

New Paper “Climate economics support for the UN climate targets” out in @NatureClimate. We update the DICE model by Nobel Laureate Nordhaus...

 threadreaderapp.com/thread/1282715768967303168.html

New Paper “Climate economics support for the UN climate targets” out in [@NatureClimate](#). We update the DICE model by Nobel Laureate Nordhaus along a number of dimensions & show that there is no discrepancy between the UN targets & the model’s optimal climate paths. A thread:

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ANALYSIS

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Climate economics support for the UN climate targets

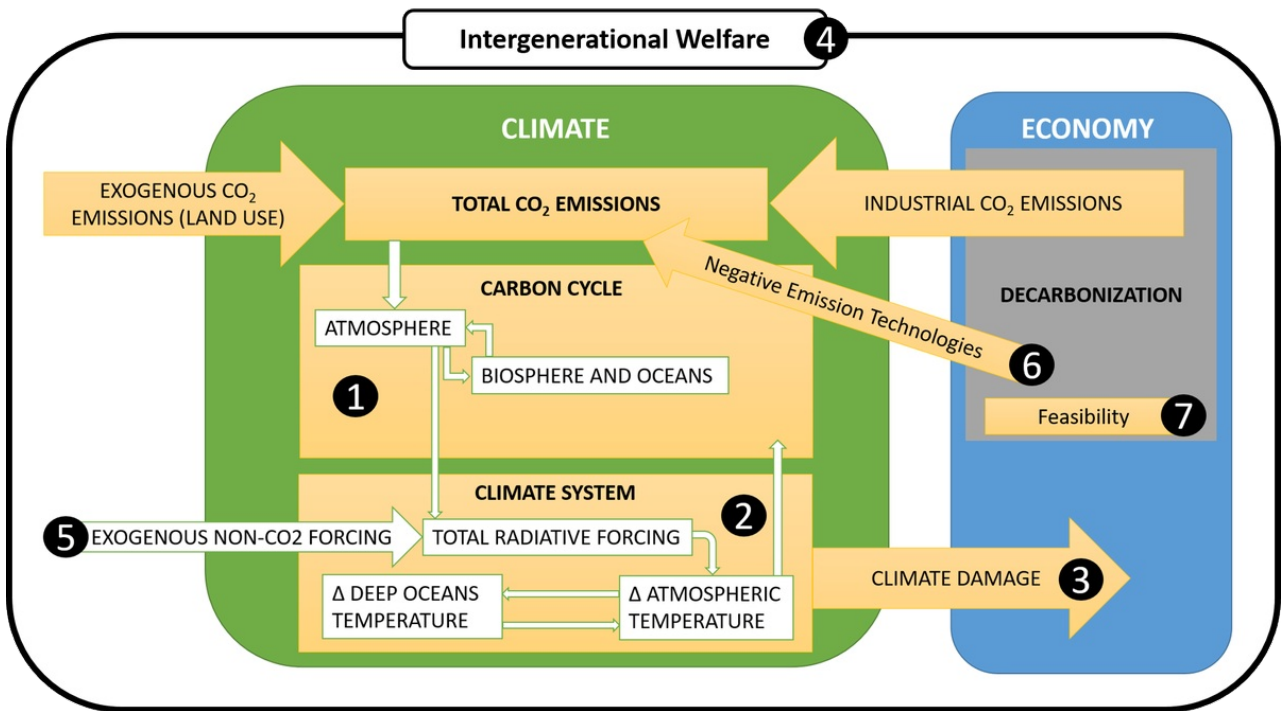
Martin C. Hänsel ¹, Moritz A. Drupp ^{2,3}, Daniel J. A. Johansson⁴, Frikk Nesje^{5,6}, Christian Azar⁴, Mark C. Freeman ⁷, Ben Groom ^{8,9}  and Thomas Sterner ¹⁰

On the same day the [@IPCC_CH](#) [@JoeriRogelj](#) released its 1.5C report Nordhaus was awarded the [@NobelPrize](#) in Economics i.a. for his Dynamic Integrated Climate-Economy (DICE) model. Using his calibration, 3.5C by 2100 would be the economically optimal outcome

