Public Economics for Public Policy Part III: Taxation, Externalities, and Climate Change

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Sciences Po

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Today's Lecture

Intro

Tax incidence and Efficiency Costs of Taxation

Labor Income Taxation

Externalities

Understanding Attitudes toward Climate Policies

Tax incidence and Efficiency Costs of Taxation Tax incidence is the study of the effects of tax policies on prices and the economic welfare of individuals

What happens to market prices when a tax is introduced or changed?

Example: what happens when impose \$1 per pack tax on cigarettes?

Effect on price \Rightarrow distributional effects on smokers, profits of producers, shareholders, farmers, etc.

This is positive analysis: typically the first step in policy evaluation; it is an input to later thinking about what policy maximizes social welfare.

Tax Incidence

Tax incidence is not an accounting exercise but an analytical characterization of changes in economic equilibria when taxes are changed.

Key point: Taxes can be shifted: taxes affect directly prices, which affect quantities because of behavioral responses, which affect indirectly the price of other goods.

If prices are constant economic incidence would be the same as legislative incidence.

Example: Liberals favor capital income taxation because capital income is concentrated at the high end of the income distribution. Taxing capital means taxing disproportionately the rich.

Conservatives respond: if people save less because of capital taxes, capital stock may go down driving also the wages down and hurting workers. The capital tax might be shifted partly on workers

Partial Equilibrium Model:

Simple model goes a long way to showing main results.

Government levies an excise tax on good x

Excise means it is levied on a quantity (gallon, pack, ton, ...). Typically fixed in nominal terms (e.g, \$1 per pack)

[ad-valorem tax is a fraction of prices (e.g. 5% sales tax)]

Let *p* denote the pretax price of *x* (producer price)

Let $p^{c} = p + t$ denote the tax inclusive price of x (consumer price)







Elasticity: percentage change in quantity when price changes by one percent

 $\varepsilon^{\rm D}=rac{p^{\rm c}}{D}rac{dD}{dp^{\rm c}}<$ 0 denotes the price elasticity of demand

$$e^{S} = \frac{p^{c}}{S} \frac{dS}{dp^{c}} > 0$$
 denotes the price elasticity of supply

It is possible to express how the change *dt* generates change *dp* so that equilibrium holds, with elasticities:

$$\frac{dp}{dt} = \frac{\varepsilon^{D}}{\varepsilon^{S} - \varepsilon^{D}}$$

When do consumers bear the entire burden of the tax? (dp/dt = 0 and $dp^{c}c/dt = 1$)

- ε^D = 0 [inelastic demand]. Example: short-run demand for gasoline inelastic (need to drive to work)
- 2. $\varepsilon^{S} = \infty$ [perfectly elastic supply]. Example: perfectly competitive industry

When do producers bear the entire burden of the tax? (dp/dt = -1 and $dp^c/dt = 0$)

- 1. $\varepsilon^{S} = o$ [inelastic supply]. Example: fixed quantity supplied
- 2. $\varepsilon^{D} = -\infty$ [perfectly elastic demand]. Example: there is a close substitute.

Tax Incidence and Elasticity



Tax Incidence and Elasticity



Tax Incidence and Elasticity



- 1. statutory incidence not equal to economic incidence (statutory burden of a tax does not determine who truly bears the burden)
- 2. equilibrium is independent of who nominally pays the tax: the side of the market on which the tax is imposed is irrelevant to the distribution of tax burdens.
- 3. more inelastic parties (on either demand or supply side) bear more of the tax; more elastic parties avoid them.

These are robust conclusions that hold with more complicated models

Result 1: Statutory incidence \neq economic incidence



Result 2: Side of the market on which the tax is imposed is irrelevant



Result 3: (More) elastic party will bear (less) none of the burden



Result 3: (More) elastic party will bear (less) none of the burden



Deadweight burden (also called excess burden) of taxation is defined as the welfare loss (measured in dollars) created by a tax over and above the tax revenue generated by the tax

In the simple supply and demand diagram, welfare is measured by the sum of the consumer surplus and producer surplus

The welfare loss of taxation is measured as change in consumer+producer surplus minus tax collected: it is the triangle on the figure

The inefficiency of any tax is determined by the extent to which consumers and producers change their behavior to avoid the tax; deadweight loss is caused by individuals and firms making inefficient consumption and production choices in order to avoid taxation.

If there is no change in quantities consumed, the tax has no efficiency costs

Marginal DWL rises with Tax Rate



Elasticities Determine Tax Inefficiency



Ramsey (1927) asked by Pigou to solve the following problem: Consider one consumer who consumes K different goods

What are the tax rates t_1, \ldots, t_K of each good that raise a given amount of revenue while minimizing the welfare loss to the individual?

Uniform tax rates $t = t_1 = \ldots = t_K$ is not optimal if the individual has more elastic demand for some goods than for others

Optimum is called the Ramsey tax rule: optimal tax rates are such that the marginal DWB for last dollar of tax collected is the same across all goods

 \Rightarrow Tax more the goods that have inelastic demands [and tax less the goods that have elastic demands]

Note: this abstracts from redistribution and focuses solely on efficiency

Who Bears True Incidence of Major US Taxes?

1. Labor taxes borne by workers if wages set as in competitive model and labor supply less elastic than labor demand

In practice, wages are rigid in short-run so employer vs. employee payroll tax don't have the same effect (evidence from France and Greece). In long-run incidence likely on wages (as employer payroll taxes haven't reduced macro capital share)

2. Consumption taxes borne by consumers if prices set competitively and demand for goods less elastic than supply

VAT evidence and salience evidence show non-standard incidence in short and medium-run but long-run incidence likely on consumers

3. Capital taxes borne by owners of capital if supply of capital (savings) less elastic than demand for capital (investment)

Evidence here is most disputed. Official CBO statistics shift 1/4 of corporate tax on workers without much evidence (see corp tax lecture)

Saez-Zucman (2019) distribute taxes by factor. At Taxjusticenow.org, you can explore changing the current tax system.

