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Q&A WITH EARTH SYSTEM SCIENCE PROFESSOR MARSHALL BURKE ON CLIMATE CHANGE ECONOMICS

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Contributing Writer

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Assistant professor of earth system science Marshall Burke recently collaborated with UC Berkeley professors Solomon Hsiang and Edward Miguel to investigate the global economic impacts of climate change. Their [paper](#), published on Oct. 21 in *Nature*, analyzes data from 166 countries between 1960 and 2010 and leads to a sobering projection: The scientists say climate change will cause a 23 percent loss in global GDP by 2100, relative to a world in which no further global warming occurs.

The Daily sat down with Burke to discuss his research.

The Stanford Daily (TSD): How did you and your fellow researchers come to study the economics of climate change?

Marshall Burke (MB): We had earlier work looking at how changes in climate might affect different small parts of the economy. Agriculture was one of the things I had worked on in particular, but also things beyond agriculture, other social and economic phenomena like labor productivity and violent conflict around the world.

But what we didn't see in the literature was a good attempt to put all that together and put a number on it. Given that we see these effects in all these different parts of the economy, what would be the total overall effect?

You want to know that number, if you want to make the key policy decisions about how much to do about climate change, how much to invest in reducing greenhouse gas emissions. About 20 percent — that's a huge pile of money that we could have made but that we didn't because of climate change.

TSD: Who will be affected economically by climate change? Will some countries be hit harder than others?

MB: Our main result is that we find that the effect of climate change in the future depends on what your average temperature is now. And the pattern is pretty stark. We find that if you're in a really cold country right now — imagine Iceland or Norway or parts of northern Russia — you're actually a little bit better off if it gets a bit warmer. I think this is intuitive, right? If it's too cold, it's too cold to grow crops; it's too cold to go outside through part of the year.

So contrast that to countries in the tropics. These countries are already pretty hot on average. The data shows pretty clearly that as these countries warm up beyond their historical average, they're actually hurt by increase in temperature. So we see this sort of differential effect around the world.

TSD: You argue that global warming could increase global wealth inequality. Can you explain?

MB: It turns out that the countries that are really cool right now tend to be pretty wealthy. So we're going to see some small subset of wealthy countries that might actually benefit from warming. But we calculate that over three quarters of the countries in the world are likely to be harmed by global warming. Most of those countries, it turns out, are poor.

TSD: But your research also indicates that wealthier countries will be impacted more than previously

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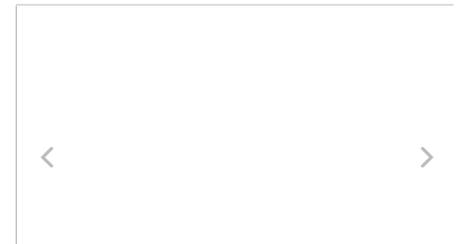
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thought, right?

MB: There are parts of the world where the temperature is just really good for producing stuff, which we find to be 13 degrees Celsius or 55 degrees Fahrenheit — which, it turns out, is the exact annual average temperature of Palo Alto, California. As warming bumps you off that optimum, you could be hurt. So even in countries like the U.S., where the annual average temperature is about 57 degrees Fahrenheit, even a little bit of warming could hurt. So not all rich countries will benefit.

TSD: Could Palo Alto's temperature account for the high productivity here?

MB: Well, one of the other places with an annual average temperature of 55 degrees is New York City, another highly productive place in the country. So, coincidence or not? I would say not, but our data won't speak to that. We're using country-level data.

TSD: Do you think that economic impacts will be more successful than environmental impacts in rallying action against climate change?

MB: Unfortunately, yes, I do. For better or for worse, that's what a lot of policymakers care about, and so the fact that we get a much bigger number than what was in the literature before, we think might persuade some people that this is a problem we should worry about.

TSD: How optimistic or pessimistic are you that we can avoid that future that you projected for 2100?

MB: I'm confident that we'll get at least part of the way there. The best estimates suggest that if we don't do anything, the world will warm up by maybe 4 degrees Celsius [by 2100]. The commitments that people have made for [the Paris Climate Conference] in a month suggest we'll stay below 4 degrees Celsius, but probably above 2 degrees Celsius. Our results suggest that even in that 2 degree Celsius to 4 degree Celsius window, we still see pretty negative effects.

So personally, I think larger investments in emissions reductions would be great. They would pass a basic cost-benefit test. We're not going to get it in Paris most likely, but I'm optimistic that sometime in the future we might be able to get more aggressive reduction targets.

Contact Hannah Knowles at hknowles@stanford.edu.

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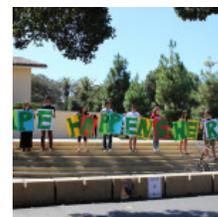
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