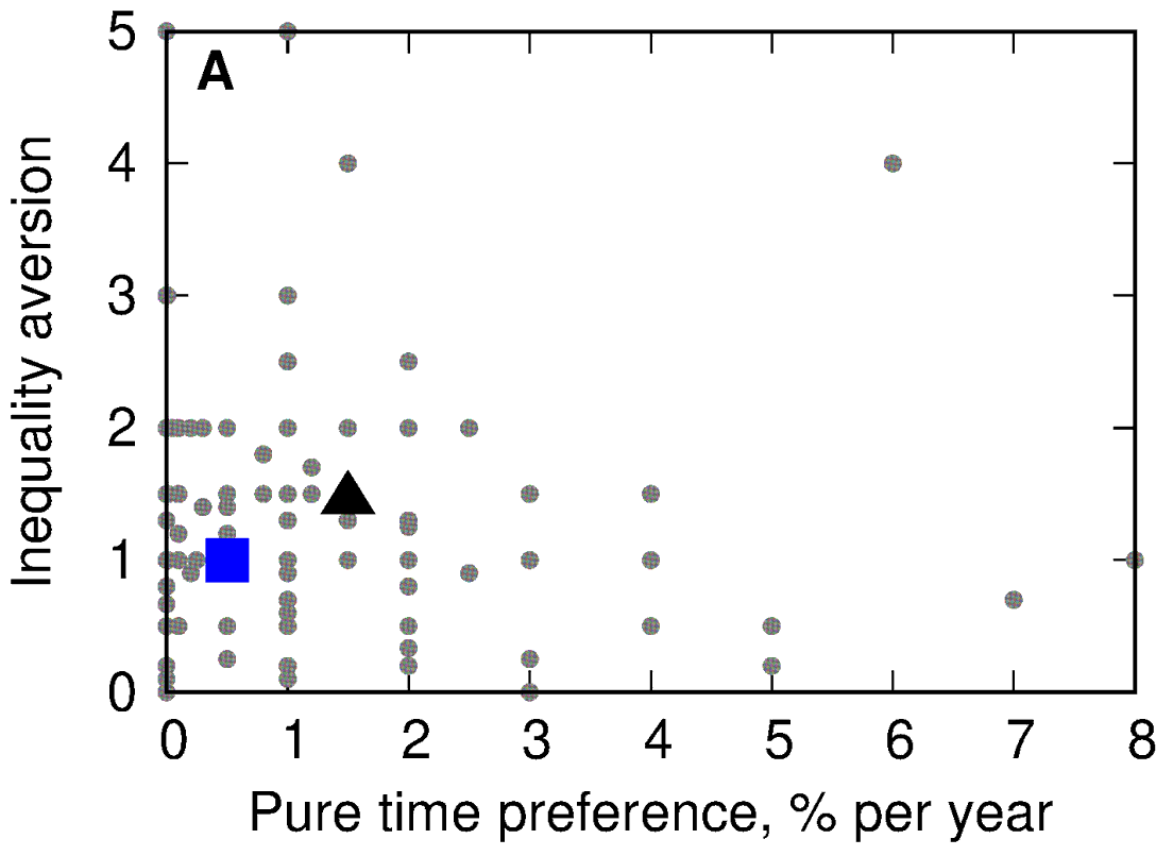
This discrepancy has puzzled observers of the climate debate, led many to question the usefulness of economics to speak to climate policy or call for ignoring it. While any such model analysis should be viewed with a lot of caution, this is unfortunate & unnecessary.

We make a number of updates to DICE from both climate science & economics. Considering these in combination, limiting global warming to <2C strikes an economically ‘optimal’ balance between future climate damages & today’s cost of taking action.

Among others, we use a carbon cycle based on the FAIR model, update the energy balance model, draw on a new meta-analysis of economic climate damages, & run the DICE model for all >170 expert views on the two key discounting parameters determining social welfare in DICE. For this



we take these expert views on pure time preference and the elasticity of marginal utility from our 2018 [@AEA](#) journals survey. Grey dots are individual expert views, in black is the position taken by Nordhaus, and in blue the combined median of the two values from all experts.



Pure time preference specifies how impatient society is or should be when waiting for future well-being. A rate of 1.5% per year (or 0.5%) implies that the well-being in 100 years from now would be valued 77% (39%) less than that of someone living today.

