Taxation of Top Incomes and Tax Avoidance*

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Abstract

This paper studies the aggregate and distributional effects of raising the top marginal income tax rate in the presence of tax avoidance. To this end, we develop a quantitative macroeconomic model with heterogeneous agents and occupational choice in which entrepreneurs can avoid taxes in two ways. On the extensive margin, entrepreneurs can choose the legal form of their business organization to reduce their tax burden. On the intensive margin, entrepreneurs can shift their income between different tax bases. In a quantitative application to the US economy, we find that tax avoidance lowers productive efficiency and reduces the effectiveness of the top marginal tax rate at lowering inequality.

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1 Introduction

In the US, increasing top income shares have stimulated an academic and political debate on how to tax the rich. It is well known that progressive income taxation may induce behavioral responses shaping the trade-off between equity and efficiency. When assessing the economic consequences of taxing top incomes, it is, therefore, crucial to account for the characteristics of rich households and their behavioral responses to marginal tax rates. In this respect, two empirical facts are of key importance. First, there is a high concentration of entrepreneurs with small and medium-sized businesses at the top of the US income distribution (Smith et al., 2019). Second, the estimated response of reported income to marginal tax rates is larger for the top 1% income earners compared to the rest of the population. This difference may be attributed to tax avoidance and suggests that entrepreneurs effectively reduce their tax burden (Mertens and Montiel Olea, 2018; Saez et al., 2012).

These empirical facts highlight the importance of understanding entrepreneurial decisions and tax avoidance when assessing the aggregate and distributional consequences of taxing top incomes. This paper focuses on two main research questions. First, how does tax avoidance by entrepreneurs affect macroeconomic outcomes and the distribution of income and wealth? Second, how does the top marginal tax rate impact the trade-off between equity and efficiency in the presence of tax avoidance?

To analyze these questions, we introduce entrepreneurial tax avoidance in a dynamic general equilibrium model with incomplete markets and occupational choice following Cagetti and De Nardi (2006), Quadrini (2000) and Kitao (2008). Households are heterogeneous in wealth, labor productivity, and entrepreneurial talent and decide every period whether to be a worker or to be an entrepreneur. Entrepreneurs can avoid taxes in two ways. On the extensive margin, entrepreneurs can choose the legal form of their business organization to reduce their tax burden. On the intensive margin, they can shift their income between different tax bases. Entrepreneurs invest in capital, hire labor and use a decreasing return to scale production technology to produce the consumption good. Entrepreneurs are credit-constrained in their investment decision and face a borrowing limit proportional to the amount of their net wealth. The government collects personal income taxes, corporate taxes, dividend taxes, and social security taxes to finance government spending and pension benefits. In addition to the entrepreneurial sector consisting of small and medium-sized businesses, there is a large corporate sector that operates under constant returns to scale using capital and labor competitively to produce the consumption good.

We focus on the tax treatment of three main forms of organization: sole proprietorship, S-corporations, and C-corporations. Sole-proprietorships are simple to establish and involve no taxation at the entity level. Instead, business income is passed through to

the owners and taxed at the personal income tax rate. The advantage of this organizational form is its simplicity but there is little room for tax avoidance. Alternatively, entrepreneurs can decide to incorporate, which, however, raises the complexity of the business and generates operational costs. Like sole proprietors, S-corporations belong to the class of pass-through businesses and are not taxed at the entity level, but their owners have the option to disguise their labor income as business income to avoid the social security tax (Smith et al., 2022). C-corporations are complex and run at higher operational costs but they benefit from a better access to credit (Dyrda and Pugsley, 2019; Chen et al., 2018). C-corporations are taxed at the entity level and face double taxation: Business income is subject to the corporate tax and then taxed again when it is paid to the owners as dividends. Like the personal income tax, the dividend tax is progressive, however, at the top it is capped and lower than the top marginal income tax rate. As S-corporations, C-corporations can shift their income between different tax bases.

We calibrate the model to the US economy. Our targets include the share of entrepreneurs by legal form, the top 1 % income share as well as the share of entrepreneurs among the top 1 % of the income distribution. Since the entrepreneurial credit constraint is of crucial importance, we calibrate the borrowing limit of pass-through businesses and C-corporations as to match their corresponding wealth shares.

Our model replicates important quantitative features of the US economy in terms of income, wealth, and the distribution of businesses by income and wealth. Our quantitative analysis highlights that poor entrepreneurs choose to run their businesses as sole proprietors. In spite of higher operational costs, richer entrepreneurs switch to S-corporations to avoid the social security tax by disguising their labor income as business income. In addition, they circumvent the double-taxation of C-corporations. In line with the empirical evidence, our model predicts that S-corporations are more common than C-corporations among small and medium-sized businesses (Smith et al., 2022). Entrepreneurs choose to organize as C-corporations if they have a high entrepreneurial talent or if they are very wealthy. The reasons for this choice of legal form of organization are twofold. First, talented entrepreneurs benefit from the relaxed credit constraint of C-corporations, which allows them to invest more. Second, if entrepreneurs are very wealthy, their credit constraint is not binding anymore but they benefit from the capped dividend tax, which is lower than the top marginal income tax rate they face.

To understand the impact of tax avoidance on aggregate and distributional outcomes we provide comparisons with two counterfactual economies. In the first economy, we shut down the intensive margin of tax avoidance and do not allow for income shifting between the tax bases. In the second economy, we eliminate the intensive and the extensive margin of tax avoidance and assume that all entrepreneurs are taxed as sole proprietors. In this scenario we remove all channels of tax avoidance and workers and entrepreneurs face an equal tax treatment. In the first counterfactual setup, in which income cannot be shifted

between tax bases, the majority of S-corporations become sole proprietors. Only the most productive entrepreneurs run their businesses as C-corporations to benefit from the better access to credit. While the composition of legal forms of organization changes, the overall share of entrepreneurs is hardly affected. Since the intensive margin of tax avoidance is eliminated, entrepreneurs pay higher taxes and the government collects more tax revenues. However, the entrepreneurial budget and credit constraint tighten such that capital investment decreases relative to the benchmark economy. Average income in the economy decreases but, overall, the macroeconomic impact is small. In contrast, in the second counterfactual setup, in which all channels of tax avoidance are removed, the share of entrepreneurs increases substantially with a sizable positive impact on average income and tax revenues. The underlying reason is that the elimination of double-taxation induces the majority of entrepreneurs to run their businesses as C-corporations. The looser borrowing limit facilitates larger entrepreneurial investment.

Our analysis highlights that tax avoidance affects productive efficiency in two opposing ways. First, the intensive margin of tax avoidance increases productive efficiency. The reason is that entrepreneurs can relax their financial constraint by minimizing their tax liabilities facilitating larger investment. Second, the extensive margin of tax avoidance reduces productive efficiency. The possibility to avoid taxes induces entrepreneurs to run their businesses as S-corporations, in spite of facing a tighter borrowing limit with adverse effects on capital investment. Quantitatively, the extensive margin dominates the intensive margin of tax avoidance.

In the next step, we study the impact of the top marginal tax rate on productive efficiency, inequality, and tax revenues in the presence of tax avoidance. Using our benchmark economy, we find that raising the top marginal tax rate induces entrepreneurs to run their businesses as C-corporations rather than S-corporations to take advantage of the capped dividend tax rate, which is lower than the top marginal tax rate. Moreover, they engage more in income shifting to minimize their tax burden. As a result, the income share held by the top 1% increases if the top marginal tax rate is raised. Our findings highlight that due to tax avoidance, the top marginal tax rate has a quantitatively minor impact on productive efficiency and is ineffective in lowering inequality. In contrast, in the absence of tax avoidance, increasing the top marginal tax rate reduces inequality at the expense of productive efficiency.

Our findings are in line with Lindsey (1987), Feldstein (1995) and Dyrda and Pugsley (2019) who report that cutting top marginal tax rates in the 1980s stimulated entrepreneurship in the US and induced a switch from C-corporations to pass-through businesses. Slemrod (1996) argues that these large responses were mainly due to tax avoidance rather than economic activity.

The rest of the paper is organized as follows. The next subsection discuss the related literature. In Section 2, we provide institutional details on the legal forms of organization

in the US. Section 3 presents the model. Section 4 explains the calibration procedure. In Section 5, we present the results and discuss how tax avoidance affects macroeconomic outcomes and the distribution of income and wealth. Moreover, we analyze how the top marginal tax rate affects the trade-off between equity and efficiency. The last section concludes.

1.1 Related Literature

Our paper builds on different strands of the literature. First, our study contributes to the analysis of optimal top marginal tax rates. Diamond and Saez (2011) consider static models and argue that in the US the top marginal tax rate should be raised to 73 %. Kindermann and Krueger (2022) analyze a large scale overlapping generations model with uninsurable labor productivity risk and find an optimal marginal tax rate for top 1% earners of 79%. Badel et al. (2020) and Guner et al. (2016) derive lower optimal marginal tax rates of 42 and 49 %.

The above mentioned studies abstract from entrepreneurs, who, however, are concentrated at the top of the income distribution. Building on Cagetti and De Nardi (2006) and Quadrini (2000), Brüggemann (2021) and Imrohoroglu et al. (2018) analyze dynamic general equilibrium models with incomplete markets and occupational choice to derive the optimal taxation of top income earners. Brüggemann (2021) reports a welfare-maximizing top marginal tax rate of 60 %. Imrohoroglu et al. (2018) argue that raising the progressivity of the income tax schedule is more effective than increasing the top marginal tax rate. Imrohoroglu et al. (2018) is related to the the papers by Heathcote and Tsujiyama (2021), Heathcote et al. (2017a), Heathcote et al. (2020), Erosa and Koreshkova (2007) and Bakış et al. (2015) who focus on the optimal progressivity of the income tax schedule.

All these papers abstract from tax avoidance, which is the focus of our paper.[1] The important role of tax avoidance has been addressed by Piketty et al. (2014) who provide empirical evidence on the decomposition of the total behavioral response of top incomes to marginal tax rates. Landier and Plantin (2017), Gorea (2014) and Uribe-Teran (2021) address tax avoidance in dynamic models by assuming agents to have access to a costly tax avoidance technology. We contribute to this literature by modeling the microfoundations of tax avoidance. Specifically, we explicitly consider the entrepreneurial choices of how to reduce the tax burden.

Our microfoundation of tax avoidance builds on the earlier literature that studies the entrepreneurial choice of corporation and the role of taxation and tax distortions in this context, see among others Gordon and Slemrod (1998), Mackie-Mason and Gordon (1997), Gordon and MacKie-Mason (1994). Bilicka and Raei (2020) apply an industry equilibrium

[1] A related literature focuses on tax evasion as illegal way to reduce tax payments, see Slemrod (2007), Maffezzoli (2011), Kotsogiannis and Mateos-Planas (2019), Di Nola et al. (2021) and the references therein. In this paper we focus on legal strategies to reduce tax liabilities.

model in which the legal form of organization is an endogenous choice to study how differential tax treatments distorts aggregate output. Chen et al. (2018) analyze the impact of the corporate tax on the entrepreneurial choice of legal form of organization and unemployment within a dynamic stochastic occupational choice model. Our paper is most closed related to Dyrda and Pugsley (2022) who develop a quantitative dynamic general equilibrium model with a fixed share of entrepreneurs who choose whether to run a pass-through business or a C-corporation. They study the optimal design of the labor and business tax and find that the progressivity of the labor tax scheme should rise and that the uniform business income tax should be set to 36 %. We contribute to this literature by focusing on the different channels of tax avoidance. While Chen et al. (2018) and Dyrda and Pugsley (2022) differentiate between pass-through businesses and C-corporations, we explicitly account for the different tax treatment of sole proprietors, S-corporations, and C-corporations. In addition, we allow for entrepreneurial income shifting between different tax bases as an intensive margin of tax avoidance. Importantly, we focus on how the top marginal tax rate affects the individuals' occupational choice as well as the entrepreneurial choice of how to run the business in the presence of tax avoidance.

