# On the Taxation of Financial Asset Income in Poland*

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**Abstract**

This paper studies the optimal taxation of income from financial assets in Poland. Using household-level data, I document substantial heterogeneity in portfolio composition and show that implied long-run returns rise strongly with the scale of financial wealth. I embed this evidence in a model with household heterogeneity in labor productivity and portfolio returns. In the calibrated model, a revenue-neutral reform that replaces the flat 19% tax with a strongly progressive schedule improves welfare by reducing consumption inequality at older ages, despite lower savings and average returns.

**Keywords:** heterogeneous returns, financial assets, income tax, financial literacy

**JEL Codes:** H24, D31, E21, G11

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# 1 Introduction

In Poland, the statutory personal income tax on labor earnings is progressive, while income from household financial assets (e.g., interest, dividends, realised capital gains) is taxed at a flat rate of 19% (often referred to as the "Belka tax" after the Prime Minister Marek Belka who introduced it). This asymmetry raises a basic policy question: if the rationale for progressivity in labor taxation is redistribution and insurance, is it desirable to keep financial-asset-income taxation proportional? To address this question, this paper evaluates the distributional and efficiency implications of progressive taxation of income from financial assets in an environment with heterogeneous returns.

I begin by documenting large heterogeneity in household financial portfolios in Poland using the third wave of the Household Finance and Consumption Survey (HFCS). Then, I construct expected long-run nominal returns by mapping each household's portfolio composition into asset-class return moments from external data, in the spirit of Jordá et al. (2019). In reduced form, I find that implied portfolio returns rise strongly with the scale of financial wealth, while labor income is not a robust predictor of returns once asset holdings are controlled for.

I then embed this evidence in a calibrated model of optimal capital-income taxation with return heterogeneity, building on Gerritsen et al. (2024) and calibratinig it to the institutional environment to Poland. I evaluate revenue-neutral reforms that replace the existing proportional tax on income from financial assets with a progressive schedule. While higher progressivity discourages saving and lowers average returns, it also provides redistributional benefits.

Quantitatively, the revenue-neutral reform of the Belka tax raises average financial-assets-income tax collections from 19% of taxable income under the proportional baseline to about 25% under the progressive schedule. At the top of the financial asset income distribution, the implied marginal tax rate at the 99th percentile of post-reform asset distribution reaches roughly 63%. At the bottom, income from financial assets is subsidised. The reform leads to a mild drop in labour supply which falls by 1.5% and much more strongly discourages savings which drop by about 12%. The consumption of young agents increases by 6% and that of the old decreases by about 12%. The distributional gains come predominantly from reducing inequality in consumption of old agents by about one-sixth.[1]

This paper contributes to two strands of the literature. Firstly, it contributes to the literature on the Polish tax system reforms by quantitatively studying reforms of taxes levied on income from financial assets in an environment with heterogeneous returns and abilities. While the heterogeneity in returns being a rationale for positive capital income taxation is well established, little is known about the optimality of the current tax arrangements in Poland in this regard. Karnowski and Rzońca (2021) discuss implications of growth theory for the design of tax policy mix in Poland. They discuss capital taxation primarily through corporate income taxation and effective investment wedges, abstracting from household-level taxation of financial assets which is the focus of my paper.

[1]The precise optimal tax schedule and its welfare effects are inherently quantitative outcomes of the model; the results elucidate the mechanisms through which replacing a flat tax on financial asset income with a progressive schedule affects welfare.

Goraus-Tańska and Inchauste (2016) provide a rich and comprehensive microsimulation of the Polish tax–benefit system that quantifies the distributional role of labor, capital, and consumption taxes. By design, their counterfactuals are partial-equilibrium, holding household behaviour fixed, whereas my analysis incorporates life-cycle savings and portfolio responses under return and productivity heterogeneity.

Additionally, the paper contributes to the literature on measurement of wealth inequality in Poland. Grejcz and Żółkiewski (2017) analyse the wealth inequality in Poland using HFCS data. I complement their work by showing how heterogeneity in asset portfolios translates into differences in returns.

# 2 Empirical Analysis

## 2.1 Data

I use the data from the third wave of the HFCS for Poland. The HFCS is a harmonised household survey coordinated by the ECB and implemented by national central banks and statistical offices in the euro area and selected countries outside of it. The HFCS collects detailed information on household balance sheets, income, employment and demographics. The third wave of HFCS data for Poland comes from the Household Wealth and Debt Survey (BZGD) conducted in 2016.

## 2.2 Sample Selection and Descriptive Statistics

Taxing capital income affects households not only through their portfolio returns but also through their ability to smooth consumption over time, which in turn feeds back into their labor-supply incentives. When capital income is taxed, saving becomes more costly, and households face tighter intertemporal trade-offs between consumption and work. Arguably, these intertemporal choices differ systematically across the income distribution. With these considerations in mind, I restrict the HFCS sample. Firstly, I keep only households with strictly positive labor income. Secondly, I exclude households with adult members aged 65 or older as their asset positions reflect life-cycle decumulation rather than active saving behaviour. Finally, because of differences in tax treatment of singles and couples in Poland, due to joint filing opportunities, I further restrict the data to couples with either one or two economically active adults. In the end, my sample consists of 1381 household-level observations across five implicates of the HFCS.[2]

[2]The HFCS relies on multiple imputation to address item non-response, which is particularly prevalent for wealth components. Each household appears in the data with five implicates, corresponding to five completed versions of missing variables drawn from the joint posterior distribution implied by the HFCS imputation model. In addition, the HFCS follows a complex survey design with unequal sampling probabilities and stratification. To ensure representativeness and correct inference, in what follows, all descriptive statistics and regressions are estimated using the provided household survey weights. Standard errors further incorporate the HFCS replicate bootstrap weights, which reflect the sampling design and clustering.

## 2.3 Motivating Evidence: Heterogeneous Asset Portfolios

I begin by demonstrating heterogeneity in asset portfolios of Polish households in the HFCS data. To this end, I compute the incidence of each asset class across the gross labor income and financial assets distributions. In order to do that, I define ownership dummies for each asset class that equals to one if a household report positive holding and zero otherwise. Then, I calculate the share of households for which this dummy is positive within each decilse of gross labor income and financial asset distributions. While nearly all households (99.7% of them) report positive holdings of sight deposits, there is substantial variation in holdings of remainding financial assets which I present on Figure 1. The incidence of term deposits (top-left panel of the Figure) exhibits a stable positive gradient with respect to household's position in the financial asset distribution but is relatively flat when it comes to labor income distribution. Bonds are essentially only held by households in the top three deciles of each distribution (top-right panel). The incidence of stock ownership and assets with delegated management (mutual funds and managed accounts) exhibits much greater dispersion and gradient than that of bonds across gross labor income and financial asset distributions.

