

# Climate-Adjusted Credit Scoring Incorporating Supply Chain Network for European SMEs

## Abstract

Climate disasters such as wildfires, floods, or storms have become more frequent and severe, posing significant threats to firms. Recent credit scoring models account for climate risk but typically overlook the cascading nature of these shocks by focusing solely on borrower-specific characteristics. SMEs are particularly vulnerable to climate disruptions compared to larger firms, due to their limited resources and less diversified supply chains or customer bases, often resulting from their operations in narrower geographic and market segments. This suggests that ignoring supply-chain network effects in SMEs' credit risk assessment might underestimate the financial impact of those extreme events.

This study proposes a novel credit scoring model based on a binary spatial autoregressive structure that integrates industry-level supply and demand linkages, capturing both direct and network-driven impacts of climate events on SME default risk. By including supply chain dependencies, the model reveals how a severe climate disaster can trigger higher default probabilities not only for directly affected borrowers, but also for those connected upstream or downstream. To the best of our knowledge, this is the first work that explicitly embeds supply-chain network into a credit scoring model. Drawing on a comprehensive dataset of European SME loans and regional climate disaster records from 2013 to 2022, our findings underscore that the supply chain network acts as a key transmission channel for climate-induced credit risk. Our research insights can help SMEs to better understand the drivers of their credit risk and support financial institutions and policymakers in designing more effective risk management strategies and regulation policies.

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