Market Structure and International Tax Competition*

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Abstract

Since the 1980s, there has been a global decrease in corporate income tax rates, while competition among firms has weakened. This paper develops a general equilibrium model with strategic interactions between governments and firms to reconcile these trends and explore the interplay between market structure and corporate taxation. The model shows that shifts in market structure, such as increased common ownership or a reduction in competitors, enhance concentration and firms' market power, thereby influencing profit shifting and tax competition. Specifically, greater market concentration amplifies firms' incentives for profit shifting through larger profits, driven by (i) increased markdowns and (ii) the reallocation of market share towards more productive firms. Furthermore, profit shifting itself endogenously increases economy-wide concentration and market power by exacerbating the reallocation of economic activity toward high-productivity, high-markup firms. A government, competing to retain firms' profits, sets low tax rates to prevent local firms from evading toward tax haven(s). As a result, the tax "race to the bottom" intensifies as concentration increases and competition decreases.

Keywords: Tax Competition, Profit Shifting, Market Structure, Market Power.

JEL Classification: E61, F23, H73, L13.

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1 Introduction

Over the past few decades, there has been a global decrease in Corporate Income Tax (CIT) rates other than a decline in competition and a reallocation of economic activity in the hands of a few 'superstar' firms, which contributed to shaping competition and macroeconomic aggregates, such as employment, wages, and labor share (Autor et al., 2020a; De Loecker et al., 2020; Díez et al., 2021). The evolving market structure has been proposed to be the root of such a secular shift in competition between firms (Azar and Vives, 2021; Berger et al., 2022). This paper develops a general equilibrium theory that reconciles these trends, i.e. the declining CIT and competition, able to disentangle agents' preferences from changes in market structure. In particular, it is shown that higher concentration, arising from common ownership or the number of competitors, implies more profit shifting and tax competition between governments to attract capital income. Furthermore, through general equilibrium effects, profit shifting increases the economy-wide level of market power because it exacerbates the reallocation of market share toward high-productivity, high market power firms (Martin et al., 2021).

Figure 1 shows the decline in CIT rates for both tax-haven and non-haven countries since the 1980s.[1] Notably, while tax havens have maintained lower tax rates throughout the period, the gap with non-haven countries has narrowed. Concurrent to the decline in CIT, the literature has documented a surge in firms' market power at the macroeconomic level, as for example De Loecker et al. (2020) and Díez et al. (2021). Concentration has been a phenomenon pervading the US economy and it has been proposed by the literature as one of the causes behind the surge in firms' market power (Grullon et al., 2019; Bajgar et al., 2023; Azar and Vives, 2021).[2][3] Notably, Backus et al. (2021) document the rise in common ownership between 1980 and 2017, the exogenous

[1] Jurisdictions are classified as haven or non-haven according to the combination of lists by Hines Jr and Rice (1994) and OECD (2000), including 225 sovereign states and dependent territories worldwide. The pattern remains consistent when using either the classification in Hines Jr and Rice (1994) or OECD (2000); see Appendix A.

[2] See Crouzet and Eberly (2018) and Grullon et al. (2019) for the increased concentration in US industries. The evidence on EU economies is less clear. Bajgar et al. (2023) show that industry concentration has increased in Europe when accounting for subsidiaries of business groups which is particularly relevant in the context of this paper. However, Kalemli-Özcan et al. (2024) challenge the findings of the previous paper, stressing the importance of firm representativeness in analyzing concentration over time.

[3] The empirical literature agrees on the connection between market concentration and labor market power, which is the only form of market power in this paper theoretical framework (Berger et al., 2022; Azar et al., 2022a; Benmelech et al., 2022).

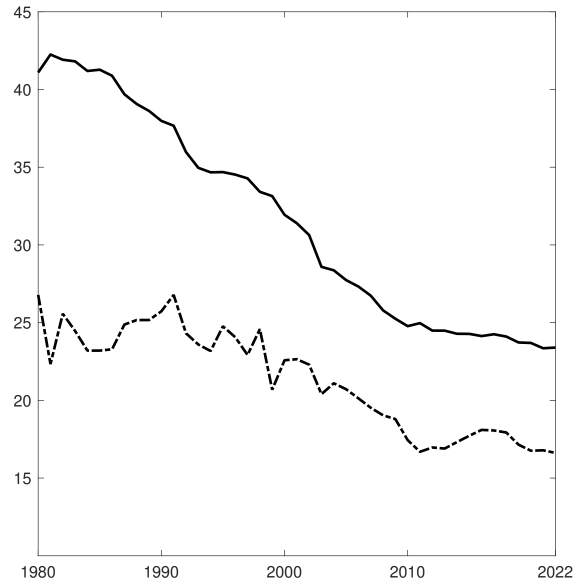

Fig. 1 Corporate Income Tax rates for haven and nonhaven countries, 1980-2022. The average CIT rates of haven countries (dashed line) and nonhaven countries (solid line) from 1980 to 2022. Havens and non-havens reflect the combination of the classification from Hines Jr and Rice (1994) and OECD (2000) Source: Enache (2022).

force driving up concentration in this paper's theoretical framework, according to which firms shift away from the classic profit-maximization objective and strategically interacts to maximize owners' financial welfare, resulting in oligopoly outcomes.[4] Relatedly, Ederer and Pellegrino (2021) estimate the welfare implications of such rise due to softened competition.

One reason behind the trend in Figure 1 is international tax competition (Wilson, 1999). Among others, Tørsløv et al. (2023) recently documented the magnitude of profit shifting country by country, exploiting comprehensive macroeconomic data.[5] Importantly, the empirical evidence on tax

[4]For example, (Azar et al., 2018) show that common ownership robustly correlates with ticket prices in the US airline industry. Boller and Morton (2020), through stock returns, corroborate the hypothesis that common ownership raises firms' profits. Azar et al. (2022c) report that bank concentration is strongly correlated with prices such as deposit account interest rates, maintenance fees and threshold. Antón et al. (2023) test empirically a prediction of their theoretical framework based on managerial incentives, and find that there is a negative relation between common ownership and product market outcomes. Notably, Azar et al. (2022a) show the average market to be concentrated and that labor market concentration is associated to lower posted wages. More in general, Bindal and Nordlund (2022) find that the influence of common ownership depends on product and industry characteristics.

[5]As pointed out by Dharmapala (2019), there has yet to be a consensus on the magnitude of profit shifting between microeconomic and macroeconomic estimates. Micro approaches suggest that MNCs shift about 20 per cent of their foreign profits to tax havens. Whereas, aggregate data indicate a percentage closer to 40%. See Dharmapala (2014) for an extensive review of estimation with microeconomic approaches; Tørsløv et al. (2018), Cobham and Janský (2018) and Crivelli et al. (2016) for additional aggregate estimates.

avoidance shares notable patterns with the literature on market power and concentration, supporting the hypothesis that these two trends are interconnected. In De Ridder (2024), the rise of intangibles explains the reallocation of output, among other things. Accordingly, many contributions show that profit shifting is more prevalent in industries heavily reliant on intellectual property and R&D, other than among large firms (Davies et al., 2018; Garrett and Suárez Serrato, 2019; Guvenen et al., 2022; Wier and Erasmus, 2023). Coherently, Kubick et al. (2015) find that firms with greater market power engage in higher levels of tax avoidance and that a firm's competitive advantage, relative to its industry peers, plays a significant role in facilitating such practices. In particular, the empirical evidence support the idea that the ownership structure, central in this paper, not only influences the distribution of market power but also tax avoidance incentives of firms (Cheng et al., 2018; Jiang et al., 2021; Prettl and von Hagen, 2023).

