National climate policies and inequality: a household perspective

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Microsimulation tool

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Description of microsimulation models. Opportunities and challenges of the microsimulation literature describing different strategies to use this kind of methodology (just for evaluating poverty/inequality effects)

Microsimulation tool

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Most of the questions we are interested in answering fall in one of the following categories (most of them closely related to policy measures):

1. Changes in size and structure of public spending (Who has the right for receiving a transfer? Which good is going to be subsidized? …)
2. Changes in prices (because of taxation, subsidies or other reasons)
3. Structural reforms (introduction of a social security system of a pension reform)
4. Changes in the macro framework such as the fiscal, inflation, and other kind of targets
5. Exogenous shocks, i.e., lockdown, extreme events, …

And we usually employ HBS (or individual administrative records) to answer them

Microsimulation (partial equilibrium)

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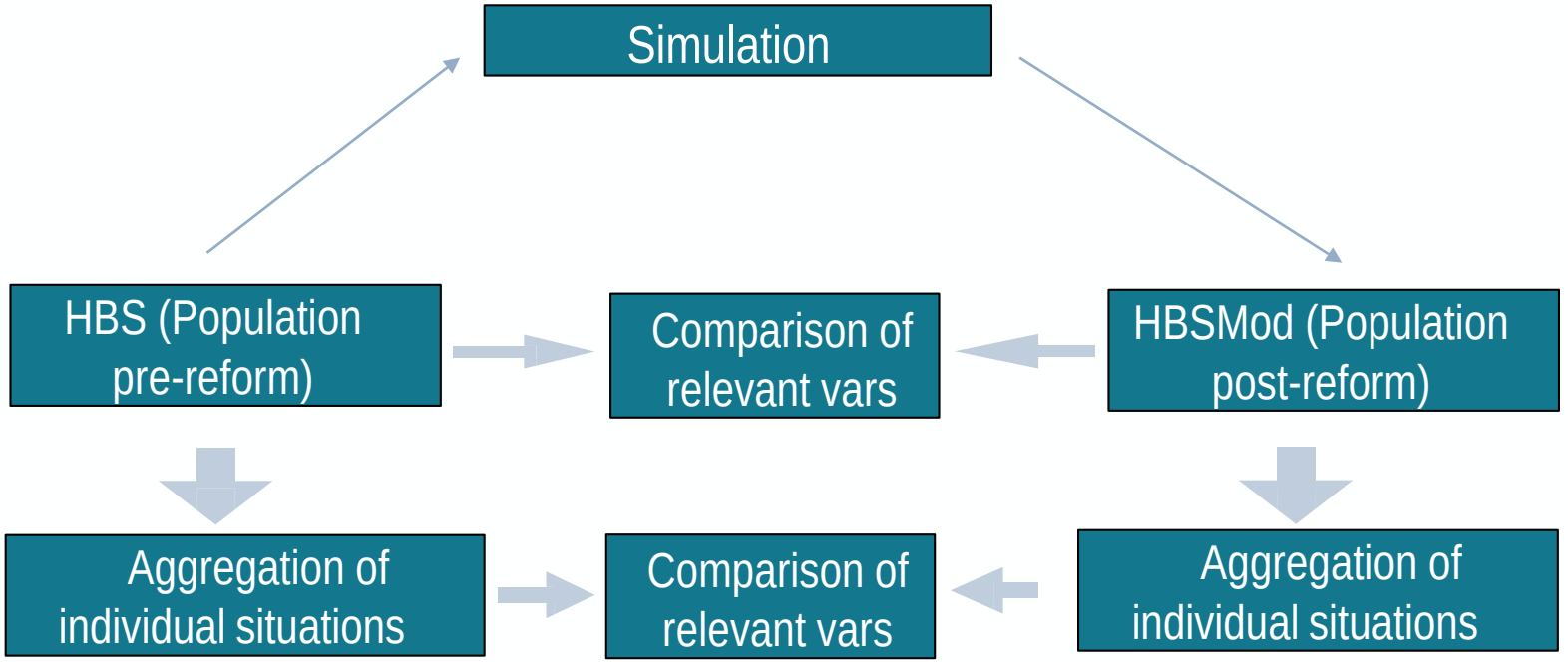
Without individual (household) response (morning-after effects)



