

Energy poverty and household's welfare in Chile
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(Simulations under global scenarios IIASA)

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Research Question

How many households has Energy vulnerability?

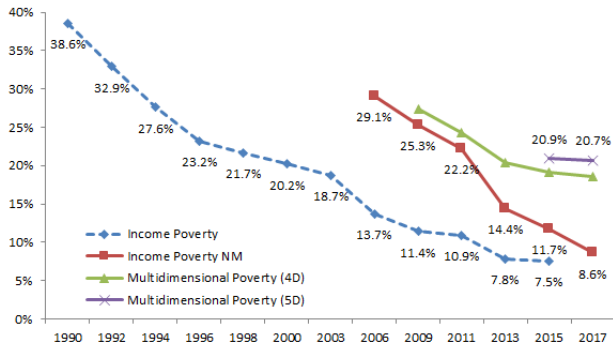
We found that 12.93% of households spend more than 10% of their disposal income in energy products. Taking out the costs of transportation.

Using MEMO, after a carbon tax implementation following the scenarios of the alternative paths of carbon prices predicted in the IIASA database for the three Representative Concentration Pathways (RCP) targets: 2.6, 3.4 and 4.5, How much is the monetary compensation for the energy poverty alleviation in Chile?

Using estimated price-demand elasticities, We calculated that the compensation goes from US\$0.3 to US\$14.5 millions targeting the first four deciles subject to the mix of electric generation.

Relevance of the question

- Poverty in Chile has declined significantly since the early 1990s. This has occurred both by occupying the traditional income measure and by the new methodology of multidimensional poverty,



but...

In either approach, access to energy and its costs appear to be absent. There are implementation risks and uncertainties why we would like to include them as a relevant factor

- ▶ Climate change will produce (and is already producing) impacts of various kinds, including increases in average temperatures, droughts, extreme weather events IPCC (2015).
- ▶ These phenomena are associated with increases in demand for energy to keep our homes and workplaces at an adequate temperature
- ▶ it is expected that the demand for energy can grow to cope with climate change

Data

- ▶ The Family Budget Survey 2013 (EPF 2013) survey conducted by the National Statistics Institute (INE) in 2012
 - ▶ Sample Size 10 527 Households nationwide expanded to 3.0 million households or 10.5 million people
 - ▶ Only Metropolitan Region could be distinguished from the rest
 - ▶ Direct observation of expenditure of 1099 products
- ▶ Survey collected every five years, the next survey will be available in August 2018

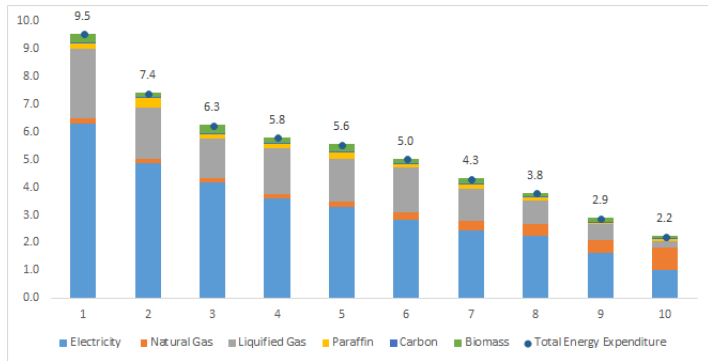
Methodology

- 1 Measuring Energy Poverty with 10% rule by decile
- 2 Variation in electricity prices because of carbon tax implementation
 - ▶ Seven scenarios, using the output of MEMO Model with energy price deviations from the baseline scenario
- 3 Measuring Welfare change for households
 - ▶ Using demand elasticities of electricity consumption at residential level from the literature
 - ▶ Estimating the Compensation Variation

1 Measuring Energy Poverty

We estimated by decile under the estimation rule:

$$\frac{EnergyExpend_H^{eq}}{DisposallIncome_H^{eq}} > 10\%$$



2 Variation of energy prices after Carbon tax following IIASA pathways in 2020

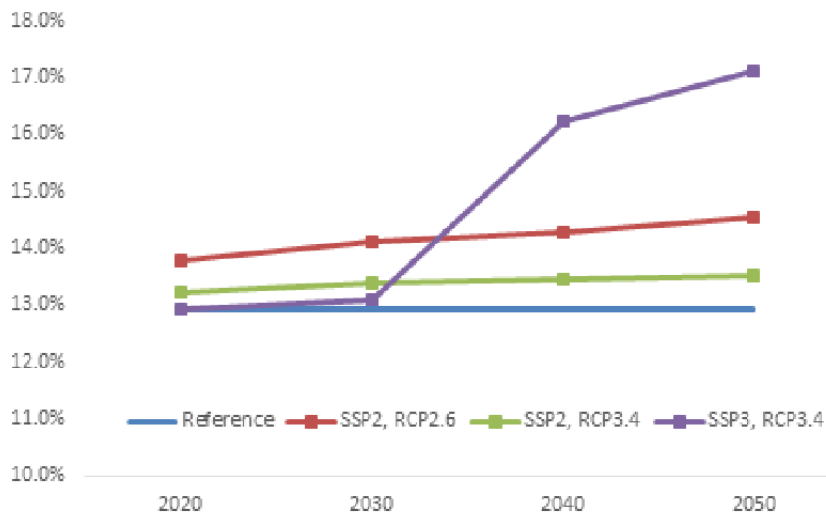
SSP	RCP	Carbon tax [US\$2005 per t CO ₂]	Energy price relative to the baseline [baseline=1]	Additional households into fuel poverty by scenario	households in fuel poverty [% of all households]	compensation to households for an increase in energy price [mln US\$ annually]
Reference (SSP2 baseline)		0.00	1.00	0	12.93%	0.00
SSP2	2.6	16.68	1.07	25 447	13.77%	-14.50
SSP2	3.4	6.63	1.03	8 455	13.21%	-5.71
SSP2	4.5	2.74	1.01	4 390	13.07%	-2.36
SSP1	2.6	8.82	1.04	13 786	13.39%	-8.47
SSP1	3.4	0.00	1.00	670	12.95%	-0.30
SSP3	4.5	0.00	1.00	250	12.94%	-0.05
SSP3	3.4	0.00	1.00	0	12.93%	0.00

3 Measuring Welfare Change for households

- a For the price-elasticity for residential electricity demand for Chile I use the Agostini et al (2016) equal to (-0.38 to -0.40) in line with previous estimations:
 - ▶ Benavente et al (2005) and Marshall (2010) equal to -0.39
 - ▶ Reiss and White (2005) for California equal to -0.39
- b With the price elasticity we can measure the $\Delta EnergyConsumption$ for each household
- c Together with the changing prices we can estimate a Welfare measure through the **Compensation Variation**

$$cv(p^0, p^1, EnergyExpend_H^{eq}) = e(p^0, u^0) - e(p^1, u^0)$$

Share of households in energy poverty assuming no growth in disposable income



Lessons and policy agenda

- ▶ Better information must be developed to analyze regional characteristics of energy poverty in Chile.
- ▶ There is a significant demand to address the poverty energy alleviation policies
- ▶ Targeting the first 4 deciles the required budget goes from \$0.3 millions to \$14.5 millions.
- ▶ Risks: The environmentally policy could be regressive to vulnerable groups if those not consider compensation measures.
- ▶ Uncertainties: Expected increasing temperatures will demand greater efforts for mitigate the climate change through carbon pricing with possible social effects

Thank you!