# Tax Avoidance and Wealth Inequality*

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**Abstract**

The hypothesis that wealth inequality is driven by the higher returns earned by the rich—thereby offsetting the progressivity of the tax system—overlooks a key dimension: tax avoidance. Tax avoidance not only undermines the progressivity of the tax system but is also one of the reasons why the wealthy earn higher returns. Using micro-data from Chilean tax records, I quantify tax avoidance and find that the top 0.01% of taxpayers reduce their tax payments by 80% through corporate investments. To explore this further, I calibrate a Bewley-Huggett-Aiyagari heterogeneous agent model, incorporating two departures from standard approaches: (i) endogenous portfolio choices between safe and corporate risky assets, and (ii) tax functions that account for tax avoidance. The model successfully replicates the 50% wealth share held by the top 1% in Chile. The main intuition is that, given the presence of tax avoidance, the after-tax rate of return on risky assets increases, leading agents to reallocate their portfolio towards these assets, ultimately resulting in an even higher rate of return on wealth. The main quantitative result is that, without tax avoidance the top 1% wealth share decreases from 50% to 11%. These findings suggest that tax avoidance is a key driver of wealth inequality.

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# 1 Introduction

What does it cause wealth inequality?. Economists have hypothesized that the heterogeneity in rate of returns across agents is key driver. In particular, the higher returns earned by the wealthy are supposed to offset the progressivity of the tax system, generating wealth inequality. However, this hypothesis is missing a key dimension. In practice, tax avoidance offsets the progressive nature of the tax system and it is, actually, part of the reasons why the rich earn higher returns.

This paper examines how the interplay between tax avoidance and agents' portfolio decisions affects wealth inequality. The main empirical finding is that the wealthiest individuals disproportionately reduce their tax burden by significantly lowering effective corporate income tax payments. To quantify the impact of tax avoidance on wealth inequality, I develop and calibrate a general equilibrium model with heterogeneous agents. The model demonstrates that tax avoidance, by affecting portfolio decisions, leads to substantial wealth inequality. The results suggest that tax avoidance plays a crucial role in the hypothesis that heterogeneity in rates of return drives wealth inequality.

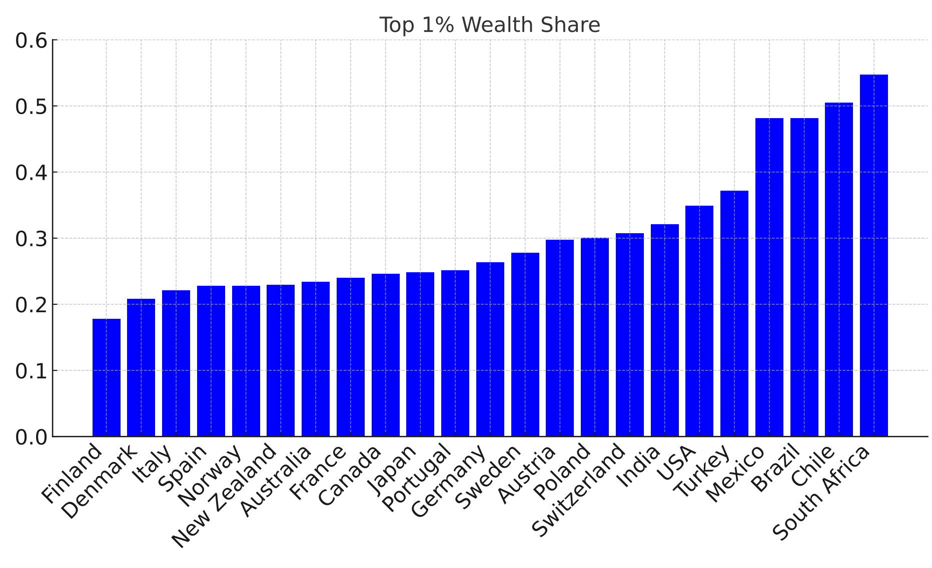


**Figure 1:** Top 1% wealth share selected countries. Source: World Inequality Database, year 2019.

Wealth concentration is a widespread global phenomenon, with some disparities in advanced and emerging economies. The top 1% wealth share ranges between 20% and 50% for most countries The top 1% wealth share for a sample of countries is displayed in Figure 1.

Wealth concentration in European countries, while lower than in other regions, still ranges between 20% and 30%. In the United States, the top 1% controls around 35%, one of the largest among developed countries. Developing countries like Chile, Mexico, and South Africa display remarkably high wealth concentration, with the top 1% holding around 50% of the wealth.

This paper delves into the interaction between tax avoidance and portfolio choices in explaining the wealth concentration at the top of the distribution. Tax avoidance refers to minimizing tax liability through various financial strategies and legal tax planning techniques.[1] Unlike tax evasion —which is illegal and involves deliberately misrepresenting or hiding income— tax avoidance uses loopholes, deductions, credits, or other tax benefits available in the tax code to reduce the effective income tax rate. Common examples of tax avoidance include transfer pricing, shifting income to a family member in a lower tax bracket, investing in tax-deferred assets, or maximizing deductions and tax credits at the individual or corporate level.

I focus my quantitative analysis on Chile. The data form the Chilean Internal Revenue Service I use allows me to precisely measured different forms of tax avoidance across the wealth distribution, since it contains detailed taxpayer-level information. There are three reasons why Chile is a particularly interesting country to study tax avoidance and wealth inequality. Firstly, wealth is highly concentrated at the top of the distribution — the top 1% wealth share is 50%— ranking as the third highest country out of 112 with available data regarding the wealth share held by the top 1%.[2] Secondly, the composition of wealth across the distribution is similar to what we observe in other countries: the rich tend to hold a higher proportion of risky assets. The third reason is that general lessons on tax avoidance affecting wealth inequality can be learned, as there are no significant differences between the Chilean income tax system and those of other countries. All of which suggest the hypothesis proposed by this paper is not specific to Chile.

The main empirical finding of this paper is that the wealthiest individuals avoid proportionally more taxes by investing in corporate assets. The top 0.01% of taxpayers reduce their tax payments by 80% through corporate investments. Corporations allow taxpayers to reduce

[1] These are actions within, or very close to, the boundaries of the law. Depending on the country, certain forms of tax avoidance are illegal. Generally, countries include in their tax codes Special Anti-Avoidance Rules (SAAR) to discourage specific types of avoidance and General Anti-Avoidance Rules (GAAR) for more complex and non-specific avoidance strategies.

[2] Source: World Inequality Database

significantly the effective income tax rate they pay. The effective income tax rate is calculated as total tax payments — including personal and corporate income taxes — over total income —comprising labor and capital income. As illustrated in Figure 2, the difference between the red bars and the blue bars is the effect of tax avoidance. The effective income tax rate experiences a significant decline at the top of the wealth distribution.

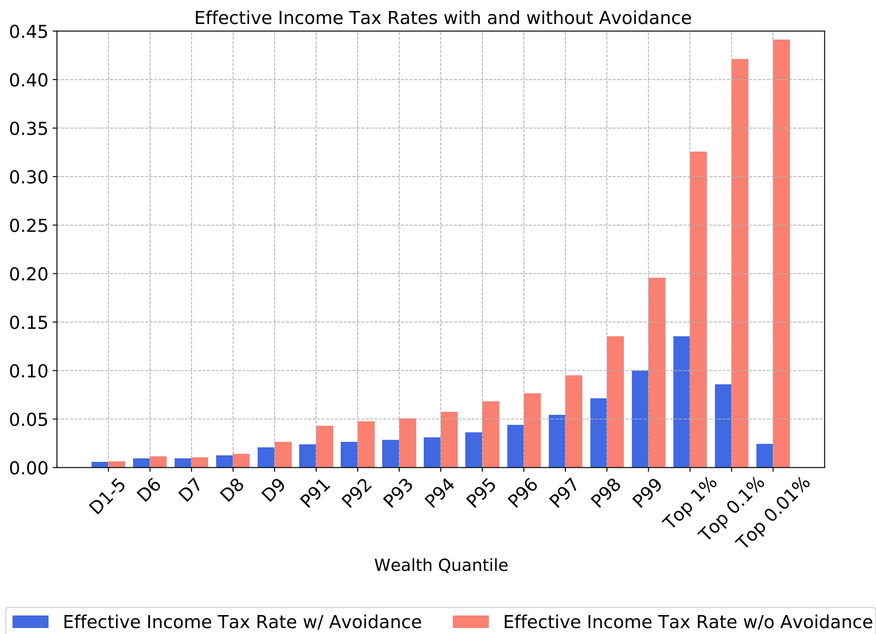


**Figure 2:** Effective income tax rates across the wealth distribution. Source: Own computations based on administrative tax data, Chile. D and P stand for Decile and Percentile, respectively.

Furthermore, I provide evidence on the different forms of tax avoidance. The gap between the red and blue bars in Figure 2 can be decomposed into three distinct effects, each representing a specific form of avoidance. First, Personal Avoidance, which refers to individual taxpayers' actions to reduce personal income tax liabilities, such as utilizing deductions or credits. Second, Corporate Avoidance, which reflects strategies used by corporations to lower their effective corporate income tax. Finally, Retained Profits, where taxpayers retain earnings within companies without distributing them to avoid dividend taxation.

In the lower and middle quantiles (ranging from the first to the ninth decile), Personal Avoidance is the predominant source, accounting for most of the effective income tax rates reduction. In contrast, Corporate Avoidance and Retained Profit play minor roles. However, the focus shifts dramatically in the top wealth groups, especially the top 1%, 0.1%, and

0.01%. Corporate Avoidance becomes the primary tax avoidance source for the wealthiest individuals, representing up to 61% of total tax avoidance in the top 0.01%. Retaining profits within companies also gains importance, particularly in the top 0.1% and 0.01%, contributing around 21-31% of total avoidance.

How much does tax avoidance account for the high wealth concentration at the top of the distribution? I answer this question by developing a general equilibrium Beweley-Hugget-Aiyagari heterogeneous agent model calibrated for the Chilean economy. My model differs from standard approaches by incorporating two key features: (i) endogenous portfolio choices between safe and risky corporate assets, and (ii) tax functions that accounts for the presence of different forms of tax avoidance. The tax functions are calibrated such that the effective income tax rates in the model align with the rates observed in the data. This calibration also accounts for the different forms of tax avoidance, as they have different effects on wealth inequality. The main quantitative result indicates that, in the absence of tax avoidance, the top 1% wealth share decreases from 50% to 11%.

The main intuition of my results is that — given the presence of tax avoidance — the expected after-tax rate of return on risky assets increases, affecting the risk-primium and causing individuals to endogenously reallocate their portfolio towards such assets, ultimately resulting in an even higher average rate of return on wealth. I do not model the decision of avoiding taxes as the calibrated tax functions exhibit a decreasing pattern for the wealthiest agents in the model.

My model shows that tax avoidance plays a crucial role in shaping wealth distribution in two ways: by influencing the level and composition of wealth. Firstly, differences in effective tax rates across agents generate heterogeneity in the rate at which wealth accumulates. Secondly, differences in effective tax rates on different class of assets — risky or safe — increase he risk premium agents experience, which affects the intensive margin of risky investments. The three forms of avoidance — Personal Avoidance, Corporate Avoidance, and Retained Profits — generate level effects, whereas the Corporate Avoidance and Retained Profits generate also composition effect, as they increase the rate of return on risky assets.

Understanding the root causes of wealth inequality has become a major topic of research interest, especially regarding the high concentration of wealth at the top of the distribution. In recent decades, inequality has rapidly increased in several countries for which data is available (see, for example, Saez and Zucman (2016), and Alvaredo, Chancel, Piketty, Saez, and Zucman

(2018)). One of the most influential explanations is Thomas Piketty's $r > g$ theory, where the rate of return on capital ($r$) exceeds the growth rate of the economy ($g$) Piketty (2014). Yet, despite significant advancements in both empirical and theoretical literature on wealth accumulation, the fundamental economic mechanisms driving this extreme concentration of wealth remain a topic of ongoing debate.

Much economic literature has traditionally focused on income inequality, particularly labor market dynamics. For example, some papers suggest that persistent differences in sectors' pay premiums have played a role in the rise in income inequality (e.g., Dickens and Katz (1987) and Katz, Summers, Hall, Schultze, and Topel (1989)) which in turn generates wealth inequality. Another example is Barth, Bryson, Davis, and Freeman (2016), who report that around one-third of the rise in earnings inequality can be attributed to the increase in between-establishment inequality. Some explanations show how human capital accumulation and skill-biased technological changes have increased the wage gap between low-skilled workers, translating into a higher income inequality (e.g., Acemoglu et al. (2012)). However, why the rich earn higher returns such that wealth accumulates at the top of the distribution is not fully understood yet. According to Gabaix, Lasry, Lions, and Moll (2016), the standard theories of income inequality[3] do not account for the rapid increase in income inequality, particularly at the top levels. They claim that a critical feature of a model that should be included in exploring this phenomenon is some scale-dependent earning process.

This paper contributes to three different fields of literature: wealth inequality in macro-quantitative models, public finance, and household investment patterns. First, it contributes to the extensive literature on quantitative heterogeneous agent models that explore the dynamics and sources of wealth inequality. This literature has built upon Aiyagari (1994). The main advantage of this workhorse model is that wealth distribution is a general equilibrium outcome, an aggregate consequence of the interaction between agents. Due to the fact that the standard version of this model fails to explain wealth accumulation at the top of the distribution, several versions of this model have been developed to try to explain the right tail of the wealth distribution. There have been mainly three avenues of research that depart from the standard model to explain wealth concentration: preference heterogeneity (Krusell and Smith, 1998), capital/investment risk and entrepreneurship (Quadrini, 2000), and inter-generational transfers

[3]For example, those that suggest that the rapid increase of income inequality is because the variance of the earning process has increased in the last decades.

(Castaneda, Diaz-Gimenez, and Rios-Rull, 2003). Since these kind of models do not generate high wealth concentration at the top, assumptions on the preferences or strong assumption on the stochastic process that governs the rate of returns have to be made. My model is able to generate high wealth concentration at the top without making strong assumptions on the preferences or the stochastic processes, since the level and composition effect of tax avoidance on wealth inequality is quantitatively relevant.

On the quantitative analysis of the super rich, there are, as far as my knowledge goes, two other papers on heterogeneous agent models that are able to match the wealth share of the super rich and develop models similar to mine. The first one is Hubmer, Krusell, and Smith Jr (2020), which replicates reasonably well the transition dynamics of the top shares for the U.S. in the last decades. The critical assumption they make — and the main difference with my model — is that they assume an entirely exogenous policy functions for the savings rule and portfolio composition across different wealth levels, which match the exact composition of wealth we observe in the data[4]. My model endogenously generates portfolio composition consistent with the data, because of the composition effect that tax avoidance generates. The other paper is Guvenen, Kambourov, Kuruscu, Ocampo-Diaz, and Chen (2019)—although their focus is wealth taxation— their model is able to match the top share of wealth in the U.S. using an OLG setting. Still, it relies heavily on further assumptions on the stochastic productivity process of entrepreneurs, using an "explosive" capital productivity shock. My paper differs from those in two key aspects: (i) I make standard assumptions on the stochastic process of capital productivity — only a simple AR(1) process— and (ii) the mechanism that makes my model match the top shares of wealth is the interaction between endogenous portfolio choice and the presence of tax avoidance, which generates level and composition effect on wealth.

Secondly, this paper also contributes to the literature on public finance. Several works have documented how people, particularly the rich, manage to pay less taxes by using different methods (see, for example, Slemrod and Weber (2012), Alstadsæter, Johannesen, and Zucman (2018), and Saez and Zucman (2019b)), affecting the progressive nature of the tax system. Although my findings are not novel but consistent with what has been found in other countries regarding the rich paying proportionally less taxes, the micro-data I use allows me to precisely measure different forms of tax avoidance — and their relative importance — that lead to a significant reduction in effective income tax rates at the top of the distribution. Measuring the

[4]In the US, as in other countries, the rich tend to hold proportionally more risky assets.

different sources of avoidance is relevant since they have different quantitative and economic implications for wealth inequality.

The empirical literature on public finance has also studied the role of tax policy in wealth inequality. For example, Saez and Zucman (2019a) highlights how preferential tax treatment on capital gains and dividends disproportionately benefits the wealthiest individuals, allowing them to accumulate wealth faster than wage earners. Similarly, Chetty and Saez (2010) find that reductions in dividend and corporate nominal tax rates incentivize wealthy individuals to invest more in stocks. I claim that the nominal income tax rates play a secondary role in explaining wealth inequality since they differ significantly from the actual tax rates taxpayers pay in practice. Additionally, by embedding tax avoidance in my model, I can conduct counter-factual exercises to see to what extent different levels of tax avoidance shape the wealth distribution in equilibrium, which has been an under-explored topic.

Last but not least, I also contribute to the macro-finance literature that has built upon Campbell (2006). One relevant insight on this regard has been provided by Bach, Calvet, and Sodini (2020). They demonstrate that high-net-worth individuals tend to invest a larger portion of their portfolios in high-risk, high-return assets such as equities, private equity, and hedge funds. These investments yield higher returns over time, allowing wealthy individuals to grow their wealth further, while lower-income households are more likely to invest in safer, lower-return assets like bonds. The presence of two different assets (safe and risky) and tax avoidance in my model enables me to provide a relatively simple setting that generates portfolio choices across different wealth levels consistent with the data: the rich hold proportionally more risky assets. My paper shows that tax avoidance affects the intensive margin of risky investment, therefore those who avoid proportionally more, tend to hold a higher fraction of risky assets. I achieve this without making further assumptions on the agents' risk preferences as the agents' utility function is a standard CRRA.

The structure of the paper is as follows: Section 2, a detailed description of the data set and the relevant details of the institutional background of the Chilean income tax system are presented. Section 3 showcases a series of empirical facts on tax avoidance and wealth inequality. In Section 4, the paper outlines the development of the model. The calibration is explained in Section 5 and Section 6 encompasses the quantitative analysis and counter-factual exercises. Finally, Section 7 presents the conclusions drawn from the paper's findings.

# 2 The Chilean Income Tax System: Data on Wealth, Income and Taxes

In this section, I will describe the dataset that I used to construct the stylized facts, quantify tax avoidance, and calibrate the model. Additionally, I describe the most relevant features of the Chilean tax system.

I utilized micro-data from the Chilean Internal Revenue Service (IRS) for the tax year 2019. This dataset contains detailed information on income sources, assets, tax credits, deductions, and other variables that individuals and companies are required to report to the IRS. It contains information on around 13 millions of taxpayers, which corresponds to about 70% of the Chilean population.

First of all, I start by explaining the difference between Received Income and Total Income. This distinction is relevant as they have different tax treatments. Secondly, I explain how wealth and its composition is computed. Lastly, I explain how the Chilean Personal and Corporate Income Tax work, what the dividends tax treatment is, and how I compute the effective income tax rates.

## 2.1 Received Income

An individual taxpayer's Received Income consists of all the income that a person receives during a year. As I will discuss later on, this income is equal or lower than the Total Income of a person, since it does not include the retained profits within companies. This income is used to compute the Personal Income Tax (PIT) rate. Let $I_i^R$ be the total Received Income of individual $i$, which it is computed as follows:

$$I_i^P = I_i^L + I_i^{RK} \tag{1}$$

$I_i^L$ is the total labor income of individual $i$ (including employed, self-employed, and pension income), and $I_i^{RK}$ is the received capital income. The latter is defined as follows:

$$I_i^{RK} = K_i^G + D_i \tag{2}$$

Where $K_i^G$ are the capital gains and $D_i$ are the total dividends a taxpayer $i$ receives.

