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Supplementary Information for

Global warming has increased global economic inequality

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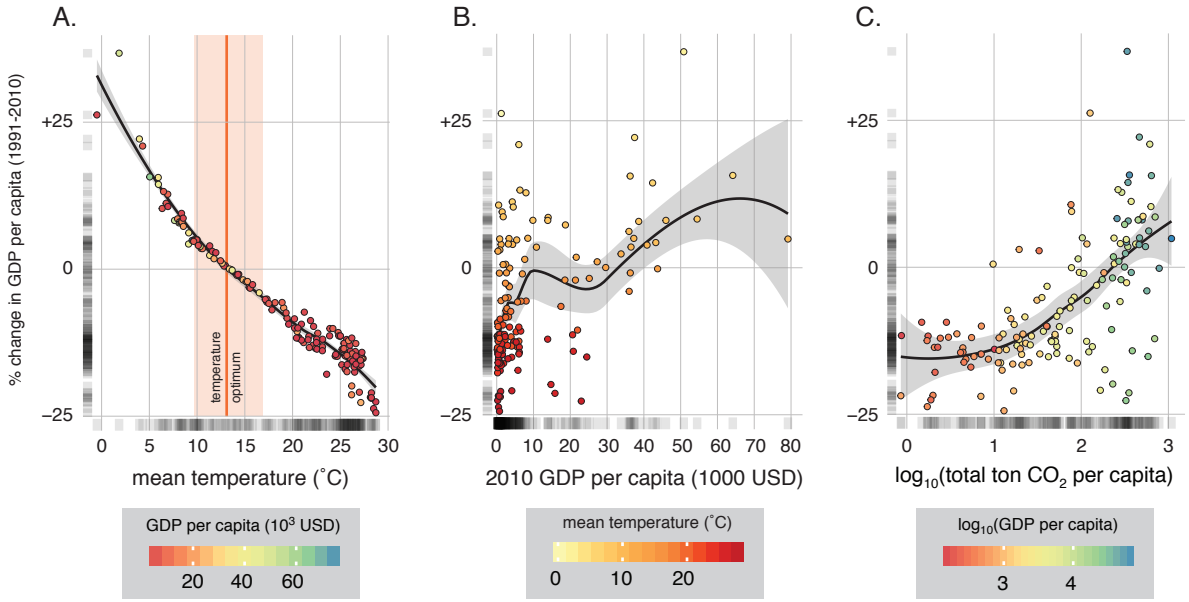

Figure S1. As in Figure 3, but for percent change in GDP per capita calculated for the 1991-2010 period.

