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WILL CLIMATE CHANGE DESTROY THE GLOBAL ECONOMY?

BY ED DOLAN

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Climate change is on course to do a lot of harm to our planet. That is why concerned economists like myself advocate measures that would at least slow the pace of damage and give us more time to adapt. Paradoxically, though, economists rarely discuss what global warming is likely to do to the economy itself. Will climate change destroy the global economy as it raises sea levels, intensifies extreme weather, and kills our crops? The

answer turns out to be more complex than you might think.

It is certainly not as simple as David Wallace-Wells endeavors to make it in his widely read New York Magazine (**http://nymag.com/daily/intelligencer/2017/07/climate-change-earth-too-hot-for-humans.html?utm_campaign=nym&utm_medium=s1&utm_source=tw**) article. In it, Wells describes an uninhabitable earth and a devastated global economy by the end of the century. Here is how he explains the economic consequences of climate change:

The most exciting research on the economics of warming has also come from [Solomon] Hsiang and his colleagues, who are not historians of fossil capitalism but who offer some very bleak analysis of their own: Every degree Celsius of warming costs, on average, 1.2 percent of GDP (an enormous number, considering we count growth in the low single digits as “strong”). This is the sterling work in the field, and their median projection is for a 23 percent loss in per capita earning globally by the end of this century (resulting from changes in agriculture, crime, storms, energy, mortality, and labor.)

Tracing the shape of the probability curve is even scarier: There is a 12 percent chance that climate change will reduce global output by more than 50 percent by 2100, they say, and a 51 percent chance that it lowers per capita GDP by 20 percent or more by then, unless emissions decline. By comparison, the Great Recession lowered global GDP by about 6 percent, in a one-time shock; Hsiang and his colleagues estimate a one-in-eight chance of an ongoing and irreversible effect by the end of the century that is eight times worse.

The scale of that economic devastation is hard to comprehend, but you can start by imagining what the world would look like today with an economy half as big, which would produce only half as much value, generating only half as much to offer the workers of the world.

The problem, however, is that the paper to which Wallace-Wells refers says nothing of the sort. The paper was written by Marshall Burke, Solomon Hsiang, and Edward Miguel, and published in Nature (<https://www.nature.com/search?journal=nature%2Cnews&q=burke%20hsiang%20miguel>) in 2015. The authors do not say that climate change will make the world economy of the future smaller than it

is now, but rather, smaller than it would be without climate change. Here is a quote:

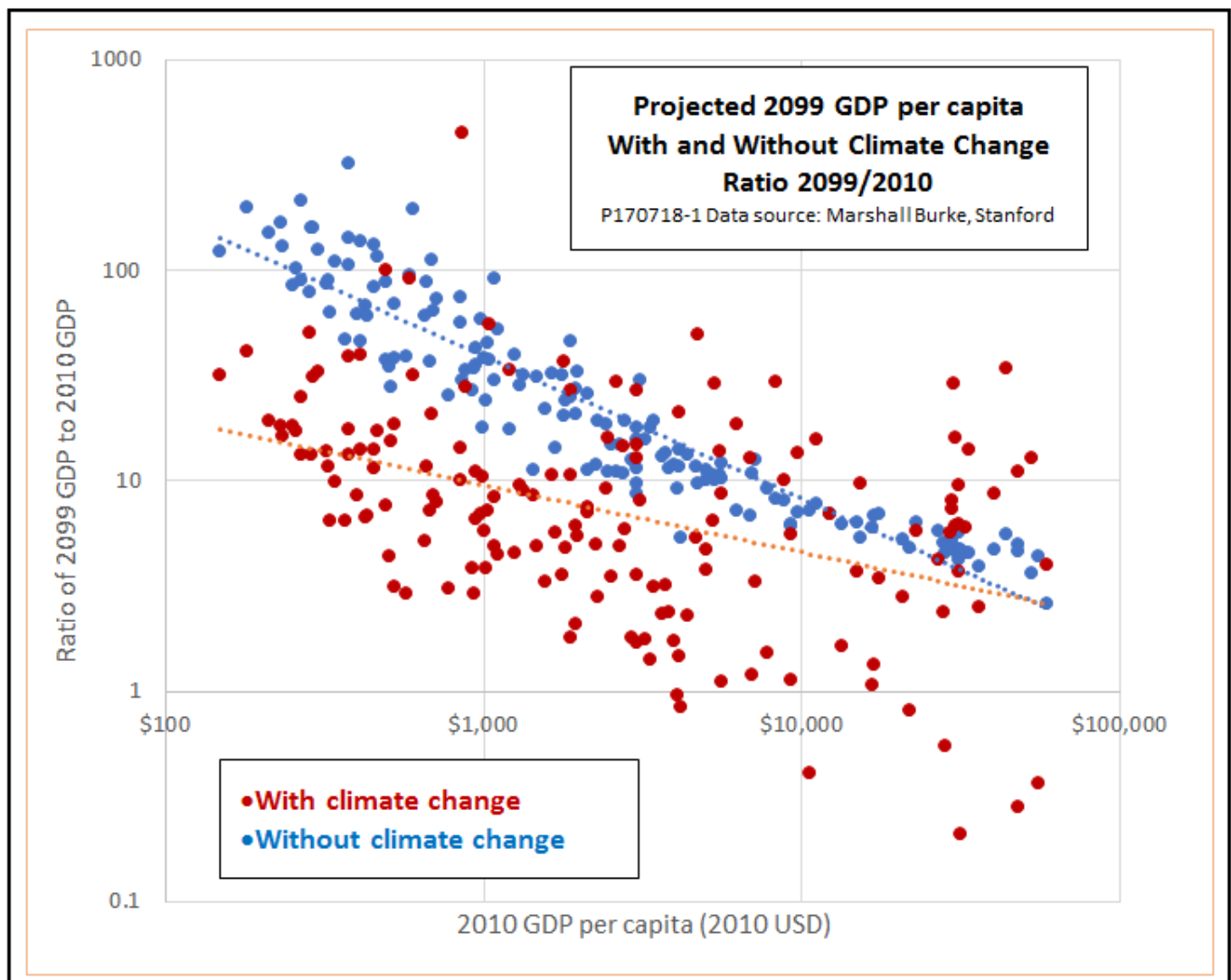
[U]nmitigated warming is expected to reshape the global economy by reducing average global incomes roughly 23% by 2100 and widening global income inequality, relative to scenarios without climate change. [Emphasis added.]

