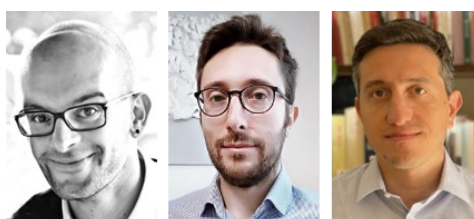


How does climate change reshape the corporate sector? Evidence from Italian firms*



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Understanding whether companies can adapt to a changing climate is crucial to grasp the lasting economic effects of climate change. This article offers evidence from Italy, illustrating how higher temperatures influence the aggregate dynamics of the corporate sector. Hotter temperatures reduce the number of new businesses entering the market and increase that of businesses shutting down, with firms' relocation to cooler areas not emerging as a relevant phenomenon. Balance sheet data reveals that temperature effects are profoundly heterogeneous across firms: large, young companies adjust to a hotter weather best, increasing their profits, while old, small ones struggle and persistently suffer from hot temperatures.

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Climate change stands as a significant structural hurdle for the global economy (Blanchard and Tirole 2022), and economists are dedicating extensive efforts towards exploring the multifaceted consequences it brings (e.g. Weder di Mauro 2021). As climate-induced extreme events – notably high temperatures – loom with heightened frequency, a pivotal issue within the ongoing economic debate is how climate change might reshape a nation's production sector. This concern has been scrutinized from various vantage points, from the immediate impacts on business activity (e.g. Addoum et al. 2020, Pankratz and Schiller 2021, Somanathan et al. 2021) to the aggregate, longer-run effects on migration flows towards regions at lower climate risk (Cruz and Rossi-Hansberg 2020, Peri and Robert-Nicoud 2021, Albert et al. 2021).

At the root of these mechanisms lie the effects of temperatures on human health and economic behavior. During heatwaves, firms' revenues might decline due to higher absenteeism of workers for health issues, to a fall in productivity in heat-exposed roles or to an increase in production costs. Over longer spans, some companies might successfully adapt – e.g., by means of technological advancements – and thrive in a hotter climate while others might not be able to face this challenge and be, therefore, more likely to exit the market.

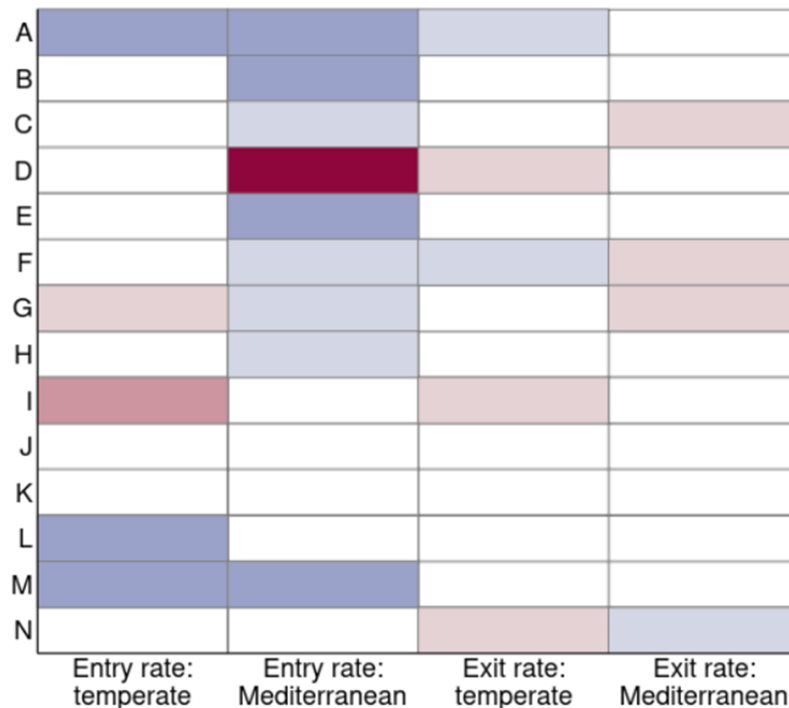
Despite their potential to influence market structure, these possibly diverging trajectories have garnered limited scholarly attention. In our recent study (Casarano et al. 2022), this matter is revisited, examining the long-term repercussions of temperatures on the Italian corporate sector. Two analyses are conducted. First, by employing comprehensive administrative data encompassing the universe of Italian firms, we show how very hot temperatures affect local firm demography – encompassing entry, exit, and relocation – across distinct Italian local labor markets (areas characterized by homogeneous work commuting patterns). Second, we leverage on firm-level balance sheet data to provide some insights into how temperatures could affect the performance of firms exposed to temperature shocks over years.

