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The effects of weather-related disasters on prices in French overseas territories*

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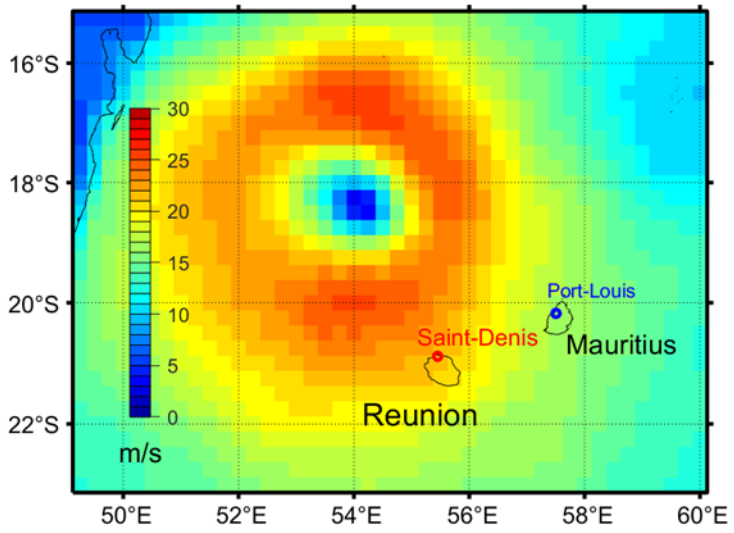
In the French overseas territories, weather-related disasters increase consumer prices by 0.5 percentage point after two months. Effects vary between goods and services: the prices of fresh products surge by 11 percentage points while the prices of services and manufactured products decline by 0.2 percentage point. Lower-income households are particularly exposed, as food accounts for a larger part of their consumption.

*This policy brief reflects the opinions of the authors and does not necessarily express the views of the Banque de France.

Chart 1: Satellite observation of cyclone Gamede passing over Réunion



Source: Gautier et al. (2023), based on Cross-Calibrated Multi-Platform (CCMP) wind vector data.
Note: Wind speed (in average meters per second for a six-hour interval) of cyclone Gamede as it passed over Reunion on 25 February 2007. 1 m/s = 3.6 km/h.

Overseas territories are ideally suited to the study of the sectoral effects of weather-related disasters

The impact of weather-related disasters (floods, storms, extreme temperatures) on inflation is subject to increasing attention from policymakers, and particularly central banks (Ciccarelli et al., 2023; Kotz et al., 2023; Cevik and Tovar Jalles, 2023). However, while a range of studies consider the effects of such disasters on the average level of prices, few analyse their effects at a by-product granular level. Yet, weather-related disasters provoke a complex combination of supply and demand shocks, which does not affect the price of each product in the same way.

In this respect, the *Départements et Régions d'Outre-Mer* (DROM – French overseas departments and regions) are particularly useful as a case study for understanding the impact of weather-related disasters on prices. First, these territories are frequently exposed to extreme weather events: since 1965, they have been hit by more than one hundred "memorable events" according to Météo-France. Furthermore, Insee has published local consumer price indices for four of these overseas territories (Guadeloupe, French Guiana, Martinique and Reunion) for the last several decades. These indices are not available for the *départements* of metropolitan France. Gautier et al. (2023) make use of the frequency of extreme weather events and the availability of local price data in these four DROM to estimate more precisely the effect of these events on inflation between 1999 and 2018.

