The social efficiency of energy access

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Dual Plenary Session: "The right of energy access, social policies and its challenges"

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Rights, social welfare and efficiency of energy access

- The “right” to energy access can be framed in an entitlement-based ethics which appeals to distributive justice.
- Under a welfarist approach subsidies to energy access are in general preferred to subsidies to consumption. Why? Some evidence in LATAM?
- But, beyond rights or equity it may be also economically efficient to subsidize energy access. When can this be the case? What evidence do we have in LATAM?

Two lines of empirical evidence

- Some (well established) literature shows that it is better (more equitable) to subsidize access than consumption.
  - This is so even if subsidies to consumption are designed with the best possible technology ("social tariff").
    - But in practice they are not !!!. They are horribly inequitable. So the comparison becomes almost trivial
- Other more recent papers suggest why access may actually favor energy efficiency
  - Access in one type of energy (natural gas) may be important in avoiding energy inefficiencies in another (electricity).
  - Access to electricity (or natural gas) may reduce the (large, excessive) biomass consumption share and enhance energy efficiency of poor households.

Subsidies to energy access are preferred to subsidies to energy consumption

- Angel-Urdinola y Wodon (2007) for Africa: Incidence of subsidies and decomposition between access and consumption
- Marchionni, Sosa-Escudero y Alejo (MSEA)(2008), extension of measure and aplication to Argentina.
- Definition of incidence of benefit Ω

$$\Omega = \frac{\%\ beneficio\ recibido\ por\ pobres}{\%\ de\ pobres} = \frac{S_P/S_H}{P/H} = \frac{S_P/P}{S_H/H} = \frac{subsidio\ medio\ pobres}{subsidio\ medio\ total\ hogares}$$

- *$\Omega = 1$ (neutral), $\Omega > 1$ (progressive), $\Omega < 1$ (regresive)*

Decomposition of Ω in MSEA(2008)

1) Access effect (AxU),
2) Focalization (T)
3) "transfer-design" (R)

Tres factores determinan la incidencia del beneficio (Ω)

$$\Omega = \frac{A_P}{A_H} \times \frac{U_{P|A}}{U_{H|A}} \times \frac{T_{P|U}}{T_{H|U}} \times \frac{R_{P|T}}{R_{H|T}} \times \frac{Q_{P|T}}{Q_{H|T}}$$

Factores de ACCESO

% de hogares con acceso al servicio (hogares pobres vs. promedio)

Factor de FOCALIZACIÓN

% de beneficiarios con acceso (hogares pobres vs. promedio)

Factores de DISEÑO

Subsidio recibido por los beneficiarios (hogares pobres vs. promedio)

