Income Taxation Across Countries*

Xincheng Qiu† Peking University

Nicolo Russo‡ Goethe University Frankfurt

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Abstract

This paper examines income tax systems in over thirty countries over the past forty years using microdata from the Luxembourg Income Study. We show that income tax systems across the world are approximated remarkably well by a two-parameter log-linear effective tax function. We provide estimates of country- and year-specific tax functions and document several insights into the nature of income tax systems. First, higher average tax rates are consistently associated with higher progressivity. Second, richer countries tend to have more progressive income tax systems. Third, progressivity varies by family structure, with marriage and children associated with higher progressivity. Finally, transfers play an important role in redistribution, with the overall tax-and-transfer system being more progressive than the tax one.

Keywords: Taxation; Income tax progressivity; Family structure
JEL Codes: E62, H20, H30

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†Email: xincheng.qiu@gsm.pku.edu.cn.
‡Email: russo@econ.uni-frankfurt.de.

1 Introduction

Income tax systems are inherently complex, shaped by statutory rates, deductions, credits, and filing rules. This complexity is magnified in cross-country comparisons due to institutional and policy differences. Yet, accurately capturing the key features of income taxation is crucial: economists require precise characterizations of the tax system to study the effects of tax policies on individual and aggregate behavior, and policymakers need reliable measures of tax progressivity to design effective redistribution and social insurance policies.

This paper pursues two main goals. First, it systematically describes and compares effective income taxation across countries. Second, it provides estimates of effective tax functions that can be readily used in structural models to investigate, for instance, questions related to redistribution and the impact of income taxation on economic behavior.

To achieve these goals, we use household-level microdata from the Luxembourg Income Study (LIS) Database. LIS is well suited for this analysis: it spans multiple decades, includes dozens of countries, harmonizes international data, and provides detailed information on income, taxes, transfers, demographics, and employment. Using this rich dataset, we estimate effective income tax functions for more than thirty countries over the past forty years. These functions capture the empirical relationship between taxes paid and pre-tax income, offering a parsimonious summary of complex tax systems. Specifically, we adopt the two-parameter log-linear tax function originally introduced by Feldstein (1969) and subsequently popularized by Benabou (2000) and Heathcote, Storesletten, and Violante (2017), to measure average tax levels and income tax progressivity worldwide.

One of our main objects of interest is the progressivity of the income tax system, rather than that of the broader tax-and-transfer system. We make this choice for several reasons. First, we focus on income taxes and avoid the confounding influences of transfer policies, which are country-specific and highly sensitive to eligibility criteria and policy design. Income taxes, by contrast, are relatively more standardized across countries. Second, income tax progressivity alone has important implications for economic behavior. For example, Guner, Kaygusuz, and Ventura (2012) show that progressive joint taxation discourages female labor supply; Holter, Krueger, and Stepanchuk (2019) find that progressivity affects labor supply and government revenue capacity; and Ferriere and Navarro (2025) show that it affects consumption, labor force participation, and welfare. Third, income tax progressivity is a necessary input in many structural models, which often require a parsimonious mapping from pre-tax to post-tax income. This mapping can be implemented through either a tax-and-transfer function that jointly captures taxes and transfers, or a tax function that treats taxes and transfers separately. The latter approach is more common in the literature, and we aim to provide researchers following

this approach with our estimated tax functions that can be readily integrated into structural models.[1]

Our findings are summarized as follows. First, we show that the log-linear tax function provides an excellent approximation of income tax systems across the world. While this was known for the US (Heathcote, Storesletten, and Violante, 2017) and a limited number of other countries, we show that the two-parameter tax function provides accurate approximations for all countries and years in our sample.

Second, we provide novel insights into the evolution of the average level of taxation and progressivity. We start by documenting a positive correlation between income tax progressivity and the average level of taxation. Throughout all years in our sample, countries with more progressive tax systems also tend to impose higher average tax burdens. We then highlight large cross-country differences in income tax systems. For instance, high-income northern European countries such as Germany and the Netherlands consistently exhibit both the highest progressivity and average tax rates over time. In contrast, other countries such as Brazil, Colombia, and Peru do not present effective income taxes despite having progressive statutory tax codes.

Third, we identify a positive relationship between income tax progressivity and economic development. Progressivity increases with development, whether measured by median income, average income, or GDP per capita. We also combine our estimates with tax revenue data from the United Nations Government Revenue Dataset and find that, consistent with results in the literature on state capacity, low-income countries like Peru and Guatemala collect most of their tax revenue through taxes on goods and services and exhibit low income tax progressivity. In turn, high-income countries like Belgium and the Netherlands collect most of their tax revenue through income taxes and display the highest levels of progressivity.

Fourth, we document significant differences in progressivity across family structures. In particular, we estimate family-type-specific tax functions and find that singles without children face the lowest progressivity across countries and over time, while married couples with children face the highest. We also show that having children and being married are associated with higher progressivity.

Finally, despite our focus on income taxes, we also study the effect of transfers on progressivity. We do so by estimating a tax-and-transfer function, which allows us to estimate the

[1] Among others, this approach is taken by De Nardi, French, and Jones (2010) in their study of the role of medical expenses in saving behavior; by Guner, Kaygusuz, and Ventura (2012) to evaluate the effects of tax reforms on couples and singles; by Guner, Kaygusuz, and Ventura (2020) to quantify the effects of child-related transfers on labor supply, human capital, and welfare; by Guner, Kaygusuz, and Ventura (2023) to study the value Americans place on means-tested transfers; by Guner, Lopez-Daneri, and Ventura (2023) to study the optimal mix of taxes and transfers needed to raise tax revenue with minimal welfare loss; and by Ferriere and Navarro (2025) to separately quantify the effects of income tax progressivity and transfers on marginal propensities to consume, labor participation elasticities, and welfare.

progressivity embedded in the combined tax-and-transfer system. Our results indicate that most redistribution is achieved through transfers. Countries with high income tax progressivity also tend to exhibit high tax-and-transfer progressivity.

Our paper contributes to three strands of literature. First, it relates to the rich literature on approximating the income tax and transfer system with a log-linear function. This approach, introduced by Feldstein (1969) and Benabou (2000) and popularized by Heathcote, Storesletten, and Violante (2017), has been used primarily for the United States. For example, Heathcote, Storesletten, and Violante (2020) and Wu (2021) analyze tax progressivity from the late 1970s to 2016 using data from the Congressional Budget Office and the Current Population Survey, respectively; Fleck, Heathcote, Storesletten, and Violante (2025) investigate progressivity at the US state level; and Borella, De Nardi, Pak, Russo, and Yang (2023) study effective tax functions using PSID data from 1969 to 2016. A few studies extend the log-linear approach to other countries: García-Miralles, Guner, and Ramos (2019) apply it to Spain using administrative data; Kaas, Kocharkov, Preugschat, and Siassi (2021) show that it is a good approximation of the tax-and-transfer system in Germany; and Tran and Zakariyya (2021) analyze the evolution of income tax progressivity in Australia after 1999.

Second, our paper contributes to the literature on cross-country comparisons of tax progressivity. Chang, Chang, and Kim (2018) study optimal income taxation across 32 OECD countries. Holter, Krueger, and Stepanchuk (2019) estimate income tax progressivity for several OECD countries between 2000 and 2007. De Magalhaes, Martorell, and Santaeulalia-Llopis (2025) use micro-data to estimate the progressivity of transfer systems in 32 countries. Ayaz, Fricke, Fuest, and Sachs (2023) analyze how optimal income taxes should respond to an increase in public debt in five European countries. Bick, Fuchs-Schündeln, Lagakos, and Tsujiyama (2022) estimate effective tax functions for singles without children across several OECD countries.

Third, our paper relates to the literature on income taxation and family structure. Guner, Kaygusuz, and Ventura (2012) study tax reforms in the context of the long-run changes in female labor supply and demographic structure that occurred in the US over the last decades. Guner, Kaygusuz, and Ventura (2014) estimate and compare tax functions using various functional forms to systematically describe income taxes in the US in 2000, highlighting variation by income, marital status, and number of children. Guner, Kaygusuz, and Ventura (2020) use US administrative data to estimate income taxes by marital status and number of children. Guner, Kaygusuz, and Ventura (2023) include income taxes by marital status and number of children in a structural model to evaluate potential reforms to means-tested government transfers in the United States. Malkov (2022) studies the optimal income taxation for couples and singles in the US.

The remainder of the paper is organized as follows. Section 2 describes the LIS data and the sample selection, and outlines the estimation strategy. Section 3 describes how income tax progressivity varies by economic development and family structure and explores the role of transfers. Section 4 concludes.

2 Estimation

2.1 Data

The Luxembourg Income Study (LIS). We use micro-data from the Luxembourg Income Study (LIS) Database, which collects and harmonizes nationally representative household data from 55 countries starting in the 1970s. LIS integrates well-known datasets, such as the Current Population Survey for the United States and the German Socio-Economic Panel for Germany, into a harmonized micro-dataset that includes detailed information on labor and capital income, public social benefits, private transfers, taxes and contributions, demographics, employment, and consumption. Ravallion (2015) provides a detailed overview of the LIS dataset, describing its development over time and data limitations.

LIS has been widely used in various areas of research. For example, De Nardi, Ren, and Wei (2000) use it to study income redistribution policies and the trade-off between redistribution and efficiency. Chiuri and Jappelli (2010) use LIS data to analyze patterns of homeownership for older adults across OECD countries. Laun and Wallenius (2016) use LIS data to assess the role of social insurance in cross-country differences in the labor supply of older workers.

Sample Selection. We use all 11 LIS waves spanning from the early 1970s to 2019. Although LIS covers 55 countries in total, the number of countries covered in each wave varies. For instance, LIS includes the United States since the first wave in the 1970s, but only records information about Japan starting in 2008. For each wave, we retain all countries for which data on all required inputs for estimating the tax function are available: gross household income, income taxes, and public social benefits. For example, we have to exclude Mexico from all waves because LIS only contains information on income after taxes and social contributions. Table A-1 in Appendix I.1 reports additional details on our sample selection and the specific reasons for excluding particular country-wave pairs.

To ensure a consistent and comparable time unit across countries, we conduct the analysis at the wave level. When a country is observed for more than one year in a wave, we pool these

years and estimate the tax function for that wave.[2] The number of countries in our final sample varies by wave, ranging from a minimum of 5 countries in the first wave to a maximum of 31 countries in wave 8. Four countries are observed in all 11 waves: France, Germany, the United Kingdom, and the United States.

In the baseline analysis, we restrict the sample to working-age households whose household head is between 25 and 60 years old. We further restrict attention to "standard" households, comprising one-person households, married couples without children, married couples with children, and single parents. Therefore, we exclude households in which other relatives or non-relatives cohabit with the core family. This maximizes comparability across countries. Figure A-1 shows that the vast majority of households with heads aged 25–60 qualify as "standard." The mean share of standard households across countries and waves is 89 percent, and the median is 91.4 percent.

Table A-2 in Appendix I.2 lists the countries and waves included in our sample and the number of observations in each country and wave. Our final sample consists of 7,625,531 household-wave observations across 37 countries, observed over different waves.

Income Definitions. Our estimates of effective taxation depend crucially on the definitions of pre- and post-tax income. Household pre-tax income is defined as the sum of labor income, capital income, private transfers, pensions, and public social benefits. Post-tax income is defined as pre-tax income minus income taxes and social security contributions. Taxes are defined as compulsory payments to the government based on the current income earned.[3,4] Public social benefits include transfers from government insurance and assistance programs. Appendix I.4 describes the income components in detail. Our definitions of pre-tax and post-tax income closely follow those used in Borella, De Nardi, Pak, Russo, and Yang (2023).

The monetary values in our income definitions need to be adjusted to be comparable across waves and countries. Consumer Price Indices (CPI) adjustments account for changes in price levels to compare real amounts over time within a country, and Purchasing Power Parity indicators (PPP) adjustments account for differences in purchasing power across currencies to compare real amounts across countries. LIS provides adjustment factors that convert nominal

[2]LIS may cover different years for different countries in a given wave. For instance, the first wave includes CPS data for the US for each year between 1979 and 1982, but covers only the 1979 wave of the French Tax Income Survey.

[3]For the United States, taxes include both federal income taxes and state income taxes.

[4]Taxes on current income as defined by LIS exclude direct taxes on windfall incomes such as inheritances, profits, and capital gains.

values into 2017 USD PPP, defined as

$$LISPPP_{i,t} = \left(\frac{CPI_{i,t}}{100}\right) PPP_{i,2017},$$

for country i in wave t. We thus divide all nominal values in each country and wave by the corresponding LIS PPP to convert them into 2017 USD PPP, which we refer to, for convenience, as 2017 dollars.

2.2 Estimating the Effective Income Tax Function

This section starts by describing our tax function and estimation strategy. We then report the goodness of fit of the estimated tax function.

Log-Linear Tax Function. Following Feldstein (1969), Benabou (2000), Heathcote, Storesletten, and Violante (2017), and Borella, De Nardi, Pak, Russo, and Yang (2023), we model taxes T on total income Y as:

$$T(Y) = Y - (1-\lambda)Y^{1-\tau}. \tag{1}$$

The corresponding average and marginal tax rates are:

$$\frac{T(Y)}{Y} = 1 - (1-\lambda)Y^{-\tau}, \tag{2}$$

$$T'(Y) = \frac{\partial T(Y)}{Y} = 1 - (1-\lambda)(1-\tau)Y^{-\tau}. \tag{3}$$

Equation (2) shows that the parameter λ determines the average tax rate at an income level of 1 unit and thus captures the level of taxation in the economy. The parameter τ governs the degree of progressivity of the income tax system. In particular, the elasticity of post-tax income with respect to pre-tax income, $\partial \log(Y - T(Y))/\partial \log(Y)$, is equal to $1-\tau$. The tax system is progressive when $\tau > 0$, regressive when $\tau < 0$, and flat with constant marginal and average tax rates both at λ when $\tau = 0$. Taking logs of Equation (1) yields a log-linear equation:

$$\log(Y - T(Y)) = \log(1-\lambda) + (1-\tau)\log(Y). \tag{4}$$

Estimation Strategy. We estimate Equation (4) by running separate regressions at the household level for each country c and wave t. We regress the logarithm of post-tax income on a constant and the logarithm of pre-tax income, using the income definitions described in Section

2.1. The regression specification is as follows:

$$\log(\text{after-tax income})_{i,c,t} = \alpha_{c,t} + \beta_{c,t} \log(\text{pre-tax income})_{i,c,t} + \varepsilon_{i,c,t}, \tag{5}$$

where the dependent and independent variables are the log post-tax income and log pre-tax income for household i of country c in wave t. We allow for country-wave-specific regression coefficients $\alpha_{c,t}$ and $\beta_{c,t}$. We apply the LIS-provided household weights to obtain results representative of the population of each country in each wave. The OLS estimates are denoted $\hat{\alpha}_{c,t}$ and $\hat{\beta}_{c,t}$.[5]

We recover the parameter λ from the estimated constant and the parameter τ from the estimated coefficient on the log of pre-tax income. In particular, comparing the regression equation (5) with the log-linear tax function (4), we obtain

$$\hat{\lambda}_{c,t} = 1 - \exp\left(\hat{\alpha}_{c,t}\right), \quad \text{and} \quad \hat{\tau}_{c,t} = 1 - \hat{\beta}_{c,t}.$$

Thanks to the large sample size, these tax parameters are estimated with high precision, and their confidence intervals are very narrow.[6]

2.3 Fit of the Tax Function

As shown by Heathcote, Storesletten, and Violante (2017), the log-linear tax function in Equation (1) provides a good approximation of the US federal income tax system. We show that this result holds not only for the US but also extends to the income tax systems in all countries in our sample. For example, Figure 1 plots the logarithm of post-tax income against the logarithm of pre-tax income for Canada, Denmark, Finland, Norway, the UK, and the US in wave 8 (corresponding to 2010).[7] To construct these graphs, we construct weighted percentiles among standard households with heads aged between 25 and 60 by country and wave. These graphs show that the relationship between post-tax income and pre-tax income is approximately log-linear in each country throughout the distribution, except for the lowest percentile.

[5] In Appendix III.1, we report estimates of the tax function using Poisson Pseudo Maximum Likelihood, as in König (2023).

[6] We construct the 95% confidence intervals as

$$\left[1 - \exp\left(\hat{\alpha}_{c,t} + 1.96 \times \hat{se}(\alpha)_{c,t}\right), 1 - \exp\left(\hat{\alpha}_{c,t} - 1.96 \times \hat{se}(\alpha)_{c,t}\right)\right]$$

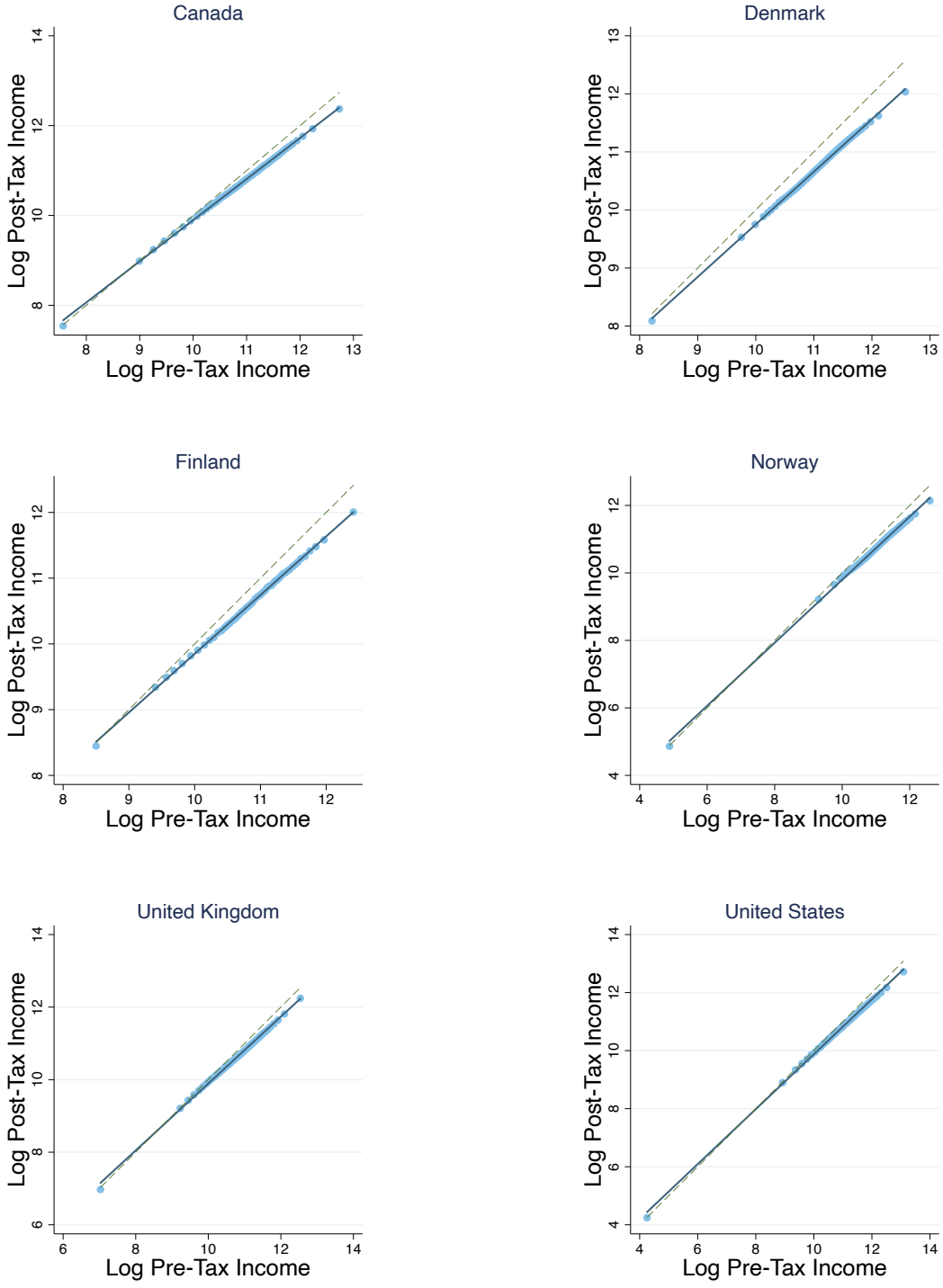
for λ, and

$$\left[1 - \left(\hat{\beta}_{c,t} + 1.96 \times \hat{se}(\beta)_{c,t}\right), 1 - \left(\hat{\beta}_{c,t} - 1.96 \times \hat{se}(\beta)_{c,t}\right)\right]$$

for τ.

