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MICROSIMULATION TOOLS FOR THE EVALUATION OF FISCAL POLICIES AT BANCO DE ESPAÑA

Roberto Ramos
Structural Analysis Unit Head

EUROMOD WORKSHOP

University of Milan
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DG ECONOMICS, STATISTICS AND RESEARCH

MICROSIMULATION TOOLS AT BANCO DE ESPAÑA

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- **Banco de España has been developing a set of microsimulation tools to evaluate the revenue impact and distributive consequences of fiscal policy reforms.**

- **Currently:**
  - Personal income tax
  - Value added tax and excise duties
  - Unemployment benefits
  - Pensions (in progress)

- **They mostly rely on (publicly available) administrative data (tax returns and Social Security registries).**

- **Only the VAT tool allows for behavioral responses.**

- See Bover, Casado, García-Miralles, Labeaga and Ramos (2017) for an overview.

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The Banco de España Personal Income Tax Microsimulation Model

- **The personal income tax (PIT) taxes the Spanish residents' income.**

- **Tax collection with the PIT represents around 7% of GDP, being the largest source of tax revenue after Social Security contributions.**

DISTRIBUTION OF TAX REVENUES IN 2015 (% OF GDP)

	Tax Revenue	Personal Income Tax	Social Security Contribu-tions	Value Added Taxes	Other Taxes	$\frac{\text{PIT}}{\text{Tax Revenue}}$
	(1)	(2)	(3)	(4)	(5)	(6)
Spain	33.8%	7.2%	11.4%	6.4%	8.8%	21.3%
Euro Area 11	38.8%	9.4%	12.2%	7.0%	10.2%	24.3%
OECD	34.0%	8.5%	8.9%	6.7%	9.8%	24.5%

- **The microsimulation tool embeds the (large set of) parameters of the tax code into a representative sample of tax returns, in order to simulate each taxpayer's tax liabilities.**
  - Changes in the parameters of the tax code allow simulating tax reforms.

TAX RETURN DATA

- **Administrative dataset containing a (stratified) random sample of tax returns.**
  - IEF-AEAT sample of tax returns (yearly data, last wave is 2016).
  - The data cover 15 regions (out of 17) and 2 autonomous cities.
  - 2.7 million tax returns ≈ 14% of the universe.

- **The dataset includes almost the complete set of fiscal and sociodemographic characteristics provided in the tax return.**
  - Income from different sources (labor, capital, self-employment).
  - Tax benefits (deductions and credits).
  - Tax liabilities.
  - Demographic characteristics (age, location, number of dependent relatives, disability…)

- **The unit of observation is the tax return.**
  - Either individual or joint filing.
  - No information on labor status or hours worked.

- **Monetary values are not censored either at the top or at the bottom of the distribution.**

- **The sample data provide an accurate representation of income and tax liabilities.**

ACCURACY OF THE 2015 CROSS-SECTION DATA (€BILLION)

	Sample Aggregate	Population Aggregate	Difference
	(1)	(2)	(3)
Number of Taxpayers (million)	19.5	19.5	0.0%
Gross Labor Income	394.1	393.3	0.2%
Gross Capital Income	46.3	46.6	-0.8%
Gross Self-Employment Income	25.8	26.5	-2.6%
Taxable Income	374.7	375.0	-0.1%
Tax Liabilities	65.5	65.6	-0.2%

THE SPANISH PERSONAL INCOME TAX

Tax structure

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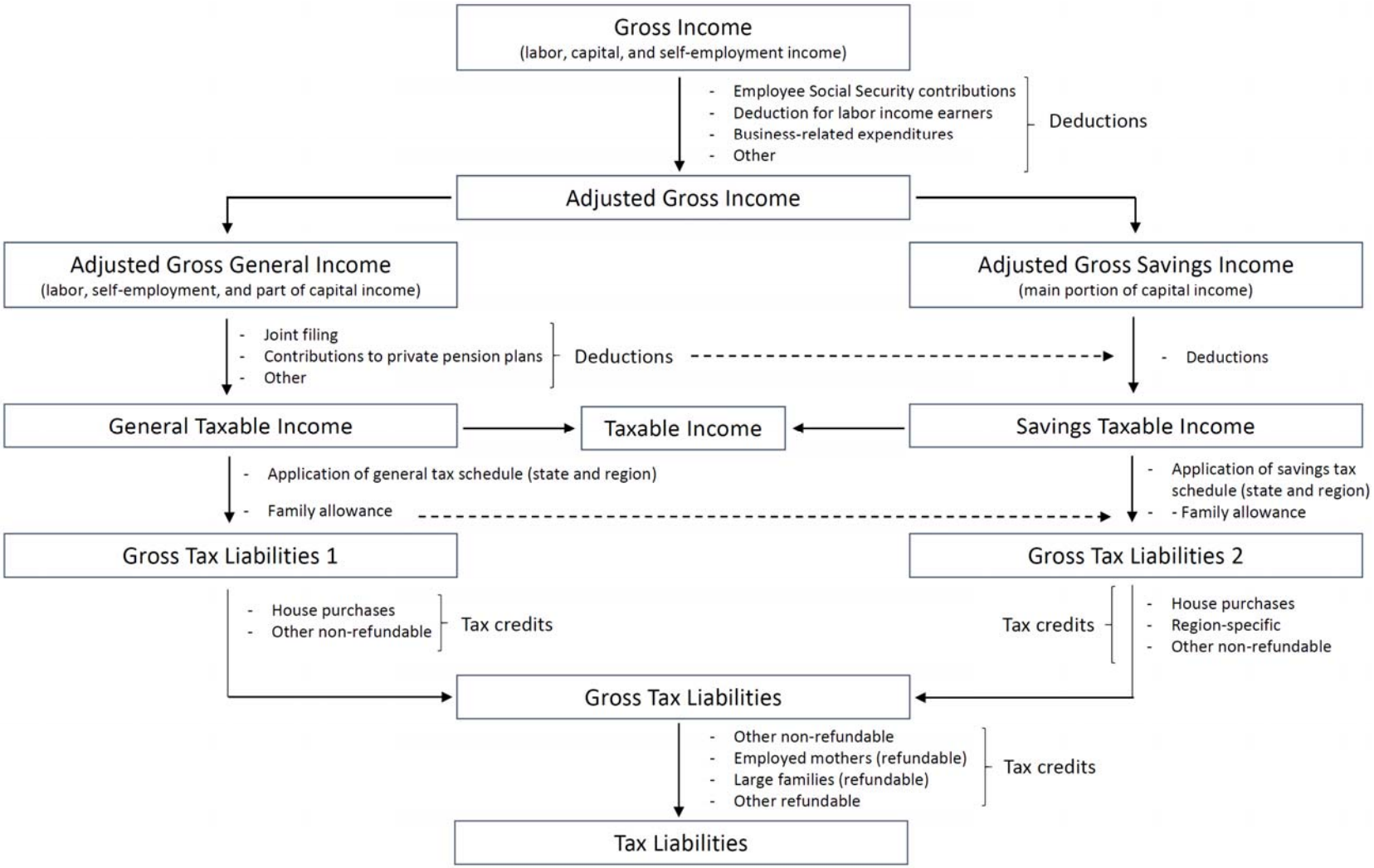
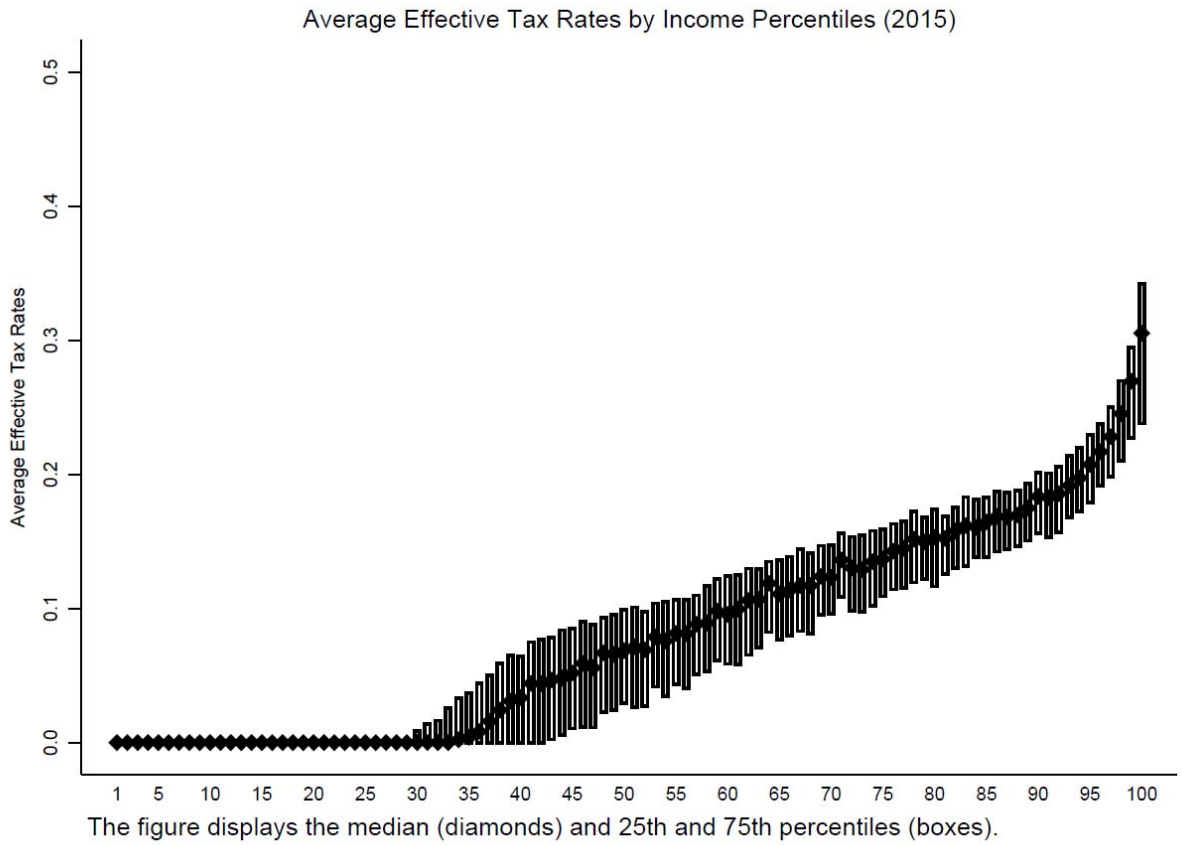


- **There is a high degree of variation in effective tax rates.**



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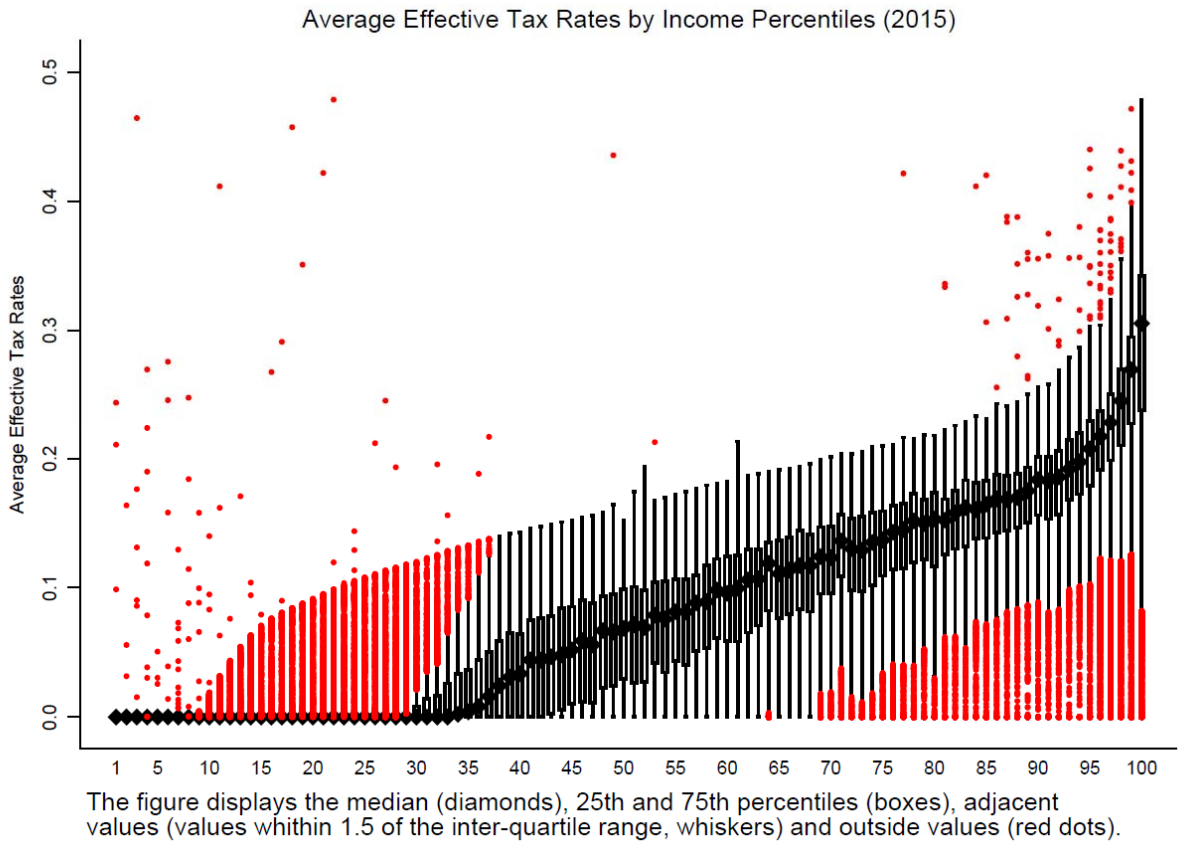


The figure displays the median (diamonds), 25th and 75th percentiles (boxes), adjacent values (values whithin 1.5 of the inter-quartile range, whiskers) and outside values (red dots).