Microsimulation (partial equilibrium)

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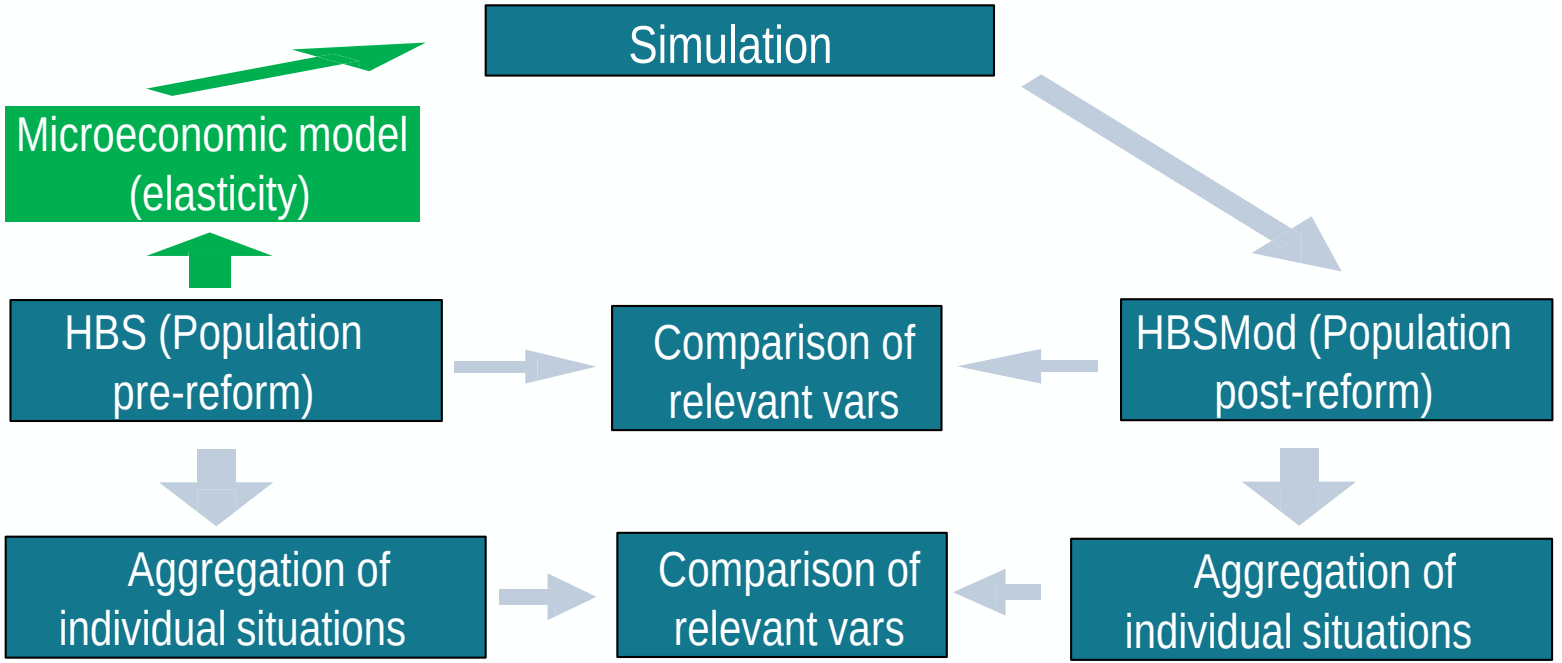
With individual (household) response, i.e., and *elasticity* for poverty (inequality)



Microsimulation (beyond partial equilibrium)

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- Microsimulation can be extended to include additional information and models to capture all potential effects (direct, indirect and induced)

  - One way is to integrate only production to capture translation of changes from production to consumption (common variables are prices)

  - Another alternative is to integrate the whole economy capturing not only the production – consumption channel, but the action of all economic agents including the rest of the world and the public sector (common variables are prices and income –GDP–)

Applications

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Application 1. Labandeira, X. JM. Labeaga, X. López-Otero and T. Sterner (2022), "Distributional impacts of carbon taxation in Mexico", *Cuadernos de ICE* 104.

