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The Impact of Natural Disasters on Banks' Impairment Flow – Evidence from Germany*


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Climate change causes natural disasters to occur at higher frequency and increased severity. Using a unique dataset on German banks, this paper explores how regionally less diversified banks in Germany adjusted their loan loss provisioning following the severe summer flood of 2013, which affected widespread regions mostly in Eastern Germany. The analysis uses a difference-in-differences estimation with banks being allocated to the treatment and control group based on the region of their primary operational activities. This paper yields various results: German savings and cooperative banks located in the affected regions experienced a significantly higher, but ephemeral, impairment flow in the years following the flood. Impairments were mostly driven by corporate loans concentrated in specific sectors, such as agriculture and manufacturing, and to some extent by retail mortgage loans. The results are robust to various model specifications.

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Increasing Physical Risks for Banks

In July 2021, Western Europe experienced heavy rainfalls causing severe flooding, in particular in areas around the Ahr/Erft in Germany and the Meuse in Belgium, resulting in more than two hundred deaths and damages to physical property and critical infrastructure. With continued global warming, such regionally highly disastrous events are expected to occur more frequently in the future. Even under the 1.5°C scenario, direct losses caused by river floods are estimated to increase by 160-240% compared to present levels (Dottori et al., 2018).

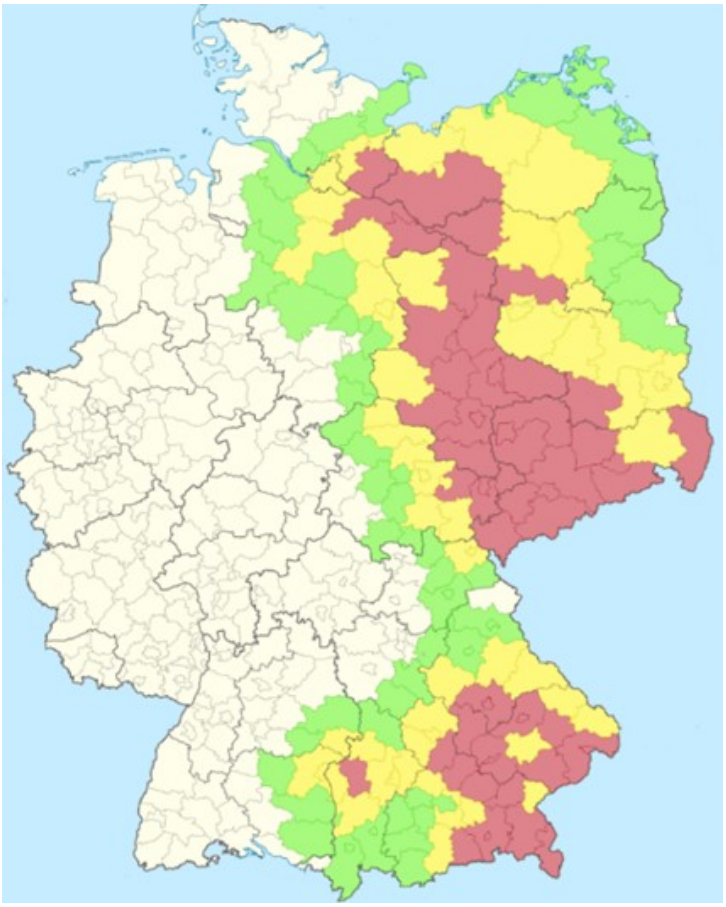
One of the increasing worries is that acute physical risks may harm the stability of the banking sectors, if not adequately addressed in banks' risk management frameworks even today (NGFS, 2019). This is also due to the fact that insurance coverage often tends to be incomplete and public support measures mostly address only part of the financial losses, leaving affected households and business owners turn to financial intermediaries for additional support (Garmaise and Moskowitz, 2009). However, even for banks the capacity for providing immediate funding might be limited if banks themselves are negatively affected by the natural disaster, either directly or indirectly through their clients (e.g. Noth and Schüwer, 2018; Brei et al., 2019; Schüwer et al., 2019; Bos et al., 2022).