## 2.4 Financial Literacy, Scale, and Expected Long-Run Returns

Household-level taxation of financial assets in Poland applies to realised income flows rather than to asset stocks themselves. A natural next step is thus to ask whether the pronounced heterogeneity in asset portfolio composition in Poland is also associated with systematic differences in realised returns. Nevertheless, HFCS data on income from financial assets are not well suited for this part of the analysis. In particular, responses to questions on financial income exhibit substantial missingness: only about 10% of households report any income from financial assets, despite all households in the sample holding positive financial wealth. This reflects the fact that returns on financial assets are often realised as capital gains rather than cash flows, are reported infrequently or opaquely for many financial products, and are subject to recall and reporting frictions.

Moreover, the HFCS records financial income over a single calendar year, so even households that receive positive financial income on average may not report it in the survey year. As a result, observed financial income in the HFCS provides an incomplete and noisy snapshot that is poorly suited for capturing households' long-run returns on financial wealth. Therefore, I instead construct proxies for long-run returns on main asset classes, in the spirit of Jordá et al. (2019).

**Long-Run Annual Nominal Returns** To map the portfolio composition to long-run returns, I distinguish four broad financial asset classes: stocks, bonds, term deposits and sight deposits. For the first asset class, I take the data provided by the Warsaw Stock Exchange (WSE) for years 2003 - 2024. This time period captures Poland joining the EU in 2004 together with any anticipatory effects in the year prior. I compute the geometric mean of annual price returns on the WIG, the main, broad-market index of the WSE. As WIG is a price index, this return reflects capital gains only thus dividend yields are incorporated separately. I find that in this period,

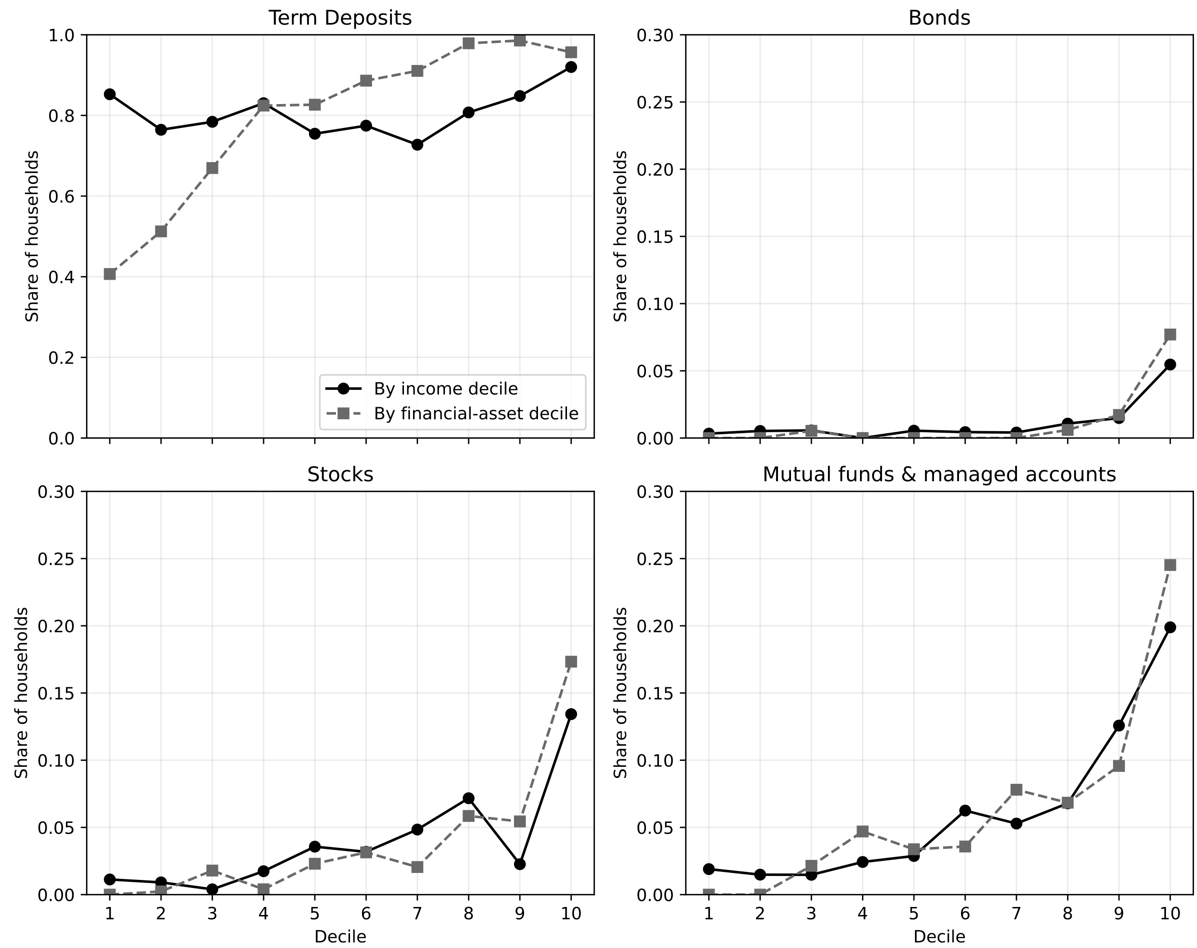


Figure 1: Incidence of financial asset holdings by deciles of household labor income and financial assets. The figure shows, for each asset class, the share of households holding the asset across deciles of gross household labor income (solid line) and household financial assets (dashed line). *Source*: Own calculations based on HFCS Wave 3 data for Poland.

the average annual capital gain was 3.4% and the dividend yield was 2.8%. Then, I take the sum of these two, 6.2%, as a proxy for long-run nominal return on stocks. Regarding bonds, I calculate an average annual yield on ten-year government bonds in the same reference period, obtaining the value of 4.6%. For the deposits, I calculate average returns using data provided by the National Bank of Poland. For term deposits, I find the average nominal annual return to equal 3% and its counterpart for sight deposits is 1%.

