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Inferring Impacts of Weather Extremes on the U.S. Crop Transportation Network (Summary)

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WHAT IS THE ISSUE?

Extreme weather such as flash floods and winter storms can disrupt transportation infrastructure that moves grain from the interior of the United States to ports of exit.

This study examines how transportation disruptions due to extreme weather can impact basis spread—the difference between the price at collection points and the price at the port—for corn and soybeans. Declines in basis, due to transportation disruptions, can jeopardize farm incomes and increase food insecurity (by limiting food availability).

If extreme weather events rise (as scientists expect) because of climate change, then an improved understanding of how such events affect the crop distribution infrastructure could be very useful in assessing the best actions or investments to mitigate these risks.

HOW WAS THE STUDY CONDUCTED?

This study inferred impacts of extreme weather on the U.S. crop distribution network, during the 2012-20 study period, by testing how crop basis is affected by extreme weather events. The test required a three-stage approach: First, hypothetical least-cost routes for transporting crops from collection points in the U.S. interior to the port of New Orleans were estimated. Second, the least-cost routes from step one were re-calculated to account for blockages of crop-transportation networks due to extreme weather. In the final step—using crop-transportation-related variables and indicators of extreme weather events generated from step two along with control variables—the researchers employed an econometric model to estimate the effect of extreme weather on crop basis.

WHAT DID THE STUDY FIND?

First, the costs of shipping crops from the Corn Belt to a primary U.S. export port (as calculated by the researchers) help to explain the basis. This finding gives evidence that mapping hypothetical least-cost routes using information about the U.S. distribution system and location of natural disasters can help to explain actual market price differences.

Second, results suggest that most disasters caused by extreme weather negatively impact crop basis spread in the U.S. Midwest.¹ During the 2012-20 study period, flash floods and winter storms had the highest negative effect on corn and soybean basis spreads, and these two disaster types occurred most frequently in this study.

When flash floods and winter storms occur near collection points, they complicate movement of crops to ports of exit. In the case of corn movements, winter storms were found to positively affect basis spread, possibly pointing to the inability to move crops from farms to collection points. (When crops cannot reach collection points, the supply declines, which raises basis spread.) The study further finds that basis spread is lowered by the costs of having to re-route crops because of extreme weather impacts.

In a well-functioning crop distribution network, one response to higher costs of moving a crop by a nonfunctioning route or mode of transport might be to look for alternative options. Thus, recognizing and responding to impediments afflicting transportation infrastructure ensures alternative options remain viable. These results imply that investments to improve the resilience of transportation infrastructure against flooding and winter storms could mitigate the negative effects these weather hazards have on basis, thereby helping stabilize farm income and food security.

PREFERRED CITATION

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¹ A negative impact causes basis to fall, and a positive one causes basis to rise. Declines in basis can jeopardize farm incomes and increase food insecurity (by limiting food availability). An increase in basis suggests transportation costs may have fallen between a key crop growing region and the main port. In addition, a combination of a higher farm crop price and/or a lower export price can result in a higher basis spread.