The inequality impact of consumption taxes
An international comparison

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Framing of the paper

1. **Problem**: measuring and comparing the impact of consumption taxes on inequality across countries, relative to direct taxes and transfers

2. **Methodology**: we use harmonized national surveys on income and consumption, national accounts and an original cross-country imputation model for consumption data

3. **Results**: we are able to estimate the distribution of consumption tax payments along the income distribution, in a manner that is consistent across countries, EVEN FOR COUNTRIES WHERE THERE IS NO CONSUMPTION DATA

The twofold effect of indirect taxes on inequalities

Consumption taxes $\approx 1/3$ of gov. tax revenues (OECD)
... but inequality impact rarely assessed in intl. comparisons

Two opposite effects on inequality:

- Distributive pattern notoriously regressive (Warren, 2008; Figari and Paulus, 2015)
- Positive correlation btw the level of consumption tax and the size of the welfare state (Kato, 2003; Prasad and Deng, 2009)

$\Rightarrow$ Are we giving with one hand what we take with the other?

Data and methodology

Data

- LIS: Household budget surveys
- OECD: National accounts data

Methodology: microsimulation of paid consumption taxes

- Imputation of missing consumption data
- Computation of individual propensities to consume
- Estimation of national effective tax rates on consumption

Data and methodology

We estimate the tax-to-income ratio (TIR) for every household

$$\frac{\text{taxes paid}}{\text{income}} = \frac{\text{consumption}}{\text{income}} \times \text{tax rate on consumption}$$

$$= \underbrace{\text{propensity to consume}}_{\text{survey data}} \times \underbrace{\text{tax rate on consumption}}_{\text{national accounts}}$$

Data

- Luxembourg Income Study data on household income, consumption, socio-economic characteristics
- 132 country-years, 27 countries from years 1978 to 2013
- Observed consumption data available for 47 country-years (spanning 12 countries)
- OECD national accounts data on income, consumption, consumption taxes

Computation of propensities to consume

$$prop_i = \frac{taxable\ consumption\ of\ household\ i}{income\ of\ household\ i} = \frac{cons_i - rents_i}{income_i}$$

- $cons_i$ is the household's total consumption expenditure
- $rents_i$ are housing rentals for tenants
- $income_i$ is the household's disposable income
- (homothetic) Scaling according to national accounts

Estimation of implicit tax rates

$$\tau_{c,y} = \frac{total\ tax\ revenue}{taxable\ consumption}$$

- Existing literature on implicit tax rates with national accounts: Carey and Tchilinguirian (2000) and Eurostat (2016), both inspired by Mendoza, Razin, and Tesar (1994).

- We propose a definition that better approaches the average implicit tax rate on consumption paid by households.

Estimation of implicit tax rates

Go back

$$\tau_{c,y} = \frac{total\ tax\ revenue}{taxable\ consumption} = \frac{total\ consumption\ tax\ revenue}{C - R - CGW}$$

- C final consumption expenditure
- R housing rentals
- CGW wages paid by government

Between Carey and Tchilinguirian (2000) (broader taxable base, covering all consumption) and Eurostat (2016) (narrower taxable base, covering only private consumption).

Estimating the tax-to-income ratio

Once we have

- Propensity to consume $prop_i$
- Effective national tax rate $\tau_{c,y}$

We can compute the individual tax-to-income ratio

$$TIR_{i,cy} = \frac{\tau_{cy} \cdot cons_i}{disposable\ income_i} = \tau_{cy} \cdot prop_i \tag{1}$$

Imputation of consumption data

We define "medianized" variables

$$\widetilde{consumption}_i = \frac{consumption_i}{\text{median}_{c,y}(consumption)}$$

Generalized Linear Model with independent variables:

- income, consumption in housing
- socio-economic variables of household (number of members, age of the head, etc.)
- "poverty indicator" ($\widetilde{income}_i < 0.60$)

Specification of the imputation model

Go back

Generalized Linear Model with logarithmic link:

$$\log\left(\mathbb{E}\widetilde{consumption}\right) = \alpha \log\left(\widetilde{income}\right) + \beta \log\left(\widetilde{housing}\right) + \mathbb{1}\left\{\widetilde{income} < 0.6\right\}\left(\delta_1 \log\left(\widetilde{income}\right) + \delta_0\right) + \gamma^T X$$

Model specifications

Model	**Independent variables**
Model 0 [if fiscal data only]	**Income**
Model 1 [used here]	**Income** + household size, head's marital status
Model 2 [used here]	**All of the above** + **total cost of housing** (rents and imputed rents), household ownership status, head's age

Housing cost (listed in 60% of the LIS datasets) is much more widely-available in household surveys than total consumption (listed in 25% of them) and is a good proxy for the household's standard of living.

