

# Ecological Considerations

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# Outline

Distribution of CO<sup>2</sup> emissions

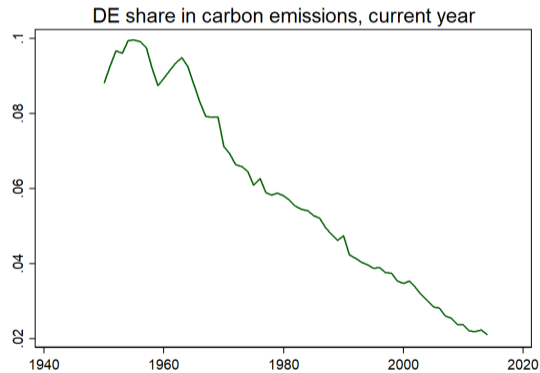
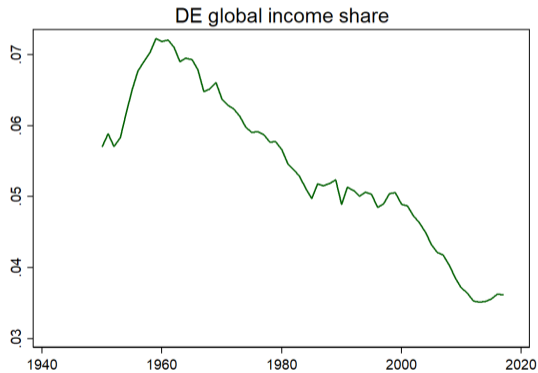
Example: Estimating Wealth Tax Revenues

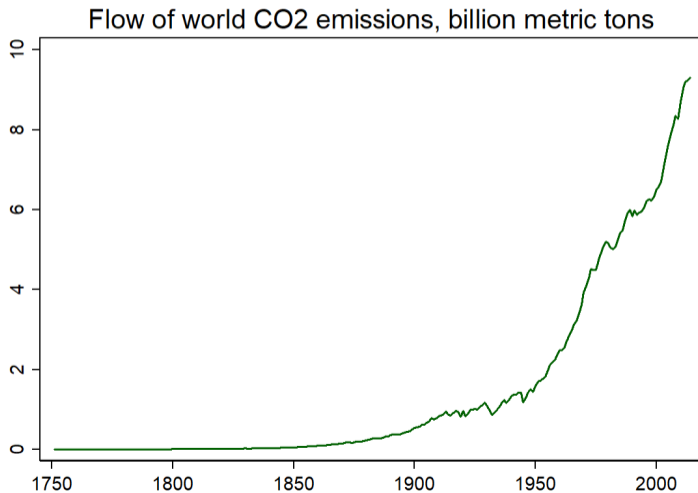
## Distribution of CO<sup>2</sup> emissions

## CO<sup>2</sup> Emissions

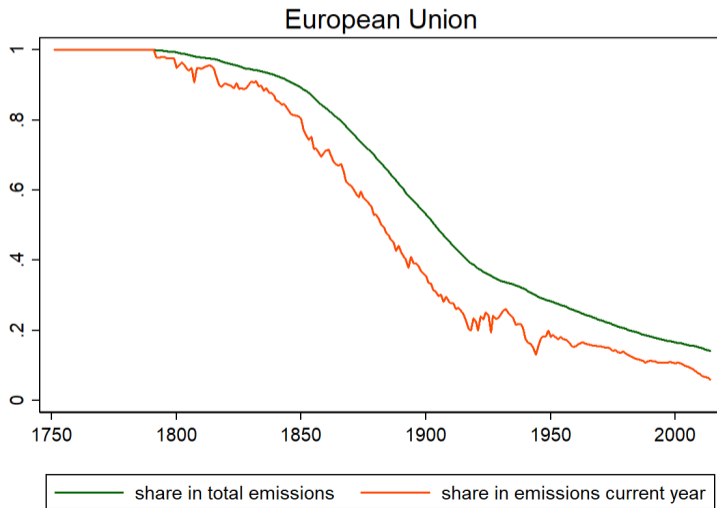
- ▶ Two main sources of CO<sup>2</sup> (and other greenhouse gas) emissions: 1) fossil fuel usage and 2) land use change and agriculture
- ▶ Fossil fuel accounts for 64% of all human induced emissions of carbon dioxide over last 150 years
- ▶ Let's take a look how these global emissions are distributed across countries and time