Ahora incorporamos este elemento

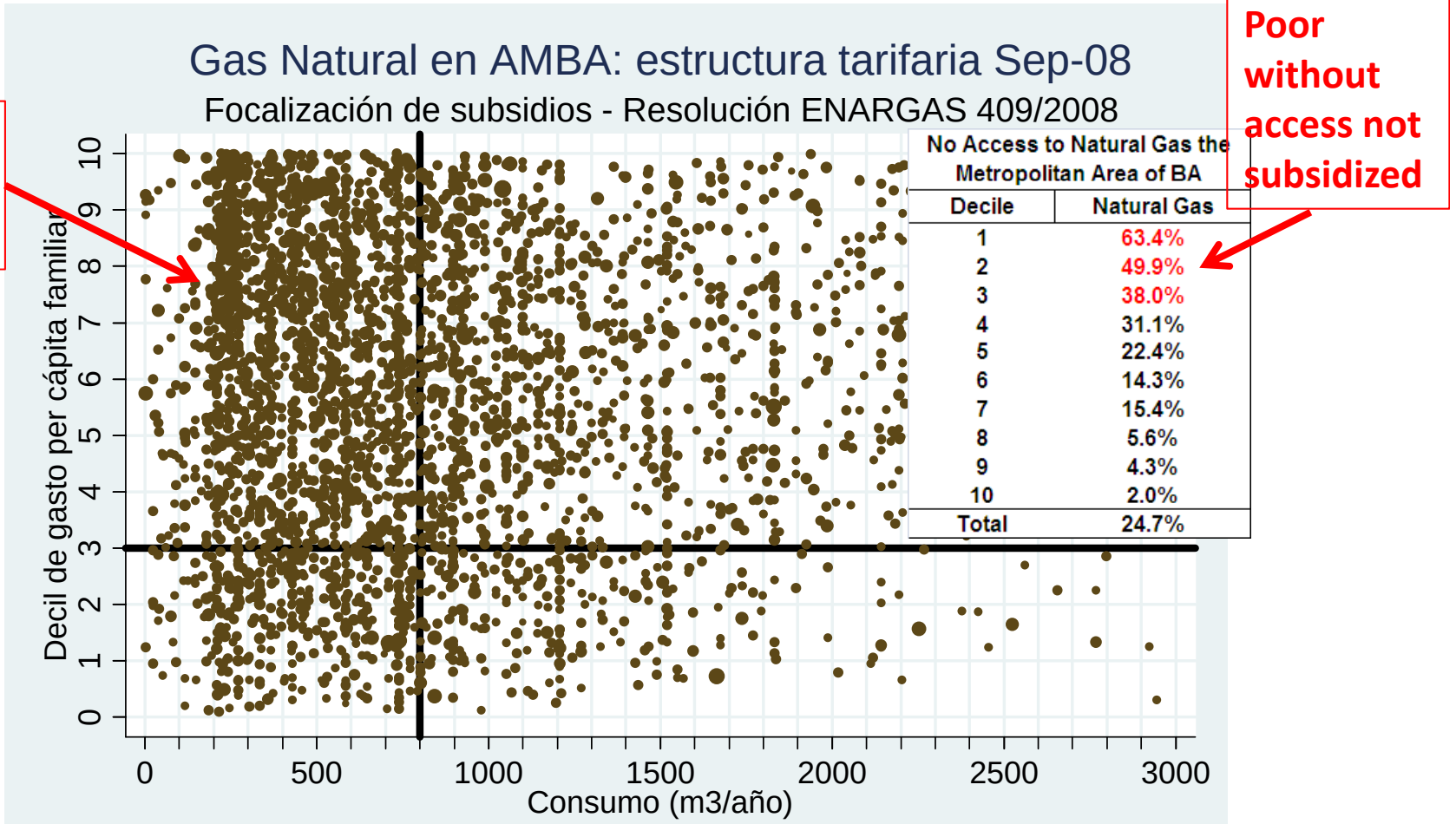
Evidence for natural gas and electricity

- Argentina, Natural Gas:
  - Ω very low (0.25 ! in MSEA, 2008) due to low Access AxU (0.50); Focalization-cum-transfer design TxR also low(0.5) due to high "inclusion error" of existing tariff structure
  - AxU and TxR are both a bit higher today. But even improving TxR with a good social tariff Ω will remain < 1.
  - Higher social benefits come from improvements in Access (AxU). Gas-pipeline/NEA promises an improvement here.
- Nicaragua, Electricity:
  - Ω very low again due to low Access AxU (0.66); Focalization-cum-transfer very low TxR (0.37) due to very high inclusion error of tariff structure.
  - Tariff reform (TxR) is very important for Nicaragua, but gains in access (AxU) have higher social value, as they also imply energy efficiency gains (see below)