This paper proposes a theory that sheds light on the mechanism linking the observed patterns, namely (i) the declining CIT rates and (ii) the decline in competition. The theory aims to investigate how changes in market structure, determined by common ownership and the number of competitors, interact with competition, profit shifting and international tax competition. As in Azar and Vives (2021), a rise in common ownership, or a reduction in the number of competitors, cause a reallocation of market share toward high-productivity firms with an increase in their market power and profits. When firms have the possibility to open an affiliate in a country running a more convenient tax regime, higher profits strengthen their incentives to shift those abroad. In turn, firms' higher propensity to shift profit increases the extent of international tax competition between governments. Therefore, rising concentration triggers a shift in the distribution of profits, enhances cross border tax avoidance, and fosters the CIT race to the bottom. Noticeably, according to this theory, increasing concentration and profit shifting are self-reinforcing and together exacerbate international tax competition. The mechanism works as follow. Only sufficiently profitable firms can access the profit shifting technology by paying the associated fixed cost. As concentration rises and market share is reallocated toward firms at the top of the profit distribution, those that shift profits gain further competitive advantage over low-productivity ones. Such a competitive advantage exacerbates the reallocation of market share toward high-productivity and high market power firms, resulting in a further increase in the economy-level concentration and market power. The excessive increase in concentration and profit share makes governments to compete even harder on CIT rates to attract capital.

The general equilibrium model of international tax competition is characterized with oligopolistic private good-producing firms à la Azar and Vives (2021). In such a model, the level of market power is tied to the market structure of the economy, which is determined by the ownership structure and the number of firms. As the extent of common ownership rises or the number of competitors decreases, thereby increasing the concentration in the economy, firms' market power increases as well. Heterogeneously productive firms are large relative to the economy and compete à la Cournot, with labor market power, where labor is the only production input.[6] Such a model economy with heterogeneous firms nicely reproduces the documented reallocation of market share from low-productivity, low-markup, and high-labor share firms towards high-productivity, high-markup, and high-profit share firms.[7] Owners and workers consume both private and public goods, with the latter produced by the government. The government finances the production of the public good with taxes levied on firms. Firms can shift profits abroad to a tax haven by incurring a fixed cost. Such as in Krautheim and Schmidt-Eisenlohr (2011), two governments engage in strategic tax competition: the government of the large country, where the firms are initially located, and that of the tax haven. The theoretical framework enables to investigate the effects of exogenous changes in different dimensions of market structure on profit shifting and tax competition, disentangling the role of ownership structure and number of competitors from the elasticity of demand. Besides, explicitly modeling the strategic interaction between firms and governments in a general equilibrium framework unveils effects that would not emerge otherwise.

I characterize the subgame-perfect general equilibrium of the model and demonstrate how an exogenous shift in market structure, which increases concentration and firms' market power, leads to

[6]The one-sector economy with heterogeneous firms does not incorporate product market power because, with a single good, any such effect is nullified by owners internalizing their consumption. In other words, since firms' managers maximize a weighted average of owners' utilities, they do not impose any markup on the single good produced because, in the model, owners are consumers, just like workers. On the other hand, Azar et al. (2022b) find a causal effect of common ownership on workers' wages and therefore labor market power, which provides supportive evidence for the model's results.

[7]See De Loecker et al. (2020) and Autor et al. (2020b) for the most recent literature.

a rise in profit-shifting practices. The reason is that higher concentration reduces competition and therefore increases market power, resulting in larger profits, which gives firms stronger incentives to move those abroad. On one hand, the increase in market power due to more concentrated common ownership leads to increased profits through two channels. First, it raises firms' markdown on wages and therefore increases the wedge between the marginal product of labor and the wage paid to workers.[8] Second, it triggers a reallocation of market share towards more productive firms, which endogenously raises their profits. On the other hand, an increase in firms' market power due to a reduction in the number of firms in the economy, raises profits through restrained labor demand and thereby larger markdowns. Overall, more concentration increases firms' incentives to shift profits and cause governments to compete stronger on tax rates. The government of the large country, the residence country for firms' owners and workers, lowers its tax rate on profits to retain the tax base and avoid firms to undertake profit shifting practices. Finally, profit shifting exacerbates the disparities among already heterogeneous firms for the following reasons. The firms that shift profits abroad and access lower taxation are the most productive ones. By shifting profits away to the tax haven, those companies strengthen their competitive advantage due to lower costs. As a result, they gain further market share and exert more market power, leading to reduced labor demand and reduced levels of employment, production, and wages through general equilibrium effects. According to this channel, profit shifting causes an endogenous increase in market power for any given ownership structure.

While the macroeconomic consequences of firms' market power are increasingly capturing attention in the literature, general equilibrium theories of international tax competition still predominantly rely on models of monopolistic competitive firms.[9] Krautheim and Schmidt-Eisenlohr (2011) developed a general equilibrium analysis of international tax competition between a so-called large country and a tax haven. In the model, firms operate under monopolistic competition, and

[8] This is consistent with the evidence that concentrated labor markets are associated to significantly lower wages (Azar et al., 2022a).

[9] Some partial equilibrium models have incorporated imperfect competition and strategic interactions among firms in the analysis of international tax competition. See, for example, Wrede (1994), Janeba (1998), Haufler and Schjelderup (2000), and Ferrett and Wooton (2010). However, these theoretical frameworks cannot capture the general equilibrium effects of exogenous changes in market structure or agents' preferences, which have been shown to be significant.

their market power is tied to consumers' preferences, represented by the elasticity of substitution across varieties. Their theory predicts that tax competition is strongest when market power is low and heterogeneity across firms' productivity is high, while data show trends of increasing market power and declining CIT rates. Moreover, the growing literature on market power highlighted other sources of market power, unrelated to consumers' preferences, such as market structure and technology. This paper contributes by developing a general equilibrium model of tax competition where firms' market power arises from empirically relevant sources of market structure and is consistent with the observed evidence. In this framework, tax competition is strongest when firms' market power is high because few of them account for a large share of profits. Notably, the model reveals a novel channel that emerges from general equilibrium effects. According to such a channel, profit shifting leads to an endogenous increase in the economy-level market power and international tax competition.

More broadly, my analysis builds on theoretical works of international tax competition and coordination started with Zodrow and Mieszkowski (1986) and Wilson (1986).[10] Studying the interplay between market structure and international tax competition in a general equilibrium framework allows to unveil the effects on wages, output and welfare, other than firms' market power.

Another related strand of the literature is that on the rise of market power and its macroeconomic consequences. For example, Yeh et al. (2022), Díez et al. (2021), De Loecker et al. (2020), Hall (2018), and Gutierrez Gallardo and Philippon (2018) document the rise in firms' market power, both in the labor and product markets. Many theoretical contributions have introduced endogenous markups and markdowns in general equilibrium models. A non-exhaustive list includes De Loecker et al. (2021), Azar and Vives (2021), Edmond et al. (2015), and Melitz and Ottaviano (2008). I contribute to this literature by introducing tax competition into a general equilibrium model of oligopolistic firms to study the interplay between market power and tax competition.