Just how large would the economy be by the end of the century if we ignore the effects of climate change? That depends on a number of assumptions about technology, population, and economic policies. For example, the OECD (<https://www.oecd.org/eco/outlook/2060%20policy%20paper%20FINAL.pdf>) thinks the total output of the global economy will grow at three percent for the next 50 years. Projecting that rate to the end of the century would make global real GDP about fourteen times higher in 2099 than in 2010. Burke et al. do not make specific forward-looking estimates of growth rates. Instead, they assume that per capita GDP in each country will grow from 2010 to 2099 at the same rate it grew from 1980 to 2010.

That implies an unweighted average annual growth rate of 2.35 percent, which would make per capita global GDP about eight times higher in 2099 than in 2010.

Based on these estimates, if climate change cuts real GDP by 23 percent relative to what it otherwise would be, total output of the global economy would still be eleven times larger than it is today, using the OECD estimate for growth. With the method used by Burke et al., per capita GDP in 2099, with climate change, would be more than six times higher in 2099 than in 2010.

For a broader perspective, Burke and his colleagues calculate the effects of climate change for scenarios using more than one set of assumptions about population growth, technologies, and other variables. Burke has posted online (<https://web.stanford.edu/~mburke/climate/data.html>) complete country-by-country growth estimates for a scenario called SSP5. The following chart, based on that data, shows the ratio of estimated 2099 GDP per capita to 2010 GDP per capita for 165 countries without climate change (blue dots) and with climate change (red dots). The points are arranged along the horizontal axis according to 2010 GDP per capita, so for each country, the blue dot lies directly above or below that same country's red dot.



(<https://niskanencenter.org/wp-content/uploads/2017/07/Dolan.png>)

Note that although climate change is, on average, detrimental to GDP, it actually causes GDP to increase for 38 of the 165 countries. The biggest winners are countries that were both cold to begin with and grew rapidly in the base period, with Mongolia, Finland, Iceland, and Russia at the top of the list. The biggest losers are countries that were hot to begin with and grew slowly in the base period, with Saudi Arabia, Kuwait, Oman, and the United Arab Emirates faring worst of all.

In Scenario SSP5, few countries suffer an absolute loss of GDP per capita as a result of climate change, but that is not true for all of the scenarios that Burke et al. explore. Although they have not posted complete data for some of the more pessimistic scenarios, they do have this to say in an FAQ (https://web.stanford.edu/~mburke/climate/BurkeHsiangMiguel_FAQ.pdf):

... our findings indicate that if climate change proceeds unmitigated, many people in the future will actually be poorer than they are today! The effects of climate change are so large for many hot countries that we expect 5-43% of countries to actually get poorer over the 21st century in absolute terms, i.e. poorer than they are today. So, our results suggest that we can't just assume that everyone will keep getting richer.

But to say that some people in some countries will be somewhat poorer (not necessarily 23 percent poorer) than today is a lot different from saying that climate change will devastate the global economy as a whole. It also implies that the far wealthier, less-impacted areas of the world will close off migration and cut off foreign aid to the worst-impacted areas. Writing in The Atlantic, Robinson Meyer (<https://www.theatlantic.com/science/archive/2016/10/trump-the-first-demagogue-of-the-anthropocene/504134/>) explains why many observers fear such an outcome. Still, that would be a political decision, not one forced on them

by economic decline or climate science.