[7] Due to space constraints, we only present results for six countries in the main text. The corresponding plots for the remaining countries are provided in Appendix I.5. Results for other waves are available upon request.

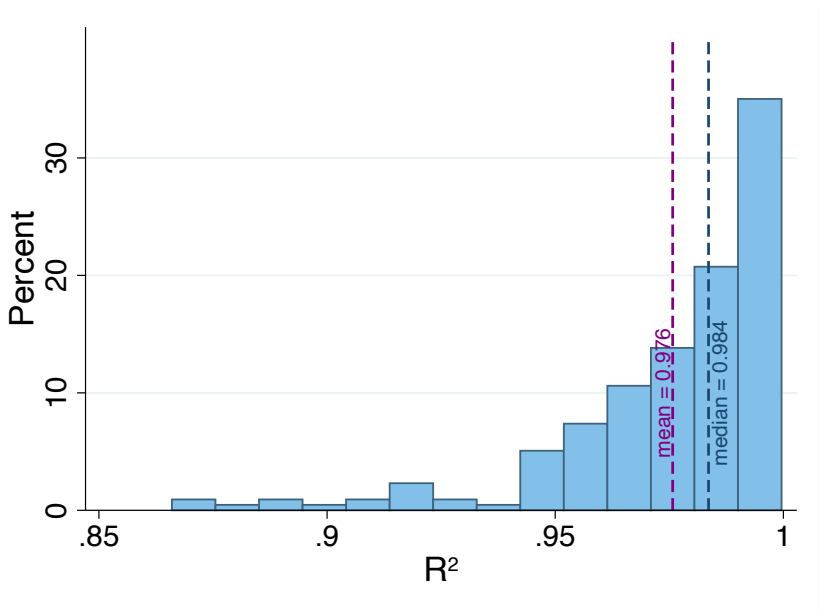
Figure 1: Goodness of Fit of the Log-Linear Tax Function



Notes: Log post-tax income against log pre-tax income, Wave 8 (2010). Post-tax income is defined as pre-tax income minus income taxes. Each dot is a binned scatter for a percentile of the log pre-tax income distribution. The dashed line is the 45-degree line, and the solid line is the fitted line.

Figure 2 shows that the R^2 from the regressions we use to estimate the tax functions is remarkably high. Specifically, we estimate the log-linear tax function in Equation (4) separately for each country and each wave, and report the distribution of the R^2 from these regressions. The distribution is significantly skewed to the right and has a mean of 0.976 and a median of 0.984. Even in the thin left tail, the R^2 is larger than 0.85, meaning that, in the worst case, the log-linear tax functions still explain over 85 percent of the variation in post-tax income. In particular, the lowest R^2 is 0.86 and corresponds to Italy in wave 6. The results on R^2 corroborate our finding that a log-linear tax function provides an excellent approximation of the effective income tax systems across countries. In Appendix I.6, we further demonstrate that the quality of fit is robust to the imputation and simulation procedures used by LIS, as well as to the underlying country-specific data sources.

Figure 2: Distribution of R^2



Notes: Distribution of the R^2 from country-wave-specific regressions of log post-tax income on log pre-tax income.

3 Results

3.1 Tax Progressivity and Average Tax Level

Figure 3 plots the estimated tax parameters for wave 8, which includes the largest number of countries in our sample. Results for the remaining waves are reported in Appendix II, which also displays the pre-tax median income by country and wave.

Figure 3 plots progressivity, measured by the parameter τ, against the average tax rate for the median household in each country, defined as the household earning the median pre-tax income.[8] This figure reveals several patterns. First, a higher degree of progressivity is associated with a higher average tax rate for the median household. This positive correlation is consistent across all waves, as shown by the upward-sloping fitted lines in Figures 3 and A-5.[9]

Second, Figure 3 shows that higher-income northern European countries such as Germany (DE), Belgium (BE), and the Netherlands (NL) consistently exhibit the highest progressivity and average tax rates. This finding is consistent with several previous studies. Chang, Chang, and Kim (2018) find that Germany and the Netherlands have among the most progressive income tax systems in 2016, and Holter, Krueger, and Stepanchuk (2019) show that this is also true for the period between 2000 and 2007.

Finally, several countries with progressive statutory income tax schedules do not exhibit progressive effective taxes. For example, Brazil, Colombia, Peru, and the Republic of Korea have statutory systems designed to be progressive, yet their effective tax systems are almost flat in all waves.

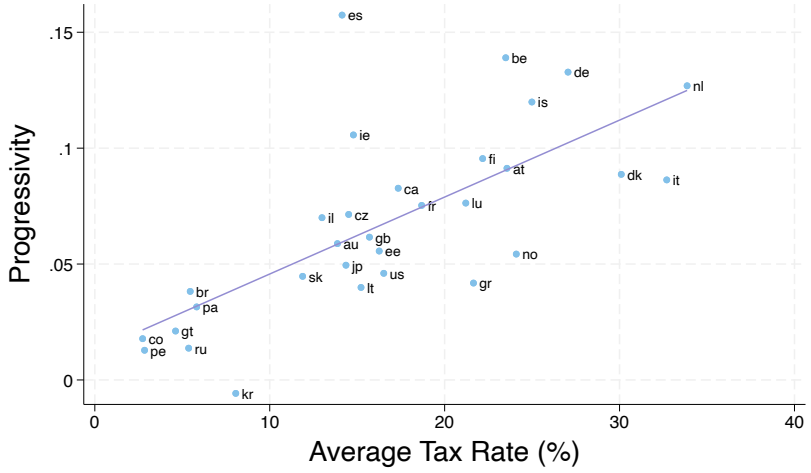
To further assess the robustness of our results and provide additional inputs for structural models, Appendix III.2 provides estimates of the tax functions for various subsamples. Tables A-7 and A-8 report estimated tax functions for households with a head aged above 60. The progressivity parameter τ for retirement-age households is, on average, 3.9% higher than that for working-age households. Tables A-9 and A-10 report tax function estimates for households with no capital or private transfer income. The results for this sample are very similar to our baseline, though baseline progressivity estimates tend to be slightly higher, by 1.2% on average, than those for households with only labor income. Tables A-11 and A-12 report the estimated tax functions for households with no public social benefits, i.e., those whose pre-tax income comprises only labor, capital, and private transfer income. For this group, progressivity estimates are lower than the baseline ones in 93% of observations, and they are on average 16% smaller than in the baseline sample.

Progressivity tax wedge. Another measure of income tax progressivity used in the literature is the progressivity tax wedge (PTW) (Guvenen, Kuruscu, and Ozkan, 2013; Holter, Krueger, and Stepanchuk, 2019). The PTW measures how strongly marginal tax rates increase between two income levels. In particular, the PTW between two arbitrary income levels y_1 and $y_2 > y_1$

[8] One can recover the original parameter λ with the values of the average tax rate denoted $\hat{\lambda}$, progressivity τ, and median pre-tax income denoted y using $\lambda = 1 - (1 - \hat{\lambda})y^{\tau}$.

[9] This positive association between progressivity and the average tax rate also holds when evaluating the average tax rate evaluated at the mean (rather than the median) income. We also verify that the relationship is robust to weights based on each country's population size.

Figure 3: Tax Progressivity and Average Tax Level



Notes: Tax Parameters Across Countries. Progressivity against the average tax rate in wave 8 (2010). The average tax rate is evaluated at the median income of each country. The solid line is the OLS fitted line.

is defined as

$$PTW(y_1, y_2) = 1 - \frac{1 - T'(y_2)}{1 - T'(y_1)},$$

where $T'(\cdot)$ denotes the marginal tax rate. The PTW ranges between 0 and 1 for progressive tax systems and becomes negative for regressive ones. The PTW is 0 for a proportional tax, and approaches one as the marginal tax rate on the higher income approaches 100%.

Using the log-linear tax function, the PTW for any $y_2 > y_1$ is

$$PTW(y_1, y_2) = 1 - \left(\frac{y_2}{y_1}\right)^{-\tau},$$

which makes clear that the PTW depends only on the ratio of the two income levels considered and the progressivity parameter τ, while it is independent of the level parameter λ.

Table 1 reports the estimated progressivity parameter τ and the progressivity tax wedge. Specifically, we compute the PTW between the average income in each country and twice that amount, that is, $PTW(\bar{y}, 2\bar{y}) = 1 - 2^{-\tau}$, which is a one-to-one mapping from the progressivity parameter τ. The results show that Korea had the least progressive taxes in 2010, while Spain, Belgium, and the Netherlands had the most progressive tax codes. Measured by the PTW, income tax systems in countries like Belgium, Finland, Germany, Iceland, Ireland, the Netherlands, and Spain are more than twice as progressive as that of the United States. Consistent with the findings of Holter, Krueger, and Stepanchuk (2019), we confirm that the United States is among the lower end in terms of income tax progressivity.

Table 1: Progressivity parameter τ and progressivity tax wedge in wave 8 (2010)

Country	τ	PTW	Relative PTW (US=1)
Australia	0.059	0.040	1.273
Austria	0.091	0.061	1.954
Belgium	0.139	0.092	2.927
Brazil	0.038	0.026	0.833
Canada	0.083	0.056	1.775
Colombia	0.018	0.012	0.391
Czechia	0.071	0.048	1.539
Denmark	0.089	0.060	1.900
Estonia	0.056	0.038	1.205
Finland	0.095	0.064	2.041
France	0.075	0.051	1.621
Germany	0.133	0.088	2.802
Greece	0.042	0.029	0.910
Guatemala	0.021	0.015	0.463
Iceland	0.120	0.080	2.541
Ireland	0.106	0.071	2.251
Israel	0.070	0.047	1.509
Italy	0.086	0.058	1.850
Japan	0.049	0.034	1.075
Lithuania	0.040	0.027	0.869
Luxembourg	0.076	0.052	1.641
Netherlands	0.127	0.084	2.683
Norway	0.054	0.037	1.177
Panama	0.032	0.022	0.688
Peru	0.013	0.009	0.281
Republic of Korea	-0.006	-0.004	-0.128
Russian Federation	0.014	0.009	0.301
Slovakia	0.045	0.031	0.972
Spain	0.157	0.103	3.294
United Kingdom	0.062	0.042	1.332
United States	0.046	0.031	1.000

Notes: We compute the PTW between the average income in each country and twice its value. Formally, for country i, this is given by $PTW^i(\bar{y}^i_{2010}, 2 * \bar{y}^i_{2010}) = 1 - 2^{-\tau^i_{2010}}$.

Comparison with other studies. Our estimates of income tax progressivity are broadly consistent with existing studies using survey and administrative data. In particular, our progressivity estimates are remarkably close to those derived from administrative data, which underscores the high quality of LIS data and the reliability of our estimation strategy. For Australia, our estimates of τ (0.065 in 2004, 0.059 in 2010, and 0.068 in 2016) closely match those reported by Tran and Zakariyya (2021) (0.066, 0.055, and 0.060), who estimate a similar tax function using a combination of survey and administrative data from 2001 to 2016. Our estimate of Spain's progressivity in 2013 also aligns well with the estimate by García-Miralles, Guner, and Ramos (2019) based on administrative data. Our estimate for τ (0.07) is slightly lower than theirs (0.12) because of differences in sample selection and the inclusion of tax credits, deductions, and allowances in their post-tax income definition, which increases progressivity, as discussed in Section 3.4. Our results for the United States are also consistent with previous estimates. Using IRS data for 2000, Guner, Kaygusuz, and Ventura (2014) estimate a log-linear tax function based on income definitions almost identical to ours. Their estimate of overall progressivity

(0.04) is slightly lower than ours (0.06) because they exclude state income taxes in their analysis. As shown by Fleck, Heathcote, Storesletten, and Violante (2025), state income taxes are progressive, and their inclusion raises the estimates of progressivity. Guner, Kaygusuz, and Ventura (2014) examine variation in progressivity by family structure and find that marriage and the presence of children are associated with higher progressivity, which we also document in Section 3.3. Finally, our estimates for the United States are in line with those obtained from the Panel Study of Income Dynamics (PSID) by Borella, De Nardi, Pak, Russo, and Yang (2023). They report progressivity parameters of 0.07, 0.07, and 0.06 in 1985, 1995, and 2004, respectively. Our corresponding estimates are 0.07, 0.07, and 0.05. Moreover, both studies identify notable declines in progressivity following major tax reforms: a drop between 1980 and 1985 following Reagan's tax reforms, and another between 2000 and 2004 following a set of reforms known collectively as the "Bush tax cuts."

3.2 Progressivity and Economic Development

In this section, we examine the relationship between income tax progressivity and economic development, motivated by several findings in the literature. First, the literature on tax capacity has shown that high-income countries collect most of their tax revenue through income taxes, while low-income countries rely more on taxes on goods, services, and trade (Burgess and Stern, 1993; Besley and Persson, 2010, 2013, 2014). Second, the growth literature has shown that greater redistribution is generally associated with higher economic growth (Berg, Ostry, Tsangarides, and Yakhshilikov, 2018; Gerber, Klemm, Liu, and Mylonas, 2020).

Our objective is to investigate whether higher-income countries also exhibit higher income tax progressivity, in addition to generating most of their tax revenue through income taxes. Although we do not seek to establish causal relationships, our empirical analysis offers valuable insights into the characteristics of income tax systems across the development spectrum. Furthermore, it provides pointers for causal investigation into the mechanisms underlying the relationship between redistribution and growth.

We start by assessing the composition of tax revenue for countries in our sample, using data from the United Nations Government Revenue Dataset (UNU-WIDER, 2023). We report the results and a description of the data in Appendix IV.1. Figure A-7 plots the share of personal income taxes and the taxes on goods and services in total tax revenue against log median pre-tax income for Wave 8 (2010). Consistent with the tax capacity literature, we find that higher-income countries collect more of their tax revenue through personal income taxes. For instance, in 2010, high-income countries like Denmark and the US collected about 50% of their tax revenue through income taxes, while low-income countries like Peru and Guatemala

collected less than 10%. Figure A-7 also shows that lower-income countries predominantly rely on taxes on goods and services.

Next, we examine the relationship between income tax progressivity and median household income as a proxy for economic development. Figure 4 shows that higher-income countries also display higher income tax progressivity. Countries such as Belgium, Germany, and the Netherlands consistently rank among the wealthiest countries and have the most progressive income tax systems. These countries also collect most of their tax revenue through personal income taxes, as shown in Figure A-7. We report additional results for other waves in Appendix IV.2, where we find a consistent positive relationship between tax progressivity and development starting in 1995.[10] At the lower end of the income distribution, countries such as Guatemala, Colombia, and Peru exhibit the lowest progressivity. This finding is consistent with the literature on tax capacity in developing countries (Besley and Persson, 2014) and our results on the composition of tax revenue. These countries primarily generate tax revenue through taxes on goods and services, with only a small portion through personal income taxes. They also tend to have a substantial informal sector, dominated by small firms, and limited tax capacity. Consequently, they exhibit both lower reliance on income taxes and lower income tax progressivity. This is confirmed by Figure A-10 in Appendix IV.3, which plots income tax progressivity against the share of individual income taxes in total tax revenue. Lower-income countries that collect only a smaller share of their revenue from income taxes tend to exhibit lower income tax progressivity.

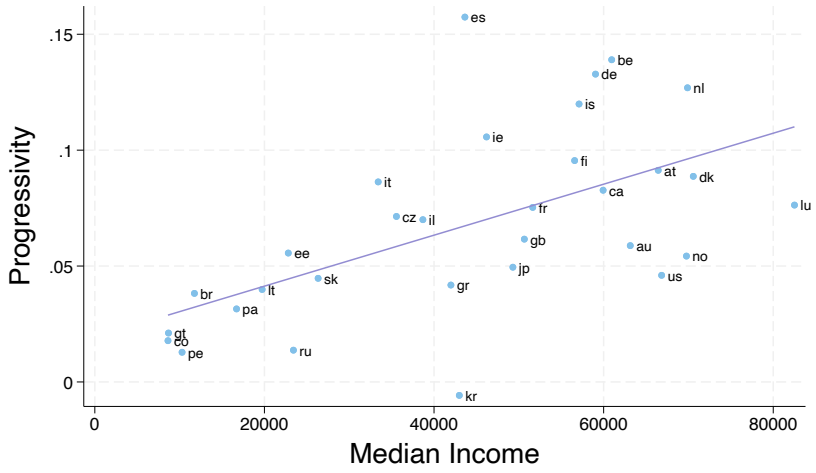
In Appendix IV.2, we use GDP per capita from the Penn World Tables as an alternative proxy for economic development (Feenstra, Inklaar, and Timmer, 2015). The results based on GDP per capita align closely with those based on median income. In particular, Figures A-8–A-9 confirm a consistently positive relationship between progressivity, median income, and GDP per capita. This is consistent with Bick, Fuchs-Schündeln, Lagakos, and Tsujiyama (2022), who also document that countries with higher GDP per capita tend to exhibit higher income tax progressivity. Our results further support Berg, Ostry, Tsangarides, and Yakhshilikov (2018) and Gerber, Klemm, Liu, and Mylonas (2020) on the absence of a trade-off between redistribution and economic development.