- **The microsimulation tool simulates each taxpayer's tax liabilities as a function of gross income and benefits (data), as well as the parameters of the tax code.**
- **The effect of reforms is simulated by modifying these parameters:**
  - Allocation of income sources to the general or savings tax base.
  - Switch tax benefits off and on, and adjust monetary values
    - *Social Security contributions, labor income earners, joint filing, contributions to private pension plans…*
    - *Family allowance, house purchases, employed mothers, large families, regional credits…*
  - Redefinition of tax deductions as tax credits.
  - Changes in tax bands and tax rates of the tax schedule
    - *General and savings income.*
    - *Region-specific tax rates.*
- **The number of parameters is around 1,500.**

- **In order to simulate reforms, the sample weights and income data pertaining to 2015 are updated to 2017 values.**
  - Net increase in the number of taxpayers by region and change in aggregate income by income source.
  - Data source is official (aggregate) figures published by the Tax Agency.
- **Aggregate figures computed from the microsimulation model resemble the corresponding aggregates provided by the Tax Agency.**

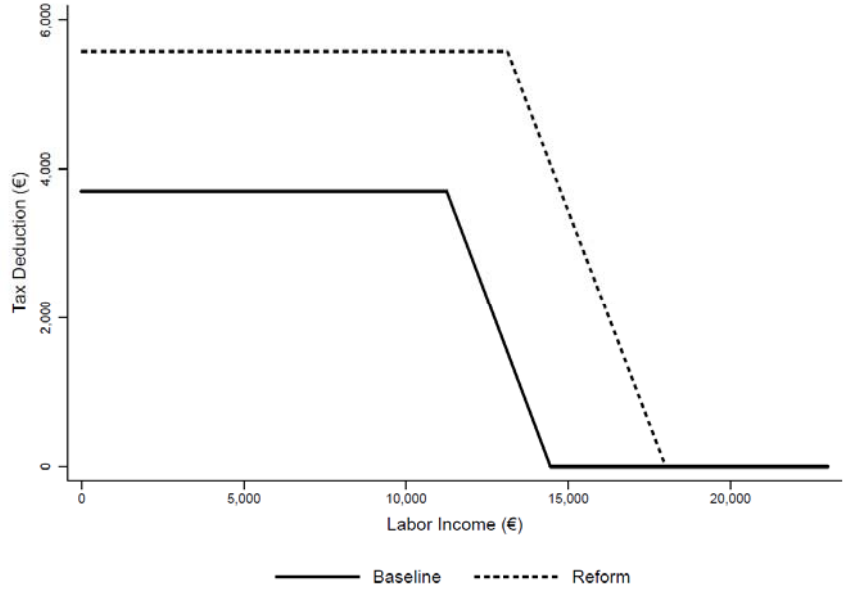
MODEL ACCURACY

€bn	Model		Data[(a)]		Difference (%)	
	2015	2017	2015	2017	2015	2017
Number of tax-payers (million)	19.5	19.9	19.5	19.9	-0.0	0.0
Income ("Rendimientos")	446.7	481.9	447.0	482.0	-0.1	-0.0
Tax Base ("Base Liquidable")	374.6	409.5	375.0	409.5	-0.1	0.0
Tax Liabilities before Tax Credits ("Cuota Íntegra")	70.9	79.6	71.0	78.7	-0.3	1.1
Tax Liabilities before Refundable Tax Credits ("Cuota Resultante de la Autoliquidación")	66.9	75.5	67.0	74.8	-0.2	0.9
Tax Liabilities after Refundable Tax Credits	65.4	74.0	65.6	73.0	-0.2	1.3

Source: BdE-PIT Microsimulation Model.

(a) *Estadísticas de los declarantes del Impuesto sobre la Renta de las Personas Físicas.*

- **The Draft Law on the State Budget for 2018 contained a number of measures designed to reduce the incidence of the PIT on low income workers and on certain groups of taxpayers:**
  - Rise in the income tax threshold from €12,000 to €14,000.
  - Increase in the amount of the tax deduction from labor income earnings between €14,000 and €18,000.
  - Introduction of a new tax credit of €1,200 for a disabled spouse.
  - Increase of €600 in the large-family tax credit, for each child above 3.



EXAMPLE

Revenue Change and winners and losers

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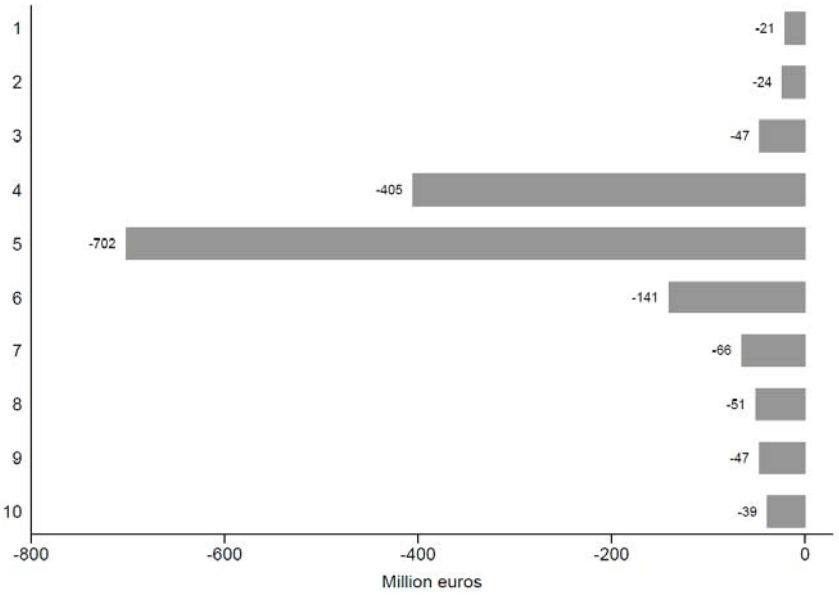
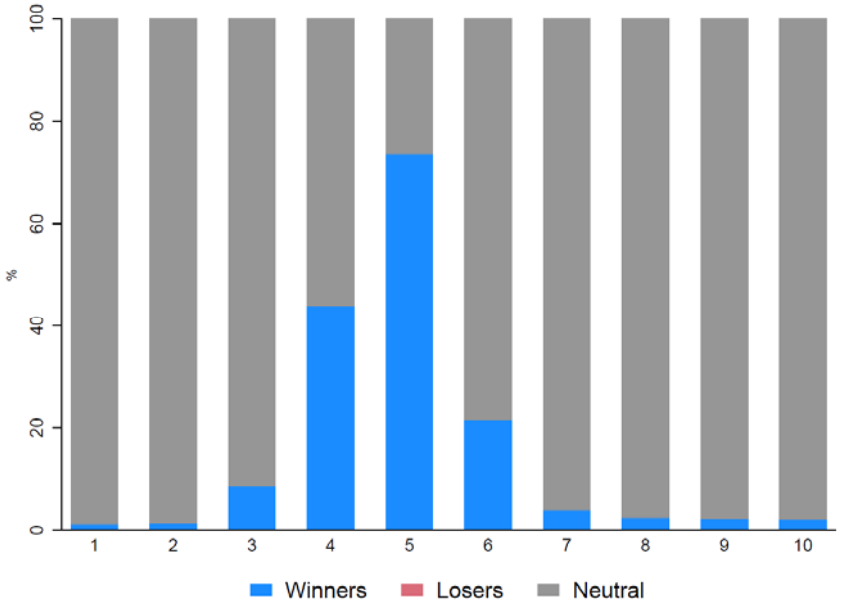
- **Revenue change: €-1.5 bn (-2.4%).**
- **Around 3 m taxpayers affected (16% of the total).**

Revenue change by income decile



Winners and losers

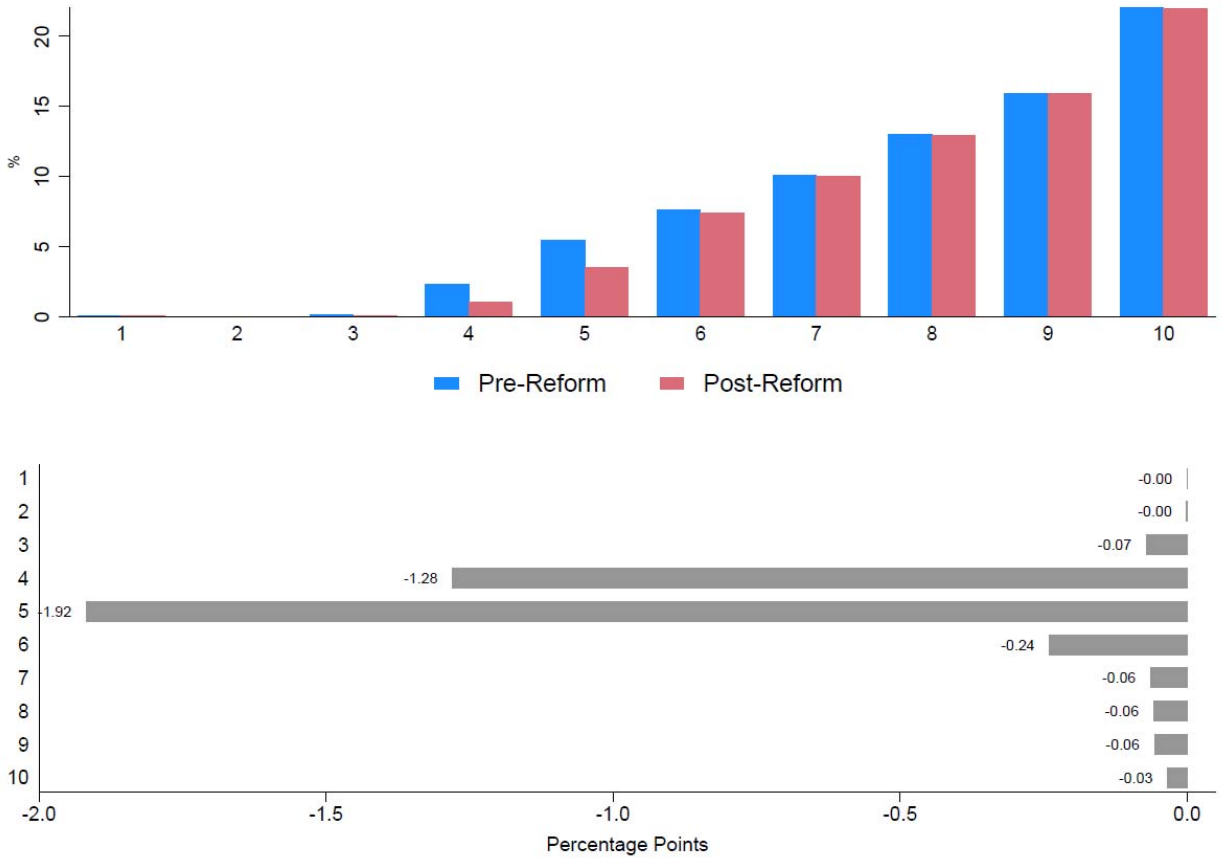


- **Winners would pay close to € 500 less on average.**

WINNERS AND LOSERS BY INCOME DECILE

	Total			Winners		
Deciles	Population	Gain (+) or loss (-)	Avg. gain or loss	Number	%	Avg. gain
	millions	million €	€	millions		€
1	1,9	21	10,8	0,0	1,1	946,5
2	1,9	24	12,3	0,0	1,2	1.027,6
3	1,9	47	24,1	0,2	8,6	281,5
4	1,9	405	208,0	0,9	43,9	473,9
5	1,9	702	360,2	1,4	73,7	489,0
6	1,9	141	72,3	0,4	21,6	335,2
7	1,9	66	33,8	0,1	4,0	855,4
8	1,9	51	26,3	0,0	2,4	1.102,6
9	1,9	47	24,4	0,0	2,2	1.094,6
10	1,9	39	20,3	0,0	2,0	990,5
Total	19,5	1.544	79,3	3,1	16,1	493,3