- 1. Labor taxes (payroll taxes and individual income taxes) assigned to corresponding workers (whether tax remitted by the workers or employers)
- 2. Consumption taxes (excise and sales) assigned to corresponding consumers
- 3. Capital taxes (corporate tax, property tax, taxes on capital income) assigned to corresponding owners of the capital assets

This distribution by factor does not capture ultimate incidence nor DWB if taxes are shifted through incidence

Tax Progressivity in the U.S.



Labor Income Taxation Key question: By how much should government reduce inequality using taxes and transfers?

- 1. Governments use taxes to raise revenue
- 2. This revenue funds transfer programs:

a) Universal Transfers: Public Education, Health Care Benefits (only 65+ in the US), Retirement and Disability Benefits, Unemployment benefits

b) Means-tested Transfers: In-kind (Medicaid, public housing, food stamps in the US) and cash benefits

Modern governments raise large fraction of GDP in taxes (30-45%) and spend significant fraction of GDP on transfers

Tax T(z) is piecewise linear and continuous function of taxable income z with constant marginal tax rates (MTR) T'(z) by brackets

In 2018+, 7 brackets with MTR 10%,12%,22%,24%,32%,35%, 37% (top bracket for z above \$600K), indexed on price inflation

Lower preferential rates (up to a max of 20%) apply to dividends (since 2003), realized capital gains [in part to offset double taxation of corporate profits].

20% of business profits are exempt since 2018

Tax rates change frequently over time. Top MTRs have declined drastically since 1960s (as in many OECD countries)





Historically, a 70 percent marginal tax rate is not unusual

The top marginal income tax rates from 1913 to 2018



... Some brand new evidence from the Social Economics Lab and understandingeconomics.org

What are the Shortcomings of the Income Tax System?

people takeadvantage hard earn people government very fair people cheat corporation share thousand dollar wealthy too many people working higher class working people low end help people use avoid people middle everyone fair million dollar people high people corporation wealthy individual break people people fair break wealthy wealthy share fair everyone find loophole people use class peoplerich corporation high low high middle rich break wealthy people government spending lower family loophole use super rich rich avoid too many wealthy people very rich keep loophole people upper class, benefit rich loophole wealthy too many break rich middle people want take awaybracket fair loophole rich ower class high earner hard working fair people lower middle Class poor middle good people too much o manv everyone share weryone share wery year poor poor fair share working class class class of any poor and the pool to observe the share to o many rich big business class wery rich too many use thing lower people rich poor rich rich rich rich farhind rise share share too many use thing lower people loophole high every year rich rich rich fair high class social security rich people fair middle avoid too much waste people richtake people people higher work hard too many people cant afford avoid fair favor wealthy people people work loophole corporation break big Icophole lower class higher poor people free free avoid share class rich complicated fair big corporation wealthy corporation poor class people like people also complicated too many class too much complicated loophole just keep fair too many corporation wealthy class lower higher bracket people lower write offs too many deduction too much government

What are your Main Considerations about the Income Tax? Relative Frequency of Topics by Political Views



People believe top bracket starts much lower, inflate extremes, and "schmedule"



Perceived Composition of the Top 1%:

so many entrepreneurs, scientists, government, teachers, arts, media & sports!


Concern that taxes funding social state could discourage work. Strong evidence that labor supply model of an individual decision based on standard invariant utility u(c, l) is highly incomplete.

Social norms play large role: e.g. women's market labor supply

a) Youth labor is regulated by labor laws/education

b) Old age labor regulated by retirement programs

c) Female market labor driven by norms + child care policy

US female labor force participation during World War II: 50

d) Hours of work regulated by overtime + vacation mandates

Responses to taxes and transfers likely affected by social norms



Source: OECD database online. Employment to population ratios.

Employment Rates of Women by Age, 2019 Source: Saez AEA-PP'21



Source: OECD database online. Employment to population ratios.



Source: OECD database online.



Source: OECD database online.

US female labor force participation, age 16-64



Source: Historical Statistics of the United States (Current Population Reports).







Diamond and Saez (JEP'11): In practice, individual income tax is progressive with brackets with increasing marginal tax rates. What is the optimal top tax rate?

Consider constant MTR au above fixed z^* . Goal is to derive optimal au

In the US in 2018+, au= 37% and $z^*\approx$ \$600, 000 (pprox top 1%)

Denote by z average income of top bracket earners [depends on net-of-tax rate $1 - \tau$], with elasticity $e = [(1 - \tau)/z] \cdot dz/d(1 - \tau)$

Suppose the government wants to maximize tax revenue collected from top bracket taxpayers (marginal utility of consumption of top 1% earners is small)

Diving into optimal taxation: Optimal Top Income Tax Rate



Diving into optimal taxation: Optimal Top Income Tax Rate



Optimal Top Income Tax Rate

Consider small d au > o reform above z^*

- 1. Mechanical increase in tax revenue: $dM = [z z^*]d\tau$
- 2. Behavioral response reduces tax revenue: $dB = \tau dz$

Optimal τ such that dM + dB = 0

Can show that, optimal tax rate is: $\tau = \frac{1}{1+a \cdot e}$ with $a = \frac{z}{z-z^*}$ Optimal τ decreases with e [efficiency] Optimal τ decrease with a [thinness of top tail]

Empirically $a \approx$ 1.5, easy to estimate using distributional data [mean income above $z^* =$ \$.5m is about \$1.5m in the US]

Empirically *e* is harder to estimate [controversial]

Example: If e = .25 then $\tau = 1/(1 + 1.50.25) = 1/1.375 = 73\%$

Externalities

Externalities

Market failure: A problem that violates one of the assumptions of the 1st welfare theorem and causes the market economy to deliver an outcome that does not maximize efficiency

Externality: Externalities arise whenever the actions of one economic agent directly affect another economic agent outside the market mechanism

Externality example: a steel plant that pollutes a river used for recreation

Not an externality example: a steel plant uses more electricity and bids up the price of electricity for other electricity customers

Externalities are one important case of market failure

Externalty Theory: Economics of Negative Production Externalities

Negative production externality: When a firm's production reduces the well-being of others who are not compensated by the firm.

