Supplementary information to:
How to win public support for a global carbon tax

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SUPPLEMENTARY INFORMATION

This paper uses survey data on a sample of 4,997 respondents from five different countries: Australia, India, South Africa, the United Kingdom, and the United States of America. The survey was realised in November 2017. The survey questionnaire provided information on the potential effects of different global carbon tax designs on several economic outcomes. These effects were estimated through a computable general equilibrium model of the world economy. In what follows, we first describe the computable general equilibrium model and then the survey collection and analysis.

Computable general equilibrium model

The computable general equilibrium model used for this analysis is GRACE (Global Responses to Anthropogenic Change in the Environment), a multi-sectorial, multi-regional, recursively dynamic computable general equilibrium (CGE) model of the world economy. CGE models, such as GRACE, are widely used to conduct an impact assessment and to assess economic implications of various policies and stress test scenarios. CGE models feature a consistent depiction of cross-regional and cross-sector interdependences and are able to analyse various policies in the presence of pre-existing distortions, such as taxes and market externalities.

GRACE is a standard model of the world economy, mainly based on the Solow-Swan neoclassical growth model.[10] The model is written in GAMS and is calibrated around the Global Trade Analysis Project (GTAP) v7 database,[11] which contains input output tables for 140 world regions times 57 sectors for 2011. Much of the nesting structure and many of the elasticities of substitution are adopted from the MIT EPPA model.[12] The model has been used to examine a wide range of topics, including joint climate and social policies[13] and energy rebound effects.[14] A full description of the model is provided in Aaheim et al. (2018).[15]

Following Mathiesen and Rutherford,[16, 17] economic equilibrium in GRACE is formulated as a mixed complementarity problem (MCP) of inequalities and associated variables. The model is coded in the General Algebraic Modeling System (GAMS), using the Mathematical Programming System for General Equilibrium analysis (MPSGE),[18, 19] and is solved by using the PATH solver.[20] Production technologies and consumption preferences are modelled by using nested Constant Elasticity of Substitution (CES) functions.

To calibrate the model, we use the GTAP9-Power database and its satellite database accounts for CO_2 emissions, which is an electricity-detailed extension of Version 9 of the GTAP database.[11, 21] The electricity-detailed extension allows us to implement policies supporting a single disaggregated electricity sector, such as a specific renewable energy source. While in the basic version of the GTAP database, all power generation technologies are aggregated into a single sector, in an electricity-detailed extension, the power generation sector is composed of disaggregated sectors. These are: transmission and distribution, nuclear, coal fired, gas fired, hydroelectric, wind, oil fired, and solar. We consider the following sources as renewable: hydroelectric, wind, and solar.

The GTAP9-Power database depicts the global economy in 2011 and provides data on 140 regions and 68 commodities. We aggregated all regions into seven macro regions: Australia, India, South Africa, United Kingdom, United States, other developing countries, and Rest of the World (RoW). Sectorial impacts (i.e., changes in production and consumption of specific goods) were analysed, but not reported to respondents to avoid any cognitive overload.

As any model, GRACE is based on a set of underlying assumptions. These are as follows. Capital is assumed to be mobile across regions and among sectors. Labour is assumed to be immobile across borders (i.e., no migration), but imperfectly mobile among sectors, which is modelled by using a Constant Elasticity of Transformation (CET) function, with a transformation elasticity of 2.0. We implement voluntary and involuntary unemployment. Voluntary unemployment reflects the so-called labour-leisure choice, which is described as a CES function over private consumption and leisure. Involuntary unemployment is modelled based on the concept of a wage curve, which describes a negative relationship between the level of unemployment and wages. Initial unemployment rates are obtained from the OECD database. The model features inter-fuel and factor-fuel substitution in production. Imported and domestically produced commodities and services are assumed to be imperfect substitutes, as per the classic Armington approach. The values of trade elasticities, which differ by commodity but are constant across countries, are taken directly from the GTAP database. Export supplies are assumed to be imperfect substitutes to domestic supplies, and the substitution is modelled by using a CET function with a transformation elasticity of 2.0.

On the demand side, we implement a standard Stone-Geary utility function, which allows to calibrate different income elasticities. The values of income elasticities are calibrated based on those used in the GTAP model. Public consumption and households' savings are endogenously determined in the model, which changes in response to changes in commodity prices and income. Price elasticities of demand for energy carriers are assumed to be around -0.5. On the supply side, following the MIT EPPA model,[12] the values of supply elasticities of coal and gas, as well as for nuclear and hydro, are assumed equal to 1. For crude oil, we use a supply elasticity of 0.5, whereas the value of supply elasticity of renewables is 2.7, adopted from Johnson (2011).[22]

To calibrate a reference scenario, we use the projections of gross domestic product (GDP) for 2011-2030 from the OECD database and the projections of population growth from the World Bank database.[1] The values of an autonomous energy efficiency improvement (AEEI) implemented in GRACE are taken from the MIT EPPA model.[12]

Given the focus of the survey, the model outputs were aggregated and analysed for the following regions: Australia, India, South Africa, the United Kingdom, the United States of America, other developed countries, and other developing countries. The purpose of this model, for this paper, is to provide orders of magnitude on the impact of different global carbon tax designs on a few economic outcomes. The objective of this exercise was to provide respondents with a general idea of the direction, and magnitude, of the expected effects of the carbon tax they were asked to express their opinion on in the survey.

The design of carbon taxes is a function of tax rate and use of revenues. An ideal global carbon tax, no matter the other elements of its design, covers all carbon emissions in the world economy at the same tax rate. This ideal global carbon tax was implemented in our model. Redistribution of revenues can take place either domestically or internationally, depending on the design. As stated in the survey, each global carbon tax design was modelled with 2020 as the implementation year. Simulation results refer to 2030. For simplicity, no gradual phase-in was considered.

[1] Available at https://data.oecd.org/gdp/gdp-long-term-forecast.htm and https://data.worldbank.org/data-catalog/population-projection-tables, respectively (last accessed on August 27, 2018).

For this paper, we considered the following tax rates: \$40, \$60, and \$80 t/CO_2. They correspond to the range of tax rates for 2020 found by the Stiglitz-Stern high-level commission on carbon pricing to be consistent with achieving the 2°C climate target.[1] The equivalent in local currency was mentioned in the questionnaires for Australia, India, South Africa, and the United Kingdom. Six common options for revenue use were implemented in the model. Three of them imply a domestic use of revenues: reducing labour taxes, a national climate fund, and a domestic climate dividend (domestic lump-sum redistribution). The remaining three options imply an international use of revenues. That is, the tax revenues from each country are added up and used for the following purposes: an international climate fund for all countries, an international climate fund for developing countries only, an international climate dividend (international lump-sum redistribution). We number these options as follows:

(1) decreasing existing domestic "distortionary" taxes on labour income ("labour tax").

(2) earmarking for domestic mitigation projects ("national fund").

(3) earmarking for mitigation projects in developing countries ("international fund, developing countries").

(4) earmarking for mitigation projects in all countries ("international fund, all countries").

(5) redistributing to the domestic population via lump-sum transfers, also known as dividends ("national dividend").

(6) redistributing to the world population via lump-sum transfers, also known as dividends ("international dividend").

The rationale for option 1, usually popular among economists, is that instead of taxing "goods" such as labour, governments should tax "bads", as pollution. Such a tax reform may lead to lower emissions, and higher GDP (and thus to a so-called "double dividend").[5] Options 2 to 4 follow from the finding in the literature that earmarking revenues to fund environmental projects tends to substantially increase public support.[4] Options 2 to 4 differ with respect to how revenues are allocated across countries, and option 3 is consistent with the idea of the Green Climate Fund. Domestic dividends (option 5) have been endorsed by influential lobbies, such as the Citizens' Climate Lobby and, in the United States, a working group of prominent Republicans.[23] Domestic dividends make carbon taxes progressive. International dividends would allow, in general, for a progressive distribution both within countries and across countries. For options (5) and (6), the size of the dividend is also simulated and provided to respondents. In options 1, 2, and 5, revenues remain in the domestic country. These types of design would be compatible with both a single global carbon tax and a system of harmonised carbon taxes. Options 3, 4, and 5 would require a single global carbon tax.

In the model, these six options were implemented as follows. A reduction in labour taxes corresponding exactly to the tax revenues generated in the country by the carbon tax. Adjustments in behaviour were allowed by endogenising the standard labour-leisure choice. In the domestic climate fund, as in the international climate funds, all tax revenues were used to subsidise renewable energy. With the domestic climate fund, all tax revenues generated by the carbon tax in the country were devoted to subsidising renewable energy. While other, potentially more cost-effective solutions to use revenues to further abate greenhouse gas emissions may exist, we focus conservatively on subsidies for renewable energy because they represent a widely used climate policy.[24] If anything, our modelling choices would lead to a conservative estimate of public support, as, if anything, they may underestimate the benefits of a carbon tax. The domestic climate dividend worked as follows. The tax revenues generated by the carbon tax in the country were divided by the population of the country, so that each resident was allocated an equal share. That is, citizens received their dividend as a lump-sum transfer.