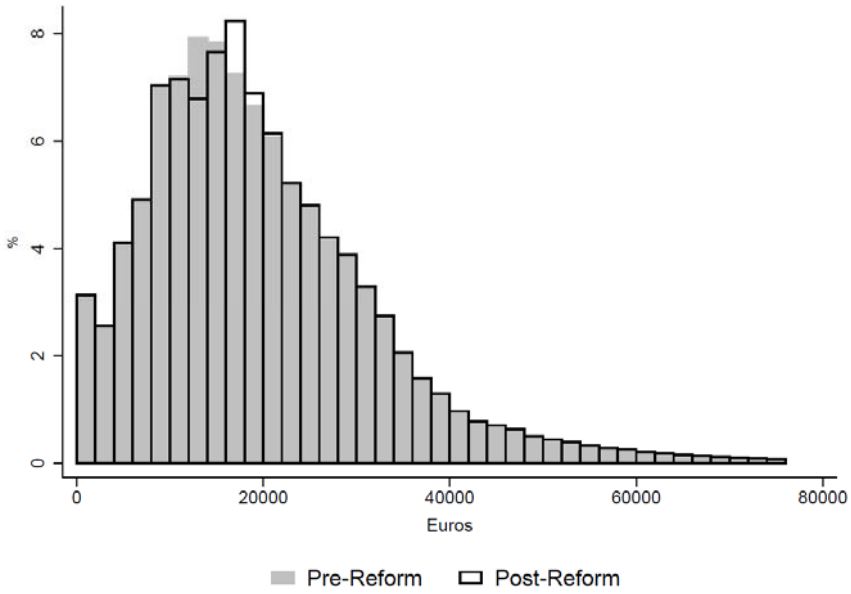
- **Effective average tax rates would decrease by close to 2 percentage points in the 5th decile.**



- **The change in some inequality measures reflects the gains of taxpayers in the middle of the income distribution.**

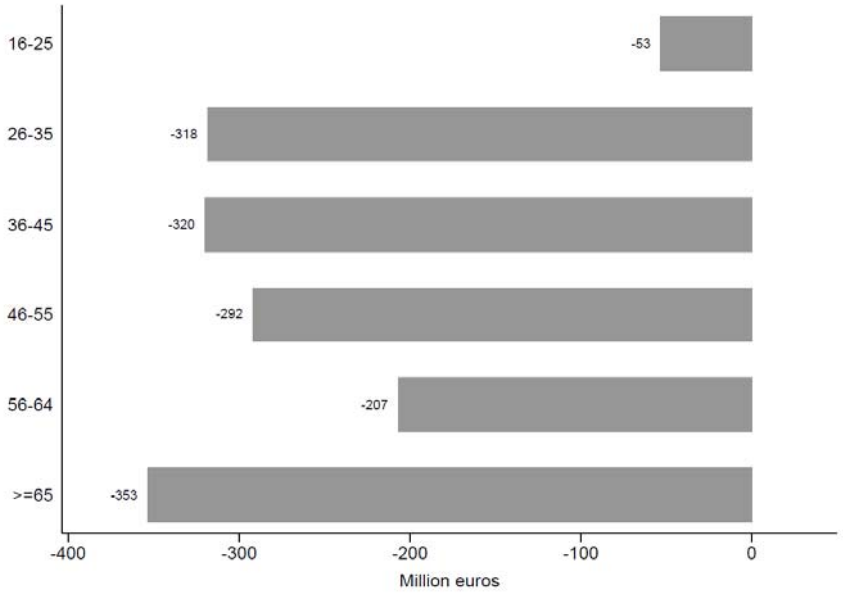
INEQUALITY MEASURES (AFTER-TAX)

Indices	Pre-Reform	Post-Reform	Change (pp)
90/10	6,3	6,3	-0,0025
90/50	2,1	2,0	-0,0151
50/10	3,1	3,1	0,0213
75/25	2,5	2,5	-0,0001
75/50	1,5	1,5	-0,0115
50/25	1,6	1,6	0,0124
Gini	0,38	0,38	-0,0016

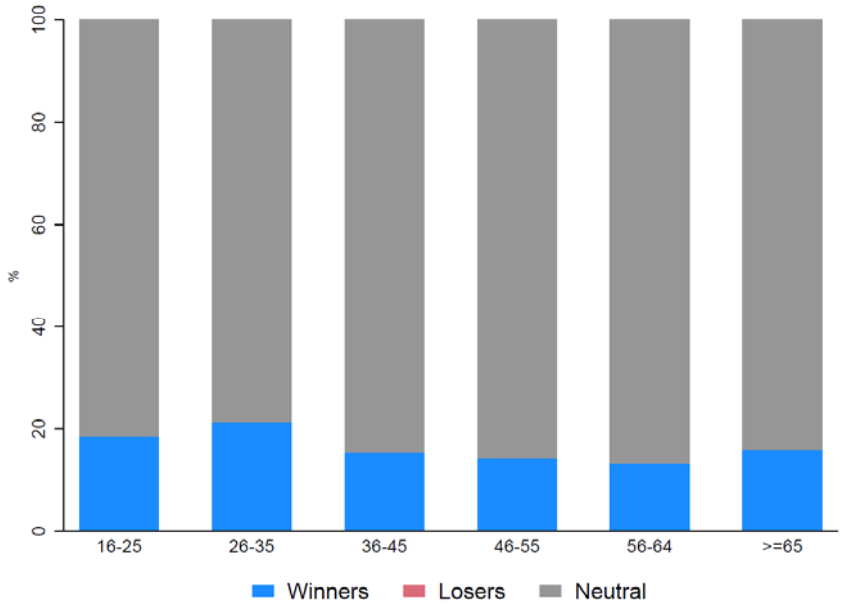


- **Young workers and retirees would benefit relatively more.**

Revenue change by age group

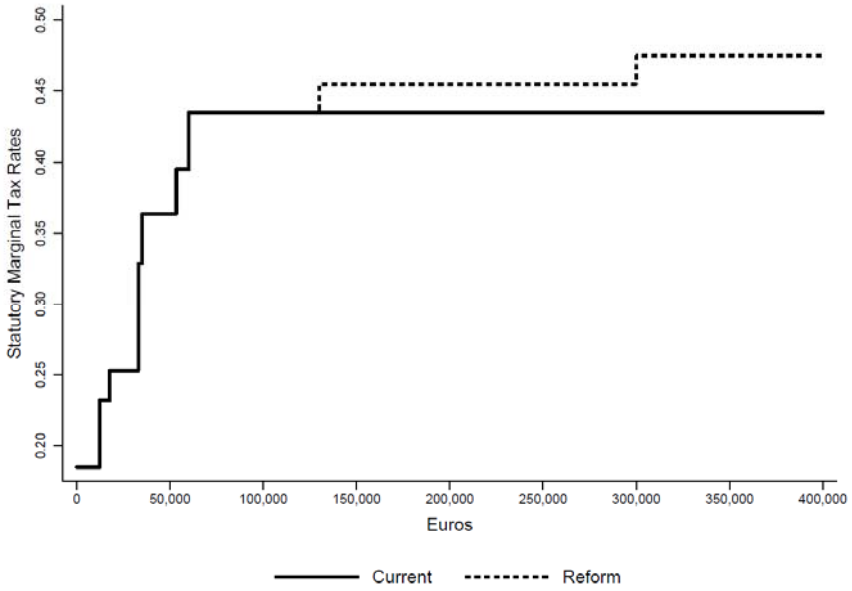


Winners and losers

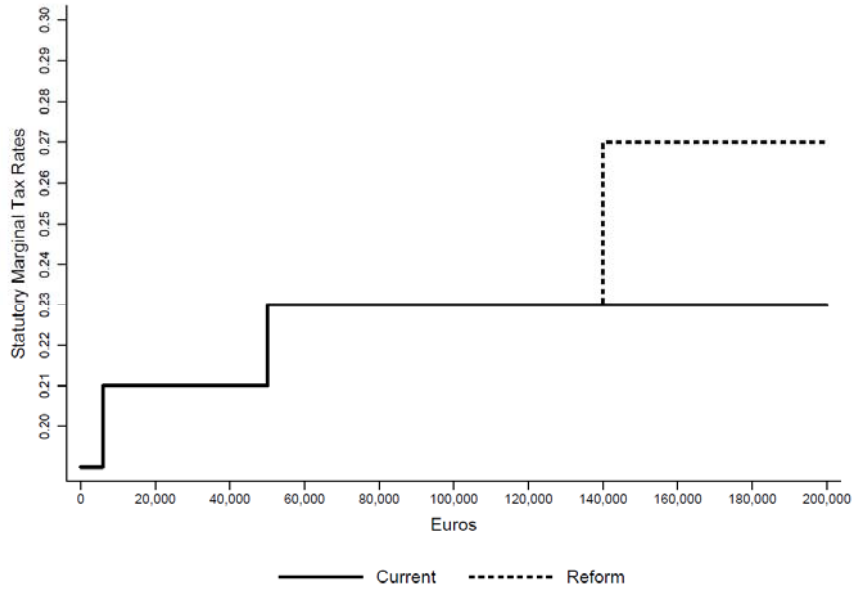


- **The previous simulations do not account for behavioral reactions as a result of the reform ('morning-after effects').**
- **A recent agreement for the 2019 Draft Law on the State Budget devises an increase the top marginal tax rate.**
  - General income: +2 pp from €130,000 and +4 pp from €300,000.
  - Savings income: +4 pp from €140,000.

General income tax schedule (Madrid)



Savings income tax schedule



EXAMPLE II

Revenue change and winners and losers

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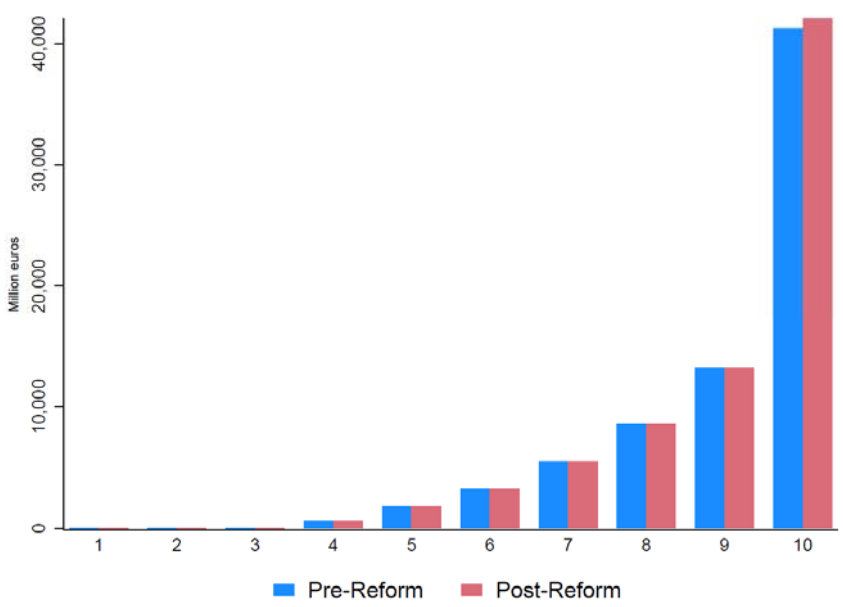
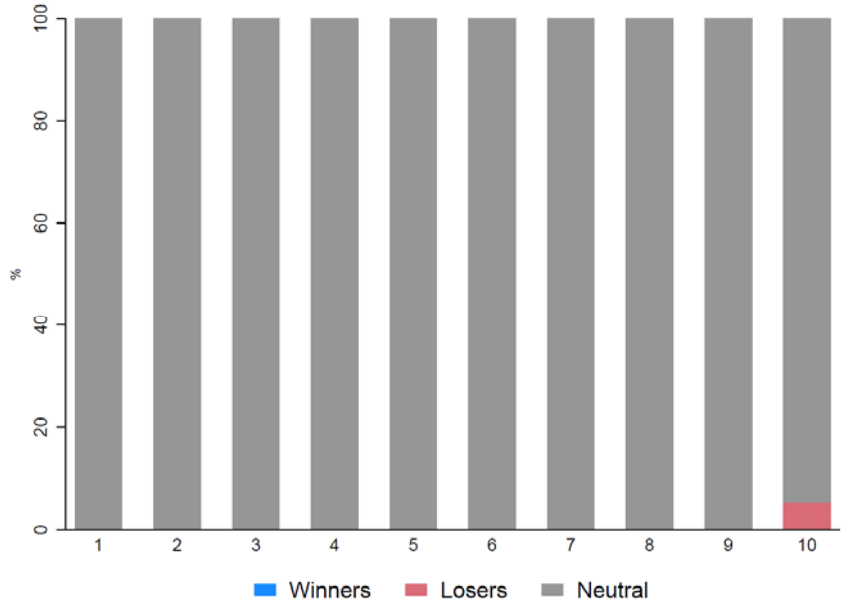
- **Revenue change (absent behavioral reactions): €+800 m (1.1%)**
- **Around 100,000 taxpayers affected (5% of taxpayers in top income decile)**
- **Losers would pay €7,600 in additional taxes on average**

Revenue by income decile



Winners and losers



- **How much more revenue can a (Spanish) government raise in the long run by making income taxes more progressive?**

- **Approach (as in Guner, Lopez Danieri and Ventura, 2016):**
  - Build a standard life-cycle model with heterogeneity (idiosyncratic shocks)
  - Parameterize the model to be consistent with facts on inequality and taxes paid in Spain.
    - *Parametric representation of effective taxes paid.*
  - Use this framework to compute how government revenue changes in the long-run with the progressivity of taxes (i.e. changes in the tax function).
    - *In the previous framework, second-round effects can be accounted for if the new tax function is estimated according to the simulated post-reform tax liabilities.*

- **Life cycle economy: j=1, ..., R, … N**
- **Households:**
  - They value consumption and dislike work.
  - Face idiosyncratic earning shocks and life uncertainty.
  - They can save in the form of riskless capital but they cannot borrow.
- **The government:**
  - Consume every period an amount G, which is financed through taxation.
  - Taxes household income with a progressive tax schedule (T).
  - Additionally, levies a flat tax on capital, consumption, and labor income to finance the social security system.
- **Working households decide how much to work and how much to save each period.**
- **There is a revenue maximizing degree of progressivity:**
  - Through the direct effect on revenue and the disincentive on labor supply and capital accumulation.