When you think about it, it is hardly surprising that Hsiang's models, and most others, see the likely future as one with both continued global warming and continued economic growth. After all, there is a fundamental causal relationship between the two. The standard models are built on the premise that economic activity is the principle source of the carbon emissions that drive climate change to begin with. Given the structure of the models, then, if the economy were to begin shrinking rather than growing, then other things equal, climate change itself would slow.

But if Wallace-Wells is wrong, and if the most likely future is, after all, one of more climate change and a much larger economy, does that let us off the hook? Can we relax and assume that much wealthier future generations will somehow figure out how to cope? Not really. Climate change still poses two big problems.

One problem is that we might not like a future world with great wealth but widespread environmental devastation. To me, such a future sounds uncomfortably like life in, say, today's United Arab Emirates—a world where you can ski, but only on artificial snow and artificial indoor mountains (<https://www.youtube.com/watch?v=KeMcIKnPLdA>); you can smell the flowers, but only in a garden; and you can see animals, but only in a zoo. Economics is supposed to be about tradeoffs. Personally, I'd be happy to trade some future GDP for a greener, healthier planet. It has always seemed strange to me (http://econpapers.repec.org/article/ctojournal/v_3a26_3ay_3a2006_3ai_3a3_3ap_3a445-468.htm), and it continues to seem strange to others (<https://niskanencenter.org/blog/libertarian-principles-climate-change/>), that opponents of action on climate change, especially those professing libertarian values, should think that the goal of government should be to maximize GDP without

considering other values.

The other problem is that the scenario of great wealth amid environmental ruin is only the most likely outcome if we continue with business as usual. Even the models used by Hsiang and his colleagues indicate that environmental ruin plus global poverty is a possibility, one with enough statistical likelihood to worry about.

That is why serious economists view the problem of climate change as one of risk management. Among the best-known advocates of that approach are Gernot Wagner of the Environmental Defense Fund and Martin Weitzman of Harvard. A website that provides numerous links (<http://gwagner.com/books/climate-shock/>) to their books and articles summarizes their thinking this way:

If you had a 10 percent chance of having a fatal car accident, you'd take necessary precautions. If your finances had a 10 percent chance of suffering a severe loss, you'd reevaluate your assets. So if we know the world is warming and there's a 10 percent chance this might eventually lead to a catastrophe beyond anything we could imagine, why aren't we doing more about climate change right now? We insure our lives against an uncertain future—why not our planet?

In their view, measures to mitigate and adapt to climate change policies are worth the costs they entail now in order to avoid small risks of large future losses. They point out that prudent business firms pursue such risk management strategies all the time, diverting resources from short-term profits to increase the chance of long-term survival. Farmers insure their barns, bankers set aside a cushion of capital against loan losses, hospitals install backup generators in case the power goes out in the middle of

someone's open-heart surgery.

So, what is the answer to our question? Will climate change destroy the global economy? Probably not, at least not in this century and not according the models used most widely in economics and climate science. If we want to pursue business as usual, a world of greater economic wealth amid a severely degraded environment is the most likely outcome.

However, as Joe Romm (<https://thinkprogress.org/climate-change-doomsday-scenario-80d28affef2e>) points out in a commentary on Wallace-Wells' article, neither economics nor climate science actually doom us to such a future. Instead, we are choosing to be doomed. We could instead choose to invest now in certain measures to mitigate and adapt to climate change. We could choose policies like carbon taxes (<https://dolanecon.blogspot.com/2013/07/why-conservatives-should-love-carbon.html?m=0>) that encourage such investments.

Or not.

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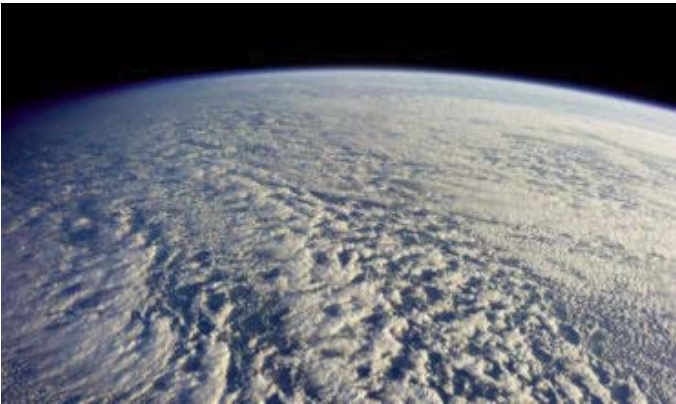
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