With the international climate fund for all countries, tax revenues generated by each country were added up and redistributed across all countries in proportion to their population, and then used, within each country, for subsidising renewable energy. In each country, the increase in subsidies for renewable energy was funded through the population-based share of global tax revenues that each country received. With the international climate fund for developing countries, tax revenues generated by each country were added up and redistributed across all developing countries (UNFCCC non-annex I countries) in proportion to their population, and then used, within each country, for subsidising renewable energy. In each country, the increase in subsidies for renewable energy was funded through the population-based share of global tax revenues that each developed country received. The international climate dividend worked as follows. Tax revenues generated by each country were added up and then allocated in equal shares to all citizens in the world. That is, world citizens received their dividend as a lump-sum transfer.

In total, 18 combinations were modelled, given the variation in tax rates and use of revenues. In each simulation, only one design, that is, only one combination of tax rate and use of revenues, was modelled. Hybrid designs were excluded to keep the message simple when approaching respondents with the survey.

While many economic variables can be observed in a computable general equilibrium model, only a few, arguably the most important, were reported to respondents. These were: domestic CO_2 emissions reductions, global CO_2 emissions reductions, variation in the price of gasoline, variation in the price of electricity, variation in domestic wealth (gross domestic product), and variation in domestic employment. Recall that these outcomes were not only estimated for Australia, India, South Africa, the United Kingdom, and the United States. They were also estimated for the remaining countries, aggregated for simplicity in two categories, other developed countries and other developing countries. While public support was measured only in five countries, the global carbon tax was modelled as to cover all countries, in line with its definition.

We refrained from including climate damages due to the highly uncertain and controversial nature of estimated climate damages.[8] Current estimates of the social cost of carbon, for example, range from approximately 10 to 1000 USD per tonne of CO_2.[25] Instead, we provide information on the avoided damages indirectly, via the estimated reduction in global emissions. To ensure that respondents were aware of how we calculated economic effects, we included the following statement in the questionnaire: "The economic benefits of lower emissions, which stem from less severe climate change, are not included in the simulations." Similarly, we do not provide estimates of co-benefits due to the high uncertainty and the controversial nature of the valuations of benefits. Providing an explicit measure of the benefits of reduced climate damages, and co-benefits,[26, 27] albeit highly uncertain, would most likely have, if anything, increased public support.

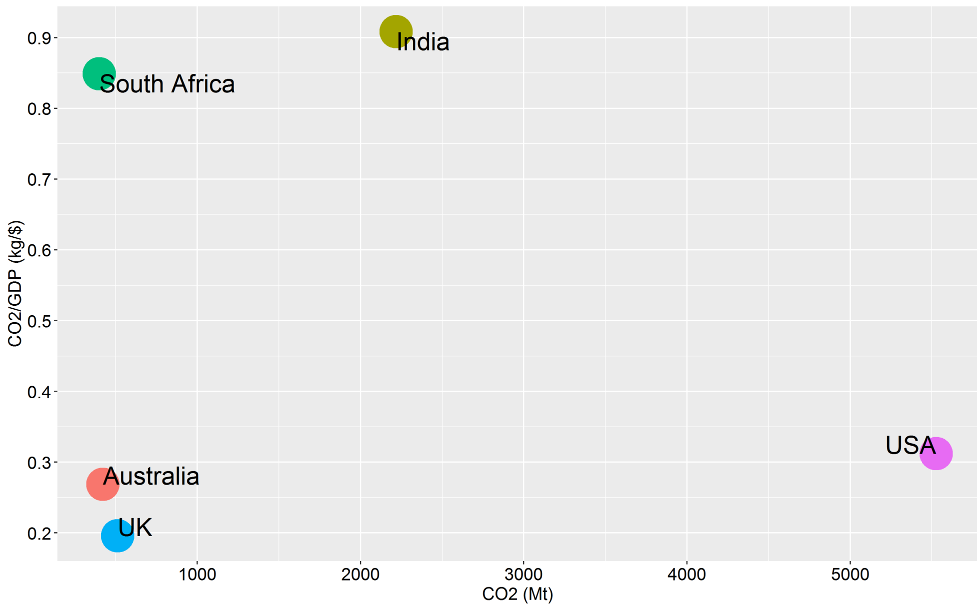
Many important economic variables are reported in what follows, at the country level. Monetary figures are all reported in USD, unless otherwise specified. Tables S1 to S3 reveal economy-wide impacts of \$40, \$60, and \$80/tCO_2 carbon taxes. In what follows, we describe how carbon taxes perform under different revenue-recycling options and how their impact differ by country. For simplicity, we organise the description by variable.

Greenhouse gas emissions (environmental effectiveness)

Obviously, higher carbon taxes lead to larger reductions in CO_2 emissions. For example, when carbon tax revenues are used for mitigation projects, average reductions in global CO_2 emissions of about 29% (34%) can be obtained under a \$60/tCO_2 (\$80/tCO_2) carbon tax. Emissions reductions are simulated around 23% with a \$40/tCO_2 carbon tax.

As expected, using carbon tax revenues for mitigation projects performs better in reducing global CO_2 emissions compared to other revenue-recycling policies; for example, when earmarking revenues from a \$40/tCO_2 carbon tax for mitigation projects (i.e., options 2-4), we obtain an average reduction in global CO_2 emissions of approximately 23%, which is by 3 percentage points larger than in options 1, 5, and 6. Intuitively, subsidising renewable energy leads to more of it being produced and consumed, thereby further reducing greenhouse gas emissions and increasing the overall effectiveness of carbon taxation. The impact of renewable energy subsidies on CO_2 emissions is not very large, most likely because production of renewables is very capital intensive and requires large investments. As mentioned, earmarking revenues for environmental purposes could also take other forms, but we apply a conservative approach and focus on a very common solution that policy-makers have adopted around the world to accelerate the transition to a low-carbon economy.

Figure S1: CO_2 emissions and CO_2 intensity, by country, in 2016.



Gross domestic product (Economic efficiency)

The results from policy simulations reveal that decreasing labour income taxes outperforms other revenue-recycling schemes in terms of economic efficiency. When revenues from a \$40/tCO_2 carbon tax are earmarked, domestically, to alleviate the burden of distortionary labour income taxes, countries such as the United Kingdom and the United States even experience slight increases in real GDP and reductions in unemployment. With this design option, Australia experiences a very small reduction in GDP and unemployment (i.e., less than 0.1%). With alternative revenue-recycling schemes (i.e., options 2-6), a \$40/tCO_2 carbon tax results in an average reduction in GDP of about 1% (0.6%) in the United States (in Australia and the United Kingdom).

Recycling revenues from a \$40/tCO_2 carbon tax through a reduction in labour income taxes is associated with very moderate decreases in GDP for South Africa and India, below 1%. With all other recycling options, these two countries experience larger reductions in GDP, due to the relatively high carbon-intensity of their economy, as shown in Figure S1 above. With options 2 to 6, GDP in India (South Africa) decreases on average by 2% (6%). Furthermore, a decrease in economic growth is accompanied by higher unemployment, especially in South Africa. For example, in options 2-6, a \$40/tCO_2 carbon tax in South Africa results in an average increase in the unemployment rate of 6 percentage points. Note that South Africa has a very high level of unemployment to begin with. In 2017, the unemployment rate, as estimated by the World Bank, was at 28%.[2] Hence, the relatively large changes in unemployment rate simulated by the model need to be put into perspective. That is, a 1% change in unemployment rate may be seen differently by a respondent in the United States and a respondent in South Africa.

Higher carbon taxes (i.e., $60/t$CO_2$ and $80/t$CO_2$) can induce higher economic costs since a stronger reduction in CO_2 emissions implies a higher marginal abatement cost. For India and South Africa, whose economies are relatively carbon intensive, we find that the reductions in GDP under a $60/t$CO_2$ ($80/t$CO_2$) carbon tax could be 2 times higher than under a $40/t$CO_2$ carbon tax. Consequently, the increase in unemployment becomes more pronounced at higher carbon tax rates.

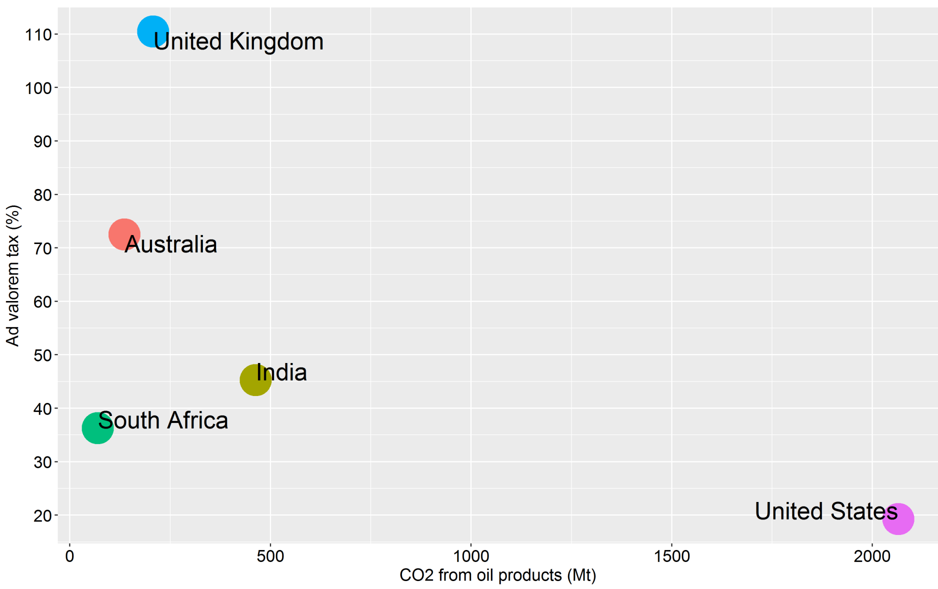
For all the other countries, the GDP loss associated with a $80/t$CO_2$ carbon tax are on average around 1.5% (2.3%) for Australia and the United Kingdom (the United States), when revenues are used according to options 2-6. Note that in options 3, 4, and 6, none or only a portion of the tax revenues remain in the United Kingdom, in Australia, or in the United States. When revenues are recycled through reductions in labour taxes, these costs are very moderate, i.e., less than 0.3%.