Natural Gas in Argentina:
TxR low due to high inclusion error of subsidies

Non-poor heavily subsidized

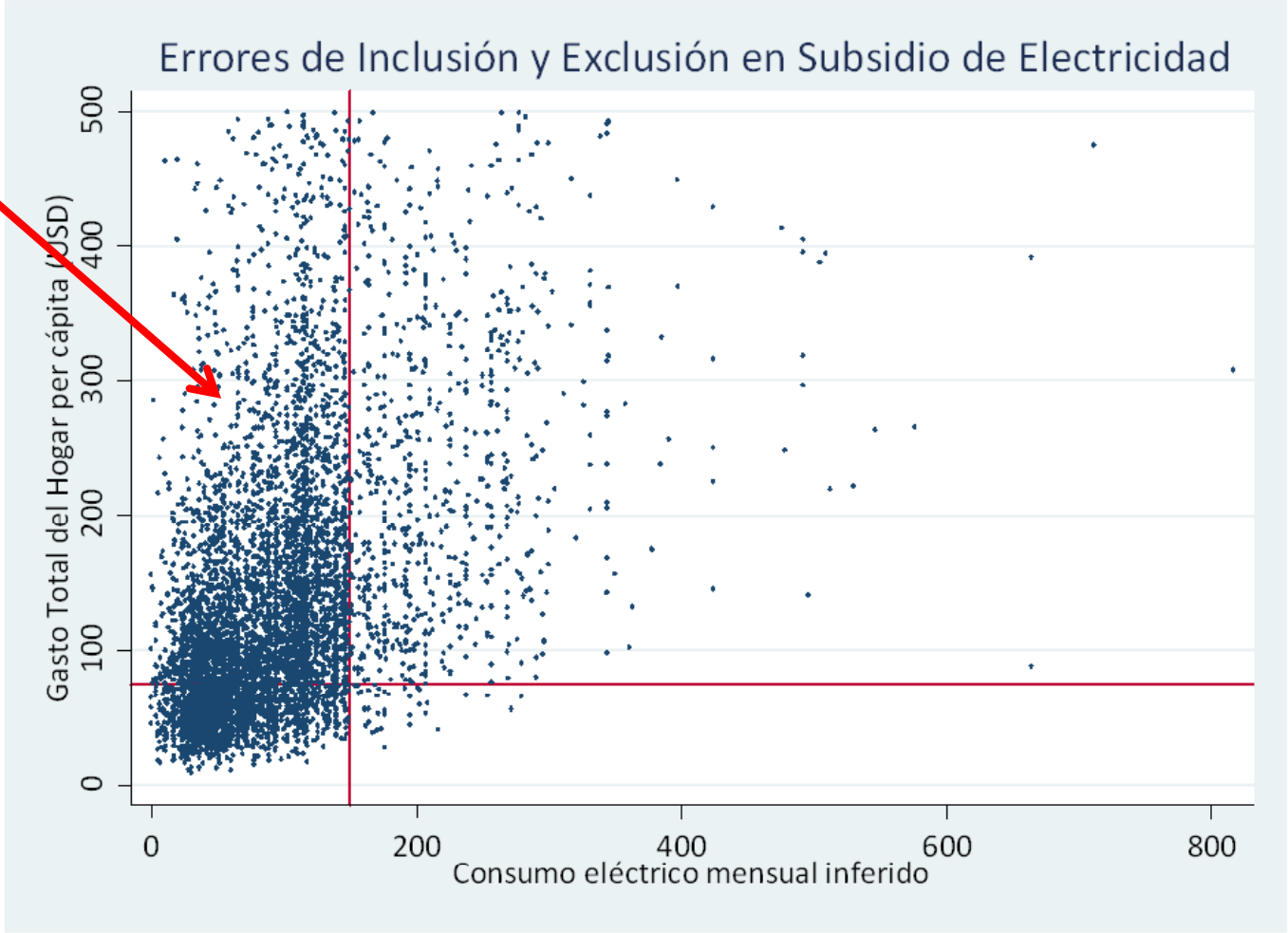
Poor without access not subsidized



Fuente: Elaboración propia en base a ENGH 96-97 y datos de ENARGAS

Electricity in Nicaragua:
TxR low due to high inclusion error of subsidies

Non-poor heavily subsidized



33% of households without access not subsidized

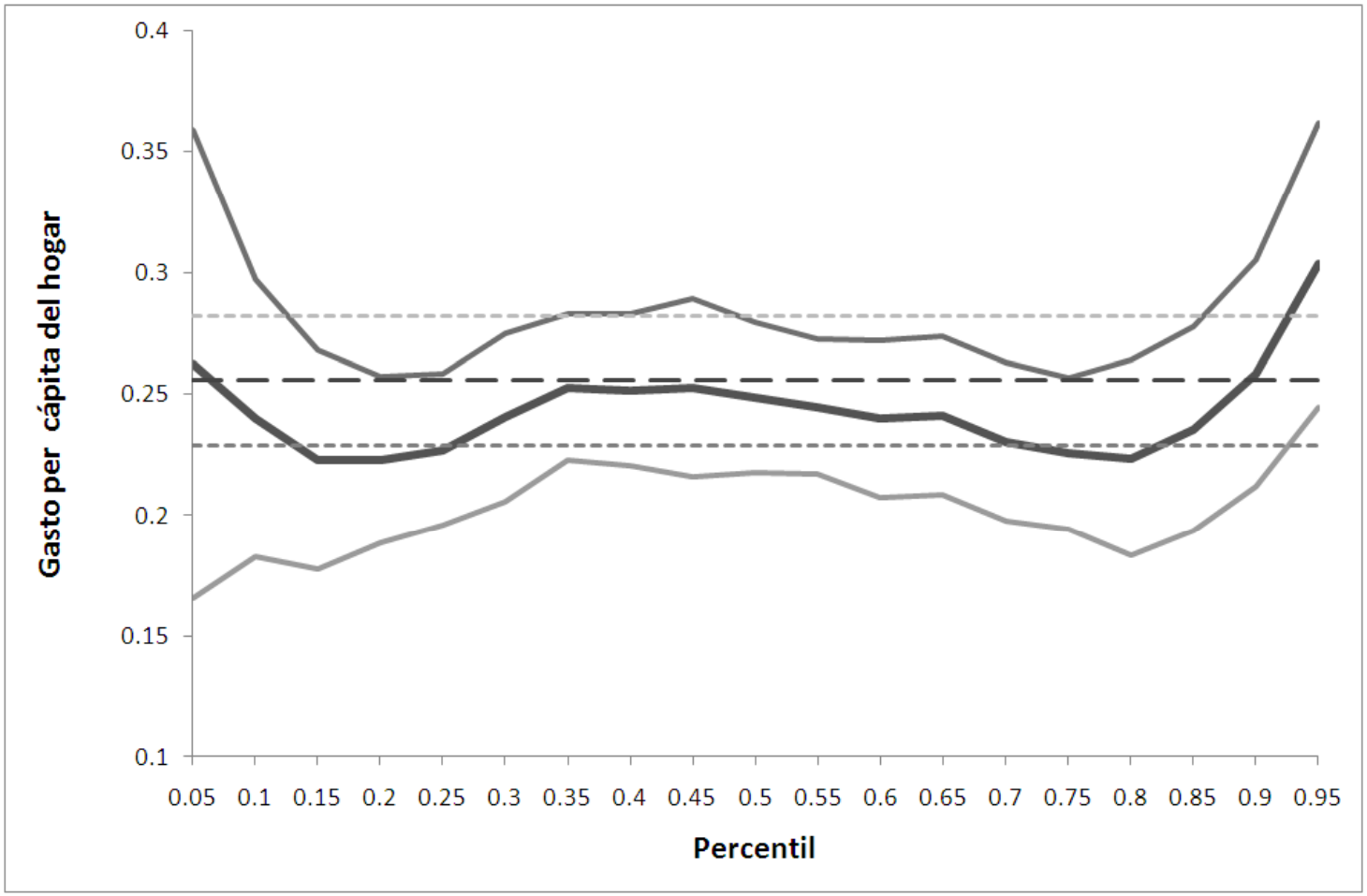
Why energy access imply efficiency

- Lack of access does not mean absence of energy consumption: households consume low-quality energy.
- Energy access implies a substitution to cheaper, efficient and cleaner energy use.
- Idea applied to previous cases/examples:
  - Argentina: Lack of natural gas access may imply over-consumption of electricity (as inefficient electric appliances are used for heating). Hancevic and Navajas (HN) (2013)
  - Nicaragua: Lack of electricity access may imply high energy-intensity and inefficiencies of relying heavily in biomass. Navajas and Natale (NN) (2013 in process).