## 2.2 Total Income

The Total Income of an individual taxpayer consists of all the income that can be attributed to this person — directly and indirectly — during a year. The direct income corresponds to the Received Income, which was defined before. The income received indirectly accounts for the non-distributed profits generated by the taxpayer's companies. The Total Income is always equal or higher than the Received Income. Let $I_i^T$ be the Total Income of individual $i$, which it is computed as follows:

$$I_i^T = I_i^L + I_i^{TK} \tag{3}$$

Where $I_i^{TK}$ is the total capital income and it is defined as follows:

$$I_i^{TK} = I_i^{RK} + I_i^{NP} \tag{4}$$

Where $I_i^{NP}$ are the total non-distributed profits of taxpayer $i$. The allocation of corporate profits to individual stakeholders is contingent upon their shareholding on an individual basis. It is important to account for both direct and indirect participation in profit allocation. This entails imputing the profits of companies controlled by individuals through alternate legal entities, such as holdings. The data utilized in this context facilitates the "attribution process" by establishing a direct link between individuals' equity ownership and the balance sheets of the companies, along with a direct link between the equity ownership of companies and the balance sheets of other legal entities.

The computation of total non-distributed profits from the data can be illustrated using the example in Figure 3. The ownership structure related to an individual taxpayer is depicted, where the taxpayer owns 100% of firm $A$. Firm $A$ owns 50% and 80% of firms $B$ and $C$, respectively, and the latter owns 25% of firm $D$. There is no distribution of profits in this example. This ownership structure allow to compute the total profits attributed to this taxpayer, which can be calculated as follows: $I^{NP} = \pi_A + 0.5 \cdot \pi_B + 0.8 \cdot (\pi_C + 0.25 \cdot \pi_D)$, where $\pi_i$ is the profit of firm $i \in \{A, B, C, D\}$.

## 2.3 Wealth

The measure of total wealth $W_i$ of taxpayer $i$ is computed as follows:

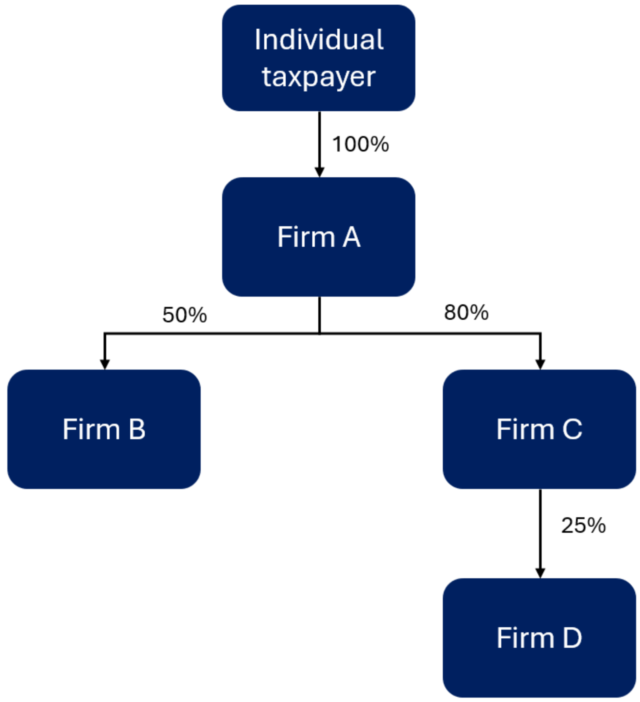


**Figure 3:** Example of ownership structure of a taxpayer

$$W_i = PE_i + NPE_i + NCFA_i + RE_i + O_i \tag{5}$$

Where $PE_i$ correspond to public equity shares, $NPE_i$ non-public equity shares, $NCFA_i$ non-corporate financial assets (such as bonds, saving accounts, mutual funds, and other financial instruments for savings), $RE_i$ real estate, and $O_i$ are other assets that do not fall in the previous categories such as cars, yachts, aircraft, helicopters, and other vehicles. I will define Corporate Assets, $CA_i$, as the sum of $PE_i$ and $NPE_i$.

The value of $CA_i$ is computed using the direct link individuals' equity ownership and companies. By using the direct link, I am assuming the value of a company includes the value of downstream companies. In terms of the example of Figure 3, the value of corporate assets of the taxpayer is equal to the value of company $A$ only. The value of publicly traded companies $PE_i$ is computed using market values, whereas the value of non-publicly traded companies is equal to the financial wealth reported in their balance-sheets.

The value of $NCFA_i$ is the same as taxpayers reports in their tax returns. The value of real estate and other assets correspond to the fiscal value, computed by the IRS.

Using tax records to measure wealth has the advantage of getting reliable numbers for the wealthiest individual. The reason being is that their wealth is composed of mainly corporate assets and they must report to the IRS a series of variables related to corporations for tax purposes. On the other hand, tax records do not provide precise values for low wealth taxpayers' wealth, since they usually report to the IRS information on labor income only, unless they hold assets that generate taxable income. Nevertheless, the focus of this paper is wealth concentration at the top of the distribution and does not aim to characterize the low-wealth taxpayer behavior.

## 2.4 Taxes

### Personal Income Tax

In Chile there are two type of income taxes at individual level. First, the Second Category Single Tax (SCST) which is an increasing marginal rates scheme that applies to those tax payer that received labor income from an employer only. Second, the Global Complementary Tax (GCT) is an increasing marginal tax rates scheme that applies to those that get income different from labor, this includes: self-employed income, pensions, interests, most of capital gains, and dividends. Both, SCST and GCT, have the same marginal tax rates schemes, as displays in table 1.

| Annual Income Bracket (USD) | Marginal Tax Rate (%) |
|---|---|
| 0 - 10,324 | 0% |
| 10,325 - 22,943 | 4% |
| 22,944 - 38,238 | 8% |
| 38,239 - 53,534 | 13.5% |
| 53,535 - 68,829 | 23% |
| 68,830 - 84,124 | 30.4% |
| 84,125 - 112,165 | 35.5% |
| 112,166 and above | 40% |

**Table 1:** Marginal Tax Rates for SCST and GCT. Tax year 2024, Chile.

The Chilean marginal income tax rate scheme does not exhibit any particular feature that makes it significantly different from with one can observe in other countries. In general, the marginal tax rate of the lower brackets in Chile are lower than other countries[5]; whereas the maximum marginal tax rate is close to the median of the OECD countries.

[5] For example, in the US the minimum marginal tax rate is 10%

### Corporate Income Tax

At corporate level, the Corporate Income Tax (CIT) is called First Category Tax which has a value of 27% for big companies (annual sells over 3 million dollars, approximately) and 25% for small companies (annual sells below 3 million dollars).

### Tax treatment of Dividends

When it comes to dividends, there is an imputation system. It allows individuals who receive dividends to use as tax credit the corporate taxes that the dividend already payed, avoiding the double taxation. Specifically, it allows to use up to 65%[6] of the corporate tax payments associated with the received dividends. Arithmetically, the dividends received by an individual belonging to the highest tax bracket is subject to a marginal tax rate of 49.45[7]. However, the Income Tax Law establishes a maximum marginal tax rate of 44.45.

## 3 Empirical Facts on Wealth and Tax Avoidance

In this section I present a series of empirical facts that provide evidence on the main hypothesis of this paper: the interplay between tax avoidance and portfolio choices generate an amplification of wealth concentration. These facts will guide the quantitative general equilibrium analysis that I conduct in the next sections.

The summary of the facts I present in this sections is: (i) Chile exhibits an exceptionally high concentration of wealth, even more than other countries in which there are available data on wealth; (ii) there is a significant heterogeneity in wealth composition across wealth levels, in particular, wealthy individuals tend to hold proportionally more risky assets; (iii) the wealth of the wealthiest individuals is mainly composed of non-publicly traded companies; (iv) the wealthiest taxpayers tend to retain a significant fraction of profits within companies; and (v) Tax avoidance accounts for the significant reduction of effective income tax rates at the top of the wealth distribution.

[6] a 100% credits can be used for dividends received from small businesses.

[7] This comes from adding the individual marginal tax rate (40%) plus the fraction of the corporate tax that cannot be used as credit ($35\% \cdot 27\% = 9.45\%$)

## Fact 1. Chile exhibits an exceptionally high concentration of wealth

Chile is a particularly suitable country for studying wealth concentration since wealth is exceptionally concentrated at the top 1% of the distribution. The top 1% hold 50% of the total wealth. According to the World Income Inequality Database (WIID), it ranks as the third highest country out of 112 with available data, in terms of the wealth share held by the top 1%[8].

In Chile there is high wealth inequality even across the wealthy individuals. The use of administrative tax data allows for a more granular analysis of the distribution of wealth. The Figure 4 displays the average wealth across different quantiles of the wealth distribution, segmented into three panels, each focusing on a different portion of the taxpayers. Panel A covers the entire wealth distribution, Panel B zooms in on the top 1%, and Panel C narrows the focus even further to the top 0.1%. In Panel A, the bottom 80% exhibits an average wealth close to zero , with a gradual increase to about 0.2 million by the 99th quantile. However, there is a dramatic spike in the top 1%, where the average wealth exceeds 1.5 million. Panels B and C show more detailed breakdowns of wealth concentration within the top 1% and top 0.1%, respectively, illustrating even steeper increases in average wealth as the focus narrows to the wealthiest taxpayers.

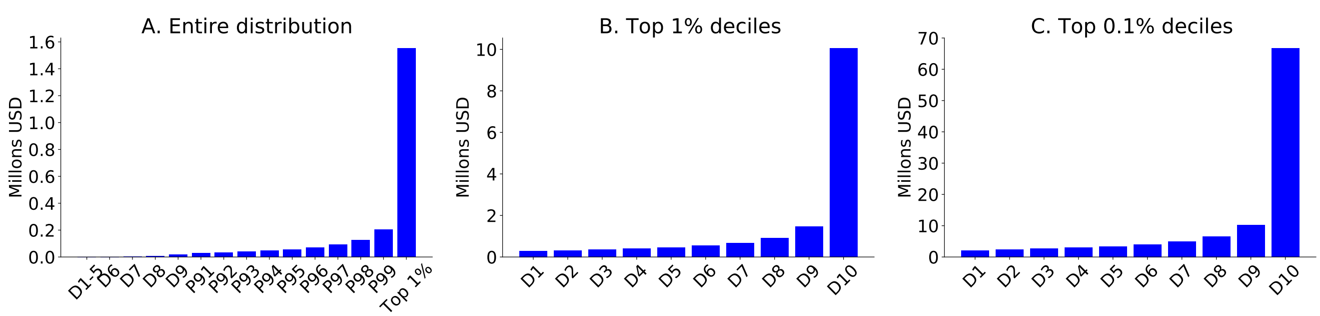


**Figure 4:** Average wealth by quantile of the wealth distribution

The main differences among the panels highlight the varying degrees of wealth concentration within these segments of the taxpayers. When taking a closer look at the distribution of the top 1%, it is possible see that the 10th decile holds 10 million on average, more than five time the average wealth held by the 9th decile. Furthermore, even among the distribution of

[8]See Appendix 8.2 for the list of all countries

the richest — the top 0.1% — one can see that wealth is exceptionally concentrated at the top 0.01%. Indeed, the top 0.01% of individual tax payers hold an average wealth 65 million approximately.

## Fact 2. The wealth of the wealthiest is mainly composed of Corporate Assets

The wealth distribution in Chile exhibits substantial heterogeneity across wealth levels. The Figure 5 displays how wealth is distributed across different types of assets among various segments of taxpayers. It is divided into three panels: Panel A illustrates the asset composition across the entire wealth distribution, broken down into deciles and specific percentiles; Panel B focuses on the top 1% of the wealth distribution, further divided into deciles; and Panel C zooms in on the top 0.1% of the wealth distribution, also broken down into deciles. The assets — as explained the the previous section— are categorized into four types: Corporate Assets, Real Estate, Non-corporate Financial Assets, and Others.

The lower wealth segments are dominated by Others, Real Estate and Non-corporate Financial Assets, as Panel A displays. Specifically, the wealth of the bottom 80% mainly comprises Other assets, which likely primarily encompass vehicles. From the 9th decile to the P99 percentile Real Estate makes up approximately between 60% and 90% of wealth, while Corporate Assets are minimal, at less than 10%. As wealth increases, the proportion of Corporate Assets grows, reaching more than 60% in the top 1%. Upon analyzing the composition of the 99th percentile of wealth and its mean value, it is fair to say that, for example, individuals in this percentile, on average, possess a medium-sized house, a car, some deposits, and some equity. In contrast, the top 1% holds more than 60% of their wealth in corporate assets.

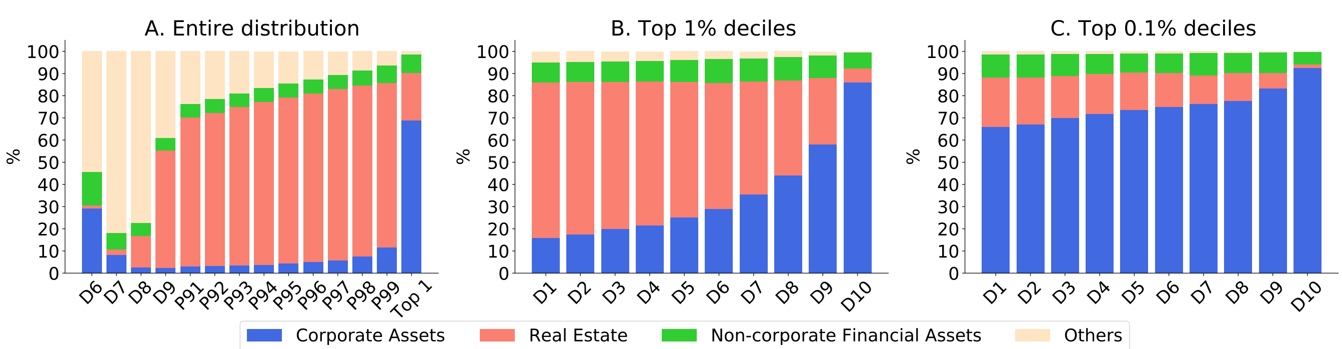


**Figure 5:** Wealth composition across the wealth distribution

Corporate Assets become increasingly significant within the top 1% (See Panel B). In the lower deciles of the top 1%, Corporate Assets account for between 20-60% of wealth, a substantial increase compared to the broader distribution. As we move to the higher deciles within the top 1% (D6-D10), Corporate Assets dominate, reaching up to more than 80%, while Real Estate, Non-corporate Financial Assets and Others together shrink to 20%. This suggests a clear shifts towards less diversified portfolio at the top of the distribution.

The wealth of the wealthiest taxpayers — the top 0.1% — is overwhelmingly dominated by Corporate Assets (see Panel C). In this group, especially in the higher deciles (D6-D10), Corporate Assets constitute 80-90% of total wealth, reflecting a heavy reliance on risky assets. Real Estate and Non-corporate Financial Assets play a minimal role, making up less than 20% of wealth, while the "Others" category is nearly negligible.

This data emphasizes the increasing reliance on Corporate Assets for wealth accumulation as one ascends the wealth distribution. While Real Estate and Non-corporate Financial Assets are more prominent in the broader segment of taxpayers, their importance diminishes among the wealthier segments, giving way to a concentration in corporate investments. This pattern highlights the growing disparity in wealth accumulation methods, with the richest individuals benefiting significantly from corporate ownership.

The composition of wealth in Chile, as detailed in this section, aligns with patterns observed in other countries. For instance, according to the Distribution Financial Accounts from the US, the wealth of the top 0.1% is composed of 67.9% of Corporate Assets[9], while the bottom 50% allocates only 10% of its wealth to such assets (see Appendix 8.1 for more details). Additionally, Bach, Calvet, and Sodini (2020) find a similar pattern using microdata for Nordic countries.

The wealth of the top 0.1% is composed mainly of corporate assets. Corporate assets, in turn, are composed of publicly traded companies (public equity) and non-publicly traded companies (private equity).The composition of Corporate Asset does not exhibit significant difference across wealth levels. In general, more than 80% of corporate assets corresponds to private equity. See Figure 6 for more details.

The fact that the top 0.1% holds more than 70% of its wealth in private equity makes the wealthiest' portfolio in Chile different than the wealthiest in other countries. For example, according to the Distributional Financial Accounts in the US, the top 0.1% holds 48% of its wealth in public equity, whereas 21% is held in private equity.

[9] This include Publicly Traded Companies and Mutual Funds (47.1%) and Non-publicly Traded Companies (20.8%)

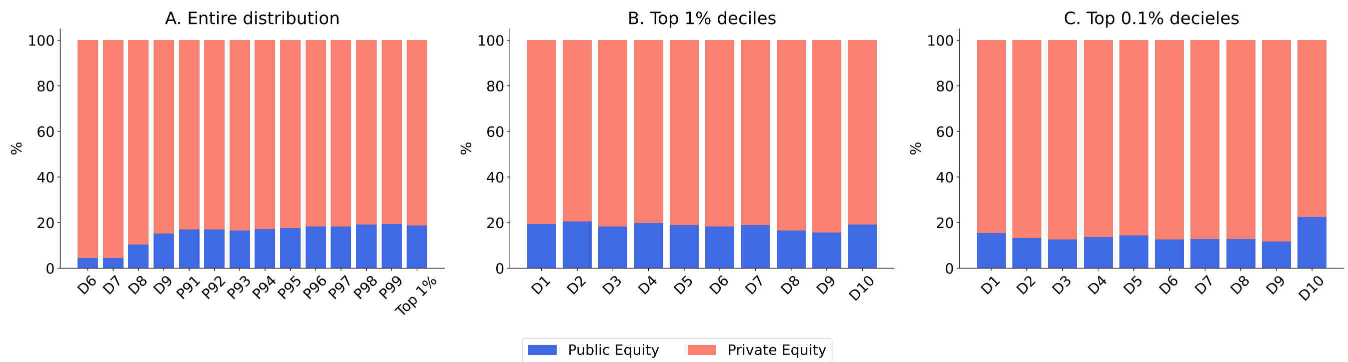


**Figure 6:** Composition of Corporate Assets

This particular aspect of the portfolio composition of wealthy taxpayers in Chile partly explains why wealth is so heavily concentrated. According to Bach, Calvet, and Sodini (2020), private equity plays a disproportionately large role in generating varying levels of returns for the wealthiest individuals. The research shows that the top 0.01% in Sweden allocate 62% of their portfolio to private equity, significantly influencing inequality among the wealthy. Additionally, based on longitudinal microdata, the study estimates that private equity generates an excess annual return of approximately 9% with a volatility of around 50%. Ultimately, the study concludes that private equity represents an asset class with high rate of returns and significant idiosyncratic risk. Unfortunately, the data set available to me does not allow me to replicate the analysis conducted for Chile in this paper.

