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The weather report

Economists are getting to grips with the impact of climate change

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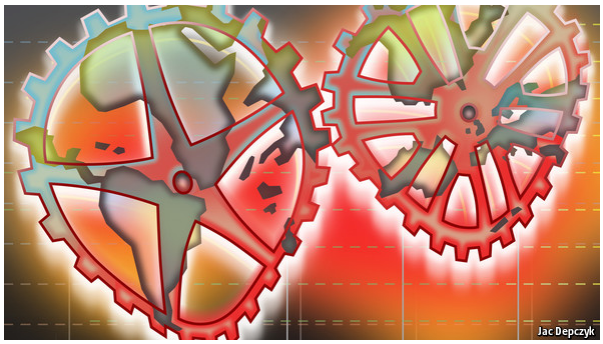

THE “polar vortex” that brought freezing weather to North America chipped roughly $3 billion off American output in a week. It was a reminder that extreme weather has economic consequences even in the richest countries and that climate change—which may usher in even wilder fluctuations—is likely to have a big economic impact. A recent burst of studies look at how large it may be, adding useful detail to the initial efforts, such as the Stern review of 2010. The results suggest that climate change may be having an effect already; that the weather influences economies through a surprisingly wide range of channels; but that calculating the long-run effects of climate change is harder than estimating the short-run impact of weather.

The link between more heat and more poverty is robust. Tropical countries are poorer. In a review of the literature, Melissa Dell of Harvard University, Benjamin Jones of Northwestern University and Benjamin Olken of the Massachusetts Institute of Technology find that, for each 1°C rise in the average temperature of a country, its GDP per head is 8.5% lower. Another study of poor countries alone showed that being 1°C warmer in any given year reduces income per head by 1.4%. These findings would not have surprised Montesquieu, who in 1748 argued that hot climates were inimical to the material conditions of the good life.

But it does not follow that if global temperatures were to rise by 1°C because of climate change, then world output would be 8.5% lower than it would otherwise have been. Perhaps the correlation between heat and poverty might exist because of some third factor (for example, the presence of malaria). If it were possible to change that factor (ie, eradicate the disease), temperature might cease to matter. Recently, tropical regions from southern China to Rwanda have been among the world’s most economically successful.

However, a correlation also exists between heat and growth, suggesting a longer-run effect. Despite some successes, tropical countries grew by 0.9 percentage points a year more slowly than the global

average in 1965-90. In a sample of 28 Caribbean countries national output fell by 2.5% for each 1°C of warming. Again, this does not prove that high temperatures were to blame. But the correlation is strong enough to make it worth investigating whether the weather itself might be dragging down countries' growth rates directly. The new literature suggests several ways in which it might do that.

First, natural disasters still wreak a lot of damage. One study reckons cyclones pushed down the world's annual GDP growth by 1.3 points in 1970-2008. (Poor countries suffer disproportionately because they are more vulnerable to such disasters.) So if global warming were associated with more extreme weather, it would lower growth.

Next, higher temperatures and worse droughts tend to reduce farm yields. This hurts poor and middle-income countries most because agriculture has a bigger share in their GDP. To take one case, a decline in rainfall of one standard deviation cuts Brazilian farm incomes by 4%. But the agricultural effect of changing weather varies a lot. There seems to be a threshold of 29°-32°C below which rising temperatures can be beneficial; above it they are sharply harmful. With some crops, rising night-time temperatures do more damage than rising noontime ones. Farmers also adapt to higher temperatures by planting new crops or by emigrating to cities. So the impact of rising temperatures on farming is heterogeneous and hard to measure.

It is often assumed that the economic effects of climate change will be confined mainly to poor countries. That may be wrong. A study of time-use surveys and temperatures in the United States found that when temperatures reach 100°F (38°C), the labour supply in farming, forestry, construction and utilities falls by an hour a day, compared with what happens at 76-80°F. These are outdoor activities, which may explain why workers fail to show up. But a study of call centres also showed that each 1°C rise between 22°C and 29°C cut labour productivity by 1.8%. And in car factories in America, a week of outside temperatures above 90°F reduced output by 8%. Perhaps the heat disrupts the supply chain—or perhaps air conditioners fail to work properly.

Lastly, the weather influences basic conditions of life and hence factors of production. In America each additional day above 32°C raises the annual age-adjusted mortality rate by 0.1% relative to a temperate day (10-15°C). In India the rate increases by almost 0.8%. Heatwaves cause early deaths (especially of mothers and infants) and, by affecting the harvest, damage nutrition. This in turn has long-lasting effects on the economy.

Uncertain, with a chance of sub-optimal equilibrium

Almost all these correlations derive from weather data from the past five or ten years. But drawing conclusions about climate change—which takes place over hundreds of years—is perilous. Even more than with farming, the impact of climate change will be "non-linear": changes may be modest up to a point, then turn dramatic. Meanwhile, people can adapt in important ways to changing conditions. This makes simple extrapolation nonsense.

But the new literature is a start. It shows how information in models of climate impact—recently described as "completely made up"—can be improved. It shows the multiple channels that economists of the climate must heed. It suggests that climate change is not something that will affect only poor countries, or hit rich ones only in the distant future. And—who knows—it may one day show how public policy, now so ineffective, might stem the emissions that are causing the mess in the first place.

Sources

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