# CO<sup>2</sup> Emissions

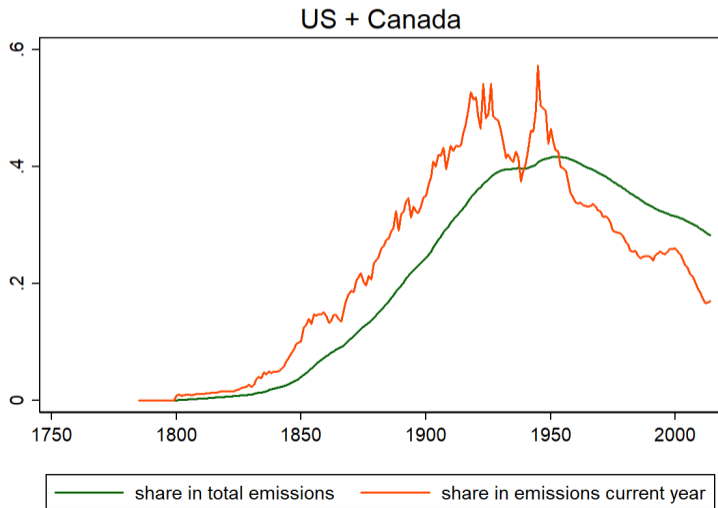




Based on data from the Carbon Dioxide Information Analysis Center. Mass of carbon, multiply by 3.67 to convert to mass of CO<sub>2</sub>.



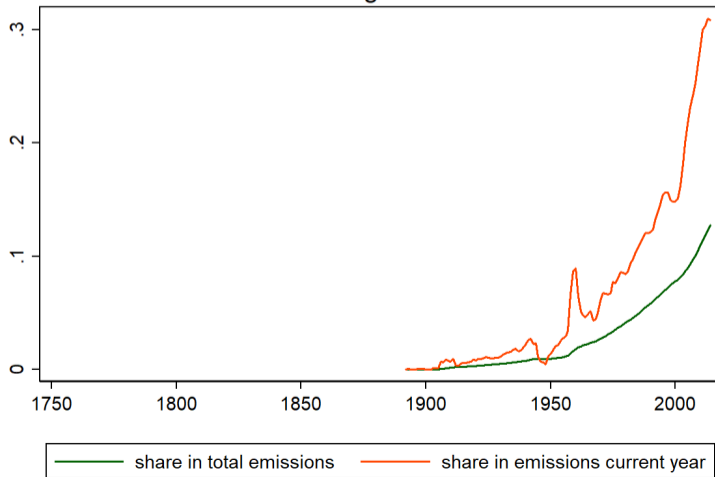
Based on data from  
the Carbon Dioxide  
Information Analysis  
Center.



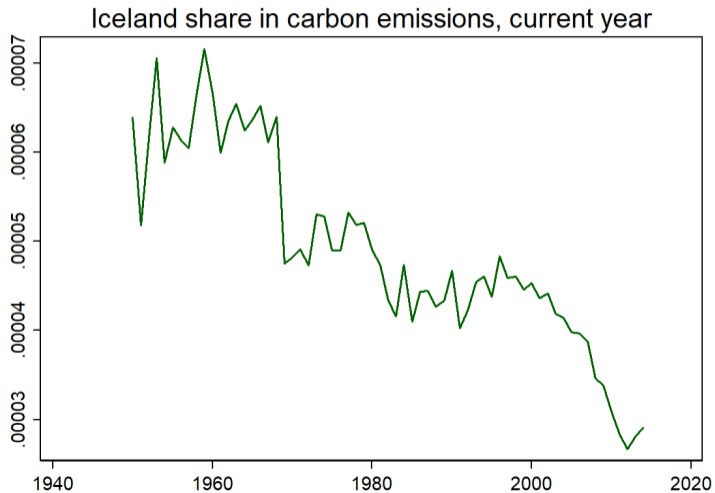
Based on data from the Carbon Dioxide Information Analysis Center.