## Fact 3. Corporate Assets are the most important source of tax avoidance

Tax avoidance refers to the practice of minimizing tax liability through various financial strategies and planning techniques within, or very close to, the boundaries of the law. There is a variety of tax avoidance methods. These methods can occur at personal or corporate level and they range from very simple to rather complex ones. The most common and simple methods are those which allow individual taxpayers who receive labor income only to reduce their effective Personal Income Tax rate, such as the use of personal deductions, tax credits or investing in some retirement accounts. However, there are more sophisticated ways of avoiding income taxation usually at corporate level, such as depreciation bonuses, corporate reorganization, business divisions, mergers, acquisitions, transfer pricing, or abuse of tax losses. Usually, avoiding taxes involves very specific knowledge about the tax code so individual taxpayers or companies pay for tax planning services (see Saez and Zucman (2019b) for more detailed examples of specific tax avoidance techniques used by corporations).

In this paper, tax avoidance is defined as the actions taken by taxpayers to reduce their effective income tax rates. These actions may occur within or at the boundaries of the law and are reflected in tax data. It's important to note that the appearance of an action of tax avoidance — according to this definition — in tax records does not necessarily mean it is legal. There are two cases in which illegal actions might be reflected in the data: (i) when a taxpayer evades taxes without being caught, such as deliberately misreporting income or expenses in a tax return without being audited by the tax authority, or (ii) avoiding taxes according to the legal definition[10], for instance, when a taxpayer engages in aggressive tax planning that is challenged by the tax authority using a General Anti-Avoidance Rule, and subsequently ruled illegal by a court. The definition of avoidance used in this paper is more economic than legal and involves all the actions that reduce the effective income tax rates payed by taxpayers.

I classify tax avoidance in three categories: (i) Personal Avoidance (tax avoidance at personal level), (ii) Corporate Avoidance (tax avoidance at corporate level), and (iii) Retained Profits (retaining profits within companies to avoid personal income taxation). Tax avoidance at individual level implies a reduction of the effective tax rate at individual level, given a fixed amount of Received Income. For instance, this might include uses of deduction, credits and other tax exemptions that benefit individual taxpayers. Whereas Corporate Avoidance implies a reduction of the effective Corporate Income Tax rate, by using, for instance, credits, tax deductions as special depreciation bonuses, or tax loss carry-forward. Whereas Retained Profits implies a reduction of the taxable income at individual level or, equivalently, a reduction of the Received Income by not distributing corporate profits to individual tax payers.

The next step is to quantify each of the three tax avoidance categories. To begin, I define the Benchmark Income Tax Rate (BITR) as the effective income tax rate that taxpayers would face in the absence of any tax avoidance actions. Let $T^B(I^T, I^L, I^K)$ be the BITR when the taxable income is $I^T$, labor income is $I^L$, and the capital income is $I^K$. In this Benchmark, the taxable income is the same as the total income, $I^T = I^L + I^K$. This Benchmark represents the effective tax rate when the gross income of a taxpayer is the same as the taxable income and

[10]In numerous jurisdictions, part of the legal definition of tax avoidance involves "intentional act of undertaking an action without a legitimate business reason, leading to a reduction in tax liability". Some definitions also use the concept "going against the spirit of the law" or "actions without economic substance".

there are no tax credits, deductions or other tax benefits at all.[11] Specifically, $T^B(I^T, I^L, I^K)$ is defined as:

$$T^B(I^T, I^L, I^K) = \frac{T^M(I^T) \cdot I^T + \tau_k \cdot I^K - 0.65 \cdot 0.27 \cdot I^K}{I^L + I^K} \tag{6}$$

Where $T^M(\cdot)$ is the effective tax rate after applying the Personal Income Marginal Tax Rates from Table 1 and $\tau_k$ is the effective Corporate Income Tax rate, which is equal to 27% in the Benchmark. The number 0.65 comes from the fact that 65% of the Corporate Income Tax paid by the firm is credited against the amount of Personal Income Tax owed. The number 0.27 is the fraction of value of the gross dividend that can be used as credit against the Personal Income Tax.[12] Figure 7 displays the BITR for different quantiles of wealth distribution.[13]

In practice, the effective income tax rate paid by taxpayers is lower than the Benchmark due to the presence of tax avoidance[14]. To illustrate this point, suppose a taxpayer who only received labor income equal to $I^L$. Then, the effective income tax rate, $\tau(I^L)$, paid in practice is:

$$\tau(I^T, I^L, 0) = \frac{T^B(I^L - TD, I^L, 0) \cdot (I - TD) - TC}{I^T} \tag{7}$$

Where $T^B(I^L - TD, I^L, 0)$ is the Benchmark Effective Tax Rate function evaluated at the taxable income — income ($I^L$) less tax deductions ($TD$) — when the labor income is $I^L$ and the capital income is 0. $TC$ is the amount of tax credits used by this taxpayer. Notice that, if $TD = TC = 0$, then $\tau(I^L) = T^B(I^L, I^L, 0)$, meaning the effective tax rates coincides with the Benchmark. Indeed, for workers the only way to avoid some taxation is by using tax deductions or credits when filling their Personal Income Tax form.

In case a taxpayer holds corporate assets, the Corporate Income Tax payments must be taken into account in the computation of the effective income tax rate paid. Similarly to the

[11]The only tax credits that is taken into account in this benchmark are the ones associated to the Income Tax Imputation System described in the previous section, where the Corporate Income Tax associated with dividends is credited against the Personal Income Tax to avoid double taxation of capital income.

[12]It is important to notice that $\tau_k$ is not always equal to 27% in practice due to Corporate Avoidance. On the other hand, the amount of credit against Personal Income Tax is always $0.65 \cdot 0.27 \cdot I^K$ regardless of what effectively was paid at corporate level. For example, if a company distributed dividends and used tax losses, then the effective Corporate Income Tax rate, $\tau_k$, is lower than 27% but the shareholder still can use as credit against the Personal Income an amount equal to $0.65 \cdot 0.27 \cdot I^K$.

[13]I compute these tax rates using the average labor and capital income by quantile of the wealth distribution according to the data.

[14]Tax avoidance as it was defined previously.

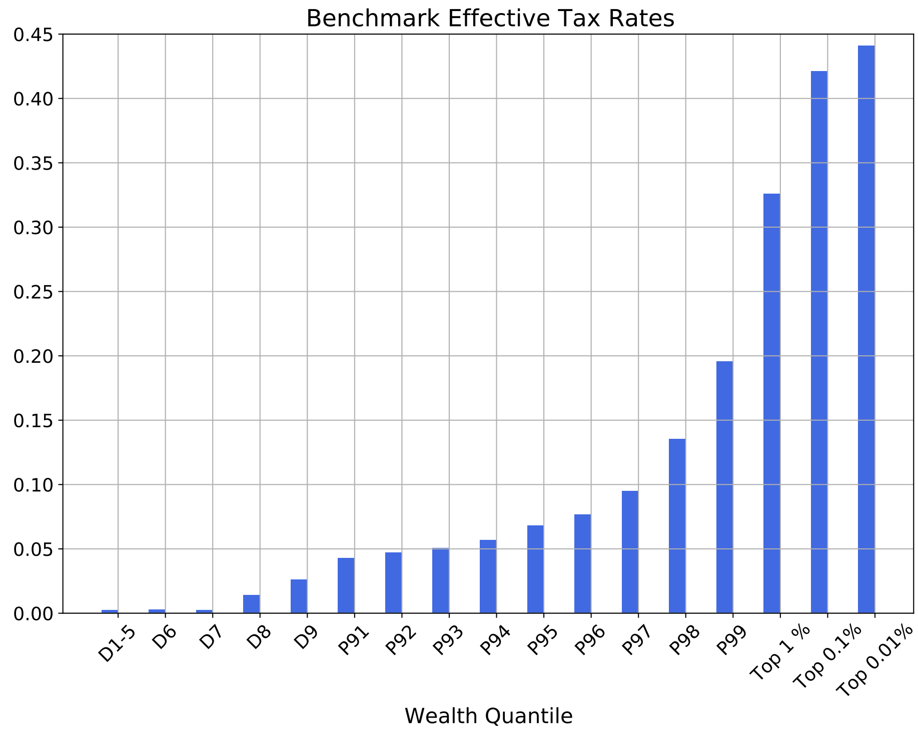


**Figure 7:** Benchmark Income Tax Rate (BITR) across different quantiles of the wealth distribution.

previous illustration, suppose a taxpayer with a total income equal to $I^T$, $I^L$ labor income, $I^K$ capital income, and a fraction $\theta$ of the capital income is distributed as dividends (meaning $1-\theta$ of the capital income is retained within companies). Hence, the effective income tax rate this taxpayer pays in practice is:

$$\tau(I^T, I^L, I^K) = \frac{T^B(I^L + \theta \cdot I^K - TD, I^L, \theta \cdot I^K) \cdot (I^L + \theta \cdot I^K - TD) + \tau_k \cdot (1-\theta) \cdot I^K - TC}{I^L + I^K} \tag{8}$$

Where $\tau_k$ is the effective corporate income tax rate paid by this taxpayer. Notice that the only case when this effective tax rate is the same as the Benchmark Income Tax Rate is when $TD = TC = 0$ (there are not tax deductions nor tax credits) , $\tau_k = 0.27$ (there is no corporate avoidance), and $\theta = 1$ (all the profits are distributed as dividends).

The Figure 8 displayed the Benchmark Effective Tax Rate and the Effective Tax Rate, the former is computed using the definition explained previously and the latter is computed directly from the data. There are two important facts to highlight from this figure. First, the Effective Income Tax Rate is lower than the Benchmark for each quantile of the wealth distribution. This comes as no surprised since, as explained before, the presence of the different categories of tax avoidance reduce the Benchmark. Second, the Effective Income Tax Rate is decreasing for the wealthiest taxpayers, which reflects that these individuals make a more intensive use of the different features of the tax code that allow them to reduce their tax liabilities.

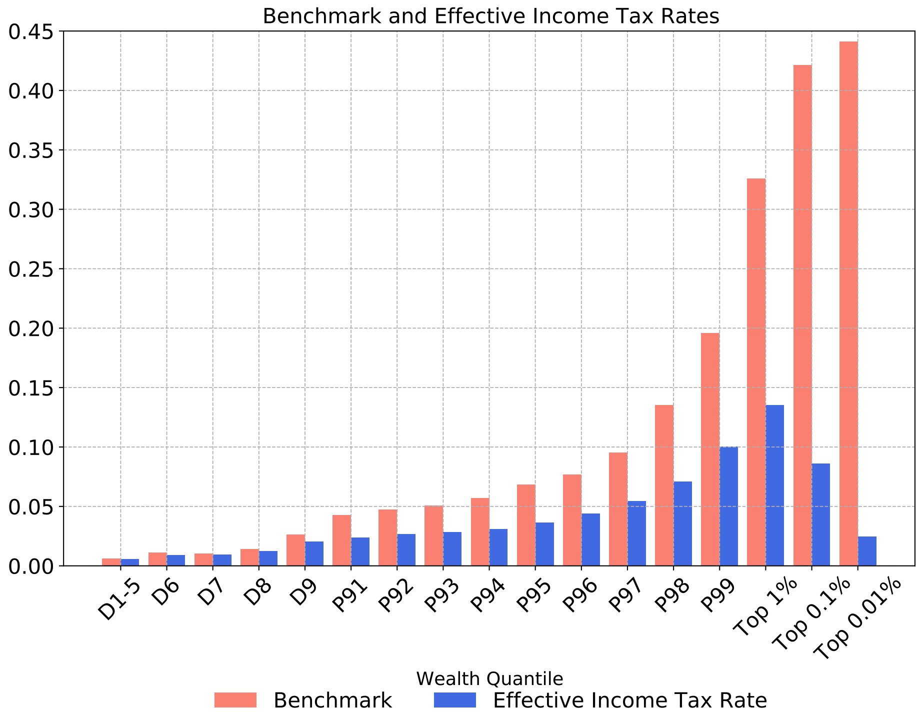


**Figure 8:** Benchmark and Effective Income Tax Rate across quantiles of the wealth distribution.

Using this benchmark definition, I then calculate the extent to which each tax avoidance category — Personal Avoidance, Corporate Avoidance, and Retained Profits — reduces the BITR. To this aim, I decompose the different effect as follows:

$$EITR = BITR - PAE - CAE - RPE \tag{9}$$

Where $EITR$ is the Effective Income Tax Rate computed from the data, $BITR$ the benchmark, $PAE$ is the Personal Avoidance effect, $CAE$ the Corporate Avoidance effect, and $RPE$ the Retained Profits effect.

### Personal Avoidance Effect

Personal Avoidance allows taxpayers to reduce their Personal Income Tax rate, given an amount of Received Income $I^R$.[15] This reduction can be due to deductions or credits.[16] Let $T^P(I^R, I^L, I^K)$ be the Effective Personal Income Tax Rate of a taxpayer who receives an income equals to $I^R$ from labor and capital, hence $I^R = I^L + \theta \cdot I^K$.[17] This tax rate is defined as follows:

$$T^P(I^R, I^L, \theta \cdot I^K) = \frac{T^B(I^R - TD, I^L, \theta \cdot I^K) \cdot (I^R - TD) - TC}{I^R} \tag{10}$$

Where $TD$ is the total tax deductions and $TC$ is the total tax credits. Notice that $T^B(I^R - TD, I^L, \theta \cdot I^K)$ is the BITR evaluated at a taxable income equal to $I^R - TD$. Also, when $TC = TD = 0$, then $T^P(I^R, I^L, \theta \cdot I^K) = T^B(I^R, I^L, \theta \cdot I^K)$, meaning that the Effective Personal Income Tax Rate coincides with the Benchmark. It is worth mentioning that both deductions and credits reduce the effective income tax rates but they have different effects. The former reduces the taxable income, whereas the latter reduces directly the effective tax payments. In case $T^B(I^R - TD, I^L, I^K) \cdot (I^R - TD) - TC < 0$, one gets a tax refund from the IRS.

The Figure 9 displays the Effective Personal Income Tax Rate, $T^P(I^R, I^L, \theta \cdot I^K)$, across different quantiles of the wealth distribution computed directly from the data. This result does reveal the progressive nature of the tax system at individual level, with higher effective income tax rates for wealthier individuals, particularly as we move from the lower to the higher wealth quantiles. However, it also reveals that within the wealthiest segments of taxpayers, particularly within the top 1% (Panel B) and 0.1% (Panel C), the increase in tax rates is not as steep. In fact, in the highest quantiles, the effective tax rate slightly decreases. This pattern suggests that while wealthiest individuals do face higher marginal tax rates overall, they use more intensively tax deductions and credits at individual level.

Next, I compute the impact of Personal Avoidance on the Benchmark Effective Tax Rate (BITR). Let $T^{PA}(I^T, I^L, I^K)$ be the effective income tax rate that accounts for the presence

[15] This income can came from labor or capital. In the case of capital income, it can be dividends, interests, or capital gains.

[16] Given an amount of Received Income, this is the only way individual taxpayers have to reduce their tax liabilities. There exists also the possibility of reducing the amount of Received Income, however this involves using corporations which is other category of tax avoidance.

[17] $\theta$ is the fraction of capital income that is distributed to individual taxpayers.

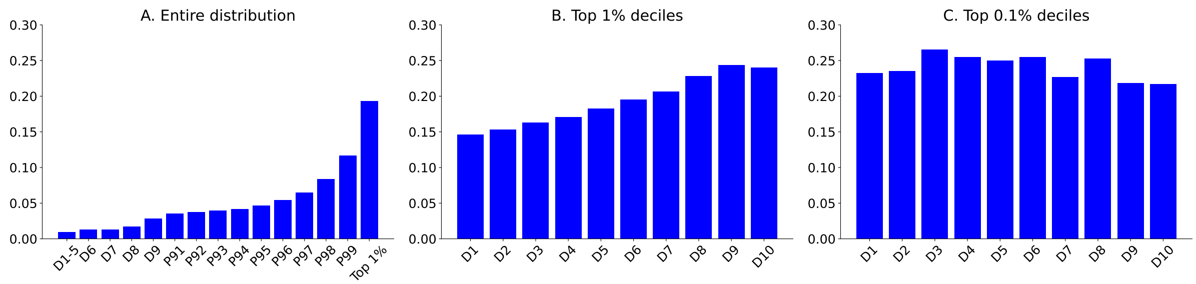


**Figure 9:** Effective Personal Income Tax Rate across different quantiles of the wealth distribution.

of Personal Avoidance only. In other words, $T^{PA}(I^T, I^L, I^K)$ represents the tax rate taxpayers would effectively pay if the only way of avoiding taxes is Personal Avoidance. The precise definition of $T^{PA}(I^T)$ is:

$$T^{PA}(I^T, I^L, I^K) = \frac{T^P(I^R, I^L, \theta \cdot I^K) \cdot I^R + T^B(I^T - I^R, I^L, (1-\theta) \cdot I^K) \cdot (I^T - I^R)}{I^T} \quad (11)$$

This definition isolate the impact of the other categories of avoidance (Corporate and Retained Profits), since it assumes that the retained profits $(I^T - I^R)$ are taxed at the Benchmark Income Tax Rate, $T^B(\cdot)$. Notice that when the Total Income is the same as the Received Income ($I^T = I^R$ or, equivalently, $\theta = 1$), then $T^{PA}(I^T, I^L, I^K) = T^P(I^R, I^L, I^K)$. For most of the taxpayers, it is the case that $I^T = I^R$ as they received labor income only. The $T^{PA}(I^T, I^L, I^K)$ and the Benchmark is displayed in the Figure 10. The Personal Avoidance effect reduces the effective income tax rates across the entire wealth distribution, yet the effective income tax rate after accounting for this effect still exhibits a progressive pattern.

### Corporate Avoidance Effect

Corporate Avoidance allows taxpayers to reduce their Effective Corporate Income Tax Rate. Usually, this reduction can be due to deductions, tax credits, depreciation bonus, or tax losses. However, there are more sophisticated ways of avoiding income taxation at corporate level, such as reorganization, business divisions, mergers, acquisitions, profit shifting, and transfer pricing.

There are two key variable the data allows to measure at corporate level: Financial Profits and Corporate Taxable Income. The latter is the actual cash flow of a company in a given year,

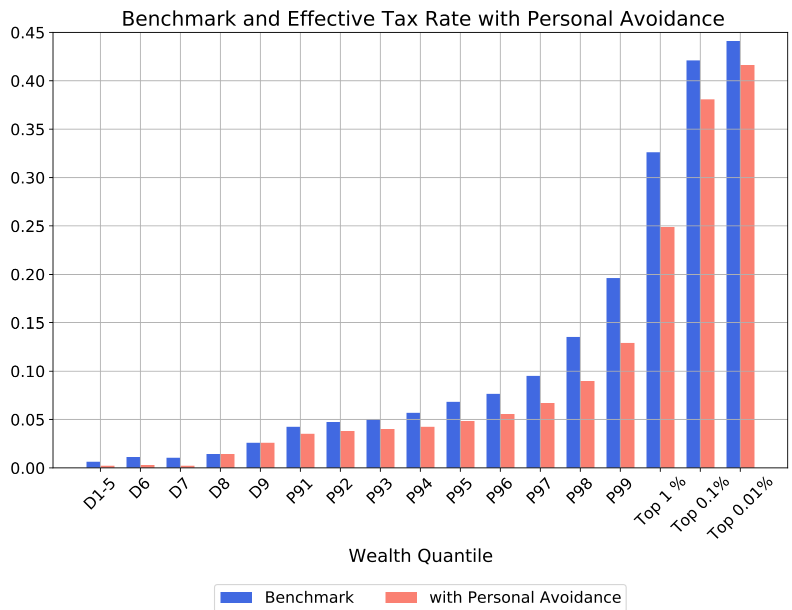


**Figure 10:** Benchmark Income Tax Rate (BITR) and Effective Tax Rates with Personal Avoidance across different quantiles of the wealth distribution.

whereas the former is amount over which the Corporate Income Tax is applied and usually lower than the Financial Profits due to tax adjustments. More precisely, the Financial Profits ($\Pi_f$) are computed as:

$$\Pi_f = R - (C_o + W + D_E + NI) \tag{12}$$

Where $R$ is Total Revenue, $C_o$ Operating Costs, $W$ Wages and Salaries, $D_E$ Economic Depreciation[18], and $NI$ Net Payment of Interest.