Apart from information on directly held four broad asset classes, households also hold them through third-party managed investment vehicles like mutual funds and managed accounts. The HFCS provides detailed information on the composition of the former. I calculate the median share of equity in mutual funds to be 0.63 in my sample and I set this to be the share of stocks in mutual funds, the remainder being invested in bonds. Managed accounts are distinct investment vehicles, offering more tailor-made services to high-end customers. Evidence on composition and performance of managed accounts in Poland is, to the best of my knowledge, not available. Thus, I follow Elton et al. (2013) by assuming a reasonable first-order proxy to the asset structure held through managed accounts is that they are fully invested in stocks.

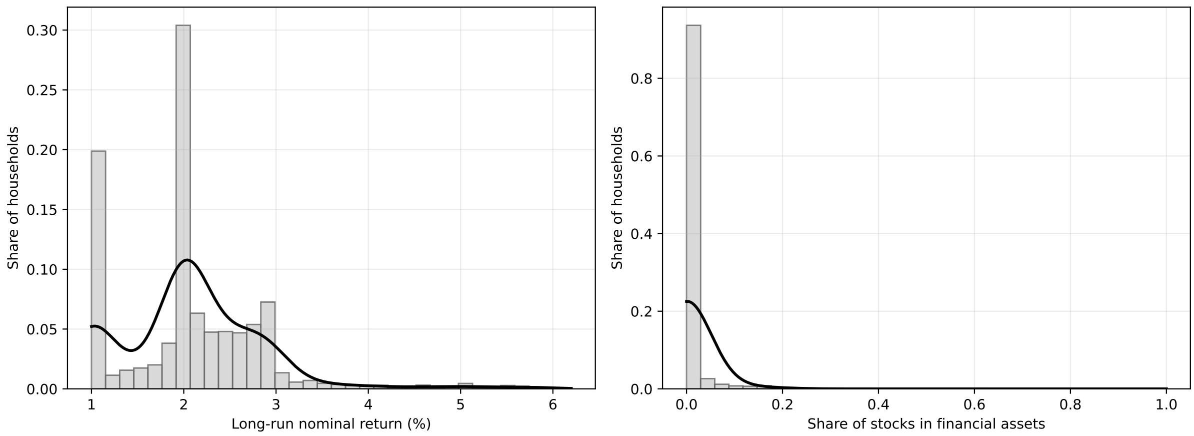


Figure 2: Distribution of implied long-run returns on financial asset portfolios (left) and share of stocks in overall financial wealth (right). *Source*: Own calculations based on HFCS Wave 3 data for Poland.

To conclude, the long run return of household $i$ on the portfolio it holds is approximated as a weighted average of the abovementioned returns for each asset class $j$, $r_j$:

$$r_i = \sum_j \mu_{i,j} r_j \text{ with } j \in \{\text{sight dep., term dep., bonds, stocks}\},$$

where the weights $\mu_{ij}$ are computed from portfolio composition of household $i$:

$$\mu_{i,\text{sight dep.}} = \frac{\text{sight deposits}_i}{\text{financial assets}_i}, \qquad \mu_{i,\text{bonds}} = \frac{\text{bonds}_i + 0.37 \times \text{mut. funds}_i}{\text{financial assets}_i},$$
$$\mu_{i,\text{term dep.}} = \frac{\text{term deposits}_i}{\text{financial assets}_i}, \qquad \mu_{i,\text{stocks}} = \frac{\text{stocks}_i + 0.63 \times \text{mut. funds}_i + \text{mng. acc.}_i}{\text{financial assets}_i}.$$

I present the resulting distribution of long-run return implied by this method on the left panel of Figure 2. The average return is approximately 2% and there are two clear mass points in the distribution at 1%, and 2%. The distributon of return is right-skewed (skewness of 1.11) and has a long right tail (kurtosis of 6.6). This is predominantly due to extremely uneven exposure to stocks (see the right panel of the Figure). Indeed, almost 90% of households hold no stocks in the sample.

**Estimation** Next, I investigate correlations between long-run return variable I constructed and individual income or size of financial assets. This aims at testing in reduced form, two hypotheses on financial asset return heterogeneity in Poland. Firstly, the observed heterogenity in long-run returns can be due to financial literacy. More financially literate agents would achieve higher returns and it is posited that more able/productive agents are also more financially literate (see Lusardi and Mitchell (2014) for a survey).

Another hypothesis is that achieving a higher return is due to scale of investment (see Bach et al. (2020)). The scale hypothesis posits that larger portfolios earn higher returns because fixed participation, information, and management costs can be spread over a larger asset base, allowing wealthier households to access higher-return instruments and more efficient diversification.

To this end, I regress the logarithm of gross nominal return on logarithms of labor income and financial assets. Both regressors are normalised by average household labor income in the sample and denoted by $y$ and $a$, respectively. Formally, I estimate:

$$\ln(1 + r_i) = \beta_0 + \beta_y \ln(y_i) + \beta_a \ln(a_i) + \varepsilon_i. \tag{1}$$

This regression is intended to document reduced-form correlations rather than causal effects: income and financial assets are endogenous to portfolio choice and returns, and the estimated coefficients should be interpreted as descriptive associations rather than structural or causal parameters. Estimating positive and significant $\beta_y$ proxies for the financial literacy hypothesis. Similarly, positive and significant $\beta_a$ captures the scale hypothesis.

**Results** The regression in Equation (1) is estimated using the five implicates of the HFCS. Point estimates are combined across implicates using Rubin (1987) rules, whereby coefficients are averaged across imputations and standard errors account for both within- and between-imputation variance. All regressions are estimated using the HFCS survey weights and replicate bootstrap weights, so reported inference reflects both multiple imputation uncertainty and the complex survey design. The estimated regression is presented below in Equation (2):

$$\ln(1 + r_i) = \underset{(0.00036)}{0.0243}^{***} + \underset{(0.00049)}{0.0008} \ln(y_i) + \underset{(0.00015)}{0.0023}^{***} \ln(a_i), \tag{2}$$

Standard errors in parentheses. $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.10$.

The estimates indicate a strong and statistically significant role for financial wealth in shaping long-run portfolio return, in line with the scale hypothesis. labor income alone does not significantly predict nominal returns.

**Discussion** The average annual return on stocks of 6.2% is a fairly conservative estimate. For example, Jordá et al. (2019) construct a historical database covering period of 1870-2015 on 17 developed economies. The sum of median annual capital gain and dividend yield in their data is 8.2%. Thus, the baseline approach in the paper is likely to underestimate the dispersion in long-run returns offering a lower bound estimate for how dispersed are nominal returns on financial assets. Another important caveat pertains to whether managed accounts and mutual funds deliver superior or inferior returns relative to broad market indices. In case privately managed wealth yields higher-than-average returns, my results would again underscore the true heterogeneity in returns on financial assets in Poland.