Although not easily seen, 0% (equal weighting of generations) is the most common response among economic experts. 0.5% is the median response and 1.5% corresponds to Nordhaus' calibration. For details, see

Discounting Disentangled Discounting Disentangled by Moritz A. Drupp, Mark C. Freeman, Ben Groom and Frikk Nesje. Published in volume 10, issue 4, pages 109-34 of American Economic Journal: Economic Policy, November 2018, Ab...
<https://www.aeaweb.org/articles?id=10.1257/pol.20160240>

The elasticity of marginal utility can be interpreted as measuring inter-temporal inequality aversion. Due to diminishing marginal utility, the idea is that an additional 1\$ is worth more to a poor person than a rich one.

In a growing economy, e.g. 2%, people in 100yrs will be (7 times) richer & their lower marginal utility motivates discounting via a wealth effect. If this is the only discounting reason & the parameter is 1=median (1.45=Nordhaus), today's value of \$1 in 100yrs is just 14(6) cents

Of course, if you expect no growth, the wealth effect provides no reason for discounting, and the reverse is the case – i.e. valuing future consumption higher – if you'd expect negative growth rates ([@Degrowth info](#))...

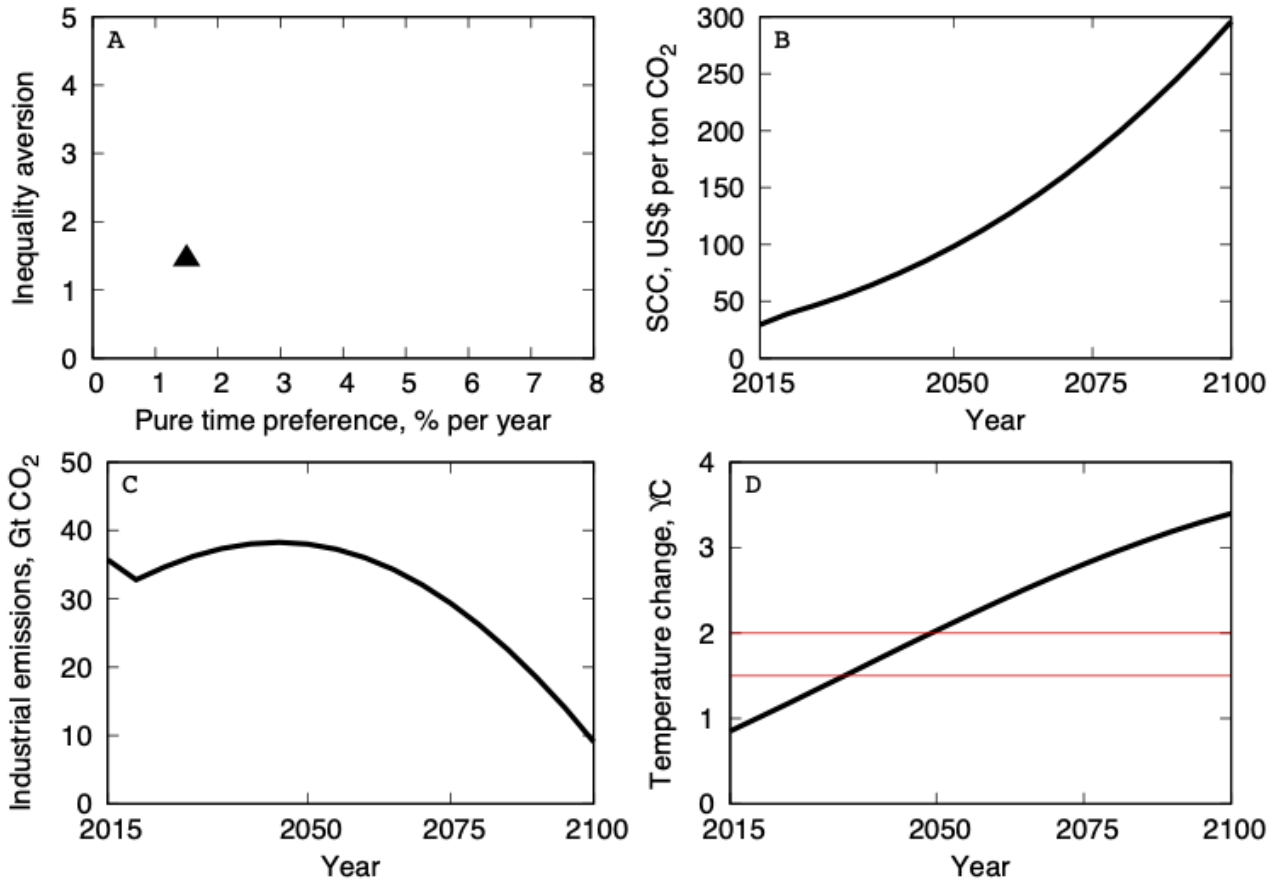
The combinations of these two parameters, in effect, determines social welfare and an optimal climate path in DICE. In an effort to only make conservative changes to the model, we restrain ourselves to the same social welfare framework Discounted Utilitarianism that Nordhaus uses

