

Extended Abstract

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Paper/Poster Title	Assessing the effect of extreme weather events on GI vs. non-GI Italian wine exports
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Abstract prepared for presentation at the 98th Annual Conference of The Agricultural Economics Society will be held at The University of Edinburgh, UK, 18th - 20th March 2024.

Abstract	200 words max
<p>This paper investigates the impact of extreme weather events, specifically heat and cold waves, on Italian wine exports, distinguishing between Geographical Indications (GIs) and non-GI wines. Weather conditions significantly affect wine yield, quality, production processes, and longevity, affecting prices and revenues. The study relies on a rich database covering 7,000 Italian municipalities, providing information on wines' export values and municipalities' socio-economic characteristics over the 2004-2018 period, non-GI wines' export value and quantity. The methodology integrates export data with geospatial meteorological data, employing the Poisson Pseudo Maximum Likelihood estimator to assess the impact of extreme events on GI vs. non-GI wine exports within a difference-in-differences framework. Preliminary results indicate that heat waves negatively affect overall wine exports, with GI wines suffering more, particularly Protected Designation of Origin (PDO) wines. Cold waves, however, do not significantly impact exports. The findings contribute to the agricultural economics literature, offering empirical evidence on the impact of climatic conditions on agri-food exports. Additionally, the study addresses the political debate within the EU concerning the adaptation capacity of GI producers to extreme weather events compared to non-PDO producers, emphasizing the challenges faced by the former due to strict regulations limiting adaptive strategies.</p>	
Keywords	wine trade, extreme weather events, Geographical Indications
JEL Code	F18, Q17, Q18, Q54 see: www.aeaweb.org/jel/guide/jel.php?class=Q)
Introduction	100 – 250 words
<p>This paper aims to understand the effect of extreme weather, particularly heat and cold waves, on Italian wine exports by disentangling the effect between Geographical Indications (GIs) and non-GI wines. Weather conditions affect wines' yield, quality, production process, and longevity, which strongly influence wines' prices and revenues. The increase in global temperatures, a consequence of climate change, is highlighted as a major factor impacting wine production. While higher temperatures have historically contributed to advancements in wine grape harvests and improved quality ratings, excessive heat may harm wine quality, particularly for high-quality wines in regions at the margins of their climatic limits.</p>	

Changes in climatic conditions require wine producers to adapt to it anyway. However, in contrast with other annual crops, any adjustment in the wine sector will be likely to take more time as wine is a perennial crop. Moreover, adaptation is limited in Europe and mostly in major wine producers such as Italy and France due to the link between wines and geography. In addition to issues such as wine planting rights, the GI certification does not allow wine producers to rely on many of the widely diffused potential adaptation strategies, such as drought-resistant varieties. Therefore, unless the EU GI regulation is somehow relaxed, GI wine production may be among those that will suffer the most severe consequences of climate change.

Methodology

100 – 250 words

We rely on destination-specific data on 7,000 Italian municipalities over 2004-2018 coming from the Italian National Institute of Statistics (ISTAT), which allows us to distinguish between export value and quantity of GI vs non-GI wines. We integrate export data with AgERA5 geospatial daily surface meteorological gridded data from the Copernicus database. We collect daily mean temperatures, maximum temperatures, and total precipitation at a 0.1 °C spatial resolution. Then, these data are downscaled using the ISTAT shapefile to align with administrative boundaries. In addition, we aggregate the daily data to obtain annual mean temperatures and total annual precipitation for each Italian municipality. Using the Poisson Pseudo Maximum Likelihood (PPML) estimator, we aim to estimate how much GI vs. non-GI wine exports are affected by climatic conditions. We focus on extreme events like heat waves, measured as periods of at least three consecutive days where the maximum temperature is above its 97.5th percentile, from the climatological baseline of 1994-2014. Cold waves, conversely, are defined as periods of at least three consecutive days with maximum temperature below its 2nd percentile. We also control for socio-demographic variables at the municipality-year level, such as GDP per capita, population density, and employment rate. The empirical specification controls also for municipalities, regional, and year-fixed effects.

In addition, we control for the following weather variables: mean temperature during the vegetation period and the growing season precipitation index, plus municipal, time, and region-by-year fixed effects.

Results

100 – 250 words

Our preliminary results suggest that, on average, heat waves negatively affect wine exports. Quantitatively, one heat wave leads, on average, decreases Italian municipalities' wine exports by around 24%. When considering the heterogeneous effect across GI and non-GI wines, the results reveal that heat waves hit GI wines more heavily than non-GI wines. Quantitatively, the occurrence of one heat wave causes a reduction in GI wine exports by about 73%. Moreover, our results suggest that, within the GI category, Protected Designation of Origin (PDO) wines are those more severely affected by heat waves. This is because wines from this product category can use only domestic (local) inputs. Therefore, PDO producers cannot rely on the use of intermediate inputs coming from outside the local production area, or they cannot rely on any other adaptation strategy that may lead the final product to depart from the

characteristics envisaged by the GI regulation. Exports of Protected Geographical indications (PGI) wines are not significantly affected by heat waves, probably thanks to their more flexible regulatory requirements.

When considering cold waves, our preliminary results reveal that they do not significantly affect Italian municipalities' wine exports, neither for GI wines nor non-GIs.

Discussion and Conclusion

100 – 250 words

This paper empirically estimates the effect of extreme weather events on wine exports. Our interest is particularly in detecting the potential heterogeneous impact between GI and non-GI wines. This is because, while regular wines can freely adapt to emergency situations generated by extreme weather events, GI wines, and PDO especially, have to respect strict regulations, which limit their adaptive capacity to extreme events (e.g., using heat-resistant grape varieties). In line with the expectations, our preliminary results show that GI wines are more severely hit by extreme weather events than non-GIs, especially by heat waves.

Our results provide, first, an empirical contribution to the literature dealing with the effect of climatic conditions on agri-food exports. Despite growing interest in this topic, little empirical evidence exists in the agricultural economics literature. Second, our analysis provides an important contribution to the overall assessment of the adaptation capacity of GI producers to extreme weather events vs. non-PDO producers. This represents a quite debated political issue in the EU, as proved by the number of amendments required by the GI producers due to changes in climatic conditions.