Private marginal cost (PMC): The direct cost to producers of producing an additional unit of a good

Marginal Damage (MD): Any additional costs associated with the production of the good that are imposed on others but that producers do not pay

Social marginal cost (SMC = PMC + MD): The private marginal cost to producers plus marginal damage

Example: steel plant pollutes a river but plant does not face any pollution regulation (and hence ignores pollution when deciding how much to produce)

Economics of Negative Production Externalities: Steel Production



Negative consumption externality: When an individual's consumption reduces the well-being of others who are not compensated by the individual.

Private marginal benefit (PMB): The direct benefit to consumers of consuming an additional unit of a good by the consumer.

Social marginal benefit (SMB): The private marginal benefit to consumers plus any costs associated with the consumption of the good that are imposed on others

Example: Using a car and emitting carbon contributing to global warming

With a free market, quantity and price are such that PMB = PMC

Social optimum is such that SMB = SMC

 \Rightarrow Private market leads to an inefficient outcome (1st welfare theorem does not work)

Negative production externalities \rightarrow over production (SMC curve above PMC curve)

Positive production externalities \rightarrow under production (SMC curve below PMC curve)

Negative consumption externalities \rightarrow over consumption (SMB curve lies below PMB curve)

Positive consumption externalities: \rightarrow under consumption (SMB curve lies above PMB curve)

Coase Theorem (Part I): When there are well-defined property rights and costless bargaining, then negotiations between the party creating the externality and the party affected by the externality can bring about the socially optimal market quantity.

Coase Theorem (Part II): The efficient quantity for a good producing an externality does not depend on which party is assigned the property rights, as long as someone is assigned those rights.

But limitations:

Internalization might not always work, in particular with large-scale, global externalities (assignment problem, transaction costs and negotiating problem,...)

Firms producing steel pollute a river enjoyed by swimmers. If the firms ignore swimmers, there is too much pollution

1. Swimmers own river: If river is owned by swimmers, then swimmers can charge firms for polluting the river. They will charge firms the marginal damage (*MD*) per unit of pollution. (Shifts up the PMC of the firm to the level of *SMC*).

Why price pollution at *MD*? If price is above *MD*, swimmers would want to sell an extra unit of pollution and get hit by pollution damage *MD*, so price must fall. *MD* is the equilibrium efficient price in the newly created pollution market.

 Firms own river: If river is owned by firms, then swimmers are willing to pay firms MD for each unit of steel it does NOT produce. This increases the firms' cost of producing each unit of steel. Their cost shifts from PMC to SMC = PMC + MD for each quantity of steel produced.

Final level of pollution will be the same in 1) and 2)

Public policy makers employ two types of remedies to resolve the problems associated with negative externalities:

- 1. **quantity regulation**: government limits use of externality producing chemicals. Example CFCs [chlorofluorocarbons] that deplete ozone layer
- 2. **corrective taxation**: corrective tax or subsidy equal to marginal damage per unit. Example: Carbon tax to fight global warming due to CO2 emissions

1) and 2) can be combined with tradable emissions permits to firms that can then be traded (cap-and-trade for carbon emissions)

Two differences between corrective taxes and tradable permits (carbon tax vs. cap-and-trade in the case of CO2 emissions)

- 1. **Uncertainty in marginal costs** : With uncertainty in costs of reducing pollution, taxes preferable when MD curve is flat. Tradable permits are preferable when MD curve is steep.
- 2. Initial allocation of permits: If the government sells them to firms, this is equivalent to the tax

If the government gives them to current firms for free, this is like the tax + large transfer to initial polluting firms.

Corrective Taxation



Climate Change and CO₂ Emissions

Industrialization has dramatically increased CO2 emissions and atmospheric CO2 generates global warming

Four factors make this challenging (Wagner-Weitzman 2015):

- 1. Global: Emissions in one country affect the full world
- 2. **Irreversible**: Atmospheric CO2 has long life (centuries) [absent carbon capture tech breakthrough]
- 3. Long-term: Costs of global warming are decades/centuries away [how should this be discounted?]
- 4. **Uncertain**: Great uncertainty in costs of global warming [mitigation vs. amplifying feedback loops]

How fast should we start reducing emissions? [Stern-Weitzman want a fast reduction, Nordhaus advocates a slower path]

Enormous variation across geographical areas and economic development. Pace of change makes adaptation daunting

- 1. Sea rise will flood low lying coasts and major population centers in many countries (e.g., Miami, Florida; value of real estate subject to regular flooding has dropped)
- 2. Impact on bio-diversity (mass extinctions)
- 3. Agricultural production could be disrupted by climate change and the increased weather variability it generates:

demand for food is very inelastic in the short-run \Rightarrow Spikes in prices if agricultural output falls \Rightarrow disruption/famines possible in low income countries

4. Droughts and heat waves will make many places less livable Some societies may collapse and generate mass migration movements

Estimating costs of Global warming is daunting because society will adapt and reduce costs (relative to a scenario with no adaptation)

Example: heat waves and mortality analysis of Barreca et al. (2016)

- 1. The mortality effect of an extremely hot day (80° F+) declined by about 75% between 1900-1959 and 1960-2004.
- 2. Adoption of residential air conditioning (AC) explains the entire decline
- 3. Worldwide adoption of AC will speed up the rate of climate change (if fossil fuel powered)

If we view global warming as a classical externality, it poses challenges because it is such a long-run problem.

