Climate Risk, Soft Information, and Credit Supply

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ONLINE APPENDIX

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In this Online Appendix, we present robustness tests to assess the impact of climate risk on the credit supply of local banks, using alternative samples. Firstly, we address the concern that wildfires might happen in a staggered way, that is, fires might occur in different locations during different periods. If locations were close enough, firms subject to wildfires early in our data could appear later as controls. However, we assess the robustness of our findings by conducting an analysis that excludes from the sample firms once they are affected by fire (column 2 in Table A1) and that considers only firms the first year that they appear in the sample (column 3). They show that our results are robust to the concerns regarding the potential staggered nature of wildfires.

Secondly, one could question the exclusion of firms geographically located in a ring between the treatment and control groups from the sample (see Figure 1 in main text). To address this issue, we restrict our sample to firms located within the ring of $r + 20km$ (i.e., radius of the fire area plus 20km) surrounding the edge of the burn-area, such that the *non-affected* or control area of this alternative sample is defined as the peripheral ring with inner radius $r + 10km$ and outer radius $r + 20km$.[1] Results are reported in column (4). We confirm that there are significant differences between the treatment and this alternative control group but consistent with the idea that the activity of firms in this new non-affected area might be contaminated, we observe that the estimated coefficient is lower than in column (1).

[INSERT TABLE A1 AROUND HERE]

Thirdly, we respond to the concern that local banks could be aware of the firms' abilities to receive subsidies. To abstract from the effect of public subsidies or aids on credit supply, we remove from our sample those firms that have received any aid or subsidy according to the information available in the CBSDO. Results are reported in column (5) of Table A1 and confirm that subsidies do not drive local banks' credit supply.

Although we find that the credit supply of local banks is also channeled through loans without guarantees, banks may extend more credit to firms with more tangible assets just because in case of liquidation, the recovery rate would be higher (Davydenko and Franks (2008)). Alternatively, firms with more tangible assets could suffer more losses in case they

[1]Note that these firms were not considered in previous analyses to avoid including areas that are not directly affected by fire but their activity might suffer from externalities of the fire.

are affected by fire. To understand, which of the two effects dominates, we split the sample into two parts depending on whether their ratio of tangible assets over total assets is below or above the median of the distribution in each year. We find that local banks extend new credit similarly to firms no matter their ratio of tangible assets (see columns (6) and (7) in Table A1).

Another factor that might contribute to explaining credit supply by local banks to firms affected by a fire is the requirement of guarantees. Collateral contributes to mitigating not only asymmetric information but also the potential losses the bank faces in case of a firm default. Therefore, we re-estimate the equation (1) using only the evolution of credit without guarantees. Suppose a more extensive use of guarantees drives the activity of a local bank. In that case, we should expect no differences between the credit supply of local and outsider banks to firms affected by fire. However, the results in column (9) of Table A1 fully support those obtained in the baseline analysis (column 8).

To account for potential distortions caused by changes in bank structures, in column (10) of Table A1 we exclude all banks involved in a merger process. Specifically, we remove banks from the sample the year in which the bank consolidation or absorption process occurred, as well as the preceding and following year, so that credit variation is not affected by the merger. While our main results already control for bank mergers, as detailed in footnote 24, we take this additional step to ensure the robustness of our findings by entirely removing banks undergoing significant organizational transitions from the analysis. This approach minimizes the potential influence of bank merger-related changes on the results.

To address the unavailability of potentially relevant data at the firm level such as corporate insurance data, we use firm-time fixed effects to compare the credit supply of two banks to the same firm depending on their specialization in the province where the firm is located. This approach enables us to abstract from the role of property insurance of a firm and the coverage of such insurance. In addition, we find similar results independently on the tangible assets of each firm[2]. We now go one step forward and examine different areas based on their ex-ante probability of experiencing a fire. Specifically, we classify these areas into two categories of fire risk within a given municipality using information from Sociedad de Tasación: (i) those with a low likelihood of fire occurrence and (ii) risky regions with a well-established fire risk. Our prior is that fires in the first type of areas are often unex-

[2]Firms with more tangible assets are more likely to purchase property insurance (Zou and Adams (2008)).

pected, and firms may not prioritize insurance coverage. However, in the risky areas, firms are acutely aware of this danger and may actively optimize their risk management through insurance strategies. Based on this prior, we hypothesize that credit supply dynamics will differ across these two types of areas. If insurance significantly influences credit allocation, we should observe divergent results. Columns (11) and (12) of Table A1 reveal that local banks extend more credit to fire-affected firms both in areas with a low probability of fire occurrence and in areas with a high probability. This suggests that factors beyond insurance play a pivotal role in credit allocation during fire-related crises. Importantly, the fact that the results remain in areas with a low probability of fire occurrence means that both the classification of firms as affected or non-affected and the results are not driven by fire predictability.

Finally, the support of local banks to firms affected by a fire could be driven by firms that exert a strategic role within a given province because these banks could be particularly inclined to aid these firms. We classify a firm as strategically significant for the local economy if it employs a substantial number of workers within a given province, as they act as vital contributors to the regional workforce and economic fabric. Local banks could face pressures from different instances to support lending to these strategic firms such that they could ultimately affect their allocation of credit. To explore whether our results are driven by the role of strategic firms, we split our sample into two groups of firms: (i) strategic firms, defined as those where the ratio of workers employed by a single firm relative to the total number of employees in the province falls within the top quintile of the distribution, and (ii) non-strategic firms, which are all other firms that do not meet the criteria to be classified as strategic. Our empirical analysis, presented in columns (13) and (14) of Table A1 for the subsamples of strategic and non-strategic firms, respectively, reveals that local banks indeed extend more credit to strategic firms when they are affected by fire incidents, compared to outsider banks. Importantly, even firms that are not strategically significant for the local economy receive significantly more credit from local banks during such challenging times.