3.3 Progressivity and Family Structure

In the previous sections, we focused on standard households to provide a comprehensive view of the dynamics of income tax progressivity. In this section, we evaluate whether income tax

[10]The positive relationship between progressivity and economic development also holds when using average income instead of median income as the proxy for economic development. Weighting countries by population size does not alter this conclusion.

Figure 4: Tax Progressivity and Development



Notes: Progressivity against median income in LIS wave 8 (2010). Progressivity is measured by the parameter τ. Income is measured in 2017 USD PPP. The solid lavender line is the OLS fitted line.

progressivity varies across household types. In particular, we split the sample into the four categories that comprise the definition of standard households: (1) married couples with children, (2) married couples without children, (3) single parents, and (4) singles without children.

This analysis reveals several noteworthy patterns. First, we observe large and significant differences in progressivity by family structure across all countries and years. Figure 5 reports point estimates of the progressivity parameter τ and the 95% confidence intervals for wave 8 (2010) in Canada, Denmark, Finland, Norway, the United Kingdom, and the United States. To save space, estimates for the remaining countries and waves are reported in Appendix V. This figure shows that the tightly estimated progressivity parameter varies markedly across family structures.

Second, conditional on the presence of children, progressivity varies by marital status. On average, the progressivity parameter for married couples without children is 25.3% higher than for singles without children. Likewise, the progressivity parameter for married couples with children is, on average, 26.4% higher than for single parents. A few notable examples are Norway in 1995, where the progressivity parameter for married couples without children is 3.5 times that of singles without children, and the United States in 2010, where the progressivity parameter of married couples with children is more than double that of single parents. These differences in progressivity by marital status reflect many institutional features, including the marriage bonuses embedded in joint taxation (which applies to countries such as France, Germany, Ireland, Spain, Switzerland, and the United States), differential statutory taxation by marital status, and targeted credits and deductions for married couples.

Third, conditional on marital status, the presence of children leads to large changes in effective progressivity. On average, the progressivity parameter for married couples with children is 18.5% higher than that for married couples without children. The difference between single parents and childless singles without children is smaller, but the progressivity parameter for single parents is still 5.9% higher on average than for singles without children. Figure 5 shows that in 2010, the progressivity parameter for American married couples with children is about 70% higher than for married couples without children, while the progressivity parameter of Danish single parents is 1.7 times that of childless singles. These patterns are consistent with the fact that most tax systems offer more generous tax credits and deductions to families with dependent children.

Fourth, despite differences across countries and waves, a clear and stable pattern emerges: singles without children consistently face the lowest progressivity, while married couples with children the highest. As shown in Figure 5, this pattern holds in the majority of country-wave observations.

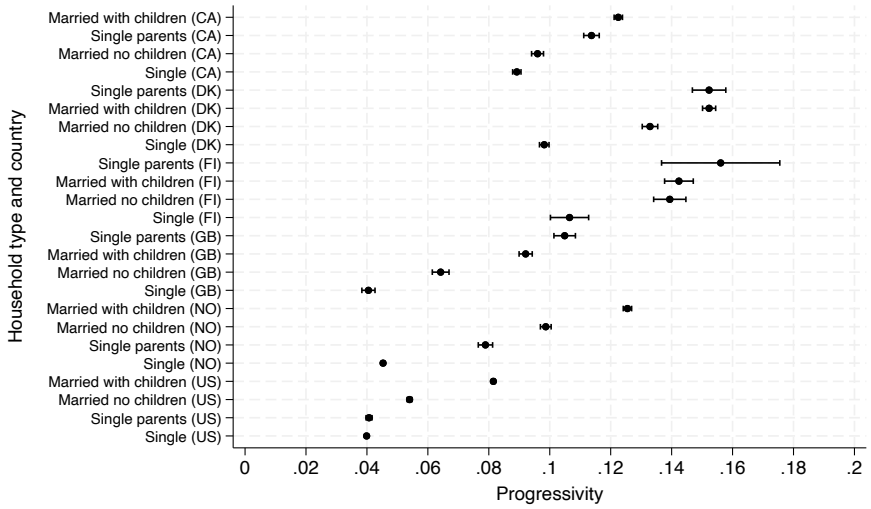
These findings are broadly consistent with prior work. Guner, Kaygusuz, and Ventura (2014) estimate income tax progressivity in the United States in 2000 for married and single households with and without children. They find that, regardless of the presence of children, married couples face higher progressivity than singles. Our results corroborate this finding: Table A-14 shows that, for the United States in wave 5 (corresponding to 2000), the progressivity parameter for married couples without children is 1.4 times that of singles without children, while the one for married couples with children is almost twice that of single parents. Our results also confirm the findings of Guner, Kaygusuz, and Ventura (2020), who estimate income tax progressivity by marital status and the number of children in 2000. They find that the progressivity parameter is higher for married households than for single ones and higher for married couples with children than for those without. Malkov (2022) uses an optimal income taxation approach and argues that married couples in the United States should be taxed less progressively than singles. Our estimates suggest that the current US tax system does the opposite—regardless of the presence of children, married couples face higher progressivity than singles.

To systematically investigate the effect of family structure on effective income taxes, we estimate the following regression:

$$y_{h,c,t} = \sum_{h} \beta_h \mathbb{I}\{\text{household type} = h\} + \gamma_{c,t} + \varepsilon_{h,c,t},$$

where the dependent variable $y_{h,c,t}$ represents an outcome of interest (i.e., the tax function parameters $\lambda_{h,c,t}$ and $\tau_{h,c,t}$ for household type h in the country c at wave t). The coefficient β_h captures the household-type fixed effects, and $\gamma_{c,t}$ denotes the country-wave fixed effects. We

Figure 5: Income tax progressivity by family structure



Notes: LIS wave 8 (2010). The dots are the point estimate for the progressivity parameter τ, and the black lines denote the 95% confidence interval. For each country and wave, family structures are ranked and shown in ascending order of progressivity.

set singles without children as the base group and normalize the country-wave fixed effects so that the constant term represents the average level of the dependent variable in the base group.

Table 2 reports the regression results. We consider four dependent variables: the tax function parameters, $\lambda_{h,c,t}$ and $\tau_{h,c,t}$, and the average and marginal tax rate for a household with median income in each country-wave-household-type group. For each of these four dependent variables, we compare the estimated household-type fixed effects, β_h, across family structures. The household-type fixed effects capture the difference in the outcome variable between each group and the base group. For instance, $\beta_h = 0.012$ for couples without children in Column (2) of Table 2 indicates that the difference in the progressivity parameter τ between married couples without children and singles without children (the base group) is 0.012.

Column (1) of Table 2 shows results for the tax function parameter λ. It is the largest for singles, smaller for couples without children, even smaller for single parents, and is the smallest for couples with children. As discussed in Section 2, a higher λ implies a higher average level of taxation conditional on the income level. Therefore, our results suggest that singles without children face the highest average level of taxation conditional on the income level, followed by married couples without children, then single parents, with married couples with children experiencing the lowest taxation.

Column (2) reports estimates of the household-type fixed effects when we use the progressivity parameter as the dependent variable in the regression. These results confirm that singles

Table 2: Tax and Family Structure

	(1) λ	(2) τ	(3) Average	(4) Marginal
Singles without children (base)	0.000	0.000	0.000	0.000
	(.)	(.)	(.)	(.)
Couples without children	-0.327**	0.012***	0.018***	0.025***
	(0.130)	(0.003)	(0.002)	(0.003)
Couples with children	-0.779***	0.021***	0.004**	0.021***
	(0.130)	(0.003)	(0.002)	(0.003)
Single parents	-0.513***	0.010***	-0.054***	-0.040***
	(0.130)	(0.003)	(0.002)	(0.003)
Constant	-1.260***	0.083***	0.182***	0.247***
	(0.092)	(0.002)	(0.001)	(0.002)
Country-Wave FE	Yes	Yes	Yes	Yes
Observations	868	868	868	868
R-squared	0.64	0.81	0.96	0.95

Standard errors in parentheses, * p<0.10, ** p<0.05, *** p<0.01

Notes: This table reports the estimates of the household-type fixed effects. Column (1) reports the results for the tax parameter λ, (2) for the tax parameter τ, (3) for the average tax rate facing a median-income household, and (4) for the marginal tax rate facing a median-income household. We set singles without children as the base group.

without children face the lowest progressivity, while married couples with children experience the highest.

The results in Column (1) allow us to compare families with a different structure at the same pre-tax income. As an alternative comparison across family structures, Columns (3) and (4) report the regression results for the average and marginal tax rates for a median household in its respective group. The very small household-fixed effect for couples with children in Column (3) highlights that the median couple with children pays a very similar average tax rate to the median single household. Column (3) also shows that a median single household is subject to an average tax rate of 18.2%, while a median couple with children faces an average tax rate of 18.6%. Single parents are subject to the lowest average tax rate, which is 5.4 percentage points lower than that for singles. At the same time, couples without children pay the highest average tax rate, which is 1.8 percentage points higher than the one for singles.

Finally, Column (4) reports the results for the marginal tax rate for the median household in each group. Similarly to what we observe in Column (3), these results show that single

parents pay the lowest marginal tax rate, whereas couples without children pay the highest. In particular, median single parents are subject to a marginal tax rate of 20.7%, while median couples without children face a marginal tax rate of 27.2%.

3.4 The Role of Transfers

So far, we have treated public social benefits in the same manner as income earned in private markets. However, governments also use transfers as a redistribution tool. Although our primary focus is the progressivity of the income tax system, in this section we evaluate more broadly the role of transfers in shaping the progressivity embedded in the overall public system. Specifically, we estimate the progressivity of the tax-and-transfer system and compare it to the one of the income tax system presented in Section 3.

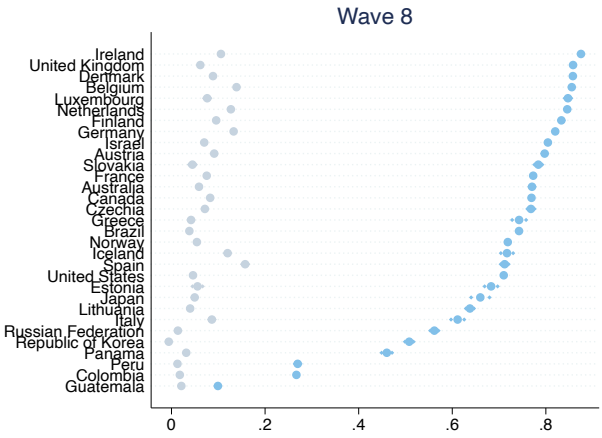
To estimate the progressivity of the tax-and-transfer system, we follow the approach of Heathcote, Storesletten, and Violante (2017) and Chang, Chang, and Kim (2018) and define a tax-and-transfer function where public social benefits are included in post-tax income rather than in pre-tax income. As discussed in Section 2.1, the public social benefits in LIS cover a wide range of government transfers, including household family benefits (such as TANF in the United States), unemployment benefits, sickness and injury pay (e.g., worker's compensation in the United States), disability benefits, general assistance transfers (such as transfers from minimum income guarantee systems), housing benefits, and the monetary value of public in-kind benefits (such as housing, food, and medical assistance programs). We expect the progressivity of the tax-and-transfer system to be substantially higher than the progressivity embedded in the tax system alone. Intuitively, this is because incorporating transfers into post-tax income increases the post-tax income of lower-income households (who are more likely to receive transfers) while leaving the post-tax income of higher-income households largely unchanged, thereby implying more redistribution and hence higher progressivity. More formally, including transfers in post-tax income reduces the elasticity of post-tax income with respect to pre-tax income. According to our tax function, this elasticity is given by $1 - \tau$. Hence, a reduction in the elasticity means an increase in progressivity (τ).

While this approach is informative for understanding the government's overall redistribution, it comes with several limitations. First, the scope of transfer programs vary substantially across countries, resulting in substantially different meanings of the progressivity of the tax-and-transfer system. Second, it is well-documented that transfer income is significantly misreported in survey data (Meyer, Mok, and Sullivan, 2015), which may severely bias the estimates of tax-and-transfer progressivity. Third, as shown by Figure A-11 in Appendix VI, the log-linear tax-and-transfer function fits the data considerably worse than the tax function. Guner, Rauh, and

Ventura (2025) provide a comprehensive study of transfers, where they estimate an alternative effective tax-and-transfer functions that better capture the generosity and scope of transfers in the United States.

Figure 6 compares the progressivity of the tax system to that of the tax-and-transfer system. It plots the point estimates of the progressivity parameter τ for both functions along with the associated 95% confidence intervals. This figure reveals large and significant differences between the two measures of progressivity. As expected, the progressivity of the tax-and-transfer system is substantially higher than that of the income tax system alone. The main takeaway is that a large part of the government's redistribution is carried out through transfers. Moreover, this figure shows that including transfers does not substantially alter the relative ranking of countries in terms of progressivity: countries with high tax progressivity also tend to have high tax-and-transfer progressivity. Appendix VI reports the results for other waves.

Figure 6: Progressivity of the tax and tax-and-transfer systems



Notes: Wave 8, 2010. Gray dots denote the progressivity parameter τ estimated with the tax function, while the dark blue dots represent the progressivity parameter τ estimated with the tax-and-transfer function. Each dot is accompanied by smaller dots denoting the 95% confidence interval.

Comparison with other studies. We compare our estimates on tax-and-transfer progressivity to those reported in a few other papers. Chang, Chang, and Kim (2018) use LIS data from 2010 to estimate the progressivity of the tax-and-transfer system in 19 OECD countries. They "drop 20% of low-income households", which results in estimates of progressivity that are lower than our baseline ones. As shown in Table A-15 in Appendix VI, when we trim the bottom 20% of the pre-tax income distribution in each country, we obtain estimates of tax-and-transfer progressivity closer to theirs. The comparison of our results to those of Chang, Chang, and Kim (2018) shows that estimates of progressivity are sensitive to the sample used and that most of the redistribution occurs at the bottom of the income distribution. Heathcote, Storesletten, and

Violante (2017) pool data from the Current Population Survey (CPS) between 2000 and 2006 to estimate tax-and-transfer progressivity in the United States. Their definition of transfers is narrower than ours, covering family assistance programs such as TANF, Supplemental Security income, unemployment benefits, worker's compensation, and veteran's pensions. To facilitate comparison, we re-estimate the tax-and-transfer function using a restricted definition of transfers, limited to household family benefits, unemployment benefits, and sickness and injury pay. Table A-16 in Appendix VI shows that the resulting estimates are lower than our baseline estimates, though still higher than those in Heathcote, Storesletten, and Violante (2017). This is likely due to differences in the exact transfer components included in the income definitions and differences in sample selection.

4 Conclusions

We study effective income taxation worldwide by estimating effective income tax functions over the last forty years. We start by showing that a simple two-parameter log-linear effective tax function approximates income tax systems worldwide remarkably well. We then analyze the dynamics of average taxation and progressivity and document a positive correlation between the average level of taxation and the degree of income tax progressivity. We then focus on the evolution of income tax progressivity, and uncover a positive relationship between progressivity and the level of economic development, as well as substantial variation in progressivity across family structures. Finally, we show that transfers play an important role in shaping overall government redistribution. Our paper offers several results and contributions.

First, we show that a two-parameter log-linear tax function provides an excellent approximation of income tax systems around the world over the last forty years. While this finding was previously established for the United States and a few other countries, we show that this result holds much more broadly for over thirty countries over the last forty years. As a result, our estimated tax functions can be readily used in empirical and structural work that needs a parsimonious representation of the income tax system. Our rich results can serve structural models requiring an effective tax function.

Second, we document considerable variation in average taxation and progressivity across countries. We find a positive association between average taxation and progressivity, with Northern European countries such as Germany and the Netherlands imposing the highest average tax rate and progressivity.

Third, we examine the dynamics of income tax progressivity along two dimensions: economic development and family structure. We show that progressivity varies systematically with economic development. We document that richer countries tend to have more progressive

tax systems. Additionally, we document large and significant differences in progressivity by family structure. We separately estimate tax functions for four types of households and find that marriage and the presence of children are associated with higher progressivity.

Finally, we demonstrate that transfers play an important role in redistribution. We estimate a tax-and-transfer function and find that the tax-and-transfer system's progressivity is substantially higher than the progressivity of income taxes alone.

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APPENDICES FOR ONLINE PUBLICATION

I LIS data

I.1 Details on Sample Selection

Table A-1 details our sample selection. In particular, it shows which country-wave pairs we included in our sample and those we excluded. There are three main reasons we excluded a country-wave pair: the data for it was not available in LIS (denoted as "no data" in red in Table A-1), there is not enough tax data to estimate our effective tax function (denoted as "no tax info" in blue in Table A-1), or taxes are not clearly defined in the LIS documentation (denoted as "unclear tax definition" in purple in Table A-1).

For instance, Table A-1 shows that LIS has data for only a few countries for the first wave. Therefore, most countries in the first wave fall in the "no data" exclusion category. Then, LIS (or the original datasets it takes its data from) only contains information on either gross or net income for some countries. For instance, the data for Mexico comes from the Household Income and Expenditure Survey (Encuesta Nacional de Ingresos y Gastos de los Hogares), which only collects information on income net of taxes and social contributions. Thus, Mexico falls in the "no tax info" category. Finally, Switzerland is the only country that falls in the "unclear taxes" category. This is because Switzerland levies income taxes at several levels of government (local, cantonal, and federal), and it is unclear how comparable these are to income taxes in other countries.