2 Tax Avoidance and Legal Forms of Organization

Business owners in the US are taxed according to the legal organization of their business. Sole proprietorships are the simplest form of business ownership.[2] They declare all the proceeds from their business as labor income, which implies that they pay income and social security taxes. Incorporated entrepreneurs have the choice to declare their business proceeds as either labor income or business income.

Corporate owners, who declare labor income, pay income and social security taxes on the declared amount.[3] When income is declared as business profits, S-corporation owners pay only income taxes due to their pass-through status. In contrast, business income of C-corporation owners is double-taxed: both corporate and dividend taxes are levied on the declared amount.

Tax avoidance. Business owners can avoid taxes through two distinct channels. First, entrepreneurs can reduce their tax burden through the choice of the organizational form of their business. We label this channel the *extensive margin* of tax avoidance. Second, conditional on choosing to incorporate their business, entrepreneurs can reduce their tax liabilities by shifting income between the two tax bases: labor income and business income.

[2]For the purposes of the analysis that follows, we group sole proprietorships and partnerships together. Partnerships are another similar pass-through business form which allows for several owners.

[3]For instance, declared labor income can represent the compensation for managerial services provided to the firm by the owner.

This practice of income shifting is the *intensive margin* of tax avoidance.

In terms of the extensive margin of tax avoidance, entrepreneurs may choose to incorporate instead of being sole proprietors in order to avoid social security taxes, which are not paid when declaring business income. Once incorporated, they can choose between S-corporations and C-corporations. S-corporations avoid the double taxation of C-corporations. C-corporations may potentially be chosen to avoid high income taxes.

The intensive margin of tax avoidance is operational only for incorporated business owners. They decide how to distribute their business proceeds between the two tax bases: labor income and business income. Clearly, S-corporation entrepreneurs are inclined to declare only business income in order to avoid paying social security taxes. However, the Internal Revenue Service (IRS) requires S-corporations to pay *reasonable compensation* to shareholders-employees who provide services to the corporations. This restriction is intended to inhibit tax avoiding practices with respect to social security taxes (Internal Revenue Service, 2022). On the other hand, given the high levels of corporate and dividend taxes, C-corporations have incentives to overcompensate their shareholders-employees. This practice of paying dividends concealed as labor income is also discouraged by the IRS (Kirkland, 2013).[4]

Facts about organizational forms. Sole proprietors are the most common form of organization for business owners. Using the sample of active business owners in the 2013 Survey of Consumer Finance (SCF), we show that 67% of the entrepreneurs are sole proprietors. S-corporation owners are 24% and C-corporation owners amount to 9%.

The predominance of pass-through businesses started after the Tax Reform Act of 1986 (TRA86). The reform reduced the top personal tax rate from 50% to 28%, which was lower than the corporate tax rate. This led to a significant increase in the number of pass-through entities.[5] Dyrda and Pugsley (2019) show that the rise of the pass-through firms in the years after the reform is mostly due to reallocation of existing businesses from C-corporations to pass-through firms.[6] Furthermore, they empirically analyze the effects of the TRA86 reform on firms' employment through the choice of legal form of organization and document that the reallocation of existing businesses from C-corporations to pass-through firms led to a decrease in their employment growth. This fact is consistent with less investment possibilities for pass-through entities relative to C-corporations.

[4]As of 2013, the top marginal income tax in the US is 39.6%, while the social security tax is 12.5%. On the other hand, the corporate income tax is 35%, and the top dividend tax rate is 23.8%.

[5]Early on, Slemrod (1996) argued that the documented increase of declared personal income after TRA86 is due to income shifting from the corporate tax base to the personal income tax base. DeBacker and Prisinzano (2015) point out that 4.2% of US business income in 2011 was earned in the pass-through sectors, compared to only 20.7% in 1980.

[6]This trend continues decades after the reform. Smith et al. (2022) document that between 2000 and 2012, 183,000 firms switched from C-corporation to S-corporation.

The top 1% income share grew from 10% in 1980 to 20% in 2012 (Cooper et al., 2016). Pass-through businesses account for much of the rise of the top 1% income share, because pass-through business income is concentrated among high-income tax payers. Cooper et al. (2016) show that 41% of the doubling of the income share of the top percentile is due to higher pass-through business income.[7] As of 2014, Smith et al. (2019) find that 69% of the top 1% and more than 84% of the top 0.01% of the income distribution earn some pass-through business income. All these facts point out that the choice of organizational form is crucial factor in income changes at the very top of the distribution. This gives us confidence to incorporate the choice of legal form of organization in an incomplete markets model with entrepreneurs and to use it in determining the optimal taxation policy at the very top of the income distribution.

3 The Model

We develop a dynamic stochastic model of occupational choice building on Cagetti and De Nardi (2006). Time is discrete and infinite, $t = 0, 1, 2, \ldots$. The economy consists of households, firms and a government. One period in the model corresponds to one year in real life. Each period households receive a pair of idiosyncratic ability shocks which determine their productivity as workers and entrepreneurs, respectively. Based on these productivity values and given the amount of assets accumulated, households decide whether to become entrepreneurs or not. Our focus on the practices of tax avoidance through firms' legal form of organization makes us expand the entrepreneurial choice. Within entrepreneurship, households choose the organization of their business.

3.1 Demographics, Preferences and Occupations

Households go through two life stages, young and old. They age stochastically with probability ρ_o. Old households are retired, do not work, receive a pension and die stochastically with probability ρ_d. Dying old households are immediately replaced by newborn young households. To keep the mass of households constant at unity, each period a mass of $\rho_o\rho_d/(\rho_o + \rho_d)$ newborn households enters the economy.

Households have preferences over consumption and leisure, $u(c, 1-\ell)$, with total time endowment normalized to one. They are heterogeneous in wealth a, working ability ε and entrepreneurial ability θ. Labor productivity $\varepsilon \in \{\varepsilon_1, \ldots, \varepsilon_{N_\varepsilon}\}$ and entrepreneurial ability $\theta \in \{\theta_1, \ldots, \theta_{N_\theta}\}$ follow an exogenous stochastic process described by the Markov chain $\Gamma(\varepsilon', \theta'|\varepsilon, \theta)$.

[7] Using a different decomposition technique, Dyrda and Pugsley (2019) show that the rise of pass-through firms accounts for 39% of the rise of top 1% income share.

Occupational choice. Young households decide every period whether to be a worker (W) or to be an entrepreneur. Moreover, entrepreneurs choose the legal form of their business enterprise: EP (sole proprietor), ES (S-corporation), or EC (C-corporation). The occupational choice is summarized by $o \in \{W, EP, ES, EC\}$.

3.2 Technology

The economy consists of two sectors of production. The single consumption good is produced either in a non-entrepreneurial sector with a representative firm or by entrepreneurial businesses run by households.

The entrepreneurial sector is made up of small C-corporations and pass-through businesses.[8] Entrepreneurs with ability θ produce output according to a *decreasing returns to scale* technology,

$$f(\theta, k, \bar{n}) = \theta(k^{\gamma}\bar{n}^{1-\gamma})^{v},$$

where $\gamma \in (0,1)$ is the share of capital in the production function and $v \in (0,1)$ is the span-of-control parameter. Entrepreneurs invest capital k, supply their own labor ℓ and hire external labor n (efficiency units of labor supplied by workers). The total labor input is $\bar{n} = \ell + n$.

The operating profits of a business owner are given by

$$f(\theta, k, \bar{n}) - (r + \delta)\, k - wn,$$

where δ is the capital depreciation rate, r is the rental rate of capital, w is the wage paid for an efficiency unit of hired labor and the price of output is normalized to one.

Firms in the non-entrepreneurial sector operate competitively with a *constant returns to scale* technology.[9] Therefore, the non-entrepreneurial sector can be characterized by a representative firm with production technology

$$F(K^C, N^C) = \left(K^C\right)^{\alpha} \left(N^C\right)^{1-\alpha},$$

where $0 < \alpha < 1$ is the capital share, while K^C and L^C are capital and labor inputs, respectively. The competitive nature of the sector ensures that input prices are given by their marginal products.

3.3 Credit Markets

There is a single financial intermediary which behaves competitively and earns zero profit. Due to partial enforceability of credit contracts entrepreneurs pledge their private assets

[8] Here we focus on small C-corporations, which empirically correspond to those with less than $10 million in receipts and owners who at least partially are managers.

[9] This sector represents the large public C-corporations.

as collateral to get a loan from the financial intermediary. Entrepreneurs can borrow up to a fraction λ of their current wealth a to invest in capital: $k \leq \lambda a$. That is, λ measures the maximum leverage of the business.

It is well documented that C-corporations have better chances of attracting external capital than pass-through businesses (Chen and Qi, 2016; Dyrda and Pugsley, 2019). We capture this stylized fact in a parsimonious way by assuming that the collateral requirement is lower for C-corporation entrepreneurs, $\lambda^{EP} = \lambda^{ES} \leq \lambda^{EC}$. Finally, we assume that workers are borrowing-constrained, $a' \geq 0$.

3.4 The Government

The government finances government spending G and pension benefits B via personal income, social security, corporate and dividend taxes. The personal income tax liability after paying social security is given by $T^I(y)$ where y is declared personal income.

The social security tax τ_s is proportional to labor income, which now are denoted by y, but they are capped at a certain level of income $\overline{y}^s$. Furthermore, social security taxes include the Medicare tax τ_m and the Medicare surcharge τ_{ms} levied only on incomes greater than a threshold $\bar{y}^m$, hence,

$$T^s(y) = \tau_s \min\{y, \overline{y}^s\} + \tau_m y + \tau_{ms} \max(y - \bar{y}^m, 0).$$

The corporate income tax paid by a C-corporation entrepreneurs is given by

$$T^c(y) = \tau_c y,$$

where now y stands for declared business income.

Corporate profits paid out as dividends are taxed proportionally as in Dyrda and Pugsley (2019). We denote the collected taxes from dividends as

$$T^d(d) = \tau_d d,$$

where d stands for dividends.

The government budget constraint reads as

$$\int \left[T^I(s) + T^s(s) + T^c(s) + T^d(s)\right] d\mu = G + B, \tag{1}$$

where μ is the invariant distribution over state variables $s = (a, \varepsilon, \theta, z)$. The variable z distinguishes workers, entrepreneurs (sole proprietors, S-corporations and C-corporations) and retirees, i.e. $z \in \{W, EP, ES, EC, R\}$. Equation (1) specifies that total tax revenues (individual income tax, social security tax, corporate tax and dividend tax) must equal government spending G and aggregate pension benefits B.