Price impacts

While economists tend to focus mainly on aggregate measures of economic production, or efficiency, these indicators may not be very informative for part of the general public. Therefore, information on the impacts of carbon taxes on gasoline and electricity prices was also included in the survey and provided to all respondents.

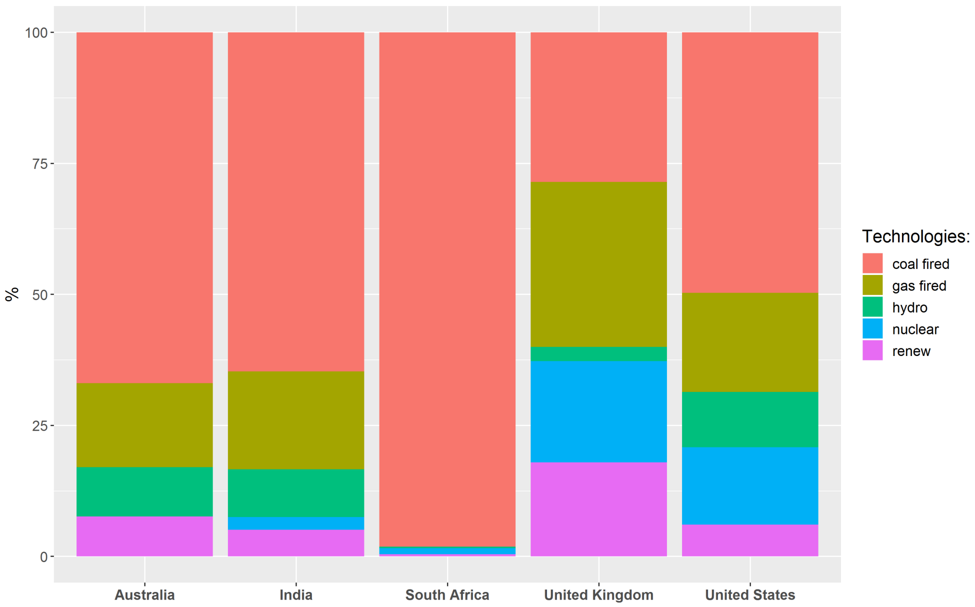
We find that Australia and the United States experience the largest increases in gasoline prices. Under a $40/t$CO_2$ carbon tax, we find an average increase in gasoline prices in these countries, across all revenue-recycling options, of about 23%. In India and South Africa, the price surge at the pump is limited to 16% and 18%, respectively. In the United Kingdom, the price of gas increases only by 9%, because of pre-existing taxes.

Figure S2: CO_2 emissions from oil products and average ad-valorem taxes on oil products, per country, in 2011.



[2] http://databank.worldbank.org/data/reports.aspx?source=2&series=SL.UEM.TOTL.ZS&country=# (last accessed, August 2018).

Figure S3: Structure of power generation, by country, in 2016.



Because the South African power generation sector relies heavily on coal, a $40/t$CO_2$ carbon tax leads to a relatively large increase in the price of electricity. On average, across all revenue-recycling options, the electricity price in South Africa increases by 105%, followed by India (32%), the United States (27%), and Australia (21%). In the United Kingdom, the electricity price increases by 7%, which is consistent with its policy mix. Such price increases are more pronounced with higher carbon tax rates; for example, under a $60 ($80) carbon tax, the average increases in electricity prices among the surveyed countries become 1.5 times (2 times) higher compared to a $40 carbon tax.

However, it should be noted that earmarking carbon tax revenues for mitigation projects, supporting the renewable energy sector, could considerably alleviate the rise in electricity prices. For instance, in the United Kingdom, subsidising domestic renewable energy projects with carbon tax revenues could even result in a decline in the price of electricity.

Transfers and dividends

Two of our carbon tax designs, options 5 and 6, involve dividends. Option 5 implies that all domestically collected carbon tax revenues are redistributed to the domestic population through dividends. With this option, Australia collects about $19 billions, which imply a per capita dividend of $838, India $109 billions ($89 per capita), South Africa $13 billions ($244 per capita), the United Kingdom $22 billions ($348 per capita), and the United States $210 billions ($675 per capita).

According to option 6, carbon tax revenues are redistributed via dividends based on the world population. With a $40/$CO_2$ carbon tax, we obtain a climate dividend of $189 per capita. By construction, the dividend is the same for each individual in each country. The dividend increases to $261 ($325) under a $60/t$CO_2$ ($80/t$CO_2$) carbon tax. With option 6, a large part of internationally collected revenues is redistributed in favour of India and non-surveyed developing countries (RoW), given that the allocation rule favours highly populated countries. For example, under a $40/t$CO_2$, the climate dividend received by India is approximately 2 times higher than in option 5 ($189 per capita versus $89 per capita). In contrast, the climate dividend received by South African households is 23% lower than with option 5 ($189 per capita versus $244 per capita), 72% lower for the United States ($189 per capita versus $675 per capita), 46% lower for the United Kingdom ($189 per capita versus $348 per capita), and 77% lower for

Australia ($189 per capita versus $838 per capita). As a result, Indian consumers experience an increase in private consumption of around 2% with option 6, whereas the decrease in private consumption in other surveyed countries is, on average, 0.7 percentage points larger than with option 5. Reductions in global CO_2 emissions are almost identical in options 5 and 6.

Similarly, due to a high population, India and the Rest of the World are better off when carbon tax revenues are redistributed for mitigation projects based on the world population (i.e., option 4) compared to the case when only domestically collected revenues are used (i.e., option 2). Under a $40/t$CO_2$, the amount of revenues received by India for supporting mitigation projects at home is approximately two times higher than domestically collected revenues ($223 billion versus $106 billion), while South Africa receives only 77% of collected revenues, the United Kingdom, 54%, the United States, 28%, and Australia, 22%. When all globally collected carbon tax revenues are redistributed for mitigation projects in developing countries (i.e., option 3), India receives 2.6 times more revenues than it collects ($106 billion).

Table S1: Economy-wide impacts resulting from a global carbon tax of $40/t$CO_2$.

a) "Labour tax"	**Australia**	**India**	**South Africa**	**United Kingdom**	**United States**
Gasoline price increase (%)	22.2	17.9	18.4	9.5	22.7
Electricity price increase (%)	24.1	42.2	110.9	12.1	31.2
National CO_2 reduction (%)	-15.4	-28.9	-40.7	-10.1	-18.3
Global CO_2 reduction (%)	-20.0	-20.0	-20.0	-20.0	-20.0
Change in GDP (%)	0.0	-0.3	-0.9	0.0	0.1
Change in unemployment rate (%-points)	0.1	-0.3	0.9	-0.1	-0.2
National carbon tax revenue (billion; USD)	19	109	13	22	211
Change in income tax rate (%-points)	-1.4	-4.1	-3.4	-1.2	-1.6
Change in private consumption (%)	-0.8	0.0	-1.9	-0.1	0.0
Change in public consumption (%)	0.1	1.9	0.7	0.7	0.9
b) "National climate fund"					
Gasoline price increase (%)	22.0	17.6	17.1	9.1	22.6
Electricity price increase (%)	9.3	27.1	97.6	-4.9	13.7
National CO_2 reduction (%)	-19.3	-31.3	-44.8	-14.1	-21.6
Global CO_2 reduction (%)	-23.6	-23.6	-23.6	-23.6	-23.6
Change in GDP (%)	-0.9	-1.7	-6.6	-0.8	-1.3
Change in unemployment rate (%-points)	0.7	0.8	6.2	0.5	0.9
National carbon tax revenue (billion; USD)	18	106	12	21	203
Change in private consumption (%)	-1.7	-0.8	-6.3	-0.8	-1.3
Change in public consumption (%)	-1.0	-0.7	-6.6	-0.5	-1.0
c) "International climate fund for developing countries"					
Gasoline price increase (%)	24.3	12.6	17.7	10.3	25.0
Electricity price increase (%)	24.7	19.3	103.1	12.0	32.0
National CO_2 reduction (%)	-15.9	-30.8	-44.1	-10.7	-19.5
Global CO_2 reduction (%)	-22.7	-22.7	-22.7	-22.7	-22.7
Change in GDP (%)	-0.6	-3.7	-6.1	-0.6	-1.1
Change in unemployment rate (%-points)	1.0	-0.1	5.9	0.8	1.4
Carbon tax revenue received (billion; USD)		275	12		
Carbon tax revenue collected (billion; USD)	19	106	12	22	208
Difference between revenue received and collected	-19	169	-1	-22	-208
Change in private consumption (%)	-2.5	1.7	-6.1	-1.7	-2.5
Change in public consumption (%)	-1.4	-0.9	-6.1	-0.4	-0.8
d) "International climate fund for all countries"					
Gasoline price increase (%)	23.5	13.9	17.7	9.5	24.0