But: Our 2018 discounting survey shows that experts don't necessarily follow this simple framework and we should note upfront that there are very good reasons to consider a host of alternative ethical approaches. These include, just naming a few, ...

Stochastic viability approaches, with tolerable windows or [#PlanetaryBoundaries](#) ([@jrockstrom](#)), Prioritarianism ([@Treich13](#), [@davidanthoff](#)), & other notions of responsibility and fairness ([@MFleurbaey](#)), etc...

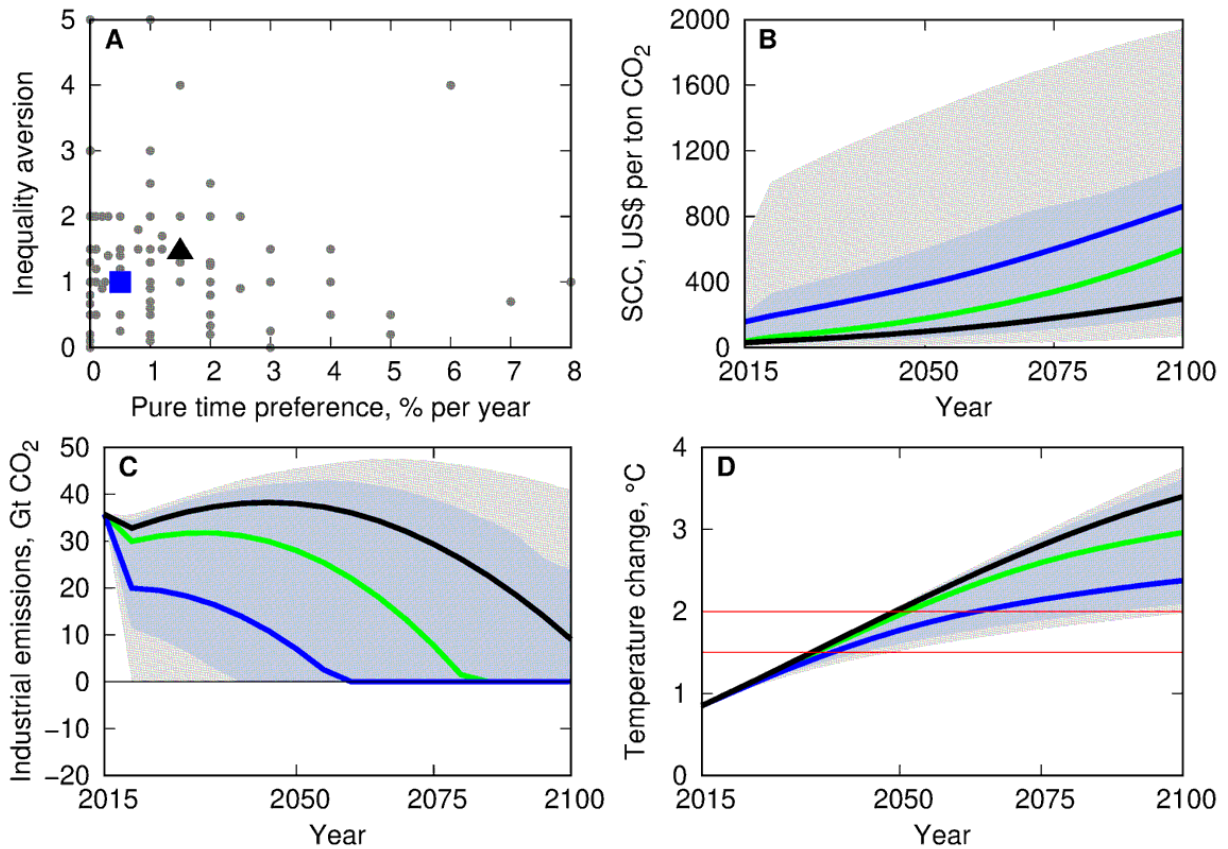
With these words of caution in mind, let's take a first look at Nordhaus' baseline run of DICE (black lines). The initial social cost of carbon (SCC)/carbon price is below \$40, decarbonization (of industrial emissions) happens in the next century & we shoot off

beyond 3.5C...