3.5 Decisions

The sequence of events and decisions in the economy is as follows. At the start of each period households receive the productivity shocks ε and θ. They also know the amount of assets a they own. The beginning-of-the-period value function of a young household is given by

$$V(a,\varepsilon,\theta) = \max_{o\in\{W,EP,ES,EC\}} \{V^o(a,\varepsilon,\theta)\},$$

where V^W is the value of a worker, V^{EP} is the value of becoming a sole proprietor, V^{ES} is the value of forming a S-corporation, while V^{EC} is the value of becoming a C-corporation. The occupational decision o is made and for the rest of the period the household operates in the chosen occupation.

Worker. The choice variables of a worker are current consumption c, supplied labor ℓ, and savings a'. The young worker gets into retirement with probability ρ_o. This is reflected in the value function (2). The value of retirement $V^R(a')$ is defined later in the text. The recursive formulation of the problem of a worker is given below,

$$V^W(a,\varepsilon,\theta) = \max_{c,a',\ell} \left\{u(c,1-\ell) + \beta(1-\rho_o)\,\mathbb{E}_{\varepsilon',\theta'|\varepsilon,\theta}\left[V(a',\varepsilon',\theta')\right] + \beta\rho_o V^R(a')\right\} \tag{2}$$

subject to

$$y_W = w\varepsilon\ell - T^s(w\varepsilon\ell) + ra, \tag{3}$$

$$c + a' = y_W + a - T^I(y_W), \tag{4}$$

$$a' \geq 0,\ \ \ell \in [0,1]. \tag{5}$$

Equation (3) defines personal income of a worker y_W after paying social security taxes $T^s(\cdot)$. It is given by labor income $w\varepsilon\ell$ and income from renting out assets ra. Equation (4) summarizes the budget set. The consumption choice c and the future assets level a' should equal the total resources available to the household: income y_W and assets a net of taxes paid on income, $T^I(y_W)$. Constraints (5) state that workers cannot borrow and the time endowment is bounded.

Sole proprietor. Sole proprietors as well as other types of entrepreneurs need to choose consumption, savings, the capital and labor inputs in production, k and n, and their own labor supply ℓ as shown in equation (6). Their business income stems from their production line. Their maximization problem is given by

$$V^{EP}(a,\varepsilon,\theta) = \max_{c,a',k,\ell,n} \left\{u(c,1-\ell) + \beta(1-\rho_o)\,\mathbb{E}_{\varepsilon',\theta'|\varepsilon,\theta}\left[V(a',\varepsilon',\theta')\right] + \beta\rho_o V^R(a')\right\} \tag{6}$$

subject to

$$\pi^{EP} = f(\theta, k, \bar{n}) - (r+\delta)\, k - wn, \tag{7}$$
$$y^{EP} = \pi^{EP} - T^s\left(\pi^{EP}\right) + ra, \tag{8}$$
$$c + a' = y^{EP} - T^I\left(y^{EP}\right) + a, \tag{9}$$
$$k \leq \lambda^{EP} a,\ a' \geq 0,\ \ell \in [0,1], \tag{10}$$
$$\bar{n} = n + \ell. \tag{11}$$

Equation (7) calculates the business profit of the sole proprietor as the difference between revenue and input costs. The total income of the entrepreneur, net of social security taxes is given by equation (8). Equation (9) describes the budget set. Income taxes $T^I\left(y^{EP}\right)$ are subtracted from income y^{EP} to get net income. If $k > a$, the entrepreneur borrows $k - a$, i.e. the amount of investment exceeds the individual wealth. However, this borrowing cannot exceed a certain limit as a fraction of own wealth; see the first inequality in (10). Finally, the total labor input is the sum of entrepreneurial labor n and the labor input ℓ in (11).

S-corporation. The decision problem of the S-corporation entrepreneur is

$$V^{ES}(a, \varepsilon, \theta) = \max_{c,a',k,\ell,n,\phi^{ES}} \left\{ u(c, 1-\ell) + \beta(1-\rho_o)\, \mathbb{E}_{\varepsilon',\theta'|\varepsilon,\theta}\left[V(a', \varepsilon', \theta')\right] + \beta\rho_o V^R(a') \right\}$$

subject to

$$w^{ES} = \phi^{ES}\left[f(\theta, k, \bar{n}) - (r+\delta)\, k - wn\right], \tag{12}$$
$$\pi^{ES} = \left(1-\phi^{ES}\right)\left[f(\theta, k, \bar{n}) - (r+\delta)\, k - wn\right], \tag{13}$$
$$y^{ES} = \pi^{ES} + w^{ES} - T^s\left(w^{ES}\right) + ra, \tag{14}$$
$$c + a' = y^{ES} - C\left(1-\phi^{ES}\right) - \kappa^{ES} - T^I\left(y^{ES} - C\left(1-\phi^{ES}\right) - \kappa^{ES}\right) + a, \tag{15}$$
$$0 \leq \phi^{ES} \leq 1,$$
$$k \leq \lambda^{ES} a,\ a' \geq 0,\ \ell \in [0,1],$$
$$\bar{n} = n + \ell.$$

The S-corporation activity generates gross business proceeds of $f(\theta, k, \bar{n}) - (r+\delta)\, k - wn$. The entrepreneur can report a fraction ϕ^{ES} of it as labor income w^{ES} and the remaining part $\left(1-\phi^{ES}\right)$ as business profit income π^{ES}, both calculated in equations (12) and (13). Equation (14) derives the taxable income of the entrepreneur after paying social security taxes.

The S-corporation entrepreneur has incentives to report all business revenue as business profit income to avoid paying social security taxes on labor income, but misreporting labor income generates an increasing and convex cost of tax avoidance $C^{ES}\left(1-\phi^{ES}\right)$

which depends on the fraction of income reported as business profit. This prevents the S-corporation owner from declaring all business proceeds as profits.[10] In addition, operating a S-corporation is costly. Each period the operation costs amount to κ^{ES}. Both of these costs are reflected in the budget set (15). Finally, the S-corporation is a form of pass-through business, so the business income is subject to the personal income tax T^I.

C-corporation. The C-corporation entrepreneur faces the following problem:

$$V^{EC}(a,\varepsilon,\theta) = \max_{c,a',k,\ell,n,\phi^{EC}} \left\{ u(c, 1-\ell) + \beta(1-\rho_o)\,\mathbb{E}_{\varepsilon',\theta'|\varepsilon,\theta}\left[V(a',\varepsilon',\theta')\right] + \beta\rho_o V^R(a') \right\}$$

subject to

$$\begin{aligned}
w^{EC} &= \phi^{EC}\left[f(\theta,k,\bar{n}) - (r+\delta)\,k - wn\right], \\
\pi^{EC} &= \left(1-\phi^{EC}\right)\left[f(\theta,k,\bar{n}) - (r+\delta)\,k - wn\right], \\
y^{EC} &= (1-\tau_c)\,\pi^{EC} + w^{EC} - T^s\left(w^{EC}\right) + ra, \qquad (16)\\
c + a' &= y^{EC} - \tau_d(1-\tau_c)\,\pi^{EC} - C^{EC}\left(\phi^{EC}\right) - \kappa^{EC}, \\
&\quad - T^I\left(w^{EC} - T^s\left(w^{EC}\right) + ra - C^{EC}\left(\phi^{EC}\right) - \kappa^{EC}\right) + a, \qquad (17)\\
0 &\le \phi^{EC} \le 1, \\
k &\le \lambda^{EC} a,\ a' \ge 0,\ \ell \in [0,1], \\
\bar{n} &= n + \ell.
\end{aligned}$$

The C-corporation business activity generates income equal to $f(\theta,k,\bar{n}) - (r+\delta)\,k - wn$. The entrepreneur can choose the fraction ϕ^{EC} of income to be reported as labor income, w^{EC}. The remaining fraction $1-\phi^{EC}$ of total income is declared as business income, π^{EC}. The income of the entrepreneur after paying corporate tax τ_c on profits and social security taxes $T^S(w^{EC})$ is denoted as y^{EC} in equation (16).

C-corporation entrepreneurs are subject to double taxation. First, they pay corporate tax on their declared profit income π^{EC}, then they pay the dividend tax on their profits after deducting the corporate tax. Here we assume that corporate profits are paid out as dividends and the C-corporations do not retain earnings.[11]

Labor income is subject to the personal income tax and the social security tax. The C-corporation owner may want to declare a large fraction of income as labor income to avoid double taxation. The exact amount of declared labor income depends on the concrete tax schedules. Similarly to the S-corporation owners, there is an increasing and convex cost of tax avoidance $C^{EC}\left(\phi^{EC}\right)$ which depends on the fraction of revenue reported as labor

[10] The cost of tax avoidance reflects the IRS requirement for reasonable compensation of owners-employees (Internal Revenue Service, 2022).

[11] This assumption is obviously at odds with the data regarding publicly listed C-corporations, which typically retain earnings from period to period and remunerate shareholders via capital gains, especially over the last three decades. We do not think, however, that it is overly restrictive for *small* C-corporations.

income ϕ^{EC}. The operational cost is κ^{EC}. Equation (17) describes the resulting budget choice set of the C-corporation entrepreneur.

Retiree. The problem of the retirees amounts to choosing consumption c and savings a' to maximize life-time utility subject to a standard budget set in which net income is given by $b\bar{Y} + (1+r)a - T^I(b\bar{Y} + ra)$. The borrowing constraint applies to this problem too,

$$V^R(a) = \max_{c,a'} \left\{ u(c) + \beta(1-\rho_d) V^R(a') + \beta\rho_d \mathbb{E}_{\varepsilon',\theta'} \left[V(a', \varepsilon', \theta') \right] \right\}$$

subject to

$$\begin{aligned} c + a' &= b\bar{Y} + (1+r)a - T^I\left(b\bar{Y} + ra\right), \\ a' &\geq 0. \end{aligned}$$

The expectation operator $\mathbb{E}_{\varepsilon',\theta'}$ signifies the expectation over the value function $V(a', \varepsilon', \theta')$ in terms of productivity shocks ε' and θ' drawn from the stationary distribution of the process $\Gamma(\varepsilon', \theta'|\varepsilon, \theta)$ when the retiree is reborn as young. The pension of the retiree is a fraction b of the average income of young households $\bar{Y}$.

3.6 Equilibrium

Let $s \equiv (a, \varepsilon, \theta, z)$ with $z \in \{W, EP, ES, EC, R\}$. A stationary equilibrium is a list of prices $\{r, w\}$, pension replacement rate b, policy functions $\{c(s), a'(s), \ell(s), k(s), n(s), o(s), \phi(s)\}$ and an invariant distribution over the states, $\mu(s)$, such that

(i) The policy functions $\{c(s), a'(s), \ell(s), k(s), n(s), o(s), \phi(s)\}$ solve the household maximization problem described in Section (3.5).