The Corporate Taxable Income is defined as follows:

$$CTI = R - (C_o + W + D_t + I) - TD - TL \tag{13}$$

Where $D_t$ is the Tax Depreciation, $TD$ Tax Deductions, and $TL$ Tax Losses. The Figure 11 displays an illustration on the difference between Financial Profits and Taxable Income. The main point of this illustration is that the Taxable Income tends to be smaller than the Financial Profits due to the presence of multiple tax benefits such us bonus depreciation or deduction for some non-related production expenses, for example.[19]

[18]Economic depreciation differs from tax depreciation, as the latter tends to be higher due to tax benefits.
[19]For example: gifts, charitable contribution, goodwill, bad debt, among others.

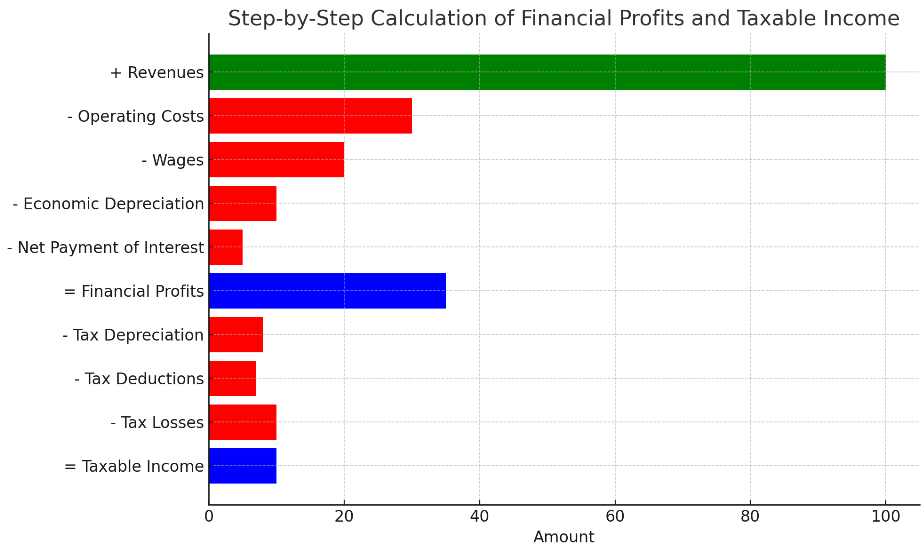


**Figure 11:** Illustration of the Financial Profits and Taxable Income computations

The Corporate Income Tax Rate is applied to the Taxable Income, so the effective tax payment is:

$$TP = 27\% \cdot TI - TC \tag{14}$$

Where $TC$ are the Tax Credits[20]. I define the Effective Corporate Income Tax Rate ($\tau_k$) as:

$$\tau_k = \frac{TP}{\Pi_f} \tag{15}$$

Notice that this definition of the effective tax rate represents the tax payments as a fraction of the actual cash flow of a company in a given year. Following the example of Figure 11, suppose that this company has \$1 in tax credits, since the Taxable Income is around a quarter of the Financial Profits, the value $\tau_k$ of this company is $\sim 4.25\%$.

The effective Corporate Income Tax rates across different quantiles of wealth distribution is displayed in Figure 12. As it is shown, the $\tau_k$ exhibits a decreasing pattern as wealth increases. In the lower quantiles, the effective corporate tax rate is close to actual the 27% written in the law, reflecting less access to corporate tax avoidance strategies. On the other hand, as wealth increases into the top 1% (Panel B), the effective tax rate declines sharply, dropping to

[20]The most relevant Corporate Tax Credits in Chile are: R&D expenses, employee training expenses, donations, and acquisition of fixed assets.

below 10% for those in the highest quantiles of this group (D6-D10). This trend is even more pronounced in the top 0.1% (Panel C), where the tax rate can fall to as low as 5% or even lower. This suggests that the wealthiest individuals, particularly those in the top 0.1%, are able to significantly minimize their corporate tax obligations, leading to a disproportionately lower tax burden compared to those in the lower wealth quantile.

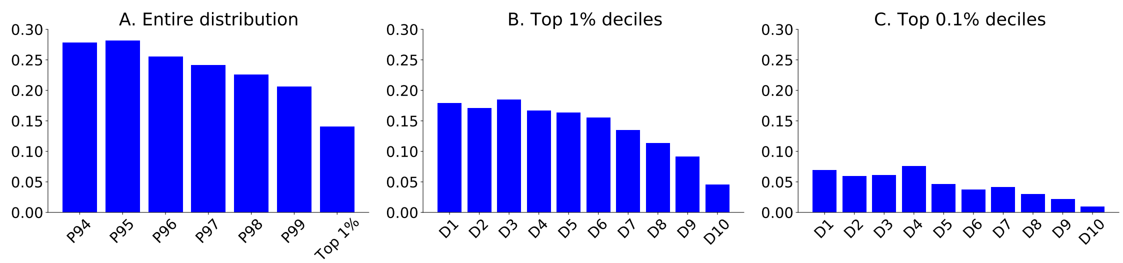


**Figure 12:** Effective Corporate Income Tax for different quantiles of the wealth distribution.

There are two important features of the Income Tax Law in Chile that makes the Taxable Income much lower than the Financial Profits: (i) it allows companies to use an "accelerated depreciation" regime, which reduces to one third the lifetime of an assets, implying a higher reduction of the Taxable Income due to tax depreciation; (ii) there are no time nor amount limits for the use of tax losses, so companies can reduce their Taxable Income as much as the amount of tax losses they have accumulated over time.

Next, I compute the impact of Corporate Avoidance on the Benchmark Effective Tax Rate (BITR). Let $T^{CA}(I^T, I^L, I^K)$ be the effective income tax rate that accounts for the presence of Corporate Avoidance only. In other words, $T^{CA}(I^T, I^L, I^K)$ represents the tax rate taxpayers would effectively pay if the only way of avoiding taxes is using Corporate Avoidance. The formal definition of $T^{CA}(I^T, I^L, I^K)$ is:

$$T^{CA}(I^T, I^L, I^K) = \frac{T^M(I^T) \cdot I^T + \tau_k \cdot I^K - 0.65 \cdot 0.27 \cdot I^K}{I^L + I^K} \tag{16}$$

Where $\tau_k$ is the Effective Corporate Income Tax computed from the data. Notice that when $\tau_k = 27\%$ — the case without Corporate Avoidance — then $T^{CA}(I^T, I^L, I^K)$ is the same as the Benchmark, $T^B(I^T, I^L, I^K)$.

The wealthiest taxpayers tend to benefit more from Corporate Avoidance. The Figure 13 displays the Benchmark and the Effective Income Tax Rate with Corporate Avoidance across different quantiles of the wealth distribution. This result shows that Corporate Avoidance does affect the progressivity of the effective income tax rate as it decreases for the wealthiest taxpayers when this category of avoidance is taken into account. The decrease in the Effective Income Tax Rate due to Corporate Avoidance is explained by two reasons: (i) the rich tend to hold more corporate assets so Corporate Avoidance affects prorportionally more the effective income tax rates, and (ii) conditional on holding corporate assets, the Effective Corporate Income Tax Rate is decreasing as wealth increases.

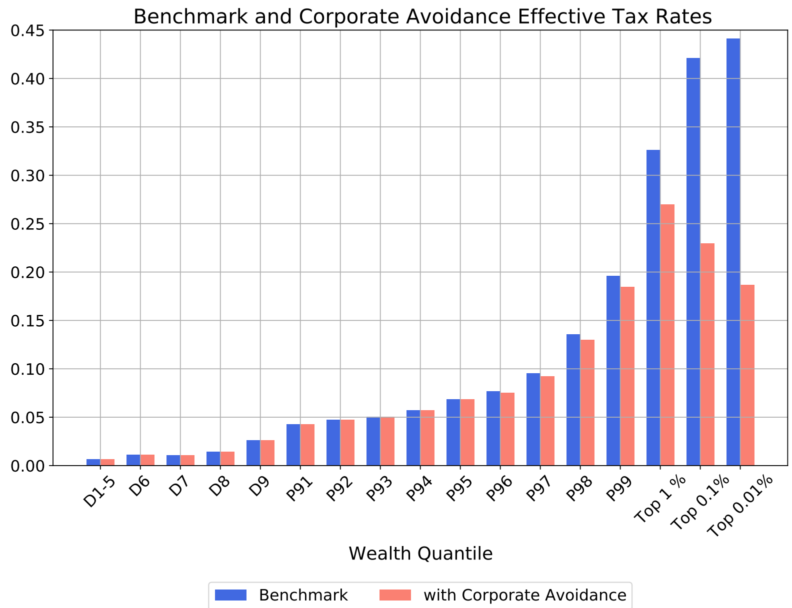


**Figure 13:** Benchmark Income Tax Rate (BITR) and Effective Tax Rates with Corporate Avoidance across different quantiles of the wealth distribution.

### Retained Profits Effect

Retained profits represent the portion of a company's net income that is reinvested in the business instead of being distributed to individual shareholders as dividends. By keeping profits within the company, taxpayers holding corporate assets can defer their Personal Income Tax obligations. This is because profits are only subject to Personal Income Tax when they are distributed to individual shareholders as dividends. Dividend distribution between companies is not subject to income tax. If a company chooses not to distribute dividends to an individual taxpayer, the associated personal income taxes are deferred until those profits are eventually received by a person. There are no legal restrictions or additional taxes tied to retaining profits, allowing taxpayers, in principle, to defer personal income tax on dividends indefinitely.

The term "retained profits" can be misleading, as it suggests the money is merely held within the business without any specific use. However, from an economic perspective, it represents shareholders' income that is saved and immediately reinvested by the company. In practice, these resources can then be used, for example, to purchase fixed capital, acquire financial assets, or even buy other businesses. Sometimes, profits are distributed to other companies so they can be reinvested in a different company. Since there are no restrictions on how retained profits can be utilized, company owners have the flexibility to diversify their wealth without distributing dividends to individual shareholders and then reinvesting in other assets.

Corporate assets provide a tax advantage by enabling individual taxpayers to defer taxes on the portion of income that is saved and retained within the company. In other words, it is as if all of the taxpayer's savings were effectively tax-deductible. In contrast, individuals who earn solely labor income face more constraints if they want to tax-deduct savings and, hence, they usually save a fraction of the after-tax income.[21]

The primary reason shareholders favor dividends over retained earnings is for personal consumption. However, individual taxpayers may blur the line by using corporate resources for personal expenses. While regulations restrict such expenditures, enforcement often proves challenging. For instance, how can the IRS effectively distinguish between a legitimate business trip and a vacation, or a business dinner and a private meal? Even assuming taxpayers strictly adhere to the rules, the wealthiest 0.01% of taxpayers receive approximately 11% of total corporate profits as dividends, suggesting that only a small portion of their total income is allocated to consumption.

Taxpayers do not always have control over a company's dividend policy, especially when dealing with publicly traded companies. However, they can minimize personal income tax on dividends by using non-publicly traded companies to invest in publicly traded ones. In this setup, dividends are paid to the non-publicly traded entity, avoiding personal income taxation. As previously noted, around 80% of corporate assets are tied to private equity, enabling taxpayers to retain profits within companies, even when they have no control over the dividend policy of a specific firm.

In order to quantify the extent to which taxpayers retain profits within companies, I com-

[21] In Chile, there are some tax benefits for individual taxpayers, similar to the 401(k) in the U.S., but these benefits, like the 401(k), are limited.

pute the ratio between Received Income and Total Income. This fraction represents the income that is actually subject to the marginal tax rates at individual level. One minus this ratio can be interpreted as the fraction of Total Income that is retained within companies. The behavior of received income as a fraction of total income — displays in Figure 15 — changes dramatically across the wealth distribution. For the vast majority of tax payers — particularly in Panel A — the ratio is close to 1 and decreases slightly from lower to higher quantiles. This is consistent with the fact that the big majority of taxpayers mainly rely on labor income. Panel B, which focuses on the top 1%, shows a more pronounced decline, especially in the highest deciles, indicating that within the top 1%, wealthier individuals are retaining an even larger share of profits within companies. For the wealthiest individuals (Panel C), a small fraction of their total income is subject to individual tax rates, being this fraction near to 10% for the top 0.01%, underscoring that the wealthiest retain most of their profits within companies.

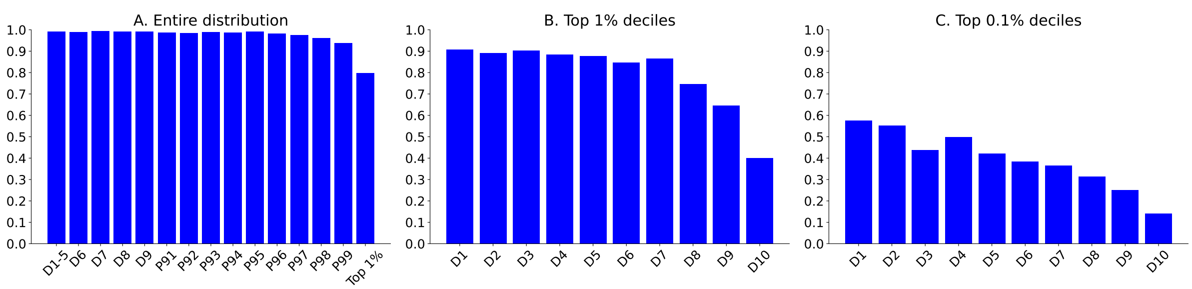


**Figure 14:** Received income as a fraction of total income across different quantiles of the wealth distribution.

Given this measure of retained profits, I compute its effect on the Benchmark for different quantiles of the wealth distribution using the following equation:

$$\tau(I^T, I^L, I^K) = \frac{T^B(I^L + \theta \cdot I^K, I^L, \theta \cdot I^K) \cdot (I^L + \theta \cdot I^K) + \tau_k \cdot (1-\theta) \cdot I^K}{I^L + I^K} \tag{17}$$

Where $I^T$ is the total income, $I^L$ is labor income, $I^K$ capital income, $\theta$ is the fraction of profits that are distributed and received by individual taxpayers, and $\tau_k = 0.27$ is the corporate tax rate. Notice that this effective tax rate is the same as the Benchmark except that the value of $\theta$ is computed directly form the data. The figure 15 displays the Benchmark Income Tax Rate and Effective Tax Rates with Retained Profits across different quantiles of the wealth distribution.

Retaining profits can serve as a mechanism for tax avoidance in two key ways. First,

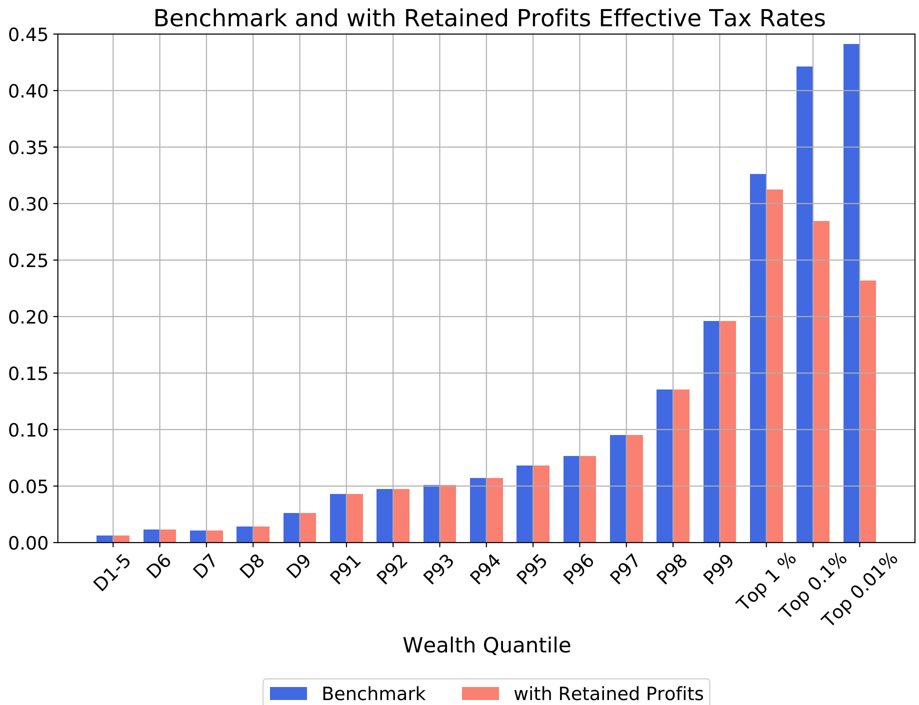


**Figure 15:** Benchmark Income Tax Rate and Effective Tax Rates with Retained Profits across different quantiles of the wealth distribution.

taxpayers can indefinitely defer personal taxation by keeping profits within the company until death, totally avoiding their tax liability. Second, by retaining earnings rather than distributing them, taxpayers may eventually pay a lower income tax rate than if the profits had been taxed when originally generated.

Regarding the first matter, if a taxpayer defers personal taxation until the end of his life, then his offspring will be subject to Estate Tax. In Chile, the Estate Tax, also known as the "Inheritance and Gift Tax", is levied on the transfer of assets after an individual's death or as a gift during their lifetime. The rates are progressive, ranging from 1% to 25%, depending on the value of the estate or gift and the relationship between the deceased (or donor) and the beneficiaries. However, wealthy individuals may use legal estate planning tools, such as trusts or private foundations, to minimize the tax impact on their heirs.

Estate tax revenues have ranged between 0.01% and 0.25% of GDP and between 0.6% and 5% of income tax revenues over the last 30 years. Figure 16 shows estate tax revenues over time, both as a percentage of GDP (left axis) and as a percentage of income tax revenues (right axis). During this period, four of Chile's wealthiest citizens passed away: Andrónico

Luksic Abaroa (1926-2005), Anacleto Angelini Fabbri (1914-2007), Guillermo Luksic Craig (1956-2013), and Agustín Edwards Eastman (1927-2017). The peak in 2009 is attributed to the estate tax payments of Anacleto Angelini Fabbri's heirs, who collectively paid around 300 million dollars.[22] However, the deaths of two members of the Luksic family —– the wealthiest family in Chile[23] — did not result in a significant increase in estate tax revenues, which suggests they might have used legal estate planning tools to avoid taxation.