A microsimulation tool to Mexico to answer how can we face reducing poverty and inequality in Mexico from a viewpoint of demand analysis? Focus on food and energy goods

Application 2. Feindt, S., U. Kornek, JM. Labeaga, T. Sterner and H. Ward (2021), "Understanding regressivity: Challenges and opportunities of European carbon pricing", *Energy Economics* 103.

A combination of a world input-output table and a microsimulation model to analyze the effects of a carbon tax combined to several compensation schemes on the regressivity at the EU level

Application 3. Ewald, J., JM. Labeaga and T. Sterner (2023), "Are individual inflation rates a useful tool to judge the effects of climate change or climate policy? Distributional effects of inflation and evaluation of the effect of an exogenous shock", manuscript

Application 4. Ewald, J., T. Sterner and E. Sterner (2022), "Understanding the resistance to carbon taxes: Drivers and barriers among the general public and fuel-tax protesters", *Resource and Energy Economics* 70.

Attitudes toward carbon taxation and other environmental policy instruments in Sweden using a survey with a sample of the population as well as members of a large political movement that protests fuel taxes

Application 1. Mexico

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HBS (Population pre-reform)

Encuesta Nacional de Ingresos y Gastos de los Hogares en Mexico (bi-annual survey representative of the Mexican population)

Micro model (elasticity)

We adjust the behaviour of Mexican households to be able to translate the effect of any potential change (reform) to consumption and compute, among other variables and indexes, inequality and poverty measures

Simulation

We assume a potential reform corresponding to a carbon tax of 25$/tCO2 and another 50$/tCO2

HBS (Population post-reform)

We reproduce (simulate) in the population the variables needed to compute variables and indexes imposing the behaviour adjusted

Comparison of relevant variables (micro level) and at aggregated level

We compare variables pre-reform to variables post-reform both at household and national levels

Application 1. Mexico

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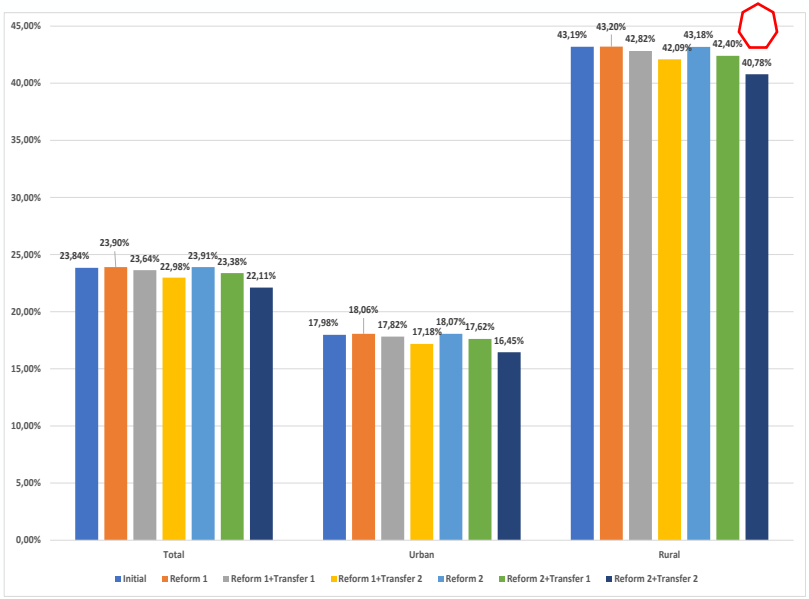
Comparison of relevant variables. Poverty rates by urban –rural divide