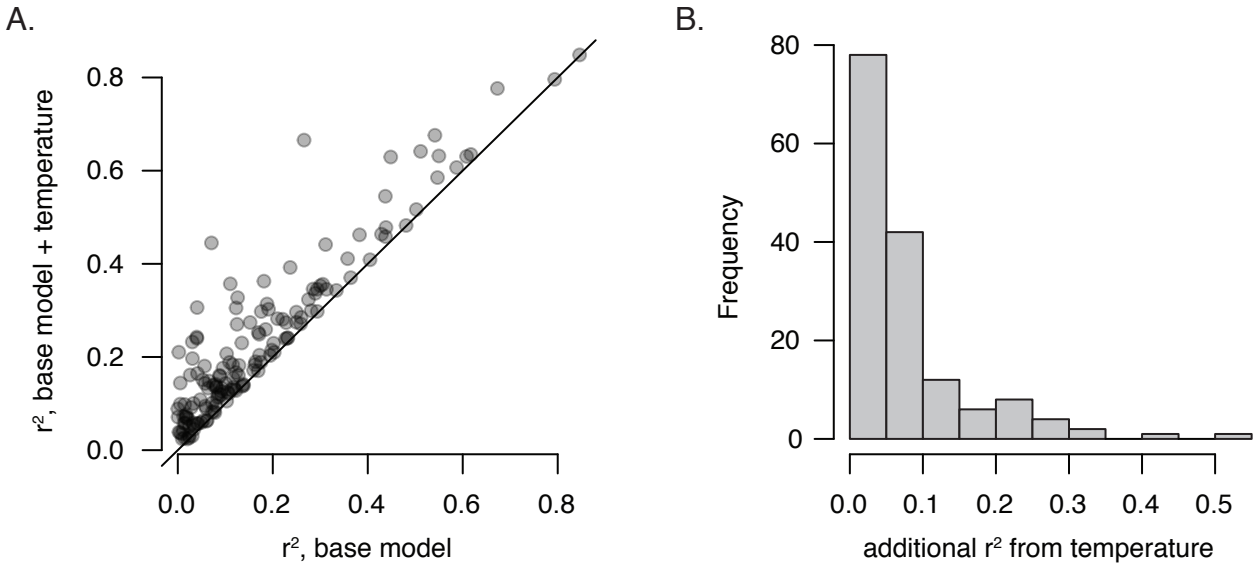

Figure S2. Temperature explains meaningful variation in income growth at the country level. A: Explanatory power of a model with only time trends (x-axis), versus a model that also includes temperature (y-axis). Each point represents values from a country-level time series regression (n=154 countries with at least 20 years of data). B: Histogram of additional variance explained by temperature across countries (mean=8.6% additional variance explained in growth).

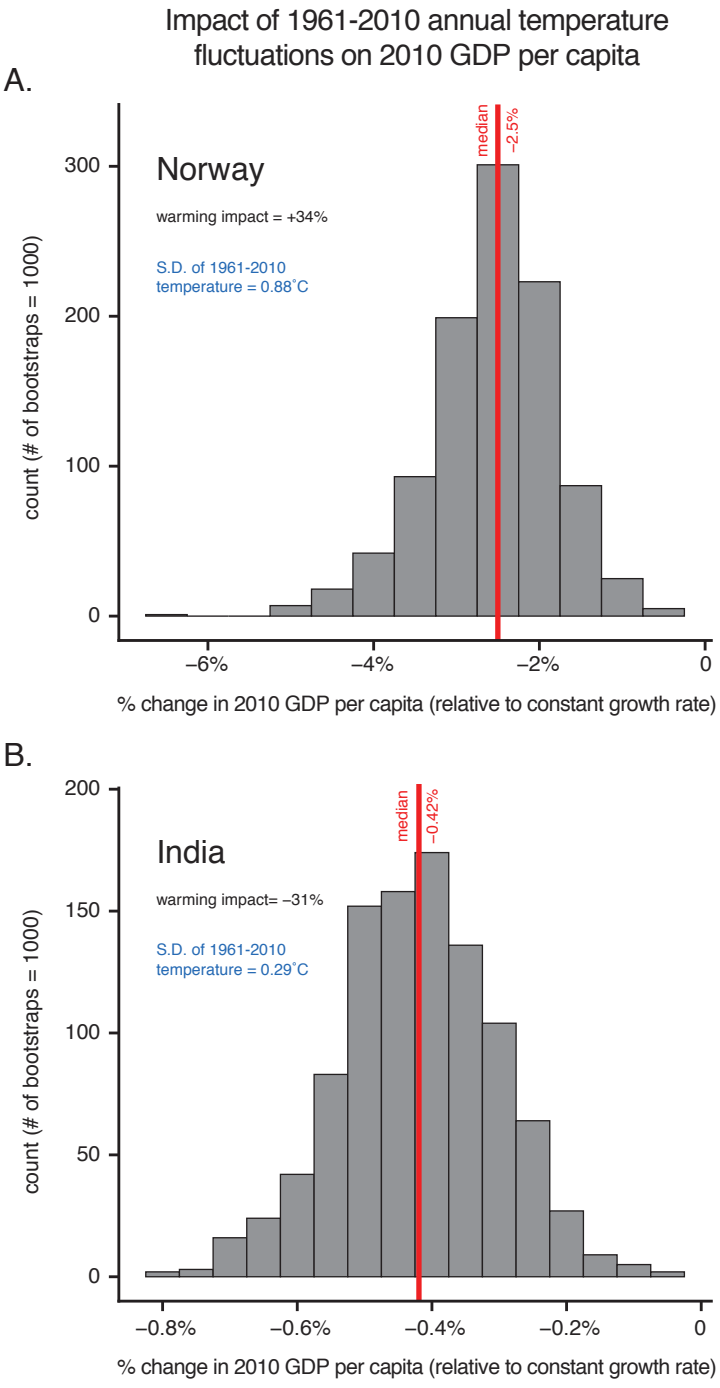

Figure S3. Impact of 1961-2010 annual temperature fluctuations on 2010 GDP per capita. A: The distribution (across the 1000 bootstraps) of percent change in 2010 GDP per capita of Norway caused by Norway's inter-annual temperature fluctuations from 1961-2010, relative to a constant mean-annual growth rate. B: As in A, but for India. The magnitude of the fluctuation effect is small compared to the impact of long term warming. Further, because the temperature variability is generally larger in the higher latitudes than the lower latitudes (e.g., (1)), we can infer that if the negative trends in GDP per capita induced by temperature fluctuations have influenced the overall impact of global warming on country-level inequality, it will have been to slightly dampen the impact of warming (because the fluctuation-induced muting of gains in cool countries will be generally larger than the fluctuation-induced enhancement of losses in warm countries).

