SUPPLEMENTARY INFORMATION

The consequences of the U.S. withdrawal from international climate negotiations

Mathematica Replication Code

```
Clear[x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, x12, x13, x14, x15, x16]
k = 0.2; (* disagreement value *)

(* 2030 BAU emissions *)
s1 = 14.100; s2 = 6.480; s3 = 4.000; s4 = 5.450; s5 = 2.650; s6 = 1.210; s7 = 1.300; s8 = 1.050; s9 = 0.800;
s10 = 0.850; s11 = 0.730; s12 = 0.670; s13 = 1.290; s14 = 0.940; s15 = 1.110; s16 = 0.520;

(* ECPC50 Expected Demand *)
z1 = 0.692; z2 = 0.442; z3 = 0.607; z4 = 1.048; z5 = 0.237; z6 = 0.592; z7 = 0.418; z8 = 0.478; z9 = 0.275;
z10 = 0.974; z11 = 0.536; z12 = 0.305; z13 = 0.239; z14 = 0.320; z15 = 0.377; z16 = 0.493;

(* CDC Expected Demand *)
(* z1=0.490; z2=0.664; z3=0.702; z4=0.974; z5=0.456; z6=0.538; z7=0.494; z8=0.429; z9=0.541;
z10=0.785; z11=0.432; z12=0.609; z13=0.301; z14=0.341; z15=0.338; z16=0.467; *)

MSE = (x1 - z1)^2 + (x2 - z2)^2 + (x3 - z3)^2 + (x4 - z4)^2 + (x5 - z5)^2 + (x6 - z6)^2 + (x7 - z7)^2 + (x8 - z8)^2 +
(x9 - z9)^2 + (x10 - z10)^2 + (x11 - z11)^2 + (x12 - z12)^2 + (x13 - z13)^2 + (x14 - z14)^2 + (x15 - z15)^2 +
(x16 - z16)^2 ;

TD = s1*x1 + s2*x2 + s3*x3 + s4*x4 + s5*x5 + s6*x6 + s7*x7 + s8*x8 + s9*x9 + s10*x10 + s11*x11 + s12*x12 +
s13*x13 + s14*x14 + s15*x15 + s16*x16;

z = NMinimize[{MSE, TD <= 26.082, x1 > k, x2 > k, x3 > k, x4 > k, x5 > k, x6 > k, x7 > k, x8 > k, x9 > k, x10 > k, x11 >
k, x12 > k, x13 > k, x14 > k, x15 > k, x16 > k}, {x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, x12, x13, x14, x15, x16}]

k2 = 0.999; (* disagreement value for the U.S. under the U.S. exit *)
z = NMinimize[{MSE, TD <= 26.082, x1 > k, x2 > k2, x3 > k, x4 > k, x5 > k, x6 > k, x7 > k, x8 > k, x9 > k, x10 > k,
x11 > k, x12 > k, x13 > k, x14 > k, x15 > k, x16 > k}, {x1, x2, x3, x4, x5, x6, x7, x8, x9, x10, x11, x12, x13, x14, x15,
x16}]

(* verify that TD \[LessEqual] 26.082 for the results above *)
x1 = z[[2]][[1]][[2]]; x2 = z[[2]][[2]][[2]]; x3 = z[[2]][[3]][[2]]; x4 = z[[2]][[4]][[2]];
x5 = z[[2]][[5]][[2]]; x6 = z[[2]][[6]][[2]]; x7 = z[[2]][[7]][[2]]; x8 = z[[2]][[8]][[2]];
x9 = z[[2]][[9]][[2]]; x10 = z[[2]][[10]][[2]]; x11 = z[[2]][[11]][[2]]; x12 = z[[2]][[12]][[2]];
x13 = z[[2]][[13]][[2]]; x14 = z[[2]][[14]][[2]]; x15 = z[[2]][[15]][[2]]; x16 = z[[2]][[16]][[2]];
TD = s1*x1 + s2*x2 + s3*x3 + s4*x4 + s5*x5 + s6*x6 + s7*x7 + s8*x8 + s9*x9 + s10*x10 + s11*x11 + s12*x12 +
s13*x13 + s14*x14 + s15*x15 + s16*x16;
N[TD]
```

Out: {8.26602*10^-16, {x1 -> 0.692, x2 -> 0.442, x3 -> 0.607, x4 -> 1.048, x5 -> 0.237, x6 -> 0.592, x7 -> 0.418, x8 -> 0.478, x9 -> 0.275, x10 -> 0.974, x11 -> 0.536, x12 -> 0.305, x13 -> 0.239, x14 -> 0.32, x15 -> 0.377, x16 -> 0.493}}