Accuracy of imputation

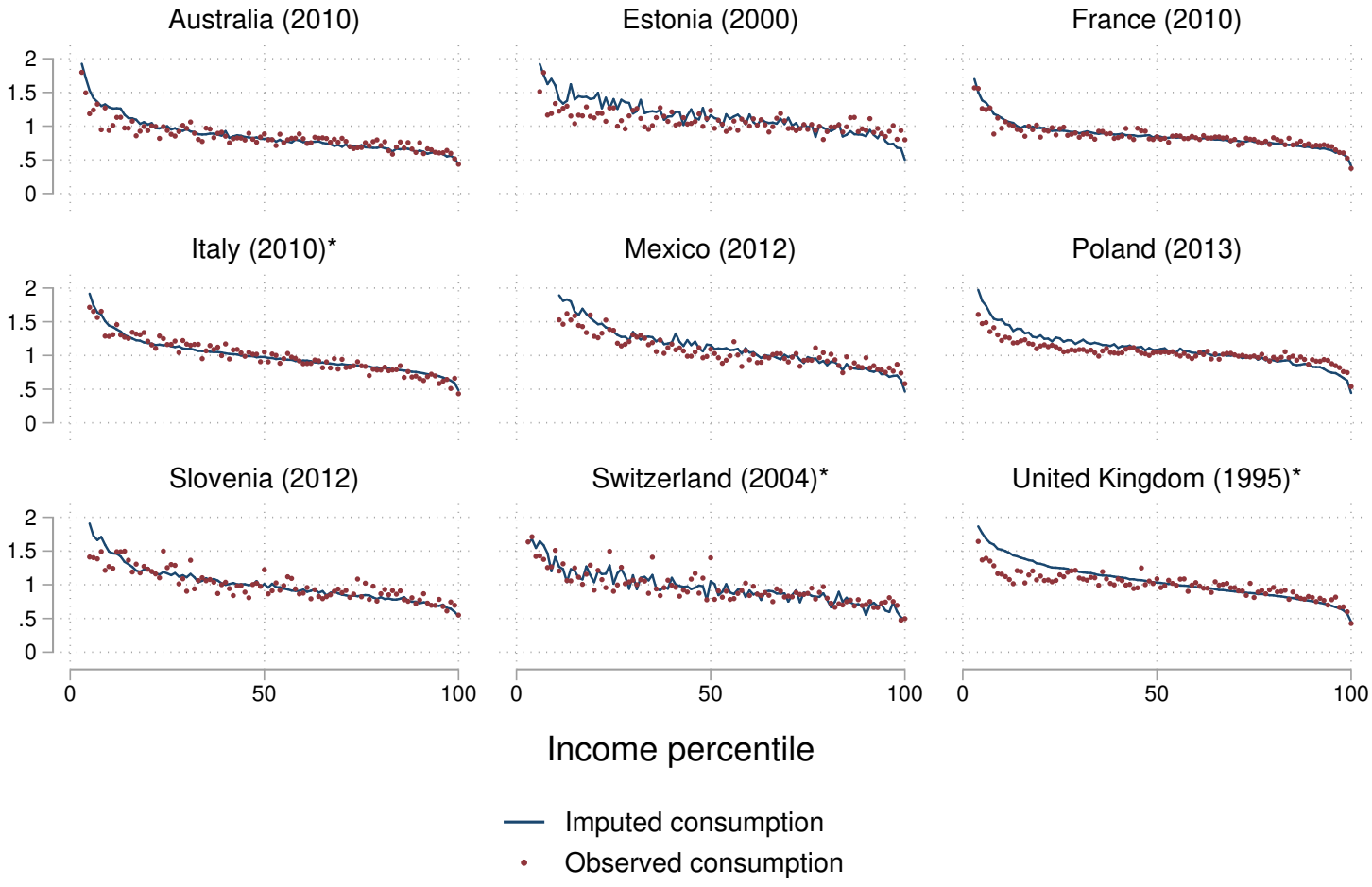

Figure 1: The imputed and observed propensities to consume, using cross-validation.

Main results

1. Consumption taxes fall disproportionately on low-income households:
   - The tax-to-income ratio of the richest 10 percent is between 50% and 60% that of the poorest 50 percent
2. Consumption taxes entail a significant rise in the Gini index:
   - The inequality rise offsets one-third of the redistributive effect of tax-benefit systems
   - The gap between the Denmark and the USA is reduced by 23%
3. The anti-redistributive impact is mainly driven by the tax rate
   - The rise in inequality amounts 0.01 Gini points in the USA and 0.04 Gini points in Denmark
   - ... in line with the tax rate gap, which varies from 7% (in the USA) to 28% (in Denmark)