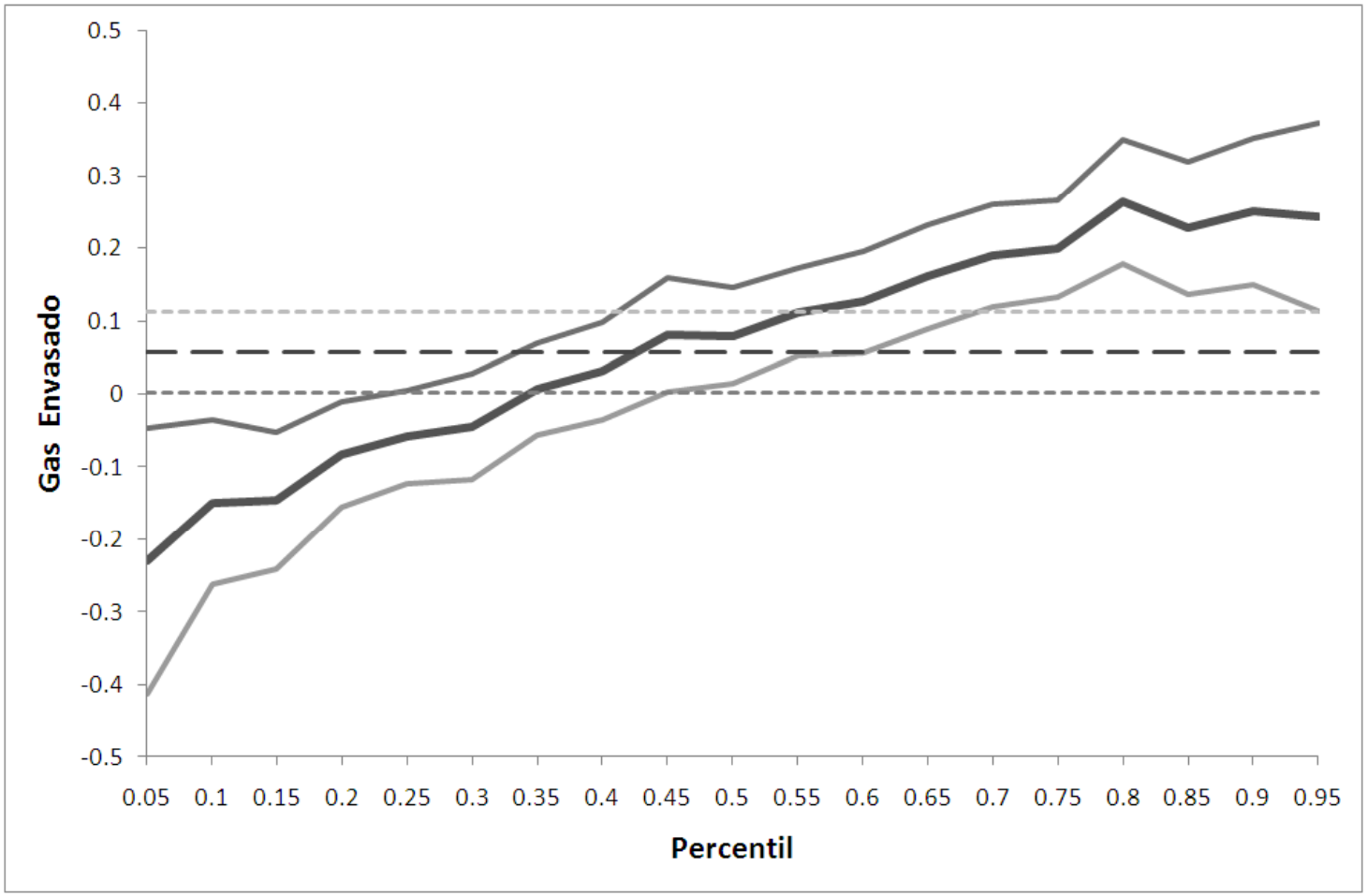
Do households without natural gas access in Argentina over-consume electricity?

- Definition of over-consumption needs a benchmark.
- HN (2013): let's use a well-defined model of household electricity consumption as a benchmark.
  - Specified on groups (vectors) of dependant variables: a) income and size of households (as in Navajas, 2009); b) age, education and labor status; c) location and type and quality of housing; d) heating equipment and air-conditioning; e) natural gas access.
- Estimate a quantile regression model to study the heterogeneous response (coefficients) across 5^{th} to 20^{th} quantiles of consumption (see for example Kaza, 2010 and Medina and Vicens, 2011).
- Implement the model on micro-data from a household expenditure survey of Buenos Aires metropolitan area (retrieving quantities, as in Navajas, 2009).

Evidence that income does not explain much over-consumption of electricity



Strong evidence that lack of access to natural gas imply over-consumption of electricity