- **Estimate the parametric relation between gross income and taxes paid.**
- **For each tax return, we compute:**

$$\text{Average effective tax rate} = \begin{cases} \dfrac{\text{Tax liabilities}}{\text{Gross income}} & \text{if tax liabilities } \geq 0 \\ 0 & \text{if tax liabilities } < 0 \end{cases}$$

- **And estimate (Heathcote, Storesletten and Violante, 2017):**

$$t(\tilde{I}) = \begin{cases} 0 & \text{if } \tilde{I} < \bar{I} \\ 1 - \lambda(\tilde{I})^{-\tau} & \text{if } \tilde{I} \geq \bar{I} \end{cases}$$

  - $t(\tilde{I})$ is the average tax rate.
  - $\tilde{I}$ stands for multiples of mean gross income.
  - $\bar{I}$ is chosen so as to minimize the mean squared error.

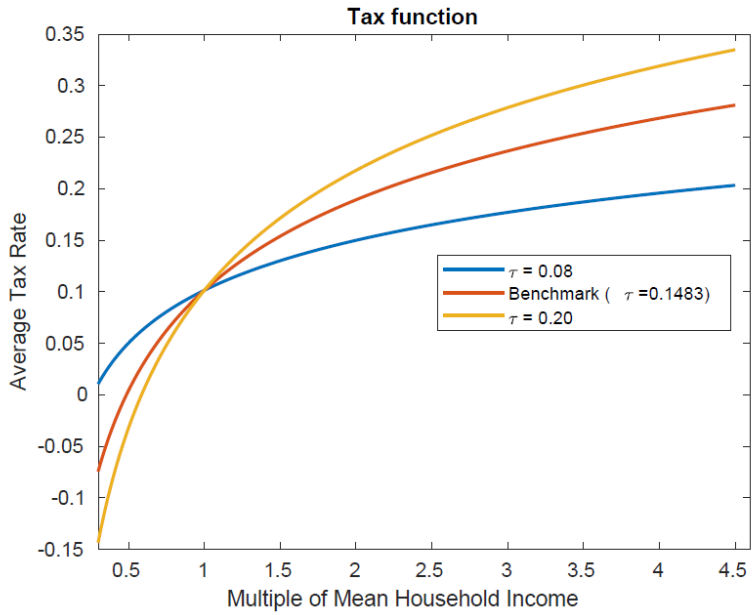
- **τ determines the progressivity of the tax function:**
  - Average tax rate:

$$t(\tilde{I}) = 1 - \lambda(\tilde{I})^{-\tau}$$

  - Hence:

$$\frac{1 - t(x\tilde{I})}{1 - t(\tilde{I})} = \frac{\lambda(x\tilde{I})^{-\tau}}{\lambda(\tilde{I})^{-\tau}} = x^{-\tau} = \frac{1}{x^{\tau}} < 1 \qquad \text{if } \tau > 0 \text{ and } x > 1$$

$$\text{if } \tau = 0 \Rightarrow t(\tilde{I}) = 1 - \lambda$$



AVERAGE TAX RATES BY MULTIPLES OF INCOME

Data

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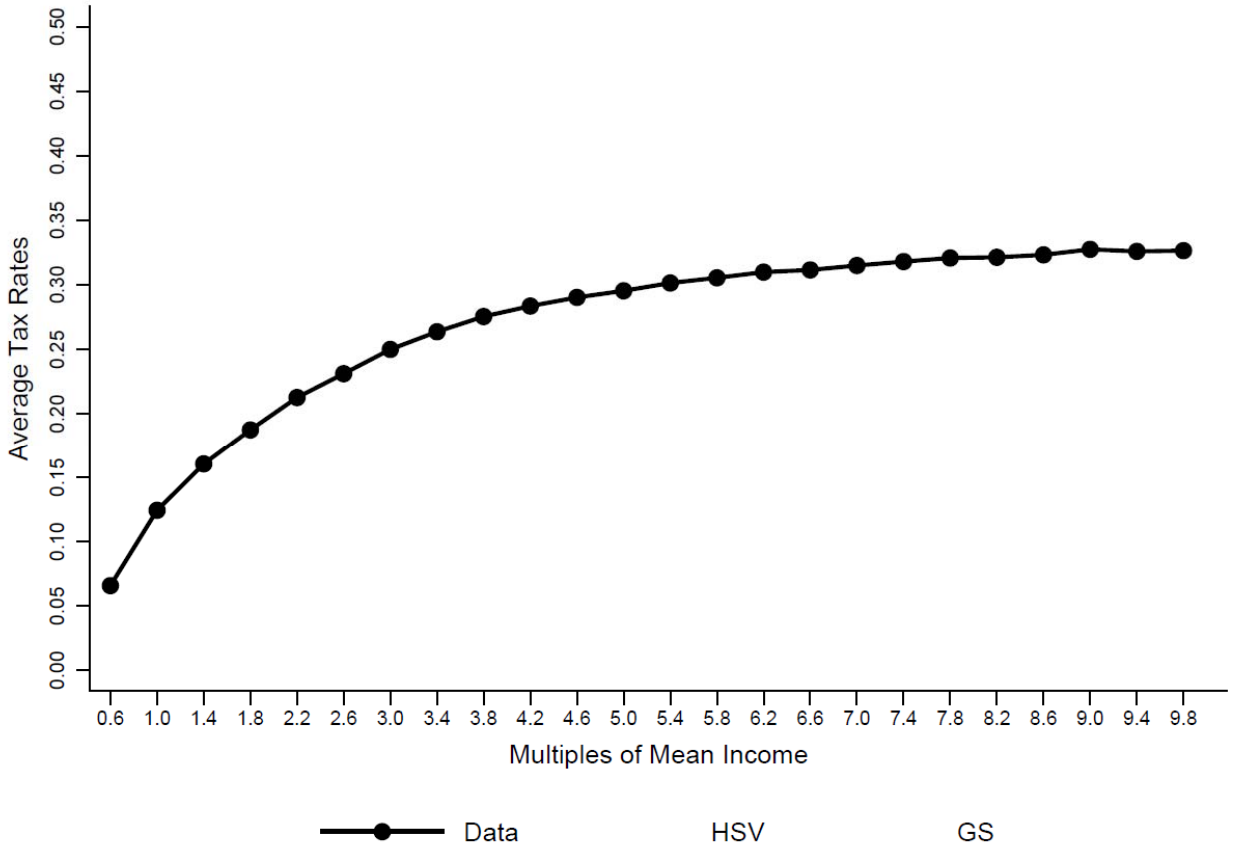
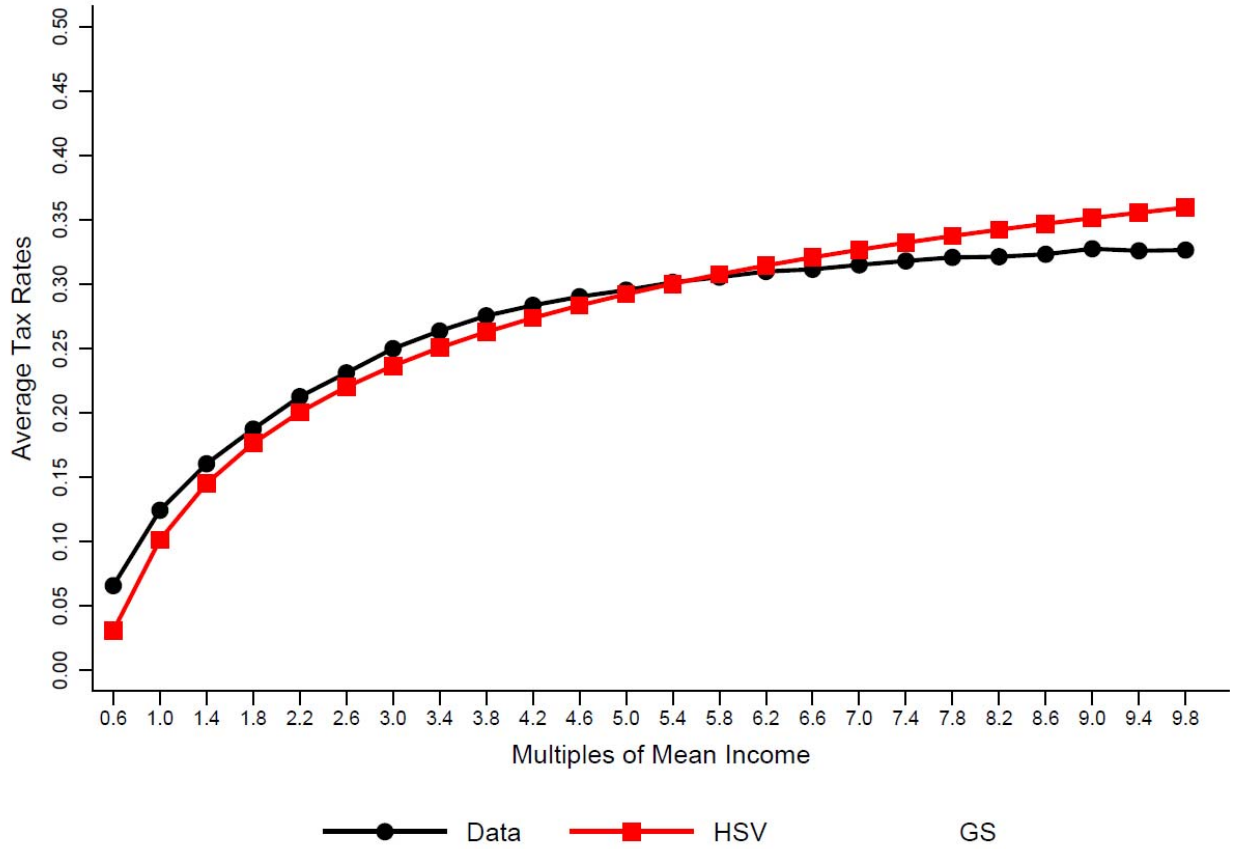


AVERAGE TAX RATES BY MULTIPLES OF INCOME

Data and functional form



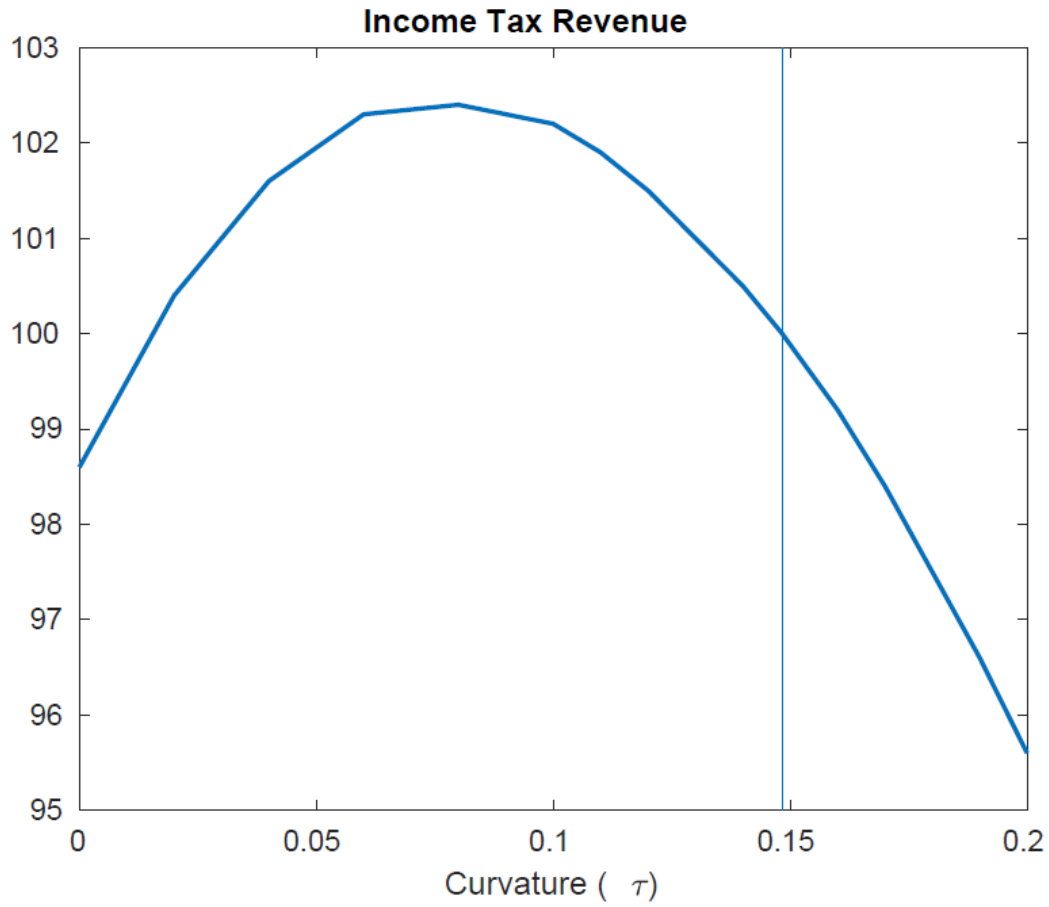
- $\lambda = 0.8995;\ \tau = 0.1483;\ \bar{I} = 49\%$
  - Measures in 2019 Draft Law on State Budget would lead to $\tau = 0.1490$.