Electricity price increase (%)	18.7	20.8	100.2	0.2	23.1
National CO_2 reduction (%)	-17.3	-31.0	-44.7	-13.1	-20.8
Global CO_2 reduction (%)	-23.3	-23.3	-23.3	-23.3	-23.3
Change in GDP (%)	-0.6	-3.1	-6.4	-0.6	-1.1
Change in unemployment rate (%-points)	0.9	0.2	6.3	0.6	1.2
Carbon tax revenue received (billion; USD)	4	223	9	12	57
Carbon tax revenue collected (billion; USD)	18	106	12	21	205
Difference between revenue received and collected	-14	117	-3	-10	-148
Change in private consumption (%)	-2.3	1.0	-6.8	-1.1	-2.0
Change in public consumption (%)	-1.3	-0.9	-6.5	-0.4	-0.9
e) "National annual payment"					
Gasoline price increase (%)	21.5	17.4	16.8	8.9	21.8
Electricity price increase (%)	23.5	41.6	107.1	11.7	30.3
National CO_2 reduction (%)	-15.5	-29.1	-42.8	-10.4	-18.8
Global CO_2 reduction (%)	-20.5	-20.5	-20.5	-20.5	-20.5
Change in GDP (%)	-0.6	-1.2	-5.8	-0.6	-1.0
Changes in unemployment rate (%-points)	0.7	1.0	5.8	0.6	1.0
National carbon tax revenue (billion; USD)	19	109	13	22	210
Dividend per capita (USD)	838	89	244	348	675
Dividend for family of four (USD)	3350	357	977	1391	2699
Change in private consumption (%)	-1.3	-0.5	-5.6	-0.6	-0.9
Change in public consumption (%)	-0.9	-0.9	-6.1	-0.5	-1.1
f) "International annual payment"					
Gasoline price increase (%)	23.3	13.4	17.5	9.4	23.7
Electricity price increase (%)	24.4	39.2	109.1	11.9	31.4
National CO_2 reduction (%)	-15.7	-28.7	-43.0	-10.5	-19.2
Global CO_2 reduction (%)	-20.7	-20.7	-20.7	-20.7	-20.7
Change in GDP (%)	-0.5	-1.9	-5.8	-0.5	-1.0
Changes in unemployment rate (%-points)	0.9	0.4	5.9	0.6	1.2
Carbon tax revenue received (billion; USD)	4	231	10	12	59
Carbon tax revenue collected (billion; USD)	19	110	13	22	209
Difference between revenue received and collected	-14	121	-3	-10	-150
Dividend per capita (USD)	189	189	189	189	189
Dividend for family of four (USD)	756	756	756	756	756
Change in private consumption (%)	-2.1	2.2	-6.2	-1.0	-1.9
Change in public consumption (%)	-1.1	-1.3	-6.1	-0.3	-0.8

Table S2: Economy-wide impacts resulting from a global carbon tax of $60/t$CO_2$.

a) "Labour tax"	**Australia**	**India**	**South Africa**	**United Kingdom**	**United States**
Gasoline price increase (%)	33.8	27.7	28.5	15.1	34.8
Electricity price increase (%)	36.6	61.9	162.1	18.5	46.6
National CO_2 reduction (%)	-20.8	-35.5	-49.4	-14.2	-24.2
Global CO_2 reduction (%)	-26.0	-26.0	-26.0	-26.0	-26.0
Change in GDP (%)	-0.1	-0.5	-2.1	-0.1	0.0
Change in unemployment rate (%-points)	0.1	-0.2	1.9	-0.1	-0.2
National carbon tax revenue (billion; USD)	26	149	17	32	294
Change in income tax rate (%-points)	-2.0	-5.6	-4.4	-1.7	-2.2
Change in private consumption (%)	-1.0	-0.3	-3.3	-0.3	-0.2
Change in public consumption (%)	0.2	2.6	0.1	1.0	1.1
b) "National climate fund"					

Gasoline price increase (%)	33.4	27.3	26.6	14.7	34.6
Electricity price increase (%)	17.6	42.5	140.6	-3.1	24.4
National CO_2 reduction (%)	-24.8	-37.6	-53.9	-18.7	-27.3
Global CO_2 reduction (%)	-29.6	-29.6	-29.6	-29.6	-29.6
Change in GDP (%)	-1.3	-2.5	-9.7	-1.3	-2.0
Change in unemployment rate (%-points)	1.1	1.3	9.2	0.9	1.5
National carbon tax revenue (billion; USD)	25	144	15	30	282
Change in private consumption (%)	-2.3	-1.4	-9.3	-1.4	-2.0
Change in public consumption (%)	-1.3	-1.1	-9.6	-0.8	-1.4
c) "International climate fund for developing countries"					
Gasoline price increase (%)	37.2	20.1	27.5	16.5	38.6
Electricity price increase (%)	37.9	32.6	150.4	18.5	48.2
National CO_2 reduction (%)	-21.6	-36.3	-53.1	-15.2	-25.9
Global CO_2 reduction (%)	-28.6	-28.6	-28.6	-28.6	-28.6
Change in GDP (%)	-1.0	-5.1	-8.9	-1.0	-1.7
Change in unemployment rate (%-points)	1.5	0.0	8.5	1.3	2.1
Carbon tax revenue received (billion; USD)		380	16		
Carbon tax revenue collected (billion; USD)	26	147	15	31	288
Difference between revenue received and collected	-26	234	1	-31	-288
Change in private consumption (%)	-3.4	2.2	-8.6	-2.6	-3.6
Change in public consumption (%)	-1.8	-1.2	-8.7	-0.5	-1.3
d) "International climate fund for all countries"					
Gasoline price increase (%)	35.8	21.9	27.3	15.4	37.0
Electricity price increase (%)	29.5	34.4	145.0	3.3	36.1
National CO_2 reduction (%)	-23.1	-36.7	-53.8	-17.8	-27.0
Global $CO_2$2 reduction (%)	-29.3	-29.3	-29.3	-29.3	-29.3
Change in GDP (%)	-1.0	-4.3	-9.3	-1.0	-1.7
Change in unemployment rate (%-points)	1.4	0.4	9.1	1.0	1.8
Carbon tax revenue received (billion; USD)	6	308	13	16	79
Carbon tax revenue collected (billion; USD)	26	146	15	30	283
Difference between revenue received and collected	-20	163	-2	-14	-205
Change in private consumption (%)	-3.1	1.2	-9.5	-1.8	-3.0
Change in public consumption (%)	-1.7	-1.3	-9.3	-0.6	-1.3
e) "National annual payment"					
Gasoline price increase (%)	32.5	26.9	25.9	14.1	33.3
Electricity price increase (%)	35.5	60.7	155.4	17.7	45.0
National CO_2 reduction (%)	-21.0	-35.8	-51.8	-14.6	-24.8
Global CO_2 reduction (%)	-26.7	-26.7	-26.7	-26.7	-26.7
Change in GDP (%)	-0.9	-1.7	-8.6	-1.0	-1.6
Changes in unemployment rate (%-points)	1.0	1.6	8.5	0.9	1.5
National carbon tax revenue (billion; USD)	26	148	16	31	292
Dividend per capita (USD)	1175	121	309	497	938
Dividend for family of four (USD)	4701	485	1235	1988	3750
Change in private consumption (%)	-1.7	-1.0	-8.3	-1.0	-1.4
Change in public consumption (%)	-1.2	-1.3	-8.8	-0.8	-1.6
f) "International annual payment"					
Gasoline price increase (%)	35.4	21.0	26.9	15.1	36.4
Electricity price increase (%)	37.2	56.8	158.7	18.2	47.1
National CO_2 reduction (%)	-21.3	-35.2	-52.0	-14.8	-25.4
Global CO_2 reduction (%)	-26.9	-26.9	-26.9	-26.9	-26.9
Change in GDP (%)	-0.8	-2.8	-8.5	-0.9	-1.5
Changes in unemployment rate (%-points)	1.3	0.7	8.5	1.0	1.8

Carbon tax revenue received (billion; USD)	6	319	13	17	81
Carbon tax revenue collected (billion; USD)	26	150	16	31	290
Difference between revenue received and collected	-20	170	-2	-15	-208
Dividend per capita (USD)	261	261	261	261	261
Dividend for family of four (USD)	1045	1045	1045	1045	1045
Change in private consumption (%)	-2.9	2.9	-8.7	-1.6	-2.9
Change in public consumption (%)	-1.6	-1.7	-8.7	-0.5	-1.2

Table S3: Economy-wide impacts resulting from a global carbon tax of \$80/tCO_2.