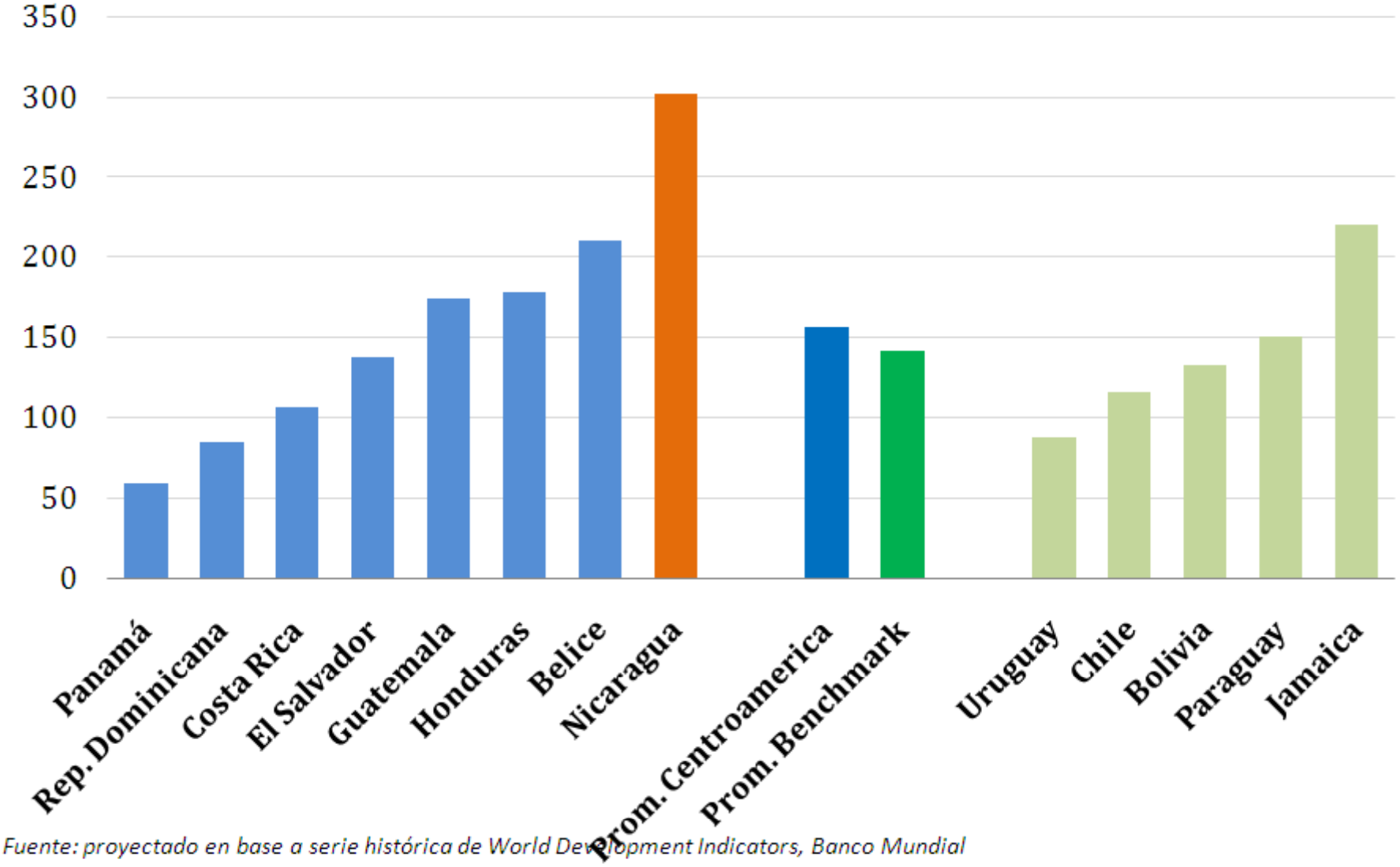


Does high energy intensity in Nicaragua depends on lack of electricity access and large biomass consumption?

- Comparative evidence in Central America shows that Nicaragua has a very high energy intensity.
- The lowest access percentage to electricity by households.
- And the largest share of biomass consumption by households.
- NN (2013 in process) study the pattern of urban household consumption from micro-data and simulate a convergence of urban and rural patterns after a process of higher access to electricity.
- Simulate the reduction in energy efficiency and gains in social welfare , considering the fiscal costs of new subsidies required and environmental gains.