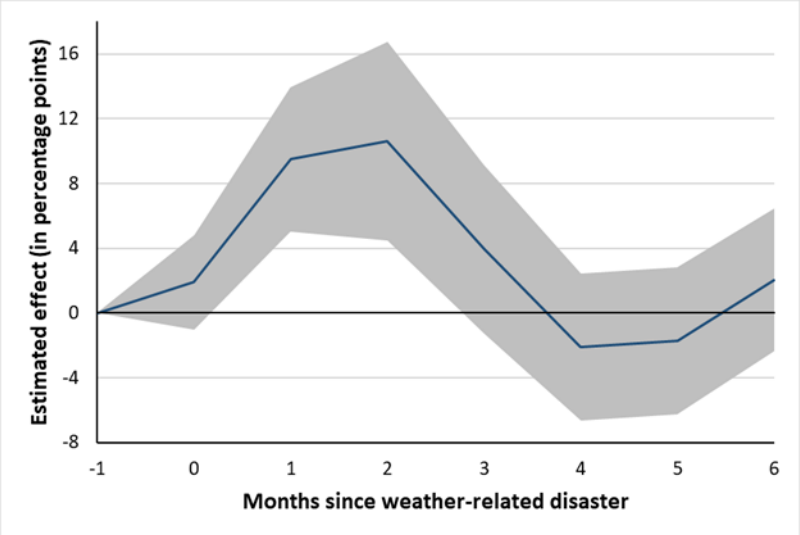
In this study, we combine administrative natural disaster data (from EM-DAT, an international disaster database and the GASPAR database, which lists declared natural disasters at the French municipal level), with satellite-collected meteorological data (see Chart 1). The combination of two types of data on disasters aims at overcoming certain well-known sources of bias. Indeed, administrative data on natural disasters are subject to potential over or under-reporting, which depend on local economic conditions. These datasets can therefore take into account disasters that are not necessarily related to extreme meteorological phenomena (Grislain-Letrémy, 2022), or select events that are systematically related to economic outcomes (Felbermayr and Gröschl, 2014). As for meteorological data, their use can be somewhat problematic, as they do not mechanically provide any indication of the economic consequences of severe weather conditions: wind or rainfall only become destructive when the levels recorded exceed a certain threshold (the effects are non-linear). The extent of the damages caused depends on the geological features and economic characteristics of the parts of the world where they occur, which biases the impact coefficient of disasters on outcome variables toward zero (attenuation bias).

We show that an instrumental variable approach can overcome these limitations in the data available to researchers for the analysis of weather-related disasters. We use meteorological records of wind speed and rainfall as instruments to predict the occurrence of economically damaging extreme weather events as reported by administrative data. We then measure the impact of these disasters on the evolution of prices for up to six months after the shock, using a local projection method. We compute the price responses at the product and aggregate level.

A modest increase in consumer prices but with heterogeneous price responses across products

Weather-related disasters induce a temporary and modest rise in consumer prices, with a maximum increase of 0.5 percentage point after two months. The effects vary significantly between goods and services. On the one hand, food prices rise sharply (see Chart 2), particularly for fresh products (up 11 percentage points after two months, compared with a 0.3 percentage point increase for processed food). On the other hand, the prices of manufactured goods and services decline slightly by around 0.2 percentage points. Finally, the prices of energy and tobacco, mainly administered in the DROM, show no significant reaction to weather-related disasters. The granularity of consumer price data by product allows us to fully break down the effect for the various price index components (see Chart 3).