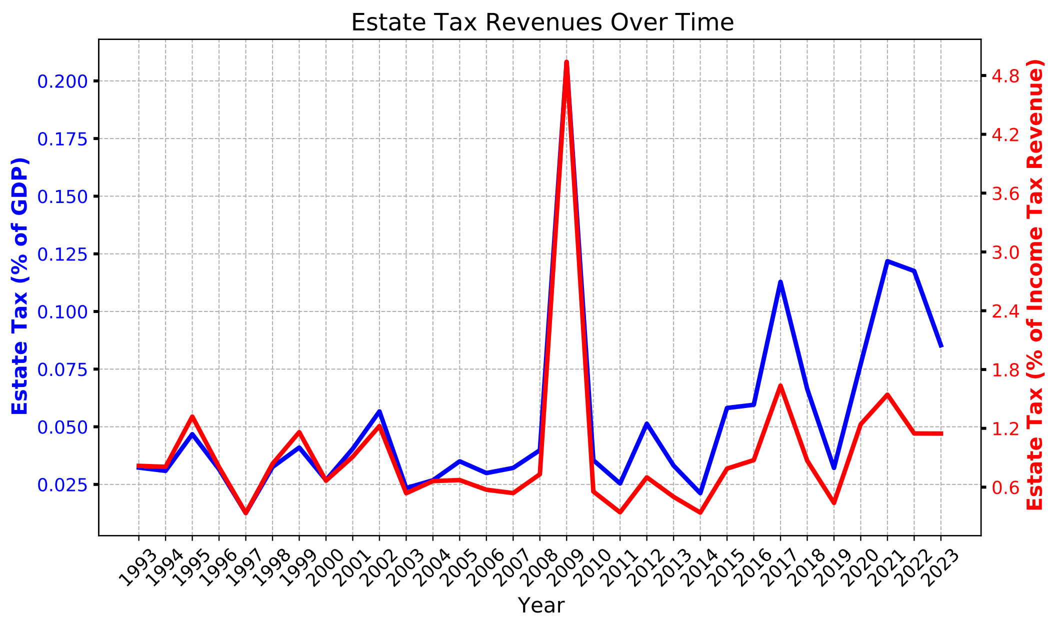


**Figure 16:** Estate Tax Revenues Over Time. Source: Internal Revenue Service, Chile.

The case of the Luksic family serves as an example on how wealth accumulated from retained profits can be organized. In light of the Pandora Papers,[24] the Chilean Center of Investigative Journalism (CIPER Chile) uncovered the intricate structure of the Luksic family's companies, noting that the ultimate corporate shareholders of their major Chilean firms are trusts and companies based in Liechtenstein.[25] Notably, the Pandora Papers disclose the

[22]The Estate Tax Law grants heirs a two-year window following the individual's death to declare and pay the estate tax.

[23]26.7 billion dollars (around 10% of Chilean GDP) according to Forbes, using public information and market values.

[24]The Pandora Papers, released in October 2021 by the International Consortium of Investigative Journalists (ICIJ), exposed the offshore dealings of wealthy individuals, global leaders, celebrities, and corporations. The leaked documents revealed how they employed complex offshore structures and tax havens to conceal assets, evade taxes, and, in some cases, engage in illegal activities such as money laundering.

[25]Liechtenstein is a small tax haven European country. With an area of around 160 square kilometers and a population of about 40,000, it is renowned for its financial industry and tax planning services.

contents of official documents related to some of the Luksic family's corporations in Liechtenstein, one of which outlines the purpose of a foundation as follows: "*To provide economic support to the descendants of Nadia Malvine Tcherniak who bear the surname Luksic as their first or second surname and who are also biological descendants of Andrónico Luksic Abaroa.*" This investigation sheds light on how the family's wealth is managed and passed down through generations using offshore entities while avoiding estate tax.

In addition to estate planing, the second way retaining profits can serve as a tax avoidance strategy is by allowing taxpayers to pay a lower effective tax rate in the future than they would have if the profits had been distributed to an individual taxpayer when originally generated. The tax code facilitates this in several ways. The simplest method is to distribute dividends in amounts that prevent the highest marginal income tax rates from applying. A more complex approach involves profit shifting (see Saez and Zucman (2019b) for more details and evidence on this specific strategy), where profits are transferred from domestic companies to offshore entities. This allows any eventual dividend distribution to individual taxpayers — if any — to occur in a low-tax jurisdiction, further minimizing the tax burden.

To better understand the "path" of a dividend, Figure 17 illustrates the corporate structure of a subset of the Luksic family's enterprises, showcasing how dividends may never reach an individual taxpayer. The figure highlights a complex web of entities across multiple jurisdictions, including tax havens such as Liechtenstein and Jersey. At the top of the structure, foundations like Lukburg and Emain, alongside companies such as Dolber Finance, Lanzville Investments, and Runa Cooper, serve as holding entities, each owning stakes in various Chilean investment firms. These firms collectively control a range of operating companies in Chile, including Banco de Chile, CCU, and Enex Chile, through the central holding company, Quiñenco. Most of the operating companies at the bottom are publicly traded but remain under Luksic family control. In the end, ownership is so fragmented across subsidiaries in tax havens that, for example, a dividend distributed by Banco de Chile may ultimately end up in Liechtenstein rather than in the hands of an individual taxpayer in Chile.

Such structures and the use of retaining profits facilitate tax avoidance by allowing profits to be shifted from higher-tax jurisdictions, like Chile, to low-tax jurisdictions such as Liechtenstein and Jersey. By using multiple layers of offshore subsidiaries and foundations, the group can transfer profits through profit shifting, reducing taxable income in Chile. The tax-haven-based entities benefit from favorable tax regimes — the tax rate on dividends is 0% in Liechtenstein —

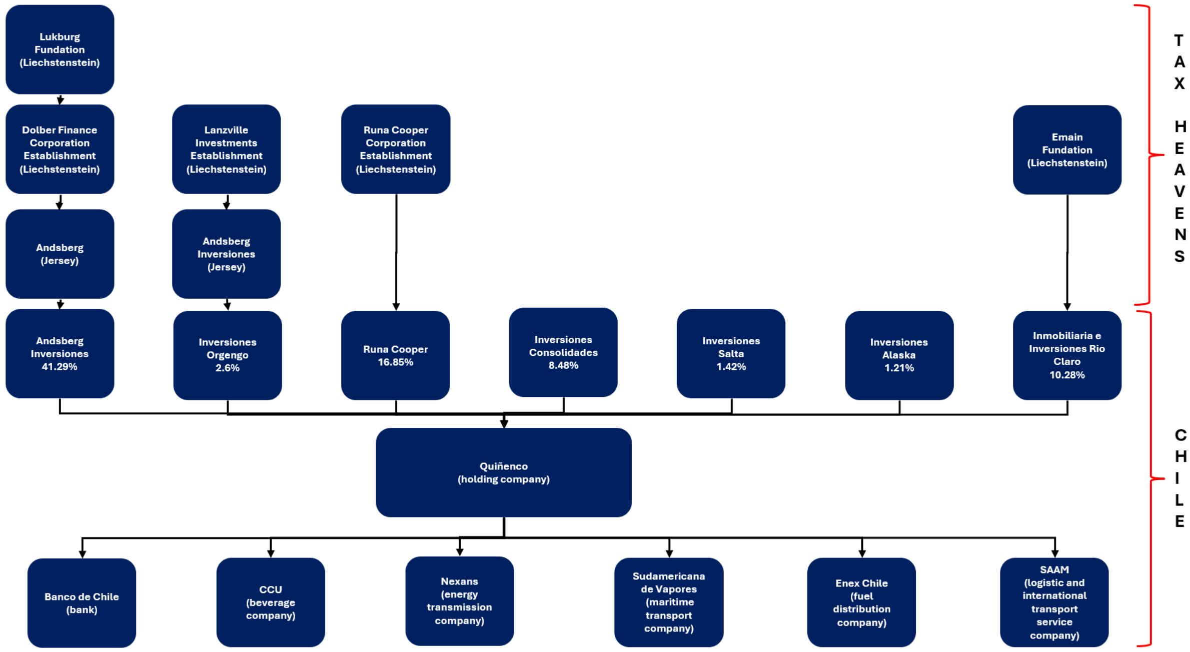


**Figure 17:** Luksic family's structure of companies. Source: CIPER Chile based on public information and Pandora Papers.

ensuring that profits are taxed minimally, if at all. Furthermore, the complexity and layering of ownership help shield assets and income from being fully taxed, effectively lowering the overall tax burden on the entire corporate group.

### Tax Avoidance Effect Decomposition

Given the measures of the different tax avoidance categories, I proceed to compute the impact of each category to the reduction in the Benchmark Effective Income Tax Rate, previously defined. The Figure 18 depicts the impact of the three tax avoidance categories previously described on the effective income tax rate across different wealth quantiles, ranging from the lower wealth quantiles (D1-5) to the wealthiest individuals (Top 0.01%). The X-axis represents the wealth quantiles, while the Y-axis displays the effective tax rate. The blue bars indicate the effective income tax rate computed from the data, while additional bars represent the contribution of different tax avoidance categories. These categories are Personal Tax Avoidance, Corporate Tax Avoidance, and Retained Profits, all of which are shown to decrease the effective tax rate to varying degrees across wealth groups.

Personal avoidance reduces the effective tax rate, but its impact is relatively small in all quantiles. For instance, in the lower and middle quantiles (D1-5 through P90), personal

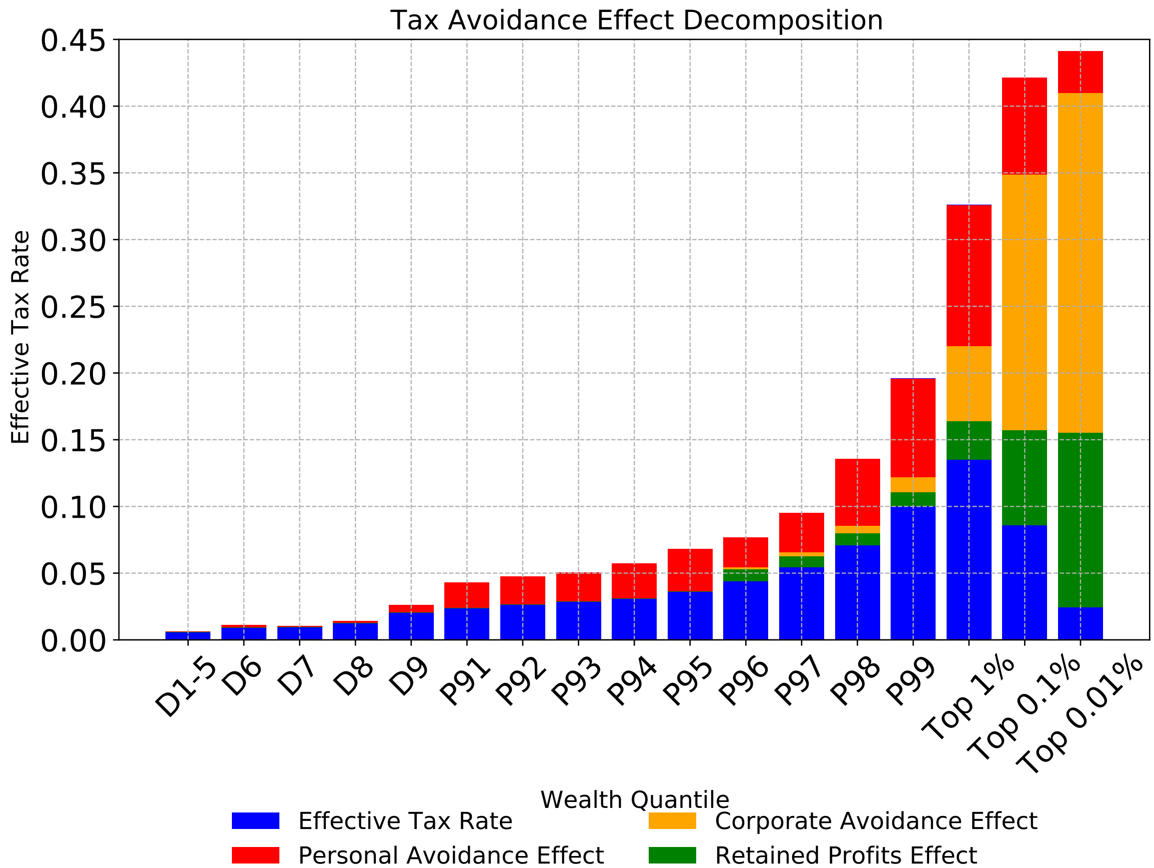


**Figure 18:** Tax Avoidance Effect Decomposition.

avoidance reduces the effective tax rate by approximately 1-2% explaining almost a 100% of the total avoidance effect. For the Top 1%, personal avoidance leads to about a 10% reduction with respect to the Benchmark, which accounts for 55% of the total avoidance effect. In the Top 0.01%, personal avoidance reduces the effective tax rate by approximately 3% , which contributes around 8% of the overall effect.

Corporate tax avoidance has a more significant effect, especially for wealthier individuals. From P96 to P99, corporate avoidance explains between 5% and 9% of the overall avoidance effect. In the Top 1%, corporate avoidance reduces the effective tax rate by around 5%, representing around 30% of the total effect. For the Top 0.01%, the effect is even larger, with corporate avoidance reducing the Benchmark by about 20%, contributing 61% to the overall effective income tax rate reduction.

Retained profits have minimal impact in the lower wealth quantiles (D1-5 to P90-P95), reducing the effective tax rate by less than 1 percentage point. In these quantiles, the effect of retained profits on the total reduction is negligible However, in the Top 1%, retained profits have a more significant impact, reducing the effective tax rate by about 5%, which is about 15% of the total reduction. In the Top 0.01%, retained profits reduce the effective tax rate by approximately 13%, which represents 31% of the total reduction in this wealth group. This shows that retained profits are a critical component of tax avoidance for the wealthiest individuals.

In summary, while all wealth groups benefit from some level of tax avoidance, the wealthiest individuals, particularly in the top 1%, 0.1%, and 0.01%, see the largest reductions in their effective tax rates. This is mainly driven by Corporate Avoidance and Retained Profits using corporate assets, which allow the wealthiest to significantly lower their tax burden compared to lower wealth groups.

# 4 The Model

I this section, I solve a simple two periods model of optimal portfolio decision to illustrate how the interplay between tax avoidance and agents' portfolio decisions generates wealth inequality. Next, I develop a heterogeneous agents model à la Beweley-Hugget-Aiyagari with two features that depart from the standard approaches: endogenous portfolio choices (safe and risky assets) and (ii) a tax functions that accounts for the different forms of avoidance. The model is able to explain the remarkably accumulation of wealth at the top levels of the distribution, and allows me to quantify the impact of tax avoidance on wealth inequality.

## 4.1 Two Periods Model of Optimal Portfolio Decision

Consider an agent with a CRRA utility function: $U(C) = \frac{W^{1-\sigma}}{1-\sigma}$. The initial wealth equal to $W_0$ at the beginning of period $t = 0$. The agent can invest a fraction $\gamma$ of her initial wealth in a risky asset — which rate of return is $r_r$ — and a safe assets — which rate of return is $r_s$. The rate of return on the risky asset is a random variable, whereas the safe asset' rate of return is constant. The returns on the risky and safe asset are taxed at $\tau_r$ and $\tau_s$, respectively. If this agent invests $\gamma$ in the risky asset, then the expected rate of return on wealth, $r_p$, is:

$$r_p = \gamma \cdot (1 - \tau_r) \cdot \mathbb{E}[r_r] + (1 - \gamma) \cdot (1 - \tau_s) \cdot r_s \tag{18}$$

Where $\mathbb{E}[r_r]$ is the expected rate of return on the risky asset. Consumption takes place in period $t = 1$. Therefore, the agent solves:

$$\begin{aligned} \max_{\gamma} \quad & \frac{W_1^{1-\sigma}}{1-\sigma} \\ s.t: W_1 \quad & = (1 + r_p) \cdot W_0 \end{aligned}$$

Using a Taylor second order expansion, it can be shown that the optimal fraction, $\gamma^*$, of risky investment is:

$$\gamma^* = \frac{(1 - \tau_r) \cdot \mathbb{E}[r] - (1 - \tau_s) \cdot r_f s}{\sigma \cdot Var(r_r)} \tag{19}$$

Where $Var(r_r)$ is the variance of $r_r$. Hence, the expected rate of return on wealth evaluated at the optimal portfolio composition is:

$$r_p^* = \gamma^* \cdot (1 - \tau_r) \cdot \mathbb{E}[r_r] + (1 - \gamma^*) \cdot (1 - \tau_s) \cdot r_s \tag{20}$$

Using this standard result, it possible to see the level and composition effect of tax avoidance on wealth accumulation. Suppose that this agent avoids taxation related to the risky asset — as the empirical evidence shows — if $\tau_r$ decreases because of tax avoidance, then $r_p^*$ increases. Notice that the increase in $r_p^*$ is due to the direct effect of $\tau_r$ on the after-tax expected return and to the indirect effect of $\tau_r$ on $\gamma^*$. The former is what I call level effect and the latter is the composition effect. Not only tax avoidance allows to accumulate wealth faster but it also affects the intensive margin of risky investments.

This simple model shows that the heterogeneity of tax avoidance across agents increases the heterogeneity in the rate of returns on wealth, leading to earn higher returns for those who avoid more taxes related to risky investments. This simple intuition is captured by the general equilibrium model with heterogeneous agents.

## 4.2 General Equilibrium Model with Heterogeneous Agents

### 4.2.1 Households

This is a heterogeneous agent model à la Beweley-Hugget-Aiyagari with no aggregate risk. There is a continuum of households indexed by $i$ that make consumption and saving decisions each period $t$. Households make two sets of decisions every period: (i) consumption and savings, and (ii) portfolio choice, how much to invest in the safe asset, $a^s_{i,t}$, and the risky asset, $a^r_{i,t}$. As I will explain later, households face two uncorrelated sources of idiosyncratic: labor productivity and the rate of return of risky assets. The latter can be interpreted as the corporate assets in the model.

In this economy, each household $i$ receives three sources of pre-tax income each period: labor income, $I^L_{i,t}$; interests from safe assets, $I^S_{i,t}$, and capital income from risky assets, $I^R_{i,t}$. Each source of income is defined as follows, respectively:

$$I^L_{i,t} = \bar{\omega}_t \cdot e_{i,t} \cdot \bar{l} \tag{21}$$

$$I^S_{i,t} = r_t \cdot a^s_{i,t} \tag{22}$$

$$I^R_{i,t} = z_{i,t} \cdot a^r_{i,t} \tag{23}$$

Where $\bar{\omega}_t$ is the equilibrium wage, $e_{i,t}$ is the idiosyncratic labor productivity shock, $\bar{l}$ is the exogenous amount of labor supply, $r_t$ is the equilibrium interest rate, and $z_{i,t}$ is an idiosyncratic rate of return of the risky asset. The idea of $z_i$ is to capture the heterogeneity in capital rate of return across agents. One possible interpretation is that households run their own businesses by investing in the risky asset, and then they use their businesses to invest in the financial markets, so they not only supply funds to the capital market but also supply "productivity", which is agent-specific.