Table A-1: Sample Selection

Country	Wave 1 1980	Wave 2 1985	Wave 3 1990	Wave 4 1995	Wave 5 2000	Wave 6 2004	Wave 7 2007	Wave 8 2010	Wave 9 2013	Wave 10 2016	Wave 11 2019
Australia	no tax info	no tax info	no tax info	no tax info	no tax info	in sample	in sample	in sample	in sample	in sample	in sample
Austria	no data	no data	no data	no tax info	no tax info	in sample	in sample	in sample	in sample	in sample	in sample
Belgium	no data	no tax info	in sample	in sample	no tax info	in sample	in sample	in sample	in sample	in sample	no data
Brazil	no data	no data	no data	no data	no data	no data	in sample	in sample	in sample	in sample	no data
Canada	no tax info	in sample	in sample	in sample	in sample	in sample	in sample	in sample	in sample	in sample	in sample
Chile	no data	no data	no tax info	no tax info	no tax info	no tax info	no tax info	no tax info	no tax info	no tax info	no tax info
China	no data	no data	no data	no data	in sample	no data	no data	no data	no tax info	no data	no data
Colombia	no data	no data	no data	no data	in sample	in sample	in sample	in sample	in sample	in sample	in sample
Cote d'Ivoire	no data	no data	no data	no data	no tax info	no data	no tax info	no data	no data	no tax info	no data
Czechia	no data	no data	in sample	in sample	in sample	in sample	in sample	in sample	in sample	in sample	no data
Denmark	no data	in sample	in sample	in sample	in sample	in sample	in sample	in sample	in sample	in sample	no data
Dominican Republic	no data	no data	no data	no data	no data	no data	in sample	no data	no data	no data	no data
Estonia	no data	no data	no data	no data	in sample	in sample	in sample	in sample	in sample	in sample	no data
Finland	no data	in sample	in sample	in sample	in sample	in sample	in sample	in sample	in sample	in sample	in sample
France	in sample	in sample	in sample	in sample	in sample	in sample	in sample	in sample	in sample	in sample	in sample
Georgia	no data	no data	no data	no data	no data	no data	no data	no tax info	no tax info	no tax info	no tax info
Germany	in sample	in sample	in sample	in sample	in sample	in sample	in sample	in sample	in sample	in sample	in sample
Greece	no data	no data	no data	no tax info	no tax info	no tax info	in sample	in sample	in sample	in sample	no data
Guatemala	no data	no data	no data	no data	no data	no data	in sample	in sample	in sample	no data	no data
Hungary	no data	no data	no tax info	no tax info	no tax info	no tax info	no tax info	no tax info	no tax info	no tax info	no tax info
Iceland	no data	no data	no data	no data	no data	in sample	in sample	in sample	no data	no data	no data
India	no data	no data	no data	no data	no data	no tax info	no data	no tax info	no data	no data	no data
Ireland	no data	no tax info	no data	no tax info	in sample	in sample	in sample	in sample	in sample	in sample	in sample
Israel	no tax info	in sample	in sample	in sample	in sample	in sample	in sample	in sample	in sample	in sample	in sample
Italy	no tax info	no tax info	no tax info	no tax info	no tax info	in sample	in sample	in sample	in sample	in sample	no data
Japan	no data	no data	no data	no data	no data	no data	in sample	in sample	in sample	no data	no data
Lithuania	no data	no data	no data	no data	no data	no data	no data	in sample	in sample	in sample	in sample
Luxembourg	no data	no tax info	no tax info	no tax info	no tax info	in sample	in sample	in sample	in sample	no data	no data
Mali	no data	no data	no data	no data	no data	no data	no data	no tax info	no tax info	no tax info	no tax info
Mexico	no data	no tax info	no tax info	no tax info	no tax info	no tax info	no tax info	no tax info	no tax info	no tax info	no tax info
Netherlands	no data	no tax info	in sample	in sample	in sample	in sample	in sample	in sample	in sample	in sample	in sample
Norway	no data	in sample	in sample	in sample	in sample	in sample	in sample	in sample	in sample	in sample	in sample
Palestinian Territory	no data	no data	no data	no data	no data	no data	no data	no data	no data	no tax info	no data
Panama	no data	no data	no data	no data	no data	no data	in sample	in sample	in sample	in sample	no data
Paraguay	no data	no data	no data	no tax info	no tax info	no tax info	no tax info	no tax info	no tax info	no tax info	no tax info
Peru	no data	no data	no data	no data	no data	in sample	in sample	in sample	in sample	in sample	no data
Poland	no data	no tax info	no tax info	in sample	no tax info	no tax info	no tax info	no tax info	no tax info	no tax info	no tax info
Republic of Korea	no data	no data	no data	no data	no data	no data	in sample	in sample	in sample	in sample	no data
Republic of Serbia	no data	no data	no data	no data	no data	no data	no tax info	no tax info	no tax info	no tax info	no tax info
Romania	no data	no data	no data	in sample	no data	no data	no data	no data	no data	no data	no data
Russian Federation	no data	no data	no data	no data	no tax info	no tax info	no tax info	in sample	in sample	in sample	in sample
Slovakia	no data	no data	in sample	no tax info	no data	in sample	in sample	in sample	in sample	in sample	in sample
Slovenia	no data	no data	no data	no tax info	no tax info	no tax info	no tax info	no tax info	no tax info	no tax info	no data
South Africa	no data	no data	no data	no data	no data	no data	no tax info	no tax info	no tax info	no tax info	no data
Spain	no tax info	no tax info	no tax info	no tax info	no tax info	no tax info	in sample	in sample	in sample	in sample	no data
Sweden	in sample	in sample	in sample	in sample	in sample	in sample	no data	no data	no data	no data	no data
Taiwan	no tax info	no tax info	no tax info	no tax info	no tax info	no tax info	no tax info	no tax info	no tax info	no tax info	no tax info
Switzerland	unclear taxes	no data	unclear taxes	no data	unclear taxes	unclear taxes	unclear taxes	unclear taxes	unclear taxes	unclear taxes	unclear taxes
United Kingdom	in sample	in sample	in sample	in sample	in sample	in sample	in sample	in sample	in sample	in sample	in sample
United States	in sample	in sample	in sample	in sample	in sample	in sample	in sample	in sample	in sample	in sample	in sample
Uruguay	no data	no data	no data	no data	no data	no tax info	no tax info	no tax info	no tax info	no tax info	no tax info
Vietnam	no data	no data	no data	no data	no data	no data	no tax info	no tax info	no tax info	no data	no data

Notes: no data = no data available in LIS at the start of our project; in sample = country-wave pair included in our sample; no tax info = not enough data to estimate our effective tax function; unclear taxes = unclear definition of income taxes.

I.2 Details on Our Sample

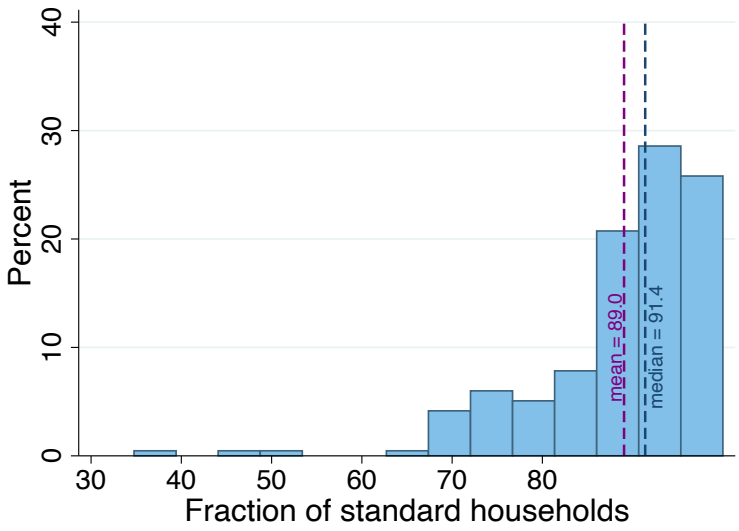
Table A-2: Sample Details

Country	**Code**	**Wave 1** 1980	**Wave 2** 1985	**Wave 3** 1990	**Wave 4** 1995	**Wave 5** 2000	**Wave 6** 2004	**Wave 7** 2007	**Wave 8** 2010	**Wave 9** 2013	**Wave 10** 2016	**Wave 11** 2019
Australia	au						7,375	5,844	10,121	8,381	9,812	8,149
Austria	at						9,355	11,046	11,491	10,653	10,670	6,865
Belgium	be			4,789	4,636		10,183	11,579	10,264	10,836	10,360	
Brazil	br							70,845	135,253	65,621	86,448	
Canada	ca		7,094	12,464	23,850	70,294	49,255	45,803	42,267	45,330	57,776	25,089
China	cn					12,155						
Colombia	co					101,550	224,936	270,445	360,223	356,371	351,783	228,934
Czechia	cz			9,828	16,700	4,768	2,501	6,149	4,693	3,980	4,388	
Denmark	dk		7,404	7,784	46,532	49,301	50,183	51,713	50,175	50,256	50,093	
Dominican Republic	do							4,346				
Estonia	ee					3,396	2,170	2,476	2,484	2,827	3,117	
Finland	fi		8,580	8,677	6,632	7,527	7,627	7,004	5,968	6,850	6,116	
France	fr	22,189	25,588	19,188	40,924	184,623	64,755	65,597	92,296	87,391	84,209	26,883
Germany	de	29,367	38,192	18,651	23,690	37,109	22,242	20,196	32,372	33,706	33,336	12,368
Greece	gr							3,054	2,659	3,854	9,577	
Guatemala	gt							7,737	7,483	6,505		
Iceland	is						1,981	1,960	2,002			
Ireland	ie					3,059	9,013	7,841	7,483	8,938	7,550	2,196
Israel	il		3,199	3,271	3,137	7,766	12,134	11,929	11,717	17,247	16,706	5,474
Italy	it						4,120	3,927	3,880	3,404	2,997	
Japan	jp							1,399	1,172	942		
Lithuania	lt								7,365	6,778	6,635	2,342
Luxembourg	lu						2,461	2,746	3,726	2,527		
Netherlands	nl			2,953	3,582	2,966	6,686	7,069	6,831	6,491	21,041	6,811
Norway	no		2,879	4,920	6,366	9,590	8,833	133,489	136,934	142,070	145,059	152,910
Panama	pa							6,801	6,868	6,055	5,624	
Peru	pe						9,923	11,822	11,134	15,250	18,826	
Poland	pl				19,318							
Republic of Korea	kr							17,540	7,709	7,189	5,495	
Romania	ro				34,508							
Russian Federation	ru								8,567	50,219	150,981	62,965
Slovakia	sk			9,920			3,187	3,061	2,877	5,593	7,545	2,386
Spain	es							6,923	6,797	6,186	6,805	
Sweden	se	7,302	6,570	8,645	9,522	8,699	9,839					
United Kingdom	gb	3,889	3,955	4,026	58,703	74,064	51,621	45,040	41,549	34,511	32,489	10,558
United States	us	37,907	33,734	68,128	156,838	211,945	145,505	143,646	138,279	119,357	119,007	71,083
Total obs.		100,654	137,195	183,244	454,938	790,167	715,885	989,027	1,172,639	1,125,318	1,264,445	625,013
Total countries		5	10	14	15	17	23	30	31	30	27	15

Notes: Countries in our sample, associated ISO code, and number of observations in each wave. Blank cells denote waves for which we do not have the data we need to estimate tax functions for a certain country.

I.3 Share of Standard Households

Figure A-1: Share of households with heads between 25 and 60



Notes: Share of households with heads between 25 and 60 that qualify as standard households. Results for all countries and all waves in our sample.

I.4 Income Components

We take the components that define our measures of pre-tax and post-tax income directly from LIS. These definitions can also be found in the codebook at: https://www.lisdatacenter.org/wp-content/uploads/files/data-lis_codebook.pdf.

Labor income. Total income from the labor of all household members. It includes wage income (which covers salary income and monetary supplements to the basic wage, such as overtime pay, bonuses, tips, etc.), self-employment income, fringe benefits (such as the value of company cars, meals, etc. paid or partly paid by the employer as substitute or supplement to wage), and the value of home production of goods and services.

Capital income. Cash payments from property and capital to all the household members. It includes interests from assets such as bank accounts, certificates of deposit, or bonds, and rental income from dwellings, business buildings, land, vehicles, etc. It excludes capital gains, lottery winnings, inheritances, insurance settlements, and all other forms of one-off lump sum payments.

Pensions. Total pension income from all pillars (private, occupational, public), all types (insurance, universal, assistance), and all functions (old-age, disability, survivors). Includes voluntary individual pensions, mandatory individual pensions, occupational pensions, employment-related public pensions, universal pensions, and assistance pensions.

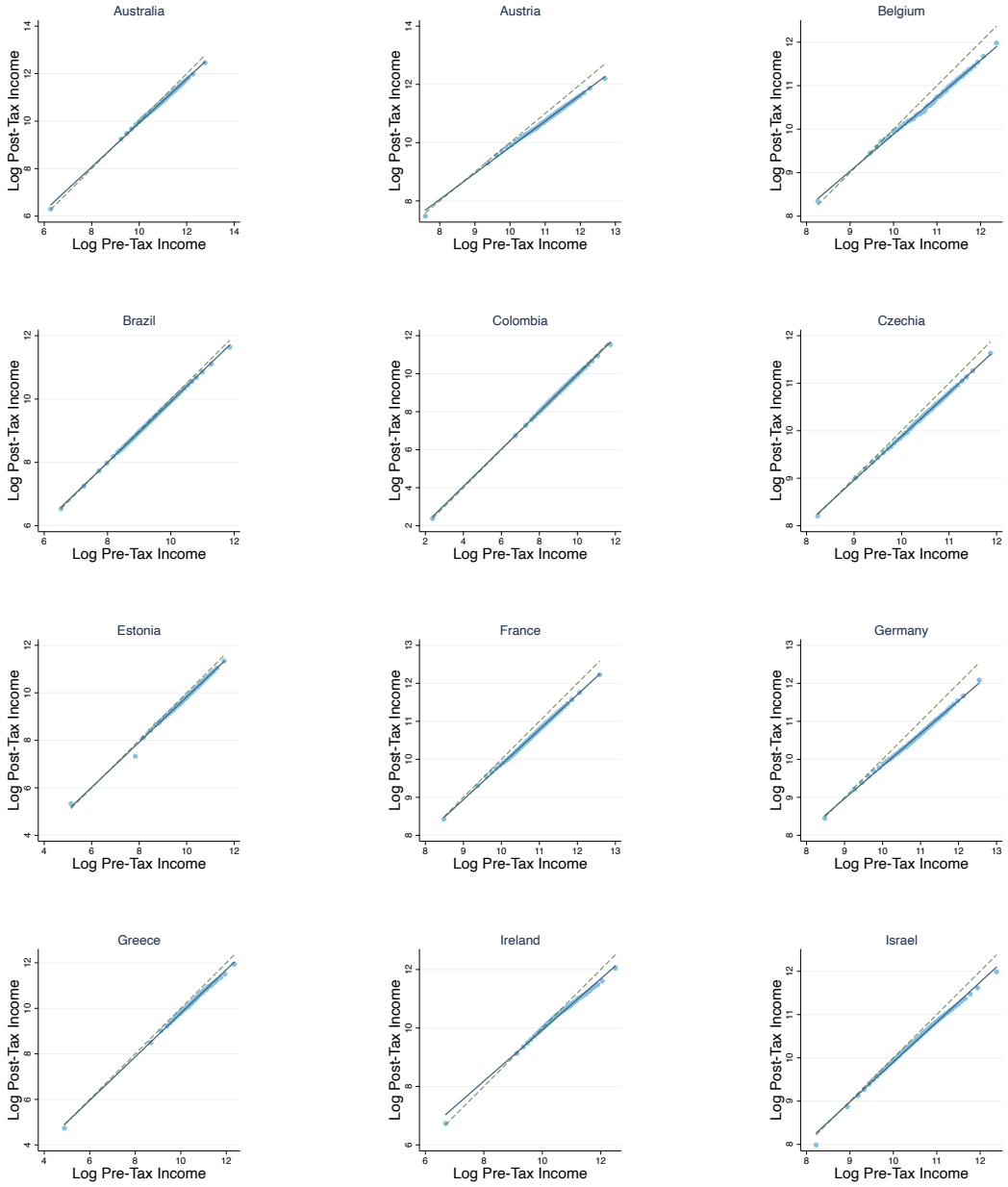
Public social benefits. Cash Social Security transfers (excluding public pensions) stemming from insurance, universal or assistance schemes, and in-kind social assistance transfers. In particular, it includes family benefits (such as parental leave benefits or parental subsidies), unemployment benefits, sickness and temporary work injury payments, disability benefits, general assistance benefits (such as transfers from minimum income guarantee systems), housing benefits, and the value of public in-kind benefits (such as transfers aimed at covering educational, housing, eating, and food needs of needy families).

Private transfers. Cash transfers and value of in-kind goods and services of a private nature that do not involve any institutional arrangement between the individual and the government or the employer. Includes transfers provided by non-profit institutions, other private persons/households, and other bodies in the case of merit-based education transfers.

Income taxes and contributions. Income taxes and Social Security contributions paid. Expenditures on income taxes are defined here as compulsory payments to the government based on the current income earned, including both the amount withheld at source and the amount directly paid at the moment of the tax adjustment. Social security contributions are payroll taxes from wage and salary workers for the first and second pillars of social insurance: social security, health plans, unemployment insurance, etc.

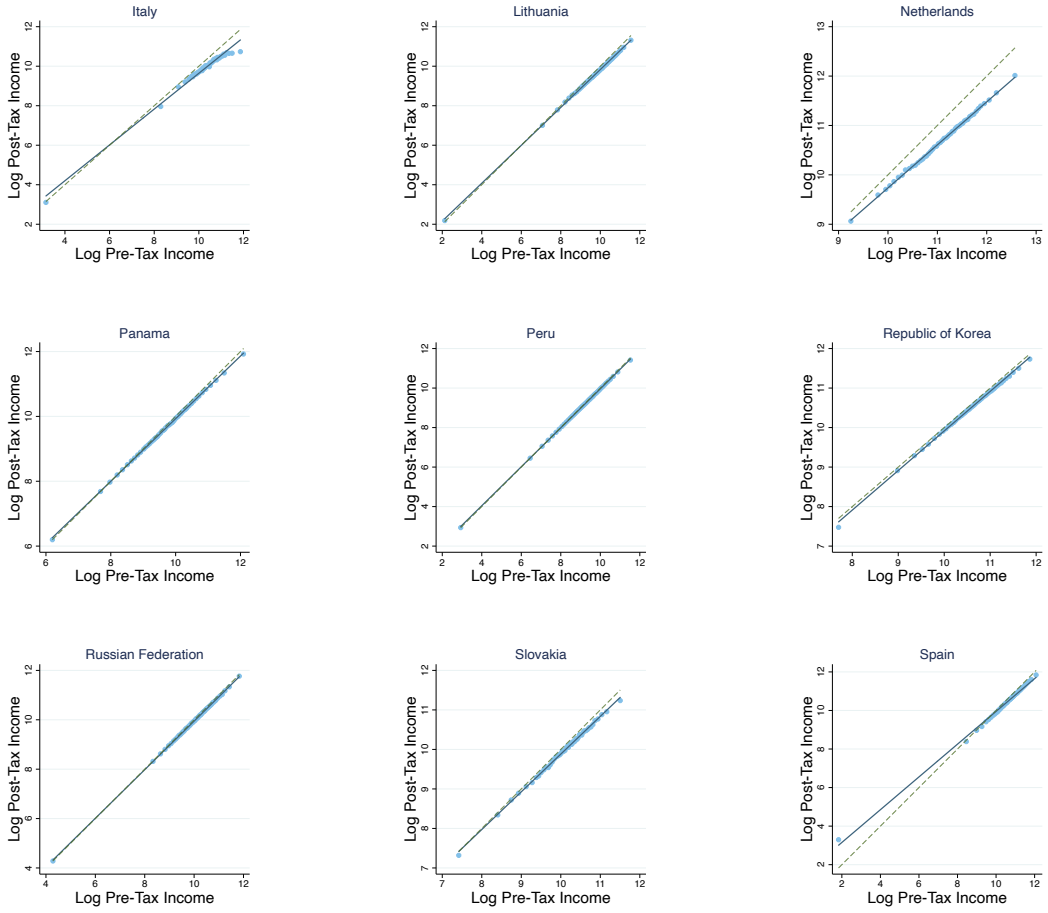
I.5 Fit of the Tax Function in Wave 8

Figure A-2: Log Post-Tax Income against Log Pre-Tax Income, Wave 8 (2010)



Notes: Post-tax income is defined as pre-tax income minus income taxes. Each dot is a percentile of the log pre-tax income distribution. The dashed line is the 45-degree line. The solid line is the OLS fitted line.