# 3 Model

In the previous section, I have documented pervasive heterogeneity in proxied long-run returns on financial assets in Poland on the household level. In this section, I briefly describe the model of optimal taxation with heterogeneous returns from Gerritsen et al. (2024) which I then calibrate on HFCS data for Poland in the next Section.[3]

The economy is populated by households who live for two periods, agents in the first period are *young* and in the second period are *old*. Each model period consists of $k$ identical years. Households make their labor supply and saving decisions once when young and repeat these decisions in each of the $k$ working years. As a result, labor income, savings, and returns are constant at the annual level within each model period. This block structure allows the model to be mapped directly to annual data while retaining a parsimonious two-period formulation.

Households are indexed by labor productivity $n$, drawn from a distribution with cumulative distribution function $F(n)$ and density $f(n)$. Productivity maps one-to-one into labor income. A household of type $n$ supplying $l^n$ units of labor earns gross labor income

$$y^n = nl^n. \tag{3}$$

When young, the household pays labor income taxes $T(y^n)$, consumes $c_1^n$, and saves $a^n$:

$$y^n - T(y^n) = c_1^n + a^n. \tag{4}$$

The tax-and-transfer system follows a Benabou (2002) tax function,

$$y - T(y) = (1 - \lambda)y^{1-\tau}, \tag{5}$$

where $\lambda$ governs the overall level of redistribution and $\tau$ captures progressivity.

Savings $a^n$ earn a *nominal annual return* $r^{\text{ann}}(a^n)$, which depends on the level of assets. This dependence is directly motivated by the empirical evidence documented in the previous section. Inflation occurs at a constant annual rate $\pi$. Taxes on nominal income on financial assets are levied on *nominal returns upon realization* at a constant rate $\psi$. The nominal return between work and retirement periods is thus $r^{\text{nom}}(a^n) = (1 + r^{\text{ann}}(a^n))^k - 1$. Then, the after-tax model-period real return $\widetilde{r}(a^n)$ is:

$$1 + \widetilde{r}(a^n) = \frac{1 + (1 - \psi)r^{\text{nom}}(a^n)}{(1 + \pi)^k}. \tag{6}$$

When old, households consume their accumulated savings together with a public pension $b(y^n)$, which depends on first-period labor income. Second-period consumption is therefore given by

$$c_2^n = (1 + \widetilde{r}(a^n))\, a^n + b(y^n). \tag{7}$$

The inclusion of a tax-financed public pension system goes beyond Gerritsen et al. (2024), who calibrate their model to U.S. data and assume retirement is financed solely from private savings. This extension reflects the near-universal coverage of public pensions in Poland.

The household's preferences over consumption and labor are described by the following

[3] Note, this section merely adjusts their model to the calibration strategy and Polish institutional setup.

utility function:

$$U(c_1.c_2, l) = \frac{c_1^{1-\frac{1}{\sigma}}}{1-\frac{1}{\sigma}} + \beta\frac{c_2^{1-\frac{1}{\sigma}}}{1-\frac{1}{\sigma}} - \chi\frac{l^{1+\frac{1}{\epsilon}}}{1+\frac{1}{\epsilon}}. \tag{8}$$

The government budget constraint is balanced with exogenous revenue $G$.

$$0 = \int T(y^n) + \psi r^{\text{nom}}(a^n)a^n - b(y^n)dF(n) + G \tag{9}$$

The exogenous spending requirement captures the idea that the government spends tax revenues not only on transfers and pensions (e.g., consumption taxes, spending on public goods etc.).

# 4 Quantitative Analysis

In this section I first discuss how I calibrate the parameters of the model and assess its fit. Then, I evaluate counterfactual tax reforms.

## 4.1 Model Calibration and Fit

I calibrate the two-period model to annual data and set $k = 30$ to be the number of years in a model period.[4] I set several preference parameters to standard values used in the literature. To this end, I set the elasticity of the intertemporal substitution $\sigma = 0.5$. Then, the Frisch elasticity is set to $\epsilon = 0.22$. The distribution of nominal returns $r^{\text{ann}}$ is assumed to be bouned below by $\underline{r}^{\text{ann}}$ and above by $\overline{r}^{\text{ann}}$. Inspired directly by the empirical distribution, I set $\underline{r}^{\text{ann}} = 0.01$ and $\overline{r}^{\text{ann}} = 0.072$ as the average between the highest value in the HFCS sample and the median return on stocks reported by Jordá et al. (2019).[5] The inflation rate is set to $\pi = 0.02$.

The discount factor $\beta$ is calibrated following the logic of Gerritsen et al. (2024). Because each model period represents a block of $k$ identical years, $\beta$ should be interpreted as a *model-period* discount factor rather than an annual one. To discipline its value, I tie $\beta$ to the lowest feasible after-tax real return available in the economy. Thus, I set the model-period discount factor to $\beta = 1/(1 + \underline{\tilde{r}})$. This normalization ensures that households with access only to the lowest-return asset are approximately indifferent at the margin between consuming in the working period and saving for retirement. Importantly, $\beta$ in this formulation captures not only pure time preference but also institutional and precautionary motives associated with retirement saving. $\beta$ should therefore be interpreted as a reduced-form parameter governing intertemporal trade-offs over a long horizon rather than as a short-run subjective discount factor.[6]

[4] Because both periods are of equal length and internally homogeneous, annual flows in the model map directly to empirically observed annual data. The choice of $k = 30$ is a normalization and does not affect the model's implications.

[5] This slight relaxation of the upper bound also accounts for the fact that the very top of the wealth and return distribution is underrepresented in survey data.