There are three tax functions that account for the presence of tax avoidance in the model. First, let $T(\cdot) \in (0, 1)$ be a function representing the personal income tax rate on total received income[26]. This function accounts for the fact that the rate of return on the risky assets (corporate assets) were already taxed at the corporate rate according to the imputation system described in the last section. The parameters that defined this tax function account for the

[26] As I explained in the previous section, in Chile, labor income, interests and dividends are taxed jointly under the same marginal tax rates at individual level.

amount of Personal Avoidance in the model.

The second tax function represents the effective corporate income tax in the model. Let $\tau^k(\cdot)$ be the corporate income tax function. In the following, I use the notation $\tau^k_{i,t}$ to represent the value of the effective corporate income tax function of agent $i$ in period $t$.[27] This is a function of the income coming from the risky asset. More precisely, agents who receive an amount $I^R_{i,t}$ of capital income must pay a tax rate equal to $\tau^k(I^R_{i,t})$.

The third function is related to retained profits. Let $\theta(\cdot) \in [0,1]$ be the fraction of capital income that is taxed only at corporate level, and the remaining fraction is taxed at personal and corporate level. Similar the corporate income tax function, I use the notation $\theta^k_{i,t}$ to represent the amount of capital income of agent $i$ in period $t$ that is taxed at corporate level only. This can be interpreted as individuals retaining a fraction $\theta_{i,t}$ of their capital income inside their business, which is taxed at a corporate income tax rate $\tau^k$. The remaining fraction, $1-\theta_{i,t}$, is "withdrawn" and subject to the personal income tax function, $T(\cdot)$. I do not model the decision of retaining profits as the parameters that define the function $\theta(\cdot)$ will replicate the patterns of the data.

In the model, the income that is subject to personal income tax is $I^P_{i,t}$, whereas the total income of an agent is $I^T_{i,t}$. Notice that because of the presence of the function $\theta$, $I^P_{i,t} < I^T_{i,t}$ for some agents. The definition of these two income are the following:

$$I^P_{i,t} = I^L_{i,t} + I^S_{i,t} + (1-\theta_{i,t}) \cdot I^R_{i,t} \tag{24}$$

$$I^T_{i,t} = I^L_{i,t} + I^S_{i,t} + I^R_{i,t} \tag{25}$$

The term $(1-\theta_{i,t}) \cdot I^R_{i,t}$ can be interpreted as the amount of dividends an agent received from their business.

Proceeding from the previous description of decisions, types of income, and tax function, I define the problem household $i$ solves, given prices and taxes:

[27]The function $\tau^k(\cdot)$ is the same across agents, but its value depends on the agent specific income at period $t$.

$$
\begin{aligned}
\max_{c_{it},a^s_{it+1},a^r_{it+1}} \quad & \textstyle\sum_{t=0}^{\infty} \quad E_0[\beta^t u(c_{it})] \\
s.t: w_{i,t+1} + c_{i,t} \quad &= \quad (1 - T(I^P_{i,t}) \cdot (1-\theta_{i,t}) - \tau^k_{i,t}) \cdot I^R_{i,t} + (1 - T(I^P_{i,t})) \cdot (I^S_{i,t} + I^L_{i,t}) + w_{i,t} \\
w_{i,t} \quad &= \quad a^s_{i,t} + a^r_{i,t} \\
I^P_{i,t} \quad &= \quad I^L_{i,t} + I^S_{i,t} + (1-\theta_{i,t}) \cdot I^R_{i,t} \\
I^L_{i,t} \quad &= \quad \bar{\omega}_t \cdot e_{i,t} \cdot \bar{l} \\
I^S_{i,t} \quad &= \quad r_t \cdot a^s_{i,t} \\
I^R_{i,t} \quad &= \quad z_{i,t} \cdot a^r_{i,t} \\
a^s_{i,t+1} \quad &\geq \quad \phi_s \\
a^r_{i,t+1} \quad &\geq \quad \phi_r
\end{aligned}
$$

Where $w_{i,t}$ is the wealth of agent $i$ at the beginning of period $t$. Notice that the term $(1 - T(I^P_{i,t}) \cdot (1-\theta_{i,t}) - \tau^k_{i,t})$ corresponds to the effective tax rate on capital income, given that and an agent is "retaining" a fraction $\theta_{i,t}$ of their capital income within his business and paying an effective corporate income tax rate equal to $\tau^k_{i,t}$. Indeed, if an agent does not retain any capital income ($\theta_{i,t} = 0$), capital income is taxed based on the individual tax rate scheme and corporate income tax rate.[28] . The term "retained" serves as interpretation only, since there are no retained profits in the model and the function $\theta_{i,t}$ affects only taxation.

Notice that the interests gain from the safe assets are taxed at the personal income tax function. This is consistent with how the tax system works in practice, since interests gained from this class of assets — such as bank deposits, for example — go to the personal taxable income. In reality, the profits of companies have a different tax treatment.

Another feature worth nothing is that $\theta_{i,t}$ affects taxation of the other sources of income by reducing $I^P_{i,t}$ as retained profits increase. Such a feature aligns with how real-world individual tax systems work in Chile. For instance, if you own a company and choose not to distribute profits, progressive marginal tax rates are applied to the income you report on your tax files, without accounting for the retained profits.

[28] As I mentioned earlier, the function $T(I^P_{i,t})$ accounts for the fact that the rate of return on the risky assets (corporate assets) were already taxed at the corporate rate according to the imputation system described in the last section.

## 4.3 Firms

In this economy, there is a representative firm with constant returns to scale production function: $F(K_t, L_t)$, where $K_t$ and $L_t$ are the aggregate demand of capital and labor in period $t$, respectively. Capital depreciates at a constant rate $\delta \in (0,1)$. The firm's problem can be stated as follows:

$$\max_{K_t, L_t}[F(K_t, L_t) - \bar{\omega_t} \cdot L_t - r_t \cdot K_t - \delta \cdot K_t] \tag{26}$$

This is, the firm demands capital, labor, and pays for the depreciation. The first order conditions of the representative firm are:

$$\bar{\omega_t} = \frac{\partial F(K_t, L_t)}{\partial L_t} \tag{27}$$

$$r_t = \frac{\partial F(K_t, L_t)}{\partial K_t} - \delta \tag{28}$$

In the absence of aggregate risk, $r_t$ turns out to be the risk-free interest rate.

## 4.4 Financial Markets

As mentioned previously, agents have the option to invest in two categories of assets: risk-free and risky. The pre-tax rate of return of the risk-free asset is determined by the equilibrium interest rate denoted as $r_t$. The pre-tax rate of return of the risky asset is expressed as follows:

$$z_{i,t} = (\bar{z}_{i,t} + \varepsilon_{i,t}) \cdot r_t \tag{29}$$

The variable $\bar{z}_{i,t}$ represents the investment productivity of agent $i$ in period $t$, which follows a Markov stochastic process. Additionally, the variable $\varepsilon_{i,t}$ is a zero-mean independently and identically distributed (i.i.d.) random variable. This means that highly productive investors tend to have a higher average rate of returns ($\bar{z}_{i,t}$), but there is also an element of luck represented by $\varepsilon_{i,t}$, indicating a lack of diversification. The parameters that define this stochastic process are part of the calibration of the model.

Further, I will make the assumption that the ergodic distribution of $\bar{z}_{i,t}$ is such that $\mathbb{E}[\bar{z}_i, t] = 1$, leading to $\mathbb{E}[z_{i,t}] = \mathbb{E}[\bar{z}_i, t + \varepsilon_{i,t}] = r_t$. The Markovian nature of $\bar{z}_i, t$ is intended to capture the persistent heterogeneity of the rate of returns on wealth, as documented in the empirical literature (see, for example, Bach, Calvet, and Sodini (2020)). In equilibrium, there is a positive mass of agentes for whom $\mathbb{E}_i[\bar{z}_i, t+\varepsilon_{i,t}] > r_t$, because of the persistence of the process.

This setup implies that individuals who hold risky assets may potentially receive an idiosyncratic excess return, which affects their portfolio decisions. This represents a simplified way of modeling the risk premium associated with risky investments, similar to the approach used by Hubmer, Krusell, and Smith Jr (2020) uses for all kinds of assets. Yet, the portfolio decision in the model (safe v/s risky) is endogenous. This is one of the features that departs from the standard approaches.

The timing of the financial decisions is as follows: given prices, taxes, wealth, and the realization of the random variables in period $t$, agents decide the faction of wealth in $t+1$ that will be allocated to safe ($a^s_{i,t+1}$) and risky ($a^r_{i,t+1}$) assets. Therefore, the total supply of funds that agent $i$ make to the financial market in period $t+1$ is $a^s_{i,t+1} + (\bar{z}_{i,t+1} + \varepsilon_{i,t+1}) \cdot a^r_{i,t+1}$. Under this setting, agents are also supplying "productivity" to the financial markets.

On the demand side, the representative firm demands $K_t$ for production every period at a price $r_t$.

## 4.5 Tax Scheme and Avoidance

The government taxes three sources of income: labor income ($I^L_{i,t}$), interests from safe assets ($I^S_{i,t}$), and capital income from risky assets ($I^R_{i,t}$). The taxes collected are used to fund public expenditure ($G$).[29] Public spending is fixed and exogenous and does not impact agents' utility or budget constraints. The idea is to isolate the impact of positive/negative transfers from the government to agents on wealth distribution.

The personal income tax rate is represented by the function $T(\cdot) \in (0,1)$ by which the governments tax agents' total received income. Capital income from risky assets is subject to the corporate tax rate represented by the function $\tau^k(\cdot) \in (0,1)$. Additionally, there's a function $\theta(\cdot) \in (0,1)$ that represents the fraction of capital income that is taxed at corporate level only.

The amount of resources the government collects from an agent $i$ in period $t$ is given by the following equation:

[29] In equilibrium, $G$ adjusts to whatever the tax revenues are.

$$(T(I_{i,t}^P)\cdot(1-\theta(I_{i,t}^R))+\tau^k(I_{i,t}^R))\cdot I_{i,t}^R+T(I_{i,t}^P)\cdot(I_{i,t}^S+I_{i,t}^L) \tag{30}$$

The effective tax rate on capital risky income is determined by the term $T(I_{i,t}^P)\cdot(1-\theta(I_{i,t}^K))+\tau^k(I_{i,t}^K)$. Notice that a fraction $(1-\theta(I_{i,t}^k))$ is taxed according to the personal tax scheme $T(I_{i,t}^P)$, while a fraction $\theta(I_{i,t}^k)$ is subject to the corporate tax rate only. Always a 100% of $I_{i,t}^k$ is taxed at the corporate income tax rate, the value of $\theta(I_{i,t}^k)$ determines if, additionally, the profits are taxed at the personal income tax rates.

The effective tax rate on the income coming from risky assets depends on this three functions: $T(I_{i,t}^P)$, $\tau^k(I_{i,t}^R)$, and $\theta(I_{i,t}^k)$. Additionally, these functions will account for the presence of the different forms tax avoidance in the model: Personal Avoidance affects $T(I_{i,t}^P)$, Corporate Avoidance affects $\tau^k(I_{i,t}^R)$, and Retained Profits affect $\theta(I_{i,t}^k)$. The parameters that define each of these functions will be calibrated such that the model replicates the effective income tax rates I observe in the data.

## 4.6 Recursive Formulation of Agents' Problem

In this section, for simplicity, I will remove the time and agent indexes. The recursive formulation of the household's problem can be written as:

$$\begin{aligned}
V(a^d,a^r,z,e) &= \max_{a'^d,a'^r,c} u(c)+\beta E[V(a'^d,a'^r,z',e')] \\
s.t: w'+c &= (1-T(I^P)\cdot(1-\theta)-\tau_k)\cdot I^R+(1-T(I^P))\cdot(I^S+I^L)+w \\
w &= a^s+a^r \\
I^P &= I^L+I^S+(1-\theta)\cdot I^R \\
I^L &= \bar{\omega}_t\cdot e\cdot\bar{l} \\
I^S &= r\cdot a^s \\
I^R &= z\cdot a^r \\
a'^s &\geq \phi_s \\
a'^r &\geq \phi_r
\end{aligned}$$

Where $V$ is the value function. Agents know the functional forms of the tax functions.

### 4.7 Competitive Equilibrium

The competitive equilibrium in this economy is define as a set of policy functions: consumption $C(w)$, safe assets $A^s(w)$, and risky asset $A^r(w)$; an endogenous interest rate $r$ and wage $\bar{\omega}$; and an ergodic wealth distribution $\Gamma(w)$, such that

1. The policy functions solve the agents' problem, given prices and tax functions.
2. Firms maximize profits, given prices.
3. Prices are such that the labor, financial, and good markets clear, respectively:

$$L = \int e_w \bar{l} d\Gamma(w) \tag{31}$$

$$K = \int (A^s(w) + z_w A^r(w)) d\Gamma(w) \tag{32}$$

$$F(K, L) = C + G + \delta K \tag{33}$$

4. The government runs a balanced budget:

$$G = \int \left((T(I^T(w)) \cdot (1 - \theta(I^T(w))) + \tau_k(I^K(w)) \cdot \theta(I^T(w)) \cdot I^K(w) + T(I^P(w)) \cdot (I^P(w))\right) d\Gamma(w) \tag{34}$$

# 5 Calibration

In this section a present the parametric assumption as well as the calibrated parameters outside and within the model.

### Preferences

I use a CRRA preference for household with $\sigma = 4$, following Guvenen, Kambourov, Kuruscu, Ocampo-Diaz, and Chen (2019). The idea of keeping as simple as possible the agents' preferences is to prevent the results from being driven by parametric assumption on the preferences toward risk. Agents are identical ex-ante.

$$u(c) = \frac{c^{1-\sigma} - 1}{1 - \sigma} \tag{35}$$

The inter temporal discount factor , $\beta$, is calibrated so that the capital stock to GDP ratio, $K/Y$, is equal to 3.

## Labor Supply Productivity

Acknowledging there is a broad literature on how labor earning processes play an important role at explaining inequality (see for example Heathcote, Perri, and Violante (2010) for an exhaustive empirical review on this regard),[30] I decided to keep the this piece of the model as simple as possible and assume labor supply side fully exogenous. The main goal is to focus on the financial side of households' decisions. As it was mentioned in the introduction, according to some theoretical and quantitative works, wage inequality by itself cannot account for the huge accumulation of wealth at the top levels of the distribution (see Gabaix, Lasry, Lions, and Moll (2016) and Kuhn, Schularick, and Steins (2020)).

Labor supply is perfectly inelastic and normalized to 1 for every agent, $\bar{l} = 1$. There is an idiosyncratic labor productivity shock, $e_{i,t}$, which follows an AR(1) process in logs:

$$\log(e_{i,t}) = \rho_l \log(e_{i,t-1}) + \varepsilon_t^l \tag{36}$$

The value of the parameters $\rho_l$ and the standard deviation of $\varepsilon_t^l$,$\sigma_l$, are set to 0.9 and 0.2, respectively, which are fairly consistent with the estimations made by the literature on this regard.

## Idiosyncratic Capital Productivity

For the parametrization of the production side, I assume a much simpler version of the idiosyncratic capital productivity stochastic process than Guvenen, Kambourov, Kuruscu, Ocampo-Diaz, and Chen (2019) does. They based the calibration of entrepreneurial productivity process on the empirical findings of Fagereng, Guiso, Malacrino, and Pistaferri (2020). The entrepreneurial productivity shock of Guvenen et al. (2019) considers a permanent component and an amplification parameter for the highly productive agents. According to Guvenen et al. (2019), those two ingredients are central to match the top 1% and top 0.1% wealth shares. However, I do not need to relay on those assumptions since the presences of endogenous port-

[30]Which includes life-cycle and family composition considerations.

folio decisions and tax avoidance are the key ingredients of my model that lead to a good replication of the top wealth shares.

The risky asset rate excess of return, $\bar{z}_{it}$ follows an AR(1):

$$\bar{z}_{i,t} = \rho_z \bar{z}_{i,t-1} + \varepsilon_t^z \tag{37}$$

The values for $\rho_z$ and the standard deviation of $\varepsilon_t^z$, $\sigma_z$, are calibrated within the model to match the top 1% and top 0.1% wealth shares. As I will show in the quantitative analyses, the presence of this capital shock by itself does not allow me to match the top wealth shares. The introduction of tax avoidance, portfolio decisions, and capital return heterogeneity are necessary condition in my model to match those shares.

As it was mentioned previously, for a model with idiosyncratic capital productivity shocks without any additional economic mechanism to match the top wealth shares, it requires further assumption on the stochastic process, such as "explosive" and permanent shocks at the top of the distribution. For a further discussion on modeling of stochastic rate of returns on wealth, see Benhabib, Bisin, and Zhu (2015) and Benhabib and Bisin (2018).

The parameter associated with the constraint of holding risky assets $\phi_r$ is calibrated such that around 70% of agents do not hold risky assets in the model, which is similar to what can be observed in the data.

## Production Function

I use a standard Cobb-Douglas production function for the representative firm:

$$Y = K^{\alpha} L^{1-\alpha} \tag{38}$$

Where $K$ and $L$ are aggregate capital and labor, respectively. The parameter $\alpha$ is set to 0.4.

## Tax Functions and Avoidance

For the tax functions I used the functional forms proposed by Heathcote, Storesletten, and Violante (2017). Let $T_j(\cdot)$ be the function representing the effective income tax rate under the avoidance scenario $j \in \{B, \quad PA\}$, where $B$ is the "Benchmark" and $PA$ the "with Personal

Avoidance" tax functions.[31] The functional form of $T_j(\cdot)$ is as follows:

$$T_j(I) = \begin{cases} 0.4445 & \text{if } 1 - \frac{\lambda_j}{I^{\tau_j}} > 0.4445 \\ 1 - \frac{\lambda_j}{I^{\tau_j}} & \text{if } 1 - \frac{\lambda_j}{I^{\tau_j}} \in [0, 0.4445] \\ 0 & \text{if } 1 - \frac{\lambda_j}{I^{\tau_j}} < 0 \end{cases}$$

The parameters $\lambda_i$ controls for the tax rate level, whereas $\tau_i$ controls for the degree of progressivity of the tax scheme. I add a maximum and minimum tax rate to be consistent with Chilean tax system where the maximum marginal tax rate is 44.45% and there are no negative tax rates. The presence of personal avoidance in the model reduces the personal income tax rate, hence, $T_B(I) > T_{PA}(I)$ in the presence of Personal Avoidance and $T_B(I) = T_{PA}(I)$ in the absence of it.

Notice that this functional form is weakly increasing given $\lambda_i$ and $\tau_i > 0$, therefore, it does not allow to get a decreasing effective tax rate in the model. According to the empirical findings presented before, Corporate Avoidance and Retained Profits are the forms of avoidance that lead to a decreasing effective income tax rate in the data. In order to generate decreasing effective income tax rates in the model, I proceed in two steps (i) I calibrate a Effective Corporate Tax Rate and Retained Profits function, $\tau^k(\cdot)$ and $\theta(\cdot)$, respectively, and, then, (ii) I compute the effective income tax rate on risky asset rate of return in the model as a function of the three sources of income (labor, safe and risky asset rate of return), $T_R(I^L, I^S, I^K)$:

$$T_R(I^L, I^S, I^K) = (1 - \theta(I^k)) \cdot T_{PA}(I^L + I^S + (1 - \theta(I^K)) \cdot I^k) + \tau_k(I^k) \tag{39}$$

Therefore, the effective income tax rate in the model is:

$$T^{model}(I^L, I^S, I^K) = \frac{T_R(I^L, I^S, I^K) \cdot I^K + T_{PA} \cdot (I^L + I^S)}{I^L + I^S + I^K} \tag{40}$$

The calibration consists in searching for parameters such that $T^{model}(I^L, I^S, I^K)$ match the effective income tax rates across the distribution I observe in the data.