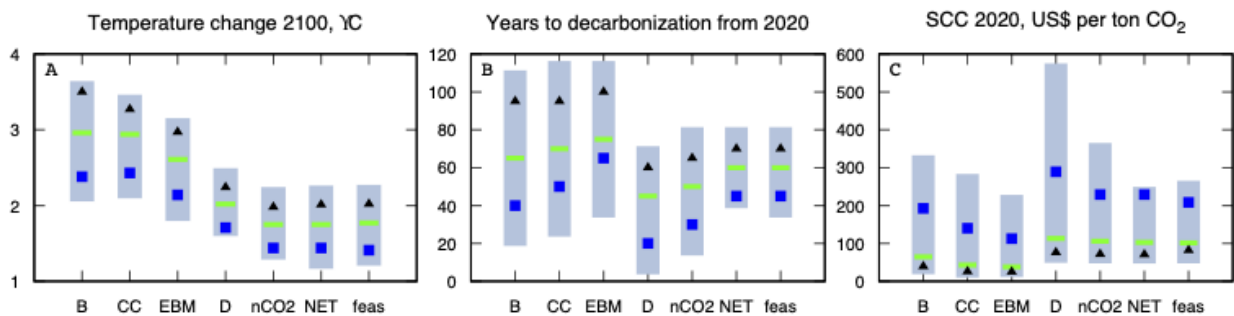


We should now emphasise that even in this constrained setting, there is no single optimal path! That's an ethical choice. We take one step in this direction by running all >170 'optimal' paths for each combined expert view, & consider two 'median votes' on parameters & paths.

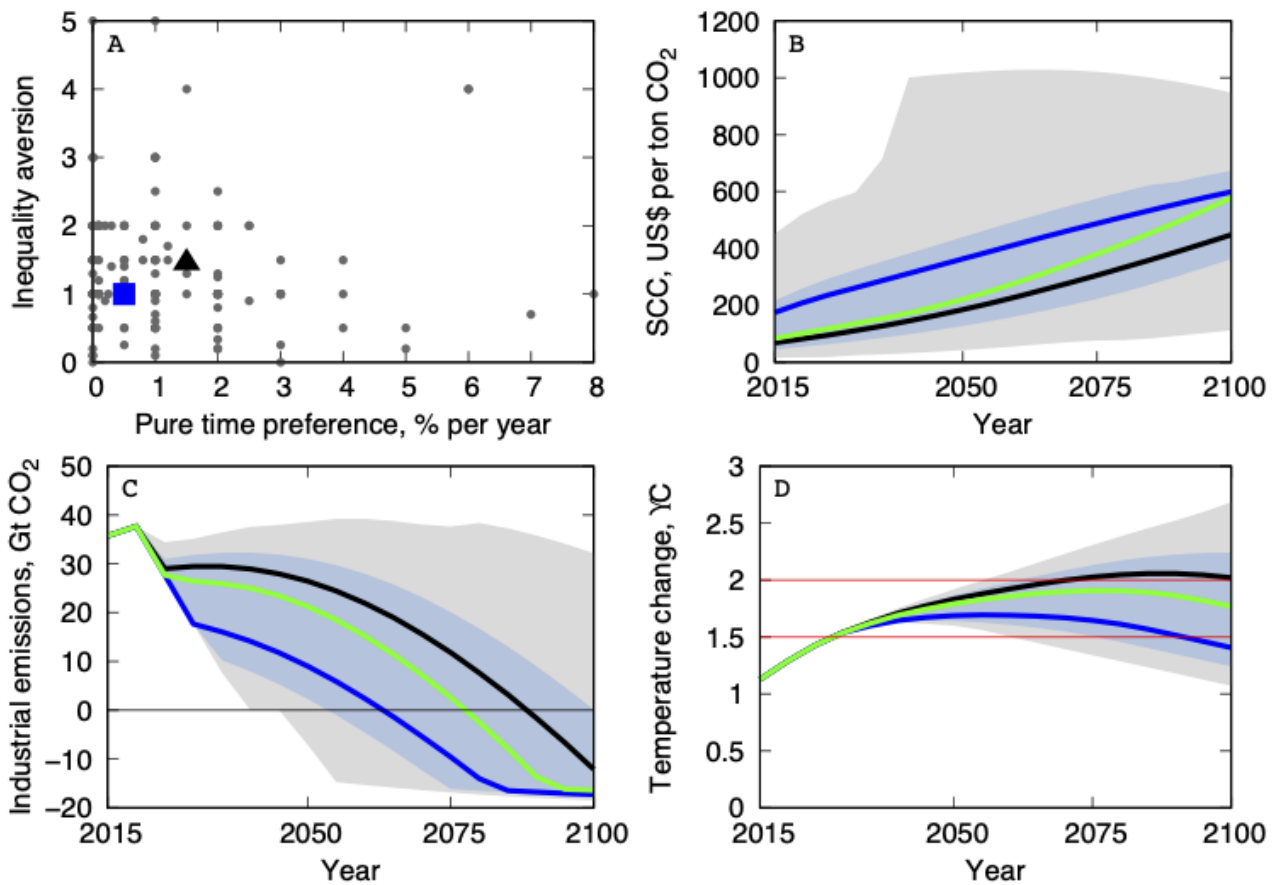
In Nordhaus' baseline model, we accordingly plot the median expert view on parameters (blue) and the median expert path (green) as well as the 66 (blue) and 95 (grey) percentile runs.