(ii) Capital and labor markets clear:

$$K_C + \int \mathcal{I}_E(s) k(s) d\mu(s) = \int a d\mu(s),$$

$$N_C + \int \mathcal{I}_E(s) n(s) d\mu(s) = \int \mathcal{I}_W(s) \ell(s) \varepsilon d\mu(s).$$

where $\mathcal{I}_E(s) = 1$ if $z \in \{EP, ES, EC\}$, and $\mathcal{I}_W(s) = 1$ if $z = W$.

(iii) Competitive factor pricing holds:

$$r = \alpha \left(\frac{K_C}{N_C} \right)^{\alpha - 1} - \delta,$$

$$w = (1-\alpha) \left(\frac{K_C}{N_C} \right)^{\alpha}.$$

(iv) The government budget is satisfied:

$$\int \left[T^I(s) + T^s(s) + T^c(s) + T^d(s)\right] d\mu(s) = G + B,$$

where G is wasteful government spending and total pension expenditures are

$$B = b\bar{Y} \int \mathcal{I}_R(s)\, d\mu(s),$$

with $\mathcal{I}_R(s) = 1$ if the agent is retired and $\bar{Y}$ is the average labor income of young households.

(v) The invariant distribution satisfies the fixed point equation

$$\mu = \mathcal{H}(\mu),$$

where $\mathcal{H}$ is a one-period-ahead transition operator such that $\mu' = \mathcal{H}(\mu)$.

4 Calibration

We calibrate our model to replicate important empirical features of the US economy including (i) the share of entrepreneurs and the distribution of entrepreneurs by legal form of organization, (ii) the share of entrepreneurs and concentration of income at the top 1% of income distribution, and (iii) reported shares of different types of income. In the remainder of this section, we describe our data, functional form assumptions and calibration strategy.

4.1 Data

Our main data source is the Survey of Consumer Finance in 2013 (SCF), a cross-sectional survey of US households with an oversample of the wealthy. We restrict our sample to households headed by males age 25 to 64 and define entrepreneurs as active business owners (ABO). We consider three categories of business organizations: (1) Sole proprietors, labeled EP, which include both sole-proprietors and partnerships, (2) S-corporations, labeled ES, and (3) C-corporations, labeled EC, which include C-corporations and other corporations. The SCF data contains rich information on incomes and wealth of workers and entrepreneurs. Our income variable includes wages, self-employment and business income, interest, dividends, realized capital gains, pension and government transfers.

Since we do not observe tax declaration of entrepreneurs, we cannot compute the fraction of income entrepreneurs earn from their business that is declared as wage income. We use aggregate data from IRS tax return tables in 2013 to compute our data target on wage share. Specifically, we take the ratio between compensation of officers to net income

as the share of income declared as wage. Our calibration strategy also requires information on occupational transitions, for which we use the Panel Study of Income and Dynamics (PSID).

4.2 Calibration strategy

In this subsection, we discuss the calibration strategy of our model parameters. We calibrate some parameters externally, including those governing demographic transitions, working ability, preferences, corporate production and taxation, to their corresponding values in the literature or policy values. These externally calibrated parameters are collected in Table 1. The rest of the model parameters are jointly calibrated by minimizing the distance between a set of data- and model-generated moments. These internally calibrated parameters and their values are shown in Table 2.

Table 1: Externally Calibrated Parameters

Parameter	**Description**	**Value**	**Source**
Demographics			
ρ_o	Prob. of getting old	0.022	Brüggemann (2021)
ρ_d	Prob. of dying	0.089	Brüggemann (2021)
Working ability			
ρ_ε	Persistence	0.94	Kitao (2008)
σ_ε	Standard deviation	0.02	Kitao (2008)
Preferences			
σ_1	Risk aversion	2	Standard value
σ_2	Inverse of Frisch elasticity	1.67	Frisch elasticity = 0.59
Production			
α	Capital share (corporate)	0.33	Standard value
δ	Capital depreciation	0.06	Standard value
Taxation			
τ_{hsv}	Income tax progressivity	0.06	Estimated, SCF (2013)
τ_c	Corporate tax rate	0.35	IRS (2013)
τ_d	Dividend tax rate	0.238	IRS (2013)
τ_s	Social security rate	0.125	IRS (2013)
b	Replacement rate, pensions	0.4	OECD (2013)

Demographics and Endowments

We set the probability of retiring at $\rho_o = 0.022$ and the probability of dying in retirement at $\rho_d = 0.089$ following Brüggemann (2021). Individuals are endowed with one unit of time.

Table 2: Internally Calibrated Parameters

Parameter	**Description**	**Value**	**Target**
Preferences			
β	Discount factor	0.907	Interest rate
χ	Disutility from working	50	Average hours worked
Production			
ν	Span of control	0.88	Median income ratio between entrepreneurs and worker
γ	Capital share, entre sector	0.375	Share of hiring entrepreneurs
Entrepreneurial ability			
μ_θ	Unconditional mean	-0.085	Share of entrepreneurs in population
ρ_θ	Persistence	0.84	Exit rate entrepreneurs
σ_θ	Dispersion	0.35	Gini income entrepreneurs
Financial Frictions			
$\lambda^{EP}, \lambda^{ES}$	Collateral constraint (Pass-through)	1.4	wealth share of Pass-throughs
λ^{EC}	Collateral constraint (Corp)	2.39	wealth share of entrepreneurs
Tax avoidance and corp costs			
κ^{ES}	Operating cost for S-corps	0.02	Share of S-corps
κ^{EC}	Operating cost for C-corps	0.025	Share of C-corps
ψ^{ES}	Intercept of $C(\cdot)$ S-corp	0.19	Share of income declared as wage, S-corps
ψ^{EC}	Intercept of $C(\cdot)$ C-corp	8	Share of income declared as wage, C-corps
Superstar shock			
ϵ^*	Value of the shock	10	Share of entrepreneurs at top 1%
p_{ϵ^*}	Probability of the shock	0.01	Gini income
$\bar{p}_{\epsilon^*}$	Probability of dropping back	0.59	Top 1% income share
Taxation			
λ_{hsv}	Income tax, level	0.855	Tax revenue to GDP

The stochastic process that governs the evolution of workers' abilities ε is modeled as a first-order linear autoregressive process.

$$\log(\varepsilon_{t+1}) = \rho_\varepsilon \log(\varepsilon_t) + \eta_{\varepsilon,t+1}, \tag{18}$$

where $\eta_{\varepsilon,t+1} \sim N(0, \sigma_\varepsilon)$ is an i.i.d. innovation term. We take the values for the persistence parameter $\rho_\varepsilon = 0.94$ and the dispersion parameter of the process $\sigma_\varepsilon = 0.02$ from Kitao (2008). We approximate the stochastic process by a discrete Markov chain following the procedure described in Tauchen and Hussey (1991).

Since we focus on taxation of top individuals, it is very important to match the concentration of income and the occupational distribution at the top of the income distribution. It proves difficult in standard incomplete markets models with occupational choice. To match the income concentration and the worker share among the top 1% households in the income distribution, we allow for a *superstar productivity shock* to workers following Brüggemann (2021) and Kindermann and Krueger (2022). In any given period, an active worker can get a productivity shock ϵ^* with probability p_{ϵ^*}. This shock is well above the average productivity levels among workers. With probability $\bar{p}_{\epsilon^*}$, a superstar worker drops back to the median productivity level of the stochastic process (18). We calibrate parameters ϵ^*, p_{ϵ^*} and $\bar{p}_{\epsilon^*}$ to match the share of entrepreneurs within top 1% income earners, the top 1% income share, and Gini coefficient of income.

The productive ability of entrepreneurs θ is modeled as an AR1 process similarly to the workers' ability.

$$\log(\theta_{t+1}) = \mu_\theta + \rho_\theta \log(\theta_t) + \nu_{\epsilon,t+1}, \tag{19}$$

where $\nu_{\epsilon,t+1} \sim N(0, \sigma_\theta)$ is the innovation term. The long-run unconditional mean μ_θ is pinned down by matching the share of entrepreneurs in the data. The persistence parameter ρ_θ and the dispersion parameter σ_θ are calibrated internally to match the exit rate of entrepreneurs and the Gini coefficient of entrepreneurial income, respectively.

Preferences

The utility function is of CRRA type and additively separable in consumption and labor:

$$u(c, \ell) = \frac{c^{1-\sigma_1}}{1-\sigma_1} - \chi \frac{\ell^{1+\sigma_2}}{1+\sigma_2} \tag{20}$$

The coefficient of relative risk aversion σ_1 is set to 2 which is standard in the macroeconomic literature. The parameter σ_2 is set to 1.67, which corresponds to a Frisch elasticity of 0.59. The weight of the disutility of labor χ is calibrated internally to match the average hours of work which is a 1/3 of total time endowment. The discount factor β pins down the interest rate in the economy. The data counterpart is an average real interest rate between 2000 and 2020 in the US (IMF, 2020).

Technology

The production side of the economy consists of two sectors. The large corporate sector operates with a Cobb-Douglas production function. The parameter α represents the corporate capital share and is set to 0.33 and the capital depreciation δ is 6% which is standard in the macroeconomic literature (Stokey and Rebelo, 1995).

The entrepreneurial sector produces using a decreasing returns to scale technology specified by

$$f(\theta, k, \bar{n}) = \theta(k^{\gamma}\bar{n}^{1-\gamma})^{\nu} \tag{21}$$

where the share of capital in the production function γ is identified by matching the share of business owners who are employers. The span of control parameter ν influences the optimal size and profitability of entrepreneurial businesses, and, therefore, can be disciplined by the income difference between entrepreneurs and workers. We pin down ν by targeting the ratio between median entrepreneurial income to the median worker income.

The collateral constraint $k \leq \lambda a$ faced by entrepreneurs captures the financial frictions in both obtaining debt and raising external equity. Direct empirical evidence that reveals the extent of such financial frictions faced by each type of businesses is difficult to come by. Hence, we calibrate λ^{EP}, λ^{ES}, λ^{EC} internally. Both sole-proprietors and S-corps are pass-through businesses and face similar financial constrains. Thus, we assume that $\lambda^{EP} = \lambda^{ES}$. C-corps have better access to external finance and, hence, their collateral constraint is looser $\lambda^{EC} > \lambda^{ES}$. In order to specify the exact values, we match the wealth share of pass-trough businesses and C-corps as well as the wealth share held by entrepreneurs: a tighter collateral constraint leads to greater wealth accumulation by entrepreneurs, and thus a greater share of wealth held by these entrepreneurs. The recovered values are 1.4 and 2.39 which are in line with the literature (Kitao, 2008).

Tax Avoidance and Business Costs

We assume that the tax avoidance cost is a quadratic cost of the avoided share of income. The avoidance cost for S-corporations increases in the share of income reported as business profits $C^{ES}(1-\phi) = \psi^{ES}(1-\phi)^2$ whereas the avoidance cost for C-corporations increases in the share of income reported as wages $C^{EC}(\phi) = \psi^{EC}\phi^2$. Parameters ψ^{ES} and ψ^{EC} govern the income declaration of S- and C-corporation owners and, thus, are calibrated internally to match the share of income reported as wage income within S- and C-corporations. We compute this share from the IRS tax declaration tables.