Regarding the functional forms of the Effective Corporate Income Tax, it does exhibit a decreasing pattern as in the data, and it is defined as:

[31] The benchmark tax function corresponds to the function that generates a progressive tax scheme as if there were not personal avoidance, corporate avoidance, and retained profits.

$$\tau^k(I) = \begin{cases} 0.27 & \text{if } \frac{\lambda_k}{I^{\tau_k}} > 1 \\ 0.27 \cdot \frac{\lambda_k}{I^{\tau_k}} & \text{if } \frac{\lambda_k}{I^{\tau_k}} \in [0, 1] \end{cases}$$

Where $\lambda_k$ and $\tau_k$ govern the level and slope, respectively. The 0.27 comes from the current Corporate Income Tax in Chile. In the absence of Corporate Avoidance $\tau^k(I) = 0.27\ \forall I$.

Similarly, the Retained Profits function, $\theta(\cdot)$, is defined as follows:

$$\theta(I) = \begin{cases} 0 & \text{if } 1 - \frac{\lambda_{RP}}{I^{\tau_{RP}}} \leq 0 \\ 1 - \frac{\lambda_{RP}}{I^{\tau_{RP}}} & \text{if } 1 - \frac{\lambda_{DP}}{I^{\tau_{RP}}} \in (0, 1) \end{cases}$$

Where $\lambda_{DP}$ and $\tau_{DP}$ govern the level and slope, respectively, of this function. As in the data, it exhibits a increasing pattern —as income increases, so does it the fraction of retained profits.

In order to calibrate these three functions, I search for the six parameters that define the three functions ($\lambda_{PA}$, $\lambda_k$, $\lambda_{RP}$, $\tau_{PA}$, $\tau_k$, and $\tau_{RP}$) such that it minimizes the sum of the squared of the difference between the data and the predicted value according to the model. In the calibration of the "without tax avoidance" scenario, $\tau^k(I) = 0.27$, $\theta(I) = 0$, and the parameters of the personal income tax function are such that they match the Benchmark effective income tax rate that was described before, which corresponds to progressive taxation.

## Baseline Calibration Performance

The summary of the values of all parameters in the model is displayed in Table 2.

The performance of the model is displayed in Table 3. The top 1% and top 0.1% are outcomes of the model I match with the data, by looking for $\rho_z$ and $\sigma_z$ accordingly. The baseline calibration, indeed, matches accurately the top 1% share, whereas slightly overestimates the top 0.1% and 0.01%. t. As I show later in details, for a standard model à la Beweley-Hugget-Aiyagari to match the top 1% and top 0.1% wealth shares at such levels of concentration, it requires strong assumptions on either the preference toward risk or the stochastic process that governs the idiosyncratic capital productivity shock, which are either not testable or inconsistent with the empirical evidence. Yet, I do not need to rely on those assumptions since the interplay between tax avoidance and agents being able to choose their portfolio composition significantly amplifies wealth accumulation at the top of the distribution.

| Parameters taken from outside the model | | |
|---|---|---|
| CRRA parameter | $\sigma$ | 4 |
| Discount factor | $\beta$ | 0.94 |
| Persistence of labor productivity process | $\rho_l$ | 0.9 |
| Std. of labor productivity process | $\sigma_l$ | 0.2 |
| Capital Share | $\alpha$ | 0.4 |
| Depreciation rate | $\delta$ | 0.05 |
| Liquidity constraint parameter of the safe asset | $\phi_s$ | 0 |
| **Parameters jointly calibrated inside the model** | | |
| Constraint risky asset | $\phi_r$ | 3.06 |
| Level parameter "Benchmark" tax function | $\lambda_B$ | 1.115 |
| Level parameter "With Personal Avoidance" tax function | $\lambda_{PA}$ | 1.065 |
| Level parameter "Retained Profits" function | $\lambda_{RP}$ | 1.633 |
| Level parameter Effective Corporate tax function | $\lambda_k$ | 1.519 |
| Slope parameter "Benchmark" tax function | $\tau_B$ | 0.176 |
| Slope parameter "With Personal Avoidance" tax function | $\tau_{PA}$ | 0.111 |
| Slope parameter "Retained Profits" function | $\tau_{RP}$ | 0.377 |
| Slope parameter Effective Corporate Tax function | $\tau_k$ | 0.3822 |
| Risky asset rate of return persistence | $\rho_z$ | 0.723 |
| Risky asset rate of return std. | $\sigma_z$ | 0.053 |

**Table 2:** Summary of the calibrated parameters

| | Chile Data | Baseline Calibration |
|---|---|---|
| **Bottom 50%** | 0.00 | 0.08 |
| **Top 10%** | 0.95 | 0.84 |
| **Top 1%** | 0.50 | 0.50 |
| **Top 0.1%** | 0.24 | 0.30 |
| **Top 0.01%** | 0.12 | 0.18 |

**Table 3:** Performance of the model

On the other hand, the model does not match the wealth shares for lower quantiles. This fact comes as no surprise. The model behaves rather standard for most of the agents. Indeed, the main economic mechanisms in the model are triggered at the top of the wealth distribution, where the tax system interacts with the financial decisions of agents. The empirical evidence I have presented shows that for the bottom 99% of the distribution, the effective tax rates experience a progressive pattern. Hence, in the model wealth is "more equally" distributed across these agents. Matching the wealth of the low quantiles would require a model with a more rich labor market — since labor income is the main source of income for these segments — or some kind type dependent collateral as in Guvenen, Kambourov, Kuruscu, Ocampo-Diaz, and Chen (2019). The behavior of wealth at the bottom of the distribution is not the focus of this paper.

# 6 Quantitative Analysis

In this section, I conduct a series of the counter-factual exercises. First, I conduct the main experiment: measuring the impact of tax avoidance — and its different forms — in wealth inequality. Next, I present a series of additional experiments which reinforce the importance of the main economic mechanism that generates a significant wealth accumulation at the top of the distribution: the interaction between tax avoidance and changes in portfolio composition.

The main experiment is to compute the ergodic wealth distribution under different tax avoidance scenarios and measure the top wealth shares. The only difference across scenarios are the calibrated functions I use to solve the model numerically. The first scenario is the Baseline Calibration, which matches the top 1% and 0.01% share wealth and includes the three forms of tax avoidance simultaneously: Personal Avoidance (PA), Corporate Avoidance (CA), and Retained Profits (RP). The second one removes Retained Profits from the model, keeping CA and PA forms only. The third, only considers PA. The last one corresponds to the "Benchmark" scenario, where the tax functions does not include any form of tax avoidance. The results are displayed in Table 4.

| | **Tax Avoidance Scenarios** | | | |
|---|---|---|---|---|
| **Wealth Share** | **Baseline (RP + CA + PA)** | **PA + CA** | **PA** | **Benchmark** |
| **Top 1%** | 0.50 | 0.26 | 0.13 | 0.11 |
| **Top 0.1%** | 0.30 | 0.14 | 0.08 | 0.04 |
| **Top 0.01%** | 0.18 | 0.03 | 0.00 | 0.00 |

**Table 4:** Wealth shares under different avoidance scenarios. RT: Retained Profits, CA: Corporate Avoidance, PA: Personal Avoidance, Benchmark: without avoidance.

The main result is that the top 1% wealth share decreases from 50% in the baseline calibration (with the three forms of tax avoidance) to 11% in the Benchmark (without any form of tax avoidance). The economic intuition behind this significant decrease is the fact that Corporate Avoidance and Retained Profits increase the expected after-after tax rate of return on the risky assets for high wealth agents, which affects the intensive margin of risky investments, leading to an even higher average after-tax rate of return on wealth.

### The role of the interplay between tax avoidance and agents' portfolio decision on wealth accumulation

The results of comparing different steady states under different tax avoidance scenario show that Personal Avoidance plays a minor role in wealth inequality, whereas Corporate Avoidance and Retained Profits do have a significant impact on the wealth distribution. There are two reasons behind this results. First, Personal a Avoidance — as it was shown in the empirical section — plays a minor role in reducing tax progressivity, whereas Corporate Avoidance and and Retained Profits are the main reasons of the lack of tax progressivity at the top of the distribution. The calibration of the model is capturing this feature of the data.

The second — and main reason — why Corporate Avoidance and Retained Profits contribute more to wealth inequality is that — unlike Personal Avoidance — they affect both the level and the composition of wealth. Indeed, these two forms of tax avoidance increase the after-tax expected return on the risky assets, whereas Personal Avoidance reduces the effective income tax rate proportionally for the two classes of assets, without affecting the risk premium.

Corporate Avoidance is —quantitatively — the main source of wealth inequality among the three forms of tax avoidance. Indeed, the absence of Corporate Avoidance accounts for most of the the decrease in the top 1% wealth share. By taking out this source of tax avoidance, the top 1% wealth share goes from 50% to 26%. This significant reduction is explained by the fact that Corporate Avoidance generates both: level and composition effect on wealth, as it was mentioned before. The former reduces the effective tax rate on income for the wealthiest agents, leading wealth to accumulate at a higher rate. The latter reduces the effective tax rate on risky assets relative to the tax rate on safe assets, which instead increases the risk premium, leading the optimal portfolio to shift toward risky assets.

The baseline results of the optimal portfolio composition, the after-tax excess of return on the optimal portfolio, and the effective income tax rates across different quantiles of the wealth distribution are displayed in Figure 19. Wealth is composed of safe assets at the bottom of the distribution. This results is driven by the presence of the constraint that prevents low wealth agents from investing in risky assets. From the D9 to P95 quantiles wealth does not experience significant differences in its composition. This is explained by two combined reasons. First, there is no significant differences between the after-tax rate of return on risky and safe assets due to the low presence of tax avoidance in these quantiles and, hence, the risk premium remains relatively constant across wealth levels. Second, the CRRA utility function — given a value of the expected return on the risky asset — leads agents to allocate the same fraction of wealth to risky assets, therefore it comes as no surprise that wealth composition is homogeneous across this quantiles. However, as wealth increases, tax avoidance emerges — particularly Corporate Avoidance and Retained Profits — leading to a an increase in the expected after-tax rate of return of the risky assets and, as a consequence, the optimal portfolio composition changes significantly.

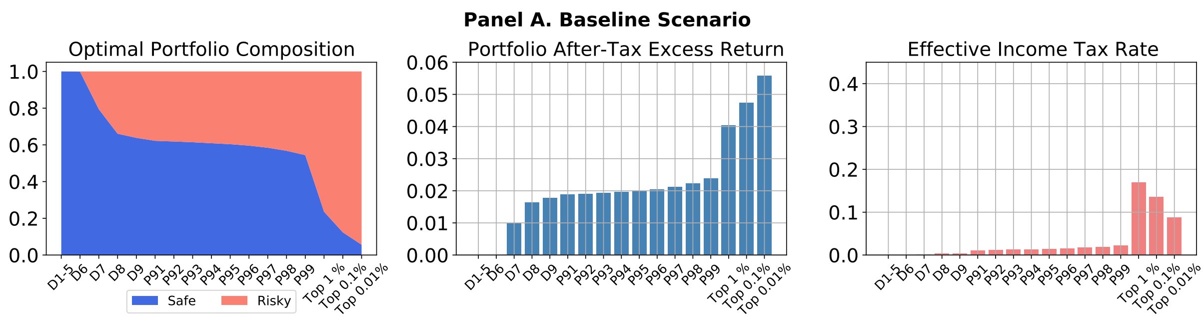


**Figure 19:** Baseline Scenario: Optimal Portfolio, Excess Return, and Effective Tax Rate.

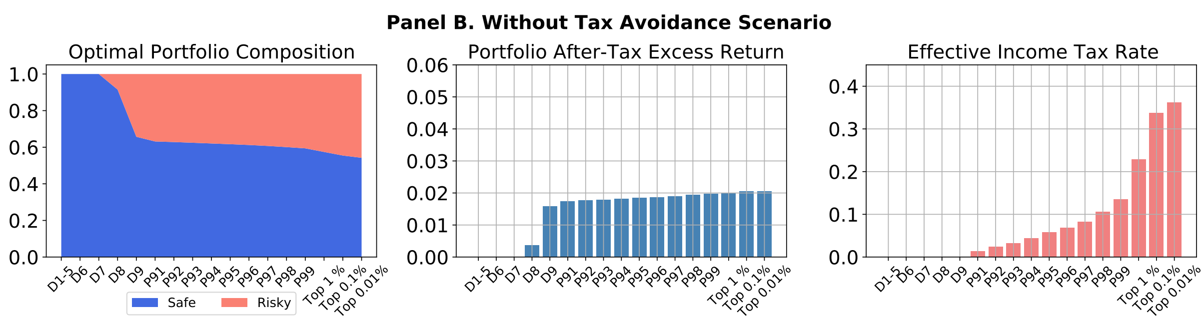


**Figure 20:** Benchmark Scenario: Optimal Portfolio, Excess Return, and Effective Tax Rate.

Regarding the level effect, agents who invest in risky assets experience a reduction of their effective income tax rates due to Corporate Avoidance and Retained Profits, which increases the overall rate at which wealth accumulates relative to other agents. Provided that tax avoidance is increasing in wealth, the model generates what Gabaix, Lasry, Lions, and Moll (2016) call a "scale-dependent earning process". As wealth increases, tax avoidance increases, wealth composition changes, and, therefore, the underlying process behind the optimal portfolio rate of return generates a higher after-tax rate of return on average. As displayed in the Figure

19, the average excess after-tax return of the optimal portfolio is increasing in wealth in the baseline scenario.[32]

The composition effect changes the after-taxed rate of return of risky assets relative to safe assets. Indeed, Corporate Avoidance and Retained Profits increase the risk premium of the risky assets, which leads to a change in the wealth composition towards risky assets, further increasing the average return on wealth. The two effects of tax avoidance increase the heterogeneity in the average rate of return on wealth across agents in the model.

The result of the Benchmark Scneario (without any form of tax avoidance) is displayed in Figure 20. The optimal portfolio is not affected by tax avoidance in this case, so there is no composition effect. This can be seen in the first graph of 20. As a consequence of the lack of composition effect, there is no significant difference in the excess after-tax return of the optimal portfolio across the distribution. In this case, progressive taxation does offset the higher rate of returns of the high wealth agents, which reduces the heterogeneity in the rate of returns on wealth, and, therefore, there is no a significant wealth concentration at the top of the distribution.

### Tax avoidance a key quantitative factor that explains wealth inequality in the model

To illustrate the quantitative importance of tax avoidance in the model, in the next exercise I show how the top 1% changes as different features of the model are added. My model is an extended version of Aiyagari (1994), therefore I can compute the top 1% wealth share when including different features. The results are show in the Table 5.

The first line (1) in Table 5 is the result of the standard Aiyagari model (without any tax functions). It is a known fact that this version of the model — which includes only safe assets and the only source of idiosyncratic risk is labor productivity — is not able to generate high wealth inequality. The top 1% wealth share in this case is 4%.

When adding the risky assets in the model —line (2) of Table 5 — the top 1% wealth share increases to 25%. In this version of the model there are no taxes on income. This result also comes as no surprise, since it is a well know fact in the quantitative heterogeneous agent models literature that capital income risk is a key driver of wealth inequality. In this version

[32] The excess after-tax return of the optimal portfolio is computed as the difference between the average after-tax rate of return on the optimal portfolio and the after-tax rate of return on the safe assets.

of the model the high wealth agents are rich because only they have received high labor and capital shocks. When adding the constraint that prevents low wealth agents to invest in risky assets — lines (3) in the table — the top 1% wealth share increases to 28%. This is explained by the fact the a lower mass of agents are able to invest in assets that provide a higher rate of return on average.

Next, I add progressive taxes as in the Benchmark calibration that was described before — lines (4) of the table. In this case, tax progressivity offsets the higher rate of return of agents, which leads to a lower wealth concentration at the top of the distribution. The reason why progressive taxes generate this quantitatively relevant effect, it is due to the fact the the high wealth agents in the model are paying an effective income tax rate close to 40%, which is slightly below the top marginal income tax rate 44.45% in reality.

Then I start including the different forms of tax avoidance. First, Personal Avoidance — line (5) in the table. This form of avoidance has a modest impact on wealth inequality — as I discussed before — it only generates level effects on wealth.

When adding Retained Profits and Corporate Avoidance — line (6) and (7), respectively — there is a quantitatively relevant effect on the top 1% wealth share. These two forms of avoidance generate both: level and composition effects on wealth. In this version of the model — which is the baseline calibration — agents become rich because of luck — as in the standard model — and the presence of tax avoidance that provides additional incentives to invest in risky assets.

My model shows that tax avoidance plays a key quantitative role in generating heterogeneity in the rate of return on wealth across agents. As I mentioned at the beginning of this paper, it is part of the reasons why high wealth agents gain higher return, which shapes the wealth distribution.

| **Model Feature** | **Top 1% Wealth Share** |
|---|---|
| **(1): Standard Aiyagari** | 0.04 |
| **(2): (1) + Risky Asset** | 0.25 |
| **(3): (2) + Risky Asset Constraint** | 0.28 |
| **(4): (3) + Progressive Taxes** | 0.11 |
| **(5): (4) + Personal Avoidance** | 0.13 |
| **(6): (5) + Retained Profits** | 0.26 |
| **(7): (6) + Corporate Avoidance** | 0.50 |

**Table 5:** Top 1% wealth share by model feature

# 7 Conclusions

This paper demonstrates that tax avoidance plays a critical role in the hypothesis that heterogeneity in rates of return across agents drives wealth inequality. Specifically, the interplay between tax avoidance and agents' portfolio decisions influences both the level and composition of wealth, resulting in greater heterogeneity in returns and, consequently, higher wealth inequality. Tax avoidance is one of the reasons why the wealthy earn higher returns.

The empirical evidence I presented shows that while tax avoidance is present across the wealth distribution, it is far more significant at the top. Despite high marginal income tax rates, the effective tax rates that individuals actually pay are considerably lower. Wealthy taxpayers avoid a larger proportion of taxes by investing in corporate assets, and features of the tax code undermine progressivity in practice, leading to substantial effects on wealth distribution.

To quantify how much tax avoidance contributes to high wealth concentration at the top, I developed a general equilibrium Bewley-Huggett-Aiyagari heterogeneous agent model calibrated for the Chilean economy. This model departs from standard approaches by incorporating two key elements: (i) endogenous portfolio choices between safe and risky corporate assets, and (ii) tax functions that account for various forms of tax avoidance. The main quantitative result indicates that, in the absence of tax avoidance, the wealth share of the top 1% would decrease from 50% to 11%.

As a policy implication, addressing wealth inequality requires a multifaceted approach, including reforms to the tax system aimed at closing loopholes and reducing opportunities for tax avoidance. Strengthening enforcement against tax avoidance appears to be more effective in reducing inequality than merely increasing income tax rates.