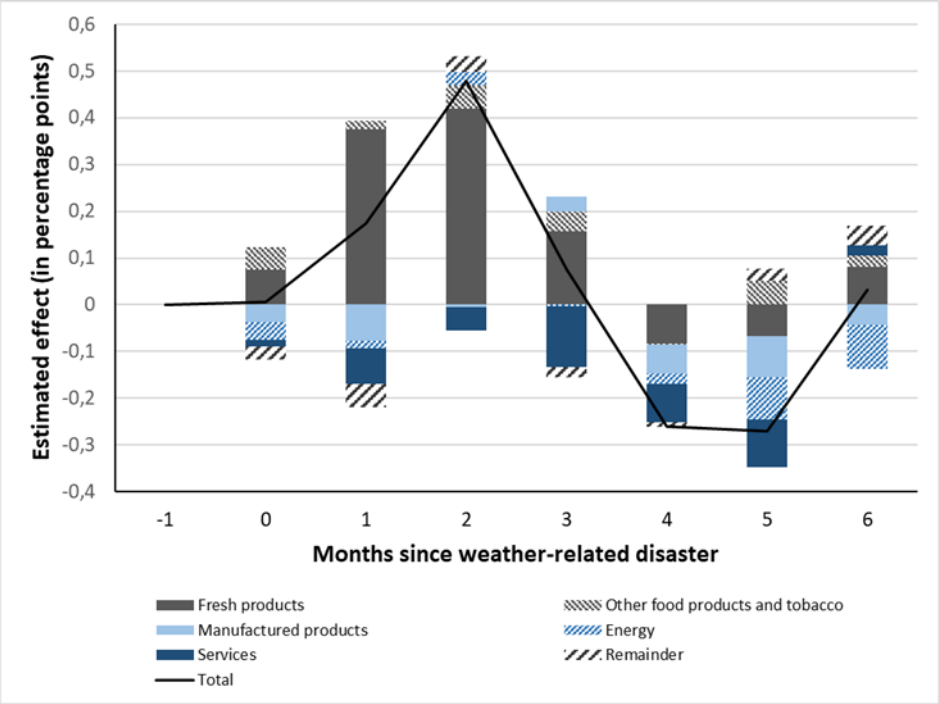
Chart 2: Reaction of fresh product prices to weather-related disasters in the DROM



Source: Gautier et al. (2023).
Note: Fresh product prices rise by 11 percentage points two months after a weather-related disaster's occurrence. 95% confidence interval in shaded areas.

The rise in food prices most likely reflects a decline in available supply. Indeed, we observe a drop in employment in the agricultural sector, and a simultaneous rise in temporary work in other sectors. This is indicative of a displacement of agricultural labour to other low-skilled sectors, possibly due to the destruction of crops. While processed food is mostly imported, fresh products tend to be grown locally. The supply shock to locally grown products would thus be more pronounced, which would explain their stronger price reaction. Meanwhile, the decline in prices of manufactured goods and services does not appear to be linked with a significant change in employment. This is consistent with the fact that manufactured products are largely imported, which points towards the predominance of negative demand effects.

Chart 3: Decomposition of the effects of weather-related disasters on consumer prices in the DROM



Source: Gautier et al. (2023).
Note: Decomposition of the reaction of consumer prices to weather-related disasters in Guadeloupe, French Guiana, Martinique and Réunion.

Lower-income households more exposed and contrasting effects after the adoption of price cap policies

As weather-related disasters have a greater effect on fresh products, their impact on households notably depends on the weight of food products in their consumption basket.

According to Insee's 2017 Household Budget Survey, in the four DROM considered in this study, this share amounted to 21.1% for the lowest-income households (first income quintile), compared with 13.3% for the highest-income households (last quintile). To illustrate the consequences of this difference, we calculate a specific price reaction for each quintile, based on their own distinctive consumption baskets: for first-quintile households, prices would increase by a maximum of 0.6 percentage point after two months, compared with 0.4 percentage point for households in the top quintile of income distribution.

Furthermore, the downward trend in the weight of fresh products in the DROM (from around 6% in 1999 to 2% in 2018) means that prices now react more mutedly to weather-related disasters: if there had been no change in the share of fresh products since 1999, the effect on the overall consumer price index would have amounted to a maximum of 0.7 percentage point after two months.

Lastly, the reaction of consumer prices varies depending on the public policies implemented to control them. Since 2013, the DROM have been shielded by a price cap (the *Bouclier Qualité Prix* – BQP, the "price-quality shield"), which sets a price ceiling every year for a basket of first necessity goods (in which fresh products account for a significant proportion). We estimate that the introduction of the BQP helped to attenuate the fresh product price reaction, with a monthly effect of between 0 and 5 percentage points during the six months following a weather event. Nevertheless, at the end of this period the cumulated price responses with or without the BQP are comparable, suggesting that the price-cap regulation may slow the shock's transmission, but does not reduce its total effect.

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