Out: {0.359831, {x1 -> 0.497617, x2 -> 0.999, x3 -> 0.552429, x4 -> 0.973535, x5 -> 0.200898, x6 -> 0.57554, x7 -> 0.400314, x8 -> 0.463719, x9 -> 0.264122, x10 -> 0.962442, x11 -> 0.526075, x12 -> 0.295891, x13 -> 0.22145, x14 -> 0.307217, x15 -> 0.361902, x16 -> 0.485931}}

Out: 26.082

Python Replication Code

```
import os
import csv
import numpy as np
from scipy.optimize import minimize

np.set_printoptions(suppress=True)
os.chdir('C:\\Replication')

# load Table 1
with open('table1.csv', 'rb') as f:
    reader = csv.reader(f)
    sdata = list(reader)

del sdata[0]
data = np.array(sdata)
data = np.delete(data, 0, 1)
data = data.astype(np.float)

CO2target1 = 26.083 # ecpc50
CO2target2 = 25.432 # cdc

def sse(X):
    return np.sum(np.power(X-data[:,7],2))

x0 = data[:,7]
savedata0 = np.zeros((101,17))
savedata0[:,0] = np.arange(0,1.01,0.01)

for i in range(101):
    j = i/100.
    cons3 = (
    {'type':'eq','fun':lambda X: np.sum(X*data[:,2])-CO2target1}, # threshold
    {'type':'ineq','fun':lambda X: X[0]-j}, # China
    {'type':'ineq','fun':lambda X: X[1]-j}, # replace j with 1 for U.S. exit
    {'type':'ineq','fun':lambda X: X[2]-j},
    {'type':'ineq','fun':lambda X: X[3]-j},
    {'type':'ineq','fun':lambda X: X[4]-j},
    {'type':'ineq','fun':lambda X: X[5]-j},
    {'type':'ineq','fun':lambda X: X[6]-j},
    {'type':'ineq','fun':lambda X: X[7]-j},
    {'type':'ineq','fun':lambda X: X[8]-j},
    {'type':'ineq','fun':lambda X: X[9]-j},
    {'type':'ineq','fun':lambda X: X[10]-j},
    {'type':'ineq','fun':lambda X: X[11]-j},
    {'type':'ineq','fun':lambda X: X[12]-j},
    {'type':'ineq','fun':lambda X: X[13]-j},
    {'type':'ineq','fun':lambda X: X[14]-j},
    {'type':'ineq','fun':lambda X: X[15]-j})

    res = minimize(sse, x0, constraints = cons3, method = 'SLSQP', \
    options = {'disp': False})

    savedata0[i,1:] = res.x

cnames = 'delta, China, USA, EU28, India, Russia, Japan, Brazil, Indonesia, Canada, Mexico, South Korea,
Australia, Saudi Arabia, South Africa, Turkey, Argentina'