# 8 Appendix

## 8.1 Wealth concentration over time in the US

If one takes a look at the evolution of the top 1% share of the income distribution in the US, it is possible to see that there was a reversal in the negative trend around mid 70s and - after the 80s - wealth inequality begun to increase rapidly until it reached around 36% by 2014 (see figure 21). This tipping point of inequality coincides with the implementation of a series of economic reforms in the U.S. that led to a decrease in tax progressivity (Saez and Zucman (2019b)), and an overall increase in financial globalization (Kose, Prasad, Rogoff, and Wei (2009)). Both structural changes have improved the rate or return on wealth for some people.

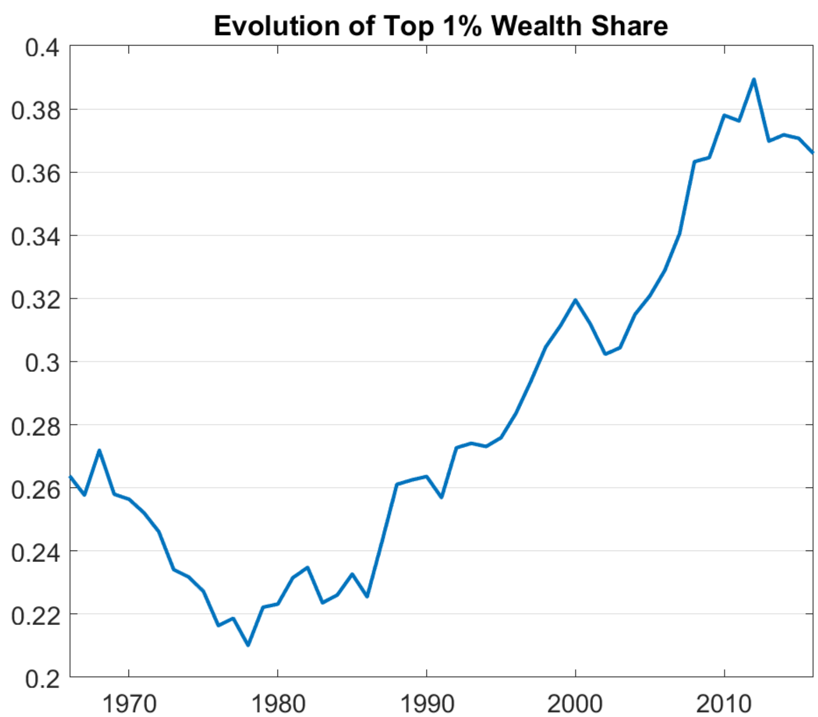


**Figure 21:** Percentage of wealth held by the wealthiest top 1% in the US. Source: World Income Inequality Data Base (WIID)

## 8.2 Wealth concentration across countries

Chile is one of the countries with the highest concentration of wealth at the top 1% of the distribution around the world.

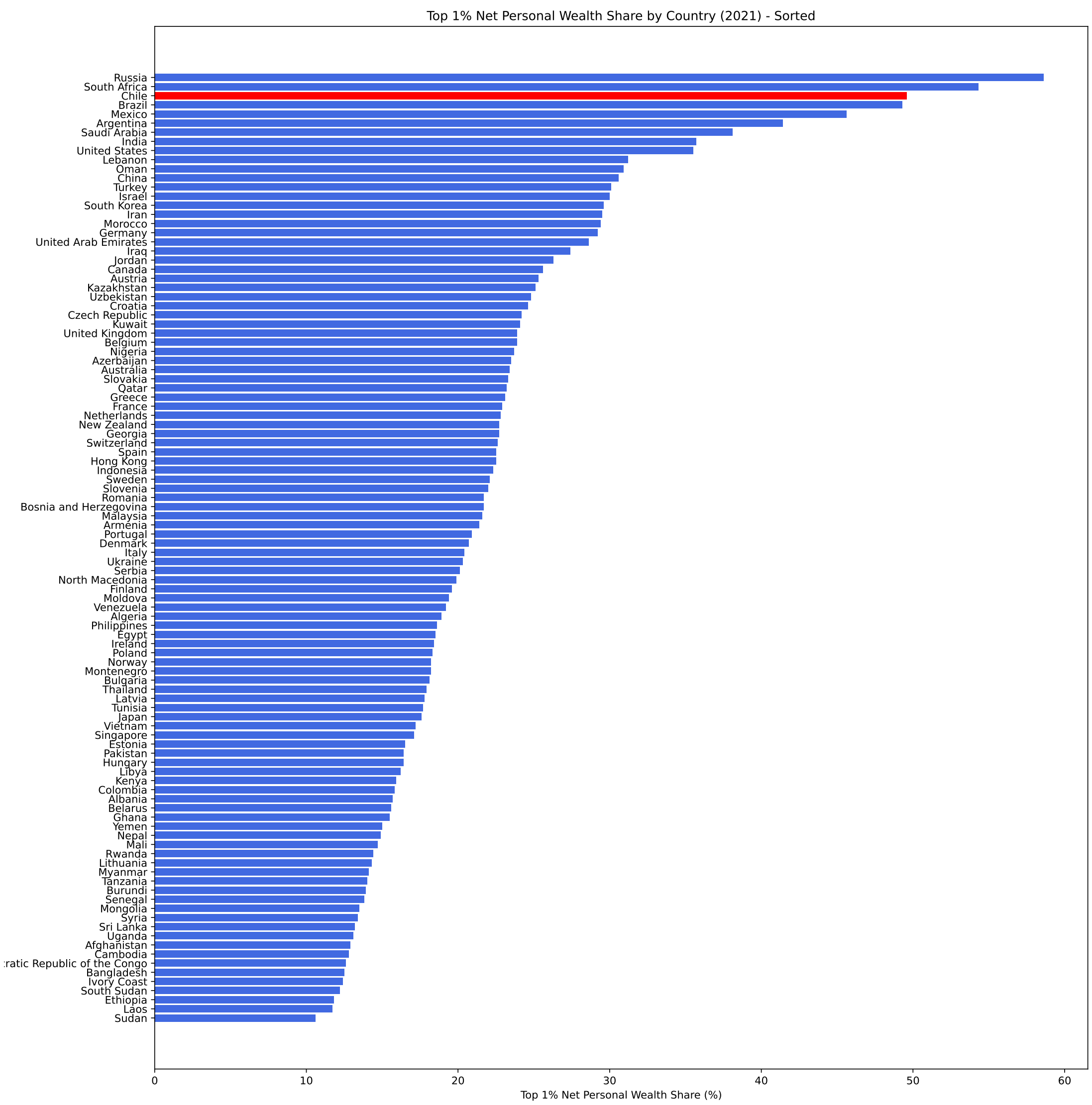


**Figure 22:** Top 1% wealth share across countries. Source: World Income Inequality Data Base (WIID)

## 8.3 Portfolio composition in the US

This remarkably heterogeneity in rate of returns on wealth is closely related to the heterogeneity in portfolio composition across different wealth levels. Households with large wealth tend to tilt their portfolio allocation toward risky assets, whereas low-wealth households mostly hold risk free assets. This portfolios' pattern has remained fairly constant over time in the US (see figure 23).

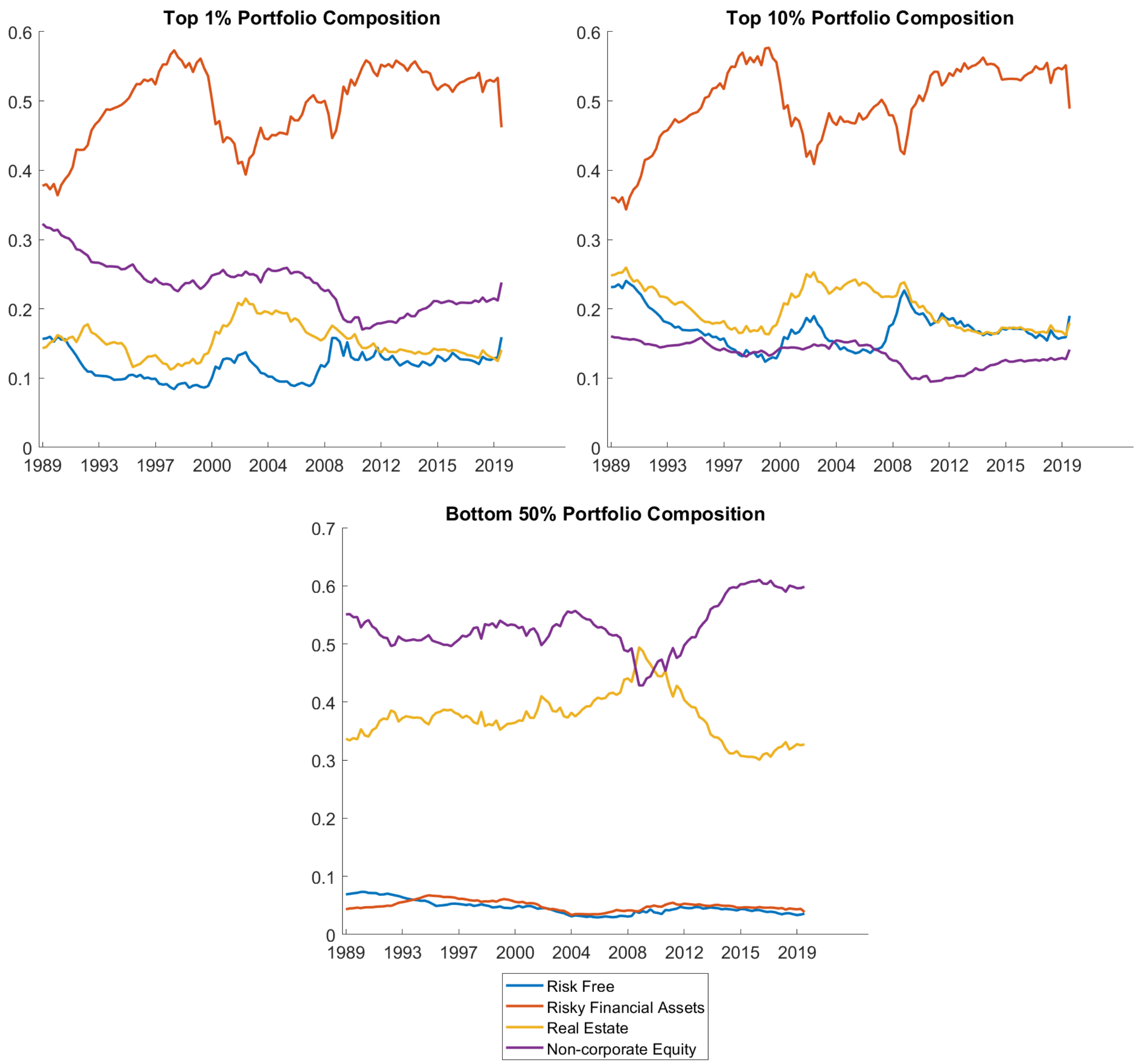


**Figure 23:** Portfolio Composition for different Wealth Shares. Source: Distributional Financial Accounts, U.S.

Where $\pi_{it}(z_{it}, a_{it}^d)$ is the profits - optimized already - of the business of agent $i$ at period

$t$ which is a function of the capital productivity and the amount of resources that the agent invested in her firm. In the next section I will describe in details the entrepreneur's problem. $\bar{w}$ is the equilibrium wage. Agents must pay tax on capital gains (domestic an foreign) and labor tax. The fact that the tax rate on foreign capital gains vary across agents implies that, potentially, the effective tax rate that agents pay depends on their level of wealth which is a reduced form of modeling tax evasion. This captures the idea that it is more difficult for governments to collect taxes from capital gains that come from oversees. For simplicity, I assume that there is perfect enforcement when it comes to taxes on domestic capital gains. The tax scheme is described in detailed in the next sections. In order to economize notation, I define $y_i^L \equiv w_{it}\bar{w}$ as labor income, $y_i^D \equiv \pi_{it}(z_{it}, a_{it}^d) + r_t^d a_{it}^d$ domestic capital income, $y_i^F \equiv r_t^f a_{it}^f$ as foreign capital income, and total capital income as $y_i^K \equiv y_i^D + y_i^F$. Hence, the budget constraint can be expressed as:

$$a_{it+1}^d + a_{it+1}^f + c_{it} = (1-\tau_k)y_i^D + (1-\tau_k^i)y_i^F + (1-\tau_l)y_i^L + a_{it}^d + a_{it}^f \tag{41}$$

Similarly, I define total after tax wealth of agent $i$ in period $t$ as:

$$W_{it} \equiv (1-\tau_k)y_i^D + (1-\tau_k^i)y_i^F + (1-\tau_l)y_i^L + a_{it}^d + a_{it}^f \tag{42}$$

Thereafter, when I talk about wealth distribution, it means the distribution of the object $W_{it}$.

## 8.4 Derivation of Optimal Portfolio Allocation Analytically

An investor aims to maximize their expected utility of wealth $E[U(W)]$. For a CRRA utility function, the utility of wealth $W$ is given by:

$$U(W) = \frac{W^{1-\gamma}}{1-\gamma}$$

where $\gamma$ is the relative risk aversion coefficient.

Assume that the investor's wealth is affected by their portfolio returns. If an investor allocates a fraction $\theta$ of their wealth to a risky asset with an expected return $E(r)$ and variance $\sigma^2$, and the rest to a risk-free asset with a return $r_f$, the expected utility can be expressed in terms of the portfolio return. Let $\tau_r$ and $\tau_f$ be the effective tax rates on the risky and risk-free assets, respectively.

The return on the investor's portfolio $r_p$ is:

$$r_p = \theta(1 - \tau_r)r_r + (1 - \theta)(1 - \tau_f)r_f$$

The wealth after one period is:

$$W = W_0(1 + r_p) = W_0(1 + \theta(1 - \tau_r)r + (1 - \theta)(1 - \tau_f)r_f)$$

where $W_0$ is the initial wealth.

For small risk (i.e., small $\sigma$), we can use a second-order Taylor expansion to approximate the expected utility:

$$E[U(W)] \approx U(E(W)) + \frac{1}{2}U''(E(W))\text{Var}(W)$$

For a CRRA utility function, the expected utility maximization problem simplifies to maximizing the expression:

$$E[U(W)] = E\left[\frac{W^{1-\gamma}}{1-\gamma}\right]$$

Given the assumptions of normally distributed returns or using the second-order approximation, this maximizes:

$$E[U(W)] \approx \frac{E(W)^{1-\gamma}}{1-\gamma} - \frac{\gamma}{2}\frac{\text{Var}(W)}{E(W)}$$

The investor's problem is to choose $\theta$ (the proportion invested in the risky asset) to maximize the expected utility:

$$\max_{\theta} E[U(W)]$$

Substituting the portfolio return and simplifying:

$$E[U(W)] \approx \theta(1 - \tau_r)E(r) + (1 - \theta)(1 - \tau_f)r_f - \frac{\gamma}{2}\theta^2\sigma^2$$

To find the optimal allocation $\theta^*$, take the derivative of the expected utility with respect to $\theta$ and set it to zero:

$$\frac{\partial E[U(W)]}{\partial \theta} = (1-\tau_r)E(r) - (1-\tau_f)r_f - \gamma\theta\sigma^2 = 0$$

Solving for $\theta$:

$$\theta^* = \frac{(1-\tau_r)E(r) - (1-\tau_g)r_f}{\gamma\sigma^2}$$

$\theta^*$ represents the proportion of wealth that should be invested in the risky asset to maximize expected utility. The numerator $(1-\tau_r)E(r)-(1-\tau_f)r_f$ represents the after-tax risk premium, or the excess return expected from the risky asset over the risk-free rate. The denominator $\gamma\sigma^2$ scales this premium by the investor's risk aversion ($\gamma$) and the risk (variance $\sigma^2$) of the risky asset.

The formula $\theta^* = \frac{E(r)-r_f}{\gamma\sigma^2}$ shows that the optimal proportion to invest in the risky asset increases with the expected excess return and decreases with the level of risk aversion and the risk of the asset.

## 8.5 Alternative way of modeling the risky asset

Every period, conditional on her productivity, $z$, and domestic asset levels, $a$, the profit of each agent is given by:

$$\pi(a,z) = \max_k [pzk - (r+\delta)l] \tag{43}$$

$$st : k \leq s(z)a \tag{44}$$

$$p = \alpha X^{\alpha-\mu} L^{1-\alpha}(zk)^{\mu-1} \tag{45}$$

The optimal policy function of capital is given by:

$$k(a,z) = \min\left\{\left(\frac{\mu\alpha X^{\alpha-\mu}L^{1-\alpha}z^{\mu}}{r+\delta}\right)^{\frac{1}{1-\mu}}, s(z)a\right\} \tag{46}$$

Notice that the marginal benefits of scaling up a business is decreasing in capital and, hence, there is a maximum level[33] of profits that they can get from their businesses. This

[33] The maximum level is reachable only if you are not financially constraint.

implies that the high productive and/or rich agents are able to rapidly scale up firms and so they become net lenders.

The way I model businesses is in the same fashion as Guvenen, Kambourov, Kuruscu, Ocampo-Diaz, and Chen (2019). There is a continuum of intermediate good indexed by $i$. Each individual $i$ produces an amount $x_i$ according to the following technology (for simplicity and due to the fact that the entrepreneur's problem is static, I will drop the time sub-indexes in this section):

$$x_i = z_i k_i \tag{47}$$

Where $z_i$ corresponds to capital productivity and is agent-specific. The idea of $z_i$ is to capture the heterogeneity in managerial skills across agents that according to some studies (see Smith, Yagan, Zidar, and Zwick (2019), for example) is a key factor to explain the high returns on wealth at the top levels of the wealth distribution. $k_i$ is the capital stock invested in agent i's firm.

The final good production, $Y$, is produced according to the following technology:

$$Y = X^{\alpha} L^{1-\alpha} \tag{48}$$

Where $L$ is aggregate labor and $X$ is the CES composite of intermediate goods:

$$X = \left( \int x_i^{\mu} di \right)^{1/\mu} \tag{49}$$

Where $\frac{1}{1-\mu}$ is the elasticity of substitution. The final good market is competitive so the profit maximization problem is as follows:

$$\max_{x_i, L} \left[ \left( \int x_i^{\mu} di \right)^{\alpha/\mu} L^{1-\alpha} - \int p_i x_i di - \bar{w} L \right] \tag{50}$$

Where $p_i$ is the price of the intermediate good $x_i$. Since this market is competitive, the prices of intermediate goods and wage are given by the first order condition of the final producer:

$$p(x_i) = \alpha x_i^{\mu-1} X^{\alpha-\mu} L^{1-\alpha} \tag{51}$$

$$\bar{w} = (1-\alpha) X^{1-\alpha} L^{-\alpha} \tag{52}$$

There is a domestic market of bonds in which agents can borrow/lend at a free risk interest rate $r_t^d$. Borrowing and saving decisions take place after agents observe their idiosyncratic shocks and before production decisions. Agents who decide to borrow to invest in their businesses face a collateral constraint:

$$k_i \leqslant s(z_i) a_i \tag{53}$$

Where $s(\cdot) : \mathcal{Z} \to [1, \infty)$ is an increasing function in individual productivity. This function captures the idea that agents with high managerial skills might have better financial opportunities since those skills are partially observed by the market. As expected, those agents with high productivity will be net lenders. This features of the model is motivated by Smith, Yagan, Zidar, and Zwick (2019) who documented that one of the primary sources of income inequality is entrepreneurs' human capital.

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