 CO_2 emissions impose a global warming externality \Rightarrow Solution is to impose a carbon tax equal to the marginal damage of CO_2 emissions and let market forces work their magic

But what is the marginal damage of CO_2 ? It depends greatly on how you discount the future

Economists use interest rate *r* to discount future: \$1 today is worth (1 + r)T in *T* years (long-distance future heavily discounted: e.g., r = 4% and $T = 1000 \Rightarrow (1 + r)T = 1017$)

If interest rate is high, it is desirable to let global warming happen and societies collapse!

Massive CO2 emissions pose existential civilizational risk (like CFC destroying vital ozone layer)

Only solution is to decarbonize and we need to do it fast (within decades not centuries)

Decarbonization is within sight: renewable electricity (solar/wind) + grid + big batteries could power most energy needs and replace most fossil fuels

 \Rightarrow could it be done without killing economic growth and without huge short-term disruptions?

Economists' useful point: some sectors are easier to decarbonize than others (e.g. cars easier than planes)

 \Rightarrow start decarbonizing easiest sectors first (Sachs 2020)

Understanding Attitudes toward Climate Policies

Fighting Climate Change: International Attitudes toward Climate Policies

Antoine Dechezleprêtre, Adrien Fabre, Tobias Kruse, Bluebery Planterose, Ana Sanchez-Chico, and Stefanie Stantcheva







Motivation: Understanding international attitudes toward climate change and climate policies

Climate change is a pressing yet unresolved issue

To limit avg. temperature increase to <2°C above pre-industrial levels, must drastically reduce global emissions by 2050

Over 140 countries, representing 90% of global GHG emissions, have adopted or announced climate neutrality targets by mid-century

Given current policies, expect avg. temp rise of about 2.7 $^{\circ}$ C by 2100

What drives support for or opposition to important climate policies across the world? Lack of knowledge?

Effects on own budget and lifestyle?

Broader concerns about the impact on others and the economy?

Struggle to assess how a given policy affects climate change?

Address these questions using surveys and experiments.

An international survey

Large-scale, cross-country survey with +40,000 respondents to analyze attitudes on climate change and climate policies with wide country coverage:

20 countries in all world regions, middle-income as well as high-income countries, covering 72% of global CO₂ emissions, including 18 out of the 21 largest emitters.



¹The three missing countries are Russia, Iran, and Saudi Arabia.

Knowledge across countries: Share of correct answers

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CC is real, human-made, & its dynamics

CC exists, is anthropogenic

Cutting emissions by half insufficient to stop global warming

GHG emission ranking

GHG footprint of beef/meat is higher than chicken or pasta GHG footprint of nuclear is lower than gas or coal GHG footprint of plane is higher than car or train/bus Total emissions of China are higher than other regions Per capita emissions of the US are higher than other regions

CC gases

 CO_{\circ} is a greenhouse gas

Methane is a greenhouse gas

CC impacts if CC goes unabated

Severe droughts and heatwaves are likely Sea-level rise is likely

More frequent volcanic eruptions are unlikely

0	63	69	63	57	71	84	65	74	80	80	67	61	81	
2	52	53	63	54	69	51	59	40	34	56	53	44	27	

80	82	82	86	72	86	82	73	77	85	74	84	74
64	67	62	73	50	56	65	73	71	71	50	70	57
55	56	56	70	62	73	51	37	55	30	62	66	41
71	71	68	66	61	70	81	82	65	86	73	69	60
49	36	48	64	50	58	60	36	54	27	52	44	54

58	65	50	51	52	56	74	60	58
47	43	51	47	54	43	55	32	58
29	25	37	23	18	36	38	32	$\overline{28}$
58	64	33	57	43	69	62	71	62
44	53	34	42	33	49	44	55	45
75	78	86	82	82	72	70	50	77
51	58	42	40	34	59	61	71	49

86	84	90	86	84	89	90	89	89	90	87	85	75
86	83	85	92	82	87	89	92	86	89	85	89	75
44	41	37	62	37	60	49	52	31	31	41	41	43

59 76 71 61 45 62 35 42 49 68 67 74 63

87	81	89	84	94	80	89	91	86
84	78	86	84	93	82	85	82	78
26	33	23	20	19	33	26	21	36

Few outright deny of climate change; most believe it is anthropogenic



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52	52	53	63	54	69	51	59	40	34	56	53	44	27	28	15	15	13	37	33	38	44	

80	82	82	86	72	86	82	73	77	85	74	84	74
64	67	62	73	50	56	65	73	71	71	50	70	57
55	56	56	70	62	73	51	37	55	30	62	66	41
71	71	68	66	61	70	81	82	65	86	73	69	60
49	36	48	64	50	58	60	36	54	27	52	44	54

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44	53	34	42	33	49	44	55	45

33	69	78	93	78	86	87	94	88	77	87	84	75
59	76	71	61	45	62	35	42	49	68	67	74	63

86	84	90	86	84	89	90	89	89	90	87	85	75
86	83	85	92	82	87	89	92	86	89	85	89	75
44	41	37	62	37	60	49	52	31	31	41	41	43