- **Different values of τ:**

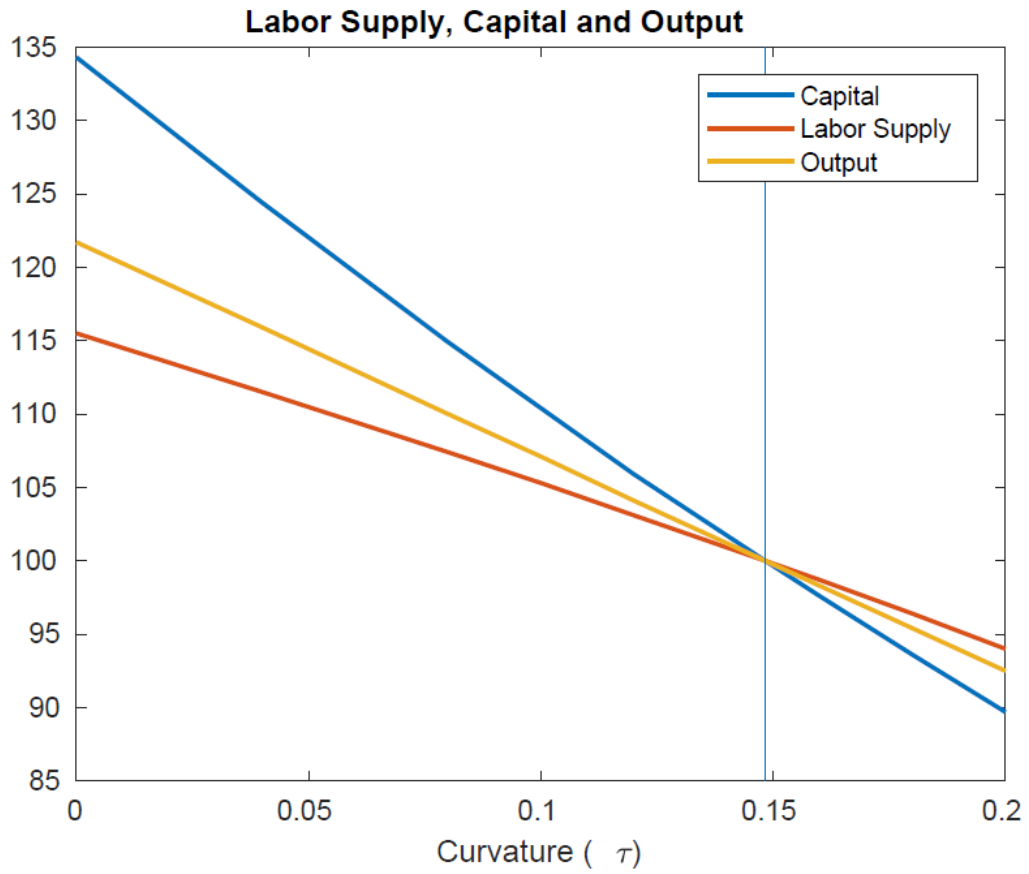
Tax Revenue – Model

	$\tau = 0.00$	0.08	**0.148 (BM)**	0.16	0.18
Output	121.7	110.0	100	98.3	95.4
Hours	113.6	106.5	100	98.9	96.9
Labor supply	115.5	107.4	100	98.7	96.4
Capital	134.3	114.9	100	97.6	93.6
Revenues					
Income tax	98.4	102.3	100	99.2	97.5
Corporate inc.tax	104.3	103.1	100	99.3	97.9
Consumption tax	121.6	109.7	100	98.4	95.6
All taxes	115.8	108.0	100	98.5	96.0

- **Relationship between τ and revenue:**



- **Aggregate output, labor supply and capital:**



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The Banco de España Indirect Tax Microsimulation Model

- **The tool allows for the simulation of changes in the VAT on 119 non-durable goods and for modifications on excise duties levied on 4 goods.**

- **The households' behavioral reaction is accounted for by the estimation of a demand system.**
  - Following a reform, households can redistribute expenditure between non-durable goods.

- **Data:**
  - Spanish Household Expenditure Survey:
    - *Around 22,000 households each year.*
    - *Info on household expenditure for 255 commodities.*
  - Consumer Price Index
    - *Monthly-region prices for 119 goods.*

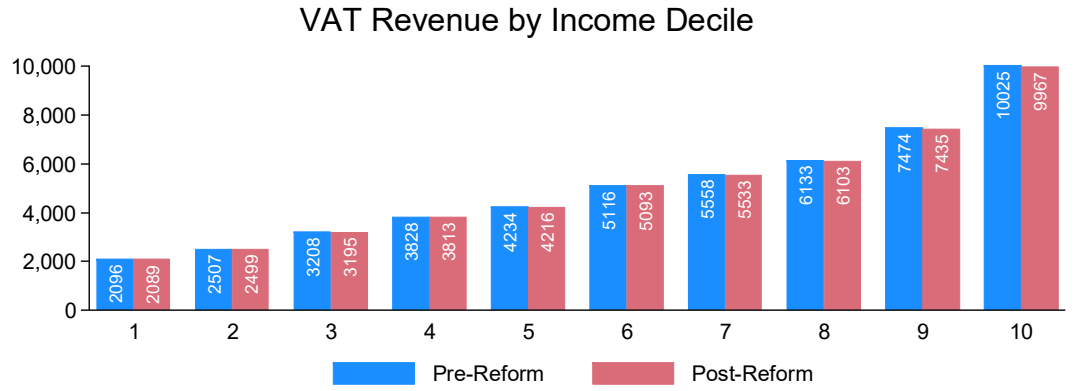
- **Policy parameters:**
  - Tax rates of 255 commodities, aggregated to 119 goods.
    - *Exempted (0%), super-reduced (4%); reduced (10%); standard (21%).*

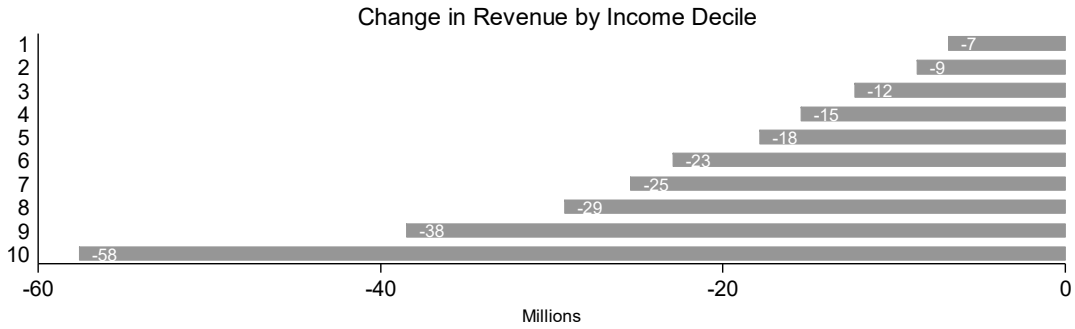
- **Estimated behavioral parameters:**
  - Coefficients from a Quadratic Almost Ideal Demand System (Banks, Blundell, and Lewbel, 1997) on 13 non-durable good categories:
    - *Provides own-, cross-price, and income elasticities, as well as parameters on socio-demographic characteristics.*

Income elasticities

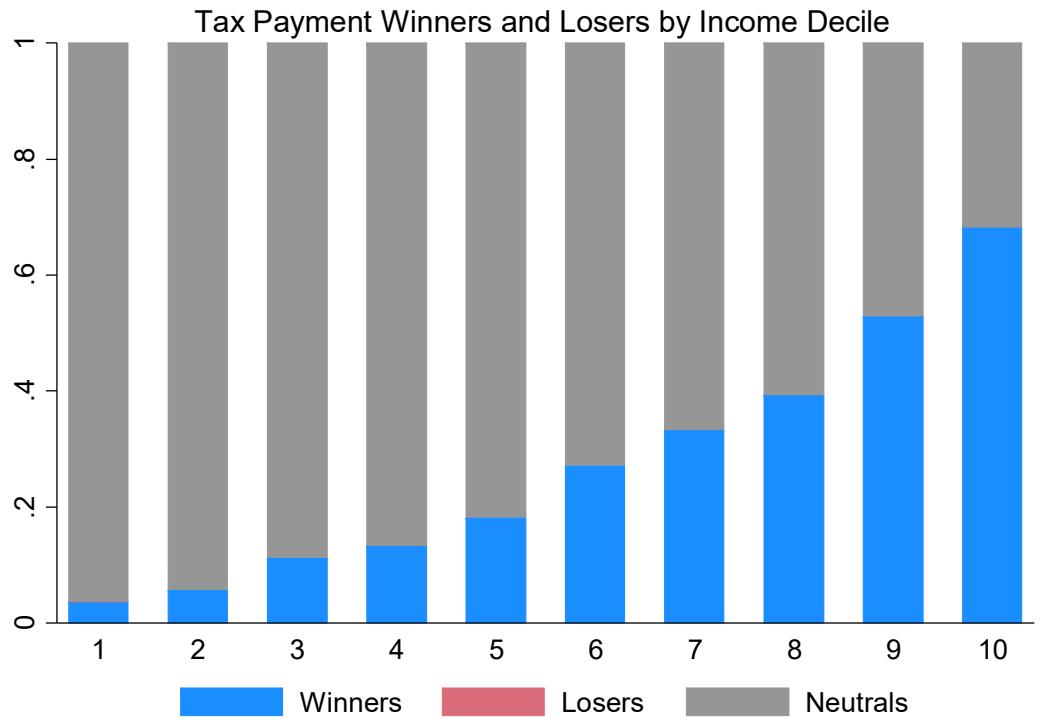
Cross-price elasticities

- **Simulation of decrease of VAT rates on cultural services from 21% to 10%:**
  - Revenue change: € -234 m (0.47%).





- **Simulation of decrease of VAT rates on cultural services from 21% to 10%:**
  - Winners would be concentrated on the top income decile



Simulation of Unemployment Benefits

MICROSIMULATION OF UNEMPLOYMENT BENEFITS

Guillamón, Izquierdo, and Puente (in progress)

- **Joint estimation of the impact of the duration and generosity of unemployment benefits on the exit from unemployment.**
  - Compare the relative incidence of duration and generosity.
  - Simulate potential reforms.

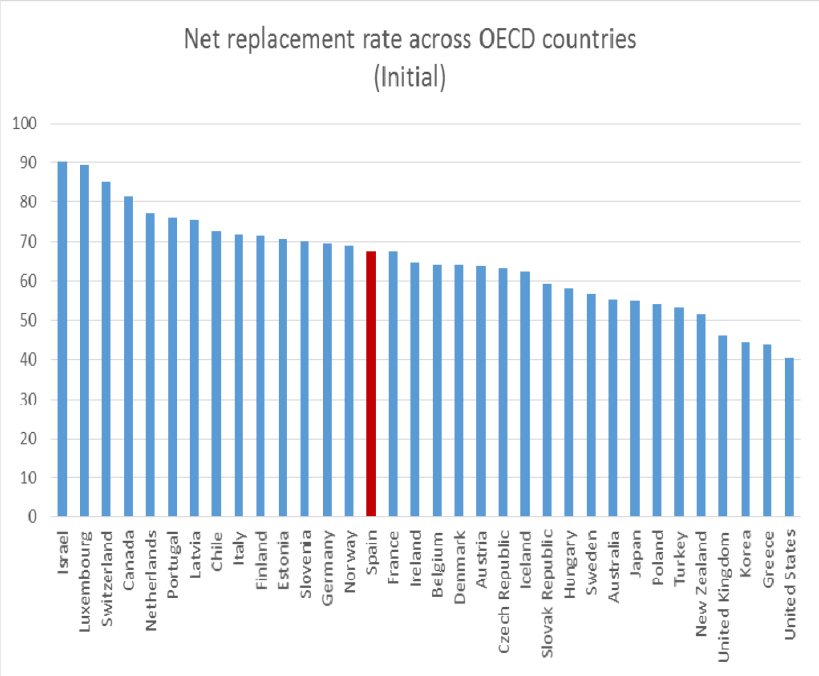
- **Data: Social Security registries (Continuous Sample of Working Histories, MCVL)**
  - Administrative dataset comprising each year a 4% random sample of the population with any relation with the Spanish Social Security.
  - Relationships stem from employment, unemployment benefits, and pensions.
  - For each individual, all changes in labor market status and work characteristics are recorded since at least 1980.
  - Last wave is 2017.

