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Population effects of wildfires: Spanish municipalities, 1986-2015

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Abstract:

Natural disasters are a current danger for the society. Concretely, wildfires are very common at Spain, mainly in the warm seasons. Although we are used to watch natural hazards in the news and social media, the actions of these disasters relative to socio-economic features are still unclear. A possible cause of this is that these events that obviously reduce welfare of human beings can however increase Gross Domestic Product per capita. This paper deals with the effects that natural disasters exert on population size at the local level. With this purpose, information of fire events and the size of Spanish municipalities covering the 1986-2015 period has been combined. Data from the National Statistics Institute, from the National Geographical Institute and from the Ministry of Ecological Transition has been employed. The information about municipality size has been extracted from the Spanish national statistical office (Instituto Nacional de Estadística). This dataset corresponds to all persons who habitually live in a given area on a reference date and cover the longest time span available for 8,098 municipalities during the period from 1986 to 2015. This is the largest dataset available for combining both samples, since the annual population data starts on 1986 and the official data for the database of wildfires vanishes on 2015. These data about the occurrence of wildfires, as well as their related affected areas, have been extracted from the official database from the Spanish Ministry of Ecological Transition entitled "General Statistic of Forest Wildfires" (Estadística General de Incendios Forestales). Apart from lagged population and its growth rate, geographical variables have been used as additional regressors. This information has been obtained from Instituto Geográfico Nacional and, at the municipality level, refers to altitude, area, latitude, longitude, and perimeter. Concerning the econometric strategy, given concerns with the parallel trends assumption underlying the estimation approach used, our aim is to find the set up that minimizes significant, pre-treatment differences in population. For the next empirical exercises, each figure of the results shows 0 as the treatment period and $-x$ and x that are, respectively, the effects on the previous and posterior x periods, being x the maximum available periods for each estimation. Additionally, later some empirical checking on the robustness of the results will be provided, homogenizing to $x=15$ for testing whether or not the next findings can be confirmed. A figure collects a graph with the estimated dynamic Average Treatment Effects when

the treatment group includes those municipalities that experienced the first wildfire during the sample period analyzed, considering that year. Using recent developments in difference-in-differences estimation methods for multiple period treatments, we find that these environmental hazards have an adverse and permanent impact on municipality size when a major agricultural area is affected. A raise on the extension of the agricultural areas affected, in addition to the number of fires, reduces population. The higher quantity of wildfires, the higher negative and significant impact on population. Nonetheless, the significance is lower after the event when more than 3 or more wildfires are considered, showing probably a matter of lack of data and then of statistical significance. For more than 2 wildfires, the economic and statistical relevance of the impact is the highest, and for more than 1 and 2 wildfires the impact on population is negative and statistically significant with high magnitude, but not significant before the event. These findings suggest that, as it is also the case of other types of shocks, the effects of minor natural disasters as fires on the urban structure are permanent when they are large enough. As most of the findings in the literature, our results show the fulfillment of a negative and significant impact during more than a year since permanent effects appear. The reason is that Local Fundamentals do not take place if large shocks are considered and they persist in the long-run, with negative impacts on population since people is inclined to move due to the economic loss. This loss is the damage of their way of life, the agriculture, due to the burnt agricultural areas. Otherwise, the effect would not depend on the agricultural areas involved. This is an empirical exercise where we do not distinguish between major and minor wildfires. Instead of reaching the effect of a 0 value after the first year, which that would be the case of a transitory effect explained by Local Fundamentals, the parameter takes a value different from 0 since the effect is permanent. Therefore, it is explained by Increasing Returns or Random Growth models. Some policy implications can be derived. First, there is a necessity on preventing these kind of natural hazards. Second, one of the roots of depopulation in some Spanish municipalities emerges from this study. Finally, this depopulation force can be compensated by employing the residents in the prevention of future wildfires. Further research includes a deeper analysis in the data on wildfires, available from the Ministry's webpage, with the application of novel techniques for this future work, and also the study of the roots and additional effects of these wildfires and the consequent depopulation for the affected municipalities.

Keywords:

Natural disasters, fires, shock persistence, difference-in-differences, heterogeneity.

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