Entry, exit and relocation across local labor markets

The firm demography analysis draws on the Infocamere dataset, featuring administrative data for an average of over 2 million firms per year (excluding single-person entities) from 2005 to 2019. We investigate how hot temperatures influence the determinants of the growth rate of active firms in local labor markets, namely the entry of new enterprises, the cessation of existing firms, and the relocations of businesses within Italy or abroad. To accurately proxy for heatwaves, we adopt a widely-accepted metric involving the count of days in which maximum temperatures exceed 30°C within a given year, with data sourced from the JRC MARS Meteorological Database. We differentiate the impact of temperatures across two climatic zones: the warmer Mediterranean areas, that predominantly include Italy's coastal areas, and the cooler temperate regions and, within them, across productive sectors. Recognizing the gradual pace of market dynamics, we conduct our analysis by assessing cumulative temperature effects over three-year temporal intervals.

Figure 1 depicts the results, with red (blue) cells indicating positive (negative) temperature effects, and white cells marking non-significant effects. In the medium term, exceptionally high temperatures induce a decrease in the entry rate of firms and, to a lesser extent a decrease in exit rates within local labor markets. The majority of these effects show up in the Mediterranean region, extending beyond the agricultural sector, whose effects are widespread across the country. The only sector benefiting from elevated temperatures in this zone is the electricity sector, potentially due to augmented demand for air conditioning. Relocation of firms towards more favorable climatic zones plays a marginal role, with temperature impacts proving negligible or insignificant in most instances. Additionally, the absence of a clear sector-level negative correlation of the impacts between Mediterranean and temperate zones implies that other forms of mobility – such as ceasing activity in one place and contextually re-opening in another – are secondary at best in the Italian case.

Figure 1: Effect of extreme temperatures on entry and exit rates across sectors and geographic areas over a 3-year horizon



Notes: red (blue) cells represents positive (negative) effects, with darker cells indicating larger effects in absolute value. Empty cells indicate non-significant estimates at the 95% significance level. The color of the cells is based on the cumulative effect, on entry and exit rates, of a 1% increase in the number of extreme heat days in three consecutive 3-year periods within the local labor market in which each firm resides. Coefficients range from -1.5 percentage points (dark blue) to 1.6 (dark red). The columns of the matrix are labeled by the dependent variable of the regression and the climate zone to which the coefficient estimate is referred. The rows of the matrix indicate the sector according to the Nace Rev. 2 classification: A. Agriculture, Forestry and Fishing; B. Mining and Quarrying; C. Manufacturing; D. Electricity, Gas, Steam and Air Conditioning Supply; E. Water Supply, Sewerage, Waste Management and Remediation Activities; F. Construction; G. Wholesale and Retail Trade, Repair of Motor Vehicles and Motorcycles; H. Transportation and Storage; I. Accommodation and Food Service Activities; J. Information and Communication; K. Financial and Insurance Activities; L. Real Estate Activities; M. Professional, Scientific and Technical Activities; N. Administrative and Support Service Activities.

The effects of extreme temperatures on market structure are quantitatively relevant. A permanent annual increase of ten days with temperatures exceeding 30°C translates to a 0.13 percentage point reduction in the growth rate of active firms. This constitutes almost one-tenth of the average growth rate in the sample, primarily driven by the decline in entry rates. Using projected local temperatures in line with the central scenario of a commonly-used climatic model (ETHZ CLM), these findings imply a cumulative decline of 0.22 percentage points in the growth rate of active firms in Italy within the current decade.