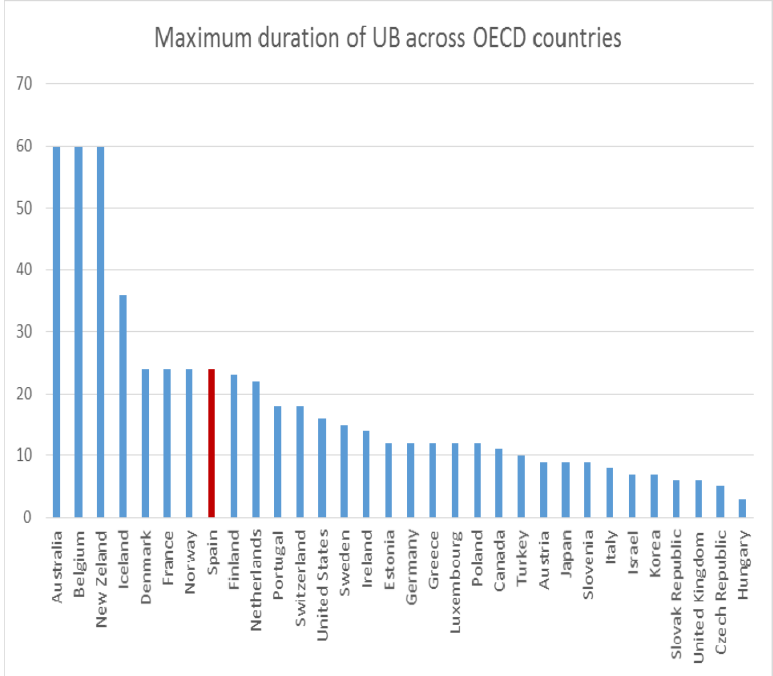
- **Eligibility:**
  - Become involuntarily unemployed.
  - At least 12 months of contributions in the last 6 years.

- **Benefits:**
  - During the first 6 months: 70% of the average wage in the last 6 months.
  - From the 6th month onwards: 50% (60% before July 2012).
  - Caps and floors apply, depending on family characteristics.

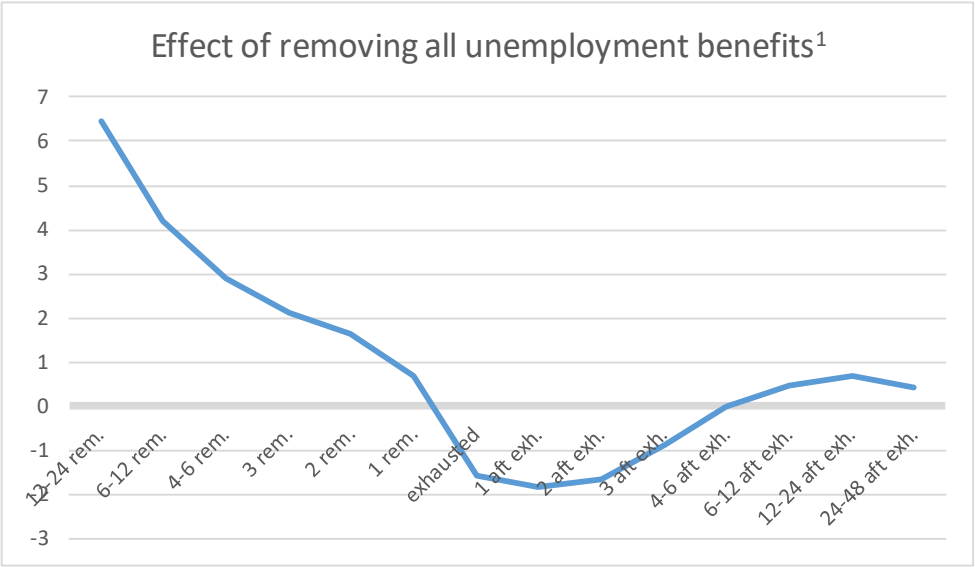
- **Duration:**
  - 12 to 18 months of contributions in the last 6 years give rise to 4 months of unemployment benefits.
  - From then on, every 6 months of contributions entitle 2 months of UB.
  - Benefit spell cannot exceed 24 months.

- **Both the replacement rate and maximum duration are above the OECD average.**





- **Estimate a linear model of the monthly probability of finding a job against:**
  - Replacement ratio.
  - Monthly dummies before and after the exhaustion of the benefit.
    - *Interactions with gender, skill, age group, and business cycle.*
  - Controls: individual fixed-effects, seasonality…

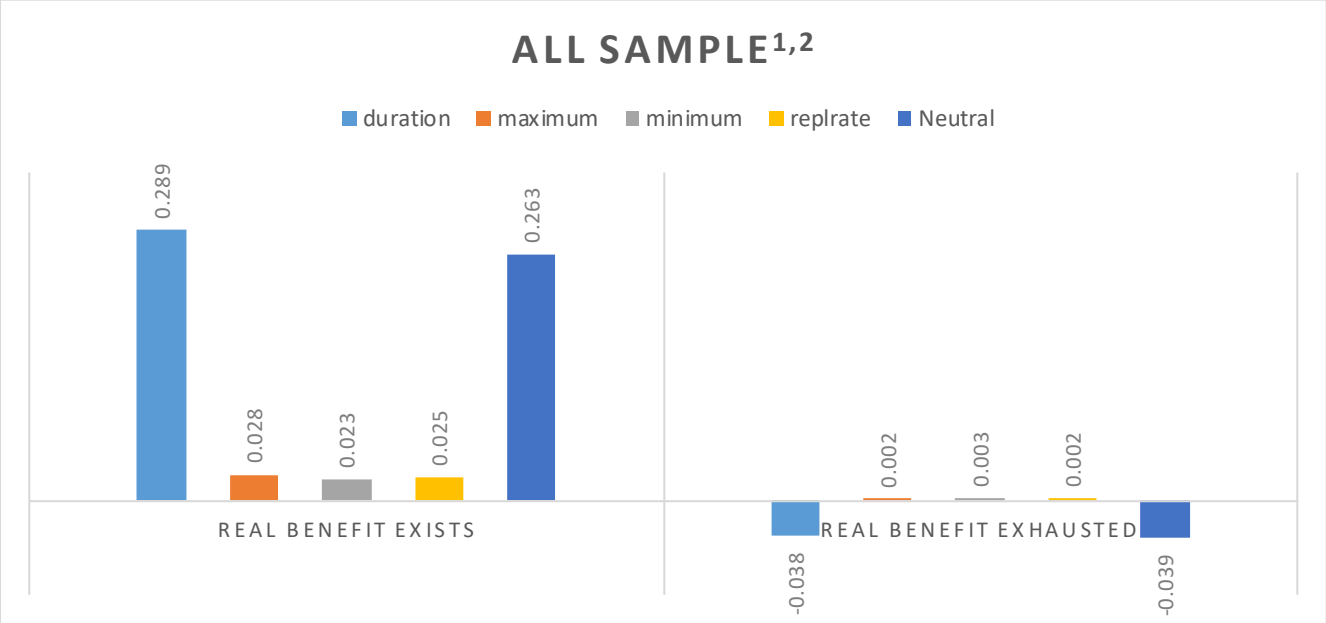


(1): Average effect on monthly probability of finding a job, in percentage points

- **Ex-ante revenue neutral reform: 5% reduction in the benefit spell and 2 pp increase in the replacement rate, keeping caps and floors constant.**

- **Empirical approach:**
  - Compute the probability of finding a job by individual-month, based on the estimated model.
  - Construct the counterfactual by recalculating the probability according to the new policy parameters.
  - The effect of the reform is estimated as the difference in both probabilities.

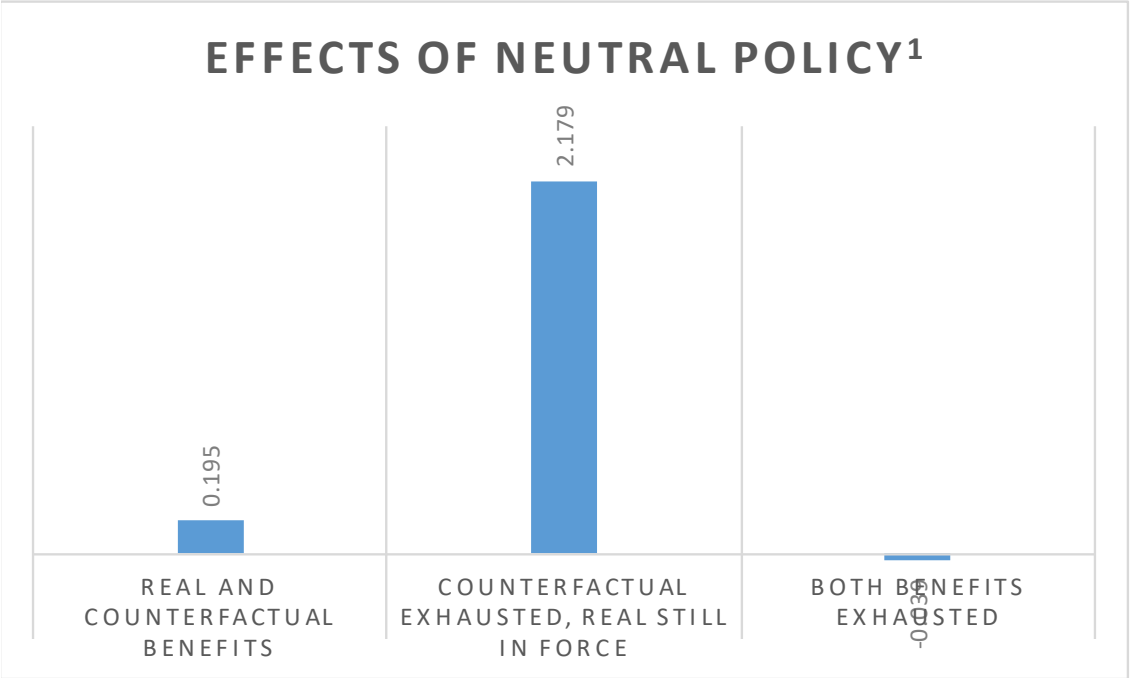
- **Results suggest that the probability of employment would slightly increase in the period before benefits are exhausted.**



(1): Average effect of indicated policy on monthly probability of finding a job, in percentage points

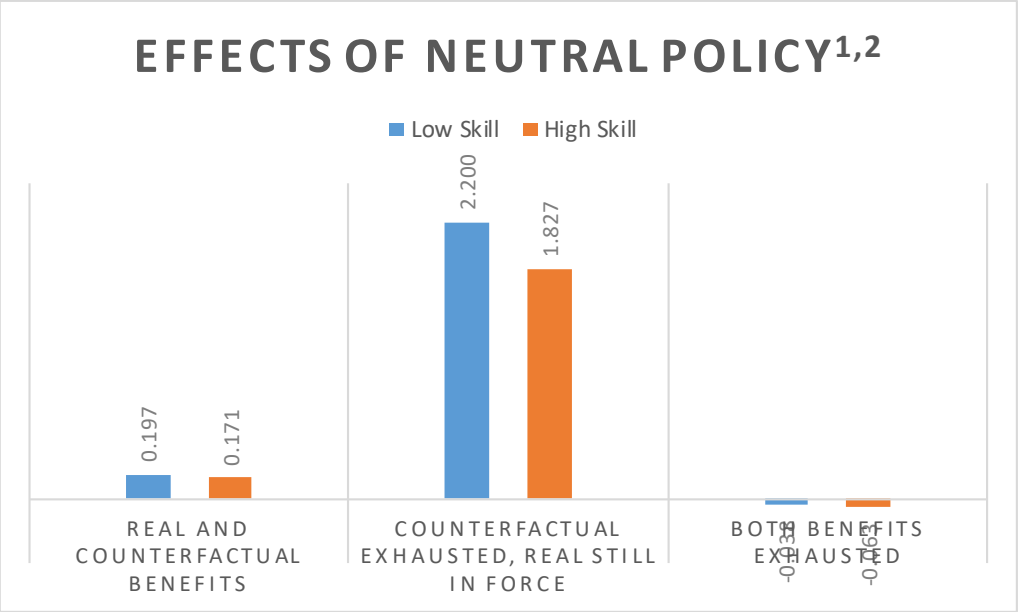
(2): Net average effect over the whole spell for each policy is: 0.144pp for duration, 0.0042pp for maximum, 0.0037pp for minimum, 0.0040pp for replrate and 0.1177pp for neutral

- **Estimated effects are larger during the months in which, as a result of the policy, the benefits are exhausted.**



(1): Average effect on monthly probability of finding a job, in percentage points