The rest of the paper is structured as follows. Section 2 describes the model setup. Section 3 outlines firms' and governments' optimal decisions, discussing the equilibrium properties and

[10] See Keen and Konrad (2013) for an instructive and comprehensive review.

analysis. Section 4 discusses the results.

2 Model setup

I introduce a government that taxes firms' profits and uses revenues to finance the provision of a public good, in an economy a la Azar and Vives (2021) populated by a finite number J of firms producing a homogeneous private good and a continuum of individuals.[11] Firms are large relative to the economy, while individuals are atomistic. There are two types of individuals, where I_W and I_O denote the mass of workers and owners, respectively. Both workers and owners derive utility from the consumption of the private good produced by firms and the public good provided by the government. Workers earn income by offering labor to firms in exchange for wages, while owners do not work and earn their income from the ownership of firms. There are three goods: a private good produced by firms and sold at a price p, leisure with price w, and a public good provided by the government.

2.1 Workers

Workers have identical separable linear preferences over the consumption of private and public goods, and isoelastic over labor. The utility function of worker i is represented by

$$U^W(C_i, L_i, G_i) = C_i - \frac{L_i^{1+1/\eta}}{1+1/\eta} + \beta G_i, \tag{1}$$

where the elasticity of labor supply is $\eta > 0$, and $\beta > 1$ is the marginal utility associated to the public good.[12] The consumption of the private good is denoted by C_i while $L_i \in [0, T]$ denotes the level of individual labor supply, and G_i is the consumption of the public good. The government distributes the public good to workers and consumers who take its supply as given. A representative worker has a time endowment of T hours and has no other endowments. Given firms' production

[11] For simplicity, I abstract from labor income taxation because the focus is on the relationship between market structure and international corporate taxation rathern than optimal taxation.

[12] Following Krautheim and Schmidt-Eisenlohr (2011), I assume $\beta > 1$ such that individuals strictly prefer the consumption of the public good over the consumption of the private good. As it will be clear later on, this is the simplest way to preserve the incentive for the government to provide the public good, ruling out any trade-off between public and private goods.

plans, the worker decides how much to work to maximize the utility, $U^W(C_i, L_i, G_i)$, subject to the budget constraint, $C_i \leq \omega L_i$, where $\omega \equiv w/p$ is the real wage.

The solution to the workers' problem leads to the following aggregate labor supply:

$$\omega(L) = L^{1/\eta}. \tag{2}$$

Given firms' production plans and the aggregate labor supply function, labor market clearing determines the real equilibrium wage. Given the total level of employment, L, associated with the real wage, ω, the optimal level of workers' consumption of the private good C^W is determined. Note that the public good, G_i, does not enter the labor supply decision of workers. The public good is distributed by the government thus, it does not affect workers' decisions. Finally, since the consumption of the public good is frictionless, workers consume the entire amount the government distributes to them.

2.2 Owners

Owners have linear preferences over the consumption of private and public goods. The utility of owner i is

$$U^O(C_i, G_i) = C_i + \beta G_i. \tag{3}$$

Owners do not work but hold all the firms' shares and earn their income from the ownership of firms. As in Azar and Vives (2021), owners are divided uniformly into J groups: owners in group j own a fraction $1 - \phi + \phi/J$ of firm j and ϕ/J of the other firms, where $\phi \in [0, 1]$ is a parameter that measures the level of portfolio diversification in the economy. The financial wealth of a representative owner i in group j is

$$W_i = \frac{1 - \phi + \phi/J}{1/J}(1 - \tau)\Pi_j + \sum_{k \neq j} \phi(1 - \tau)\Pi_k, \tag{4}$$

where $\Pi_j = pF(L_j) - wL_j$ are the firm j's nominal profits and τ is the tax rate on firm's profit.

Following Azar and Vives (2021), I assume there is a manager that maximizes a weighted average of the indirect utilities of firm j's owners.[13] The indirect utility of the representative owner is denoted as $V^O(p, w; W_i) = W_i/p + \beta G_i$, and the real profits of firm j as $\pi_j = F(L_j) - \omega L_j$. I assume that firms have heterogeneous CRS production technologies of the kind $F_j(L_j) = A_j L_j$, where A_j indicates firm j's productivity and L_j is the amount of labor demanded by firm j. Regarding, the consumption of the public good, G_i, the logic developed for workers applies here. The public good is distributed by the government and owners always consume all of it. Furthermore, as workers, owners consider the supply of public goods as exogenous. Therefore, since G_i is taken as given, it does not affect the manager's objective function

$$\begin{aligned} &(1-\phi+\frac{\phi}{J})\left[(1-\phi+\frac{\phi}{J})(1-\tau)\pi_j+\frac{\phi}{J}\sum_{k\neq j}(1-\tau)\pi_k\right] \\ &+\sum_{k\neq j}\frac{\phi}{J}\left[(1-\phi+\frac{\phi}{J})(1-\tau)\pi_k+\frac{\phi}{J}\sum_{s\neq k}(1-\tau)\pi_s\right] \end{aligned} \tag{5}$$

After some algebra, the objective function can be rewritten as[14]

$$(1-\tau)\pi_j + \underbrace{\frac{(2-\phi)\phi}{(1-\phi)^2 J + (2-\phi)\phi}}_{\lambda}\sum_{k\neq j}(1-\tau)\pi_k, \tag{6}$$

where 'λ' weights all the other firms' profits into the objective function of the manager of firm j, due to common ownership. Note that when common ownership is maximum, i.e. $\lambda \to 1$, only the most productive firm produces in equilibrium. On the other hand, when there is no common ownership at all, i.e. $\lambda = 0$, each group owns only one firm and there is no strategic interaction, since managers do not care about other firms' profits. A manager's objective function depends only on real wages and can be written as

$$(1-\tau)[A_j L_j - \omega(L)L_j] + \lambda\sum_{k\neq j}(1-\tau)[A_k L_k - \omega(L)L_k], \tag{7}$$

[13]Note that managers fully internalize owners' welfare thus, the theoretical framework do not allow for agency problems. See Azar and Vives (2021) for a discussion on the matter.

[14]See Appendix B for the derivation of the objective function.

The strategic interaction across firms materializes through the effect that the individual labor demand has on the labor market. Since firms are large relative to the economy, their labor demand affects the equilibrium in the labor market and, thus, the real wage paid by all firms. An increase of labor demand by firm j, i.e. L_j, triggers an increase in the real wage ω that will affect firm j's profits, i.e. π_j, but also all other firms' profits, i.e. π_k for $k \neq j$. It is clear from Equation (7) that if all firms are subject to a unique τ, the tax rate does not affect their decision and cancels out in the objective function. When they have the possibility to shift profits, firms may face two possibly different tax rates: the tax rate imposed by the government of the country where firms' owners reside, denoted by τ_l, and the tax rate set by the tax haven, denoted by τ_x.