[6] The lowest nominal return in the data implies negative real return for moderate inflation level. Nevertheless, as demonstrated in the previous section, the majority of households only makes use of simple financial assets, accepting negative real return precisely for consumption-smoothing motives between activity and retirement

Table 1: Exogenously calibrated parameters

| Parameter | Value | Source |
|---|---|---|
| Intertemporal elasticity of substitution $\sigma$ | 0.5 | Gerritsen et al. (2024) |
| Frisch elasticity $\epsilon$ | 0.22 | Gerritsen et al. (2024) |
| Inflation rate $\pi$ | 0.02 | Long-run average within inflation target |
| Lower bound on annual nominal return $\underline{r}^{\text{ann}}$ | 0.01 | HFCS data |
| Upper bound on annual nominal return $\overline{r}^{\text{ann}}$ | 0.072 | HFCS data and Jordá et al. (2019) |
| Financial asset income tax rate $\psi$ | 0.19 | Polish tax system |
| Pareto tail parameter $p$ | 2.5 | Gerritsen et al. (2024) |
| Period length $k$ | 30 | Model normalization |
| Intertemporal cons. smoothing motive $\beta$ | 1.41 | Pinned by $\underline{\widetilde{r}}$ as in Gerritsen et al. (2024) |

The disutility of labor shifter $\chi$ is solved for numerically to normalize the average income in the model so that $\mathbb{E}\left[y^n\right] = 1$, making the model distribution of labor income directly comparable to the empirical distribution of normalised household gross labor income.

**Nominal Return Function** Let $g(a) = \log(1 + r^{\text{ann}}(a))$, then I choose the following parsimonious specification:

$$g(a) = g(\underline{r}^{\text{ann}}) + \left(g(\overline{r}^{\text{ann}}) - g(\underline{r}^{\text{ann}})\right) S\left(\alpha + \kappa \log(a)\right), S(x) = \frac{1}{1 + e^{-x}}. \tag{10}$$

This choice ensures that the distribution of returns is bounded in $\left[\underline{r}^{\text{ann}}, \overline{r}^{\text{ann}}\right]$ and the return varies smoothly with the size of asset level $a$. The function $g(a)$ is independent of income, in line with my empirical results from the previous section. The parameters $(\alpha, \kappa)$ are solved for numerically to target the median and 90-th percentile of the nominal return distribution. In my data, median nominal annual return is approximately 1.98% and the 90-th percentile is 2.86%.

**Tax and Transfer System** To estimate the tax-and-transfer schedule, I apply the statutory Polish personal income tax system to HFCS microdata. All monetary variables are first converted to PLN. Self-employment income is assumed to be taxed at a linear flat rate of 19%. Payroll income is split across spouses and taxed at the individual level according to the statutory PIT brackets, including income-dependent tax credits. When eligible, households may opt for joint filing, in which case total PIT liability equals twice the tax due on half of combined spousal payroll income and I assign the type of filing that each household in the data would find optimal. Consistent with Polish tax law, joint filing is not permitted when either spouse reports self-employment income. Effective household PIT liability is defined as the minimum of individual and joint filing liabilities. After-tax labor income is constructed by subtracting self-employment taxes and effective PIT from gross labor income and adding cash transfers.

After-tax and pre-tax labor incomes are normalized by mean pre-tax labor income within each implicate. I then estimate the reduced-form relationship

$$\log y_i^{\text{net}} = \beta_0 + \beta_1 \log y_i^{\text{gross}} + \varepsilon_i,$$

Table 2: Endogenously calibrated parameters

| Parameter | Value | Target | Data | Model |
|---|---|---|---|---|
| Labor disutility scale $\chi$ | 16.30 | Mean labor income | 1.0 | 1.00 |
| Ability dispersion $\sigma$ | 0.688 | Income dispersion ($p90/p10$) | 4.62 | 4.61 |
| Return function intercept $\alpha$ | 0.990 | Median nominal return | 1.98% | 1.99% |
| Return function slope $\kappa$ | 1.097 | 90th percentile nominal return | 2.85% | 2.84% |
| External govt. revenue $G$ | 0.081 | Balanced budget | — | — |
| Ability dist. location $\mu$ | −0.298 | Normalization of $n$, pinned by $\sigma$ | — | — |
| Pareto tail location $n^*$ | 2.414 | Smooth distribution of $n$ | — | — |

where $y_i^{\text{net}}$ denotes normalized after-tax labor income and $y_i^{\text{gross}}$ normalized pre-tax labor income. The regression is estimated separately in each implicate using HFCS bootstrap replicate weights, and final coefficient estimates and their variance–covariance matrix are obtained by combining implicates using Rubin's rules. The estimated regression reads:

$$\ln y_i^{\text{net}} = \underset{(0.0018)}{-0.1648^{***}} + \underset{(0.0091)}{0.9254^{***}} \ln y_i^{\text{gross}}. \tag{11}$$

Hence, the progressivity parameter is given by $\tau = 1 - \hat{\beta}_1 \approx 0.075$ and the average tax level parameter by $\lambda = 1 - \exp(\hat{\beta}_0) \approx 0.15$. Holter et al. (2019) provide comparable estimates of the Benabou (2002) tax function for several developed countries. The progressivity index I estimated is lower even than that they find in Japan where the tax system is least-progressive in their sample. This echoes the findings of Brzezinski et al. (2022) who show that the progressivity of labor taxation and social insurance has declined markedly in Poland since the 1990s.

The linear rate of tax on financial asset income is fixed to statutory level, $\psi = 0.19$. Finally, I further assume that the replacement rate in retirement is 40%. This is in the ball-park of the estimates of future replacement rates in Poland.

**Distribution of ability $n$.** Finally, I specify the distribution of labor productivity following Gerritsen et al. (2024). Ability $n$ follows a log-normal distribution over its main support and a Pareto distribution in the upper tail. Specifically, $\log n \sim \mathcal{N}(\mu, \sigma^2)$ up to a cutoff $n^*$, while for $n > n^*$ the distribution has a Pareto tail with shape parameter $p = 2.5$. The cutoff $n^*$ and the scale of the Pareto tail are chosen so that both the density and its first derivative are continuous at $n^*$, yielding a $C^1$-spliced distribution.

The dispersion parameter $\sigma$ is treated as a free parameter and is calibrated jointly with the remaining structural parameters of the model to deliver the P90/P10 ratio of household income in the model of 4.625, as in the data. For any given value of $\sigma$, the location parameter $\mu$ is determined endogenously so that mean ability in the theoretical $C^1$-spliced distribution is normalized to one. This normalization ensures that changes in $\sigma$ affect only the dispersion of ability rather than its scale, and it allows model-implied labor income to be interpreted directly in normalized units. As a result, the level of average labor income in the model is disciplined by households' labor supply decisions.