Intensidad Energética en Centroamérica, año 2011*

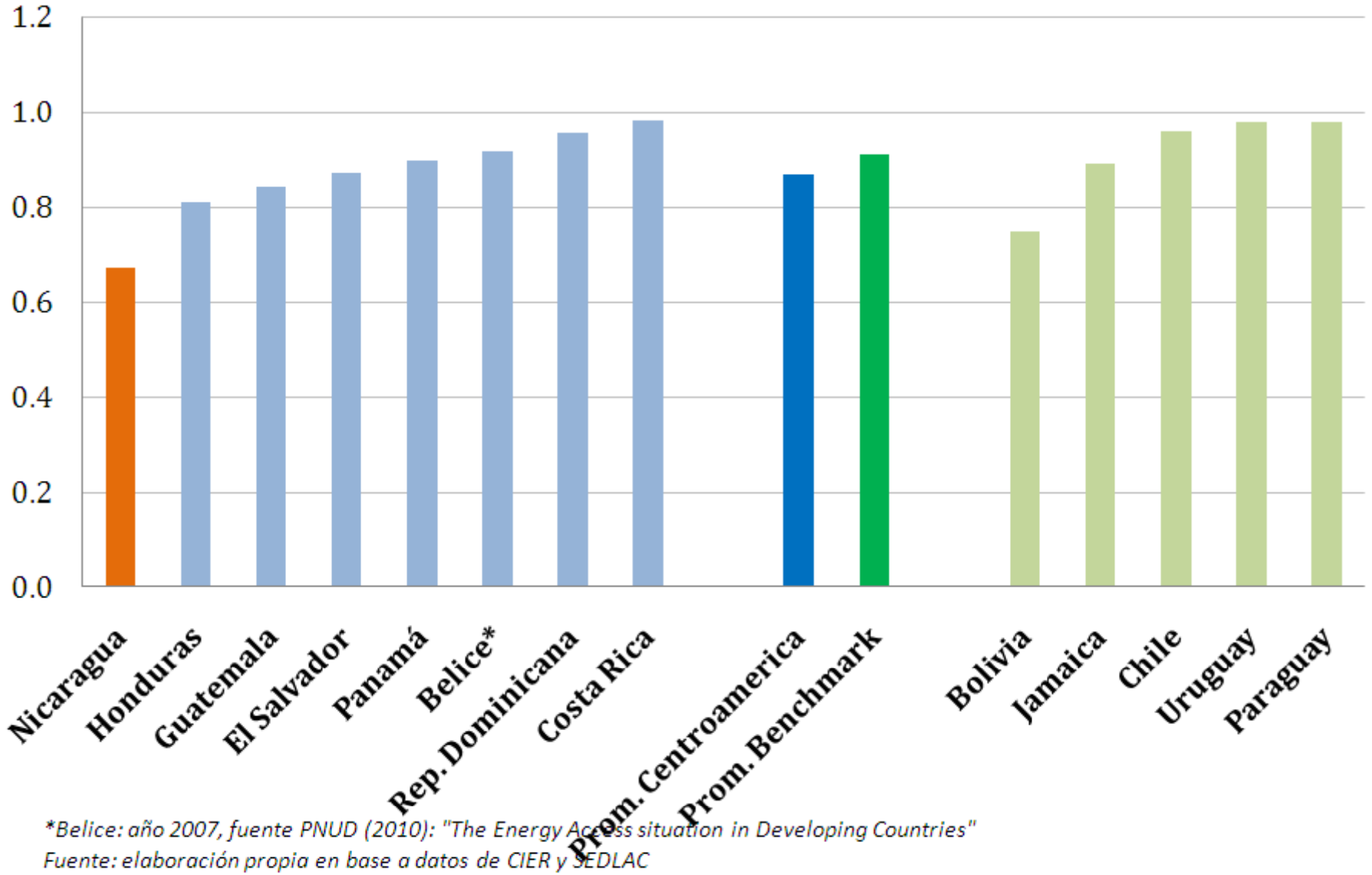
koe/$1000 PIB PPP 2005



Fuente: proyectado en base a serie histórica de World Development Indicators, Banco Mundial