2.3 The government

The government collects revenues by taxing firms' profits using a proportional tax rate as the only instrument. Tax revenues finance the public good production, denoted by G, with one-to-one production technology. The government chooses how much of the public good to produce, which implies choosing the tax rate, τ, in order to maximize a weighted sum of a representative owner's and worker's utilities, with weights $\kappa \in [0, 1]$ and $1 - \kappa$, respectively. Formally, the government solves the following problem

$$\max_{\tau} \; W(L, C^W, C^O, G^W, G^O) = (1-\kappa)\left[C^W - \frac{L^{1+1/\eta}}{1+1/\eta} + \beta G^W\right] + \kappa\left[C^O + \beta G^O\right] \tag{8}$$

$$s.to$$

$$G^W + G^O = \tau\Psi \tag{9}$$

where $\Psi \equiv \sum_{j=1}^{J} \pi_j$ is the tax base. As metioned earlier, I assume $\beta > 1$ such that individuals strictly prefer the consumption of the public good to ensure that the government has the incentive to provide the public good. I assume the government attributes equal weights to the utilities of workers and owners, i.e. $\kappa = 0.5$, implying that it distributes the public good equally across all individuals, i.e. $G_i = G_j = G$ for any $i \neq j$.[15]

2.4 Profit shifting and international tax competition

Following the approach adopted in Krautheim and Schmidt-Eisenlohr (2011), I introduce the possibility for firms, initially all established in the so-called "large country", to open an affiliate in a foreign country referred to as "tax haven". Opening the affiliate there allows firms to shift profits and pay the tax rate imposed by the tax haven. A tax haven is tiny compared to the country where firms' owners reside. More precisely, I assume that the tax haven is populated by a mass of people close to zero, implying a negligible demand/supply of goods and, thus, a negligible tax base. Therefore, the only source of revenue for the government comes from taxing firms that establish an affiliate there. I assume that the objective of the government of the tax haven is to maximize tax revenues, i.e. the sum of firms' profits located in the tax haven multiplied by the tax rate or $R_x = \tau_x \Psi_x$. The large conutry is denoted by l and the tax haven by x.

If firms open an affiliate in the tax haven, they declare zero profits at home, i.e. the large country. Firms can open the affiliate by paying a fixed cost denoted by γ and measured in real resources.[16] The fixed cost represents the investment needed to establish the affiliate in the tax haven and implement the profit-shifting strategy, such as employing tax experts and collecting costly information on tax laws.[17] Provided that $\gamma > 0$, it is straightforward that profit shifting occurs only if the tax differential $\delta = \tau_l - \tau_x > 0$. Moreover, firms with higher productivity and profits are more inclined to pay the fixed cost and shift profits, as they can save more due to the (possibly) lower taxation.

[15] Studying redistributive effects and potential inequality are behind the scope of the paper and the model is not rich enough to provide insights on those issues.

[16] The fixed costs are in real terms and they are not tax-deductible, meaning that firms are not taxed net of the fixed costs.

[17] It is reasonable to assume the fixed cost is a deadweight loss for firms and the economy as a whole, in order to avoid any redistributive issue that may affect the welfare analysis. Furthermore, the subsidiary does not add value to the firms' activities and, if any, produces welfare effects on the destination country that I assumed to have a negligible endowment of agents.

2.5 Structure and timing

The managers of firms and the two countries' governments play a game structured as follows:

1. In the first stage, that I refer to as the *tax game*, governments simultaneously choose their tax rate.

2. In the second stage, that I refer to as the *production game* firms' management chooses the production plans and the location of profits.

I solve for the equilibrium by backward induction. First, I solve the second stage of the game of imperfect competition across firms, with shareholder representation characterized by firms' production plans and profit location decisions. In that game, the manager of each firm j decides the quantity of labor to demand, L_j, and the location of their profit, a_j. Second, I solve the first stage where governments simultaneously choose the tax rates to impose on firms' profits and, in the case of the government of the large country, also the allocation of the public good among households.

3 Equilibrium analysis

This subsection outlines the properties of the equilibrium, analyze the stages of each subgame and characterizes analytically the general equilibrium of the economy. Given the complexity of the analytical expressions and the discontinuity of the problem, in the following section I explore the comparative statics for the relevant parameters with a numerical analysis.[18] The equilibrium concept follows Azar and Vives (2021), with two additional elements: the firms' decision about the location of profits, denoted with $a_j \in \{l, x\}$, and the subgame related to the governments' tax rate decisions. Given the possibility that firms can locate profits in the two locations, I denote with J_l the number of firms locating profits in the large country. Conversely, $J - J_l$ is the number of firms locating profits in the tax haven. I define the competitive equilibrium relative to the firms' production plans, a Walrasian equilibrium conditional on the quantities of output and profits' location decision announced by firms. As in Azar and Vives (2021), I proxy firm j's production

[18] The discontinuity of the problem arises due to the intersection between the location problem and the discrete number of firms, which implies the solution to be the optimum of a piecewise function.

plan by the quantity L_j of labor demanded, implicitly setting the planned production quantity equal to $F(L_j)$.

Definition 1 *Competitive equilibrium relative to production plans and location decisions: a competitive equilibrium relative to* $(L_1, ..., L_J)$ *and* $(a_1, ..., a_J)$ *is a price system and allocation* $[\{w, p\}; \{C_i, L_i\}_{i\in I_W}, \{C_i\}_{i\in I_O}]$ *such that the following statements hold:*

(i) For $i \in I_W, (C_i, L_i)$ *maximizes* $U(C_i, L_i)$ *subject to* $pC_i \leq wL_i$*; for* $i \in I_O, C_i = W_i/p$.

(ii) labor supply equals labor demand by firms: $\int_{i\in I_W} L_i\, di = \sum_{j=1}^{J} L_j$.

(iii) Total consumption equals total production minus the fixed cost paid by the firms that shift profits: $\int_{i\in I_W \cup I_O} C_i\, di = \sum_{j=1}^{J} F(L_j) - \sum_{j=J_l+1}^{J} \gamma$.

Firms make production plans and profits location decision conditional on price functions $\mathbb{W}(\mathbf{L}, \mathbf{a})$ and $\mathbb{P}(\mathbf{L}, \mathbf{a})$, where $\mathbf{L} \equiv (L_1, ..., L_J)$ is the production plan vector, such that $[\mathbb{W}(\mathbf{L}, \mathbf{a})\mathbb{P}(\mathbf{L}, \mathbf{a});$ $\{C_i, L_i\}_{i\in I_W}$,$\{C_i\}_{i\in I_O}]$ is a competitive equilibrium. Price functions reflect a firm's expectation about prices' reaction with respect to its and other firms' plans.

Definition 2 *Define the equilibrium where some firms shift profits and others pay taxes domestically, i.e.* $J_l^* \in (0, J)$*, as an internal equilibrium.*

The general equilibrium is characterized by (i) governments setting their tax rates on firms profits and (ii) firms deciding their production plans and location choices optimally. When a firm's employment and production plans coincide with the expectations of all other firms, and the tax rate imposed by a government coincide with the expectations of the other government, the economy is in equilibrium.