Figure A-3: Log Post-Tax Income against Log Pre-Tax Income, Wave 8 (2010)



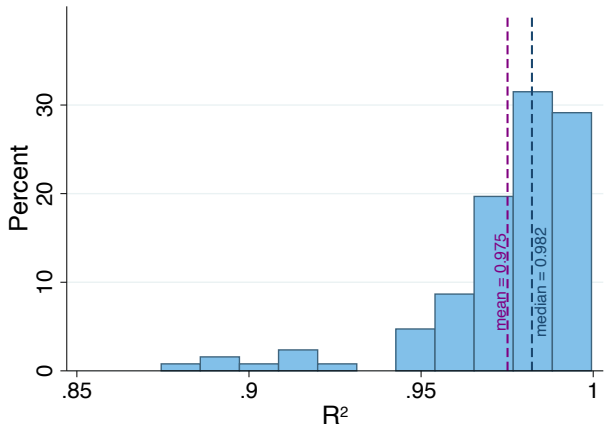
Notes: Post-tax income is defined as pre-tax income minus income taxes. Each dot is a percentile of the log pre-tax income distribution. The dashed line is the 45-degree line. The solid line is the OLS fitted line.

I.6 Details on Imputation

While for numerous countries, such as Canada, Norway, and the United Kingdom, information on income taxes and social contributions is directly observed, for several other countries, such as Australia, Israel, and the United States, income taxes and social contributions are either imputed or simulated based on available information. Table A-3 shows whether taxes and contributions are imputed in each country and wave. Unless the imputation procedures rely on a log-linear tax function similar to ours, our goodness-of-fit measures are not overestimated. To our knowledge, neither LIS nor any country-specific dataset uses a log-linear tax function to impute income taxes. Instead, they use more complex micro-simulations methods. For example, the data on income taxes for the United States come from the Annual Social and Economic Supplement (ASEC) of the Current Population Survey (CPS). It uses the Census Bureau's tax model, a micro-simulation model comparable to NBER's TAXSIM, to compute federal income taxes based on information from the CPS, the Internal Revenue Service, the American Housing Service, and the State Tax Handbook.

Figure A-4 confirms that imputation does not affect our results. Here we plot the distribution of R^2 obtained when we exclude from our sample all countries and waves for which taxes and social contributions were imputed rather than observed directly. This graph shows that the mean and the median of the distribution of R^2 obtained when we exclude imputed values are the same as the ones for the overall sample.

Figure A-4: R^2 distribution



Notes: Distribution of the R^2 from year-by-year and country-by-country regressions of log post-tax income on log pre-tax income when we exclude imputed values

Table A-3: Income Tax Imputation

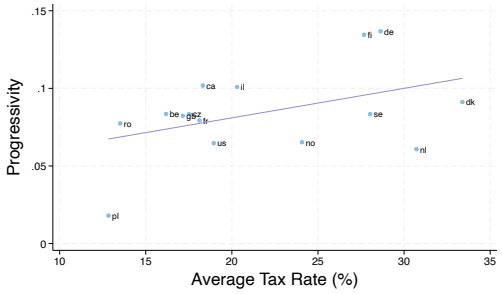
Country	**Wave 1** 1980	**Wave 2** 1985	**Wave 3** 1990	**Wave 4** 1995	**Wave 5** 2000	**Wave 6** 2004	**Wave 7** 2007	**Wave 8** 2010	**Wave 9** 2013	**Wave 10** 2016	**Wave 11** 2018
Australia						yes	yes	yes	yes	yes	yes
Austria						no	no	no	no	no	no
Belgium			yes	yes		yes	yes	yes	yes	yes	
Brazil							yes	yes	yes	yes	
Canada		no	no	no	no	no	no	no	no	no	no
China					no						
Colombia					yes	yes	yes	yes	yes	yes	yes
Czechia			no	no	yes	no	no	no	yes	yes	
Denmark		no	no	no	no	no	no	no	no	no	
Dominican Republic							no				
Estonia					no	yes	yes	yes	yes	yes	
Finland		no	no	no	no	no	no	no	no	no	
France	no	no	yes	no	no	no	no	no	no	no	no
Germany	no	no	yes	yes	yes	yes	yes	yes	yes	yes	yes
Greece							yes	yes	yes	yes	
Guatemala							no	yes	yes		
Iceland						no	no	no			
Ireland					no	no	no	no	no	no	no
Israel		yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Italy						yes	yes	yes	yes	yes	
Japan							yes	yes	yes		
Lithuania								no	no	no	no
Luxembourg						no	no	no	no		
Netherlands			yes	no	no	no	no	no	no	no	no
Norway		no	no	no	no	no	no	no	no	no	no
Panama							yes	yes	yes	yes	
Peru						no	no	no	no	no	
Poland				no							
Republic of Korea							no	no	no	no	
Romania				no							
Russian Federation								yes	yes	yes	yes
Slovakia			no			no	no	no	yes	yes	yes
Spain							no	no	no	no	
Sweden	no	no	no	no	no	no					
United Kingdom	no	no	no	no	no	no	no	no	no	no	no
United States	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Percent Imp.	20	20	43	27	35	35	40	45	53	52	47

Notes: This table shows which country-wave pair has an imputed measure of income taxes. "yes" means taxes are imputed, while "no" means taxes are directly observed. In the last row, we compute the percentage of countries with imputed income taxes in each wave.

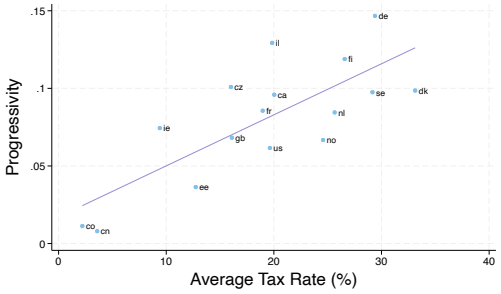
II Effective Taxes Across Countries

Figure A-5: Tax Parameters Across Countries

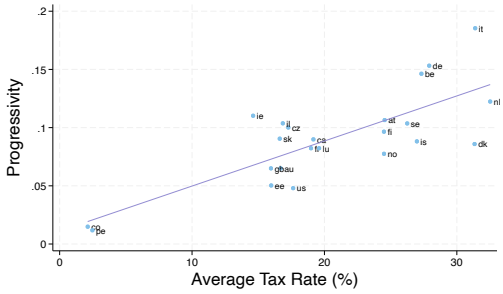
(a) Wave 4, 1995



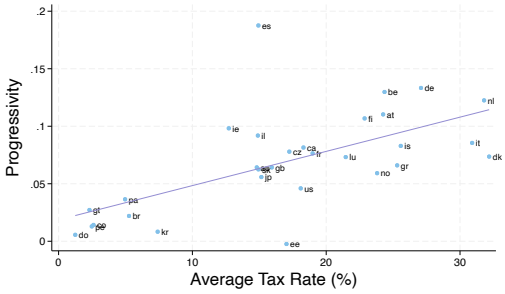
(b) Wave 5, 2000



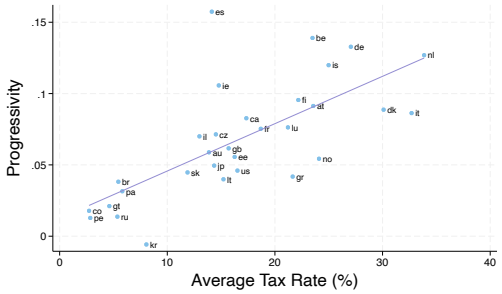
(c) Wave 6, 2004



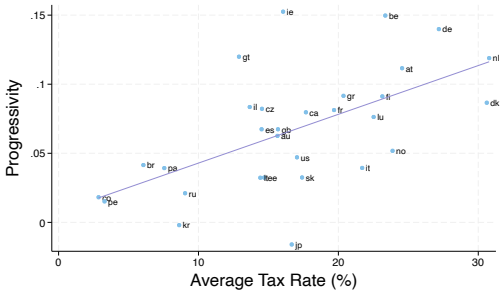
(d) Wave 7, 2007



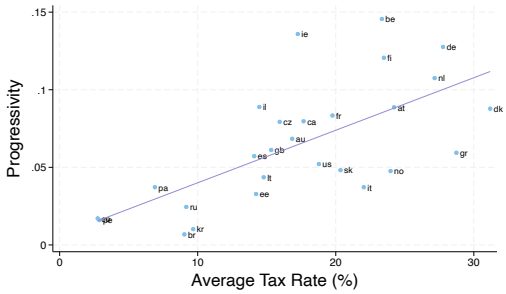
(e) Wave 8, 2010



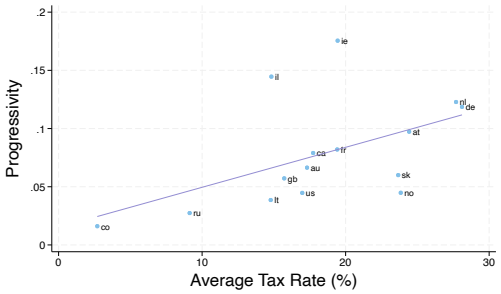
(f) Wave 9, 2013



(g) Wave 10, 2016



(h) Wave 11, 2019



Notes: The average tax rate is evaluated at the median income of each country. The solid lavender line is the OLS fitted line. We drop waves with fewer than 15 countries (waves 1, 2, and 3) for meaningful cross-country comparisons.

Table A-4: Average Tax Rate across Countries and Waves

Country	Wave										
	1	2	3	4	5	6	7	8	9	10	11
	1980	1985	1990	1995	2000	2004	2007	2010	2013	2016	2019
Australia						16.70	14.81	13.87	15.65	16.85	17.31
Austria						24.55	24.26	23.56	24.56	24.23	24.43
Belgium			14.30	16.18		27.32	24.36	23.49	23.35	23.34	
Brazil							5.26	5.45	6.06	9.03	
Canada		17.99	18.27	18.31	20.04	19.17	18.30	17.34	17.68	17.67	17.74
China					3.59						
Colombia					2.21	2.12	2.61	2.73	2.86	2.76	2.70
Czechia			14.76	17.52	16.01	17.27	17.24	14.51	14.54	15.94	
Denmark		31.53	32.68	33.39	33.13	31.34	32.18	30.10	30.61	31.19	
Dominican Republic							1.25				
Estonia					12.74	15.98	17.03	16.26	14.69	14.23	
Finland		26.60	24.70	27.68	26.58	24.50	22.87	22.17	23.14	23.49	
France	5.98	6.04	5.34	18.12	18.96	18.99	18.98	18.69	19.69	19.76	19.42
Germany	21.30	26.20	27.58	28.63	29.39	27.91	27.08	27.05	27.18	27.77	28.11
Greece							25.30	21.65	20.37	28.74	
Guatemala							2.31	4.62	12.89		
Iceland						26.98	25.57	24.99			
Ireland					9.40	14.61	12.72	14.78	16.05	17.25	19.44
Israel		19.48	17.11	20.30	19.84	16.86	14.89	12.99	13.66	14.46	14.83
Italy						31.39	30.91	32.70	21.70	22.03	
Japan							15.15	14.36	16.67		
Lithuania								15.22	14.42	14.78	14.78
Luxembourg						19.60	21.46	21.21	22.52		
Netherlands			26.22	30.72	25.65	32.52	31.80	33.86	30.78	27.16	27.69
Norway		24.00	21.69	24.07	24.57	24.50	23.80	24.10	23.88	23.97	23.84
Panama							4.97	5.82	7.56	6.90	
Peru						2.47	2.48	2.84	3.28	2.88	
Poland				12.84							
Republic of Korea							7.40	8.06	8.62	9.67	
Romania				13.52							
Russian Federation								5.36	9.04	9.17	9.13
Slovakia			13.97			16.62	14.93	11.88	17.41	20.34	23.66
Spain							14.93	14.14	14.51	14.09	
Sweden	30.45	32.48	24.28	28.03	29.16	26.25					
United Kingdom	20.12	22.57	23.54	17.16	16.10	15.96	15.93	15.70	15.68	15.32	15.72
United States	19.33	19.55	18.75	18.95	19.63	17.64	18.10	16.52	17.04	18.78	16.98

Notes: The average tax rate is evaluated at the median income of each country in each wave.

Table A-5: Progressivity across Countries and Waves

Country	Wave										
	1	2	3	4	5	6	7	8	9	10	11
	1980	1985	1990	1995	2000	2004	2007	2010	2013	2016	2019
Australia						0.07	0.06	0.06	0.06	0.07	0.07
Austria						0.11	0.11	0.09	0.11	0.09	0.10
Belgium			0.07	0.08		0.15	0.13	0.14	0.15	0.15	
Brazil							0.02	0.04	0.04	0.01	
Canada		0.07	0.09	0.10	0.10	0.09	0.08	0.08	0.08	0.08	0.08
China					0.01						
Colombia					0.01	0.01	0.01	0.02	0.02	0.02	0.02
Czechia			0.06	0.08	0.10	0.10	0.08	0.07	0.08	0.08	
Denmark		0.06	0.08	0.09	0.10	0.09	0.07	0.09	0.09	0.09	
Dominican Republic							0.01				
Estonia					0.04	0.05	0.00	0.06	0.03	0.03	
Finland		0.13	0.11	0.13	0.12	0.10	0.11	0.10	0.09	0.12	
France	0.04	0.03	0.05	0.08	0.09	0.08	0.08	0.08	0.08	0.08	0.08
Germany	0.08	0.11	0.12	0.14	0.15	0.15	0.13	0.13	0.14	0.13	0.12
Greece							0.07	0.04	0.09	0.06	
Guatemala							0.03	0.02	0.12		
Iceland						0.09	0.08	0.12			
Ireland					0.07	0.11	0.10	0.11	0.15	0.14	0.18
Israel		0.14	0.16	0.10	0.13	0.10	0.09	0.07	0.08	0.09	0.14
Italy						0.19	0.09	0.09	0.04	0.04	
Japan							0.06	0.05	-0.02		
Lithuania								0.04	0.03	0.04	0.04
Luxembourg						0.08	0.07	0.08	0.08		
Netherlands			0.04	0.06	0.08	0.12	0.12	0.13	0.12	0.11	0.12
Norway		0.08	0.05	0.07	0.07	0.08	0.06	0.05	0.05	0.05	0.04
Panama							0.04	0.03	0.04	0.04	
Peru						0.01	0.01	0.01	0.02	0.02	
Poland				0.02							
Republic of Korea							0.01	-0.01	0.00	0.01	
Romania				0.08							
Russian Federation								0.01	0.02	0.02	0.03
Slovakia			0.06			0.09	0.06	0.04	0.03	0.05	0.06
Spain							0.19	0.16	0.07	0.06	
Sweden	0.07	0.10	0.06	0.08	0.10	0.10					
United Kingdom	0.06	0.07	0.07	0.08	0.07	0.07	0.06	0.06	0.07	0.06	0.06
United States	0.07	0.07	0.07	0.06	0.06	0.05	0.05	0.05	0.05	0.05	0.04

Notes: Progressivity is measured by the tax function parameter τ.

Table A-6: Pre-Tax Median Income

Country	Wave										
	1	2	3	4	5	6	7	8	9	10	11
	1980	1985	1990	1995	2000	2004	2007	2010	2013	2016	2019
Australia						52833	63831	63139	68425	69480	69272
Austria						60440	63462	66436	65999	65605	66523
Belgium			44374	50970		60974	61359	60949	61815	62912	
Brazil							9969	11746	13448	11854	
Canada		58589	55039	54902	55426	56308	58583	59940	61359	63538	64952
China					5109						
Colombia					6616	6959	7789	8629	9775	9922	9605
Czechia			22270	27937	26609	29337	35355	35568	33554	38820	
Denmark		63405	59922	65271	67819	67826	72294	70573	68398	70679	
Dominican Republic							8306				
Estonia					11176	16813	26981	22813	27065	33955	
Finland		44338	47202	44161	48436	53686	57240	56579	57699	58501	
France	37972	38219	39411	45959	49001	50408	51524	51642	50463	50681	50574
Germany	66165	57331	62449	59856	61642	60379	59184	59042	58203	62162	64867
Greece							50483	41991	27502	32657	
Guatemala							12341	8688	10248		
Iceland						62056	72758	57102			
Ireland					48835	55166	55271	46189	46681	55166	61292
Israel		30709	34669	34899	36593	35778	37934	38685	43192	48460	52240
Italy						35380	34472	33416	34468	34166	
Japan							46789	49301	46602		
Lithuania								19730	21703	27463	30415
Luxembourg						84238	85716	82504	79650		
Netherlands			58052	58081	59433	64196	70566	69892	62474	66463	68186
Norway		51565	46728	49306	56444	60518	68145	69766	71783	70277	71361
Panama							15592	16714	20548	23875	
Peru						6816	7928	10290	11406	11555	
Poland				15000							
Republic of Korea							41378	42980	45973	49326	
Romania				10061							
Russian Federation								23421	32611	29446	29679
Slovakia			19193			20915	25949	26334	27601	30098	34269
Spain							49504	43639	38369	41130	
Sweden	33117	36228	37553	34829	42925	45702					
United Kingdom	35398	36468	41427	41894	47094	51803	53648	50650	49439	50443	53035
United States	68412	67225	65980	66430	71503	70622	70509	66836	65500	71532	77188

Notes: Pre-tax median income measured in 2017 USD PPP across countries and waves.

III Additional Results

III.1 Poisson Pseudo Maximum Likelihood Estimates

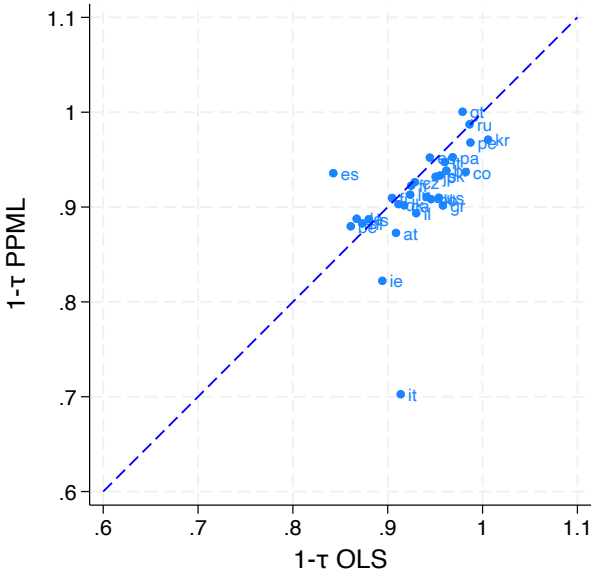
König (2023) builds on Silva and Tenreyro (2006) and argues that taking logs of a tax function like ours introduces a dependence between the regressor (pre-tax income) and the error term that might lead to inconsistent OLS estimates of $1-\tau$. To overcome this issue, he proposes the Poisson Pseudo Maximum Likelihood (PPML) estimator, which is nonlinear and uses data on pre and post-tax income in levels. In particular, with the PPML approach, the parameters λ and $1-\tau$ are estimated by solving

$$\sum_{j=1}^{J}\left[(Y_j - T(Y_j)) - (1-\hat{\lambda})Y_j^{1-\hat{\tau}}\right] Y_J = 0, \tag{A1}$$

where Y_j denotes pre-tax income for household j.