Main results: Decreasing tax-to-income ratios

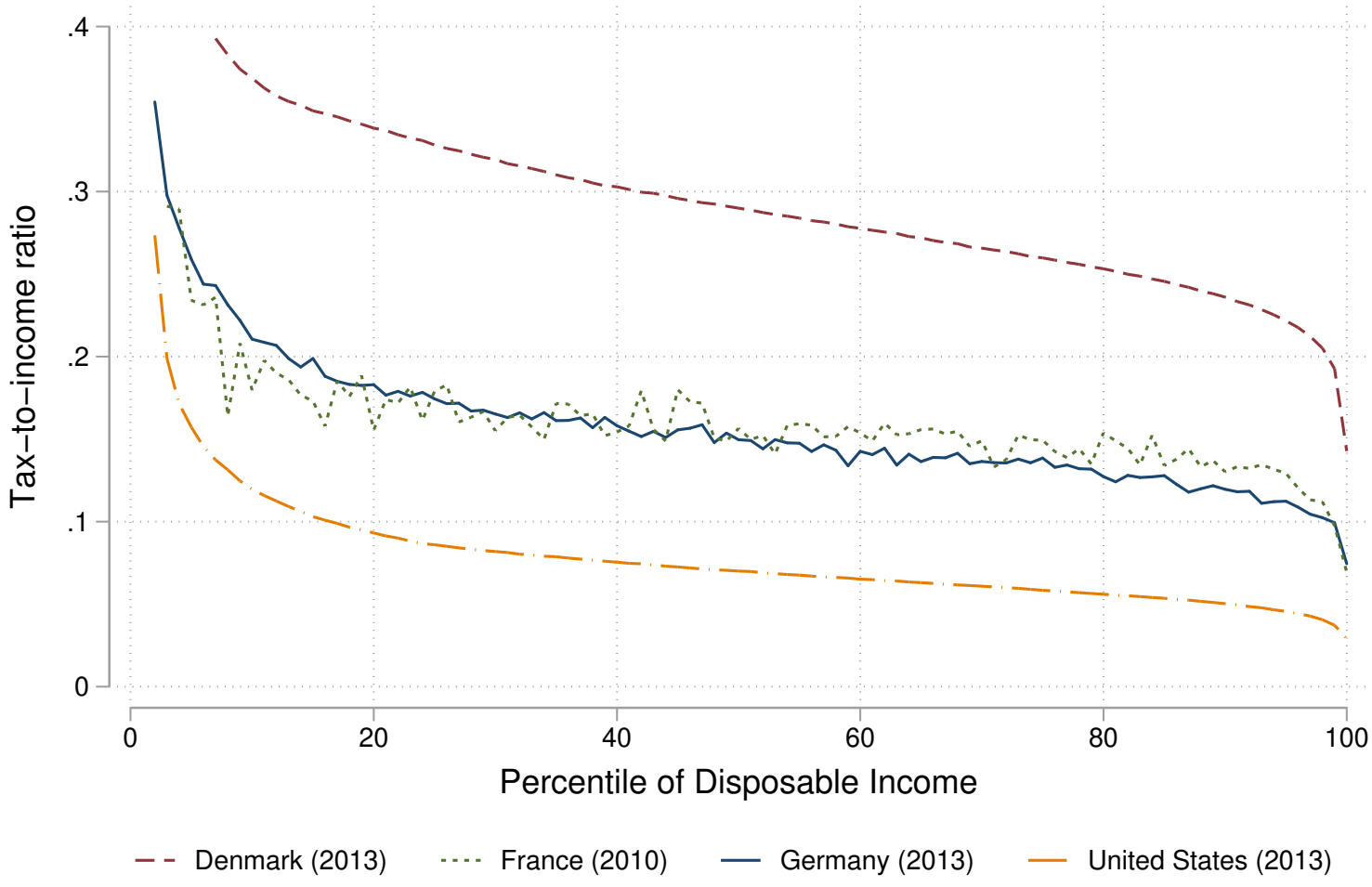

Figure 2: Tax-to-income ratios in Germany, Denmark, France and the United States.