a) "Labour tax"	**Australia**	**India**	**South Africa**	**United Kingdom**	**United States**
Gasoline price increase (%)	45.5	37.9	38.8	21.0	47.1
Electricity price increase (%)	48.8	80.6	210.3	24.7	61.5
National CO_2 reduction (%)	-25.2	-40.4	-55.3	-17.8	-28.8
Global CO_2 reduction (%)	-30.6	-30.6	-30.6	-30.6	-30.6
Change in GDP (%)	-0.3	-0.8	-3.3	-0.2	-0.2
Change in unemployment rate (%-points)	0.2	-0.2	3.1	-0.1	-0.1
National carbon tax revenue (billion; USD)	33	183	20	40	369
Change in income tax rate (%-points)	-2.5	-6.8	-5.2	-2.1	-2.7
Change in private consumption (%)	-1.3	-0.5	-4.8	-0.5	-0.4
Change in public consumption (%)	0.4	3.3	-0.6	1.2	1.4
b) "National climate fund"					
Gasoline price increase (%)	44.8	37.1	36.1	20.5	46.6
Electricity price increase (%)	26.0	57.1	179.3	-0.8	34.8
National CO_2 reduction (%)	-29.0	-42.1	-60.1	-22.4	-31.6
Global CO_2 reduction (%)	-34.1	-34.1	-34.1	-34.1	-34.1
Change in GDP (%)	-1.8	-3.3	-12.5	-1.8	-2.7
Change in unemployment rate (%-points)	1.4	1.8	12.0	1.3	2.0
National carbon tax revenue (billion; USD)	31	178	18	38	354
Change in private consumption (%)	-2.9	-2.0	-12.1	-2.0	-2.7
Change in public consumption (%)	-1.6	-1.3	-12.4	-1.0	-1.9
c) "International climate fund for developing countries"					
Gasoline price increase (%)	50.3	27.8	37.3	23.1	52.5
Electricity price increase (%)	51.0	45.3	194.1	25.0	64.0
National CO_2 reduction (%)	-26.3	-40.2	-59.1	-19.1	-30.9
Global CO_2 reduction (%)	-33.2	-33.2	-33.2	-33.2	-33.2
Change in GDP (%)	-1.3	-6.4	-11.5	-1.5	-2.4
Change in unemployment rate (%-points)	1.9	0.2	10.9	1.8	2.8
Carbon tax revenue received (billion; USD)		475	20		
Carbon tax revenue collected (billion; USD)	33	183	18	40	357
Difference between revenue received and collected	-33	291	2	-40	-357
Change in private consumption (%)	-4.3	2.5	-10.9	-3.5	-4.8
Change in public consumption (%)	-2.3	-1.5	-11.2	-0.7	-1.7
d) "International climate fund for all countries"					
Gasoline price increase (%)	48.3	30.1	37.0	21.5	50.1
Electricity price increase (%)	40.2	47.4	185.6	6.7	48.7
National CO_2 reduction (%)	-27.7	-40.7	-59.9	-21.6	-31.9
Global CO_2 reduction (%)	-33.9	-33.9	-33.9	-33.9	-33.9
Change in GDP (%)	-1.4	-5.4	-12.0	-1.5	-2.4
Change in unemployment rate (%-points)	1.8	0.6	11.6	1.4	2.5

Carbon tax revenue received (billion; USD)	7	384	16	20	98
Carbon tax revenue collected (billion; USD)	32	182	18	38	353
Difference between revenue received and collected	-25	203	-1	-19	-255
Change in private consumption (%)	-3.9	1.2	-12.0	-2.5	-4.0
Change in public consumption (%)	-2.1	-1.5	-11.9	-0.8	-1.7
e) "National annual payment"					
Gasoline price increase (%)	43.7	36.5	35.2	19.6	44.8
Electricity price increase (%)	47.2	78.8	200.1	23.5	59.0
National CO_2 reduction (%)	-25.4	-40.7	-57.9	-18.2	-29.5
Global CO_2 reduction (%)	-31.4	-31.4	-31.4	-31.4	-31.4
Change in GDP (%)	-1.2	-2.3	-11.3	-1.4	-2.1
Changes in unemployment rate (%-points)	1.4	2.2	11.1	1.3	2.0
National carbon tax revenue (billion; USD)	33	182	19	40	365
Dividend per capita (USD)	1479	149	359	634	1172
Dividend for family of four (USD)	5917	597	1437	2537	4687
Change in private consumption (%)	-2.2	-1.5	-11.0	-1.4	-2.0
Change in public consumption (%)	-1.4	-1.6	-11.4	-1.0	-2.0
f) "International annual payment"					
Gasoline price increase (%)	47.8	28.9	36.5	21.0	49.4
Electricity price increase (%)	49.8	73.2	204.6	24.4	62.2
National CO_2 reduction (%)	-25.8	-39.9	-58.2	-18.6	-30.3
Global CO_2 reduction (%)	-31.7	-31.7	-31.7	-31.7	-31.7
Change in GDP (%)	-1.2	-3.5	-11.0	-1.3	-2.1
Changes in unemployment rate (%-points)	1.7	0.9	11.0	1.4	2.4
Carbon tax revenue received (billion; USD)	7	397	17	21	101
Carbon tax revenue collected (billion; USD)	33	185	18	40	361
Difference between revenue received and collected	-26	213	-2	-19	-259
Dividend per capita (USD)	325	325	325	325	325
Dividend for family of four (USD)	1301	1301	1301	1301	1301
Change in private consumption (%)	-3.7	3.3	-11.1	-2.3	-3.8
Change in public consumption (%)	-1.9	-1.9	-11.2	-0.7	-1.6

Survey data

This paper uses survey data for 4,997 individuals for the following five countries: Australia, India, South Africa, United Kingdom, and United States. 1,000 individuals are surveyed in each country. The survey was administered by a global private marketing firm based in the United States. As usual in online surveys, the response rate was around 10% (9.75% to be precise).

This paper uses a split-sample design. The objective of the paper is to test public support for 18 different global carbon tax designs, resulting from the combination of three tax rates and six uses of revenues. Each respondent was randomly allocated to one and only one of these 18 designs. Given that information about the potential effects of each global carbon tax design was country specific, this analysis uses in total 90 questionnaire versions. That is, the 4,997 respondents were randomly allocated to one of these 90 versions. The large sample size followed from this approach. Table S4 shows how tax rates and uses of revenues were allocated among respondents. Uses of revenues are numbered as follows: reducing labour taxes (1), a national climate fund (2), an international climate fund for developing countries only (3), an international climate fund for all countries (4), a domestic climate dividend (5), an international climate dividend (6).

Table S4: Versions and valid questionnaires

Tax rate	Use of revenues						
	1	2	3	4	5	6	Total
40	278	275	277	278	279	278	1,665
60	276	277	278	278	278	278	1,665
80	276	279	276	279	278	279	1,667
Total	830	831	831	835	835	835	4,997

We implemented two measures to ensure the quality of responses. We excluded respondents who either completed the survey in less than two fifths of the median time or who were caught not paying attention to the questionnaire by questions designed specifically for this purpose. Our final sample size was 4,997.

The objective of this survey is to estimate the popularity of the carbon tax designs in the 5 countries. The extent to which our survey can provide valid information about the popularity of these designs in the 5 countries depends on how representative our sample is of the underlying population. The survey that we use was designed to be representative and administered online by a professional marketing firm. Participants were randomly drawn from a panel of potential respondents. Respondents were screened based on age and gender. Figures S4 to S8 show that there is a deviation of 5 percentage points at most between our sample and the underlying population for each age-gender group. In all figures, women are shown on the left hand side and men on the right hand side. A lighter shade of green (women) or blue (men) indicates underrepresentation in the sample. Red shows overrepresentation.
The variation of 5% or less suggests that our survey is, as expected, fairly representative. Note that, in the specific case of India, we refer, as underlying population, to the population of English speakers. English speakers tend to be better educated than the rest of the Indian population. Educated individuals tend to be overrepresented also in the other countries, although to a lesser extent.

Figure S4: Representativeness of the surveyed Australian population by age-gender groups

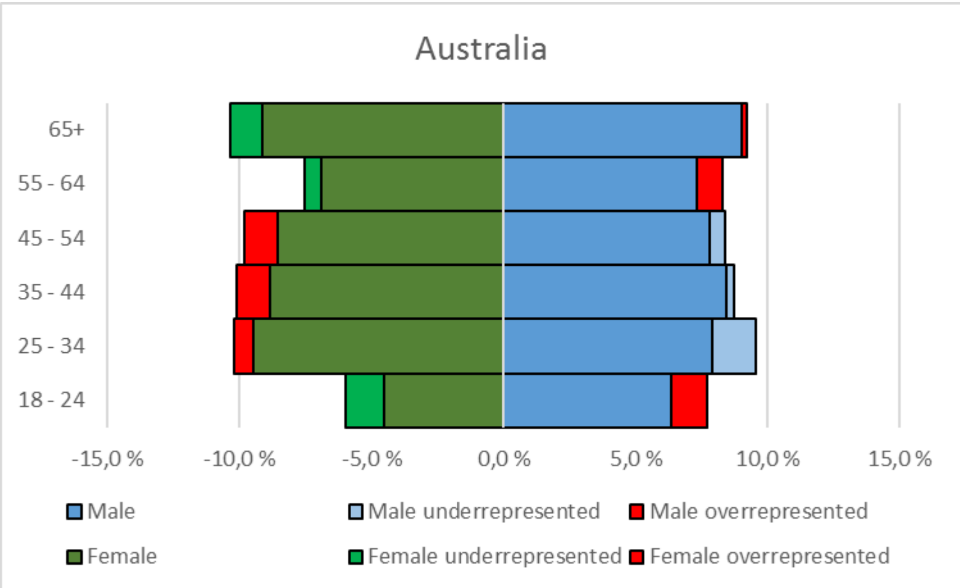


Figure S5: Representativeness of the surveyed Indian population by age-gender groups.

