

Research links temperature to economic performance

Global warming will hurt many nations, study authors say

BY SETH BORENSTEIN
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WASHINGTON — With each upward degree, global warming will singe the economies of three-quarters of the world's nations and widen the north-south gap between rich and poor countries, according to a new study.

Compared to what it would be without more global warming, the average global income will shrivel 23 percent at the end of the century if heat-trapping carbon dioxide pollution continues to grow at its current trajectory, according to a study published this week in the scientific journal *Nature*.

Some countries, like Russia, Mongolia and Canada, would see large economic benefits from global warming, the study projects. Most of Europe would do slightly better, the United States and China slightly worse. Essentially, all of Africa, Asia, South America and the Middle East would be hurt dramatically, the economists found.

"What climate change is doing is basically devaluing all the real estate south of the United States and making the whole planet less productive," said study co-author Solomon Hsiang, an economist and public policy professor at the University of California at Berkeley. "Climate change is essentially a massive transfer of value from the hot parts of the world to the cooler parts of the world."

Lead author Marshall Burke of Stanford and Hsiang examined 50 years of economic data in 160 countries and found what Burke called "the goldilocks zone in global temperature at which humans



LAURENT DUBRULÉ/EPA

Environmental activists march in Belgium this week. A study found global warming will singe economies.

are good at producing stuff" — an annual temperature of around 55.4 degrees Fahrenheit, give or take a degree.

For countries colder than that economic sweet spot, every degree of warming heats up the economy and benefits. For the U.S. and other countries already at or above that temperature, every degree slows productivity, Burke and Hsiang said.

The 20th century's global average annual temperature was 57 degrees, according to the National Oceanic and Atmospheric Administration.

Last year — the hottest on record — was 58.24 degrees, and this year is almost certain to break that record, according to the NOAA. Burke and Hsiang use different population-weighted temperature figures than the NOAA calculates.

But the U.S. economy is humming despite the heat. When asked how that can be so, Burke said there were many factors important to growth. He said one year's temperature and economic growth in one nation isn't telling. Instead, he and Hsiang looked at more than 6,000 "country-years" to get a bigger picture.

Burke compared the ef-

fect of global warming on economies to a head wind on a cross-country airplane flight. The effects at any given moment are small, but they add up.

The authors' main figures are based on the premise that carbon dioxide emissions will continue to rise at the current trajectory. But countries across the world are pledging to control if not cut carbon pollution as international leaders prepare for a summit on climate change in Paris later this year. If the current pledges are kept, the warming cost in 2100 will drop from 23 percent to 15 percent, Burke said.

Gary Yohe, an environmental economist at Wesleyan University in Connecticut, praised the study as significant and thorough, saying Burke and Hsiang "use the most modern socio-economic scenarios."

But Richard Tol, an economist at the University of Sussex in England, dismissed the study as unworthy to be published, saying "the hypothesized relationship is without foundation."

Other experts found good and bad points, with Massachusetts Institute of Technology's John Reilly saying it will spark quite a debate among economists.