This research paper adds to the still evolving literature that examines the channels through which physical risks affect bank performance. The analysis is based on the severe summer flood of 2013, which mostly concentrated around the Elbe basin, but also affected other regions in Eastern Germany, resulting in direct damages of up to EUR 8 billion in Germany alone (Thieken et al., 2016). Unlike the Ahr/Erft flood from 2021, floods around the Elbe have been more frequent in the recent past, with the floods from 2002 and 2006 previously also being considered one-in-a-century events each of them resulting in considerable financial damage (Noth and Rehbein, 2019; BMU, 2021).

Methodological set-up leverages on decentralised structure of banking sector in Germany

We estimate our baseline equation in a standard difference-in-differences framework to analyse the effect from the flood on the impairment flow on banks in affected counties. The allocation of banks into the treatment or control group is determined by whether or not the local administration of a county, where a particular bank is headquartered, issued an official disaster alert because of the flood. Generally, any county administration in Germany can issue such a disaster alert if the damages significantly impede the current living or become even life threatening. In total, 55 counties had issued a disaster alert during the 2013 flood (BMI, 2013). Figure 1 depicts the allocation of counties into treatment and control group. The banks located in counties, which are highlighted in red, constitute the treatment group. The control group constitutes of banks whose counties are bordering on the affected counties, but where no disaster alert was issued. Banks located in these counties are assumed to be most comparable, e.g. in terms of size and business model, with the only difference being that these banks were not directly operating in regions affected by the natural disaster (Huang, 2008). The first adjacent counties, highlighted in yellow, are those that are directly bordering on the treated counties. However, one concern is that even first adjacent counties might have been partially flooded, just not severely enough that would have justified the issuance of a disaster alert. Therefore, we also identify the second adjacent counties, highlighted in green, which are bordering on the first adjacent ones. With these counties, we are more confident to rule out any smaller flooding and banks being affected by the flood, while these banks are still comparable to those in affected areas. In our baseline, we group banks located in the first adjacent or second adjacent counties to the control group.

Figure 1: Comparison of banks located in flooded areas (red) against banks with similar characteristics (yellow, green)