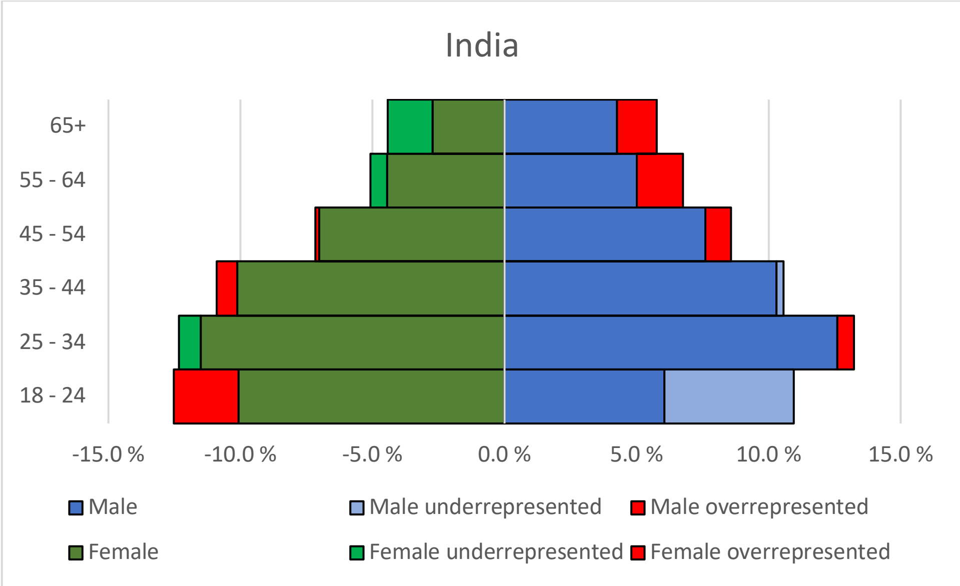


Figure S6: Representativeness of the surveyed South African population by age-gender groups.

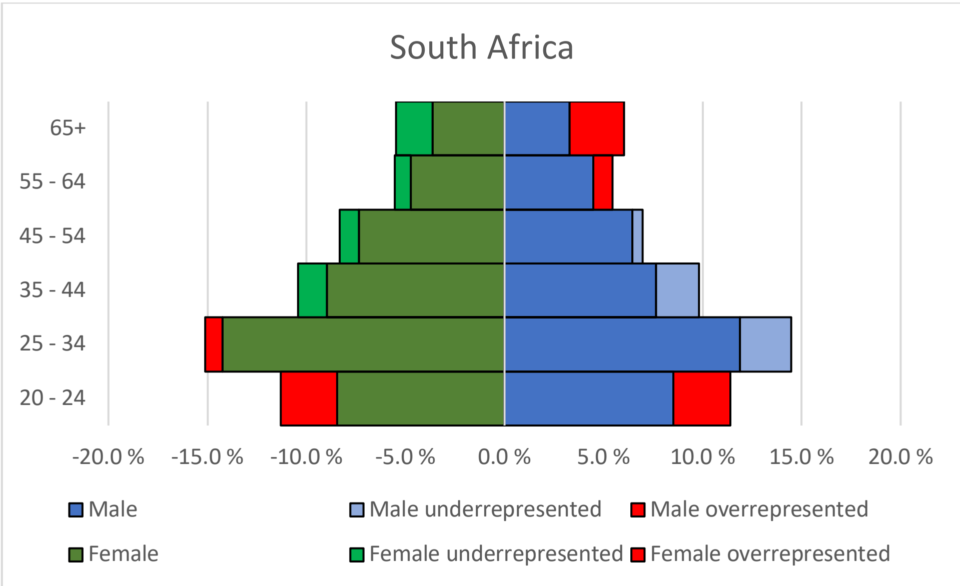


Figure S7: Representativeness of the surveyed United Kingdom population by age-gender groups.

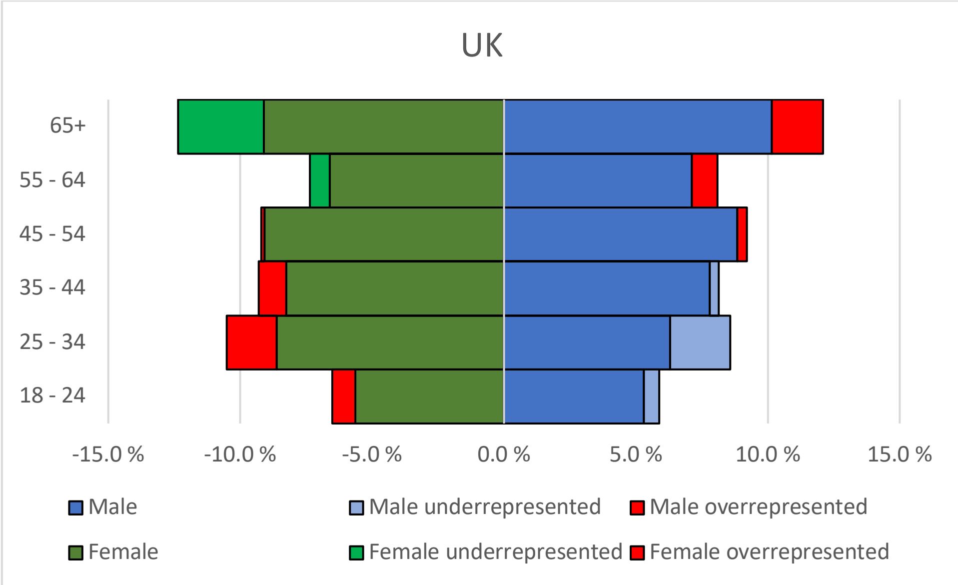
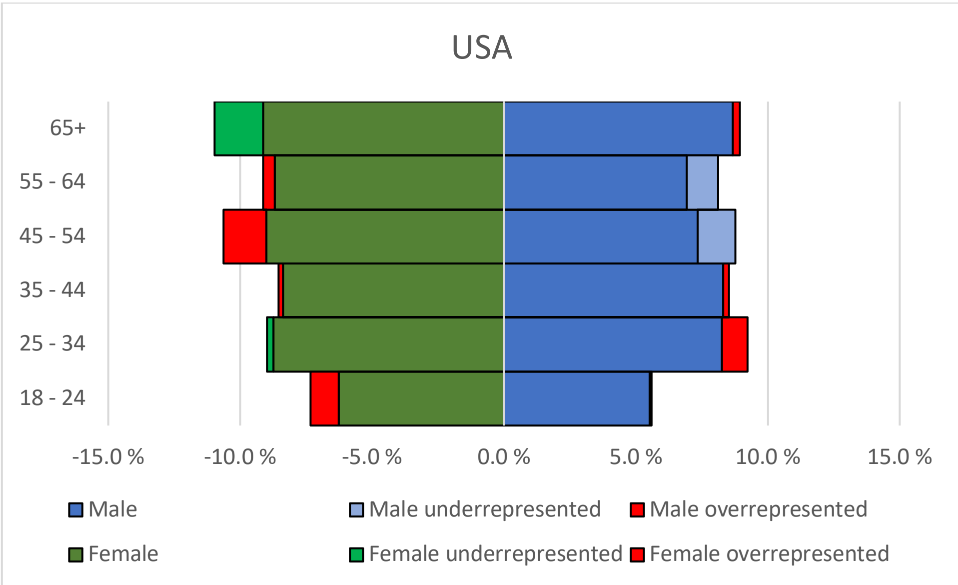


Figure S8: Representativeness of the surveyed United States of America population by age-gender groups.



Analysis

In what follows, we report the main results from our survey. The tables in this section are used to derive the main results in the article. Our main variable is the share of respondents supporting the carbon tax over the total number of respondents providing an unambiguous answer, either yes or no. Below, we re-evaluate our results considering all respondents providing a "do not know" answer as if they were opposed to the policy. Naturally, this new way of coding support decreases support. Hence, this additional test provides a likely lower bound estimate on public support.

Table S5 shows public support across countries and uses of revenues. The average support across the three tax rates is reported. Table S5 is the basis for Figure 1 in the main text, and for Figure S9 below, which provides the same evidence, but shows total support instead of net support.

Table S5: Cross-country support as a function of revenue recycling, averaged across tax rates (as reported in the main text)

	Labour tax	National climate fund	International climate fund, developing countries	International climate fund, all countries	National climate dividend	International climate dividend
USA	50,4 %	59,0 %	43,1 %	58,9 %	56,8 %	43,8 %
UK	54,9 %	65,4 %	57,6 %	61,5 %	58,5 %	55,5 %
Australia	55,0 %	59,7 %	49,6 %	50,8 %	52,5 %	58,6 %
South Africa	53,3 %	49,7 %	64,6 %	58,9 %	54,2 %	52,7 %
India	82,5 %	88,8 %	87,6 %	80,7 %	85,7 %	84,5 %

Our first finding is that three tax designs would reach a majority in all countries when averaging support across tax rates: decreasing existing domestic "distortionary" taxes on labour income, redistribution through domestic dividends, and earmarking for mitigation projects in all countries. The first two options are compatible with harmonised carbon taxes, while the latter would require a single global carbon tax. The average level of support across countries is the highest for the option of earmarking for mitigation projects in all countries. A scheme with dividends to all world citizens also garners majority support in Australia (58.6 %), India (84.5 %), South Africa (52.7%), and the United Kingdom (55.5 %). However, the United States would tend to reject it, at about 56 %. As mentioned, this scheme would create an important transfer of funds from wealthy to lower-income countries, such as India.