Main results: A significant rise in income inequality

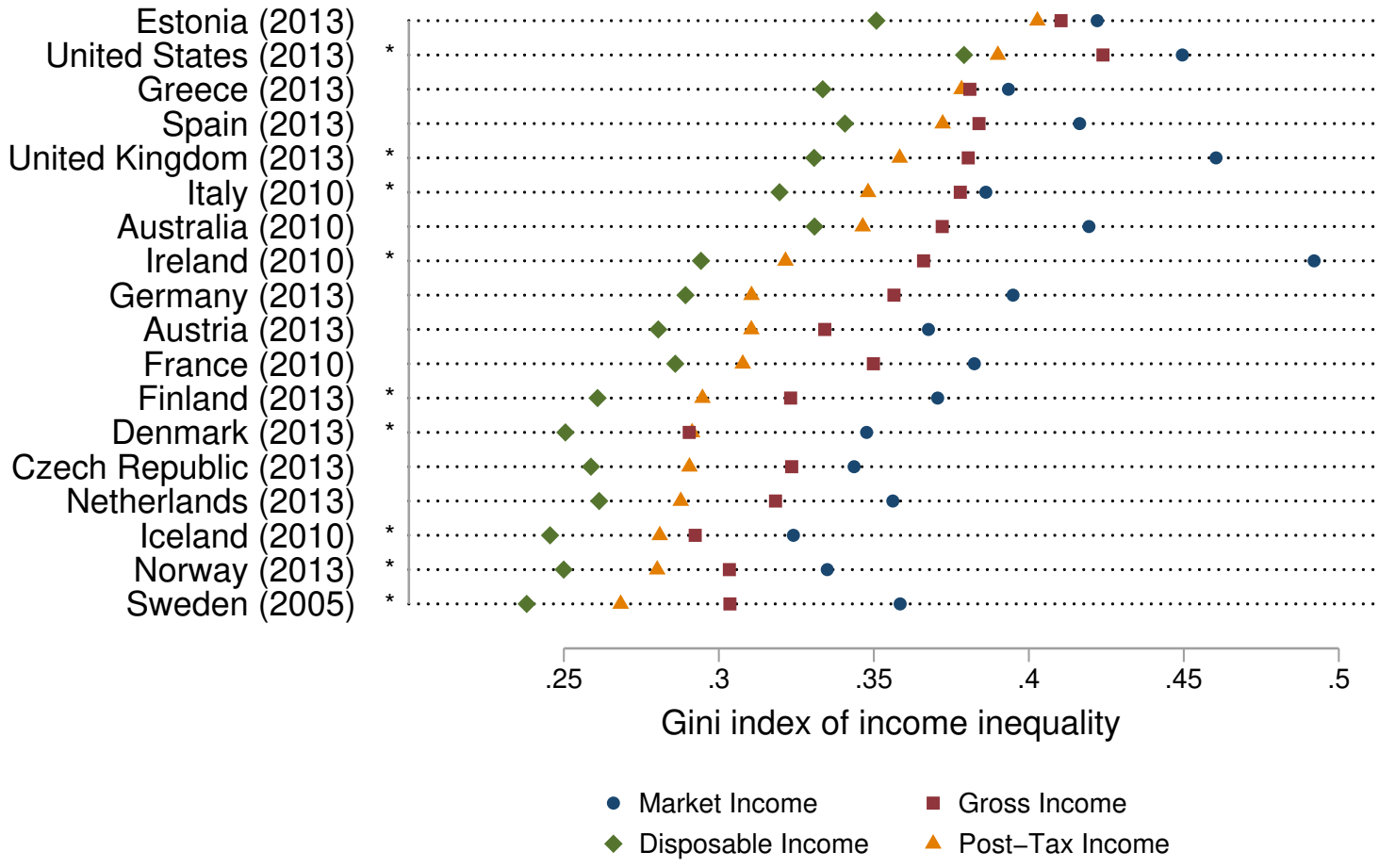

Figure 3: The Gini coefficients for market, gross, disposable and post-tax income.

Main results: Determinants of the (anti-)redistributive effect

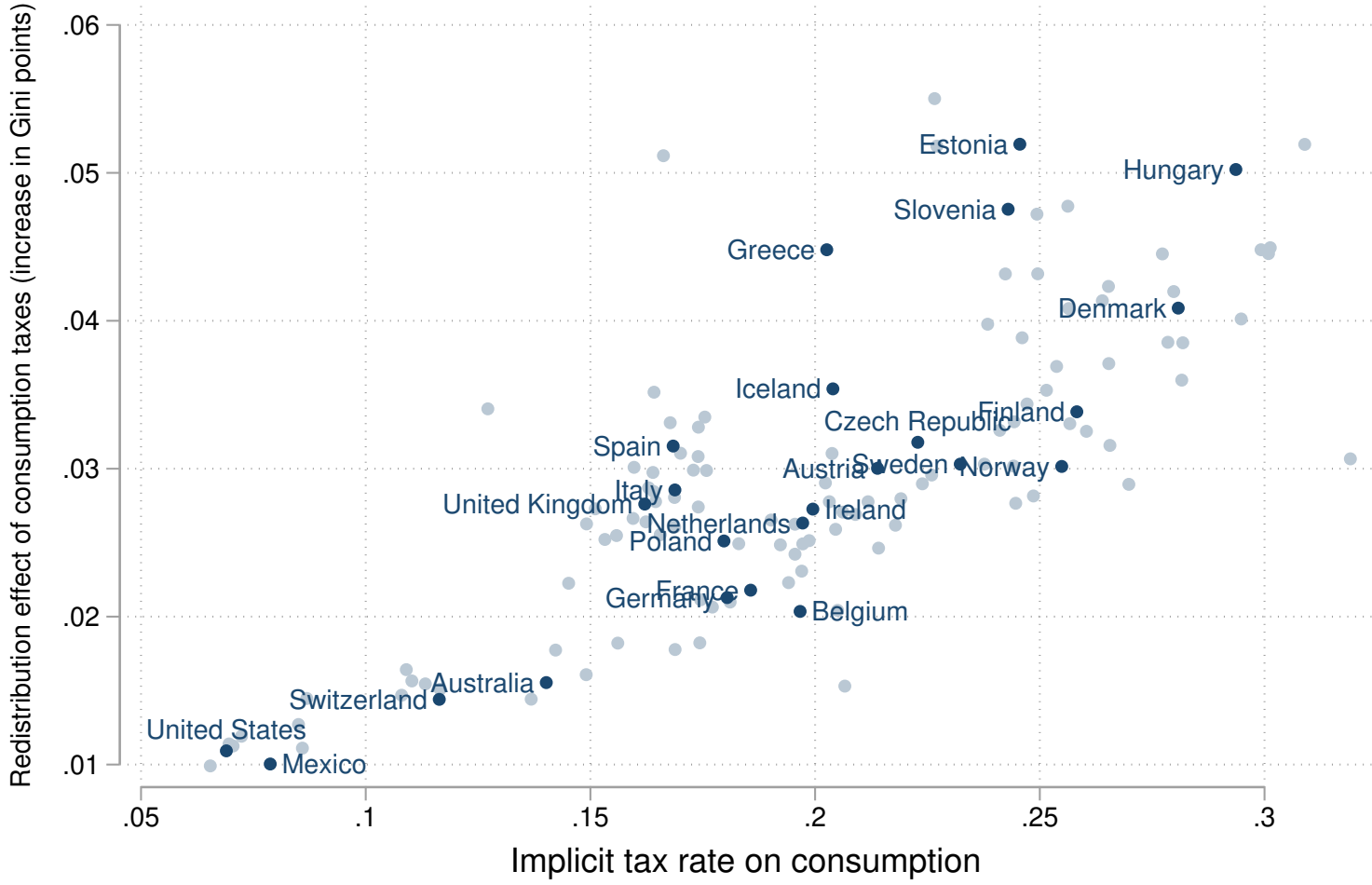

Figure 4: The redistributive impact is mainly driven by the tax rate.