Definition 3 *Cournot-Walras equilibrium with shareholder representation is a price function* $(\mathbb{W}(\cdot), \mathbb{P}(\cdot))$*, an allocation* $\{\{C_i^*, L_i\}_{i\in I_W}, \{C_i^*\}_{i\in I_O}\}$*, a set of production plans* $\mathbf{L}^*$*, profits location decisions* $\mathbf{a}^*$ *and tax rates* $\boldsymbol{\tau}^*$ *such that:*

(i) $[\mathbb{W}(\mathbf{L}^*, \mathbf{a}^*, \boldsymbol{\tau}^*)\mathbb{P}(\mathbf{L}^*, \mathbf{a}^*, \boldsymbol{\tau}^*); \{C_i^*, L_i\}_{i\in I_W}, \{C_i^*\}_{i\in I_O}]$ *is a competitive equilibrium relative to* $\mathbf{L}^*$, $\mathbf{a}^*$ *and* $\boldsymbol{\tau}^*$*,*

(ii) firms' profits location decisions are such that

$$\begin{cases} a_j = l & if\ (22)\ holds \\ a_j = x & otherwise \end{cases} \tag{10}$$

(iii) the production plan vector $\mathbf{L}^*$ *and the profits' location decision* $\mathbf{a}^*$ *are a pure-strategy Nash equilibrium of a game in which players are the J firms, the strategy spaces of firm j are* $L_j \in [0, T]$ *and* $a_j \in [l, x]$ *and the firm's payoff function is*

$$\begin{cases} (1-\tau_l)\pi_{jl} + \lambda \left[\sum_{k \neq j} (1-\tau_l)\pi_{kl} + (1-\tau_x)\pi_{kx} - \gamma \right] & for\ a_j = l \\ (1-\tau_x)\pi_{jx} - \gamma + \lambda \left[\sum_{k \neq j} (1-\tau_l)\pi_{kl} + (1-\tau_x)\pi_{kx} - \gamma \right] & for\ a_j = x \end{cases} \tag{11}$$

Note that profits are reported in real terms and $\pi_j = \Pi_j/p$.

(iv) the tax rate vector $\boldsymbol{\tau}^*$ *is a pure-strategy Nash equilibrium of the tax game, where the strategy space for governments is* $\tau \in (0, 1)$ *such that governments maximize their respective objective functions, where:*

- *the objective function for the tax haven government is to maximize its tax revenues* $R_x = \tau_x \Psi_x$;
- *the objective function for the large country government is to maximize a weighted-average of people's welfare*

$$(1-\kappa)\left[C^W - \frac{L^{1+1/\eta}}{1+1/\eta} + \beta G^W\right] + \kappa\left[C^O + \beta G^O\right]. \tag{12}$$

3.1 Equilibirum of the production game - Stage two

The manager of each firm j chooses the optimal production plan given the location of profits. Then, the manager determines the optimal location choice, a_j, by comparing the values of the optimized profits across locations.

Firm's optimal production plan with profits in the large country. The maximization problem faced by firm j's manager, conditional on the firm paying taxes in the large country, is the following

$$\max_{L_{jl}} \quad (1-\tau_l)[A_j L_{jl} - \omega(L)L_{jl}] \tag{13a}$$

$$+ \lambda \sum_{k \neq j} (1-\tau_l)[A_k L_{kl} - \omega(L)L_{kl}] \tag{13b}$$

$$+ \lambda \sum_{k \neq j} [(1-\tau_x)(A_k L_{kx} - \omega(L)L_{kx}) - \gamma], \tag{13c}$$

where A_j is the productivity of firm j; L_{jl} is the labor demanded by firm j while locating profits in the country l; ω is the real wage that depends on the total employment in equilibrium; τ_l and τ_x are the tax rate imposed in the large country and tax haven, respectively; λ is the level of common ownership in the economy, and γ is the fixed cost to open the affiliate in the tax haven.[19]

In equation (13), line (13a) represents the after-tax profits of firm j subject to the tax rate τ_l; line (13b) is the sum of after-tax profits of all other firms paying taxes in the large country and subject to the tax rate τ_l; line (13c) is the sum of after-tax profits of all other firms paying taxes in the tax haven and subject to the tax rate τ_x. Other firms' profits are weighted by λ that takes into account the ownership group j has in all the other firms.[20]

From the first-order conditions of the maximization problem in (13), given the profits' location decision of all firms and tax rates, the markdown of real wages for firm j is[21]

$$\mu_{jl} \equiv \frac{A_j - \omega(L)}{\omega(L)} = \frac{s_{jl} + \lambda \left[\sum_{k \neq j} \left(\frac{1-\tau_x}{1-\tau_l} \right) s_{kx} + s_{kl} \right]}{\eta}, \tag{14}$$

where $s_{jl} \equiv L_{jl}/L$ is the market share for firm j with profits located in country l; and $\eta \equiv \omega L/\omega'$

[19] Productivities are not affected by the decision to shift profits abroad since firms always produce and sell their goods in the large country.

[20] All profits are reported in real terms. Nominal and real terms lead to the same solution of the maximization problem

[21] See Appendix D for the analytical derivation.

is the elasticity of labor supply. Note that when all firms locate their profits in the large country, the markdown of real wages becomes

$$\mu_j \equiv \frac{A_j - \omega(L)}{\omega(L)} = \frac{s_j + \lambda(1 - s_j)}{\eta}, \tag{15}$$

since $\sum_{k \neq j} s_{kx} = 0$ given that no firm locates profits in the tax haven, and $\sum_{k \neq j} s_{kl} = 1 - s_j$.

All firms hire workers, produce and sell their products in the large country, and thus operate in the same competitive labor market. Therefore, they must pay the same real wage to workers in equilibrium. Equating the inverse demand of labor of two representative firms paying their taxes in the large country, their market share is

$$s_{jl} = S_l \left[\frac{A_j}{\bar{A}_l J_l} + \left(\frac{A_j}{\bar{A}_l} - 1 \right) \left(\frac{\lambda \left(\frac{\tau_x - \tau_l}{1 - \tau_l} \right)}{1 - \lambda} \right) \right] + \left(\frac{A_j}{\bar{A}_l} - 1 \right) \left(\frac{\lambda \left(\frac{1 - \tau_x}{1 - \tau_l} \right) + \eta}{1 - \lambda} \right), \tag{16}$$

that is function of firm j's productivity, the average firm's productivity in the large country $\bar{A}_l$, the common ownership parameter, λ, the tax rates, τ_l, and τ_x, and the aggregate market share of firms locating profits in the large country, $S_l = \sum_{k \neq j} s_{kl}$.[22,23]

3.1.1 Firm's optimal production plan with profits in the tax haven

The maximization problem firm j's manager faces, conditional on the firm opening the affiliate in the tax haven, is the following

$$\max_{L_{jx}} \quad (1 - \tau_x)[A_j L_{jx} - \omega(L) L_{jx}] - \gamma \tag{17a}$$

$$+ \lambda \sum_{k \neq j} [(1 - \tau_l)(A_k L_{kl} - \omega(L) L_{kl})] \tag{17b}$$

$$+ \lambda \sum_{k \neq j} [(1 - \tau_x)(A_k L_{kx} - \omega(L) L_{kx}) - \gamma]. \tag{17c}$$

[22]See Appendix D for the analytical derivation.
[23]Note that S_l will be determined at the end of the next subsection.

