endogenously change in response to the shock.[3] In this respect, our results contribute to those papers that highlighted why good institutions are good for growth. For example, they are consistent with those of Acemoglu et al. (2005), who discuss how institutions determine the incentives and the constraints on economic actors and shape economic outcomes. Our paper is also related to Rajkumar and Swaroop (2008), who show that the quality of public spending can be largely explained by the quality of governance, and Nannicini et al. (2013), who show how (pre-existing) social capital may improve the functioning of institutions.

Finally, our paper contributes to the urban economics literature that studies how local growth reacts to unanticipated local (and negative) shocks. Most papers indicate that local growth patterns are robust to large negative shocks. Davis and Weinstein (2002) find that Japanese cities reverted quickly to pre-war population trends, despite widespread destruction by Allied bombings during WWII. Similarly, Brakman et al. (2004) find that the populations of West German cities recovered rapidly from the devastation caused by WWII. Miguel and Roland (2011) find that even the extensive bombing campaign in Vietnam did not have a permanent impact on the distribution of population and basic measures of economic

[2] Unsurprisingly, the two seminal papers regarding the synthetic control approach (Abadie et al., 2010; Abadie and Gardeazabal, 2003) adopt a within-country perspective. Other papers using within-country data (but not the synthetic control approach) in a somewhat similar field are Strobl (2011) – that analyses the impact of hurricanes using a panel of US counties – and Hornbeck (2012) – that examines the impact of the 1930s American Dust Bowl.

[3] In this respect, our paper also shares an interest with Kahn (2005), Stromberg (2007) and Noy (2009) who argue that countries with better institutions suffer fewer deaths and are better able to withstand the disaster. However, these studies consider institutions as given.