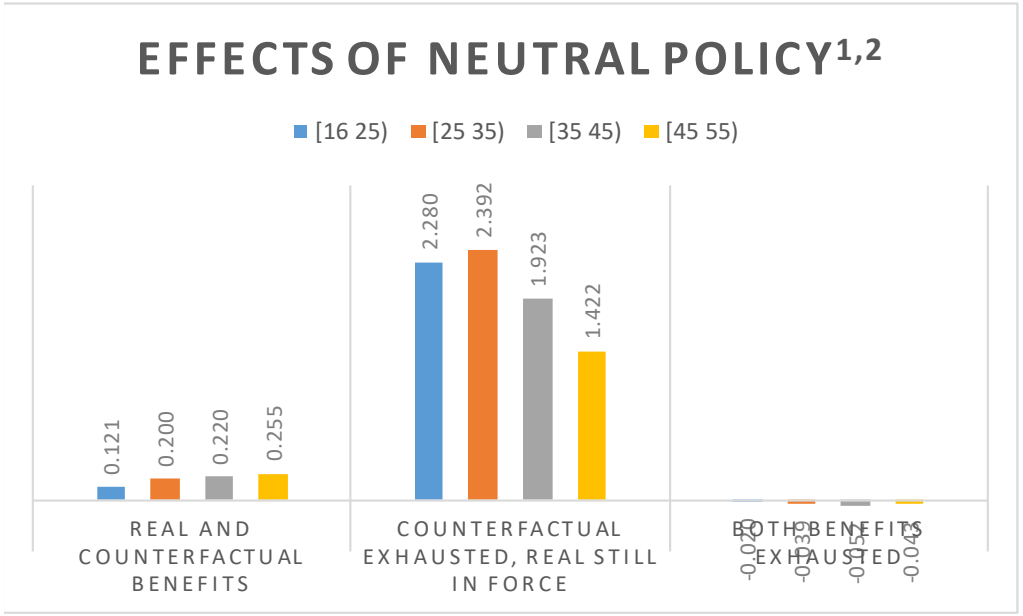
- **For both high and low skilled workers the probability of finding a job would increase.**



(1): Average effect on monthly probability of finding a job, in percentage points

(2): Net average effect over the whole spell is: 0.109pp for low skilled and 0.097pp for high skilled

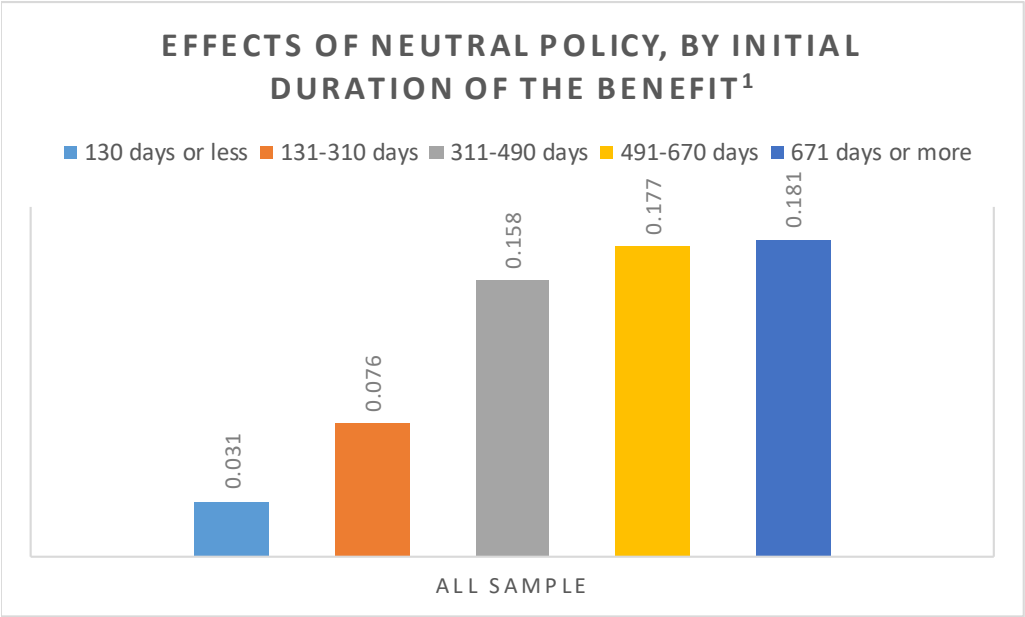
- **The uptick in employment would concentrate on young workers.**



(1): Average effect on monthly probability of finding a job, in percentage points

(2): Net average effect over the whole spell is: 0.083pp between 16 and 25, 0.117pp between 25 and 35, 0.111pp between 35 and 45 and 0.104pp between 45 and 55

- **The effects would be higher for those with longer benefit spells.**



(1): Average effect on monthly probability of finding a job, in percentage points
(2): Net average effect over the whole spell is: 0.117pp in recessions and 0.102pp in expansions

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THANK YOU FOR YOUR ATTENTION

DG ECONOMICS, STATISTICS AND RESEARCH

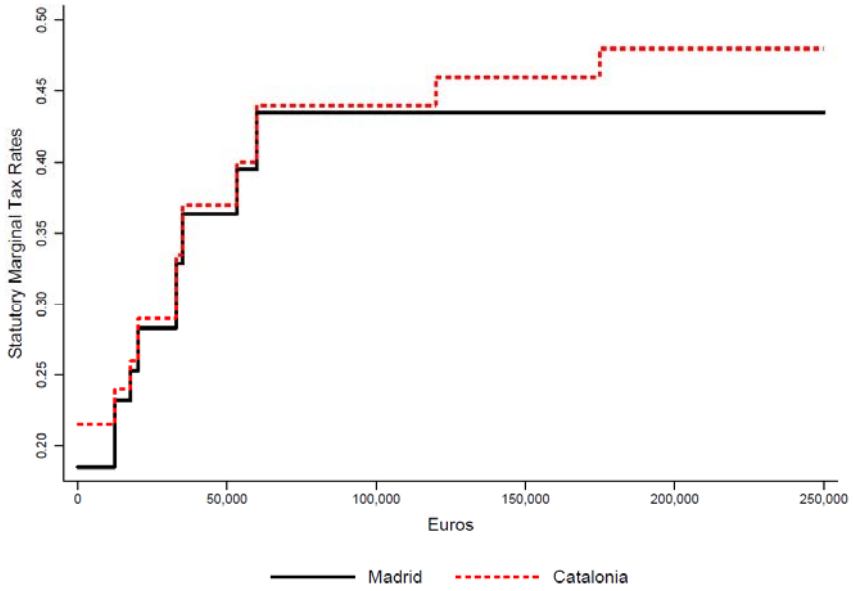
SOURCES OF INDIVIDUAL TAX DEDUCTIONS (2015)

Quantiles	Social Security Contributions	Labor Income	Joint Filing	Contributions to Private Pensions	Other
	(1)	(2)	(3)	(4)	(5)
Bottom					
1%	3.8%	36.4%	26.4%	1.8%	31.6%
1-5%	4.0%	71.3%	11.4%	2.2%	11.0%
5-10%	3.6%	84.9%	4.7%	1.9%	5.0%
Quintiles					
1st (bottom 20%)	4.2%	82.7%	6.0%	1.8%	5.3%
2nd (20-40%)	9.2%	79.2%	8.3%	1.6%	1.7%
3rd (40-60%)	22.7%	58.7%	14.2%	2.5%	1.9%
4th (60-80%)	28.4%	53.7%	12.4%	3.4%	2.1%
5th (80-100%)	32.9%	43.2%	9.7%	10.2%	3.9%
Top					
90-95%	36.9%	40.4%	8.7%	10.4%	3.6%
95-99%	34.8%	34.5%	7.7%	17.8%	5.2%
1%	25.5%	28.2%	6.9%	27.2%	12.1%
Total	20.0%	62.8%	10.3%	4.0%	2.9%

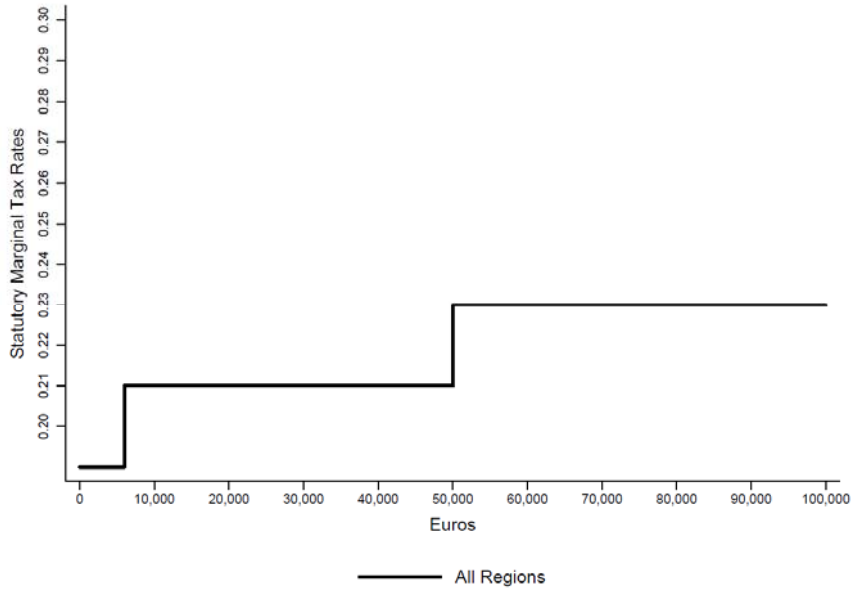
Notes: This table shows the distribution of different tax deductions across the income distribution. Each row adds up to 100.

- **Tax schedules**

General income tax schedule



Savings income tax schedule



SOURCES OF INDIVIDUAL TAX CREDITS (2015)

Quantiles	Family Allowance	House Purchases	Employed Mothers	Large Families	Regional	Other
	(1)	(2)	(3)	(4)	(5)	(6)
Bottom						
1%	98.1%	0.0%	0.7%	0.8%	0.0%	0.4%
1-5%	95.3%	0.0%	2.2%	1.8%	0.0%	0.7%
5-10%	93.8%	0.1%	3.2%	2.1%	0.0%	0.8%
Quintiles						
1st (bottom 20%)	95.3%	0.4%	2.4%	1.4%	0.0%	0.5%
2nd (20-40%)	93.7%	2.8%	1.8%	0.8%	0.6%	0.3%
3rd (40-60%)	86.5%	7.5%	1.3%	0.6%	1.5%	2.7%
4th (60-80%)	86.1%	8.9%	1.2%	0.5%	1.1%	2.1%
5th (80-100%)	83.5%	10.9%	0.9%	0.9%	0.5%	3.3%
Top						
90-95%	82.7%	11.5%	0.9%	1.0%	0.5%	3.4%
95-99%	80.7%	12.5%	0.7%	1.3%	0.5%	4.3%
1%	77.1%	11.3%	0.4%	1.8%	0.3%	9.0%
Total	88.7%	6.3%	1.5%	0.8%	0.8%	1.8%

Notes: This table shows the distribution of different tax credits across the income distribution. Each row adds up to 100.

EXAMPLE II
Average loss

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- **Losers would pay €7,600 in additional taxes on average.**

WINNERS AND LOSERS BY INCOME DECILE

	Total			Losers		
Deciles	Population	Gain (+) or loss (-)	Avg. gain or loss	Number	%	Avg loss
	millions	million €	€	millions		€
1	2,0	0	-0,0	0,0	0,0	0,0
2	2,0	0	-0,0	0,0	0,0	0,0
3	2,0	0	0,0	0,0	0,0	0,0
4	2,0	0	-0,0	0,0	0,0	0,0
5	2,0	0	0,0	0,0	0,0	0,0
6	2,0	0	0,0	0,0	0,0	0,0
7	2,0	0	0,0	0,0	0,0	0,0
8	2,0	0	0,0	0,0	0,0	0,0
9	2,0	0	0,0	0,0	0,0	0,0
10	2,0	-800	-401,7	0,1	5,3	7.645,5
Total	19,9	-800	-40,2	0,1	0,5	7.645,0

Parameter Values

Parameter	Value	Comments
Discount Factor (β)	0.983	Calibrated matches K/Y
Intertemporal Elasticity (γ)	1	Literature
Disutility of Market Work (φ)	7.5	Calibrated matches hours
Capital Share (α)	0.35	Calibrated
Depreciation Rate (δ_k)	0.06	Calibrated

Parameter Values

Parameter	Value	Comments
Aut. Perman. Shocks (ρ)	0.874	estimated
Var. Persis. Shocks (σ_{ϵ}^2)	0.0072	Kaplan (2012)
Var. Perman. Shocks (σ_{θ}^2)	0.1295	Calibrated
Fraction of superstars (π)	0.01	
Value of superstar prod. (θ^*)	2.2	Calibrated
Payroll Tax Rate (τ_p)	0.249	Calibrated
Cap. Income Tax Rate (τ_k)	0.16	Calibrated
Tax Function Level (λ)	0.899	Garcia-Miralles et al (2018)
Tax Function Curvature (τ)	0.148	Garcia-Miralles et al (2018)