Cobertura eléctrica

% de la población con acceso, datos homogéneos de 2009

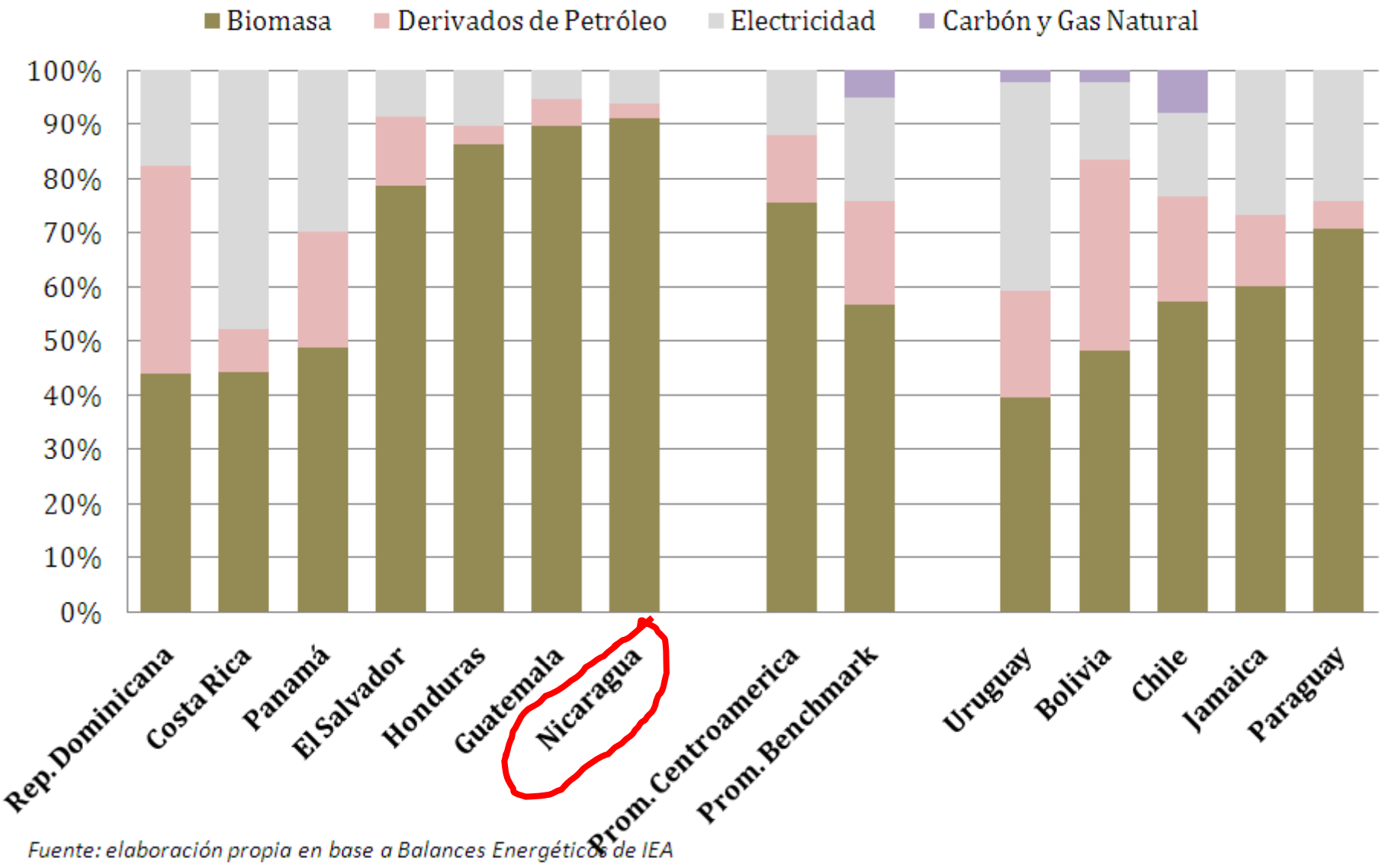


**Belice: año 2007, fuente PNUD (2010): "The Energy Access situation in Developing Countries"*

Fuente: elaboración propia en base a datos de CIER y SEDLAC

Matriz de consumo energético del sector residencial

Año 2009



Fuente: elaboración propia en base a Balances Energéticos de IEA

Final remarks

- “Rights” and social welfare are strong enough arguments to push for energy access.
- Subsidies to access are preferred to consumption subsidies, even if these were properly designed.
- But this is not the case: huge amounts of public money goes to non-poor households in many countries
  - Argentina is an extreme case in natural gas and electricity, see Cont, Hancevic and Navajas 2011).
- New (and old) infrastructure plus new (and old) energy needs cost-recovery, which means sustainable pricing.
- But generalized subsidies to the non-poor are unsustainable and force a status-quo bias against the right to energy access.
- They are also hindering progress towards energy efficiency, as household with access and heavily subsidized energy neglect or delay improvements.
- And those without access remain energy-inefficient and cannot obtain the energy efficiency gains provided by access to cheap and efficient energy.

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