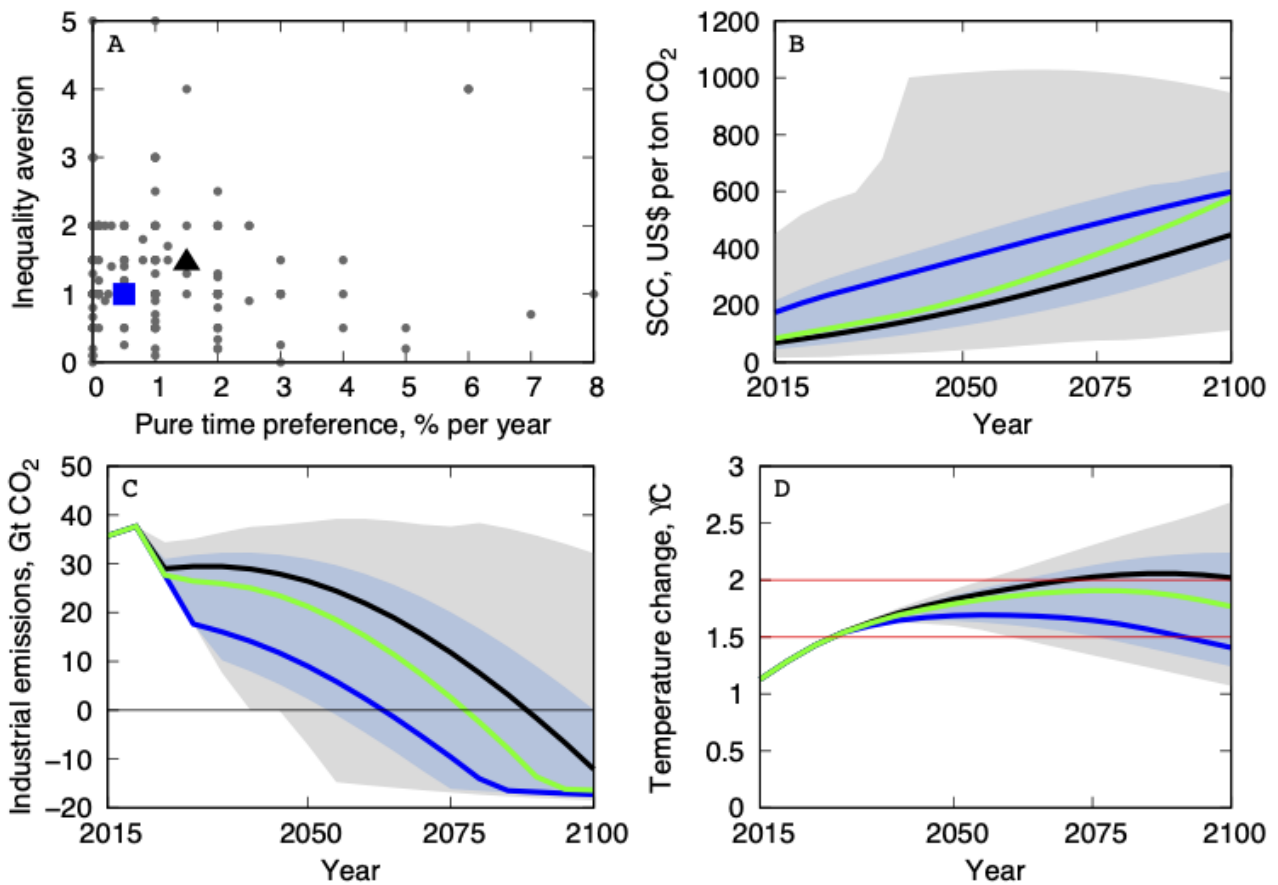
We then build up the different updates summarized in the figure above step-by-step & examine how these impact temperature change, years to decarbonization and the SCC/carbon price, highlighting substantial disagreement (no uncertainty here) on which climate paths we should follow