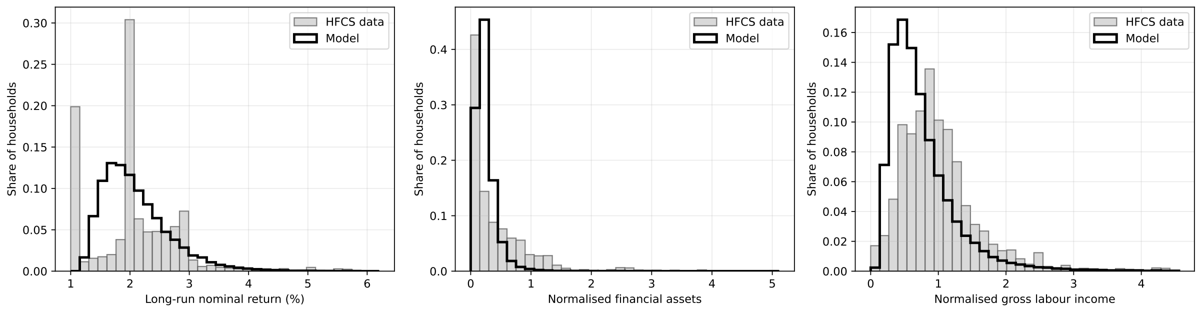


Figure 3: Model-implied and data distributions of return on financial assets, gross labor income (normalized by mean gross labor income in the data), and financial assets (normalized by mean gross labor income in the data). *Source:* Own calculations based on calibrated model and HFCS data.

**Calibrated Parameters and Model Fit** I summarize the values of pre-determined calibrated parameters in Tables 1.

Regarding endogenously calibrated parameters, the values that I obtained numerically and model fit are reported in Table 2. The model fits the data well, all targets are closely matched.

To assess the untargeted fit of the model to the data, I first juxtapose the model-implied distributions of household income, financial assets, and nominal returns and demonstrate the results of this exercise on Figure 3. Overall, the fit of the model is quite satisfactory. Despite a very parsimonious specification of the dependence of returns on assets, the model matches the average return closely and captures about 80% of the dispersion of returns in the data.[7]

For completeness, I report the descriptive statistics of the economy in the baseline calibration in Table 3. The first row shows mean levels of labor supply ($l$), gross labor income ($y$), disposable income ($y - T(y)$), first- and second-period consumption ($c_1$ and $c_2$), the nominal return on financial assets ($r$), and asset holdings ($a$). All variables are normalised such that average gross labor income equals one. Several insights emerge. Firstly, as is standard in life-cycle models, consumption increases with age. Additionally, an average household holds financial assets amounting to about 28% of average gross household income.[8]

The second row reports log-variances, capturing cross-sectional dispersion in levels and being particularly informative about tail behaviour. Gross labor income exhibits substantial dispersion ($\log \mathrm{Var}(y) = 0.380$), which is partially compressed by the tax-and-transfer system: the dispersion of disposable income is lower ($\log \mathrm{Var}(y - T(y)) = 0.326$). The same pattern is reflected in rank-based inequality measures: the Gini coefficient declines from 0.492 for gross income to 0.420 for disposable income. This reduction directly reflects the progressivity of the labor income tax schedule, which insures households against productivity-driven income differences.

Despite this compression at the level of disposable income, consumption inequality does not

[7]The average annual nominal return in the model is 0.021 against 0.02 in the data, and the standard deviation of returns in the model is 0.0058 against 0.0071 in the data.

[8]In my sample, average gross household income before taxes stands at approximately 80k PLN. Thus, average financial asset holdings implied by the model are approximately 22k PLN and annual nominal return of approximately 500PLN.

Table 3: Baseline Economy

| | $l$ | $y$ | $y-T(y)$ | $c_1$ | $c_2$ | $r$ | $a$ |
|---|---|---|---|---|---|---|---|
| **Mean** | 0.840 | 1.000 | 0.774 | 0.498 | 0.771 | 0.021 | 0.276 |
| **Log-variance** | 0.012 | 0.380 | 0.326 | 0.314 | 0.450 | 0.718 | 7.652 |
| **Gini** | 0.059 | 0.492 | 0.420 | 0.432 | 0.540 | 0.147 | 0.398 |

*Notes*: The table reports levels of means, log-variances, and Gini coefficients implied by the model. Log-variances are defined as $\log \mathrm{Var}(\cdot)$. *Source:* own calculations based on calibrated model.

uniformly decline. While the tax-and-transfer system compresses the distribution of disposable income, first-period consumption is an endogenous choice and need not inherit this compression one-for-one. In the model, households optimally trade off current consumption against saving for retirement under heterogeneous asset returns. As a result, saving behavior varies substantially even among households with similar disposable income. This heterogeneity in intertemporal choices reinforces dispersion at the level of first-period consumption, leading to a higher Gini coefficient for $c_1$ than for disposable income $y - T(y)$. This reflects differences in optimal saving incentives driven by heterogeneity in expected returns.

Furthermore, dispersion increases markedly in second-period consumption ($\log \mathrm{Var}(c_2) = 0.450$, $\mathrm{Gini}(c_2) = 0.540$), exceeding that of first-period consumption. This increase of consumption inequality with respect to age arises from heterogeneity in asset holdings and asset returns. While asset holdings are highly skewed ($\log \mathrm{Var}(a) = 7.652$), returns are also substantially dispersed ($\log \mathrm{Var}(r) = 0.718$) due to the return function increasing in asset size. As a result, households with larger asset positions earn systematically higher returns, which amplifies cross-sectional differences in resources at older age. The fanning out of inequality with age is also a standard feature of life-cycle models.

Finally, the contrast between relatively moderate Gini coefficients and very large log-variances for assets highlights the importance of tail behaviour in wealth distributions. Rank-based measures capture inequality in relative positions, whereas log-variances are driven by extreme asset holdings in the upper tail, a feature that is central for understanding both consumption risk and welfare in the presence of heterogeneous returns.

## 4.2 A Counterfactual Tax Reform

I evaluate counterfactual reforms of capital income taxation that alter the degree of progressivity while holding aggregate capital tax revenue constant. This design choice is motivated by the empirical observation that revenues from capital income taxation constitute a relatively small share of total government revenues in Poland. Focusing on revenue-neutral reforms allows me to isolate the behavioral and welfare consequences of changes in the structure of capital taxation, rather than mechanically scaling up the importance of capital tax revenues. Implicitly, I assume that any shortfall or surplus due to behavioral response of labor supply is absorbed by adjustment in $G$.