75 78	86	82	82	72	70	50	77
51 58	42	40	34	59	61	71	49

87	81	89	84	94	80	89	91	86
84	78	86	84	93	82	85	82	78
26	33	23	20	19	33	26	21	36

People correctly foresee consequences of climate change

Middleincome . United King Lon Highincome South Africa South Kores Denmark Indonesia Germany France Poland Metico Spain 18Pan aibina dia Trally 70 63 69 63 57 71 84 65 74 80 80 67 61 52 52 53 63 54 69 51 59 40 34 56 53 44 13 37 33 86 72 86 82 73 77 85 74 84 74 58 65 50 51 52 56 74 60 58 64 67 62 73 50 56 65 73 71 71 50 70 57 47 43 51 47 54 43 55 32 58 55 56 56 70 62 73 51 37 55 30 62 66 41 29 25 37 23 18 36 38 32 28 71 71 68 66 61 70 81 82 65 86 73 69 60 58 64 33 57 43 69 62 71 62 49 36 48 64 50 58 60 36 54 27 52 44 54 44 53 34 42 33 49 44 55 45 82 82 72 70 50 77 51 58 42 40 34 59 61 71 49 59 76 71 61 45 62 35 42 49 68 67 74 63 44 41 37 62 37 60 49 52 31 31 41 41 43

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More frequent volcanic eruptions are unlikely
People make insufficient distinction between disaster types

Middleincome . United King States Highincome South Africa South Kores Dennark Germany Indonesia anada Poland Mexico Tance Japan Chinadia Spain really 70 63 69 63 57 71 84 65 74 80 80 67 61 52 52 53 63 54 69 51 59 40 34 56 53 44 37 33 38 44 58 65 50 51 52 56 74 60 58 86 72 86 82 73 77 85 74 84 74 64 67 62 73 50 56 65 73 71 71 50 70 57 47 43 51 47 54 43 55 32 58 55 56 56 70 62 73 51 37 55 30 62 66 41 29 25 37 23 18 36 38 32 28 71 71 68 66 61 70 81 82 65 86 73 69 60 58 64 33 57 43 69 62 71 62

49	36	48	64	50	58	60	36	54	27	52	44	54	44	53	34	42	33	49	44	55	45
83	69	78	93	78	86	87	94	88	77	87	84	75	75	78	86	82	82	72	70	50	77
59	76	71	61	45	62	35	42	49	68	67	$\overline{74}$	63	51	58	42	40	34	59	61	71	49

40 36 48 64 50 58 60 36 54 97 59 44 54

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More frequent volcanic eruptions are unlikely

People are too optimistic about level of decarbonization needed



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Most people are aware of the factors that cause climate change

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Cutting emissions by half insufficient to stop global warming

GHG emission ranking

GHG footprint of beef/meat is higher than chicken or pasta GHG footprint of nuclear is lower than gas or coal GHG footprint of plane is higher than car or train/bus Total emissions of China are higher than other regions Per capita emissions of the US are higher than other regions

CC gases

 $\begin{bmatrix} CO_2 & \text{is a greenhouse gas} \\ Methane & \text{is a greenhouse gas} \end{bmatrix}$

CC impacts if CC goes unabated

Severe droughts and heatwaves are likely

Sea-level rise is likely

More frequent volcanic eruptions are unlikely

Share of people willing to adopt climate-friendly behaviors

61 54 60 58 58

49

58

55



Willingness to adopt climate-friendly behaviors

Have a fuel-efficient or electric vehicle

Limit flying

Limit beef/meat consumption

Limit driving

Limit heating or cooling your home

Factors that would encourage behavior adoption

The well-off also changing their behavior Having enough financial support One's community also changing behaviors

Country adopting ambitious climate policies

Real-stakes

Willing to donate to reforestation cause

Willing to sign petition supporting climate action

54	45	52	60	45	45	78	48	53	57	60	51	50
51	37	53	49	56	64	64	37	58	43	62	46	39
40	31	38	33	38	45	62	24	49	36	44	44	36
37	26	35	33	32	41	57	37	41	36	47	37	29
34	25	27	33	39	36	55	26	37	29	46	30	28

62

58 49 45 64 71

45 52 56 40 55

49 40 43 45 42 54 72 4

69	78	65	74	67	70	60	73	62
55	52	59	66	56	59	48	44	49
44	44	48	62	49	40	33	35	35
49	41	62	66	54	47	38	46	25
48	46	56	68	60	59	39	34	9

76 59

72

60 30

67 68

7	58	60	65	62	53	67	71	53	71	71	60	71
7	64	63	68	61	52	66	65	53	67	68	63	72
1	56	68	63	50	47	66	69	53	70	72	63	72
7	50	61	59	40	32	58	57	68	71	64	52	51





Around half are willing to buy fuel-efficient car or to limit flying



Willingness to adopt climate-friendly behaviors

ſ	Have a fuel-efficient or electric vehicle	54	45	52	60	45	45	78	48	53	57	60	51	50	(59	78	65	74	67	70	60	73	62
	Limit flying	51	37	53	49	56	64	64	37	58	43	62	46	39	ų,	55	52	59	66	56	59	48	44	49
	Limit beef/meat consumption	40	31	38	33	38	45	62	24	49	36	44	44	36	4	4	44	48	62	49	40	33	35	35
	Limit driving	37	26	35	33	32	41	57	37	41	36	47	37	29	4	9	41	62	66	54	47	38	46	25
	Limit heating or cooling your home	34	25	27	33	39	36	55	26	37	29	46	30	28	4	18	46	56	68	60	59	39	34	9
Fa	actors that would encourage behavior adoptio	n																						
	The well-off also changing their behavior	61	54	60	58	58	62	81	57	58	60	65	62	53	(57	71	53	71	71	60	71	76	59
	Having enough financial support	58	49	58	49	45	64	71	47	64	63	68	61	52	(66	65	53	67	68	63	72	67	68
	One's community also changing behaviors	55	45	52	56	40	55	80	51	56	68	63	50	47	(66	69	53	70	72	63	72	72	46
	Country adopting ambitious climate policies	49	40	43	45	42	54	72	47	50	61	59	40	32		68	57	68	71	64	52	51	60	30
R	eal-stakes																							
	Willing to donate to reforestation cause	77	71	74	69	73	72	85	83	83	86	76	75	82	ę)1	85	99	92	96	86	90	85	92
	Willing to sign petition supporting climate action	69	54	70	59	66	66	77	72	81	83	85	67	51	ę	00	75	96	96	96	90	88	87	84