Contributions

- The anti-redistributive effect of consumption taxes is fairly large, but far from offsets the positive effect of direct taxes and transfers
  - The USA remains more unequal than Denmark!
- The variation in the distributional effect comes from the average consumption-tax rate, a political parameter
  - ...and not from the propensity to consume, which falls with income in all countries
- New cross-country imputation method for distribution of consumption using widely available data
  - All you need is income and standard socio-economic variables
  - and the code `https://doi.org/10.5281/zenodo.4291984`

LCS questions

1. **Consumption concept**: Which consumption concept did you use? What are its strengths and weaknesses?

2. **Cross-country comparability**: What is your view on cross-country comparability? In particular, what are the implications of not including social transfers in kind (STiK)?

3. **Recommandations**: Based on the LCS note you received (variable list, aggregation plan, definitions), what would you like to see included or adjusted? Any concrete recommendations (e.g. prices, quantities, health, education)?

Appendices and robustness checks

- Bundle effect
- Accuracy of prediction of Gini

Bundle effect

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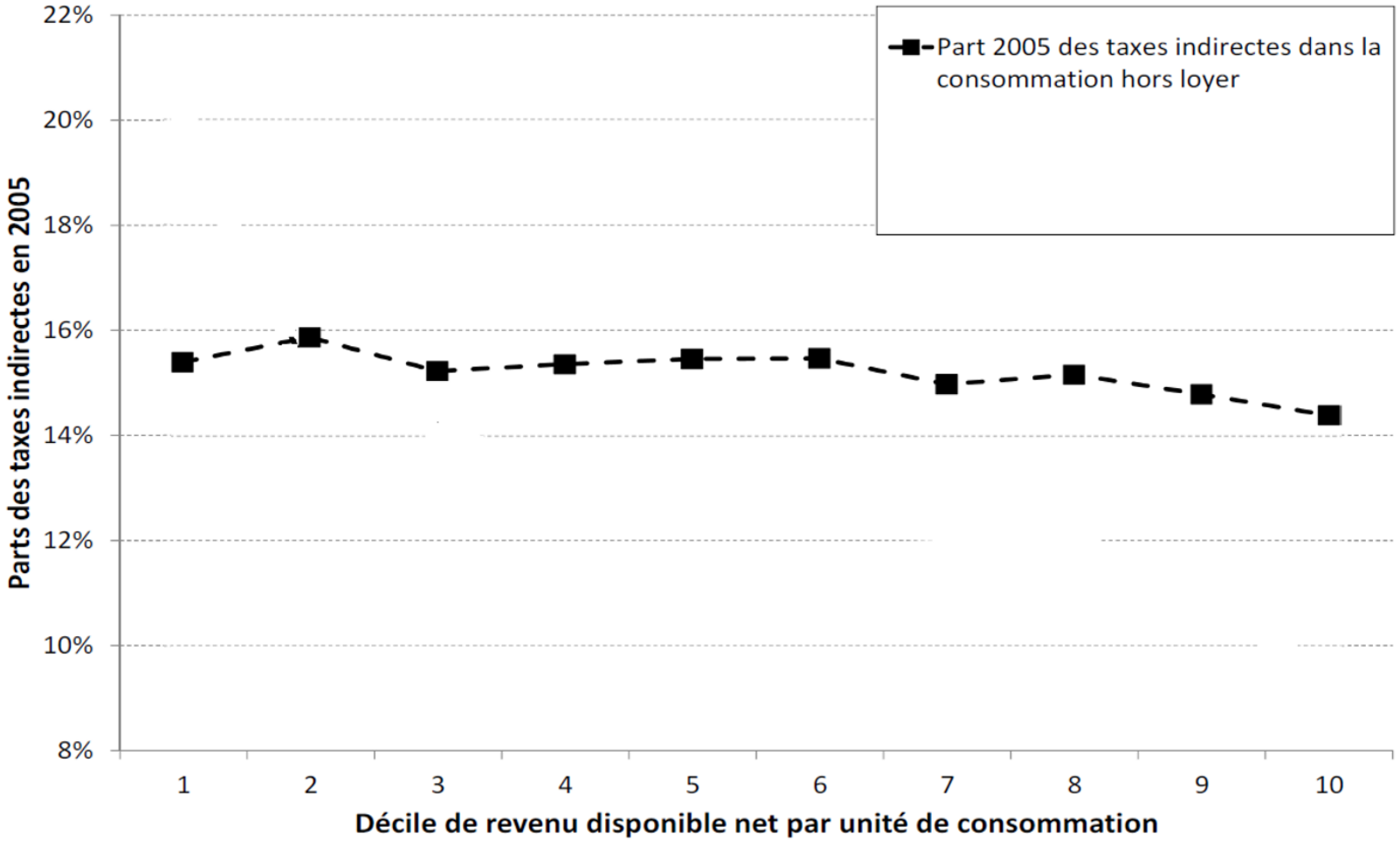

Figure 5: Tax-to-income ratio by decile of income (Dauvergne 2012)