- The introduction of a carbon tax without compensation negatively affects more poor than rich households
- Designing adequate transfers could mitigate the undesired effects of the tax proposal (poor could arrive to lose half the loss of rich!)
- Initial poverty rate is more than double in rural (poor) areas than in urban (rich) areas
- Establishing a specific objective of poverty reduction, we can get up to 6 percent reduction in poverty rates in poor-rural areas

Policy message: A very relevant issue of a policy is the correct definition of the compensation packages to get its objectives (in inequality – poverty terms) even to convert a regressive tax introduction of 25$/tCO2 into a progressive one

Application 2. European Union

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HBS (Population pre-reform) + IO tables

We use Word (GTAP) input-output tables together with HBS surveys for 23 EU countries

Micro model

1. We calculate morning-after effects
2. We take elasticities from literature

Simulation

We assume a potential reform corresponding to a carbon tax of 25$/tCO2

HBS (Population post-reform)

We calculate new consumption after tax to compute indicators neeed

Comparison of relevant variables (micro level) and at aggregated level

1. Tax burden relative to total expenditure (without and with transfers)
2. Count of affected households

Application 2. European Union

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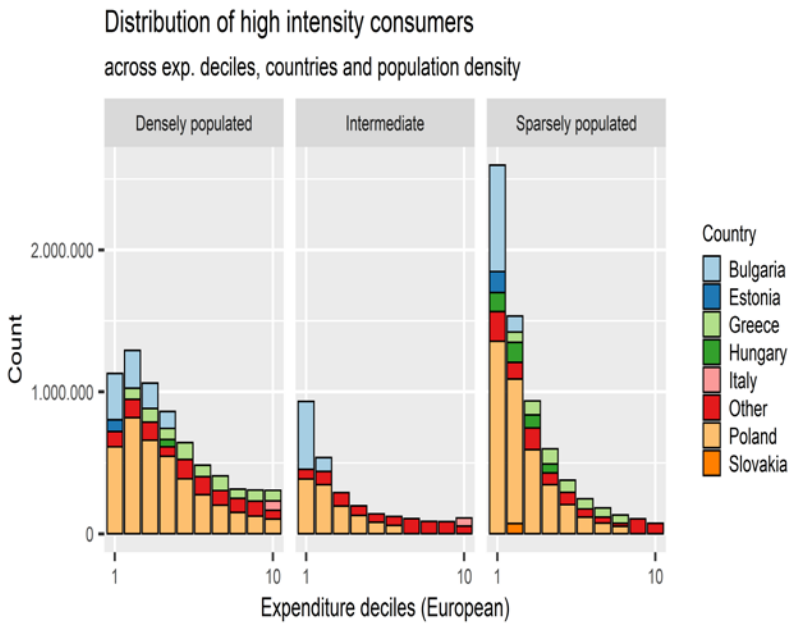

- Climate policy implies costs affecting households heterogeneously across different dimensions (income distribution, consumption patterns, structure of production, location, etc.)
- Combination of data at different aggregated levels allows analyzing the effects of the policies on individuals/households with msm tools for which we need micro data at a first/last step when inequality/poverty issues are targets of the policies

Message. The convenience of analyzing and decomposing the heterogeneous effects. In the case of designing common climate policies affecting different countries to understand between and within countries differences

Application 2. European Union

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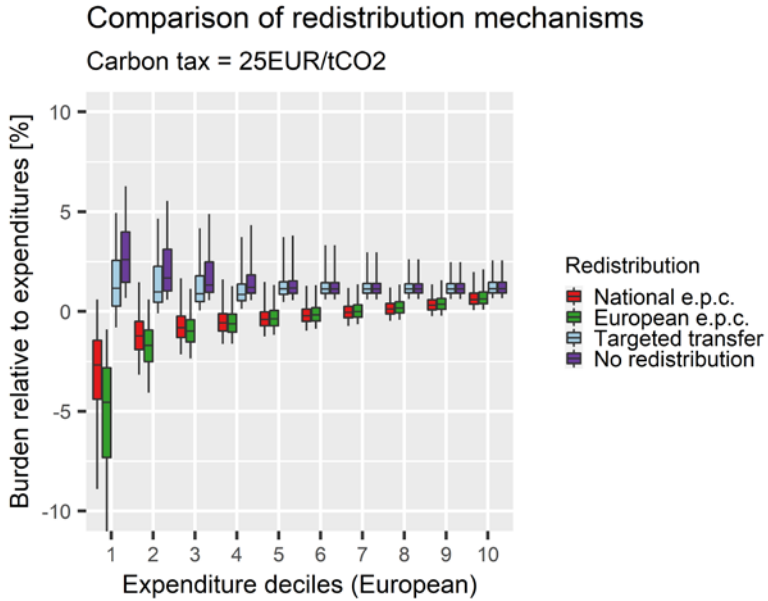