People are unwilling to limit some behaviors



Willingness to adopt climate-friendly behaviors

Have a fuel-efficient or electric vehicle	54	45	52	60	45	45	78	48	53	57	60	51	50	6	9 7	78	65	74	67	70	60	73	62
Limit flying	51	37	53	49	56	64	64	37	58	43	62	46	39	5	5 5	52	59	66	56	59	48	44	49
Limit beef/meat consumption	40	31	38	33	38	45	62	24	49	36	44	44	36	4	4 4	14	48	62	49	40	33	35	35
Limit driving	37	26	35	33	32	41	57	37	41	36	47	37	29	4	9 4	11	62	66	54	47	38	46	25
Limit heating or cooling your home	34	25	27	33	39	36	55	26	37	29	46	30	28	4	8 4	16	56	68	60	59	39	34	9

Factors that would encourage behavior adoption

The well-off also changing their behavior	61	54	60	58	58	62	81	57	58	60	65	62	53	67	7
Having enough financial support	58	49	58	49	45	64	71	47	64	63	68	61	52	66	6
One's community also changing behaviors	55	45	52	56	40	55	80	51	56	68	63	50	47	66	69
Country adopting ambitious climate policies	49	40	43	45	42	54	72	47	50	61	59	40	32	58	5'
Real-stakes															
Willing to donate to refore station cause	77	71	74	69	73	72	85	83	83	86	76	75	82	91	8
Willing to sign petition supporting climate action	69	54	70	59	66	66	77	72	81	83	85	67	51	90	73





People are willing to change behavior with financial support and if others do



Willingness to adopt climate-friendly behaviors

Have a fuel-efficient or electric vehicle	54	45	52	60	45	45	78	48	53	57	60	51	50	69	78	65	74	67	70	60	73	62
Limit flying	51	37	53	49	56	64	64	37	58	43	62	46	39	55	52	59	66	56	59	48	44	49
Limit beef/meat consumption	40	31	38	33	38	45	62	24	49	36	44	44	36	44	44	48	62	49	40	33	35	35
Limit driving	37	26	35	33	32	41	57	37	41	36	47	37	29	49	41	62	66	54	47	38	46	25
Limit heating or cooling your home	34	25	27	33	39	36	55	26	37	29	46	30	28	48	46	56	68	60	59	39	34	9

Limit heating or coc

Factors that would encourage behavior adoption

ſ	The well-off also changing their behavior	61	54	60	58	58	62	81	57	58	60	65	62	53	67	71	53	71	71	60	71	76	59	
l	Having enough financial support	58	49	58	49	45	64	71	47	64	63	68	61	52	66	65	53	67	68	63	72	67	68	
l	One's community also changing behaviors	55	45	52	56	40	55	80	51	56	68	63	50	47	66	69	53	70	72	63	72	72	46	
	Country adopting ambitious climate policies	49	40	43	45	42	54	72	47	50	61	59	40	32	58	57	68	71	64	52	51	60	30	
R	teal-stakes																							
	Willing to donate to reforestation cause	77	71	74	69	73	72	85	83	83	86	76	75	82	91	85	99	92	96	86	90	85	92	

Willing to sign petition supporting climate action 69

11	14	09	15	12	00	00	00	80	10	10	02	
54	70	59	66	66	77	72	81	83	85	67	51	



Political leanings very strong predictors (left-leaning respondents support more climate action).

Those with higher levels of education, particularly college degree (even conditional on income).

Those whose lifestyle allows them to do so: i) have access to high-quality public transportation; ii) rely less on a car; iii) have lower gas expenses.

- 1. Effectiveness belief: the policy is helpful in reducing emissions.
- 2. Inequality concern: the policy will not disproportionately hurt lower-income or vulnerable households.
- 3. Self-interest: the policy will not financially hurt my household.