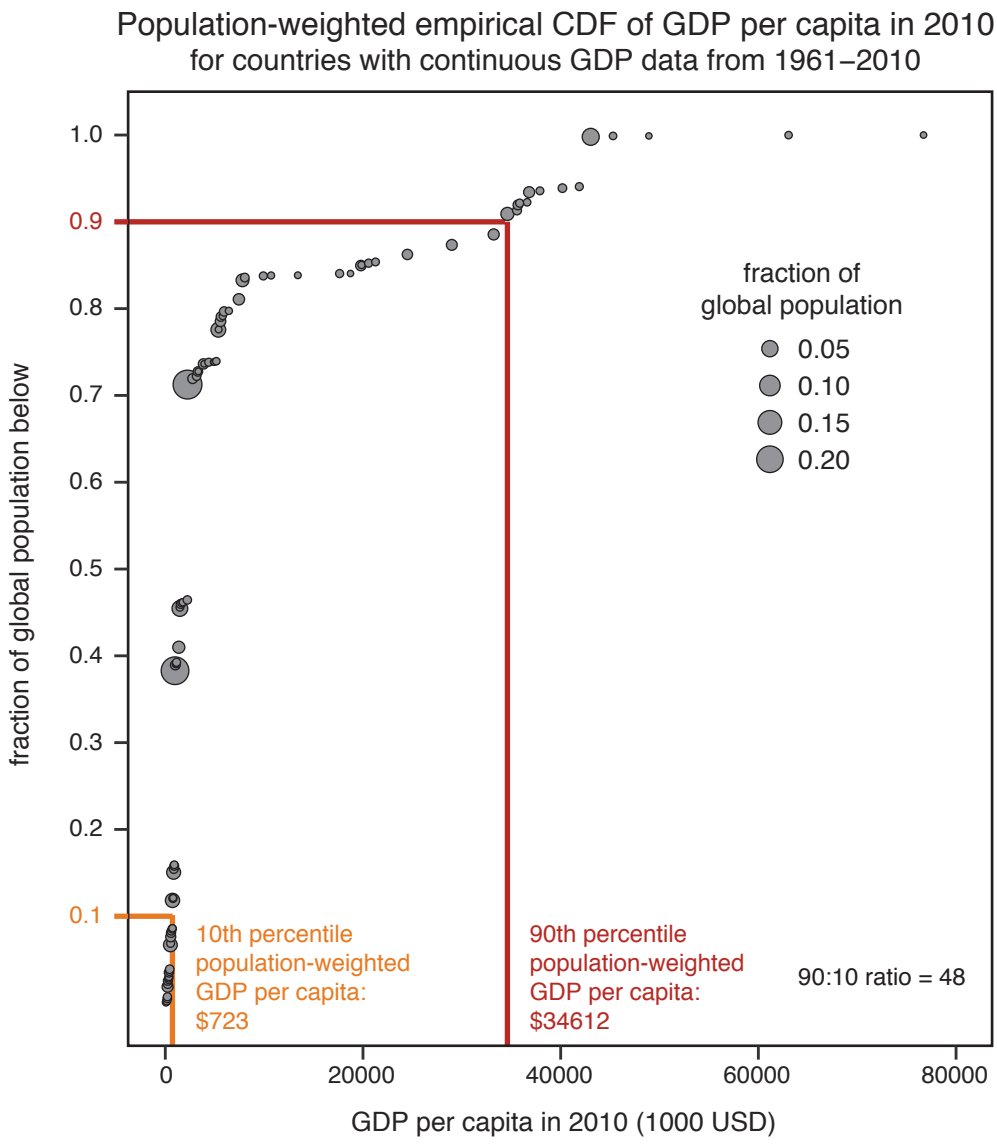

Figure S4. Calculation of the ratio between the top and bottom deciles of the population-weighted per capita GDP distribution. Because of the lack of availability of long timeseries of sub-national economic data, global country-level inequality is calculated as the ratio between the top and bottom deciles using the 10th percentile and 90th percentile of the population-weighted empirical CDF of country-level per capita GDP values. The 10th percentile population-weighted per capita GDP and the 90th percentile population-weighted per capita GDP are calculated as the country-level per capita GDP for which the total population of countries with a lower per capita GDP are 10% and 90% of the total population of countries in the 1961-2010 dataset, respectively. The between-country population-weighted economic inequality is then calculated as the ratio between the 90th percentile and 10th percentile population-weighted per capita GDP ("90:10 ratio").

