How this summer's heat waves may impact the economy

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This sweltering summer has brought record-breaking high temperatures to 63 countries, all but cementing 2024's status as the world's hottest year on record (even though we're barely past the halfway point). Such

extreme weather trends are bound to have serious implications for the environment, public health, and the economy.

Why, then, aren't economic indicators flashing bright red? Joseph (Han) Stice, assistant professor of accounting at the Donald G. Costello College of Business at George Mason University, has run the numbers on business and climate change. His recent working paper, co-authored by Marcus Kirk of University of Florida and Derrald Stice of University of Hong Kong, paints a picture of profound climate-related disruption underneath the placid-seeming surface of the economy.

For the years 1990 to 2020, the researchers compared quarterly sales performance from a large sample of U.S. firms to the temperature data at their base of operations. In this way, they constructed a measure of weather sensitivity, which they termed "weather beta," for each company in the initial sample. Specifically, they were looking at whether sales either benefited or suffered when local temperatures were higher or lower than the "ideal" of 65 degrees Fahrenheit.

"What they—'they' being the people who examine temperature—say is that if it's above 65, you turn on your air conditioning. If it's below 65, you turn on your heater," says Stice.

After restricting the sample to only those firms with discernible weather beta, they ended up with a data-set comprising 66,795 firm-quarters.

Across the sample as a whole, the results were a misleading nonstarter. Weather fluctuations did not seem to have an impact on economy-wide sales, one way or the other.

This was no surprise to Stice. Citing past research, he points out that "the overall economic effect is that colder weather is, on average, better. But that's not true in every single instance. Some industries (i.e., agriculture)

benefit from hot weather. And it also depends on what region you're in, what time of year it is, etc."

To gauge the actual impact, the researchers split the sample by size and geographic concentration, presuming that larger firms with a wider geographic footprint would be less affected by temperature changes at home base. These differences between firms proved to be critical. For the smallest, most localized firms, a swing from the 75th to the 25th percentile in terms of nonideal temperature meant 8.8-15.9% lower sales. The biggest and most sprawling firms saw sales declines of just 4.3-5.6% from an equivalent shift.

Stice clarifies that "we are talking about very small deviations, like percentages of degrees on average per day over an entire quarter. If it were one degree hotter than 65 degrees every day, that would come up in our measure as a 90. The biggest number we have is like a 25 or a 30."

Also, sales impact tells only part of the story. The sheer size of the data-set allowed Stice and his co-authors to predict quarterly sales performance for individual firms, based on the weather and firm characteristics. On average, actual sales declines were about half as severe as predicted. The researchers speculate that firms were able to soften the blow of immoderate temperatures by adjusting their business practices. The time and resources spent on these adaptations are part of the hidden economic costs of climate volatility.

If firm managers can anticipate how the weather can impact business outcomes, you would expect financial analysts to be at least as attentive to climate effects. However, the researchers found that sales forecasts made shortly before earnings announcements were thrown off by abnormal temperatures in the previous quarter, with 7.4% inaccuracy in the mean. Similarly, the researchers found that weather impact was positively correlated with announcement-period stock market returns.

Apparently, even professional investors are being caught off guard by the subtle but costly interactions between climate and economic activity.

For more accurate appraisals, Stice suggests we should turn to the local level. He notes that his measures of firm-specific weather sensitivity happen to line up fairly neatly with municipal self-assessments made by local governments as part of the Carbon Disclosure Project.

"We need to have a national discussion and a global discussion," Stice says. "But the people who really matter are the local leaders, as far as climate is concerned. The people you elect on the local level are going to have a much greater impact on how you respond and how your companies can adjust, than whether or not your candidate is in the White House."

More information: Marcus Kirk et al, The Real Effects of Weather on Firm Performance, Analyst Forecasts, and Stock Prices, (2024). DOI: 10.2139/ssrn.4770543

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