Our results show that schemes that imply a particularly large transfer of wealth from developed to emerging countries may face substantial opposition in some of the former countries. An international climate fund would have more chances to succeed, provided that its revenues are allocated to all countries, as this design option seems to gather majority support in all countries. Americans, for instance, appear to be more willing to support transfers to emerging countries such as India if these funds are used to mitigate further emissions reductions, abroad as well as domestically.

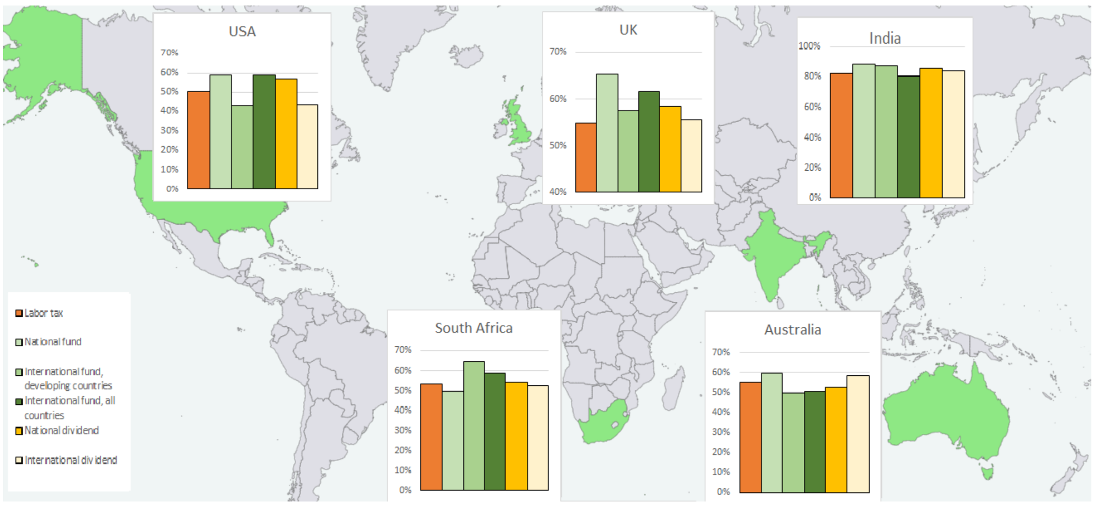
Finding support for a system of harmonised carbon taxes should be easier, as countries do not have to agree on the use of revenues. Respondents in Australia, India, the United Kingdom, and the United States would support all carbon tax designs with a domestic use of revenues. All these countries would have a preference for earmarking revenues for environmental projects. South Africans would prefer to install a dividend, which would make the carbon tax progressive in South Africa. Recall that a carbon tax would impose a substantial burden on the South African economy. Redistributing revenues through dividends would reduce this burden considerably. A national environmental fund would not.

This second set of results underlines that the options to reach a global carbon price increase as soon as the constraint of agreeing on a common use of revenues is relaxed. While developing countries have lobbied, in international climate negotiations, for financial schemes supporting their transition towards a cleaner economy, our results suggest that, if all countries agreed on taxing carbon, sufficient public support could be found in these countries even for a scheme of harmonised carbon taxes without international transfers. Developing countries tend to be the most vulnerable to climate change, and often suffer from very high exposure to local air pollution, which a carbon tax may also reduce (as a "co-benefit"). Hence, they would be among the top beneficiaries of stringent international climate policy.

Additional insights can be obtained by disaggregating support for the three tax rates. The literature suggests that a higher tax rate is generally associated to lower support. The literature focuses on domestic climate policy. The intuition is that a higher tax rate implies a higher willingness to pay for climate change mitigation. Our paper, however, focuses on a global carbon tax. A higher tax rate does not necessarily imply that people are made worse off. As shown above, this depends on the design, the country where they live, and their preferences. For instance, in the United States, even a relatively high tax rate is associated with lower unemployment rates when revenues are used to decrease taxes on labour. For instance, in India, the net inflow of money is a positive function of the tax rate, when revenues from a global carbon tax are earmarked for mitigation projects in all countries, or in developing countries, as well as when revenues are redistributed through dividends internationally. Additionally, a higher tax rate implies lower greenhouse gas emissions. Also, while not simulated by our model and not reported to respondents, a higher tax rate also implies lower levels of local pollution, which respondents in a country such as India may value.

In Table S6, we observe how public support varies with the tax rate, for each revenue recycling option. Not surprisingly, public support may increase in developed countries with higher tax rates, when revenues are used to reduce labour taxes. When revenues are instead used to contribute to a public good, through a national or an international climate fund, support may decrease with higher tax rates. This effect seems to be especially strong for American respondents. In the United States, support for a national climate fund (for an international climate fund funding mitigation projects in developing countries) drops from 75.6 % (53.3 %) with a 40\$/tCO_2 carbon tax to 44.7 % (30.2 %) with a 80\$/tCO_2 carbon tax. When revenues are redistributed back to the world population under the form of per-capita dividends, public support may increase or decrease when the tax rate increases, depending on the situation of each country. Recall that, in our setting, respondents are provided with information on the general effects of each proposed carbon tax design, as simulated with the computable general equilibrium model. In India, public support increases with higher tax rates. Given its balance of greenhouse gas emissions and population, India is a net winner with an international climate dividend, with, as mentioned above, an estimated net inflow of $121-213 million per year. Public support decreases instead in countries such as the United Kingdom, or the United States. This makes sense. Recall that, according to our model, both countries are net losers with international climate dividends, with a net outflow of $10-19 million per year for the United Kingdom and $150-259 million for the United States.

Figure S9: Total public support by country and revenue use



Public support, in our dataset as in the literature, tends generally to decrease as the tax rate increases. While we find, based on the five countries surveyed, that a single (uniform) global tax, or a system of harmonised carbon taxes, could set a carbon price at 80$ per tonne of CO_2, we would suggest starting international negotiations at a lower level, such as 40$ per tonne of CO_2.

Table S6: Cross-country public support as a function of revenue recycling and tax rate (as reported in the main text)

Revenue use	Labour tax			National climate fund			International climate fund for developing countries		
Tax rate	40	60	80	40	60	80	40	60	80
USA	36,2 %	60,5 %	55,6 %	75,6 %	57,4 %	44,7 %	53,3 %	45,2 %	30,2 %
UK	54,2 %	57,8 %	52,5 %	64,4 %	70,0 %	62,5 %	63,6 %	55,6 %	53,5 %
Australia	52,4 %	59,6 %	52,5 %	62,2 %	67,4 %	50,0 %	47,9 %	53,7 %	47,7 %
South Africa	62,0 %	46,2 %	52,0 %	51,0 %	51,0 %	46,9 %	68,1 %	59,2 %	66,7 %
India	80,8 %	78,4 %	88,2 %	90,0 %	88,2 %	88,2 %	85,7 %	94,1 %	83,0 %
	International climate fund for all countries			National climate dividend			International climate dividend		
USA	57,1 %	63,0 %	56,9 %	60,8 %	51,1 %	58,0 %	46,7 %	47,8 %	35,9 %
UK	66,0 %	60,9 %	57,4 %	55,3 %	58,7 %	61,2 %	61,4 %	53,3 %	52,1 %
Australia	46,7 %	51,2 %	54,5 %	54,2 %	45,8 %	58,1 %	57,8 %	76,1 %	40,5 %
South Africa	52,2 %	69,4 %	54,3 %	60,0 %	50,0 %	52,9 %	50,0 %	59,2 %	48,9 %
India	84,0 %	74,0 %	84,0 %	92,5 %	79,6 %	85,2 %	81,5 %	78,8 %	93,9 %

Surveys may slightly overestimate public support, as people may provide more pro-social answers in hypothetical situations. Here we repeat the same analyses by considering undecided respondents as opposed to the carbon tax. Table S7 displays public support as in Table S5, but with public support measured as the sum of all yes-votes over the total number of respondents, which includes undecided respondents who abstained from the "vote" (i.e., "Do not know" answers). Mechanically, support decreases, as the numerator is unchanged and the denominator increases. Even so, we observe non-negligible levels of public support. A system of harmonised carbon taxes, in which countries agree on a tax rate and use revenues domestically as they see fit, would be supported in the UK (52.4%), South Africa (50,3%), and India (82.1%). Public support in the United States and Australia is at 49.4% and 46.4%, respectively. Table S7 provides support for the main findings, as reported above and in the article. In real-world politics, people do abstain. Even considering undecided respondents as opposed to carbon taxes, we find non-negligible support for a global carbon tax. While, technically, no strict majority is reached in all countries, public support is sufficiently high to back the main message from our analysis. There is, based on our data, sufficient public support to justify an open public debate on a global carbon tax, whether under the form of a single global tax or a system of harmonised carbon taxes.