Table S1. National-level response of per capita GDP to anthropogenic climate forcing shown in Figure 2.

	% change in GDP per capita (median)		probability of economic damage	
country ISO	1961-2010	1991-2010	1961-2010	1991-2010
AGO	–	-12.9%	–	0.998
ALB	–	-0.1%	–	0.490
ARE	–	-22.7%	–	0.999
ARM	–	9.5%	–	0.101
AUS	-7.0%	-4.0%	0.913	0.904
AUT	16.0%	7.9%	0.197	0.099
AZE	–	0.6%	–	0.444
BDI	-23.4%	-11.6%	0.995	0.995
BEL	7.2%	3.5%	0.219	0.111
BEN	-27.9%	-15.2%	0.904	0.904
BFA	-37.4%	-21.8%	1.000	1.000
BGD	-22.8%	-12.0%	0.809	0.904
BGR	–	4.0%	–	0.208
BHS	-23.7%	-14.2%	0.999	0.999
BLR	–	11.2%	–	0.144
BLZ	-25.8%	-15.2%	0.999	0.999
BOL	-11.1%	-5.6%	0.955	0.947
BRA	-24.5%	-13.5%	0.998	0.998
BRN	–	-15.2%	–	0.999
BTN	–	0.5%	–	0.398
BWA	-22.9%	-12.5%	0.949	0.949
CAF	-24.6%	-13.6%	0.999	0.999
CAN	32.0%	15.6%	0.049	0.049
CHE	–	8.3%	–	0.050
CHL	10.4%	5.0%	0.042	0.046
CHN	-1.4%	-0.9%	0.580	0.618
CIV	-32.0%	-17.5%	0.999	0.999
CMR	-27.0%	-14.8%	0.998	0.998
COD	-32.2%	-17.9%	0.998	0.998
COG	-30.3%	-16.3%	0.998	0.999
COL	-23.5%	-11.8%	0.995	0.995
COM	–	-13.7%	–	0.999
CPV	–	-7.3%	–	0.997
CRI	-21.0%	-10.9%	0.998	0.998
CUB	–	-12.6%	–	0.999
CYP	–	-6.6%	–	0.896
CZE	–	8.6%	–	0.146

DEU	–	6.2%	–	0.108
DJI	–	-21.0%	–	1.000
DNK	15.5%	8.1%	0.193	0.100
DOM	-24.0%	-12.6%	0.999	0.999
DZA	-9.3%	-5.1%	0.897	0.910
ECU	-16.7%	-8.3%	0.992	0.992
EGY	–	-11.4%	–	0.997
ESP	-2.9%	-1.8%	0.702	0.703
ETH	–	-9.4%	–	0.993
FIN	48.2%	22.1%	0.095	0.048
FJI	-17.6%	-10.1%	0.998	0.998
FRA	4.8%	2.4%	0.207	0.169
GAB	-25.0%	-13.5%	0.999	0.999
GBR	9.5%	5.0%	0.121	0.034
GEO	–	4.0%	–	0.246
GHA	-28.2%	-15.6%	0.999	0.999
GIN	–	-17.0%	–	0.999
GMB	–	-15.6%	–	0.999
GNB	–	-14.5%	–	0.999
GNQ	–	-10.8%	–	0.998
GRC	-3.5%	-2.1%	0.623	0.671
GTM	-20.5%	-12.3%	0.998	0.998
GUY	-31.5%	-16.3%	0.999	0.999
HND	-26.0%	-14.8%	0.998	0.998
HUN	5.4%	3.5%	0.317	0.230
IDN	-27.3%	-14.7%	0.999	0.999
IND	-31.0%	-16.2%	0.951	0.951
IRL	–	4.3%	–	0.016
IRN	–	-3.1%	–	0.823
ISL	92.3%	36.7%	0.095	0.000
ISR	-16.7%	-10.6%	0.900	0.995
ITA	1.0%	0.0%	0.475	0.480
JOR	–	-6.9%	–	0.972
JPN	-1.1%	-0.9%	0.552	0.572
KAZ	–	10.3%	–	0.001
KEN	-18.6%	-10.0%	0.994	0.994
KGZ	–	10.7%	–	0.049
KOR	2.9%	1.8%	0.356	0.305
LAO	–	-11.3%	–	0.856
LBN	–	-1.0%	–	0.600
LBR	-27.8%	-14.0%	0.999	0.999
LKA	-26.3%	-14.0%	0.999	0.999
LSO	6.5%	3.0%	0.169	0.164