Share of respondents who support climate change policies



More than half support subsidies to low-carbon technology and infrastructure

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	÷\$	All	0.82	Der	61.00	Cer	12al	200	50%	500	580	010	Unit	20	810	CU	ho	had	Net	300	Lar	30	
Main Policies Studied	_																					_	
Green infrastructure program	57	49	56	53	57	42	78	48	58	68	71	54	50	78	77	82	80	80	84	73	76	69	
Ban on combustion-engine cars	43	35	47	41	28	32	54	41	44	52	54	45	39	65	60	72	77	65	67	53	62	58	
Carbon tax with cash transfers	37	34	41	30	29	28	47	35	36	53	44	34	33	59	47	80	71	67	55	52	55	39	
Transportation Policies																							
Ban on polluting cars in city centers	60	53	60	66	57	50	76	64	61	52	64	65	49	71	65	73	74	85	72	66	60	67	
Ban on combustion-engine vehicles w. alternatives available	48	38	47	42	42	41	58	51	48	58	57	52	44	68	60	78	77	72	66	62	64	63	
Tax on flying $(+20\%)$	45	35	44	60	46	53	41	47	44	42	44	46	33	52	39	61	64	68	51	43	45	36	
Energy Policies											_			_				_		_			
Subsidies to low-carbon technologies	67	62	65	67	56	64	79	69	75	71	73	65	57	73	77	75	68	79	66	75	75	68	٦
Mandatory and subsidized insulation of buildings	66	70	64	70	64	60	73	59	72	72	71	70	53	75		80				73	75	75	
Funding clean energy in low-income countries	54	49	50	53	48	48	76	53	55	57	65	51	50	73	63	71	75	81	74	76	66	78	ر
Tax on fossil fuels (\$45/tCO2)	36	36	40	43	31	31	38	35	27	42	39	38	34	48	35	58	64	58	41	38	52	28	
Food Policies		1.0					-	1.0	-				10			-	_						
Subsidies on organic and local vegetables	56	42	50	59	52	56	71	46	73	62	65	49	43	68	62	79		77	58	59	80	58	
Ban of intensive cattle farming	42	32	41	31	55	49	64	17	44	44	43	50	36	39	38	50		45	46	28	32	25	
Removal of subsidies for cattle farming	34	31	33	32	28	38	42	16	34	31	42	37	38	39	43	47		51	47	27	31	22	
A high tax on cattle products, doubling beef prices	30	24	27	31	29	40	37	19	30	26	31	31	31	36	33	48		49	37	30	26	24	
Support for Carbon Tax With:	00	0.0	10	00	0.0	00	-	* 0	00	-	00	00	* 0		-	-	-		-	-	-	00	
Funding environmental infrastructures	63	60	48	60	65	60	76	56	68	78	69	63	56	75	78	76	71	81	73	79	73	69	
Subsidies to low-carbon tech.	63	58	49	52	57	66	76	68	71	79	69	59	53	73	74	79	68	79	71	78	66	65	
Reduction in personal income taxes	57	52	48	38	62	54	72	64	69	62	67	52	49	69	69	74	68	74	69	68	66	64	
Cash transfers to the poorest households	53	51	48	41	55	47	68	54	50	59	63	57	46	73	67	82	69	86	66	65	82	62	
Cash transfers to constrained households	50	50	42	36	55	47	62	47	39	62	61	52	44	64	59	69	63	74	59	60	65	61	
Tax repates for the most affected firms	48	41	41	38	52	34	00	49	61	59	55	41	43	62	59	72	65	68	54	63	55	50	
Reduction in the public deficit	48	40	39	34	49	39	06	50	56	48	62	44	48	63	62	72	05	70	01	62	57	52	
Progressive transfers	47	40	54	07	15	45	66	56	40	44	40	43	00	58	04	84	07	01	44	45	51	49	
Equal cash transfers to all nouseholds	38	37	38	27	45	31	42	43	37	42	44	33	38	61	45	10	64	76	62	57	59	53	
Reduction in corporate income taxes	37	29	32	24	31	25	55	38	48	48	50	26	29	58	54	07	60	07	01	50	00	42	

Many support banning polluting vehicles in city centers

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Main Deligion Studied				
Creen infrastructure program	40 56 53 5	7 49 79 49 59 69	71 54 50 78 7	7 89 80 80 84 73 76 60
Ban on combustion ongine cars	15 00 00 0	8 32 54 41 44 52	54 45 39 65 6	0 72 77 65 67 53 62 58
Carbon tex with each transform	7 34 41 30 9	0 98 47 35 36 53	14 24 22 50 A	7 80 71 67 55 59 55 90
Transportation Policies	04 41 00 2	3 20 41 30 30 33	44 04 00 03 4	1 80 11 01 33 32 33 33
Ban on polluting cars in city centers	53 60 66 5	7 50 76 64 61 52	64 65 49 71 6	5 73 74 85 72 66 60 67
Ban on combustion-engine vehicles w alternatives available	38 47 42 4	2 41 58 51 48 58	57 52 44 68 6	0 78 77 72 66 62 64 63
Tax on flying $(\pm 20\%)$	35 44 60 4	6 53 41 47 44 42	44 46 33 52 3	9 61 64 68 51 43 45 36
Energy Policies	00 11 00 1	0 00 11 11 11 12	11 10 00 02 0	0 01 01 00 01 10 10 00
Subsidies to low-carbon technologies	62 65 67 5	6 64 79 69 75 71	73 65 57 73 7	7 75 68 79 66 75 75 68
Mandatory and subsidized insulation of buildings	6 70 64 70 6	4 60 73 59 72 72	71 70 53 75	80 73 75 75
Funding clean energy in low-income countries	49 50 53 4	8 48 76 53 55 57	65 51 50 73 6	3 71 75 81 74 76 66 78
Tax on fossil fuels ($$45/tCO2$)	36 40 43 3	31 31 38 35 27 42	39 38 34 48 3	5 58 64 58 41 38 52 28
Food Policies				
Subsidies on organic and local vegetables	3 42 50 59 5	2 56 71 46 73 62	65 49 43 68 6	2 79 77 58 59 80 58
Ban of intensive cattle farming	2 32 41 31 5	5 49 64 17 44 44	43 50 36 39 3	8 50 45 46 28 32 25
Removal of subsidies for cattle farming	31 33 32 2	8 38 42 16 34 31	42 37 38 39 4	3 47 51 47 27 31 22
A high tax on cattle products, doubling beef prices	24 27 31 2	9 40 37 19 30 26	31 31 31 36 3	3 48 49 37 30 26 24
Support for Carbon Tax With:				
Funding environmental infrastructures	60 48 60 6	5 60 76 56 68 78	69 63 56 75 7	8 76 71 81 73 79 73 69
Subsidies to low-carbon tech.	58 49 52 5	7 66 76 68 71 79	69 59 53 73 7	4 79 68 79 71 78 66 65
Reduction in personal income taxes	52 48 38 6	62 54 72 64 69 62	67 52 49 69 6	9 74 68 74 69 68 66 64
Cash transfers to the poorest households	51 48 41 5	5 47 68 54 <u>50</u> 59	63 57 46 73 6	7 82 69 86 66 65 82 62
Cash transfers to constrained households	50 42 36 5	5 47 62 47 39 62	61 52 44 64 5	9 69 63 74 59 60 65 61
Tax rebates for the most affected firms	8 41 41 38 5	52 34 66 49 61 59	55 41 43 62 5	9 72 65 68 54 63 55 56
Reduction in the public deficit	8 40 39 34 4	9 39 66 50 56 48	62 44 48 63 6	52 72 65 70 61 62 57 52
Progressive transfers	40 54	45 66 56 40 44	40 43 58 6	4 84 67 61 44 45 51 49
Equal cash transfers to all households	3 37 38 27 4	5 31 42 43 37 42	44 33 38 61 4	5 70 64 76 62 57 59 <u>53</u>
Reduction in corporate income taxes	29 32 24 3	37 25 55 38 48 48	50 26 29 58 5	4 67 60 67 61 50 60 42