Dep. Var.: $\Delta L_{f,b,t+1}$	(1)	(2)	(3)	(4)	(5)	(6)	(7)
LocalBank × Fire	0.324***	0.333***	0.368***	0.204**	0.357***	0.351***	0.280**
	(0.069)	(0.079)	(0.085)	(0.093)	(0.077)	(0.100)	(0.133)
Observations	664,960	602,081	386,420	249,815	584,866	447,554	215,373
R-squared	0.441	0.437	0.452	0.449	0.450	0.428	0.494
Firm-Time FE	YES	YES	YES	YES	YES	YES	YES
Bank-Province-Time FE	YES	YES	YES	YES	YES	YES	YES

Table A1: **Credit supply by local banks after fire. Alternative samples.** This table reports the results obtained for alternative samples in equation (1). Column (1) is identical to column (1) of Table 3 and is included for comparability reasons. The dependent variable is the log change in credit (plus one to deal with zeros) extended by bank b to firm f between December of year $t-1$ and December of year $t+1$. The explanatory variable of interest is the interaction of a dummy variable that is equal to one if the firm was affected by fire in year t and the fraction of credit of bank b in December of year $t-1$ in the province where the firm is located ($LocalBank$). We consider fires with an area burned equal to or larger than 500 ha. Columns (1) - (5) are analogous to column (1) of Table 3 but with different samples of firms. In column (2) we restrict the group of *affected* firms to first-time fire-damaged firms. Similarly, in column (3) we only consider firms the first year that they appear in the sample (independently of whether they were affected by fire or not). In columns (1) - (3) and (5) – (7) we consider the *affected* or treatment area as the region that includes the burn area (i.e., a circle with radius r) plus a 10-kilometer ($10km$) peripheral ring around it. The *non-affected* or control area is defined as the peripheral ring with inner radius $r+20km$ and outer radius $r+40km$. We exclude the firms located in the peripheral ring with inner radius $r+10km$ and outer radius $r+20km$. However, in column (4) we restrict our sample to those firms located less than $r+20km$ from the centroid of the fire, such that *non-affected* firms are those beyond the threshold of $r+10km$ and they are not considered in columns (1) - (3). In column (5) we restrict our sample to firms that have not received subsidies in years t and $t+1$. Column (6) only considers firms with a ratio of tangible assets over total assets equal to or below the median ratio each year. In column (7) only those firms with a ratio of tangible assets over total assets greater than the median in each year are included in the sample. The estimation period is 2004-2017. Standard errors in parenthesis are clustered at the province and bank levels. ***, ** and * indicate statistical significance at the 1%, 5% and 10% levels, respectively.

Dep. Var.: $\Delta L_{f,b,t+1}$	(8)	(9)	(10)	(11)	(12)	(13)	(14)
LocalBank × Fire	0.324***	0.320***	0.358***	0.213***	0.423***	0.284***	0.486***
	(0.069)	(0.113)	(0.124)	(0.078)	(0.139)	(0.061)	(0.109)
Observations	664,960	472,517	270,215	343,486	315,683	462,978	149,405
R-squared	0.441	0.465	0.471	0.434	0.457	0.471	0.389
Firm-Time FE	YES	YES	YES	YES	YES	YES	YES
Bank-Province-Time FE	YES	YES	YES	YES	YES	YES	YES

Table A1: **(cont.) Credit supply by local banks after fire. Alternative samples.** This table reports the results obtained for alternative samples in equation (1). Column (8) is identical to column (1) of Table 3 and is included for comparability reasons. The dependent variable is the log change in credit (plus one to deal with zeros) extended by bank b to firm f between December of year $t-1$ and December of year $t+1$. The explanatory variable of interest is the interaction of a dummy variable that is equal to one if the firm was affected by fire in year t and the fraction of credit of bank b in December of year $t-1$ in the province where the firm is located ($LocalBank$). We consider fires with an area burned equal to or larger than 500 ha. In column (9) we remove firms that had credit with any type of guarantee either the year before or after fire. In column (10) we exclude from the sample all bank entities that were involved in a bank merger during that year and the preceding and following year. In column (11) we include firms located in municipalities with low probability of wildfires. Conversely, in column (12) we include firms located in municipalities with higher probability of wildfires. In columns (13)-(14) we gauge the strategic importance of firms by measuring their employment relative to total employment in the province. Column (13) includes the less strategic firms, representing those in the bottom quintile of the distribution of this measure within a province and year, whereas column (14) considers more strategic firms, identified as those in the 20th percentile of a province and year. The estimation period is 2004-2017. Standard errors in parenthesis are clustered at the province and bank levels. ***, ** and * indicate statistical significance at the 1%, 5% and 10% levels, respectively.

References

Davydenko, Sergei A., and Julian R. Franks. 2008. "Do bankruptcy codes matter? A study of defaults in France, Germany, and the U.K." *The Journal of Finance* 63:565–608.

Zou, Hong, and Mike B Adams. 2008. "Debt capacity, cost of debt, and corporate insurance." *Journal of Financial and Quantitative Analysis* 43 (2): 433–466.