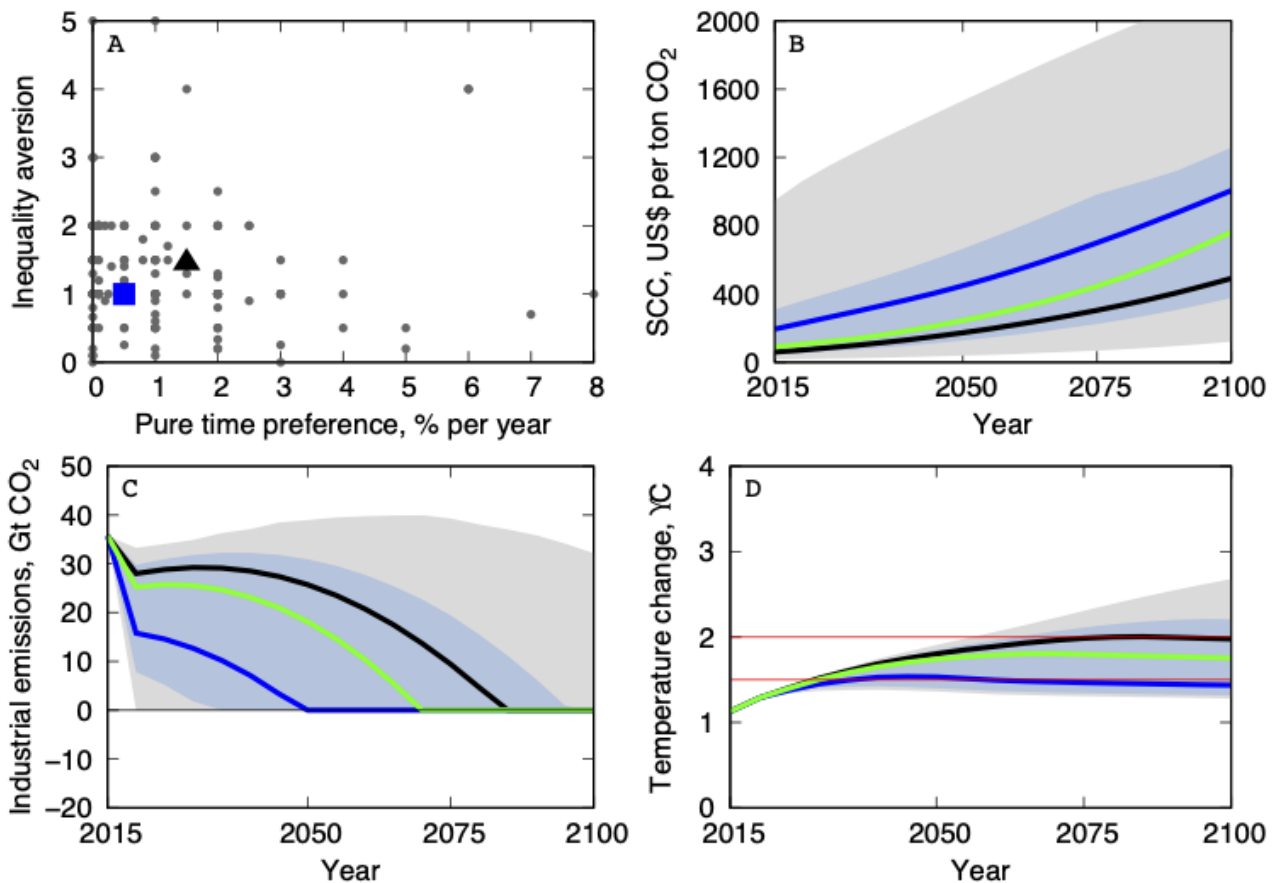
Let's jump to the end after all updates. We still see substantial disagreement stemming from differences in views on social welfare parameters. Nordhaus's view on social welfare would decarbonize within this century, start with a carbon price of \$80 and hit 2C by 2100.