- The results of the transfers (and their effects on inequality) depend very much on how heterogeneity between and within countries is considered
- The final progressive/regressive effects of a tax combined to a common/differentiated subsidy depends on the way the compensating scheme of transfers is designed

Policy message. In the case of designing common climate policies affecting different countries to understand between and within countries differences and how the compensation should be designed

Application 3. Spain

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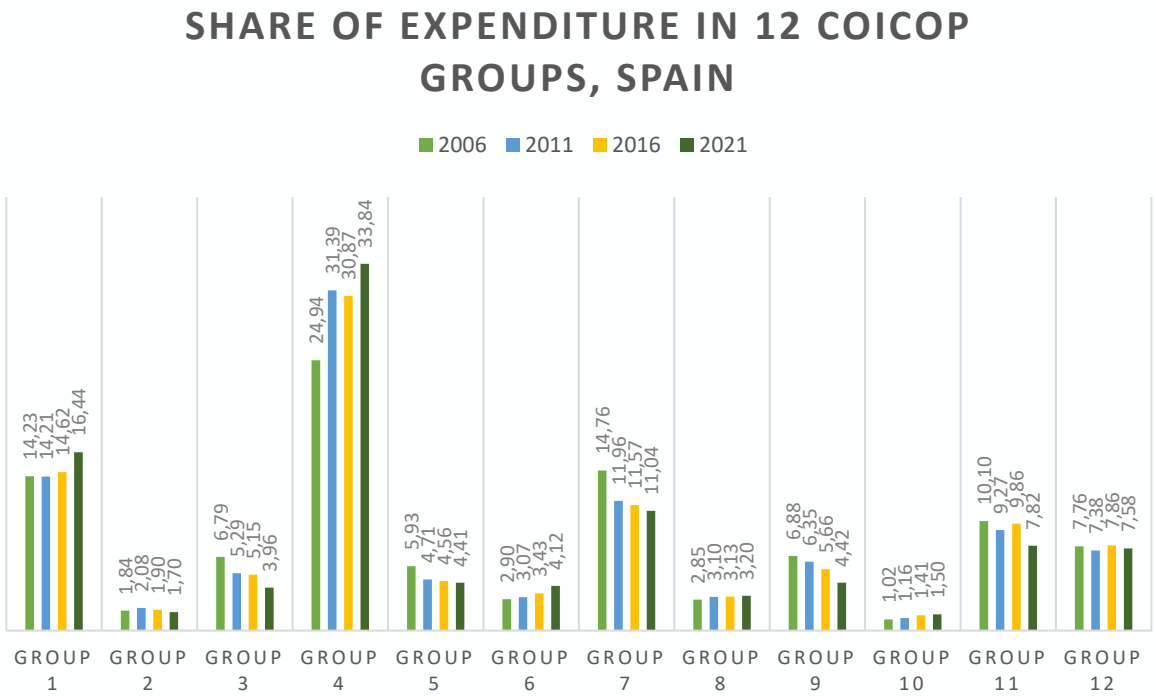

- The RPI is the main measure of inflation in most countries. We can think about it as a measure of changing cost of buying a very large shopping basket of goods containing the purchases of all these goods made by a typical (average) household. Is there a typical (average household)? How the ”differences” between typical and ”real” can translate to inequality?
- Average household ⇨ Average basket of goods