Additionally, we assume that operating an S-corporation or C-corporation leads to additional administrative costs κ^{ES} and κ^{EC}. These costs govern the share of Sole-proprietors, S-corporations and C-corporations among entrepreneurs, which we use as internal calibration targets.

Tax Schedule

We approximate the *statutory* income tax schedule with a HSV specification (Heathcote et al., 2017b).

$$T^I(y) = y - \lambda_{hsv} y^{1-\tau_{hsv}} \tag{22}$$

The approximation is done by constructing hypothetical income taxes using the 2013 income tax schedule, including the standard tax deduction, using the SCF. We focus on married households with household heads between age 25 and 64. The pre-tax income is the total income minus social security benefits and pension. We construct the hypothetical "after-tax" income by subtracting the statutory amounts of income taxes from the pre-tax income. Finally, we obtain the values for λ_{hsv} and τ_{hsv} by estimating the linear regression of log "after-tax" income on log pre-tax income.

The resulting parameter values for tax schedule progressivity is $\tau_{hsv} = 0.06$. Note that the value may deviate from estimates in the literature because ours is an approximation of the statutory tax schedule, not the effective tax schedule. The effective tax schedule takes into account tax credits, welfare benefits, and tax avoidance. Since we model tax avoidance explicitly, it is important that τ_{hsv} represents statutory income tax progressivity. The parameter governing the level of the income tax λ_{hsv} is internally calibrated to match the total tax revenue to GDP ratio.

The corporate tax rate τ_c is set to the 2013 level of 35% and the dividend tax τ_d is set to 23.8%. We set the social security tax τ_s to a flat rate of 12.4%.[12] The pension benefit replacement rate b is set to 40% which corresponds to the average replacement rate in the US in 2013 (OECD, 2013).

4.3 Model Fit

Table 3 shows the values of targeted moments. As can be seen, our model is successful in replicating important empirical dimensions of the US economy in 2013. The share of entrepreneurs in the working population as well as the share of entrepreneurs by each type of business organization are matched very well. Importantly, our model generates shares of income reported as wage income for S- and C-corporations that closely replicate their data counterpart.

Since this paper focuses on the interaction of occupational choice, income shifting and inequality, it is important that the model generates the observed level of inequality in the population and inequality between and within occupations. Our model performs well in this regard. Specifically, the model closely matches targeted inequality moments including the Gini coefficient of income, the income difference between entrepreneurs and workers, concentration of income and entrepreneurs in the top 1% of the income distribution, and the share of wealth owned by entrepreneurs and by C-corporation owners.

[12] In future work, we will incorporate a social security cap and a medicare surcharge.

As a validation, we show that our model can replicate moments of the US economy that are not targeted in our calibration procedure. In addition to the Gini coefficient of income, our model also replicates the observed Gini coefficient of wealth, both in the entire population and among entrepreneurs, and the income and wealth shares over the entire distribution (Table 4). The distribution of employment size across entrepreneurial businesses offers insights into the dispersion of entrepreneurial ability. We use the Kauffman Firm Survey (KFS), a panel data that follows a cohort of US startups from 2004 to 2011, to construct employment shares of businesses in each employment quartile. As reported in Table 5, our model replicates the feature that over 80% of employment is concentrated in the largest quartile of businesses.

Table 3: Model Fit

	Data	**Model**	**Data Source**
Aggregates			
Interest rate	0.030	0.034	IMF (2000-2020)
Average hours worked	0.330	0.331	SCF (2013)
Share of hiring entre	0.512	0.524	SCF (2013)
Exit rate entre	0.220	0.232	SCF (2013)
Income tax revenues to GDP	0.249	0.236	IMF
Occupational choice			
Share of entrepreneurs	0.152	0.144	SCF (2013)
Share of sole-prop.	0.674	0.667	SCF (2013)
Share of S-corp	0.236	0.231	SCF (2013)
Share of C-corp	0.090	0.102	SCF (2013)
Income shifting			
Wage share S-corp	0.363	0.341	IRS (2013)
Wage share C-corp	0.199	0.216	IRS (2013)
Inequality			
Gini income	0.544	0.483	SCF (2013)
Gini income, entrepreneurs	0.622	0.667	SCF (2013)
Median income ratio: entre. to workers	1.557	1.582	SCF (2013)
Share of entre in top 1% income	0.668	0.669	SCF (2013)
Top 1% income share	0.191	0.211	SCF (2013)
Wealth share entre	0.536	0.510	SCF (2013)
Wealth share C-Corps (cond. on entre.)	0.199	0.186	SCF (2013)

Table 4: Model validation: inequality statistics

	Data	**Model**
Gini wealth	0.842	0.822
Gini wealth entrepreneurs	0.781	0.707
Income shares, %		
Top 1%	0.191	0.211
Top 10%	0.449	0.472
Top 20%	0.587	0.568
Bottom 40%	0.111	0.170
Wealth shares, %		
Top 1%	0.335	0.329
Top 10%	0.736	0.704
Top 20%	0.862	0.843
Bottom 40%	0.010	0.032

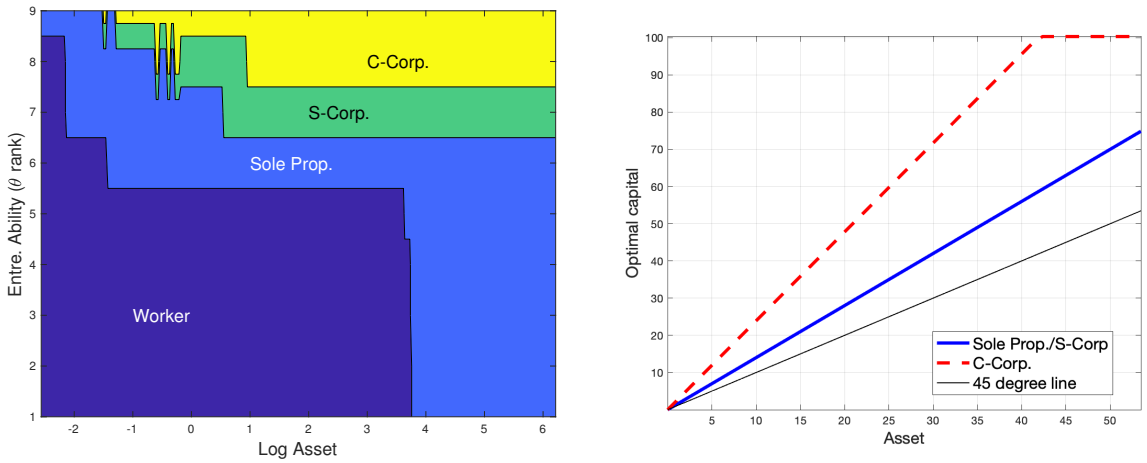
Source: SCF 2013.

Table 5: Employment Distribution by Firm Size

	Data	**Model**
Employment quartiles	*Employment share, %*	
Q1	0.00	0.00
Q2	0.054	0.00
Q3	0.162	0.185
Q4	0.805	0.815

Data source: Kauffman Firm Survey, 2004-2011.

Figure 1: Policy Functions: Occupation, Legal Form of Organization, and Capital



5 Results

5.1 Entrepreneurial Decisions and Tax Avoidance

In this section, we analyze the economic mechanisms of tax avoidance and start with a discussion of the policy functions displayed in Figure 1. We start with the households' occupational choice (left panel), which depends on entrepreneurial ability θ and wealth a (given average working ability ε). For a given level of entrepreneurial ability, households become entrepreneurs only if they hold sufficient wealth. Poor talented agents become workers as they are credit-constrained and not able to generate sufficient income from running a business.

Next, we turn to the choice of the legal form of organization as the extensive margin of tax avoidance. Among the entrepreneurs, only the very talented and wealthy households choose to run their businesses as a C-corporations in spite of facing higher operational costs and double-taxation. There are two explanations for this entrepreneurial decision. First, productive entrepreneurs benefit from the relaxed credit constraint of C-corporations, which allows them to invest more (right panel of Figure 1). Second, if entrepreneurs are very wealthy, their credit constraint is not binding anymore but they take advantage from the capped dividend tax, which is lower than the top marginal income tax rate they face. Entrepreneurs who are productive but not as talented as the owners of C-corporations operate their business as S-corporation because they can circumvent the double-taxation and can report a fraction of their income as business income to avoid the social security tax. Entrepreneurs with the lowest entrepreneurial ability are sole proprietors as they cannot afford to pay the operational cost associated with running a S-corporation.

Figure 2 shows the equilibrium distribution of the occupational choice by quintiles of income (left panel) and wealth (right panel). The model (in blue) predicts that the share

Figure 2: Occupation by Income and Wealth

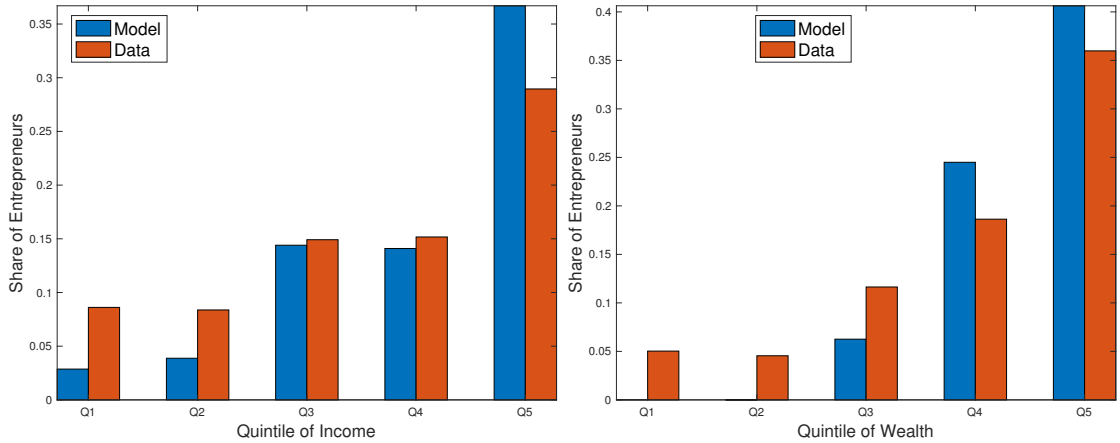


Table 6: Legal Forms of Organization at the Top Quintile

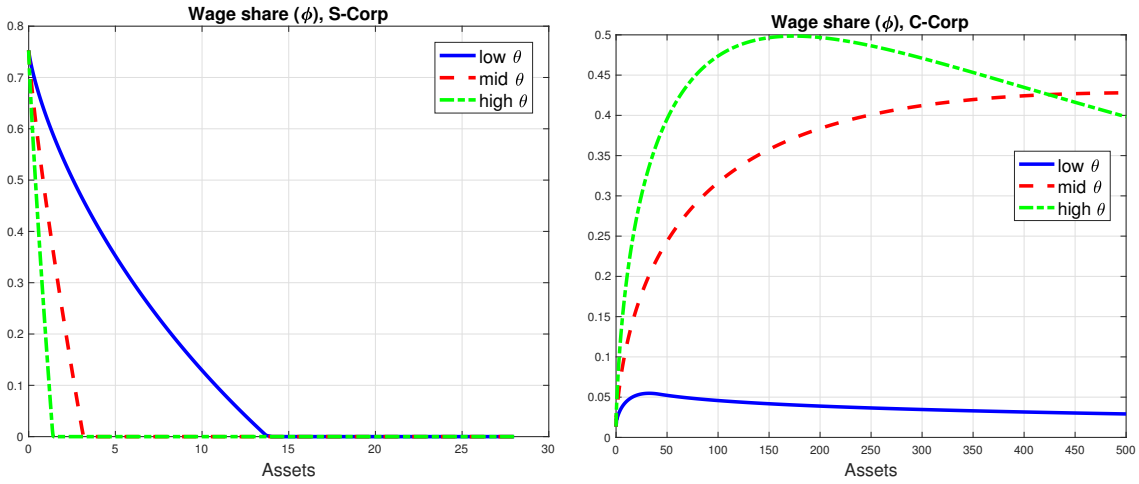
	Income		**Wealth**	
	Data	Model	Data	Model
Share of Sole-prop.	0.497	0.347	0.540	0.515
Share of S-corp	0.339	0.453	0.326	0.335
Share of C-corp	0.163	0.199	0.134	0.151

of entrepreneurs is increasing in income, which is in line with the data (shown in red). The model provides a very good match of the occupational choice in the third and fourth income quintile, but underestimates the share of entrepreneurs in the lower quintiles and overestimates it in the fifth quintile. A similar pattern appears if we consider the quintiles of wealth.