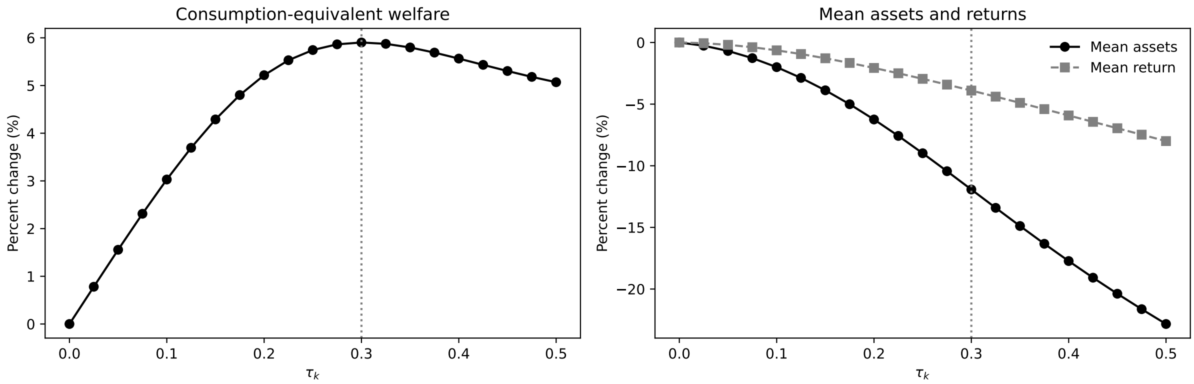


Figure 4: Model-implied changes (relative to linear tax on return from financial assets) in welfare, average assets and average nominal return. *Source:* Own calculations based on calibrated model.

**Financial Assets Tax Schedule.** In the baseline economy, nominal capital income is taxed at a proportional rate. In the counterfactuals, I replace this proportional tax with a Benabou-style progressive schedule applied to *block-level nominal capital income*. Let annual nominal returns be denoted by $r^{\text{ann}}(a)$ and let $k$ denote the number of years in a model period. Block-level nominal capital income is given by

$$x^n = \left((1 + r^{\text{ann}}(a^n))^k - 1\right) a^n.$$

Capital taxes are defined implicitly by

$$x^n - T_k(x^n) = (1 - \lambda_k)(x^n)^{1-\tau_k},$$

where $\lambda_k$ governs the overall level of capital taxation and $\tau_k \geq 0$ controls its progressivity. When $\tau_k = 0$, the schedule reduces to a proportional capital income tax with rate $\lambda_k$ and when $\lambda_k = \psi$ collapses to the baseline case. For $\tau_k > 0$, marginal tax rates increase with capital income.

**Revenue Neutrality.** For each value of the progressivity parameter $\tau_k$, I adjust the level parameter $\lambda_k$ so that aggregate capital tax revenue remains equal to its baseline level. Formally, $\lambda_k(\tau_k)$ is chosen to satisfy

$$\int T_k(x^n)\, dF(n) = \int T_k^{\text{base}}(x^n)\, dF(n),$$

where $T_k^{\text{base}}$ denotes the baseline proportional capital tax schedule with $\tau_k = 0$ and $\lambda_k = \psi$. This condition is imposed numerically using a local iterative solver that updates $\lambda_k$ until the capital-tax-revenue gap falls below a tight tolerance.

**Household Responses and Welfare.** For each revenue-neutral tax schedule $(\lambda_k(\tau_k), \tau_k)$, households re-optimize labor supply and savings taking prices and policy as given. Aggregate

Table 4: Effects of Capital Tax Reform ($\tau_k = 0.3$ relative to baseline)

| | $l$ | $y$ | $y - T(y)$ | $c_1$ | $c_2$ | $r$ | $a$ |
|---|---|---|---|---|---|---|---|
| Δ **mean (%)** | -1.49 | -0.17 | -0.52 | +5.80 | -11.03 | -3.90 | -11.93 |
| Δ **log-variance (%)** | -5.31 | +0.94 | +0.94 | +5.23 | -17.10 | +3.13 | -10.61 |
| Δ **Gini** | -0.00 | +0.01 | +0.01 | +0.02 | -0.09 | -0.01 | -0.03 |

*Notes*: Mean changes are percentage deviations relative to the $\tau_k = 0$ baseline. Log-variance changes are expressed as differences in $\log \mathrm{Var}(\cdot)$. *Source:* own calculations based on calibrated model.

welfare is evaluated using a utilitarian social welfare function,

$$W = \int U(c_1^n, c_2^n, l^n)\, dF(n),$$

where utility is measured at the household level and integrated using the population weights implied by the calibrated ability distribution. All counterfactual outcomes are therefore directly comparable to the baseline equilibrium and differ only through changes in the progressivity of capital income taxation. To compare welfare under different levels of tax progressivity on income from financial assets I use the consumption certainty equivalent $C(W)$ applying the inverse transformation of within-period utility function from consumption, $u(c) = c^{1-\frac{1}{\sigma}}/(1-\frac{1}{\sigma})$ so that:

$$C(W) = u^{-1}(W). \tag{12}$$

This welfare measure maps the lifetime utility from consumption and disutility from work into a single consumption level that an agent who does not know their $n$ type yet would be willing to accept. I present the results of this exercise on Figure 4. Changes in the tax code discourage savings, on average, and decrease nominal return. Increases in $\tau_k$ improve welfare up to $\tau_k = 0.3$, the optimal revenue-neutral level of progressivity in the model. The value of $\lambda_k$ which ensures budget neutrality of the optimal reform is 0.21.

The effects of the switch from proportional to progressive tax on income from financial assets with $\tau_k = 0.3$ and $\lambda_k = 0.21$ are presented in Table 4. In broad terms, the results follow the classical equity-efficiency trade-off. Firstly, more progressive tax on nominal returns mildly discourages labor supply (decrease of about 1.5%) and strongly discourages savings which drop, on average, by almost 12%. Agents optimally respond by increasing consumption when young, and decreasing it when old. Importantly, consumption in the first period becomes slightly more dispersed but also becomes much less dispersed in the second period.[9]

Finally, I present the implied average and marginal tax rates implied by the introduction of the progressive schedule on Figure 5. Asset-poor agents with low returns receive subsidies. Households, who in the post-reform economy held nominal assets amounting to 60% of pre-reform gross labor income end up paying identical tax. Wealthier households end up paying more, and poorer households pay less. The tax revenue under the reform corresponds to 25%

[9] While quantitative results reflect the calibration of intertemporal behaviour, the results provide a clear intuition about the mechanisms and direction of welfare changes induced by progressive capital income taxation.