np.savetxt('replication_output.csv', savedata0, delimiter=',', fmt='%1.2f', header=cnames, comments='')

# end of Python replication code
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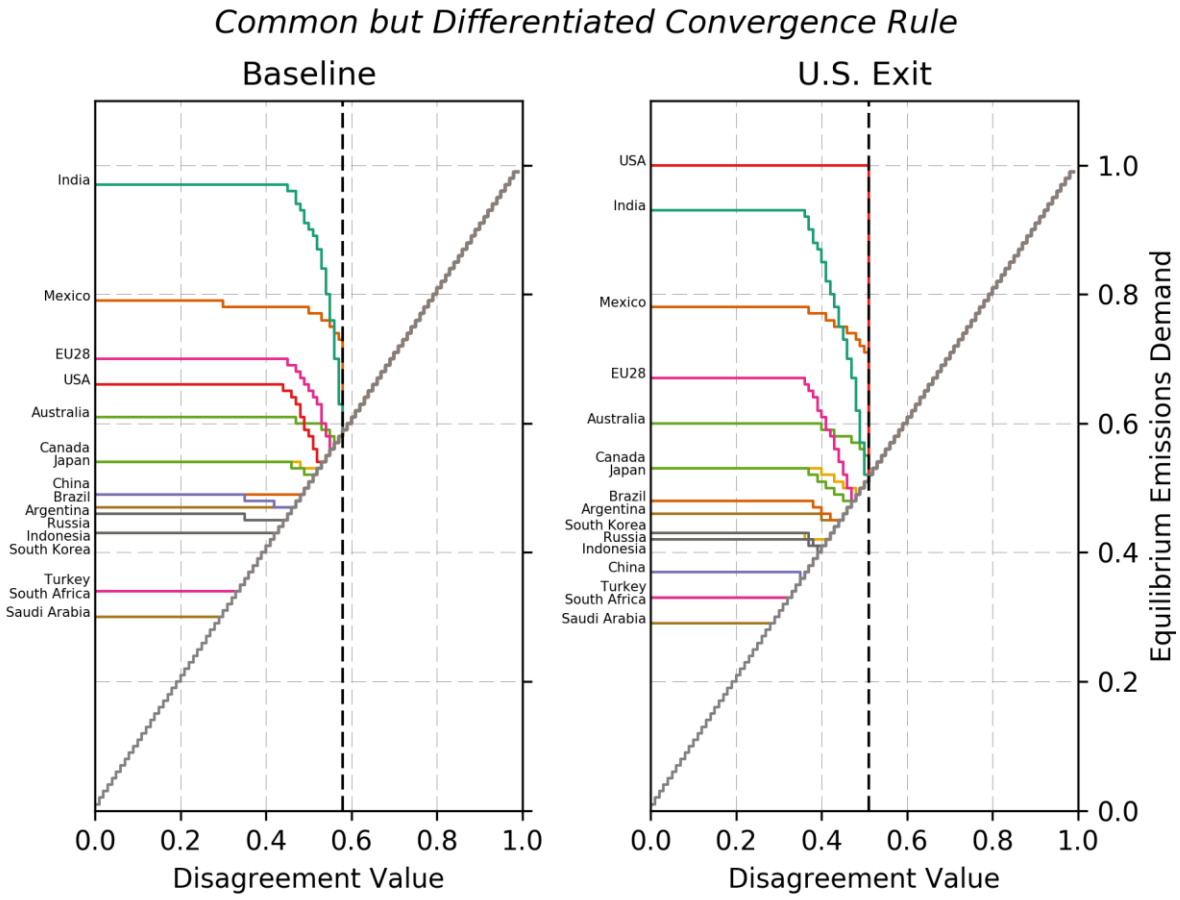

Figure A1 | The Fair equilibrium demands under the common but differentiated convergence (CDC) fair allocation approach. The fair target demand is derived on the basis of CDC (Meinshausen et al., 2015) and Climate Action Tracker 2030 emissions projections at the time of the 2015 Paris Agreement and current national policies (CAT Consortium, 2015).

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Table A1 | The Fair equilibrium demands under the common but differentiated convergence (CDC) fair allocation approach.

	CDC Fair Demand	Baseline scenario			U.S. exit			Baseline – U.S. exit difference		
Disagreement Value		0.20	0.40	0.50	0.20	0.40	0.50	0.20	0.40	0.50
China	0.49	0.49	0.48	0.50	0.37	0.40	0.50	0.12	0.08	0.00
USA	0.66	0.66	0.66	0.59	1.00	1.00	1.00	-0.34	-0.34	-0.41
EU28	0.70	0.70	0.70	0.66	0.67	0.62	0.50	0.03	0.08	0.16
India	0.97	0.97	0.97	0.91	0.93	0.87	0.57	0.04	0.10	0.34
Russia	0.46	0.46	0.45	0.50	0.43	0.40	0.50	0.03	0.05	0.00
Japan	0.54	0.54	0.54	0.52	0.53	0.51	0.50	0.01	0.03	0.02
Brazil	0.49	0.49	0.49	0.50	0.48	0.47	0.50	0.01	0.02	0.00
Indonesia	0.43	0.43	0.43	0.50	0.42	0.41	0.50	0.01	0.02	0.00
Canada	0.54	0.54	0.54	0.53	0.53	0.53	0.50	0.01	0.01	0.03
Mexico	0.79	0.79	0.78	0.78	0.78	0.77	0.72	0.01	0.01	0.06
South Korea	0.43	0.43	0.43	0.50	0.43	0.42	0.50	0.00	0.01	0.00
Australia	0.61	0.61	0.61	0.60	0.60	0.60	0.56	0.01	0.01	0.04
Saudi Arabia	0.30	0.30	0.40	0.50	0.29	0.40	0.50	0.01	0.00	0.00
South Africa	0.34	0.34	0.40	0.50	0.33	0.40	0.50	0.01	0.00	0.00
Turkey	0.34	0.34	0.40	0.50	0.33	0.40	0.50	0.01	0.00	0.00
Argentina	0.47	0.47	0.47	0.50	0.46	0.46	0.50	0.01	0.01	0.00

The fair target demand is derived on the basis of CDC(Meinshausen et al., 2015) and Climate Action Tracker 2030 emissions projections at the time of the 2015 Paris Agreement and current national policies (CAT Consortium, 2015).