In Table 6 we focus on the top quintile of income and wealth and report the equilibrium shares of sole proprietors, S-corporations and C-corporations. Our model predicts that 15% of businesses in the top wealth quintile are operated as C-corporations, 33% of the entrepreneurs run S-corporations and the remaining 51% of the entrepreneurs are sole proprietors. A similar pattern can been seen considering the top quintile of income. Overall, the model matches the data fairly well.

Figure 3 shows how S-corporations and C-corporations make use of the intensive margin of tax avoidance. The left panel considers the entrepreneurial choice of S-corporations and depicts the share of total income declared as labor income as a function of wealth for three different realizations of entrepreneurial ability θ. Owner of S-corporations have an incentive to report their income as business income to avoid the social security tax. However, shifting income between tax bases is costly. Consequently, less talented and less wealthy owners of S-corporations report a larger share of their income as labor income. In contrast, rich and very productive owners of S-corporations declare all of their income

Figure 3: Share of Income Reported as Wage Income



as business income. The right panel of Figure 3 shows how owners of C-corporations shift their income. C-corporations have incentives to declare their income as labor income to avoid the double-taxation. But income shifting is costly. Therefore, the talented and wealthier owners of C-corporations declare large shares as labor income. Since poor owners of C-corporations cannot afford the tax avoidance cost, they report a small share of their income as labor income. At the same time, the pattern of the wage share is hump-shaped for the owners with a very high entrepreneurial ability. This is the outcome of two opposing forces. On the one hand, entrepreneurs want to avoid the double-taxation. On the other hand, very talented and wealthy entrepreneurs prefer to declare a lower share as labor income to benefit from the capped dividend tax, which is lower than the top marginal income tax rate they face.

5.2 The Macroeconomic Impact of Tax Avoidance

To highlight the macroeconomic effects of tax avoidance, we provide comparisons with two counterfactual economies. In the first economy, we shut down the intensive margin of tax avoidance and do not allow for income shifting between the tax bases. In the second economy, we eliminate the intensive and the extensive margin of tax avoidance and assume that all entrepreneurs are taxed as sole proprietors. In this scenario we remove all channels of tax avoidance, and workers and entrepreneurs face an equal tax treatment. The resulting model corresponds to an extended version of the one studied by Brüggemann (2021) who considers sole proprietors only. However, in our model, entrepreneurs can still choose to run their businesses as a C-corporations in order to benefit from the better access to credit.

Table 7 facilitates a comparison between the benchmark economy and the two counterfactual economies. We first turn to the economy in which the intensive margin of tax avoidance is shut down and income cannot be shifted between the tax bases. In this econ-

Table 7: The Aggregate Effects of Tax Avoidance

	Benchmark	**No Income Shifting**	**No Tax Avoidance on all margins**
Share of Entre	0.144	0.148	0.171
Distribution of LFO:			
Sole-Prop.	0.667	0.889	0.316
S-Corp	0.231	-	-
C-corp	0.102	0.111	0.684
$\mathbb{E}(\theta \vert entre)$	1.522	1.519	1.525
$\mathbb{E}(k \vert entre)$	6.591	6.288	9.281
Aggregate output	0.632	0.628	0.700
interest rate r	0.034	0.035	0.023
wage w	1.245	1.237	1.319
Total tax revenue	0.149	0.155	0.161

omy, the majority of S-corporations become sole proprietors. Only the most productive entrepreneurs run their businesses as C-corporations to benefit from the better access to credit. While the composition of legal forms of organization changes, the overall share of entrepreneurs is hardly affected. Since the intensive margin of tax avoidance is eliminated, entrepreneurs pay higher taxes and the government collects more tax revenues. However, since entrepreneurs cannot avoid the tax payments, their budget and credit constraint tighten such that capital investment decreases relative to the benchmark economy. Average income in the economy decreases but, overall, the macroeconomic impact is small.

In contrast, in the second counterfactual economy, in which all channels of tax avoidance are removed, the share of entrepreneurs increases substantially with a sizable positive impact on average income and tax revenues. The underlying reason is that the elimination of double-taxation induces the majority of entrepreneurs to run their businesses as C-corporations, which benefit from a better access to credit. The looser borrowing limit facilitates larger entrepreneurial investment.

Our analysis highlights that tax avoidance affects productive efficiency in two opposing ways. First, the intensive margin of tax avoidance increases productive efficiency. The reason is that entrepreneurs can relax their financial constraint by minimizing their tax liabilities facilitating larger investment. However, this positive impact of tax avoidance on productive efficiency turns out to be small. Second, the extensive margin of tax avoidance reduces productive efficiency. The possibility to avoid taxes induces entrepreneurs to run their businesses as S-corporations, in spite of facing a tighter borrowing limit with adverse effects on capital investment.

5.3 The Top Marginal Tax Rate and Tax Avoidance

In this section, we study the aggregate and distributional consequences of increasing the top marginal tax rate. Following Imrohoroglu et al. (2018), we modify our baseline income tax function with a top marginal tax rate as the follows

$$T^I(y) = \begin{cases} y - \lambda y^{1-\tau} & \text{if } y < y_h \\ y_h - \lambda y_h^{1-\tau} + \tau_h(y - y_h) & \text{if } y \geq y_h, \end{cases} \tag{23}$$

y_h is set at a value corresponding to the 99th percentile of taxable income subject to the income tax and τ_h is the top marginal tax rate. To highlight the role of tax avoidance, we facilitate a comparison between the benchmark economy and the counterfactual economy, in which all channels of tax avoidance are shut down.

Figure 4 considers different values of τ_h and displays the share of entrepreneurs, the composition of legal forms of organization among the top 1 %, and the share of income declared as labor income. The effects of the top marginal tax rate on output and tax revenues are shown in Figure 5. To assess the distributional consequences of raising the top marginal tax rate, Figure 6 depicts the interest rate, the wage, the Gini of income, and the income share held by top 1 %.

In response to an increase in the top marginal tax rate, the share of entrepreneurs rises in both economies, however, the increase is quantitatively much smaller in the benchmark economy than in the counterfactual economy (Figure 4). This finding can be explained as follows. In the counterfactual economy, the higher marginal tax rate reduces savings and aggregate capital such that aggregate output decreases (Figure 5). Consequently, the wage falls (Figure 6) inducing more households to become entrepreneurs. Since in the benchmark economy, entrepreneurs can avoid taxes, the distortionary effect on aggregate output and the decline in wages are much smaller.

To avoid the higher marginal tax rate, more entrepreneurs operate their businesses as C-corporations to take advantage of the capped divided tax, which is lower than the marginal tax rate they face. Moreover, they declare a larger share of their income as business income to avoid the personal income tax (Figure 4). In the benchmark economy, entrepreneurial output increases since more entrepreneurs operate their businesses as C-corporations benefiting from the better access to credit. These findings are in line with Lindsey (1987), Feldstein (1995) and Dyrda and Pugsley (2019) who report that cutting top marginal tax rates in the 1980s stimulated entrepreneurship in the US and induced a switch from C-corporations to pass-through businesses. Slemrod (1996) argues that these large responses were mainly due to tax avoidance rather than economic activity.

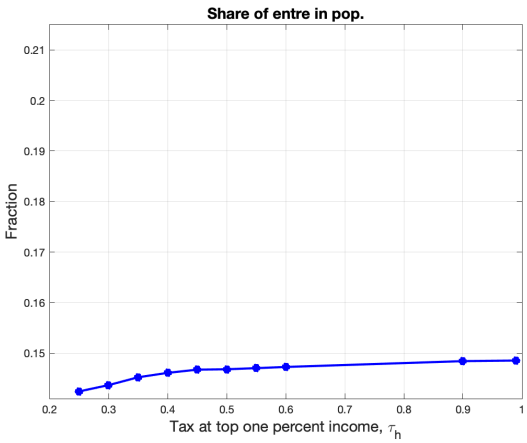
In the counterfactual economy without tax avoidance, entrepreneurial ouput is hump-shaped resulting from two opposing effects. On the one hand, more households become entrepreneurs such that output in the entrepreneurial sector increases. On the other hand, the distortionary impact of taxation reduces entrepreneurial output (Figure 5).

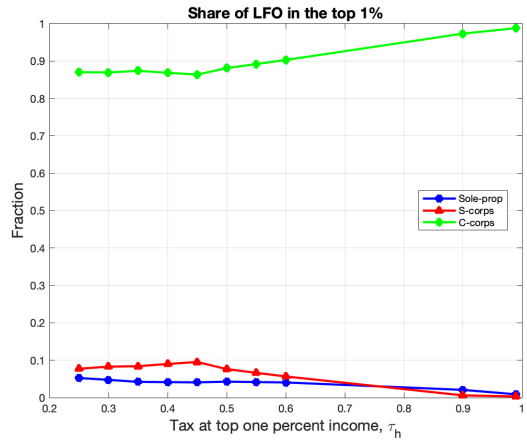
The last row of Figure 5 highlights that increasing the top marginal tax rate has a very small impact on tax revenues in the benchmark economy due to the tax avoidance respones of entrepreneurs. In contrast, in the counterfactual economy, tax revenues are quantitatively sizable and follow a hump-shaped pattern. These results are in line with Brüggemann (2021).

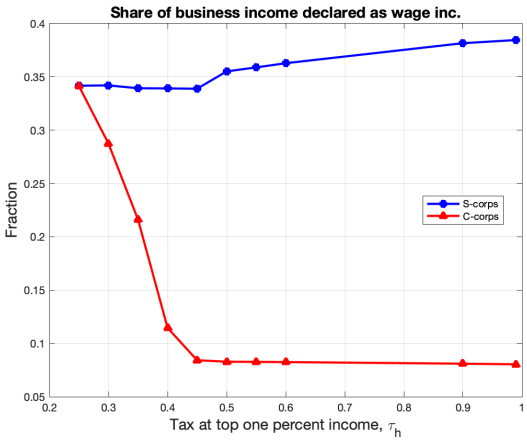
The last row of Figure 6 displays the distributional effects of increasing the top marginal tax rate in the presence of tax avoidance. While in the counterfactual economy, inequality can be substantially decreased, the impact is small if tax avoidance is taken into account. Importantly, the income share held by the top 1 % increases, indicating that in the presence of tax avoidance, the top marginal tax rate is ineffective in reducing inequality.

