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Column Climate change will be an economic disaster for rich and poor, new study says



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The argument against addressing climate change always has been fundamentally an economic one: We can't afford the needed disruptions to our fossil fuel-driven society.

Now a trio of researchers at UC Berkeley and Stanford have come to the opposite conclusion. In a paper just published in *Nature*, they find that we can't afford *not* to address climate change. That's because the phenomenon will have devastating effects on the global economy, reducing average global incomes by nearly one-fourth relative to a world without climate change and widening the gap between rich and poor countries.

That's a much greater effect than previous studies have projected. What's worse, the new paper by Solomon M. Hsiang and Edward Miguel of Berkeley and Marshall Burke of Stanford suggests that rich countries aren't immune from the economic hit, as others have postulated.

The impact of warming worsens over time for any country that becomes warmer, they write. "We cannot assume rich countries will be unaffected... nor can we assume that the impacts of future warming will attenuate over time as countries become wealthier." In simple terms, that means that all countries, rich or poor, are in this together.

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It also means that an attack on climate change could yield much greater gains than previous assumptions have implied. It may be hard to justify the expense of mitigation if the cost of climate change is estimated at a mere 1% to 2% of gross domestic product. "But it's a lot different," Burke

told me, "if the costs [of climate change] are more like 23%." That's the reduction in global incomes he and his co-authors projected by 2100. "It tells us we should have a lot more options on the table than we've had before."

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The most severe effects will be felt by countries in the already-warm zones destined to become warmer. That encompasses Latin America from Mexico south; all of Africa, the Middle East, Australia, and all of Asia south of China. (See map above.)

Regions now in the temperate zone that will get warmer and therefore less economically productive encompass the United States, China and southern Europe, including Spain, Italy and Greece. Regions that may remain relatively cool and may experience an increase in productivity, or at least a relative advantage over other regions, include Canada, much of the rest of Europe, and Russia (including its Asian regions).

The new paper arises from the relatively new field of the economics of climate change. "We are only beginning to understand just how much damage a changed climate can wreak," writes economist Thomas Sterner of the University of Gothenburg, Sweden, in a [companion editorial](#) in *Nature*. But these new findings imply that the damage will be "much more serious than is generally believed."

The new paper reached its conclusions by taking a new approach to modeling the effect of climate change. Previous studies of country-wide impacts tended to smooth out the effects of localized disturbances in crop or human productivity. This misled researchers into thinking that wealthier countries with varied economies could escape all but modest effects of climate change, write Burke, Hsiang and Miguel.

Their findings undermine this assumption. By comparing a country's own economic performance during warm spells and cooler spells--thus using a country as its own "control"--they determined that overall economic productivity peaks at an average annual temperature of about 55 degrees Fahrenheit (13 degrees Celsius), then drops off sharply. "Labor supply, labor productivity, and crop yields all decline abruptly" beyond 68 and 86 degrees F (20-30 degrees C).

For comparison, the optimal temperature of 55 degrees F is about that of the Bay Area or New York City. In today's climate almost no country reaches 30 degrees C year-round, though regions of some countries may hit that mark seasonally. But the authors' calculations suggest that once the optimal temperature is passed, the effects of continued warming grow quickly. Importantly, they calculated the economic effect of temperature alone, not even counting the cost of ancillary effects such as more severe storms or coastal flooding.

The relationship between economic productivity and temperature, applied globally, has been unchanged since 1960, and holds for "agricultural and non-agricultural activity in both rich and poor countries," the authors say. The bottom line is that they expect average global incomes to be 23% lower by the year 2100, relative to a world without climate change. Some 77% of countries will be poorer in per capital income than otherwise, and some--5% of all countries and 43% of less-developed countries--will be absolutely poorer at the turn of the next century than they are today.

The findings are also the tip of the iceberg, Burke says. "Just in the past five years we've learned a ton about how various economic and social phenomena respond to climate change. Every rock we look under has been surprising. Health, human violence, and labor productivity are all affected by hotter temperatures."

The paper concludes with a caution that "unprecedented innovation or other adaptations might reduce the toll of warming and social conflict or other disruptions might worsen them. They're not optimistic, Burke says: "In the historical record we don't see signs that rich countries are more adaptive, or that the world as a whole has gotten better at it."

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