In the above equation, line (17a) represents the after-tax profits of firm j subject to the tax rate τ_x; line (17b) is the sum of after-tax profits of all other firms paying taxes in the large country and subject to the tax rate τ_l; line (17c) is the sum of after-tax profits of all other firms paying taxes in the tax haven and subject to the tax rate τ_x. Lines (17b) and (17c) are weighted by λ that takes into account the common ownership group j has in all the other firms.

From the first-order conditions of the maximization problem (17), given the tax rates and the profits' location decision of all firms, the markdown of real wages for firm j is[24]

$$\mu_{jx} \equiv \frac{A_j - \omega(L)}{\omega(L)} = \frac{s_{jx} + \lambda \left[\sum_{k \neq j} s_{kx} + \left(\frac{1-\tau_l}{1-\tau_x}\right) s_{kl}\right]}{\eta}. \tag{18}$$

Note that, when all firms locate their profits in the tax haven, the markdown of real wages becomes equal to equation 15, because $\sum_{k \neq j} s_{kl} = 0$ since no firms locate profits in the large country, and $\sum_{k \neq j} s_{kx} = 1 - s_j$.

Equating the inverse demands of labor of two representative firms paying taxes in the tax haven, their market share is

$$s_{jx} = S_l \left[\left(\frac{A_j}{\bar{A}_x} - 1\right)\left(\frac{\lambda\left(\frac{\tau_x - \tau_l}{1-\tau_l}\right)}{1-\lambda}\right) - \frac{A_j}{\bar{A}_x(J - J_l)}\right] + \frac{A_j}{\bar{A}_x(J - J_l)} + \left(\frac{A_j}{\bar{A}_x} - 1\right)\left(\frac{\lambda + \eta}{1-\lambda}\right), \tag{19}$$

that is a function of firm j's productivity, the average productivity in the tax haven, $\bar{A}_x$, common ownership, λ, the tax rates, τ_l, and τ_x, and the aggregate market share of the large country, $S_l = \sum_{k \neq j} s_{kl}$. The aggregate market share of the large country is obtained by equating the inverse demands of labor of firms paying taxes in the large country and the tax haven, plugging in s_{jl} and s_{jx}, which yields[25]

$$S_l = \frac{\bar{A}_l\left(\frac{1-\lambda}{J-J_l} + \eta + \lambda\right) - \bar{A}_x\left(\lambda\frac{1-\tau_x}{1-\tau_l} + \eta\right)}{\bar{A}_x\left[\frac{1-\lambda}{J_l} + \lambda\left(\frac{\tau_x - \tau_l}{1-\tau_l}\right)\right] - \bar{A}_l\left[\lambda\left(\frac{\tau_x-\tau_l}{1-\tau_l}\right) - \left(\frac{1-\lambda}{J-J_l}\right)\right]}. \tag{20}$$

[24] See Appendix D for the analytical derivation.

[25] See Appendix D for the analytical derivation.

Assumption 1 *The average productivity of firms shifting profits relative to the average productivity of firms paying taxes domestically has to be sufficiently high, i.e.*

$$\frac{\bar{A}_x}{\bar{A}_l} > \frac{1 - \frac{1-\tau_l}{(J-J_l)(\tau_x-\tau_l)}}{1 - \frac{1-\tau_l}{J_l(\tau_x-\tau_l)}} \tag{21}$$

Assumption 1 establishes that firms shifting profits are sufficiently more productive than those paying taxes domestically, on average. Such a condition leads to the following proposition.

Proposition 1 *In an internal equilibrium, the aggregate market share of firms locating profits in the large country, S_l, is decreasing in λ.*

Proof: *See Appendix E.*

Proposition 1 highlights how common ownership influences the aggregate market share of firms locating profits in the large country. As common ownership becomes more concentrated, firms place greater weight on other firms profitability that can take advantage of a more favorable taxation. Accordingly, they give up market share in favor of more productive firms that can shift profits, in order to exploit tax savings through common ownership.[26]

The market shares, conditional on the location decision, are obtained by plugging S_l into s_{jl}. The market share of a firm that locates profits in a large country is s_{jl} and s_{jx} for those in the tax haven. Crucially, they differ in the ratios of tax rates and average productivities, implying distinct allocation of market shares across locations. Keeping fixed the endogenous number of firms not shifting profits, i.e. J_l such that $0 < J_l < J$, the market shares of a generic firm j depend only on parameters. When $J_l = 0$ or $J_l = J$, a firm's market share depends only on its productivity A_j, the average productivity in the economy $\bar{A}$, the elasticity of labor supply, and the level of common ownership λ. In other words, taxation has no amplification effect on the reallocation of market share towards more productive firms since they all pay the same tax rate.

[26]Such an analytical result is obtained by considering the number of firms locating profits in the large country, i.e. J_l, as fixed. Obviously, common ownership can vary such that firm(s) decide to move profits, influencing average productivities, market shares and aggregate profits. For the same reason, the same analytical analysis cannot be performed on the market size, J, becuase keeping fixed J_l would imply a mechanic change in market share S_l. In other words, keeping J_l fixed, an increase in the number of firms would imply an increase in the market share of firms shifting profits or vice versa.

3.1.2 The location of firms' profits

The manager of firm j decides to open an affiliate in the tax haven and pay taxes there if the firm optimized payoff, net of the fixed cost and taxes, is strictly greater than the optimized payoff locating profits in the large country. The associated condition is determined by the following expression:[27]

$$\begin{gathered}(1-\tau_x)\pi^*_{jx} - \gamma + \lambda \left\{ \sum_{k\neq j,s} (1-\tau_l)\pi^{*'}_{kl} + \sum_{s\neq j,k} (1-\tau_x)\pi^{*'}_{sx} - \gamma \right\} > \\ (1-\tau_l)\pi^*_{jl} + \lambda \left\{ \sum_{k\neq j,s} (1-\tau_l)\pi^*_{kl} + \sum_{s\neq j,k} (1-\tau_x)\pi^*_{sx} - \gamma \right\}.\end{gathered} \tag{22}$$

It is implicitly assumed the indifferent firm pays taxes at home with probability one, rather than establishing the affiliate in the tax haven and not gaining from it.[28] Equation (22) determines the number of firms that locate profits in the large country, i.e., J_l, and the number of firms that locate profits in the tax haven, i.e., $J - J_l$.

Proposition 2 *Firm "j" moves its profits to the tax haven if the fixed cost is lower than the gains from shifting or*

$$\gamma < \frac{\Delta\pi_j + \lambda\sum_{k\neq j}\Delta\pi_k}{1-\lambda(J^{*'}_l - J^*_l)}, \tag{23}$$

where $\Delta\pi_j \equiv (1-\tau_x)\pi^{*'}_{jx} - (1-\tau_l)\pi^*_{kl}$ *is the differential of firm j's after-tax profits and* $\Delta\pi_k \equiv \{[(1-\tau_l)\pi^{*'}_{kl} + (1-\tau_x)\pi^{*'}_{kx}] - [(1-\tau_l)\pi^*_{kl} + (1-\tau_x)\pi^*_{kx}]\}$ *is the differential of the other firms' after-tax profits, weighted by the* λ *coefficient.*

Proof: *See Appendix F.*

The decision about the location of profits involves strategic interaction because it has an impact on the allocation of market share, which in turn affects employment and real wages. Therefore, firm j's manager consider the general equilibrium effects of shifting profits and how those affect the revenues of the firms shareholders are interested in. It opens the affiliate in the tax haven and shift profits only if the fixed cost is lower than the sum of the payoff differentials for firm j, but also the

[27] The condition is reported in real terms. Considering nominal terms does not alter the analysis.

