

## Extended Abstract

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| Paper/Poster Title | THE IMPACT OF WILDFIRES ON ASSETS AND EMPLOYMENT |
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Abstract prepared for presentation at the 96<sup>th</sup> Annual Conference of the Agricultural Economics Society, K U Leuven, Belgium

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| <b>Abstract</b>  | <b>200 words max</b>  |
| <p>This paper analyzes the impact of wildfires on firms' assets and employment levels. We match the firms' balance sheet information with detailed geographic distribution of the burnt areas in Portugal in 2017, using the 7-digit postal code of the firms. This allows us to distinguish between treated firms, located in burnt areas, and a control group of firms in non-affected regions. Using a difference-in-differences approach, we find that treated firms have, on average, suffered a decrease in their assets and employment levels, having increased other expenses which include losses in inventories, when compared to firms in non-burnt areas. Considering the heterogeneity in firms' asset structure, we also find evidence that the negative effect on assets is amplified in firms with higher shares of land and buildings. Firms in the agricultural sector, most recent firms and smaller firms seem to be more vulnerable to this type of event. This analysis allows us to quantify the impacts of wildfires and its heterogeneous effects, which are relevant to better inform public policy that designs <i>ex-post</i> supporting measures for firms affected by wildfires.</p> |   |
| <b>Keywords</b>  | wildfires, Portugal, employment, assets, difference-in-differences  |
| <b>JEL Code</b>  | D24, L25, Q54, R11<br>see: <a href="http://www.aeaweb.org/jel/guide/jel.php?class=Q">www.aeaweb.org/jel/guide/jel.php?class=Q</a> ) |
| <b>Introduction</b>  | <b>100 – 250 words</b>  |
| <p>Southern Europe has been impacted by significant wildfires in recent years. The increasing frequency and severity of wildfires linked to climate change is predicted by climate models and justify the need to evaluate economic costs for affected firms.</p> <p>Wildfires can be considered a sudden, severe and exogenous shock for firms that impose negative consequences on their activities. Firms can be impacted by the immediate damage or destruction of capital and inventories. Illnesses and morbidity caused by fire may affect workers, which in turn may lead to a reduction in labour supply and labour productivity. Further impacts are related to business disruptions and the destruction of value chains, eventually requiring firms to adjust their activity and reduce inputs.</p>   |   |

These negative consequences of wildfires, along with the increasing magnitude and frequency of this type of events, justify the quantification of their effects on firms.

This paper adds to the existing literature that analyzes the impact of natural events or catastrophes on economic indicators. To our knowledge, this is the first time that the causal impact of wildfires on firms' variables is measured, considering also different effects according to firms' asset structure.

The results of this paper can either contribute to improve the design of a targeted and more sustainable ex-post public policy to compensate firms for their losses, or of ex-ante measures to mitigate the risk of fires. The existence of heterogeneous effects may imply that policy makers should take into account the characteristics of the firms for policy purposes.

### **Methodology**

**100 – 250 words**

Since Portugal is at risk due to climate change given its geographical position located in the southwestern part of Europe, it is used as a case study to analyse the effects of wildfires on firms. We use a unique database containing the geo-localisation of the burnt area to exploit the regional differences in a large burnt area in 2017.

We rely on this very precise geo-localised data with the Cartesian coordinates of the polygons of burnt areas matched to the firms' 7-digit postal code to identify the firms located there. This allows us to distinguish between firms affected by the wildfires in 2017 (treatment group), and otherwise (control group). We implement a DD strategy to analyse the cumulative effects on the outcome variables (firms' total assets, number of workers and other expenses, which includes the losses in inventories), by considering the physical and immediate damages, and other indirect effects, such as businesses disruptions and substitution of input factors and reconstruction activities caused by wildfires.

We also explore heterogeneous effects by comparing *more* and *less-vulnerable* firms in terms of tangible assets, in particular the land and buildings owned by the firms, which are more likely to be destroyed by wildfires. This specification exploits firms' asset structure, given the hypothesis that a higher share of land and buildings on tangible and intangible fixed assets determines the impacts of wildfires.

We also explore the existence of other heterogeneous impacts on firms, according to their sector of activity, size, age and export status.

### **Results**

**100 – 250 words**

We find evidence that firms in burnt areas have, on average, decreased their assets (-10.3%) and employment levels (-9.4%), compared to those in non-affected areas. Other expenses rose (+39.4%) in firms relative to non-affected after the wildfires.

The results from the standard DD approach are consistent with those based on the specification that accounts for heterogeneous effects on firms' asset structure.

The negative impact on assets is further aggravated in face of higher shares of land and buildings, which are more prone to be damaged or destroyed by wildfires. However, deviations of firms from the mean of the share of land and buildings play no role in determining the effects of wildfires on employment and other expenses.

The results obtained when considering separately firms either that do not possess any land or buildings (with low intensity of tangible assets) or above the percentile 75% for those assets within its sector (high intensity) entirely support the previous findings.

Firms in the agricultural sector seems to be more vulnerable to wildfires relative to the other sectors analysed, which can be related to a larger dependence on soil quality and less capability of adaptation. Most recent firms and smaller firms also present vulnerabilities.

### **Discussion and Conclusion**

**100 – 250 words**

As mentioned above, Portugal was used as a case study to investigate the short-run effects, within a two-year time frame, of wildfires on firms' inputs and other expenses, including inventory losses. Given the richness of the data set, we also investigate whether these effects are different according to firms' asset structure and other characteristics of the firm.

We find evidence that firms in burnt areas have, on average, decreased their assets and employment levels and increased other expenses, compared to those in non-affected areas. The negative impact on assets is further aggravated when possessing higher shares of land and buildings, which are more prone to be damaged or destroyed by wildfires. Firms in the agricultural sector, most recent firms and smaller firms seem to be more vulnerable to wildfires.

This analysis allows us to quantify the impacts of wildfires and its heterogeneous effects, which are relevant to better inform public policy that designs *ex-post* supporting measures for firms affected by wildfires. Even though we are using Portugal as a case study, the obtained results are also relevant and applicable to other countries affected by wildfires, with similar characteristics, namely, in southern Europe

Further research about this topic can include the causal analysis with varying treatment time and multiple time periods, which is suitable for treatments (wildfires) with varying starting dates and treatment durations (for instance, firms in burnt areas in two consecutive years).