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Integrating climate modelling and inequality: challenges and way forward

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3 broad questions when modeling inequality and climate change dynamics:

- Who pollutes? Inequality among polluters
- Who is impacted by policy? Inequality among taxpayers
- Who is impacted by climate change? Inequality among citizens
- → Each of these dimensions raises several measurement issues from the point of view of economic inequality analysis (I will leave aside all other issues for now)



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Figure 15. Pre and post tax average income in the US and Western Europe, 1980-2017

Source: Blanchet, Chancel and Gethin (2019). Distribution of per adult pretax income, see paper and WID.world (2019) for data series and notes.







Total income growth by percentile across all world regions, 1980-2016

Income group (percentile)





The geographical breakdown of global income groups changed significantly (1990)

Geographic breakdown of global income groups in 1990



Source: World Inequality Report 2018, Figure 2.1.5. See wir2018.wid.world for data sources and notes.

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The geographical breakdown of global income groups changed significantly (2016)

Geographic breakdown of global income groups in 2016



Source: World Inequality Report 2018, Figure 2.1.6. See wir2018.wid.world for data sources and notes.

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1. Inequality among polluters





Inequality among polluters

- Different strategies to distribute carbon emissions : consumption/income, wealth. Standard analysis = pollution associated to consumption levels.
- Carbon emissions associated to consumption: national level estimates for many countries thanks to combination of I-O tables and HH surveys
- Issues with consumption estimates:
 - Knowledge about consumption is very limited at the top of the distribution. Sampling and non-sampling errors at the top means top-end inequality badly reported.
 - Investments (20-25% GDP) have been badly distributed to consumers so far
 - → Elasticities measured in the literature typically around 0.8-1 (Chakravarty et al. 2009; Lenzen et al., 2006). But elasticities may not be constant.



FIGURE E.1. BREAKDOWN OF TOP 10, MIDDLE 40 AND BOTTOM 50% CO₂e EMITTERS



Source: authors. Key: Among the top 10% global emitters, 40% of CO₂e emissions are due to US citizens, 20% to the EU and 10% from China.



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TABLE 7. CO2e EMISSIONS CONCENTRATIONSHARES IN 2013 (%)

Year	elast	top1	top5	top10	mid40	bot50	bot10
2013	0.9	13.8	31.5	45.2	41.8	13.0	1.2
2013	0.7	9.9	26.6	40.0	44.8	15.3	1.5
2013	1.1	19.0	38.0	51.3	38.0	10.7	0.9

Source: authors. Key: assuming an income-CO₂e elasticity of 0.9, the top10% highest emitters are responsible for 45% of global emissions.







Regional composition of CO2 emitter groups







- What about the content of pollution associated to wealth ownership?
 - Rationale:
 - Consumers not always « responsible » for emissions associated to lifestyles... shareholders are also accountable
 - Typically, I-O databases present « C+G+I » estimates
 - Measurement issues:
 - Lack of data on wealth per se (but huge progress lately)
 - Lack of data on the distribution of wealth (progress lately)
 - Lack of data on the carbon content of wealth ownership (some progress lately)
 - Conceptual issues:
 - How to distribute carbon ownership?
 - Avoiding double counting is hard
 - Policy relevance:
 - If we start to tax ownership of carbonated assets, divestment effect is potentially large
 - Impacts also potentially much more concentrated than consumption taxes





2. Inequality among taxpayers



The U.S. flat tax: decomposition by type of tax



Notes: The figure depicts the average tax rate by income group and its decomposition by type of tax in 2018. All federal, state, and local taxes are included. Tax rates are expressed as a fraction of pre-tax income. Complete details at triumphofinjustice.org.





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Distribution of factor national income among working population, i.e. adults aged 25-60 y.o working at least part-time.













- Inequality among polluters:
 - Need for better country-level estimates
 - In the mean time, it is already possible to produce national & global pollution distributions at percentile level, making rough assumptions
- Inequality among taxpayers:
 - New horizon: integration of climate models with national tax simulators → towards EU-wide climate/tax model?
 - Need to go beyond quintile group level to properly assess policy-induced inequalities to take into account social relevance
- Inequality among citizens:
 - Cf. morning discussions on damage functions
 - Distribution of costs of inaction / benefits of action: issues discussed above also apply



NB: it's not only about good modelling, also about ability to convey results and implications to general public / policymakers (cf. yellow vests)

Strong decline of tax progressivity in the US driven by strong decline of corporate taxes

The key role of the corporate tax for wealthy

(Average tax rate of the top 0.1% highest income earners)





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Saez and Zucman, 2019



Figure 4.4.4

Asset composition by wealth group in France, 2012





Source: Garbinti, Goupille-Lebret and Piketty (2017). See wir2018.wid.world for data series and notes.

In 2012, 67% of the personal wealth of the 5th decile (p50-p60) was composed of housing assets (net of debt). All values have been converted to 2016 constant euros (accounting for inflation). For comparison, $\in 1 = \$1.1 = \7.3 at market exchange rates.

Tracking Progress Toward Global Financial transparency and Tax Justice: Public Statistics to be Published by National Tax Administrations

Summary: In order to track progress toward global financial transparency and tax justice, all countries should commit to publish on an annual basis the following tables. This applies in particular to the countries participating to the various international discussion groups on these issues, in particular those coordinated by OECD on CRS (Common Reporting Standards on cross-border financial assets) and BEPS (Base Erosion and Profit Shifting on corporate taxation).

Net wealth: total assets (real estate, business, financial, etc.), net of debt. For coutry residents, all domestic and foreign assets should be included. For non-residents, all domestic assets should be included (in particuler real estate assets located in the country, as well as all financial assets related to firms and economic activites conducted in the country). To the extent possible, their foreign assets should also be included.

Table 1A - Number of individuals, Wealth and Taxes paid by wealth bracket													
Net wealth	Number of	incl number of	incl number of	Total net wealth	incl. residents	incl. non- residents	Wealth taxes				Income taxes		
bracket (€)	individuals	residents	non-residents				Total wealth taxes	incl. wealth and property tax	incl. capital gains tax	incl. inheritance & estate tax	Total income taxes	incl. personal income tax	incl. corp. income taxes
0-10k 10k-100k 100k-1m 1m-10m 10m-100m 100m-1bn 1bn-5bn 5bn-10bn 10bn+													

Table 1B - Wealth and income composition by wealth bracket														
	Wealth											Income		
Net wealth bracket (€)	Total wealth	incl. currency & deposits	incl. bonds & loans	incl. equities & fund shares	incl. pension funds & life insur.	inc. real estate	incl. business & other non-fin. assets	incl. debt	incl. total domestic assets	incl. total foreign assets	Total income	incl. capital income	incl. labor income	
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Net wealth = total assets (business, financial, deposits, etc.) net of debts.





Monitoring the Road Toward Global Financial transparency and Tax Justice: Public Statistics to be Published by National Tax Administrations

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