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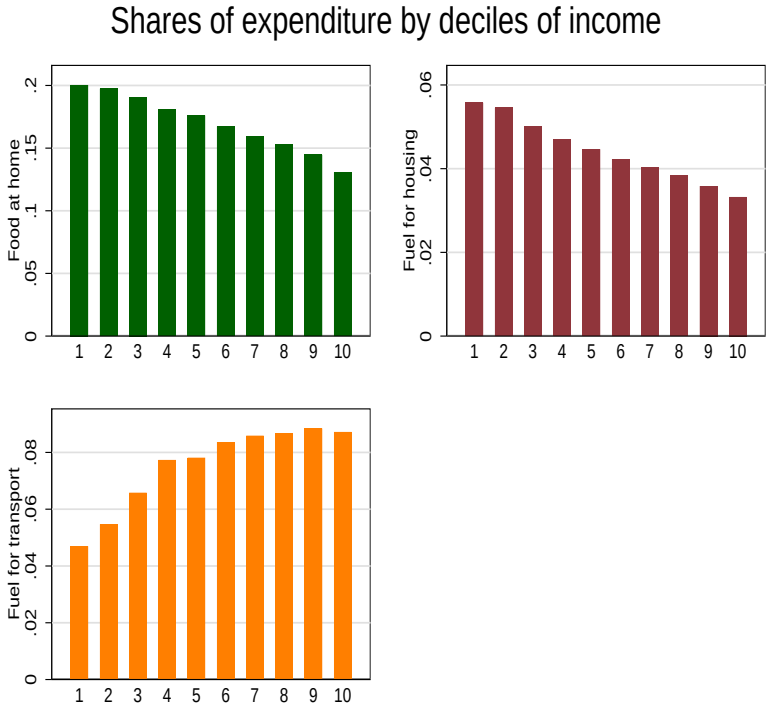
- Is the average basket of goods representative for all households?
- If not, RPI is not going to capture the ”real” effects of changes in prices on welfare
- Households spend different due to many reasons (availability of goods, proximity to purchase, distance to production place, time devoted, labour market situation of members of the household)
- One important determinant of demand is **income**

Message. Climate change and climate policies, which are going to affect prices of goods (some necessities as food, electricity, gas …) could produce undesired inequality direct effects through their prices and indirect effects through average inflation



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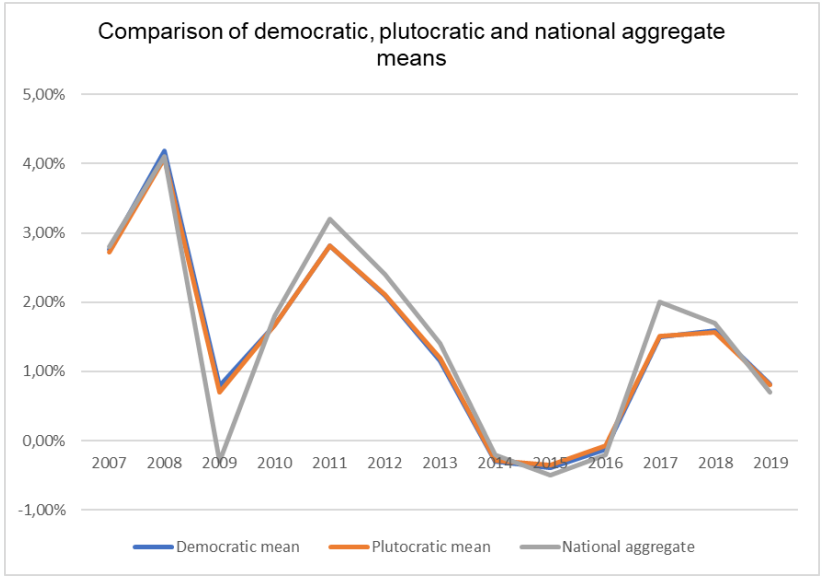

- On average, differences are not relevant, at least pre-COVID-19 since demand structure did not change a lot
- The pandemic brought two effects:
  - ✓ Changes in structure of demand
  - ✓ Impossibility to collect prices (and update the basket of goods)
- In this situation (with an ”extreme event” as the pandemic), average (national) inflation is going to be far from ”real” and depending on the goods affected (and their prices), channels to increase inequality appear