Carbon taxes appear to be least popular at first glance

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Main Doligios Studied																						_	
Groop infrastructure program	57	40	56	53	57	49	78	18	58	68	71	54	50	78	77	82	80	80	84	73	76	60	
Ban on combustion-engine cars	43	35	47	41	28	32	54	41	44	52	54	45	39	65	60	72	77	65	67	53	62	58	
Carbon tax with cash transfors	37	34	41	30	20	28	47	35	36	53	44	34	33	59	47	80	71	67	55	52	55	39	
Transportation Policies				00	20	-		00	00	00			00	00		00	••	0.	00	02	00	00	
Ban on polluting cars in city centers	60	53	60	66	57	50	76	64	61	52	64	65	49	71	65	73	74	85	72	66	60	67	
Ban on combustion-engine vehicles w. alternatives available	48	38	47	42	42	41	58	51	48	58	57	52	44	68	60	78	77	72	66	62	64	63	
Tax on flying $(+20\%)$	45	35	44	60	46	53	41	47	44	42	44	46	33	52	39	61	64	68	51	43	45	36	
Energy Policies																							
Subsidies to low-carbon technologies	67	62	65	67	56	64	79	69	75	71	73	65	57	73	77	75	68	79	66	75	75	68	
Mandatory and subsidized insulation of buildings	66	70	64	70	64	60	73	59	72	72	71	70	53	75		80				73	75	75	
Funding clean energy in low-income countries	54	49	50	53	48	48	76	53	55	57	65	51	50	73	63	71	75	81	74	76	66	78	
(Tax on fossil fuels (\$45/tCO2)	36	36	40	43	31	31	38	35	27	42	39	38	34	48	35	58	64	58	41	38	52	28	
Food Policies							_		_		_			_		_	_	_		_			
Subsidies on organic and local vegetables	56	42	50	59	52	56	71	46	73	62	65	49	43	68	62	79		77	58	59	80	58	
Ban of intensive cattle farming	42	32	41	31	55	49	64	17	44	44	43	50	36	39	38	50		45	46	28	32	25	
Removal of subsidies for cattle farming	34	31	33	32	28	38	42	16	34	31	42	37	38	39	43	47		51	47	27	31	22	
A high tax on cattle products, doubling beef prices	30	24	27	31	29	40	37	19	30	26	31	31	31	36	33	48		49	37	30	26	24	
Support for Carbon Tax With:																							
Funding environmental infrastructures	63	60	48	60	65	60	76	56	68	78	69	63	56	75	78	76	71	81	73	79	73	69	
Subsidies to low-carbon tech.	63	58	49	52	57	66	76	68	71	79	69	59	53	73	74	79	68	79	71	78	66	65	
Reduction in personal income taxes	57	52	48	38	62	54	72	64	69	62	67	52	49	69	69	74	68	74	69	68	66	64	
Cash transfers to the poorest households	53	51	48	41	55	47	68	54	50	59	63	57	46	73	67	82	69	86	66	65	82	62	
Cash transfers to constrained households	50	50	42	36	55	47	62	47	39	62	61	52	44	64	59	69	63	74	59	60	65	61	
Tax rebates for the most affected firms	48	41	41	38	52	34	66	49	61	59	55	41	43	62	59	72	65	68	54	63	55	56	
Reduction in the public deficit	48	40	39	34	49	39	66	50	56	48	62	44	48	63	62	72	65	70	61	62	57	52	
Progressive transfers	47	40	54			45	66	56	40	44	40	43		58	64	84	67	61	44	45	51	49	
Equal cash transfers to all households	38	37	38	27	45	31	42	43	37	42	44	33	38	61	45	70	64	76	62	57	59	53	
Reduction in corporate income taxes	37	29	32	24	37	25	55	38	48	48	50	26	29	58	54	67	60	67	61	50	60	42	

Use of revenue matters substantially for support of carbon taxes



Least support for carbon tax with equal transfers or to reduce corporate tax



Policies to reduce cattle farming least popular in all countries



Policy Implications

1. Policies need to be effective and distributionally progressive: compensate low-income and vulnerable households.

2. There is a need for explanations of policies' effectiveness and distributional impacts, not just information about climate change impacts

3. People care about impact on their households, so need to provide alternatives and means to substitute before imposing punitive policies.

Help households transition out of fossil fuel equipment (cars, heating systems). Requires time and financial help.

Ensure a transition (e.g.: announce path of carbon tax increases in advance, especially in light of current energy prices)



THANK YOU!

These slides are available on my website: https://bluebery-planterose.com/teaching

These slides are partly based on courses by: Ghazala Azmat, Raj Chetty, Emmanuel Saez, Stefanie Stantcheva, and Gabriel Zucman.