The median paths hits zero emissions by around 2080, stays below 2C and requires an immediate carbon price of around \$100. The run of the median expert view is more stringent with a carbon price of \$200, and hitting below 1.5C in 2100 with interim overshooting.



Now, many things to quibble about; e.g., you may think that we can/should not use negative emissions techs this century? Take a few updates back & see that the UN climate targets still come out as econ. optimal, but that we should decarbonize earlier & need higher carbon prices!



As stated above, there are many caveats going beyond simply tweaking parameters. A comprehensive evaluation of climate policy should consider risk&uncertainty, tipping points, distributional issues within generations, limited substitutability of nature (e.g. biodiversity loss)...

Much more work is needed here. Also, economists certainly don't command the high ground on matters of ethics, so we've also run a similar survey with philosophers too & asked carbon pricing experts directly without imposing the tight structure of such models. Stay tuned!

Fortunately, many smart colleagues are on it too, some of them on twitter, randomly highlighting [@ClimateFran](#), [@GernotWagner](#), [@ProfJeroenBergh](#), [@ivanjrudik](#), [@davidanthoff](#), [@JohannesEmm](#), [@tavoni](#) massimo, [@CGollier](#), ...

I also want to highlight some recent related work i.a. by [@PolicyIntegrity](#), [@LinusMattauch](#) & Dietz et al. from [@GRI](#) [LSE](#) on the relevancy of updating the climate science components, & [@ALevermann](#), who arrive at similar conclusions by using the damage function by [@MarshallBBurke](#)

Last not least: This is joint work with an interdisciplinary team, incl. T. Sterner from [@econGU](#), D. Johansson & C. Azar from [@chalmersuniv](#), [@MarkFreemanYork](#), [@ben_d_groom](#) [@FrikkNesje](#), & [@MartinHaensel](#) from [@PIK](#) [Climate](#), who just

joined Twitter—you should follow him!

Now coming to what may be a bottom line: We can tweak these models hard and long, and it's good that different teams do this independently! At the end of the day it seems to get harder and harder to justify economically not doing very ambitious climate policies.

Our results suggest that we should indeed aim at achieving the UN climate targets. This will likely require carbon prices $> \$100$ in the near future. That's a lot, but with 0.25 Euro per litre of gasoline it may be in the politically acceptable domain if implemented well.

Smart implementation with transparent communication is key here that accounts for distributional implications & uses complementary instruments. Other papers better speak to this, so I refer to work by [@LinusMattauch](#), [@camjhep](#), [@lordstern1](#) et al., also in [@NatureClimate](#)!

Our [@NatureClimate](#) study provides climate economics support for the UN climate targets and is available for free reading at: rdcu.be/b5AvD, feel free to share! [@UNEP](#), [@OECD](#), [@EUClimateAction](#), [@EU_ENV](#), [@beisgovuk](#), [@EPA](#), [@bmu](#), [@SvenjaSchulze68](#), [@Umweltbundesamt](#), ...

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Climate economics support for the UN climate targets

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Under the UN Paris Agreement, countries committed to limiting global warming to well below 2 °C and to actively pursue a 1.5 °C limit. Yet, according to the 2018 Economics Nobel laureate William Nordhaus, these targets are economically suboptimal or unattainable and the world community should aim for 3.5 °C in 2100 instead. Here, we show that the UN climate targets may be optimal even in the Dynamic Integrated Climate-Economy (DICE) integrated assessment model, when appropriately updated. Changes to DICE include more accurate calibration of the carbon cycle and energy balance model, and updated climate damage estimates. To determine economically 'optimal' climate policy paths, we use the range of expert views on the ethics of intergenerational welfare. When updates from climate science and economics are considered jointly, we find that around three-quarters (or one-third) of expert views on intergenerational welfare translate into economically optimal climate policy paths that are consistent with the 2 °C (or 1.5 °C) target.