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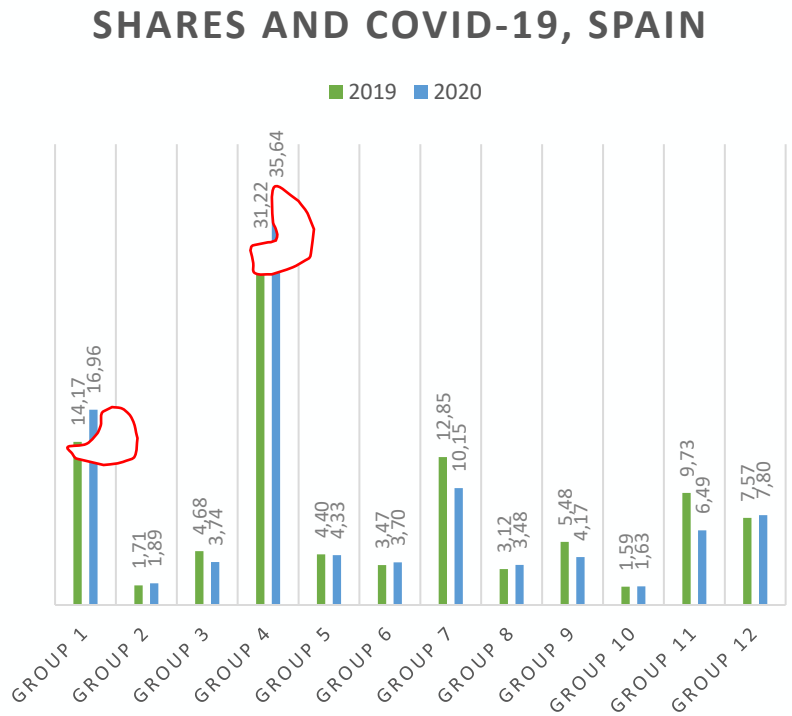

- Main facts:
  - ✓ But, on average, differences are not relevant, at least pre-COVID-19 since demand structure did not change a lot
- The pandemic brought two effects:
  - ✓ Changes in structure of demand
  - ✓ Impossibility to collect prices (and update the basket of goods)
- Message:
  - ✓ Composition of the basket. Food: Average20% increase in food over a basket of 20% vs 12%. Energy for housing: Average 14% increase over a basket of 5,8% vs 3%
  - ✓ Huge price increases of both goods

Application 3. Spain

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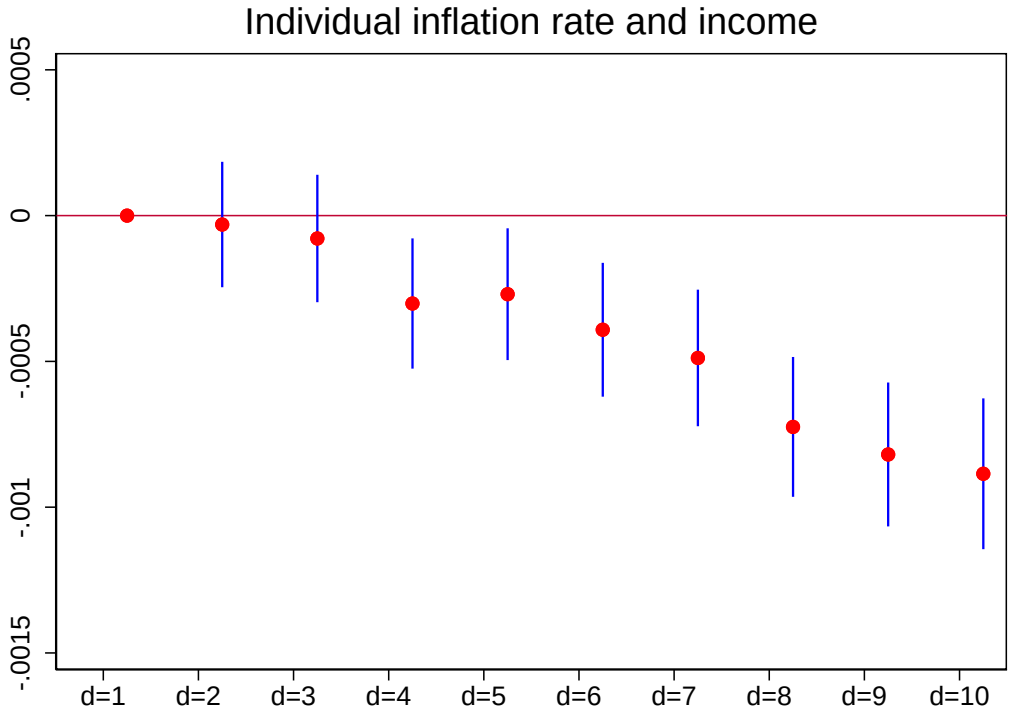