LTU	–	12.7%	–	0.143
LUX	10.1%	4.9%	0.117	0.071
LVA	–	13.2%	–	0.144
MAR	–	-5.1%	–	0.943
MDA	–	4.9%	–	0.207
MDG	-18.4%	-9.4%	0.996	0.997
MEX	-10.0%	-5.7%	0.987	0.987
MKD	–	5.0%	–	0.252
MLI	–	-23.7%	–	1.000
MNG	–	26.2%	–	0.190
MOZ	–	-14.5%	–	0.998
MRT	-41.1%	-24.4%	1.000	1.000
MUS	–	-10.1%	–	0.998
MWI	-25.6%	-13.6%	0.998	0.998
MYS	-26.0%	-14.4%	0.999	0.999
NAM	–	-13.3%	–	0.997
NER	-40.1%	-22.6%	1.000	1.000
NGA	-29.2%	-16.5%	0.904	0.904
NIC	-29.9%	-16.6%	0.999	0.999
NLD	7.9%	3.9%	0.194	0.104
NOR	34.3%	15.7%	0.144	0.049
NPL	-23.5%	-12.1%	0.902	0.949
NZL	–	1.0%	–	0.344
OMN	-30.7%	-19.9%	0.951	0.951
PAK	-23.9%	-11.9%	0.856	0.903
PAN	-27.4%	-14.7%	0.999	0.999
PER	-6.4%	-3.2%	0.814	0.820
PHL	-24.8%	-12.9%	0.999	0.999
PNG	-17.5%	-8.7%	0.998	0.998
POL	–	8.1%	–	0.148
PRI	-20.8%	-11.4%	0.998	0.999
PRT	-4.0%	-2.1%	0.736	0.768
PRY	-18.9%	-9.7%	0.998	0.951
ROU	–	4.7%	–	0.206
RUS	–	20.9%	–	0.096
RWA	-21.0%	-11.7%	0.994	0.995
SAU	–	-21.4%	–	0.999
SDN	-36.0%	-22.0%	1.000	1.000
SEN	-29.9%	-16.3%	0.999	0.999
SLB	–	-14.1%	–	0.999
SLE	-29.2%	-16.2%	0.999	0.999
SLV	–	-13.2%	–	0.998
SRB	–	4.0%	–	0.260

SUR	–	-20.9%	–	0.999
SVK	–	8.0%	–	0.194
SVN	–	7.3%	–	0.149
SWE	24.8%	14.4%	0.096	0.096
SWZ	–	-8.4%	–	0.994
TCD	-38.7%	-21.9%	1.000	1.000
TGO	-26.1%	-14.8%	0.904	0.904
THA	–	-15.5%	–	0.999
TJK	–	2.8%	–	0.231
TKM	–	-2.6%	–	0.862
TTO	-21.3%	-12.1%	0.999	0.999
TUN	–	-7.4%	–	0.945
TUR	2.8%	1.4%	0.362	0.352
TZA	–	-11.9%	–	0.998
UGA	–	-12.5%	–	0.903
UKR	–	8.7%	–	0.195
URY	-10.7%	-5.7%	0.932	0.934
USA	-0.2%	-0.2%	0.510	0.518
UZB	–	-0.9%	–	0.650
VCT	-24.4%	-12.6%	0.999	0.999
VEN	-31.8%	-17.4%	0.999	0.999
VNM	–	-11.3%	–	0.951
VUT	–	-11.3%	–	0.999
WSM	–	-11.7%	–	0.999
YEM	–	-13.9%	–	0.998
ZAF	-11.0%	-5.8%	0.961	0.959
ZMB	-22.6%	-12.0%	0.997	0.997
ZWE	-18.4%	-10.0%	0.995	0.995

Table S2. Percent change in population-weighted 90:10 percentile per capita GDP ratio from anthropogenic forcing.

	Lag = 0 years	Lag = 1 year	Lag = 5 years
Median % change in 90:10 per capita GDP ratio	+25%	+11%	+7%
Probability that change in 90:10 per capita GDP ratio is > 0	0.89	0.79	0.66

References

1. Diffenbaugh NS, Charland A (2016) Probability of emergence of novel temperature regimes at different levels of cumulative carbon emissions. *Front Ecol Environ* 14:418–423.