Figure 4: The Top Marginal Tax Rate and Tax Avoidance

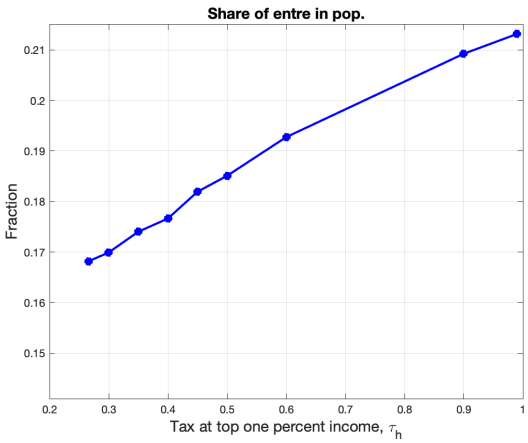
Benchmark Economy







No Tax Avoidance



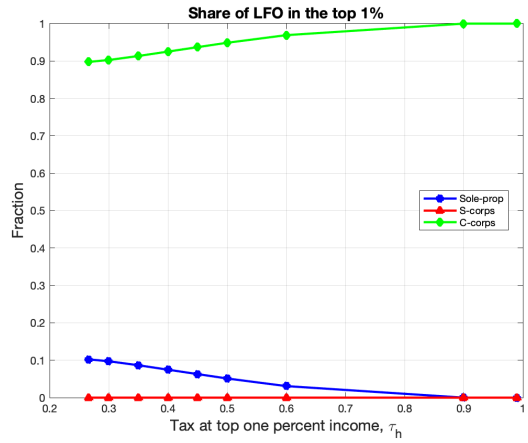
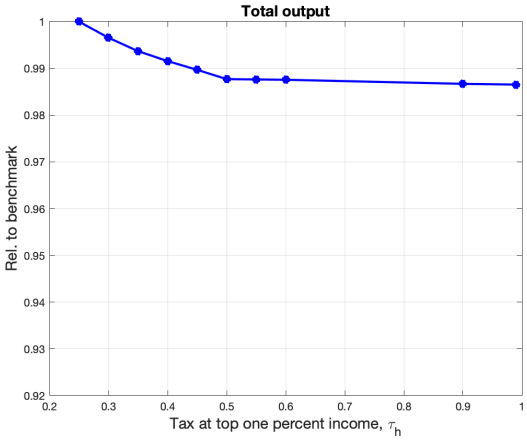
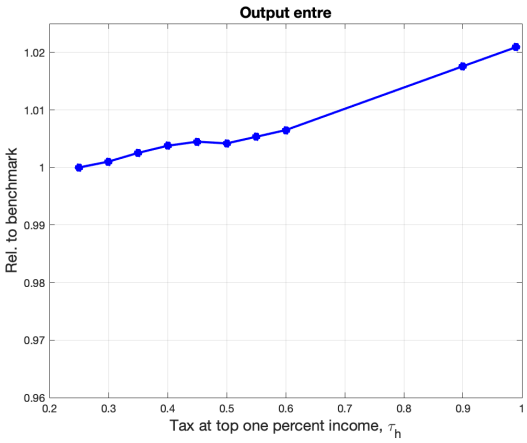
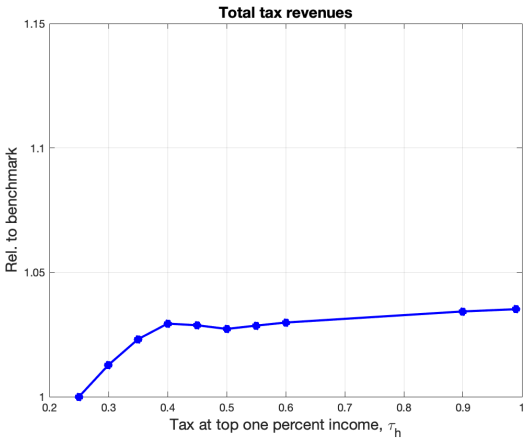


Figure 5: The Top Marginal Tax Rate, Output and Tax Revenues

Benchmark Economy







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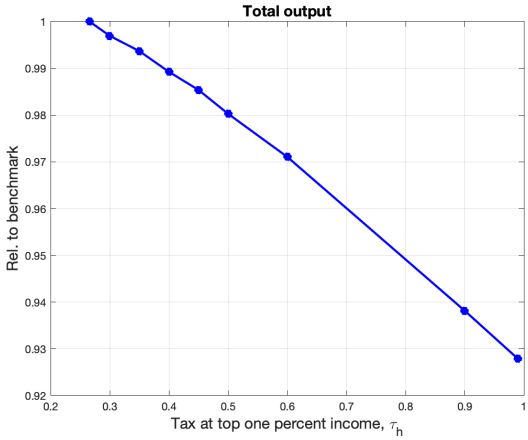
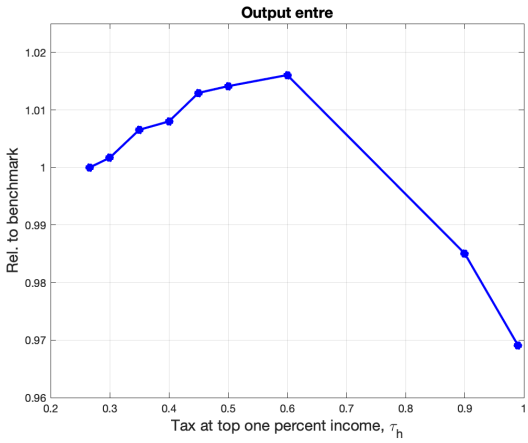




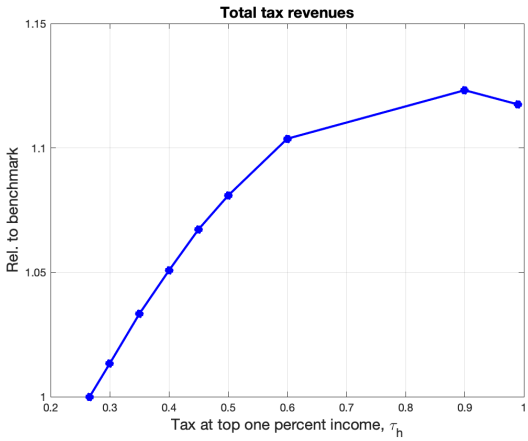
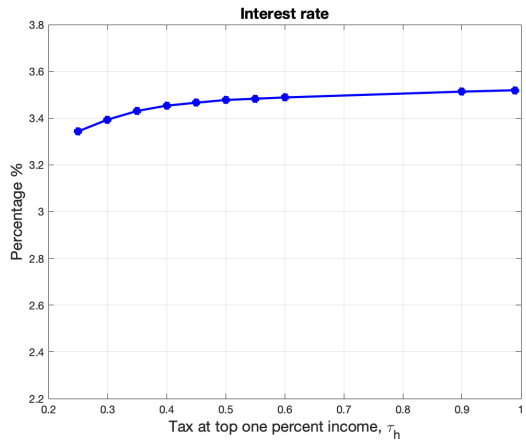
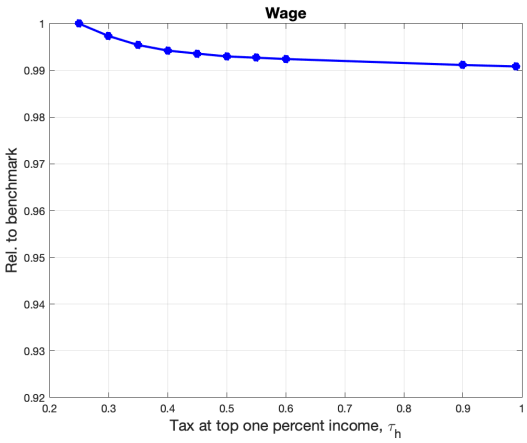
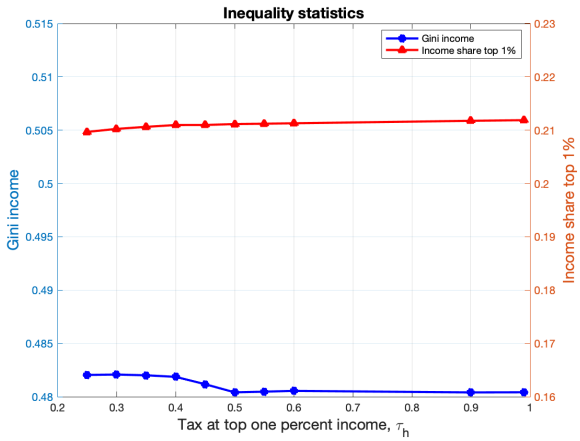


Figure 6: The Top Marginal Tax Rate and Inequality

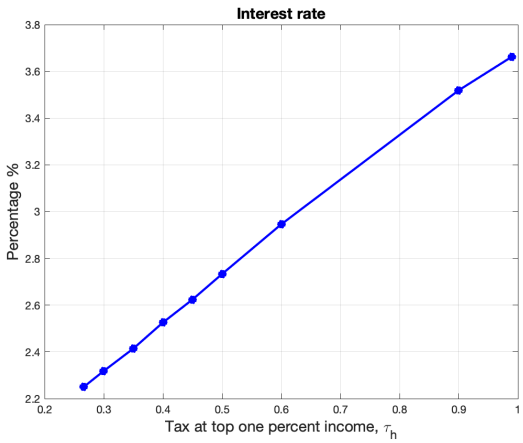
Benchmark Economy

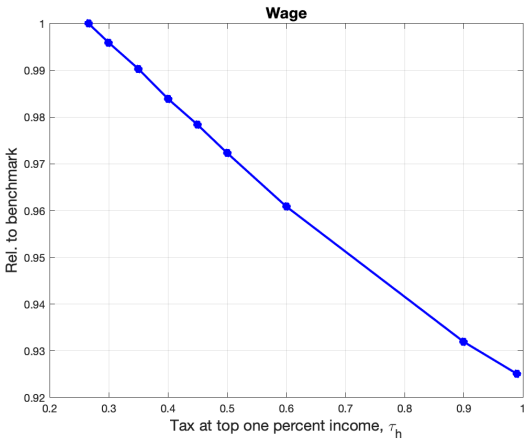


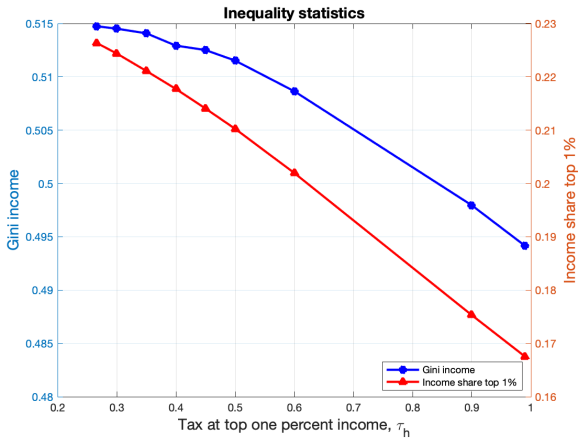




No Tax Avoidance







6 Conclusions

This paper has aimed to improve our understanding of two important research questions. First, how does tax avoidance by entrepreneurs affect macroeconomic outcomes and the distribution of income and wealth? And, second, how does the top marginal tax rate impact the trade-off between equity and efficiency in the presence of tax avoidance?