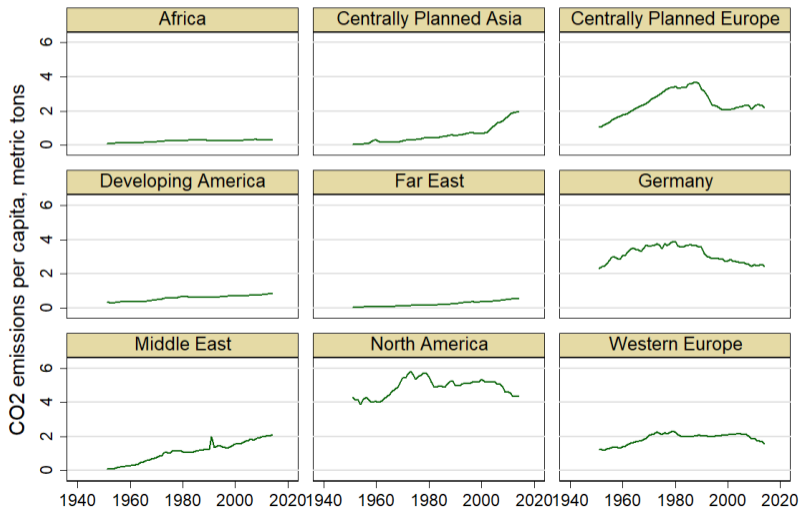
### China + Mongolia + Vietnam



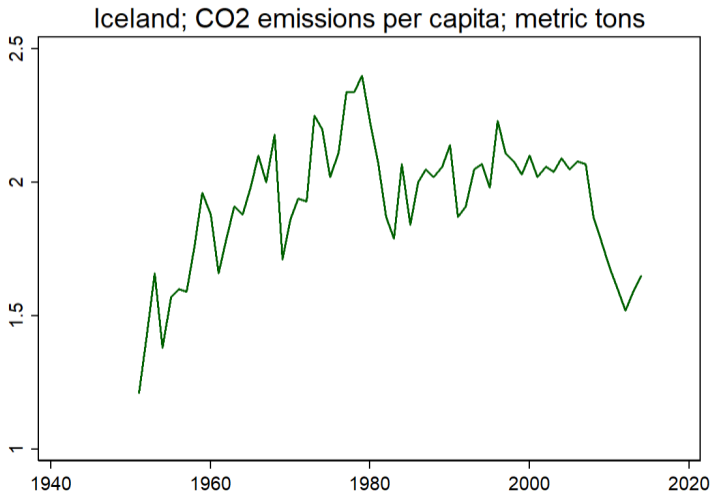
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## CO<sup>2</sup> Emissions

1. Economic growth was (and still is) directly linked with emissions
  - ▶ wealth is accumulated past economic activity means accumulated emissions:  
public support for wealth taxation
2. No significant decline in global emissions
3. Western Countries started much earlier and thus contributed more to total stock of emission
4. "China"'s current per capita emissions ( $\approx 2t$ ) about half of US' ( $> 4t$ ) and slightly more than Western Europe's ( $< 2t$ )
5. What we don't see in this data is who ultimately consumes emissions. Outsourcing production and importing finished goods reduces carbon footprint.

## Example: Estimating Wealth Tax Revenues

## Data Source: Wealth and Asset Survey (WAS)

Estimate Tax Revenues of Wealth Tax in the UK based on the WAS.

- ▶ Bi-annual survey of UK households about their income, assets and liabilities
- ▶ Managed by the Office for National Statistics
- ▶ Introduced in 2006 (wave 1); consecutive waves in 2008, 2010, 2012, 2014 (2016 should be available soon; 4 year delay)
- ▶ results based on waves 2008, 2010, 2012

## Methodology: Raw vs Corrected Data

- ▶ There is evidence from other countries and good reason to believe that the very wealthy do not take part in this survey! (differential unit non-response)
- ▶ What that means is we obtain a biased picture of the wealth distribution if we use the (raw) WAS data
- ▶ (By "raw" WAS data I mean using the data as it comes from the ONS)
- ▶ One way of trying to mitigate the problem is to use a statistical model, to model the missing part of the distribution
- ▶ What kind of model: we fit a Pareto distribution
- ▶ The key feature of the Pareto distribution is its **heavy tail**



## Wealth in the UK based on raw and corrected Data

We are looking here at **net wealth** (i.e. total assets minus total liabilities) of **households!**

	WAS wave 2 2008-2010	WAS wave 3 2010-2012	WAS wave 4 2012-2014
total wealth raw (bn pound)	5,482	5,905	6,599
total wealth corrected (bn pound)	5,756	6,026	7,038
number of millionaires raw	553,565	630,794	887,219
number of millionaires corrected	579,836	653,365	933,479

## Tax Scenarios

- ▶ **Linear Model 1:** no tax up to £500k  
1% above £500k
- ▶ **Linear Model 2:** no tax up to £1 million  
1% above £1 million
- ▶ **Progressive Model 1:** no tax up to £1 million  
0.3% between £1 million and £2 million  
and 0.7% above
- ▶ **Progressive Model 2:** no tax up to £700k  
0.5% between £700k and £2 million  
1% between £2 million and £3 million  
1.5% above £3 million

## Estimated Revenues

billion pounds	raw			corrected		
	2008	2010	2012	2008	2010	2012
linear model 1	10.0	13.9	17.5	12.7	15.0	21.8
linear model 2	4.2	7.3	9.1	6.7	8.3	13.1
progressive model 1	1.9	3.9	4.7	3.6	4.5	7.3
progressive model 2	4.6	8.9	10.6	8.0	10.1	16.0

## Estimated Revenues

% of GDP	raw			corrected		
	2008	2010	2012	2008	2010	2012
linear model 1	0.6%	0.9%	1.0%	0.8%	0.9%	1.3%
linear model 2	0.3%	0.5%	0.5%	0.4%	0.5%	0.8%
progressive model 1	0.1%	0.2%	0.3%	0.2%	0.3%	0.4%
progressive model 2	0.3%	0.6%	0.6%	0.5%	0.6%	0.9%

## Conclusions

- ▶ Wealth tax(es) have substantial potential to generate revenues
- ▶ Two problems: evasion
- ▶ and under representation of wealthy households (despite Pareto model)
- ▶ Both problems have opposite effects