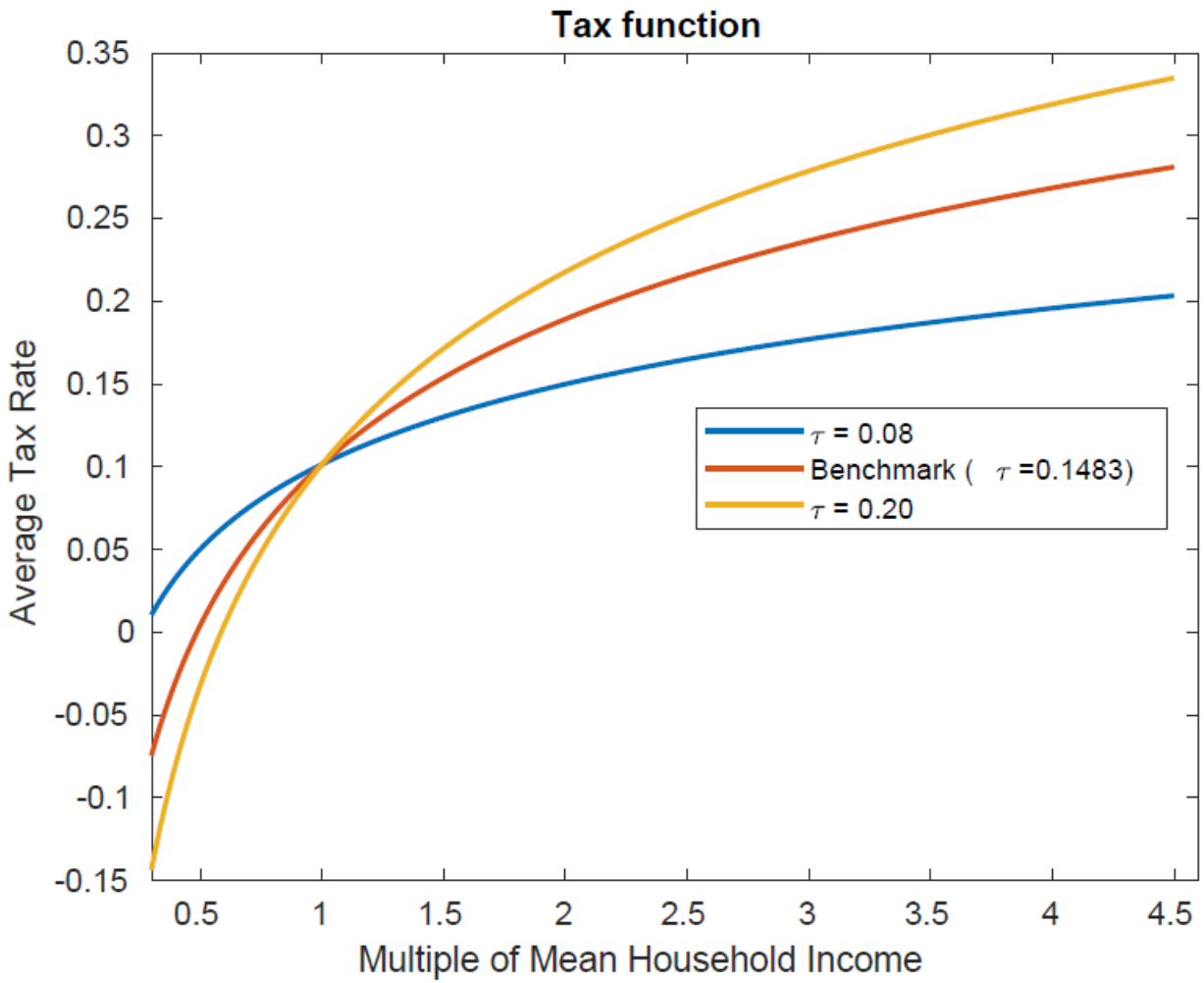
Shares of Total Gross Income – Model and Data

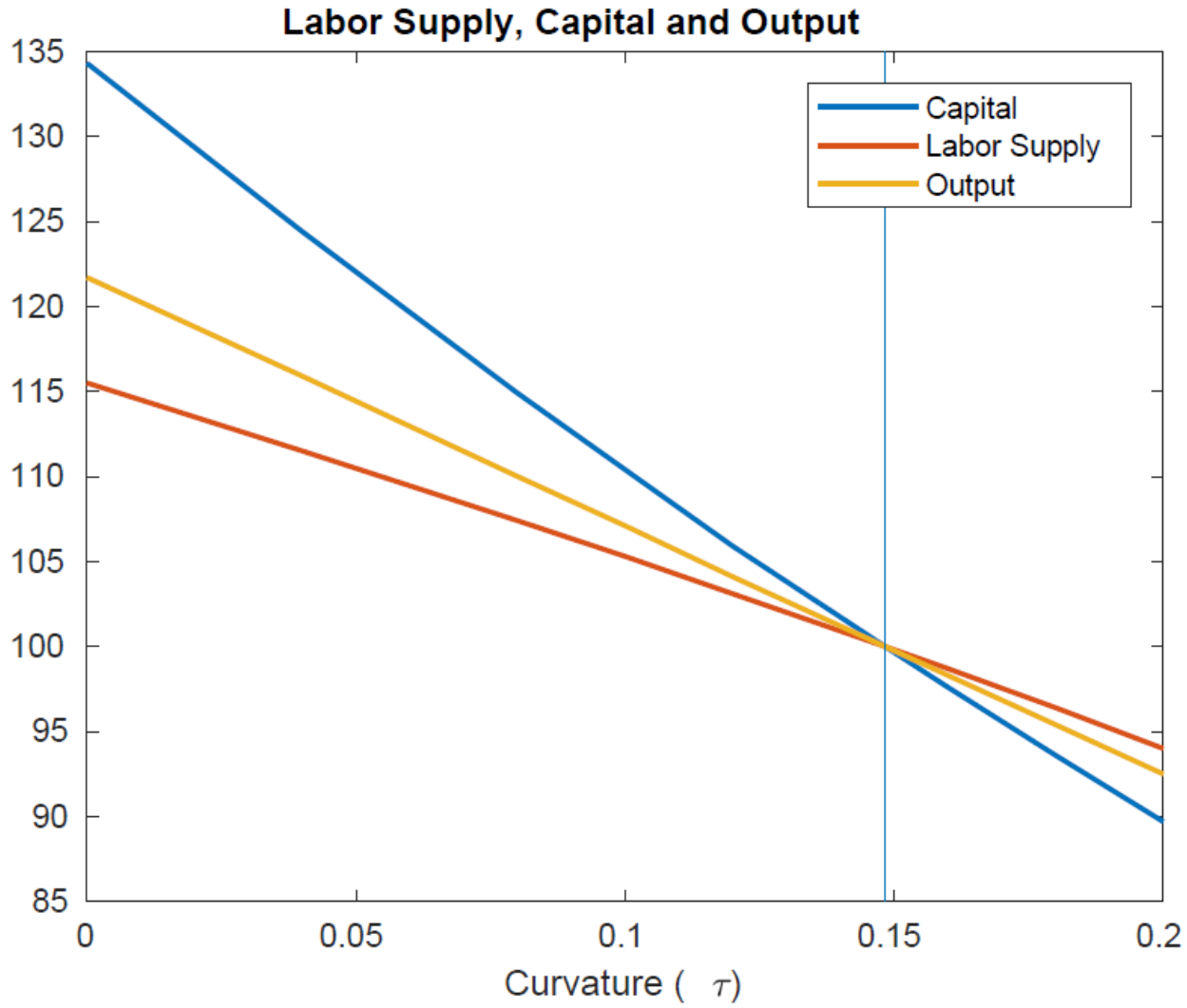
Quantiles	Data	Model
1%	0.0%	0.3%
1-5%	0.3%	1.7%
5-10%	1.0%	2.6%
Quintiles		
1st (bottom 20%)	4.6%	10.6%
2nd (20-40%)	10.2%	13.1%
3rd (40-60%)	15.5%	15.9%
4th (60-80%)	22.7%	21.0%
5th (80-100%)	47.1%	39.4%
Top		
90-95%	10.1%	8.7%
95-99%	11.9%	9.2%
1%	9.5%	7.4%

Shares of Income Tax Payments – Model and Data

Quantiles	Data	Model
1%	0.0%	0.0%
1-5%	0.0%	0.1%
5-10%	-0.1%	0.2%
Quintiles		
1st (bottom 20%)	-0.2%	1.5%
2nd (20-40%)	0.7%	4.3%
3rd (40-60%)	7.0%	9.0%
4th (60-80%)	19.4%	18.6%
5th (80-100%)	73.2%	66.6%
Top		
90-95%	13.8%	12.6%
95-99%	20.6%	16.0%
1%	21.0%	21.2%

REFORMING THE INDIVIDUAL INCOME TAX IN SPAIN (GUNER, LÓPEZ SEGOVIA AND RAMOS, IN PROGRESS)




Labor Supply, Capital and Output
135
130
125
120
115
110
105
100
95
90
85
0
0.05
0.1
0.15
0.2
Curvature (τ)
Capital
Labor Supply
Output

Tax Rates

Percentiles of income	$\tau = 0.148$ (BM)	0.08
	Avg. tax rate	
Top 10%	19.9%	15.7%
Top 5%	22.8%	17.5%
Top 1%	32.3%	23.2%
	Mar. tax rate	
Top 10%	29.0%	20.7%
Top 5%	30.9%	21.9%
Top 1%	35.9%	25.2%

Distribution of Tax Liabilities

Percentiles of income	$\tau = 0.148$ (BM)	0.08
1st (bottom 20%)	1.5%	4.3%
2nd (20-40%)	4.3%	7.4%
3rd (40-60%)	9.0%	11.2%
4th (60-80%)	18.6%	19.0%
5th (80-100%	66.6%	58.1%
Top		
10%	49.7%	42.4%
1%	21.2%	17.3%

INCOME ELASTICITIES

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OBSERVED (2015) AND PREDICTED SHARES, INCOME AND OWN-PRICE ELASTICITIES TABLE 9

	Observed shares	Predicted shares	Income elasticity	Uncompensated own-price elasticity
1. Food and beverages	0.2775	0.2766	0.715***	-0.109
2. Alcoholic drinks	0.0106	0.0114	1.010***	-0.993***
3. Tobacco	0.0219	0.0221	0.846***	-0.833***
4. Clothing and footwear	0.0739	0.0759	1.385***	-1.011***
5. Domestic utilities	0.1370	0.1362	0.538***	-0.525***
6. Household non-durables	0.0402	0.0433	1.548***	-1.969***
7. Health	0.0382	0.0354	1.901***	-0.524***
8. Vehicle fuels	0.0635	0.0652	0.973***	-0.159***
9. Transport	0.0522	0.0520	0.955***	-1.090***
10. Communications	0.0511	0.0479	0.592***	-0.189***
11. Leisure and culture	0.0476	0.0478	1.421***	-2.253***
12. Hotels and restaurants	0.1254	0.1234	1.404***	-0.974***
13. Other non-durables	0.0607	0.0638	1.224***	-0.572*

* p<0.05, **p<0.01, ***p<0.001
SOURCE: BdE VAT Microsimulation Model.

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CROSS-PRICE ELASTICITIES

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	1. Food and beverages	2. Alcoholics drinks	3. Tobacco	4. Clothing and footwear	5. Domestic utilities	6. Household non-durables	7. Health	8. Vehicle fuels	9. Transport	10. Communications	11. Leisure and culture	12. Hotels and restaurants	13. Other non-durables
1. Food and beverages	-0.109	0.02	-0.009	0.181***	0.216***	-0.079	-0.179***	-0.224***	-0.142**	0.091**	0.170***	-0.379***	-0.272**
2. Alcoholic drinks	0.487	-0.993***	0.104	0.256***	0.715***	-1.959***	-0.281*	-0.806***	0.711***	0.422**	1.852***	-0.874*	-0.645
3. Tobacco	-0.14	0.046	-0.833***	-0.364***	-0.106	0.456	0.556***	-0.027	0.188	0.427***	0.117	-0.61	-0.556
4. Clothing and footwear	0.449*	0.029	-0.120*	-1.011***	-0.404***	0.076	0.042	-0.158**	0.007	-0.053	0.16	-0.462*	0.061
5. Domestic utilities	0.576***	0.067	-0.014	-0.210***	-0.525***	0.118	-0.577***	0.046	0.062	-0.019	0.056	-0.377***	0.258*
6. Household non-durables	-0.784*	-0.489	0.246**	0.135*	0.216	-1.969***	0.944***	-0.176*	-0.058	0.307*	-1.013***	1.468***	-0.375
7. Health	-1.998***	-0.102	0.405***	0.068	-2.356***	1.255***	-0.524***	1.320***	0.253	-1.200***	0.026	-0.252	1.203*
8. Vehicle fuels	-0.925***	-0.109	-0.012	-0.136***	0.021	-0.073	0.569***	-0.159***	-0.032	-0.145*	-0.232*	0.272	-0.011
9. Transport	-0.854***	0.141	0.084	0.046	0.092	-0.022	0.180**	-0.045	-1.090***	0.210**	0.480***	-0.191	0.016
10. Communications	0.522***	0.085	0.197***	-0.015	-0.047	0.277*	-0.651***	-0.176***	0.222**	-0.189***	0.046	-0.334**	-0.530***
11. Leisure and culture	0.746***	0.366	0.041	0.249***	0.025	-0.816***	0.03	-0.375***	0.461***	0.004	-2.253***	1.196***	-1.095***
12. Hotels and restaurants	-1.069***	-0.076	-0.131**	-0.302***	-0.458***	0.496***	-0.047	0.132**	-0.103	-0.187**	0.494***	-0.974***	0.823***
13. Other non-durables	-1.594***	-0.125	-0.257***	0.105**	0.486***	-0.277	0.713***	-0.034	0.002	-0.563***	-1.036***	1.929***	-0.572*

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