Message. Considering heterogeneity in the effects of inflation (i.e., introducing dispersion in crucial variables) reveals very important differences in its effects negatively affecting poor households. In 2020 up to 1 percentage point of difference. Official inflation rate: -0,5%

Differences rich-poor: 1% [0.75, 1.25]

This effects translate into wages, pensions, transfers, etc., affecting poor more with second round effects

Policy message. Individual inflation rates could be a useful tool to judge the effects of climate change and climate policies

Application 4. Sweden

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	(3) Effectiveness	(4) Policy ranking	(5) Collecting revenue
Education (ref. Comprehensive schooling)			
Upper secondary schooling or equivalent	0.04	0.02	0.04
Postsecondary nontertiary education	0.03	0.06*	0.10***
Bachelor's degree or equivalent	0.07**	0.04	0.12***
Master's degree or equivalent	0.16***	0.12***	0.18***
Income (ref. <14,000 SEK)			
14,000–18,999	0.05	0.04	0.02
19,000–22,999	0.02	-0.04	-0.03
23,000–29,999	0.06**	-0.02	0.00
>29,999	0.04	-0.00	0.00
Residence (ref. City)			
Town or smaller city	-0.05**	-0.03	-0.03
Village	-0.09***	-0.05**	-0.09***
Countryside	-0.13***	-0.08***	-0.14***
Demographic controls	Yes	Yes	Yes
Pseudo-R-squared	0.089	0.061	0.119
Observations	2080	2080	2080

Income plays no role!

Application 4. Sweden

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	REPRESENT	PROTEST
Earmark for clean energy to reduce emissions	60	51
Research on climate change	34	28
Traditional public goods, health, education, social	24	30
General Budget use	11	10
Refunding Progressive	8	15
Refunding Equal	7	18

- Fee and dividend only gets moderate support
- STRONG support for EARMARKING for climate purposes!

Policy message. Similarities and differences between the representative and protestors samples. Many of the protestors are concerned about climate change and want climate policy, even if they tend to prefer some different policies of those preferred by the representative sample

Final thoughts

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- Messages
  - ✓ Analyzing micro data through the lens of micro (adjustment and simulation) is useful to evaluate ex-ante public policies, in general, climate policies, in particular
  - ✓ Combining data at different aggregation levels is useful to identify all potential effects of climate policies, direct, indirect and induced effects
- Policy messages
  - ✓ When introducing climate policies, special care should be given to the design of compensation schemes to:
    - Reduce inequality (and poverty)
    - To compensate vulnerable groups
    - To convince opponents of the policies (protestors)
  - ✓ It is necessary to look not only at aspects related to the income distribution, since individual inflation rates could also constitute a useful tool to judge the effects of climate change and climate policies
- Future
  - ✓ Use the msm tool in reverse
    - Application 3: Define an objective and get the price increase to achieve it
    - Application 4: Define a probabilistic objective and find the economic-sociodemographic variables to identify groups (or thresholds) supporting the policies
  - ✓ Better integration of the the msm tool with aggregated information

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