Robustness checks: bundle effect

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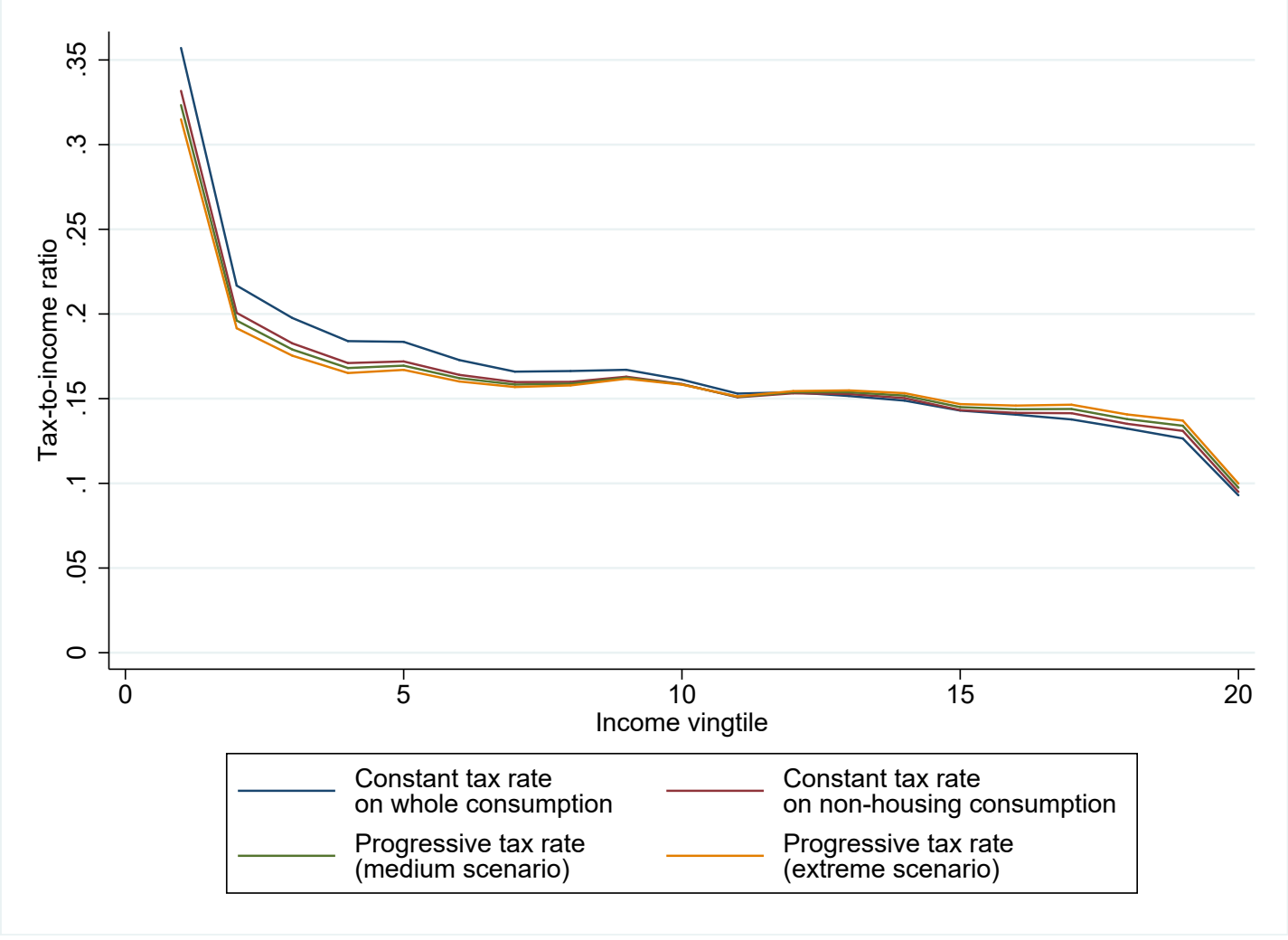

Figure 6: Tax-to-income ratio with three scenarios (France 2010)