[28] In other words, firms location of profits does not admit mixed strategies.

sum of payoffs differentials of all the other firms k. In other words, profit shifting takes place only if the gains for all shareholders are sufficiently high. Provided that tax haven undercuts the rate of the large country, net profits for firm j increases due to lower taxation. Moreover, firm j gains in market share due to the reallocation of economic activity from other firms, since it now has lower (tax) costs. However, the total net effect depends also on the equilibrium variables w and L. On the other hand, the payoff differential for the other firms, i.e. $\sum_{k \neq j} \Delta\pi_k$, decreases due to the lost market share. However, the total net effect is ambiguous as it depends on equilibrium variables as well.

There are three possible outcomes. First, when $J_l = J$ all firms locate profits in the large country and are subject to a tax rate, τ_l. Second, in an internal equilibrium as defined before, when $0 < J_l < J$ some firms locate profits in the large country and are subject to a tax rate, τ_l, and some firms locate profits in the tax haven being subject to a tax rate, τ_x. Third, when $J_l = 0$ all firms shift profits to the tax haven and are subject to the tax rate, τ_x. In the extreme cases where all firms locate profits either in the large country, $J_l = J$, or in the tax haven, $J_l = 0$, firms' production plans are independent of taxation, and the maximization leads to Azar and Vives (2021) results with heterogeneous firms.

Lemma 1 *In an equilibrium where all firms locate profits in the large country or in the tax haven, when $J_l^* = J$ and $J_l^* = 0$ respectively, firms' production plans are independent of taxation. As a result, the equilibrium outcome becomes identical to that in Azar and Vives (2021) with heterogeneous firms.*

Proof*: see Appendix G.*

Note that the optimized profits of firm j, and therefore its labor demand, are location specific. The labor demand when firm j locates profits in the large country is different from the labor demand when it decides to locate profits in the tax haven, due to different market share across locations. Given that common ownership causes strategic interaction among firms, a change in labor demanded by a firm influences the other firms' decisions.

As discussed above, the manager of firm j chooses L_j that maximizes the following expressions

$$\begin{cases} (1-\tau_l)\pi_{jl} + \lambda\left[\sum_{k\neq j}(1-\tau_l)\pi_{kl} + (1-\tau_x)\pi_{kx} - \gamma\right] & \text{for } a_j = l \\ (1-\tau_x)\pi_{jx} - \gamma + \lambda\left[\sum_{k\neq j}(1-\tau_l)\pi_{kl} + (1-\tau_x)\pi_{kx} - \gamma\right] & \text{for } a_j = x \end{cases} \tag{24}$$

and then choose a_j according to the profit shifting conditions in equation (22). An equilibrium exists, with constant returns to scale and heterogeneously productive firms, when the elasticity of the inverse labor supply's slope is lower than one, i.e. when $E_{\omega'} \equiv -\omega'' L/\omega' < 1$.[29] In other words, it is necessary that a firm's increase in labor demand is met by a reduction in the labor demand by the other firms.

Proposition 3 *When firms have the possibility to shift profits by paying a fixed cost, $\gamma > 0$, to open an affiliate in the tax haven, in an internal equilibrium:*

(a) The markdown of real wages for firm j, with profits located in the large country, is

$$\mu_{jl} \equiv \frac{A_j - \omega(L^*)}{\omega(L^*)} = \frac{s^*_{jl} + \lambda\left[\sum_{k\neq j}\left(\frac{1-\tau_x}{1-\tau_l}\right)s^*_{kx} + s^*_{kl}\right]}{\eta}, \tag{25}$$

where $s^*_{jl} \equiv L^*_{jl}/L^*$ is the equilibrium market share for firm j locating profits in the large country denoted by l; and $s^*_{kx} \equiv L^*_{kx}/L^*$ is the equilibrium market share for firm k locating profits in the tax haven denoted by x.

(b) The markdown of real wages for a firm j, with profits located in the tax haven, is

$$\mu_{jx} \equiv \frac{A_j - \omega(L^*)}{\omega(L^*)} = \frac{s^*_{jx} + \lambda\left[\sum_{k\neq j} s^*_{kx} + \left(\frac{1-\tau_l}{1-\tau_x}\right)s^*_{kl}\right]}{\eta}. \tag{26}$$

(c) The total level of employment is

$$L^* = \left[\frac{\eta \bar{A}_x}{S^*_l[\lambda(\frac{\tau_x-\tau_l}{1-\tau_x}) - \frac{1-\lambda}{J-J_l}] + \frac{1-\lambda}{J-J_l} + \eta + \lambda}\right]^{\eta}. \tag{27}$$

[29] See Appendix C for the analytical proof.

Proof: *see Appendix I.*

The equilibrium markdown of real wages depend on the tax rates imposed by governments, which influences the strategic allocation of market share among firms. Firms that are sufficiently profitable to access the profit shifting technology, gain a competitive advantage which provides them with greater market share. Given that high-productivity firms charge an higher markdown on workers' real wages, the reallocation of economic activity through concentration triggers an endogenous increase in the overall economy-level of market power.

3.2 The tax game - Stage one

Governments set their tax rates simultaneously, anticipating firms' equilibrium strategies characterized in the second stage of the game. Due to the discontinuities in the second stage, which arise from the discrete number of firms in the economy, most equilibrium solutions for aggregate variables are represented by piecewise functions. As a result, it is complicated to fully derive an analytical solution for the tax game which must be the resulting optimum of such aggregated piecewise functions. This section, therefore, discusses the key properties of the tax game, the behaviour of governments under specific assumptions, and the conditions under which the numerical analysis provides equilibrium solutions.

Optimal behavior of the government of the tax haven As already anticipated, following Krautheim and Schmidt-Eisenlohr (2011), I consider the tax haven to be the limiting case of a tiny country. It has a mass of people close to zero, implying a negligible demand/supply of goods and tax base. Its only source of revenue comes from taxing firms' profits that establish an affiliate there. Hence, the maximization of welfare for the government is equivalent to the maximization of its tax revenues $R_x = \tau_x \Psi_x$, where $\Psi_x = \sum_{j=J_l+1}^{J} \pi_j$ is the haven tax base. Since firms have to pay a fixed cost to open the affiliate and shift profits, for any $\gamma > 0$ they will shift profits only if $\delta > 0$. Therefore, for any positive tax rate τ_l played by the large country, the tax haven undercuts and plays a lower tax rate τ_x.

Lemma 2 *When firms can shift profits from a large country toward a tax haven by paying a fixed cost to open an affiliate, the tax haven consistently undercuts the large country such that* $\delta \equiv \tau_l - \tau_x > 0$.

The government of the tax haven undercuts the large country because, given that firms incur a positive fixed cost to shift profits, undercutting is the only way to attract a tax base to the tax haven. In other words, the only incentive for firms to shift profits to the tax haven, and pay taxes there, is a sufficiently lower tax rate that at least compensates for the fixed cost.