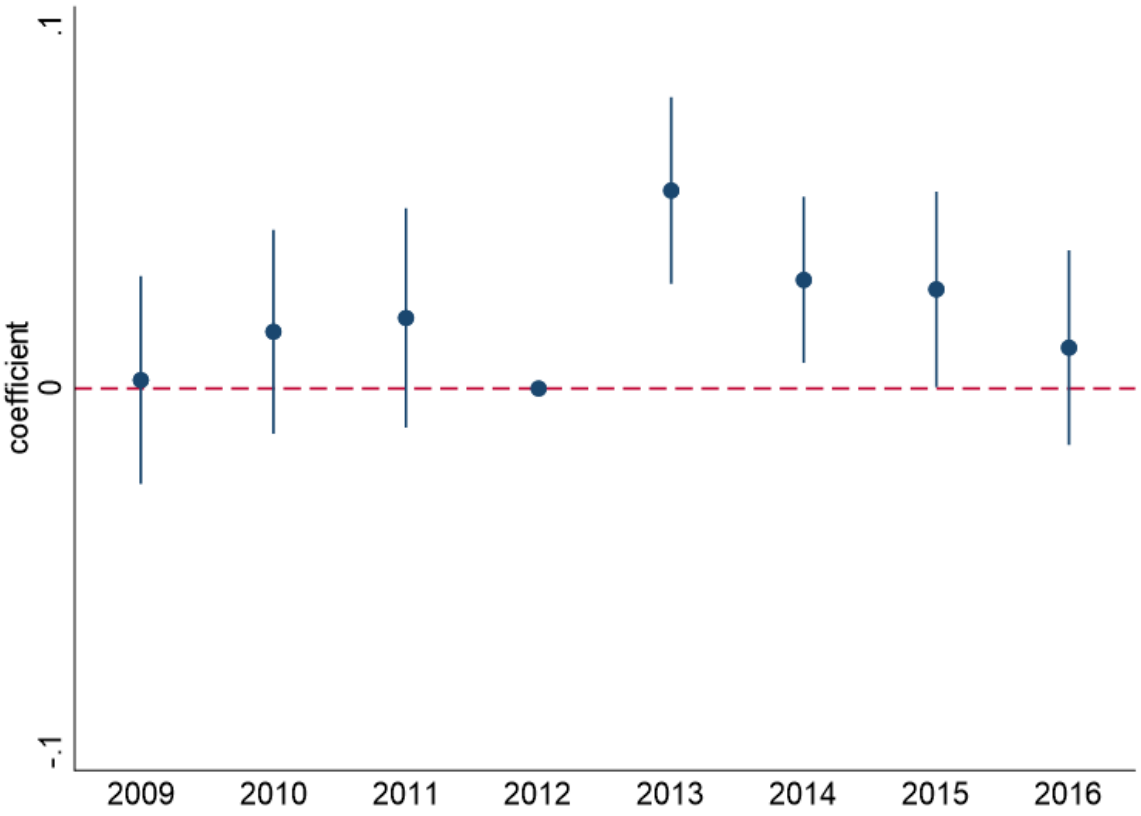
The analysis mostly relies on supervisory bank-level data. Because our analysis is built on county-level disaster information, we limit the sample to German savings and cooperative banks only as they tend to be less diversified on a regional scope than private banks either de jure following the regional or de facto restricted to operating in their region (Koetter et al., 2020).

Banks located in affected counties experienced a higher, but ephemeral impairment flow

Our results show that banks in affected regions increased their loan loss provisioning following the flood. The results are even more striking as the 2013 flood was preceded by two floods of similar spread and severity in 2002 and 2006. Therefore, we assume a largely saturated insurance coverage, both from demand and supply side. Yet, the results suggest that banks had to absorb losses stemming from exposures not (fully) insured. Also, banks in affected regions are assumed to have adjusted their expected loan loss provisioning following the previous floods to account for flood risk. The significant effect on the impairment flow could therefore also hint at ex-ante insufficient expected loan loss provisioning.

Figure 2 illustrates the disaggregated yearly effect of the flood on banks' impairment flow. The effect is strongest in 2013, i.e. the year in which the flood occurs, with some persistency, but seems to vanish after three years following the flood. This concords with the literature finding a rather short-term effect of natural disasters on banks especially in developed countries (Garmaise and Moskowitz, 2009; Noth and Schüwer, 2018).

Figure 2: German banks located in affected areas experienced a significant, but temporary rise in loan impairments following the flood



Note: The figure plots the disaggregated yearly coefficient estimates and the 95% confidence interval for the impairment flow of affected relative to unaffected banks using the sample period 2009-2016, where 2012 (the year preceding the flood) represents the base year.

In a subsequent set of analyses, we gauge the effect of the flood on the impairment flow separately for exposures by economic sectors. We find that the overall effect largely stems from corporate exposures concentrated in specific sectors, such as agriculture and manufacturing, and to some extent by retail mortgage loans. This is in line with the previous findings based on surveys done by Thieken et al. (2016). Accordingly, public financial support for firms and households only covered up to 80% of direct damages. However, losses arising from supply chain interruptions were only classified as indirect damages. This might be one factor explaining the different effects for corporate and retail exposures.

Need for taking forward-looking perspective on climate change

Our findings underscore the need for taking a forward-looking perspective when accounting for the impact of climate-induced physical risk events on banks' balance sheets. Therefore, banks (but also supervisors) will have to render their risk management toolkit fit-for-purpose in order to better anticipate and steer losses from physical risk events, especially given that natural calamities in terms of frequency and magnitude are expected to rise in the future.

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