Impact of rent

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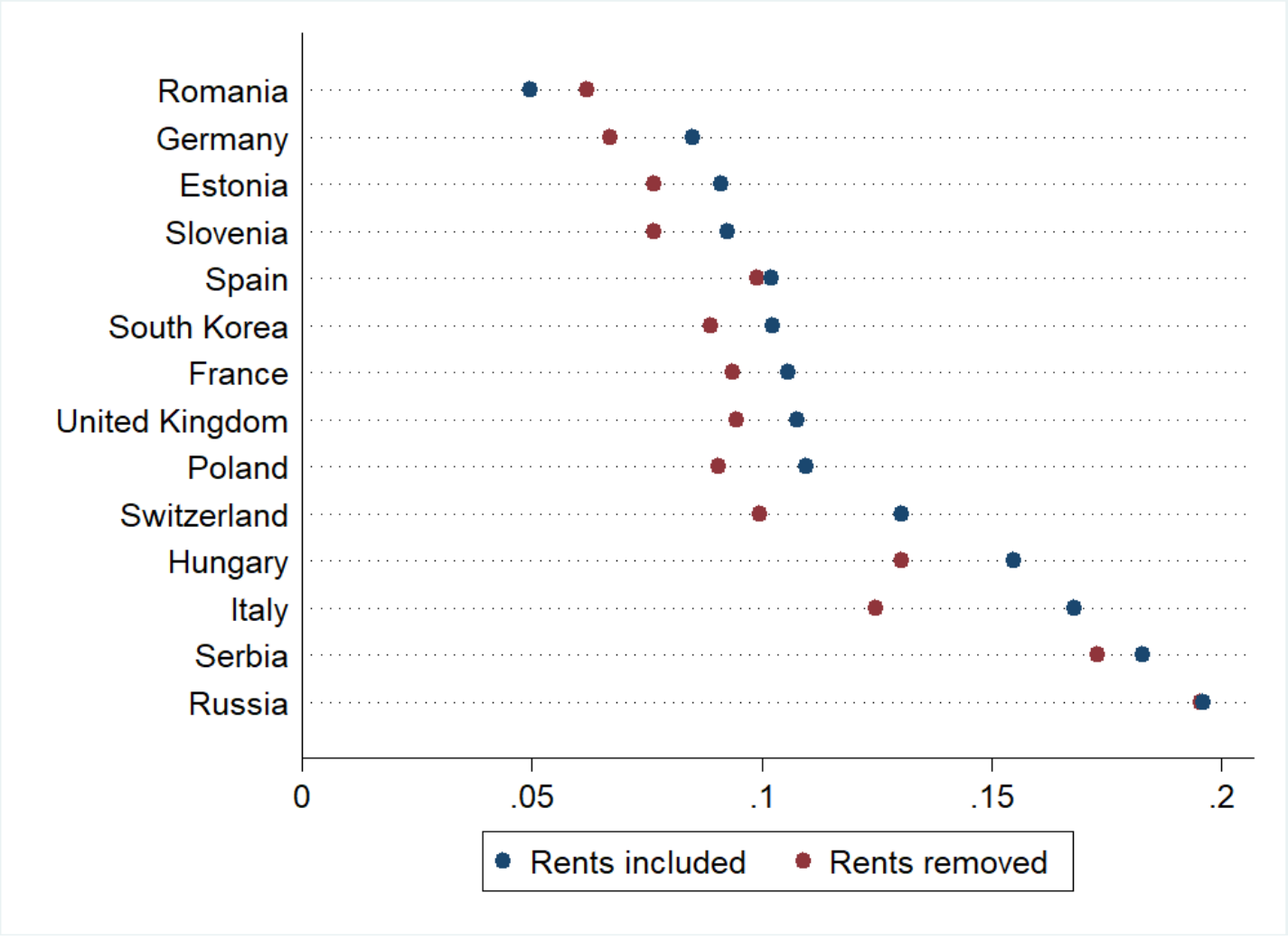

Figure 7: Mean value of Kakwani index whether taxable consumption includes rentals

Accuracy of prediction of Gini

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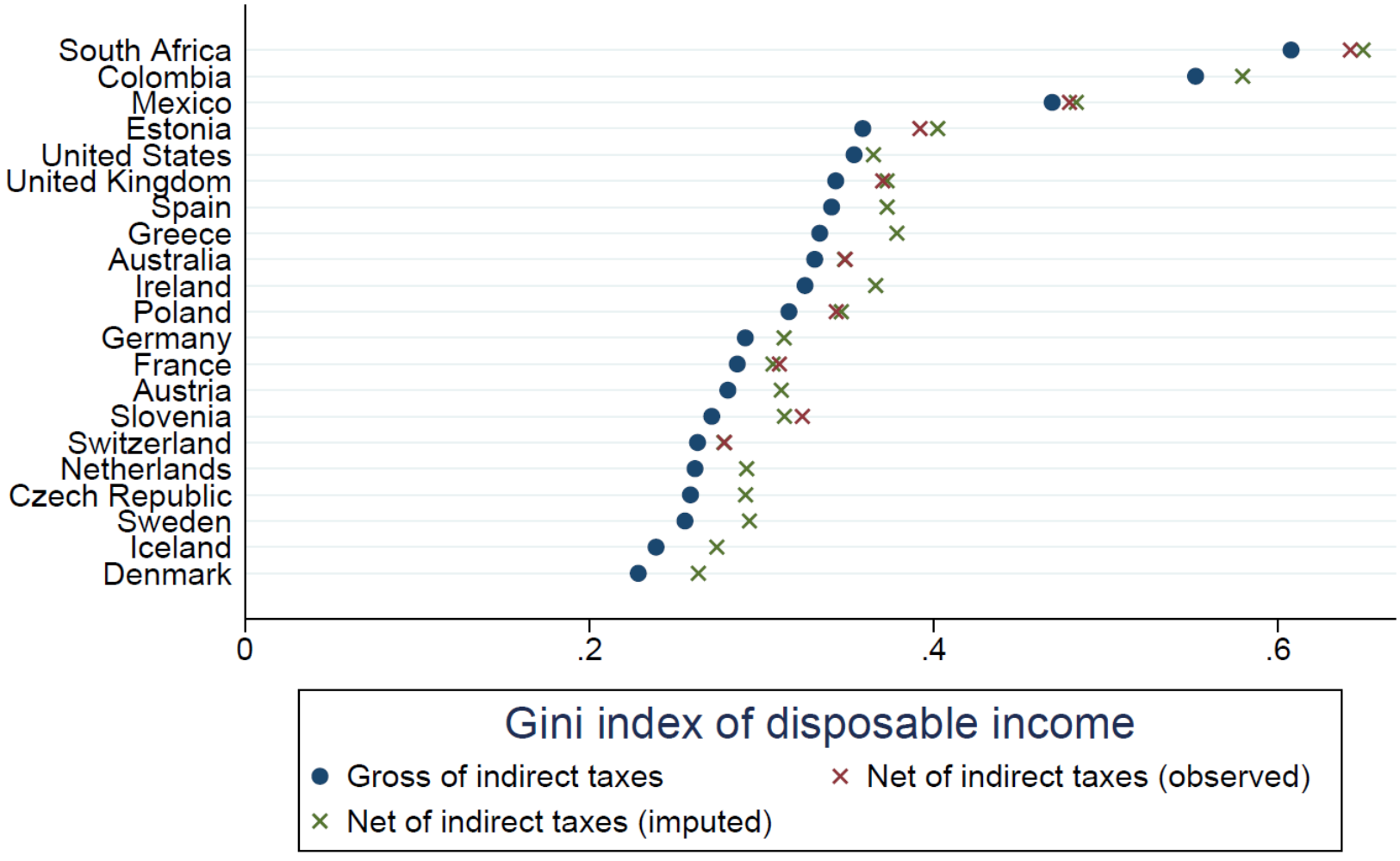