Table S7: "Lower-bound" cross-country support as a function of revenue recycling, averaged across tax rates

	Labour tax	National climate fund	International climate fund, developing countries	International climate fund, all countries	National climate dividend	International climate dividend
USA	40,7 %	49,4 %	33,7 %	51,5 %	49,7 %	34,1 %
UK	44,0 %	52,4 %	45,5 %	52,4 %	50,0 %	45,5 %
Australia	42,8 %	46,4 %	39,5 %	39,8 %	43,7 %	46,4 %
South Africa	48,5 %	44,3 %	56,0 %	50,0 %	50,3 %	46,7 %
India	76,5 %	81,3 %	81,2 %	72,0 %	82,1 %	78,4 %

In a last sensitivity test, we perform the same analyses by taking into account the degree of certainty of respondents in expressing support for, or rejection of, the carbon tax. Certainty was measured on a scale from 1 to 7, with 1 standing for "very uncertain" and 7 for "very certain". The average in our sample is 5.5 for both the group of those who voted yes and the group of those who voted no. The median is 6 for both groups. Table S8 shows how public support per revenue use and country changes when uncertain answers (1 to 3) are removed. The number of observations goes from 4253 to 3787. Despite the non-negligible change in observations, public support is largely unaffected, both by country and revenue use, as shown by comparing Table S8 with Table S5. Average support is 0.7 percentage points higher when uncertain respondents are removed from the analysis, and no single value changes by more than 3 percentage points. This suggests that public support and the degree of support are uncorrelated.

Finally, we look at variation within our sample. Table S9 include, in parentheses, 90% confidence intervals for the figures reported in Table S5. While the large majority of estimates are statistically different from 50% public support, where the majority line passes, some other results should be interpreted as "close calls". Such results are also consistent with the main findings of this study and support further debate and research on a global carbon tax.

While a direct referendum question as in this survey may be unlikely in some contexts, this is arguably the best way to measure public support. Our results show, with different sensitivity tests, that public support for a global carbon tax, or for harmonised carbon taxes, is likely higher than what currently assumed in the policy debate as well as in the academic literature.

Table S8: Cross-country support as a function of revenue recycling, averaged across tax rates, with uncertain responses removed.

	Labour tax	National climate fund	International climate fund, developing countries	International climate fund, all countries	National climate dividend	International climate dividend
USA	52,8 %	58,3 %	41,2 %	60,5 %	59,5 %	43,6 %
UK	55,0 %	66,9 %	58,9 %	62,4 %	60,0 %	56,8 %
Australia	52,2 %	59,0 %	51,4 %	50,4 %	50,8 %	61,0 %
South Africa	54,2 %	51,2 %	63,9 %	59,7 %	54,1 %	55,4 %
India	82,6 %	90,0 %	88,7 %	82,3 %	85,3 %	86,5 %

Table S9: Cross-country support as a function of revenue recycling, averaged across tax rates, with 90% confidence intervals

	Labour tax	National climate fund	International climate fund, developing countries	International climate fund, all countries	National climate dividend	International climate dividend
USA	50,4 % (43-58%)	59,0 % (52-66 %)	43,1 % (36-50 %)	58,9 % (52-66 %)	56,8 % (50-64 %)	43,8 % (37-51 %)
UK	54,9 % (48-62 %)	65,4 % (59-72 %)	57,6 % (50-65 %)	61,5 % (55-68 %)	58,5 % (52-65 %)	55,5 % (48-63 %)
Australia	55,0 % (48-62 %)	59,7 % (53-67 %)	49,6 % (42-57 %)	50,8 % (43-58 %)	52,5 % (45-60 %)	58,6 % (52-66 %)
South Africa	53,3 % (47-60 %)	49,7 % (43-56 %)	64,6 % (58-71 %)	58,9 % (52-66 %)	54,2 % (48-61 %)	52,7 % (46-60 %)
India	82,5 % (77-88 %)	88,8 % (85-93 %)	87,6 % (83-92 %)	80,7 % (75-86 %)	85,7 % (81-90 %)	84,5 % (80-89 %)

The raw data for the analysis (in Excel and SPSS format) can be found at:
http://folk.uio.no/steff/CarbonTaxSI/Carbon_tax_survey_SI.xlsx
http://folk.uio.no/steff/CarbonTaxSI/Carbon_tax_survey_SI.sav

QUESTIONNAIRE

-- beginning of the questionnaire --

SQ1: How old are you? [Numerical input; Prefer not to answer]

SQ2: What is your gender? [Male; Female; Other; Prefer not to answer]

SQ3 What is the approximate annual gross (before tax) income of your household? [Country specific brackets; Don't know; Prefer not to answer]

Country specific income brackets:

USA: Less than $10,000; $10,000 - $14,999; $15,000 - $19,999; $20,000 - $24,999; $25,000 - $29,999; $30,000 - $34,999; $35,000 - $39,999; $40,000 - $49,999; $50,000 - $59,999; $60,000 - $74,999; $75,000 - $99,999; $100,000 - $124,999; $125,000 - $149,999; $150,000 - $199,999; $200,000 or more.

UK: Less than £12,000; £12,000 - 14,999; £15,000 - 17,999; £18,000 - 20,999; £21,000 - 23,999; £24,000 - 27,999; £28,000 - £34,999; £35,000 - £39,999; £40,000 - £44,999; £45,000 - £49,999; £50,000 - £54,999; £55,000 or more.

Australia: Less than $20,000; $20,000 - $29,999; $30,000 - $39,999; $40,000 - $49,999; $50,000 - $59,999; $60,000 - $69,999; $70,000 - $79,999; $80,000 - $89,999; $90,000 - $99,999; $100,000 - $119,999; $120,000 - $139,999; $140,000 or more.

South Africa: Less than R 34,000; R 34,001 - R 68,000; R 68,001 - R 102,000; R 102,001 - R 170,000; R 170,001 - R 271,000; R 271,001 or more.

India: Less than INR 76,000; INR 76,001 - INR 151,000; INR 151,001 - INR 226,000; INR 226,001 - INR 376,000; INR 376,001 - INR 601,000; INR 601,001 or more.

-- explanatory text preceding Q1 --

This survey focuses on potential policies to deal with climate change. We are interested in your opinions. This survey may allow us to better understand people's preferences, and to provide better recommendations to policy-makers. This is a public opinion survey and there are no right or wrong answers. This survey is completely anonymous. We encourage you to take your household budget into account when answering our questions, and to assume that your answers may have actual consequences on the policies of [Insert country name].

We are going to ask you a series of questions regarding a tax on carbon dioxide (CO_2) emissions. This tax would be introduced in all countries around the world in order to reduce CO_2 emissions, and would not be implemented in [Insert country name] unless other countries also implement it. It would be introduced on January 1st 2020.

Carbon taxes change the price of fossil fuels such as coal, oil, gasoline and natural gas depending on how much carbon emissions they generate. A carbon tax does not affect directly the price of renewable energy such as solar, wind or hydro. We have used an economic model to estimate the effect of the tax on emissions, prices and other economic outcomes.

Imagine a tax of [Insert tax rate in national currency] per ton of CO_2 from all fossil fuels. According to our economic model, the tax would generate [Insert amount in national currency] collected by the government of [Insert country name]. *The money would be used to reduce existing income tax rates in [Insert country name] by [Insert value] percentage points.* Based on our economic simulations, this tax program would reduce CO_2 emissions from [Insert country name] by about [Insert value]% and global CO_2 emissions by about [Insert value]% by 2030. The tax would increase the price of gasoline by [Insert value]% and the price of electricity by [Insert value]%. It would also [reduce/increase] GDP, a measure of national wealth, by about [Insert value]%. The effect on employment in [Insert country name] would be of about [minus/plus] [Insert value] percentage points. The economic benefits of lower emissions, which stem from less severe climate change, are not included in the simulations.

-- authors' comments on the questionnaire --

The example above is for the "labor tax" revenue use option. For other revenue use options the text in italics was replaced, as appropriate, with the following text:

The money would be used to build a national climate fund, whose purpose is to reduce CO_2 emissions by investing in renewable energy sources such as wind, solar and hydro power.

The money would be added to the money collected by all other governments. It would then be used to build an international climate fund, whose purpose is to reduce CO_2 emissions by investing in developing countries in renewable energy sources such as wind, solar and hydro power.

The money would be added to the money collected by all other governments. It would then be used to build an international climate fund, whose purpose is to reduce CO_2 emissions by investing in all countries in renewable energy sources such as wind, solar and hydro power.

The money would be returned in equal amounts to all [Insert country name] citizens as an annual payment. It would correspond to approximately [Insert value in national currency] per individual, or [Insert value in national currency] rupees for a household with four members.

The money would be added to the money collected by all other governments. It would then be returned in equal amounts to all citizens of all countries, including India, as an annual payment. It would correspond to approximately [Insert value in national currency] per individual, or [Insert value in national currency] for a household with four members.

-- remaining part of the questionnaire --

Q1: If there was a referendum today to decide whether this policy should be approved by the government of India, what would you have voted? [Yes, the policy should be introduced; No, the policy should not be introduced; Don't know].

Q2:How certain are you that you would vote to [support/oppose] the policy? [7-point scale where 1 = very uncertain and 7 = very certain]

-- end of questionnaire –

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