We have studied these questions within a dynamic general equilibrium model with incomplete markets and occupational choice in which entrepreneurs can avoid taxes in two ways. On the extensive margin, entrepreneurs can choose the legal form of their business organization to reduce their tax burden. On the intensive margin, entrepreneurs can shift their income between different tax bases.

Our analysis has highlighted that tax avoidance affects productive efficiency in two opposing ways. First, the intensive margin of tax avoidance increases productive efficiency. The reason is that entrepreneurs can relax their financial constraint by minimizing their tax liabilities facilitating larger investment. Second, the extensive margin of tax avoidance reduces productive efficiency. The possibility to avoid taxes induces entrepreneurs to run their businesses as S-corporations, in spite of facing a tighter borrowing limit with adverse effects on capital investment. In an application to the US economy we have shown that the extensive margin dominates the intensive margin of tax avoidance.

Our quantitative analysis suggests that raising the top marginal tax rate induces entrepreneurs to switch the legal form of their business and to shift income to minimize their tax burden. It turns out that the top marginal tax rate has a quantitatively minor impact on productive efficiency and is ineffective in lowering inequality in the presence of tax avoidance. In contrast, in the absence of tax avoidance, increasing the top marginal tax rate reduces inequality at the expense of productive efficiency.

Our findings highlight the importance of taking into account tax avoidance when studying tax reforms.

References

Badel, Alejandro, Mark Huggett, and Wenlan Luo, "Taxing Top Earners: A Human Capital Perspective," *The Economic Journal*, 2020, *130* (629), 1200–1225. 1.1

Bakış, Ozan, Barış Kaymak, and Markus Poschke, "Transitional Dynamics and the Optimal Progressivity of Income Redistribution," *Review of Economic Dynamics*, 2015, *18* (3), 679–693. 1.1

Bilicka, Katarzyna and Sepideh Raei, "Output Distortions and the Choice of Legal Formof Organization," *CESifo Working Paper*, 2020, (8756). 1.1

Brüggemann, Bettina, "Higher Taxes at the Top: The Role of Entrepreneurs," *American Economic Journal: Macroeconomics*, 2021, *13* (3), 1–36. 1.1, 4.2, 4.2, 5.2, 5.3

Cagetti, Marco and Mariacristina De Nardi, "Entrepreneurship, Frictions, and Wealth," *Journal of Political Economy*, 2006, *114* (5), 835–870. 1, 1.1, 3

Chen, Daphne and Shi Qi, "The Importance of Legal Form of Organization on Small Corporation External Financing," *Economic Inquiry*, 2016, *54* (3), 1607–1620. 3.3

_ , _ , and Don Schlagenhauf, "Corporate Income Tax, Legal Form of Organization, and Employment," *American Economic Journal: Macroeconomics*, October 2018, *10* (4), 270–304. 1, 1.1

Cooper, Michael, John McClelland, James Pearce, Richard Prisinzano, Joseph Sullivan, Danny Yagan, Owen Zidar, and Eric Zwick, "Business in the United States: Who Owns It, and How Much Tax Do They Pay?," in "Tax Policy and the Economy, Volume 30" NBER Chapters, National Bureau of Economic Research, Inc, 2016, pp. 91–128. 2

DeBacker, Jason M. and Richard Prisinzano, "The Rise of Partnerships," *Tax Notes*, 2015, *147* (13), 1563–1575. 5

Di Nola, Alessandro, Georgi Kocharkov, Almuth Scholl, and Anna-Mariia Tkhir, "The Aggregate Consequences of Tax Evasion," *Review of Economic Dynamics*, 2021, *40*, 198–227. 1

Diamond, Peter and Emmanuel Saez, "The Case for a Progressive Tax: From Basic Research to Policy Recommendations," *Journal of Economic Perspectives*, 2011, *25* (4), 165–90. 1.1

Dyrda, Sebastian and Benjamin Pugsley, "Taxes, Private Equity and Evolution of Income Inequality in the US," Technical Report, University of Toronto 2019. 1, 2, 7, 3.3, 3.4, 5.3

_ **and** _ , "How to Tax Capitalists in the Twenty-First Century?," Technical Report, University of Toronto 2022. 1.1

Erosa, Andres and Tatyana Koreshkova, "Progressive Taxation in a Dynastic Model of Human Capital," *Journal of Monetary Economics*, 2007, *54* (3), 667–685. 1.1

Feldstein, Martin, "The Effect of Marginal Tax Rates on Taxable Income: A Panel Study of the 1986 Tax Reform Act," *Journal of Political Economy*, 1995, *103* (3), 551–572. 1, 5.3

Gordon, Roger H. and Jeffrey K. MacKie-Mason, "Tax distortions to the choice of organizational form," *Journal of Public Economics*, October 1994, *55* (2), 279–306. 1.1

_ **and Joel Slemrod**, "Are Real Responses to Taxes Simply Income Shifting Between Corporate and Personal Tax Bases?," NBER Working Papers 6576, National Bureau of Economic Research, Inc May 1998. 1.1

Gorea, Denis, "Tax Avoidance: Aggregate and Distributional Consequences," Post-Print, European University Institute, Florence 2014. 1.1

Guner, Nezih, Martin Lopez-Daneri, and Gustavo Ventura, "Heterogeneity and Government revenues: Higher taxes at the top?," *Journal of Monetary Economics*, 2016, *80* (C), 69–85. 1.1

Heathcote, Jonathan and Hitoshi Tsujiyama, "Optimal Income Taxation: Mirrlees meets Ramsey," *Journal of Political Economy*, 2021, *129* (11), 3141–3184. 1.1

_ **, Kjetil Storesletten, and Giovanni L Violante**, "Optimal Tax Progressivity: An Analytical Framework," *The Quarterly Journal of Economics*, 2017, *132* (4), 1693–1754. 1.1

_ **,** _ **, and Giovanni L. Violante**, "Optimal Tax Progressivity: An Analytical Framework," *The Quarterly Journal of Economics*, 2017, *132* (4), 1693–1754. 4.2

_ **,** _ **, and Giovanni L Violante**, "Optimal Progressivity with Age-dependent Taxation," *Journal of Public Economics*, 2020, *189*, 104074. 1.1

Imrohoroglu, Ayse, Cagri S. Kumru, and Arm Nakornthab, "Revisiting Tax on Top Income," ANU Working Papers in Economics and Econometrics 2018-660, Australian National University, College of Business and Economics, School of Economics February 2018. 1.1, 5.3

Internal Revenue Service, "S Corporation Employees, Shareholders and Corporate Officers," IRS Website https://www.irs.gov/businesses/small-businesses-self-employed/s-corporation-employees-shareholders-and-corporate-officers February 2022. 2, 10

Kindermann, Fabian and Dirk Krueger, "High Marginal Tax Rates on the Top 1%? Lessons from a Life Cycle Model with Idiosyncratic Income Risk," *American Economic Journal: Macroeconomics*, 2022, *forthcoming*. 1.1, 4.2

Kirkland, Stephen D., "Preventing a Challenge to (Un)reasonable Compensation," *Journal of Accountancy*, September 2013. 2

Kitao, Sagiri, "Entrepreneurship, Taxation and Capital Investment," *Review of Economic Dynamics*, 2008, *11* (1), 44–69. 1, 4.2, 4.2

Kotsogiannis, Christos and Xavier Mateos-Planas, "Tax Evasion as Contingent Debt," Discussion Papers 1903, Centre for Macroeconomics (CFM) 2019. 1

Landier, Augustin and Guillaume Plantin, "Taxing the Rich," *Review of Economic Studies*, 2017, *84*, 1186–1209. 1.1

Lindsey, Lawrence B., "Individual Taxpayer Response to Tax Cuts: 1982–1984: With Implications for the Revenue Maximizing Tax Rate," *Journal of Public Economics*, 1987, *33* (2), 173–206. 1, 5.3

Mackie-Mason, Jeffrey K. and Roger H. Gordon, "How Much Do Taxes Discourage Incorporation?," *The Journal of Finance*, 1997, *52* (2), 477–505. 1.1

Maffezzoli, Marco, "Tax Evasion under Market Incompleteness," Working Paper 378, Innocenzo Gasparini Institute for Economic Research, Bocconi University 2011. 1

Mertens, Karel and Jose Luis Montiel Olea, "Marginal Tax Rates and Income: New Time Series Evidence*," *The Quarterly Journal of Economics*, 2018, *133* (4), 1803–1884. 1

Piketty, Thomas, Emmanuel Saez, and Stefanie Stantcheva, "Optimal Taxation of Top Labor Incomes: A Tale of Three Elasticities," *American Economic Journal: Economic Policy*, February 2014, *6* (1), 230–271. 1.1

Quadrini, Vincenzo, "Entrepreneurship, Saving and Social Mobility," *Review of Economic Dynamics*, 2000, *3* (1), 1–40. 1, 1.1

Saez, Emmanuel, Joel Slemrod, and Seth H. Giertz, "The Elasticity of Taxable Income with Respect to Marginal Tax Rates: A Critical Review," *Journal of Economic Literature*, March 2012, *50* (1), 3–50. 1

Slemrod, Joel, "High-Income Families and the Tax Changes of the 1980s: The Anatomy of Behavioral Response," in Martin Feldstein and James Poterba, eds., *Empirical Foundations of Household Taxation*, University of Chicago Press, 1996, pp. 169–192. 1, 5, 5.3

_ , "Cheating Ourselves: The Economics of Tax Evasion," *Journal of Economic Perspectives*, 2007, *21* (1), 25–48. 1

Smith, Matthew, Danny Yagan, Owen Zidar, and Eric Zwick, "Capitalists in the Twenty-First Century," *The Quarterly Journal of Economics*, 2019, *134* (4), 1675–1745. 1, 2

_ , _ , _ , and _ , "The Rise of Pass-Throughs and the Decline of the Labor Share," *American Economic Review: Insights*, September 2022, *88* (11), 2283–2299. 1, 6

Stokey, Nancy L. and Sergio Rebelo, "Growth Effects of Flat-Rate Taxes," *Journal of Political Economy*, 1995, *103* (3), 519–550. 4.2

Tauchen, George and Robert Hussey, "Quadrature-Based Methods for Obtaining Approximate Solutions to Nonlinear Asset Pricing Models," *Econometrica*, 1991, *59* (2), 371–396. 4.2

Uribe-Teran, Carlos, "Higher Taxes at the Top? The Role of Tax Avoidance," *Journal of Economic Dynamics and Control*, 2021, *129*, 104187. 1.1