To implement the PPML approach, we run Equation A1 for each country and wave in our sample. Figure A-6 reports the PPML and OLS estimates of $1-\tau$ in wave 8 (2010). Figure A-6 shows that PPML and OLS estimates of $1-\tau$ are close (PPML estimates are, on average, 1.99% lower) and highly correlated (the rank correlation is 0.77). Pooling all waves and years, PPML estimates of $1-\tau$ are, on average, smaller than (1.83%) and highly correlated with the OLS ones (the rank correlation is 0.65).

Figure A-6: PPML estimates in wave 8 (2010)



III.2 Alternative Samples and Income Definitions

Tables A-7 and A-8 present our estimated tax function parameters λ and τ for households with a head aged between 61 and 100. LIS lacks data on retirement status, so we proxy retirement status with the head's age and denote these households as retired. Tables A-9 and A-10 present the estimated tax function parameters λ and τ for households with no capital or private transfer income. Tables A-11 and A-12 show the estimated tax function parameters λ and τ for households with zero public social benefits.

Table A-7: Tax parameter λ for retired households

Country	Wave										
	1 1980	2 1985	3 1990	4 1995	5 2000	6 2004	7 2007	8 2010	9 2013	10 2016	11 2019
Austria						-3.14	-0.81	-1.06	-0.88	-1.24	-0.54
Australia						-0.60	-0.78	-0.47	-0.74	-0.80	-0.51
Belgium			-0.19	-2.86		-3.13	-2.02	-2.00	-4.92	-1.87	
Brazil							-0.30	-0.28	-0.35	-0.40	
Canada		-0.61	-0.70	-0.97	-1.69	-1.60	-1.47	-1.27	-1.67	-1.65	-1.76
China					0.10						
Colombia					-0.04	-0.09	-0.07	-0.10	-0.11	-0.13	-0.13
Czechia			-0.58	-0.96	-0.97	-1.18	-1.26	-1.02	-0.94	-1.13	
Germany	-0.79	-1.07	-1.17	-0.75	-1.29	-1.17	-1.34	-1.21	-1.26	-1.42	-1.50
Denmark		-1.82	-1.57	-1.31	-1.37	-0.90	-1.17	-0.95	-1.03	-1.39	
Dominican Republic							-0.02				
Estonia					-0.45	-0.70	-0.82	-1.01	-0.70	-0.88	
Spain							-0.79	-0.97	-2.67	-3.23	
Finland		-4.17	-3.09	-5.06	-1.84	-2.17	-1.86	-1.89	-2.08	-1.97	
France	-0.68	-0.88	-0.69	-1.38	-1.26	-1.24	-1.38	-1.39	-1.57	-1.53	-1.62
United Kingdom	-2.77	-2.02	-1.43	-1.12	-1.04	-1.08	-1.12	-1.12	-1.02	-0.86	-0.64
Greece							-1.38	-0.53	-0.90	-0.35	
Guatemala							-0.17	-0.09	-0.60		
Ireland					-0.38	-1.03	-0.80	-1.26	-0.47	-0.78	-2.07
Israel		-1.20	-0.89	-0.57	-0.61	-0.23	-0.39	-0.39	-0.40	-0.50	-0.80
Iceland						-1.17	-1.11	-1.89			
Italy						-2.32	-1.00	-3.59	-0.69	-0.53	
Japan							-0.55	-0.51	-0.17		
Republic of Korea							0.16	0.15	0.10	-0.15	
Lithuania								-0.21	-0.24	-0.33	-0.65
Luxembourg						-2.04	-1.74	-1.44	-0.98		
Netherlands			-0.19	-0.37	-0.92	-3.06	-2.94	-3.10	-3.53	-2.90	-2.74
Norway		-3.24	-2.21	-1.98	-1.78	-2.59	-1.32	-1.42	-1.49	-1.20	-1.06
Panama							-0.13	-0.12	-0.17	-0.19	
Peru						-0.03	-0.03	-0.04	-0.06	-0.08	
Poland				-0.03							
Romania				-0.17							
Russian Federation								-0.15	-0.44	-0.44	-0.46
Sweden	-11.57	-6.78	-2.34	-2.44	-2.22	-0.71					
Slovakia			-0.70			-0.71	-0.86	-0.58	-1.02	-1.57	-1.78
United States	-0.81	-1.01	-0.92	-0.58	-0.69	-0.46	-0.43	-0.45	-0.41	-0.42	-0.38

Notes: Tax parameter λ for households with a head aged between 61 and 100. Here, we report the non-normalized parameter λ, which can be used directly in a tax function. It does not represent the average tax rate at the median income in each country and wave.

Table A-8: Tax parameter τ for retired households

Country	Wave										
	1	2	3	4	5	6	7	8	9	10	11
	1980	1985	1990	1995	2000	2004	2007	2010	2013	2016	2019
Austria						0.15	0.07	0.08	0.08	0.09	0.06
Australia						0.05	0.06	0.04	0.06	0.06	0.05
Belgium			0.02	0.14		0.15	0.12	0.12	0.18	0.12	
Brazil							0.03	0.03	0.03	0.04	
Canada		0.05	0.06	0.08	0.11	0.10	0.10	0.09	0.10	0.10	0.10
China					-0.01						
Colombia					0.01	0.01	0.01	0.01	0.02	0.02	0.02
Czechia			0.05	0.07	0.07	0.08	0.09	0.07	0.07	0.08	
Germany	0.06	0.08	0.09	0.06	0.09	0.08	0.09	0.09	0.09	0.10	0.10
Denmark		0.13	0.12	0.11	0.11	0.09	0.10	0.09	0.10	0.11	
Dominican Republic							0.00				
Estonia					0.05	0.06	0.07	0.08	0.06	0.07	
Spain							0.06	0.07	0.13	0.15	
Finland		0.18	0.15	0.20	0.12	0.13	0.12	0.12	0.13	0.12	
France	0.06	0.07	0.06	0.09	0.09	0.09	0.09	0.09	0.10	0.10	0.10
United Kingdom	0.15	0.12	0.10	0.08	0.08	0.08	0.08	0.08	0.08	0.07	0.05
Greece							0.10	0.05	0.08	0.05	
Guatemala							0.02	0.01	0.06		
Ireland					0.04	0.07	0.06	0.08	0.04	0.06	0.11
Israel		0.09	0.07	0.06	0.06	0.03	0.04	0.04	0.04	0.05	0.06
Iceland						0.09	0.09	0.12			
Italy						0.14	0.08	0.17	0.06	0.06	
Japan							0.05	0.05	0.03		
Republic of Korea							-0.01	-0.01	-0.01	0.02	
Lithuania								0.02	0.03	0.03	0.06
Luxembourg						0.11	0.10	0.09	0.08		
Netherlands			0.04	0.05	0.08	0.15	0.15	0.16	0.17	0.15	0.15
Norway		0.16	0.13	0.12	0.12	0.14	0.10	0.10	0.10	0.09	0.09
Panama							0.01	0.01	0.02	0.02	
Peru						0.00	0.01	0.01	0.01	0.01	
Poland				0.02							
Romania				0.02							
Russian Federation								0.02	0.04	0.04	0.04
Sweden	0.28	0.24	0.15	0.15	0.14	0.08					
Slovakia			0.06			0.06	0.07	0.05	0.08	0.10	0.11
United States	0.06	0.07	0.07	0.05	0.06	0.04	0.04	0.04	0.04	0.04	0.04

Notes: Tax parameter τ for households with a head aged between 61 and 100.

Table A-9: Tax parameter λ for households with only labor income

Country	Wave										
	1	2	3	4	5	6	7	8	9	10	11
	1980	1985	1990	1995	2000	2004	2007	2010	2013	2016	2019
Austria						-1.47	-1.51	-1.01	-1.81	-0.99	-1.27
Australia						-0.38	-0.40	-0.37	-0.30	-0.42	-0.37
Belgium			-0.69	-0.03		-3.08	-1.77	-2.15	-3.06	-2.67	
Brazil							-0.15	-0.34	-0.39	0.05	
Canada		-0.68	-0.84	-1.32	-1.22	-1.13	-0.89	-0.98	-0.97	-0.94	-0.94
China					0.08						
Colombia					-0.07	-0.10	-0.09	-0.12	-0.12	-0.12	-0.11
Czechia			-0.49	-0.94	-1.27	-1.29	-0.65	-0.62	-1.13	-1.06	
Germany	-0.44	-1.12	-1.52	-1.12	-1.53	-1.86	-1.38	-1.64	-2.64	-1.44	-1.33
Denmark		-0.01	-0.18	-0.17	-0.22	-0.10	-0.03	-0.46	-0.54	-0.55	
Dominican Republic							-0.03				
Estonia					-0.20	-0.29	0.56	-0.53	-0.17	-0.17	
Spain							-8.16	-4.17	-0.59	-0.45	
Finland		-1.57	-0.84	-2.04	-1.71	-1.31	-1.39	-0.89	-0.91	-1.99	
France	-0.33	-0.12	-0.34	-0.42	-0.79	-0.69	-0.47	-0.47	-0.51	-0.95	-0.64
United Kingdom	-0.33	-0.54	-1.52	-1.08	-0.64	-0.53	-0.56	-0.52	-0.59	-0.47	-0.44
Greece							-0.41	-0.10	-0.97	-0.13	
Guatemala							-0.30	-0.13	-1.93		
Ireland					-0.89	-1.87	-1.28	-1.36	-3.06	-2.52	-4.07
Israel		-2.39	-3.73	-1.22	-2.48	-1.57	-1.18	-0.77	-1.12	-1.21	-3.66
Iceland						-0.89	-0.96	-2.59			
Italy						-0.76	-0.06	-0.10	-0.02	-0.00	
Japan							-0.49	-0.44	0.44		
Republic of Korea							0.05	0.24	0.17	-0.05	
Lithuania								-0.24	-0.16	-0.33	-0.25
Luxembourg						-0.88	-0.48	-0.49	-0.59		
Netherlands			-0.07	-0.19	-0.57	-0.23	-1.47	-1.95	-2.37	-0.68	-2.05
Norway		-0.48	-0.08	-0.07	-0.03	-0.11	-0.03	-0.01	-0.01	-0.01	-0.01
Panama							-0.39	-0.25	-0.30	-0.31	
Peru						-0.08	-0.09	-0.08	-0.11	-0.11	
Poland				-0.00							
Romania				-0.80							
Russian Federation								-0.06	-0.16	-0.20	-0.26
Sweden	-0.09	-1.08	-0.35	-0.58	-1.54	-1.30					
Slovakia			-0.60			-1.02	-0.63	-0.36	-0.16	-0.29	-0.44
United States	-0.33	-0.29	-0.34	-0.26	-0.22	-0.17	-0.17	-0.19	-0.17	-0.16	-0.13

Notes: We report the non-normalized parameter λ, which can be used directly in a tax function. It does not represent the average tax rate at the median income in each country and wave.

Table A-10: Tax parameter τ for for households with only labor income

Country	Wave										
	1	2	3	4	5	6	7	8	9	10	11
	1980	1985	1990	1995	2000	2004	2007	2010	2013	2016	2019
Austria						0.11	0.11	0.09	0.12	0.09	0.10
Australia						0.05	0.04	0.04	0.04	0.05	0.04
Belgium			0.06	0.00		0.16	0.12	0.13	0.15	0.14	
Brazil							0.02	0.04	0.04	0.01	
Canada		0.06	0.07	0.10	0.09	0.09	0.08	0.08	0.08	0.08	0.08
China					-0.01						
Colombia					0.01	0.01	0.01	0.02	0.02	0.01	0.01
Czechia			0.06	0.08	0.10	0.10	0.07	0.06	0.09	0.09	
Germany	0.05	0.10	0.11	0.10	0.11	0.12	0.10	0.11	0.15	0.11	0.10
Denmark		0.02	0.04	0.05	0.05	0.04	0.03	0.06	0.07	0.07	
Dominican Republic							0.00				
Estonia					0.04	0.04	-0.07	0.06	0.03	0.03	
Spain							0.22	0.17	0.06	0.05	
Finland		0.12	0.08	0.14	0.12	0.10	0.10	0.08	0.08	0.13	
France	0.03	0.02	0.03	0.05	0.07	0.07	0.05	0.05	0.05	0.08	0.06
United Kingdom	0.05	0.06	0.11	0.08	0.06	0.05	0.05	0.05	0.06	0.05	0.05
Greece							0.06	0.03	0.09	0.05	
Guatemala							0.03	0.02	0.13		
Ireland					0.07	0.11	0.09	0.09	0.15	0.13	0.17
Israel		0.14	0.17	0.10	0.14	0.11	0.09	0.07	0.08	0.09	0.16
Iceland						0.09	0.09	0.15			
Italy						0.08	0.03	0.04	0.02	0.02	
Japan							0.05	0.05	-0.04		
Republic of Korea							0.00	-0.02	-0.01	0.01	
Lithuania								0.04	0.03	0.04	0.04
Luxembourg						0.08	0.05	0.06	0.06		
Netherlands			0.03	0.05	0.07	0.05	0.12	0.14	0.14	0.07	0.13
Norway		0.06	0.03	0.02	0.02	0.03	0.02	0.01	0.02	0.01	0.01
Panama							0.04	0.03	0.04	0.03	
Peru						0.01	0.01	0.01	0.01	0.02	
Poland				0.00							
Romania				0.08							
Russian Federation								0.01	0.02	0.03	0.03
Sweden	0.03	0.11	0.05	0.07	0.12	0.11					
Slovakia			0.06			0.09	0.06	0.04	0.03	0.05	0.06
United States	0.04	0.04	0.04	0.04	0.03	0.03	0.03	0.03	0.03	0.03	0.02

Table A-11: Tax parameter λ for households with no public social benefits

Country	Wave										
	1	2	3	4	5	6	7	8	9	10	11
	1980	1985	1990	1995	2000	2004	2007	2010	2013	2016	2019
Austria						-0.64	-0.53	-0.21	-0.71	-0.28	-0.42
Australia						-0.28	-0.38	-0.34	-0.37	-0.40	-0.36
Belgium			-0.18	-0.32		-1.12	-0.49	-0.98	-2.04	-1.50	
Brazil							-0.12	-0.50	-0.52	0.05	
Canada		-0.09	-0.08	-0.20	-0.52	-0.37	-0.41	-0.34	-0.31	-0.40	-0.43
China					-0.13						
Colombia					-0.07	-0.10	-0.09	-0.13	-0.13	-0.12	-0.11
Czechia			0.11	-0.15	-0.20	-0.48	-0.22	-0.33	-0.55	-0.39	
Germany	-0.30	-0.65	-0.65	-0.73	-1.08	-1.32	-0.80	-0.76	-0.98	-0.72	-0.58
Denmark		-0.08	-0.09	-0.22	-0.20	-0.16	-0.11	-0.58	-0.64	-0.61	
Dominican Republic							-0.04				
Estonia					-0.09	-0.13	0.55	-0.37	-0.07	-0.01	
Spain							-7.47	-4.20	-0.62	-0.42	
Finland		-1.03	-0.10	-0.89	-0.60	-0.30	-0.79	-0.40	0.03	-1.14	
France	-0.39	-0.14	-0.55	-0.19	-0.39	-0.25	-0.19	-0.20	-0.23	-0.23	-0.29
United Kingdom	-0.27	-0.04	0.34	-0.11	-0.13	-0.18	-0.15	-0.08	-0.17	-0.18	-0.18
Greece							-0.36	-0.14	-0.80	-0.17	
Guatemala							-0.29	-0.11	-1.50		
Ireland					-0.67	-0.82	-0.47	-0.42	-2.67	-0.70	-3.57
Israel		-1.84	-3.42	-0.02	-1.52	-1.22	-1.00	-0.84	-1.00	-1.07	-9.89
Iceland						-0.71	-0.64	-0.81			
Italy						-3.63	-0.61	-0.53	-0.14	-0.12	
Japan							-0.52	-0.57	-0.44		
Republic of Korea							0.18	0.16	0.21	0.03	
Lithuania								-0.15	-0.02	-0.26	-0.14
Luxembourg						-0.75	-0.21	-0.72	-0.32		
Netherlands			-0.00	-0.07	-0.40	-1.29	-0.47	-1.10	-0.86	-1.03	-1.55
Norway		-0.19	-0.08	-0.08	-0.13	-0.16	-0.12	-0.10	-0.10	-0.09	-0.08
Panama							-0.37	-0.27	-0.32	-0.31	
Peru						-0.05	-0.05	-0.05	-0.06	-0.08	
Poland				-0.05							
Romania				-0.51							
Russian Federation								-0.04	-0.01	-0.03	-0.07
Sweden	-0.05	-0.57	0.00	-0.14	-0.51	-1.23					
Slovakia			0.03			-0.05	-0.08	0.14	0.04	0.20	0.22
United States	-0.35	-0.32	-0.30	-0.24	-0.24	-0.11	-0.08	-0.07	-0.09	-0.11	-0.11

Notes: We report the non-normalized parameter λ, which can be used directly in a tax function. It does not represent the average tax rate at the median income in each country and wave.