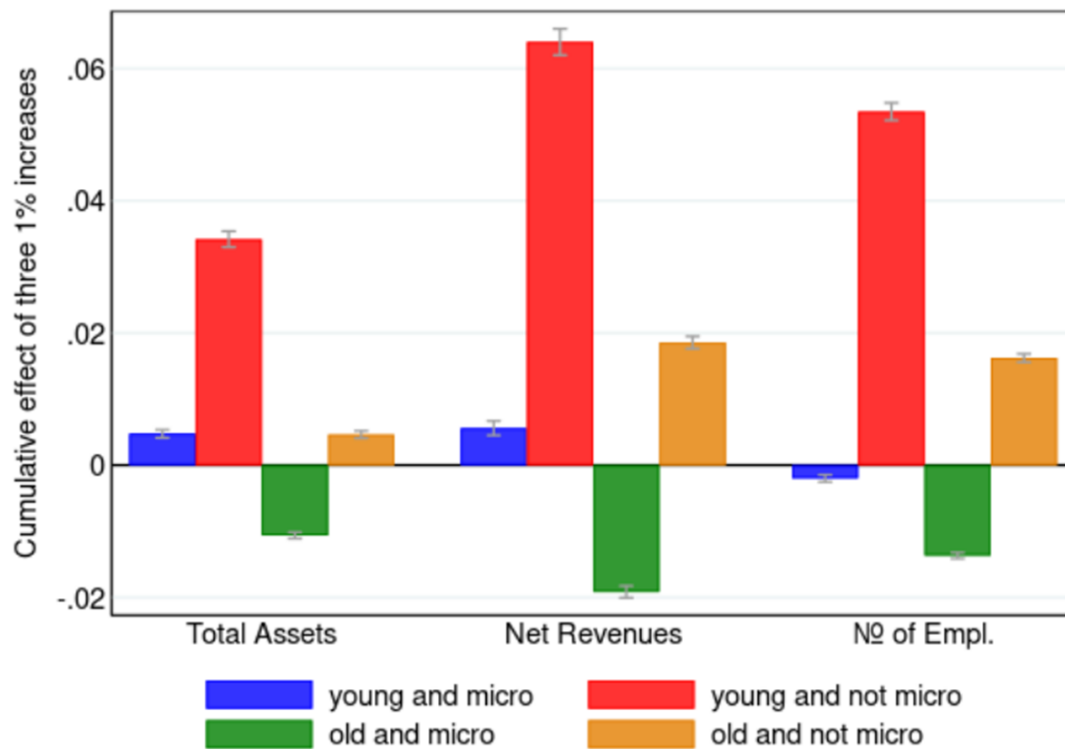
Effects at the firm level

To delve into the impact of temperature on firm outcomes, we rely on nearly 10 million observations of firm-year balance sheets from the Cerved dataset. Firms are categorized into four size classes according to the Eurostat classification, and the study examines the influence of temperatures on metrics such as total assets, net revenues and employee numbers. In order to explore the heterogeneity of these impacts, we categorize firms into four classes based on their size-by-age, i.e. combining size categories (micro vs. non-micro)¹ and age groups (young and old)².

¹ Micro firms are those with less than 10 workers and whose annual balance sheet does not exceed 2 million EUR (EU Recommendation 2003/361).

² Young firms are defined as those less than 10 years old.

Figure 2: The effect of extreme temperature events on firm activity, by size and age



The results, depicted in Figure 2, offer compelling insights. Over the medium term, young, not-micro firms exhibit positive temperature effects, suggesting that healthy, fast-growing firms can adapt to climate change, enhancing profitability. A positive effect, albeit smaller in size, also holds for other sufficiently large firms, even among the older ones. Instead, old, micro firms experience the opposite effects, i.e. a contraction across all the three explored dimensions, underscoring their challenges in adapting by undertaking green or climate adaptation investments (Accetturo et al. 2022).

In conclusion, these findings suggest that high temperatures are already impacting the corporate sector in terms of both size and composition, with global warming making such threat the more and more material. Elevated temperatures could magnify existing growth disparities between small and large firms, prompting a reshaping of the business sector's value-added creation dynamics. This dynamic might have important consequences for aggregate productivity growth. ■

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