Figure 8: Actual and predicted Gini coefficient of post-consumption-tax income

Comparison of models

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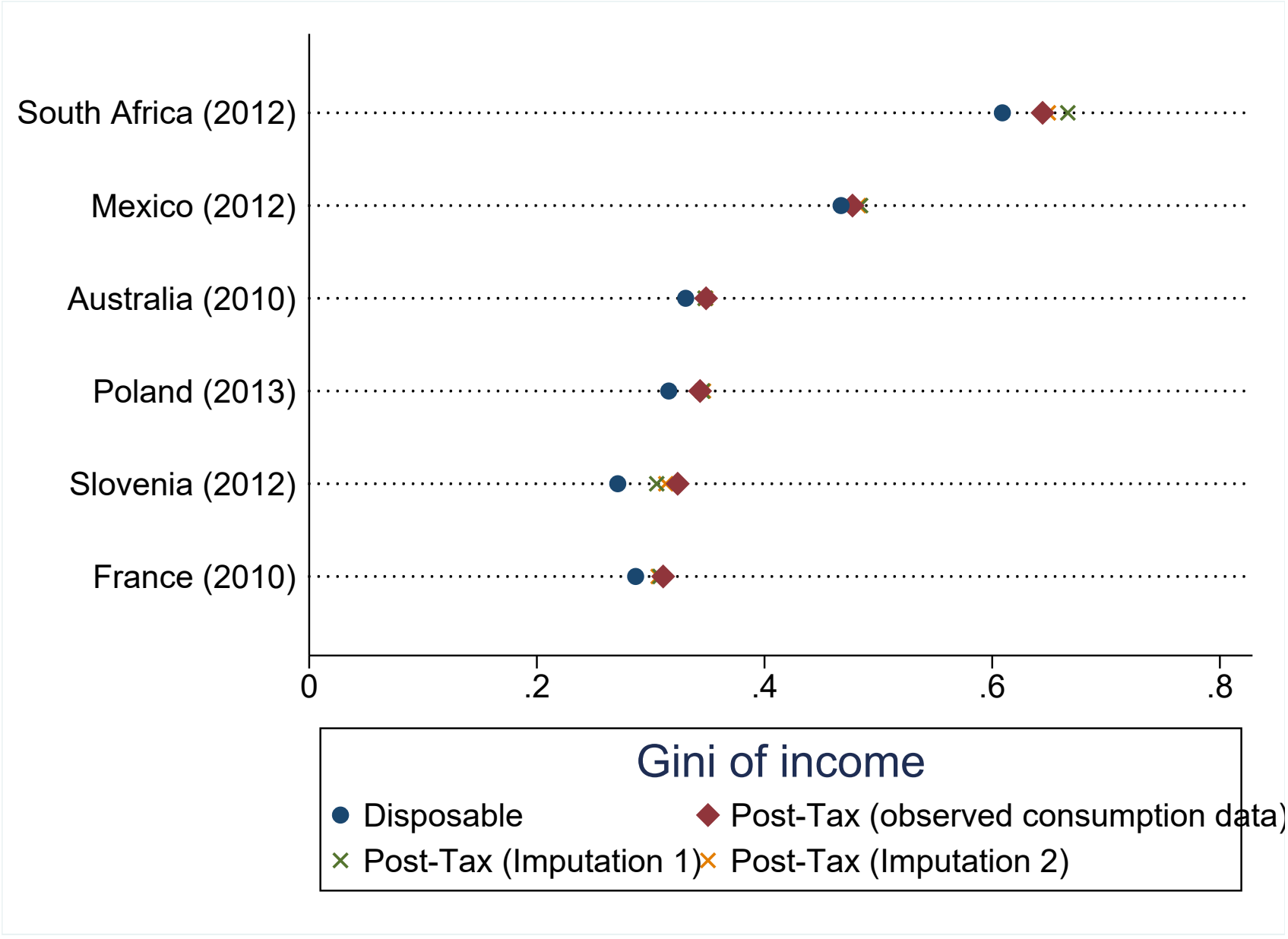

Coverage

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The model is calibrated on: France, Germany, Italy, Spain, United Kingdom, Poland, Switzerland, South Korea, Estonia, Slovenia, Taiwan

Consumption is estimated on: Austria, Belgium, Denmark, Estonia, Finland, France, Georgia, Germany, Greece, Hungary, Iceland, Ireland, Italy, Lithuania, Luxembourg, the Netherlands, Norway, Poland, Romania, Russia, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, and the United States

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