Table A-12: Tax parameter τ for for households with no public social benefits

Country	Wave										
	1	2	3	4	5	6	7	8	9	10	11
	1980	1985	1990	1995	2000	2004	2007	2010	2013	2016	2019
Austria						0.08	0.07	0.05	0.08	0.05	0.06
Australia						0.04	0.05	0.04	0.05	0.05	0.05
Belgium			0.04	0.05		0.10	0.07	0.09	0.13	0.11	
Brazil							0.02	0.05	0.05	0.01	
Canada		0.03	0.03	0.04	0.06	0.05	0.05	0.05	0.05	0.05	0.06
China					0.02						
Colombia					0.01	0.01	0.01	0.02	0.02	0.02	0.02
Czechia			0.01	0.04	0.04	0.06	0.04	0.05	0.06	0.05	
Germany	0.05	0.08	0.08	0.09	0.11	0.11	0.09	0.09	0.10	0.09	0.08
Denmark		0.05	0.05	0.06	0.06	0.05	0.05	0.08	0.08	0.08	
Dominican Republic							0.01				
Estonia					0.03	0.03	-0.06	0.05	0.02	0.02	
Spain							0.21	0.17	0.06	0.05	
Finland		0.10	0.04	0.10	0.08	0.05	0.08	0.06	0.03	0.10	
France	0.04	0.02	0.05	0.04	0.06	0.05	0.04	0.04	0.05	0.05	0.05
United Kingdom	0.05	0.03	-0.01	0.03	0.03	0.04	0.03	0.03	0.04	0.03	0.04
Greece							0.06	0.04	0.08	0.05	
Guatemala							0.03	0.02	0.12		
Ireland					0.06	0.08	0.05	0.06	0.15	0.07	0.17
Israel		0.12	0.16	0.03	0.11	0.10	0.08	0.07	0.08	0.08	0.24
Iceland						0.08	0.07	0.08			
Italy						0.18	0.08	0.08	0.04	0.04	
Japan							0.06	0.06	0.05		
Republic of Korea							-0.01	-0.01	-0.01	0.01	
Lithuania								0.03	0.02	0.04	0.03
Luxembourg						0.07	0.04	0.07	0.05		
Netherlands			0.03	0.04	0.06	0.11	0.07	0.11	0.09	0.10	0.12
Norway		0.05	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.03
Panama							0.04	0.03	0.04	0.04	
Peru						0.01	0.01	0.01	0.01	0.01	
Poland				0.02							
Romania				0.06							
Russian Federation								0.01	0.01	0.01	0.02
Sweden	0.05	0.10	0.03	0.05	0.08	0.11					
Slovakia			0.02			0.03	0.03	0.00	0.02	0.00	0.01
United States	0.05	0.05	0.05	0.04	0.04	0.03	0.03	0.03	0.03	0.03	0.03

IV Progressivity and Development

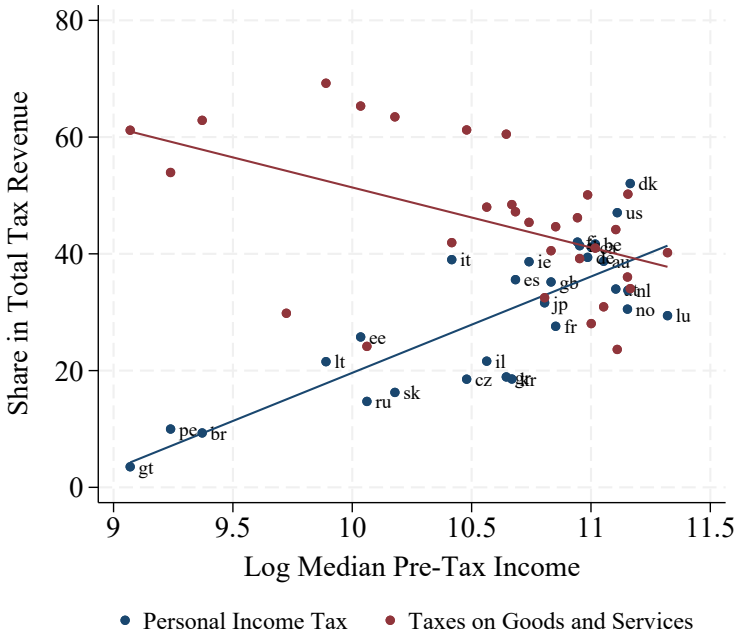
IV.1 Tax Revenue Composition

As discussed in Section IV, we use data from the United Nations Government Revenue Dataset (GRD) to examine the sources of tax revenue for the countries in our sample. The GRD was initially developed in 2010 by the International Centre for Tax and Development with the aim of providing reliable and comparable cross-country tax revenue data. It combines data from the IMF, OECD, and numerous national sources to provide high-quality data on tax revenue and its components. The GRD is free to download and use and is described in Prichard, Cobham, and Goodall (2014).

Our main object of interest in the GRD is the share of individual income taxes in total tax revenue. To compute this ratio, we use total tax revenue net of social contributions in the denominator. In the numerator, we use taxes on income, profits, and capital gains received by the government from individuals (rather than corporations) net of social contributions. The GRD provides these two variables directly.

Figure A-7 plots the share of individual income taxes as well as taxes on goods and services (which include sales taxes, value-added taxes, and excise duties) in total tax revenue for countries in LIS wave 8. Together, these two account for the majority of the tax revenues. Other tax revenue streams include taxes on trade (which include taxes on imports and exports), income taxes other than those received from individuals (such as those received by corporations), and other direct taxes (such as payroll and property taxes). We choose these categories following the GRD documentation and to highlight the differences in income taxes and taxes on goods and services described in the tax capacity literature (see, for instance, Burgess and Stern (1993) and Besley and Persson (2014)).

Figure A-7: Share of personal income taxes and taxes on goods and services against median income

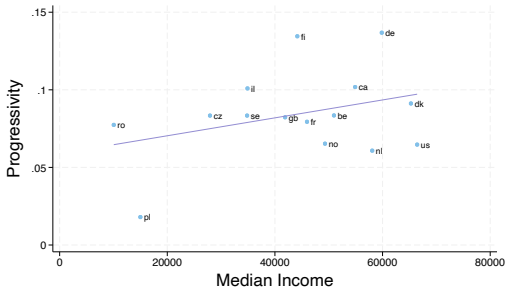


Notes: This figure plots the share of individual income taxes as well as taxes on goods and services against log median pre-tax income for each country in Wave 8 (2010).

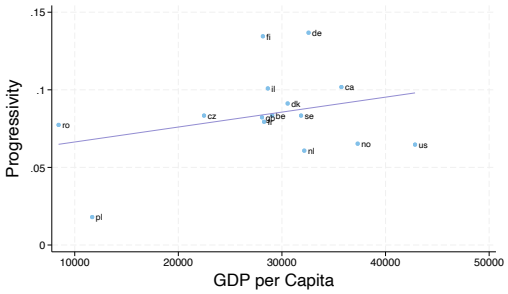
IV.2 Progressivity against median income GDP-per-capita

Figure A-8: Progressivity against median income and GDP per capita

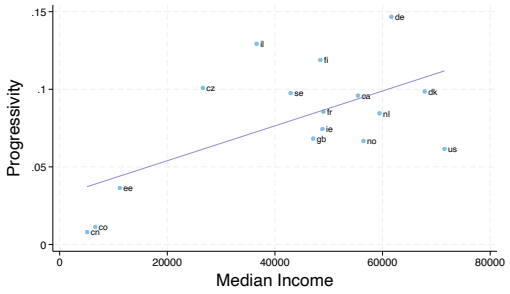
(a) Wave 4, 1995



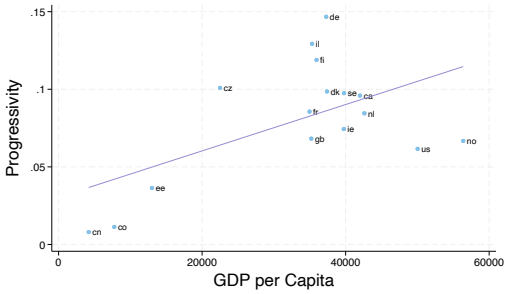
(b) Wave 4, 1995



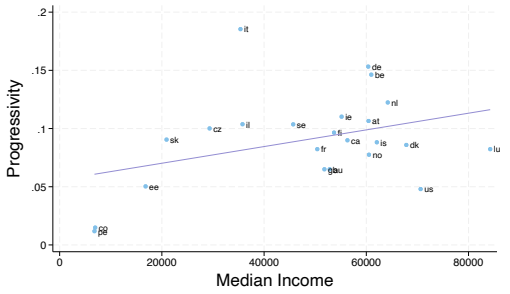
(c) Wave 5, 2000



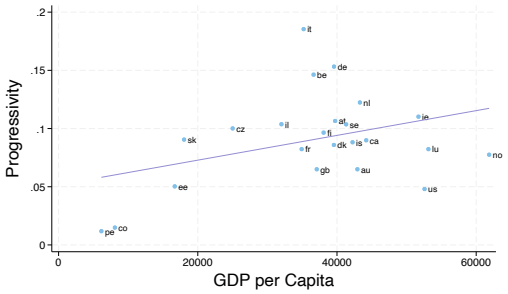
(d) Wave 5, 2000



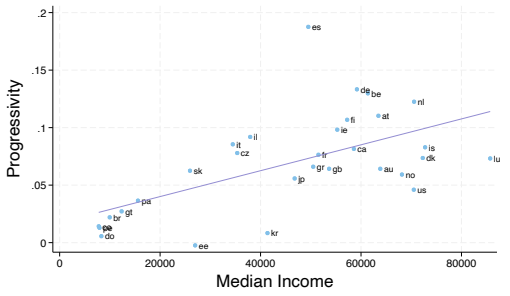
(e) Wave 6, 2004



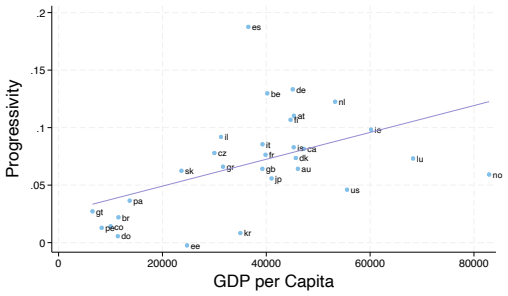
(f) Wave 6, 2004



(g) Wave 7, 2007

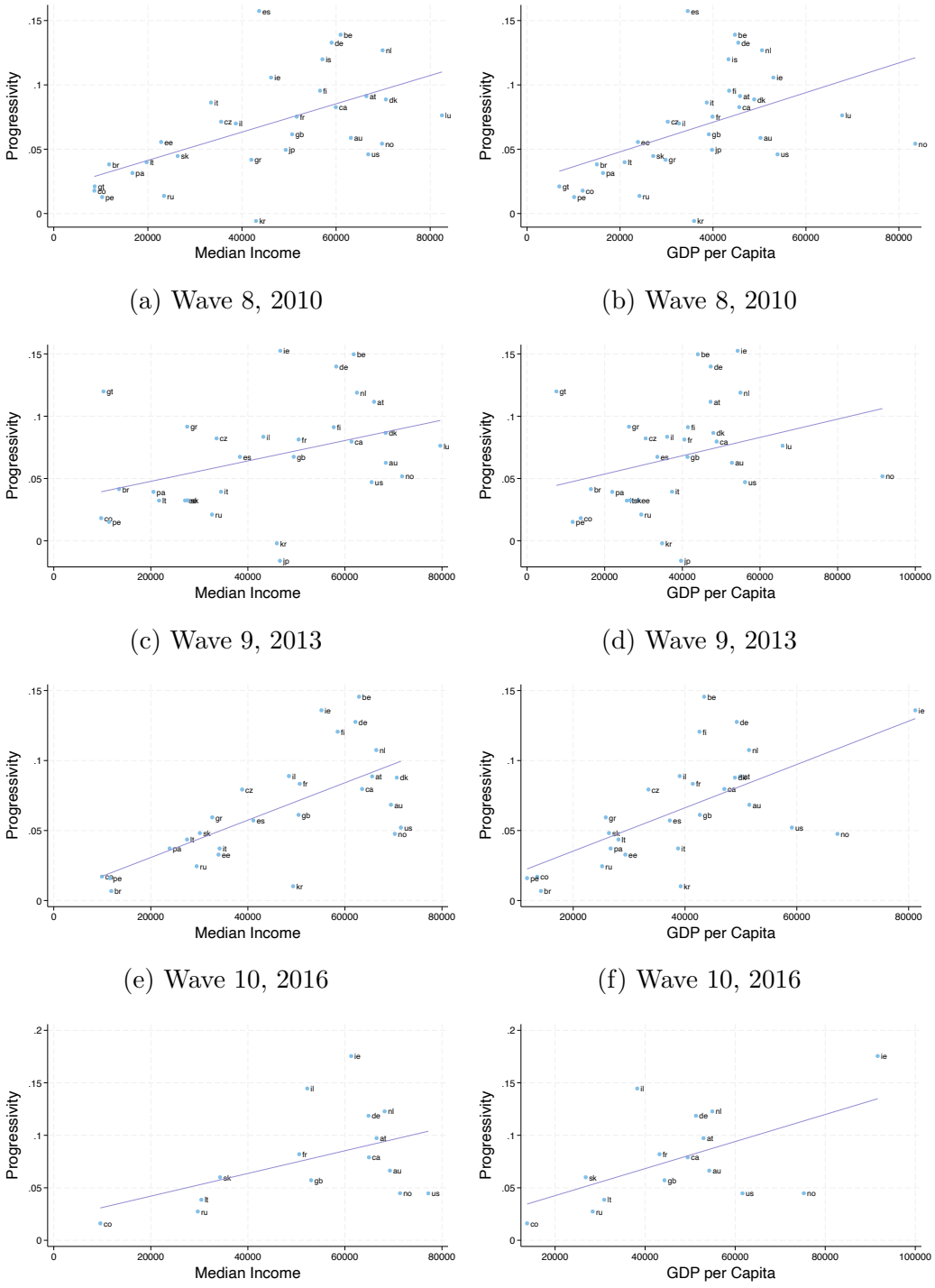


(h) Wave 7, 2007



Notes: Progressivity is measured by the parameter τ. GDP per capita comes from the Penn World Tables and is measured at chained PPP and in 2017 US dollars.

Figure A-9: Progressivity against median income and GDP per capita



(a) Wave 8, 2010

(b) Wave 8, 2010

(c) Wave 9, 2013

(d) Wave 9, 2013

(e) Wave 10, 2016

(f) Wave 10, 2016

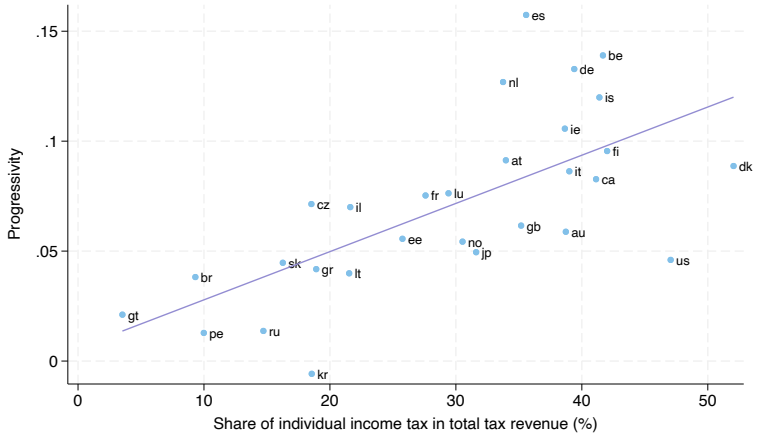
(g) 2019

(h) Wave 11, 2019

Notes: Progressivity is measured by the parameter τ. GDP per capita comes from the Penn World Tables and is measured at chained PPP and in 2017 US dollars.

IV.3 Progressivity against the share of personal income taxes

Figure A-10: Progressivity against the share of personal income taxes (Wave 8, 2010)



Notes: Progressivity is measured by the parameter τ we estimate using LIS data. The share of personal income taxes in total tax revenue is computed using GRD data.

V Additional Results on Progressivity by Household Type

Table A-13: Progressivity by Household Type

Country	Family Structure	Wave 1 1980	Wave 2 1985	Wave 3 1990	Wave 4 1995	Wave 5 2000	Wave 6 2004	Wave 7 2007	Wave 8 2010	Wave 9 2013	Wave 10 2016	Wave 11 2018
Australia	Married, no children	.	.	.	.	.	0.087	0.069	0.065	0.069	0.100	0.072
	Married with children	.	.	.	.	.	0.111	0.111	0.084	0.086	0.112	0.104
	Singles	.	.	.	.	.	0.053	0.053	0.047	0.047	0.046	0.048
	Single parents	.	.	.	.	.	0.064	0.073	0.064	0.063	0.090	0.072
Austria	Married, no children	.	.	.	.	.	0.097	0.122	0.120	0.131	0.161	0.150
	Married with children	.	.	.	.	.	0.124	0.138	0.119	0.143	0.115	0.130
	Singles	.	.	.	.	.	0.149	0.131	0.100	0.123	0.088	0.108
	Single parents	.	.	.	.	.	0.136	0.163	0.088	0.162	0.083	0.086
Belgium	Married, no children	.	.	0.049	0.093	.	0.163	0.179	0.139	0.172	0.151	.
	Married with children	.	.	0.152	0.220	.	0.192	0.162	0.209	0.221	0.215	.
	Singles	.	.	0.054	0.050	.	0.158	0.140	0.147	0.164	0.155	.
	Single parents	.	.	0.061	0.137	.	0.230	0.198	0.214	0.220	0.282	.
Brazil	Married, no children	.	.	.	.	.	.	0.024	0.041	0.046	0.007	.
	Married with children	.	.	.	.	.	.	0.027	0.041	0.047	0.004	.
	Singles	.	.	.	.	.	.	0.015	0.038	0.038	0.008	.
	Single parents	.	.	.	.	.	.	0.016	0.032	0.035	0.011	.
Canada	Married, no children	.	0.125	0.074	0.092	0.105	0.103	0.098	0.096	0.098	0.101	0.100
	Married with children	.	0.115	0.145	0.115	0.125	0.116	0.119	0.123	0.116	0.122	0.127
	Singles	.	0.054	0.076	0.135	0.100	0.096	0.083	0.089	0.087	0.086	0.085
	Single parents	.	0.083	0.117	0.119	0.134	0.125	0.122	0.114	0.121	0.109	0.108
China	Married, no children	.	.	.	.	0.005	.	.	.	.	.	.
	Married with children	.	.	.	.	0.009	.	.	.	.	.	.
	Singles	.	.	.	.	0.006	.	.	.	.	.	.
	Single parents	.	.	.	.	0.014	.	.	.	.	.	.
Colombia	Married, no children	.	.	.	.	0.014	0.018	0.017	0.023	0.023	0.021	0.019
	Married with children	.	.	.	.	0.013	0.017	0.016	0.021	0.023	0.021	0.021
	Singles	.	.	.	.	0.009	0.012	0.013	0.015	0.015	0.014	0.013
	Single parents	.	.	.	.	0.009	0.011	0.010	0.012	0.013	0.012	0.011
Czechia	Married, no children	.	.	0.132	0.137	0.132	0.131	0.140	0.105	0.120	0.113	.
	Married with children	.	.	0.077	0.112	0.122	0.114	0.121	0.101	0.103	0.098	.
	Singles	.	.	0.155	0.097	0.139	0.138	0.062	0.072	0.127	0.120	.
	Single parents	.	.	0.084	0.090	0.124	0.117	0.109	0.093	0.111	0.105	.
Denmark	Married, no children	.	0.071	0.106	0.178	0.182	0.163	0.136	0.133	0.122	0.122	.
	Married with children	.	0.146	0.153	0.193	0.205	0.177	0.174	0.152	0.147	0.150	.
	Singles	.	0.053	0.083	0.095	0.100	0.080	0.064	0.098	0.094	0.093	.
	Single parents	.	0.044	0.102	0.151	0.211	0.178	0.141	0.152	0.145	0.156	.
Dominican Republic	Married, no children	.	.	.	.	.	.	0.008	.	.	.	.
	Married with children	.	.	.	.	.	.	0.006	.	.	.	.
	Singles	.	.	.	.	.	.	0.003	.	.	.	.
	Single parents	.	.	.	.	.	.	0.005	.	.	.	.
Estonia	Married, no children	.	.	.	.	0.022	0.048	0.083	0.052	0.039	0.040	.
	Married with children	.	.	.	.	0.046	0.051	0.052	0.064	0.043	0.063	.
	Singles	.	.	.	.	0.040	0.064	-0.026	0.071	0.029	0.031	.
	Single parents	.	.	.	.	0.045	0.050	0.004	0.088	0.043	0.071	.
Finland	Married, no children	.	0.213	0.156	0.198	0.154	0.134	0.142	0.139	0.126	0.161	.
	Married with children	.	0.197	0.188	0.201	0.160	0.150	0.152	0.142	0.151	0.166	.
	Singles	.	0.210	0.161	0.198	0.170	0.110	0.144	0.106	0.094	0.161	.
	Single parents	.	0.196	0.211	0.218	0.187	0.173	0.134	0.156	0.170	0.180	.
France	Married, no children	0.053	0.050	0.081	0.089	0.098	0.099	0.093	0.091	0.098	0.107	0.097
	Married with children	0.072	0.060	0.088	0.099	0.105	0.094	0.088	0.084	0.100	0.109	0.101
	Singles	0.035	0.019	0.049	0.102	0.120	0.115	0.103	0.103	0.108	0.104	0.108
	Single parents	0.042	0.031	0.054	0.108	0.115	0.114	0.113	0.110	0.120	0.125	0.122
Germany	Married, no children	0.124	0.170	0.163	0.212	0.231	0.185	0.182	0.173	0.153	0.166	0.169
	Married with children	0.067	0.128	0.140	0.172	0.196	0.193	0.129	0.168	0.169	0.149	0.164
	Singles	0.148	0.138	0.155	0.153	0.169	0.193	0.168	0.162	0.188	0.152	0.133
	Single parents	0.116	0.144	0.149	0.175	0.196	0.210	0.209	0.202	0.192	0.178	0.179
Greece	Married, no children	.	.	.	.	.	.	0.097	0.041	0.089	0.056	.
	Married with children	.	.	.	.	.	.	0.066	0.033	0.094	0.063	.
	Singles	.	.	.	.	.	.	0.057	0.056	0.100	0.055	.
	Single parents	.	.	.	.	.	.	0.051	0.050	0.087	0.087	.
Guatemala	Married, no children	.	.	.	.	.	.	0.041	0.017	0.120	.	.
	Married with children	.	.	.	.	.	.	0.031	0.023	0.123	.	.
	Singles	.	.	.	.	.	.	0.016	0.019	0.138	.	.
	Single parents	.	.	.	.	.	.	0.016	0.017	0.111	.	.
Iceland	Married, no children	.	.	.	.	.	0.118	0.088	0.144	.	.	.
	Married with children	.	.	.	.	.	0.111	0.119	0.168	.	.	.
	Singles	.	.	.	.	.	0.156	0.121	0.136	.	.	.
	Single parents	.	.	.	.	.	0.160	0.131	0.192	.	.	.
Ireland	Married, no children	.	.	.	.	0.108	0.128	0.109	0.100	0.155	0.212	0.221
	Married with children	.	.	.	.	0.111	0.138	0.152	0.183	0.202	0.223	0.227
	Singles	.	.	.	.	0.054	0.107	0.079	0.073	0.169	0.098	0.241
	Single parents	.	.	.	.	0.058	0.105	0.073	0.105	0.091	0.113	0.157