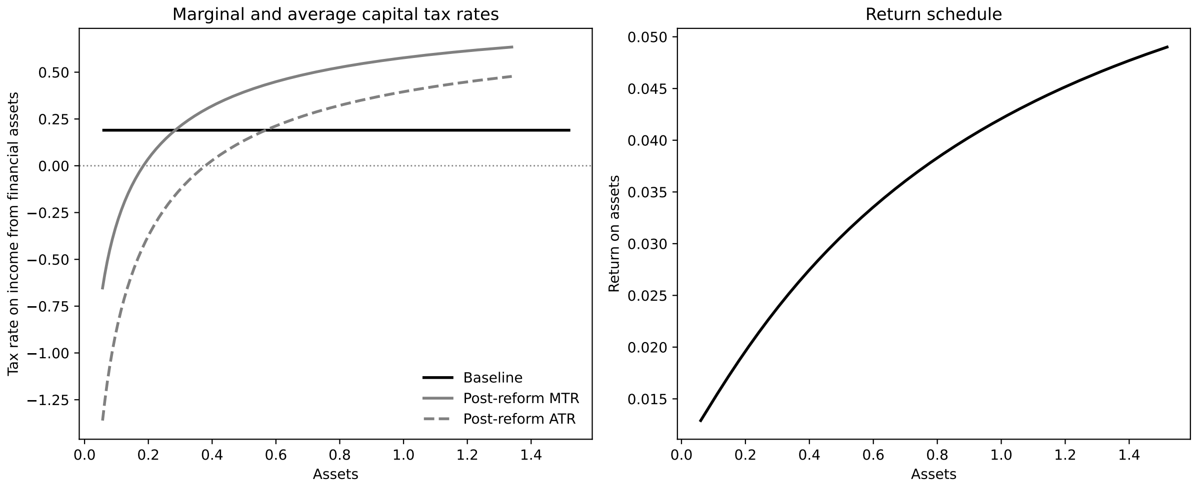


Figure 5: Model-implied marginal (MTR) and average (ATR) tax rates on nominal returns as functions of assets in the baseline and post-reform (left panel) and nominal annual return as a function of assets (right panel). *Source:* Own calculations based on calibrated model.

of taxable income on financial assets. This is an increase of 6 percentage points relative to the proportional tax baseline. The household at the 99th percentile of the asset distribution faces marginal tax rates of about 63%.

The reform compresses disparities in capital income by subsidizing households at the lower end of the asset distribution and taxing households higher up. For example, at the first quartile of the post-reform distribution ($a \approx 0.155$), the implied subsidy is about 55%. At the third quartile ($a \approx 0.513$), the household pays 14.6% of tax. Consequently, the gap in capital income between the first and third quartiles falls by about 29%.

# 5 Conclusions

This paper documents substantial heterogeneity in households' long-run returns on financial assets in Poland and shows that this heterogeneity is tightly linked to the scale of financial wealth rather than to labor income. Using HFCS data combined with external long-run return series, I construct household-level proxies for expected nominal returns and find that households with larger asset holdings systematically earn higher returns, primarily due to differential exposure to high-return instruments such as equities and professionally managed assets. Embedding this empirical evidence into a calibrated heterogeneous-agent model of optimal taxation reveals that replacing Poland's flat tax on capital income with a progressive schedule can improve aggregate welfare in a revenue-neutral reform. Welfare gains arise despite lower average savings and returns, reflecting improved redistribution and reduced dispersion of consumption at older ages.

The analysis herein points to promising directions for future research. First, survey data inevitably underrepresent the very top of the wealth and return distribution, implying that the true extent of return heterogeneity—and hence the welfare relevance of capital tax design—may be larger than estimated here. Second, long-run returns are proxied using asset-class averages rather than household-specific realised performance, which abstracts from within-class heterogeneity, timing, and active management decisions. Future work could combine administrative or brokerage data with survey information to measure returns more directly and to distinguish skill from access channels. Next, it would be interesting to empirically assess the importance of tax avoidance and evasion, including illicit activities and migrating out of the country in Poland. Furthermore, as Sawulski et al. (2023) show, political implementation of tax reforms in Poland has been subject to pressures from various interest groups and political economy considerations of reforms like the one discussed in this paper are important.

# References


Bach, L., Calvet, L. E., and Sodini, P. (2020). Rich pickings? risk, return, and skill in household wealth. *American Economic Review*, 110(9):2703–47.

Benabou, R. (2002). Tax and education policy in a heterogeneous-agent economy: What levels of redistribution maximize growth and efficiency? *Econometrica*, 70(2):481–517.

Brzezinski, M., Myck, M., and Najsztub, M. (2022). Sharing the gains of transition: Evaluating changes in income inequality and redistribution in poland using combined survey and tax return data. *European Journal of Political Economy*, 73:102121.

Elton, E. J., Gruber, M. J., and Blake, C. R. (2013). The performance of separate accounts and collective investment trusts*. *Review of Finance*, 18(5):1717–1742.

Gerritsen, A., Jacobs, B., Spiritus, K., and Rusu, A. V. (2024). Optimal taxation of capital income with heterogeneous rates of return. *The Economic Journal*, 135(665):180–211.

Goraus-Tańska, K. and Inchauste, G. (2016). The distributional impact of taxes and transfers in poland. *World Bank Policy Research Working Paper*, (7787).

Grejcz, K. and Żółkiewski, Z. (2017). Household wealth in poland: the results of a new survey of household finance. *Bank i Kredyt*, 48(3):295–326.

Holter, H. A., Krueger, D., and Stepanchuk, S. (2019). How do tax progressivity and household heterogeneity affect laffer curves? *Quantitative Economics*, 10(4):1317–1356.

Jordá, O., Knoll, K., Kuvshinov, D., Schularick, M., and Taylor, A. M. (2019). The rate of return on everything, 1870–2015. *The Quarterly Journal of Economics*, 134(3):1225–1298.

Karnowski, J. and Rzońca, A. (2021). Directions for the reconstruction of the tax system in poland–a growth-enhancing proposal. *Acta Universitatis Lodziensis. Folia Oeconomica*, 2(353):75–109.

Lusardi, A. and Mitchell, O. S. (2014). The economic importance of financial literacy: Theory and evidence. *Journal of Economic Literature*, 52(1):5–44.

Rubin, D. B. (1987). *Multiple Imputation for Nonresponse in Surveys*. John Wiley & Sons, New York.

Sawulski, J., Szewczyk, N., Rafalska, K., and Smólko, M. (2023). Business power against redistribution: The case of watered-down tax reform in poland. *Business and Politics*, 25(2):133–151.