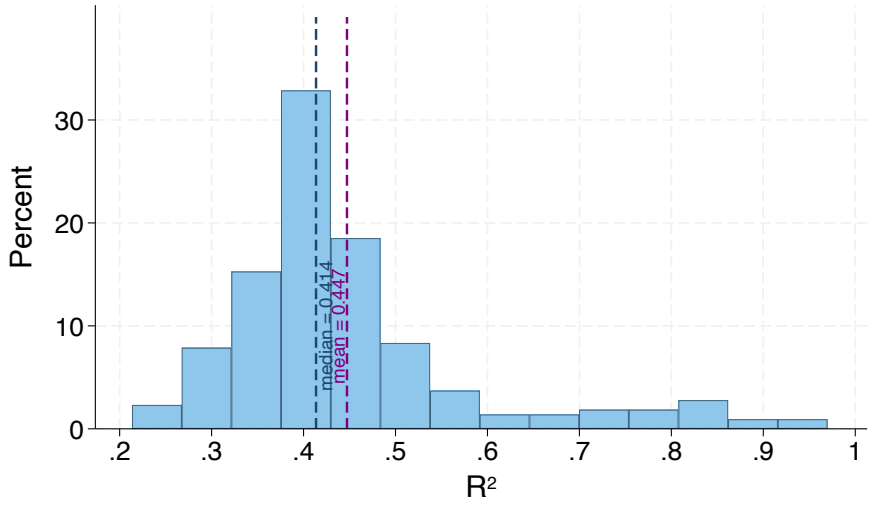
Table A-14: Progressivity by Household Type

Country	Family Structure	Wave 1 1980	Wave 2 1985	Wave 3 1990	Wave 4 1995	Wave 5 2000	Wave 6 2004	Wave 7 2007	Wave 8 2010	Wave 9 2013	Wave 10 2016	Wave 11 2018
Israel	Married, no children	.	0.177	0.163	-0.062	0.153	0.131	0.115	0.103	0.105	0.132	0.130
	Married with children	.	0.199	0.184	0.138	0.153	0.109	0.106	0.074	0.098	0.105	0.116
	Singles	.	0.091	0.154	0.161	0.095	0.097	0.077	0.071	0.079	0.077	0.343
	Single parents	.	-0.111	0.116	0.075	0.081	0.069	0.043	0.047	0.044	0.056	0.086
Italy	Married, no children	.	.	.	.	.	0.257	0.164	0.069	0.054	0.041	.
	Married with children	.	.	.	.	.	0.226	0.087	0.101	0.048	0.038	.
	Singles	.	.	.	.	.	0.214	0.097	0.088	0.038	0.039	.
	Single parents	.	.	.	.	.	0.107	0.052	0.072	0.025	0.029	.
Japan	Married, no children	.	.	.	.	.	.	0.074	0.064	0.081	.	.
	Married with children	.	.	.	.	.	.	0.058	0.075	0.061	.	.
	Singles	.	.	.	.	.	.	0.084	0.059	-0.092	.	.
	Single parents	.	.	.	.	.	.	0.060	0.087	0.057	.	.
Lithuania	Married, no children	.	.	.	.	.	.	.	0.048	0.052	0.055	0.064
	Married with children	.	.	.	.	.	.	.	0.048	0.046	0.042	0.041
	Singles	.	.	.	.	.	.	.	0.036	0.030	0.034	0.028
	Single parents	.	.	.	.	.	.	.	0.041	0.043	0.124	0.110
Luxembourg	Married, no children	.	.	.	.	.	0.097	0.121	0.137	0.116	.	.
	Married with children	.	.	.	.	.	0.107	0.120	0.106	0.121	.	.
	Singles	.	.	.	.	.	0.132	0.089	0.114	0.104	.	.
	Single parents	.	.	.	.	.	0.112	0.054	0.108	0.146	.	.
Netherlands	Married, no children	.	.	0.032	0.044	0.118	0.124	0.145	0.162	0.137	0.156	0.162
	Married with children	.	.	0.039	0.122	0.159	0.168	0.160	0.172	0.179	0.148	0.162
	Singles	.	.	0.041	0.062	0.067	0.155	0.187	0.187	0.148	0.142	0.180
	Single parents	.	.	0.077	0.046	0.124	0.123	0.183	0.136	0.099	0.166	0.192
Norway	Married, no children	.	0.147	0.155	0.069	0.123	0.093	0.121	0.099	0.099	0.089	0.078
	Married with children	.	0.137	0.154	0.144	0.147	0.126	0.133	0.125	0.123	0.100	0.097
	Singles	.	0.079	0.044	0.058	0.059	0.086	0.051	0.045	0.042	0.040	0.038
	Single parents	.	0.157	0.158	0.134	0.151	0.074	0.084	0.079	0.074	0.068	0.064
Panama	Married, no children	.	.	.	.	.	.	0.041	0.035	0.047	0.043	.
	Married with children	.	.	.	.	.	.	0.041	0.038	0.049	0.043	.
	Singles	.	.	.	.	.	.	0.032	0.022	0.029	0.025	.
	Single parents	.	.	.	.	.	.	0.030	0.030	0.035	0.036	.
Peru	Married, no children	.	.	.	.	.	0.017	0.011	0.017	0.019	0.022	.
	Married with children	.	.	.	.	.	0.013	0.016	0.016	0.019	0.019	.
	Singles	.	.	.	.	.	0.010	0.009	0.008	0.010	0.010	.
	Single parents	.	.	.	.	.	0.009	0.008	0.010	0.012	0.015	.
Poland	Married, no children	.	.	.	0.019	.	.	.	.	.	.	.
	Married with children	.	.	.	0.021	.	.	.	.	.	.	.
	Singles	.	.	.	0.030	.	.	.	.	.	.	.
	Single parents	.	.	.	0.023	.	.	.	.	.	.	.
Republic of Korea	Married, no children	.	.	.	.	.	.	0.001	-0.037	-0.013	0.004	.
	Married with children	.	.	.	.	.	.	0.009	0.004	0.005	0.015	.
	Singles	.	.	.	.	.	.	0.001	-0.022	-0.017	0.005	.
	Single parents	.	.	.	.	.	.	-0.006	0.000	-0.039	-0.039	.
Romania	Married, no children	.	.	.	0.091	.	.	.	.	.	.	.
	Married with children	.	.	.	0.074	.	.	.	.	.	.	.
	Singles	.	.	.	0.097	.	.	.	.	.	.	.
	Single parents	.	.	.	0.079	.	.	.	.	.	.	.
Russian Federation	Married, no children	.	.	.	.	.	.	.	0.017	0.027	0.034	0.034
	Married with children	.	.	.	.	.	.	.	0.017	0.017	0.021	0.026
	Singles	.	.	.	.	.	.	.	0.016	0.029	0.033	0.036
	Single parents	.	.	.	.	.	.	.	0.009	0.026	0.026	0.027
Slovakia	Married, no children	.	.	0.145	.	.	0.115	0.106	0.082	0.060	0.059	0.091
	Married with children	.	.	0.101	.	.	0.097	0.074	0.053	0.015	0.061	0.052
	Singles	.	.	0.112	.	.	0.158	0.102	0.051	0.036	0.051	0.086
	Single parents	.	.	0.075	.	.	0.084	0.061	0.057	0.058	0.079	0.075
Spain	Married, no children	.	.	.	.	.	.	0.177	0.092	0.045	0.064	.
	Married with children	.	.	.	.	.	.	0.234	0.226	0.068	0.079	.
	Singles	.	.	.	.	.	.	0.171	0.111	0.091	0.032	.
	Single parents	.	.	.	.	.	.	0.097	0.224	0.030	0.131	.
Sweden	Married, no children	0.110	0.111	0.104	0.116	0.102	0.137	.	.	.	.	.
	Married with children	0.140	0.157	0.144	0.163	0.135	0.153	.	.	.	.	.
	Singles	0.064	0.174	0.074	0.099	0.152	0.153	.	.	.	.	.
	Single parents	0.147	0.177	0.155	0.117	0.181	0.158	.	.	.	.	.
United Kingdom	Married, no children	0.084	0.091	0.049	0.085	0.069	0.070	0.065	0.064	0.070	0.074	0.069
	Married with children	0.032	0.018	0.041	0.091	0.083	0.087	0.077	0.092	0.110	0.098	0.083
	Singles	0.135	0.134	0.104	0.073	0.057	0.053	0.054	0.041	0.046	0.039	0.043
	Single parents	0.122	0.114	0.114	0.124	0.093	0.079	0.098	0.105	0.069	0.078	0.010
United States	Married, no children	0.113	0.085	0.083	0.072	0.069	0.052	0.058	0.054	0.052	0.054	0.055
	Married with children	0.100	0.103	0.095	0.098	0.103	0.082	0.073	0.082	0.083	0.092	0.077
	Singles	0.055	0.053	0.056	0.051	0.048	0.041	0.041	0.040	0.038	0.041	0.038
	Single parents	0.066	0.072	0.063	0.057	0.053	0.046	0.042	0.041	0.045	0.057	0.048

VI The Role of Transfers for Progressivity

Fit of the tax and transfer function. Figure A-11 shows the distribution of the R^2 we obtained when estimating the tax and transfer function described in Section 3.4. Both the mean and median R^2 are more than half as small as those we obtained when estimating the tax function, denoting a poorer fit of the log-linear tax-and-transfer function.

Figure A-11: R^2 for the tax and transfer function

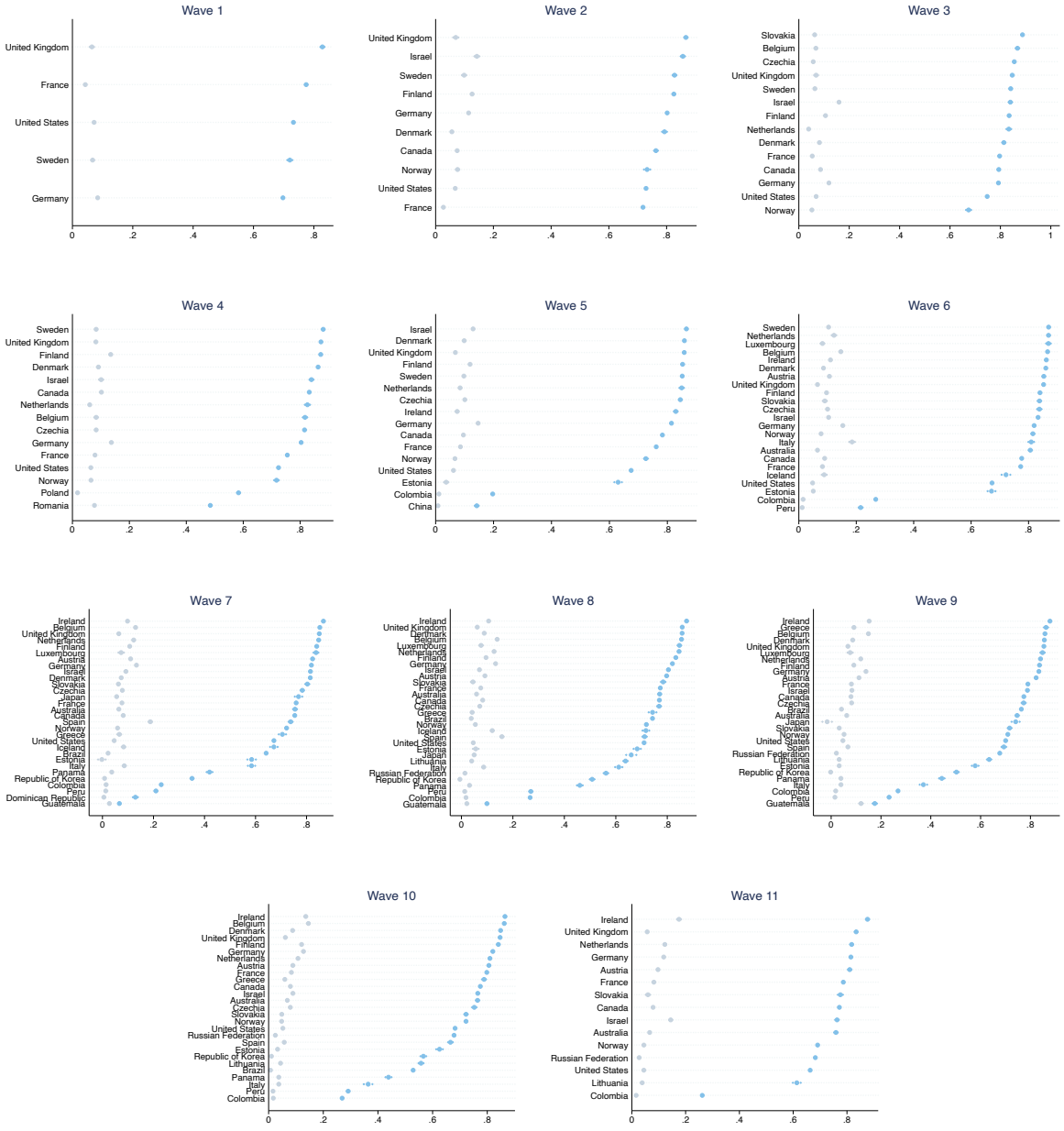


Additional results. Figure A-12 compares the progressivity parameter τ for the tax and the tax-and-transfer function in all the LIS waves.

Comparison with other studies. Table A-15 compares our results on tax-and-transfer progressivity to those in Chang, Chang, and Kim (2018). To make our results comparable to theirs, we re-estimate our tax-and-transfer function after trimming the bottom 20% of the pre-tax income distribution in each country.

Table A-16 compares our results on tax-and-transfer progressivity to those in Heathcote, Storesletten, and Violante (2017). To make our results comparable to theirs, we modify the transfer definition to include only household family benefits, unemployment benefits, and sickness and injury pay. Heathcote, Storesletten, and Violante (2017) pools data from the 2000, 2002, 2004, and 2006 waves of the CPS. We compare their result to our results for waves 5 (2000), 6 (2004), and 7 (2007).

Figure A-12: Comparison of progressivity for the tax and tax-and-transfer functions



Notes: The gray dots mark the progressivity parameter τ from the tax function. The blue ones denote the progressivity parameter τ from the tax-and-transfer function. Gray and blue diamonds mark the 95% confidence interval for the corresponding progressivity.

Table A-15: Comparison of tax-and-transfer progressivity with Chang, Chang, and Kim (2018)

Country	τ	τ (CCK)
Denmark	0.22	0.44
Estonia	0.10	0.31
Finland	0.22	0.46
France	0.16	0.37
Germany	0.17	0.51
Greece	0.15	0.26
Iceland	0.22	0.35
Ireland	0.55	0.46
Israel	0.19	0.22
Italy	0.36	0.35
Luxembourg	0.21	0.37
Netherlands	0.19	0.48
Poland	0.13	0.21
Slovakia	0.17	0.33
Spain	0.13	0.24
United Kingdom	0.23	0.31
United States	0.18	0.25

Notes: The column τ denotes our estimate of tax-and-transfer progressivity when we trim the bottom 20% of the pre-tax income distribution in each country. The column τ (CCK) reports the estimates of progressivity in Chang, Chang, and Kim (2018).

Table A-16: Comparison of tax-and-transfer progressivity with Heathcote, Storesletten, and Violante (2017)

τ (HSV)	τ (2000)	τ (2004)	τ (2007)
0.181	0.598	0.592	0.590

Notes: The column τ (HSV) reports the estimate of tax-and-transfer progressivity in Heathcote, Storesletten, and Violante (2017). The remaining columns report our estimates in three waves when we use a comparable definition of transfer.