Optimal behavior of the government of the large country The government of the large country has a unique tax instrument that is a proportional tax rate on firms' profits. It then employs the tax revenues to produce a public good with a one-to-one production technology, meaning that a unit of real resources is transformed into one unit of the public good without any loss or gain. So, the following equivalence is true $G = \tau_l \Psi_l$, where $\Psi_l = \sum_{j=1}^{J_l} \pi_j$ is the tax base of the large country's government. The government has to maximize its objective function concerning the tax rate τ_l. As anticipated, to avoid any redistributive trade-off, I assume that the government attributes equal weights to the utilities of workers and owners, i.e., $\kappa = 0.5$.[30] If the marginal utility of the public good consumption is greater than that of the private good one's, i.e. $\beta > 1$ as assumed, the government will try to tax firms and produce as much public good as possible. On the other hand, if the private good's marginal utility is greater than the public good one's, the government will not tax firms and set $\tau_l = 0$ always. I focus on the former, hence on the scenario when $\beta > 1$.

Proposition 4 *In autarky, the welfare-maximizing tax rate in the absence of international tax competition is* $\tau = 1$.

Proof*: see Appendix H.*

When firms do not have the possibility of opening an affiliate in the tax haven and are subject to a unique tax rate, as a result, optimal production plans and the tax base are independent of

[30]Studying the redistributive effects and potential inequality issues are behind the scope of the paper. The model is not rich enough to provide insights on that issues.

taxation.[31] Given the assumption that the marginal utility of the public good exceeds that of the private good, i.e. $\beta > 1$, and the government does not consider the distribution of welfare across individuals, i.e. $\kappa = 0.5$, it chooses to maximize tax revenue by setting the tax rate on firms' profits to $\tau = 1$, thereby allocating those tax revenues to the production of the public good.

Proposition 5 *In an internal equilibrium, the aggregate market share of firms paying taxes domestically, S_l, is decreasing in τ_l and increasing in τ_x.*
Proof*: see Appendix J.*

The strategic allocation of market share is responsive to changes in tax rates. Specifically, an increase in the tax rate imposed by the government of the large country induces a reallocation of market share toward the tax haven. This shift is not driven by changes along the extensive margin, i.e. the number of firms engaging in profit shifting, but rather stems from the strategic interactions among firms. In other words, a rise in τ_l leads low-productivity firms that pay domestic taxes to cede part of their market share to high-productivity firms operating through affiliates in the tax haven. Conversely, a reduction in the large country's tax rate reallocates market share back to domestically taxed firms. A symmetric mechanism governs the relationship between the aggregate market share allocated in the large country and the tax rate of the tax haven, τ_x.

Departing from the autarky case, the optimal tax rate for the large country is no longer one, as it now influences the tax base, which may shift toward the tax haven. Since the large country government cares about the aggregate welfare of agents, she wants the utility deriving from the public good to exceed the one deriving from the additional units of private good consumption due to tax savings, net of the fixed costs of shifting profits. The mechanism operates as follows. While owners, through common ownership, benefit from shifting profits to the tax haven and reallocating market share to high-productivity, high-markdown firms that can access such cost-saving technology, they experience a net loss in welfare due to the costs of shifting profits. Provided the assumptions to rule out any redistributive effect, the rise in the weighted average markdown following the reallocation of market share due to profits shifting is not relevant, as it results in a

[31] See the proof in Appendix G.

redistribution of private good consumption from workers to owners. In other words, the government prevents profit shifting if, for any J_l,

$$\beta G > (\tau_l - \tau_x)\Psi_l - (J - J_l)\gamma, \tag{28}$$

where $G = \tau_l \Psi_l = \tau_l \sum_{j=1}^{J_l} \pi_j$. For the empirically relevant calibration discussed in the following section, and sufficiently high fixed costs to shift profits, it turns out that the government prevent firms from shifting profits at all. The reason is that, as already anticipated, the additional utility derived from the production of the public good is greater than the net tax savings. As a result, the large country sets the maximum tax rate that ensures the retention of the entire tax base domestically. More precisely, the government imposes a positive tax rate such that the incentives for the most productive firms to shift profits are precisely offset by the costs associated with profit shifting. Under such a condition, the tax haven can set any tax rate, i.e., $\tau_x \in [0, 1]$, without attracting any positive tax base.

3.3 Calibration

The equilibrium of the theoretical model is now explored through a numerical analysis to elucidate the following aspects. First, it provides the characterization of the equilibrium under certain parameters. Second, it examines the relationship between market structure and profit shifting. Third, by considering endogenous tax rates, it examines the interplay between market structure and international tax competition among governments.

The comparative statics reveals how market concentration, driven by increased common ownership or reduced number of competitors, enhances firms' market power and profit shifting practices. Notably, the exercise reveals that profit shifting endogenously increases the overall level of market power in the economy, exacerbating the reallocation of market share toward high-productivity, high-markdown firms through strategic interaction, with general equilibrium implications.

Parameter	Description	Value
η	The elasticity of labor supply	0.59
β	Marginal utility of the public good	2
J	Number of firms in the economy	6
ϕ	Level of portfolio diversification	0.125
λ	"Effective Sympathy" coefficient	0.049
γ	Fixed cost of shifting profits	0.01
τ_x	Tax rate paid in the tax haven	0.04
τ_l	Tax rate paid in the large country	0.21
κ	Weight on households' welfare	0.5

Table 1 Baseline parameters

The baseline scenario is calibrated with values reported in Table 1. Following Chetty et al. (2011), the elasticity of labor supply, η, is 0.59. The public good marginal utility, β, is set such that the government always has the incentive to provide the public good, as in Krautheim and Schmidt-Eisenlohr (2011). For common ownership, the lowest value for the competition policy exercise in Azar and Vives (2021) is taken. The order of firms' productivities is $A_1 < ... < A_j < ... < A_J$. Tax rates for the large country and tax haven are taken from Dharmapala and Hines Jr (2009).[32]

3.4 Market structure and profit shifting

Figure 2 reports key variables as a function of the level of common ownership. The shaded areas represent internal equilibria, i.e. where $0 < J_l^* < J$. As shown in panel (a), the market share is increasingly allocated to more productive firms at the expense of least productive, when common ownership rises.[33] Consequently, the number of firms that locate profits in the large country

[32] Specifically, the average tax rate faced by US firms in haven countries is taken for the baseline tax rate imposed by the tax haven, τ_x. Similarly, the average tax rate faced by US firms in non haven countries is taken for the baseline tax rate imposed by the large country. In Dharmapala and Hines Jr (2009), the tax rate is defined as the minimum between the average effective tax rate for US firms in the sample and the country's statutory corporate tax rate.

[33] In internal equilibria, the market share of high-productivity firms is decreasing when less productive becomes sufficiently profitable and shift their profits to the tax haven, due to general equilibrium effects on wages, up to the point in which all firms virtually shift profits to subsidiaries.

and their aggregate market share, reported in panel (b), decrease with common ownership. The mechanism behind is that increased common ownership leads to a reallocation of market share from low-productivity, low-markdown firms to high-productivity, high-markdown firms. Such reallocation results in heightened market concentration, higher firms' profits that are further shifted toward the tax haven. In other words, higher market concentration correlates with more firms shifting profits and a larger market share being virtually shifted to subsidiaries in the tax haven by more productive firms.[34]

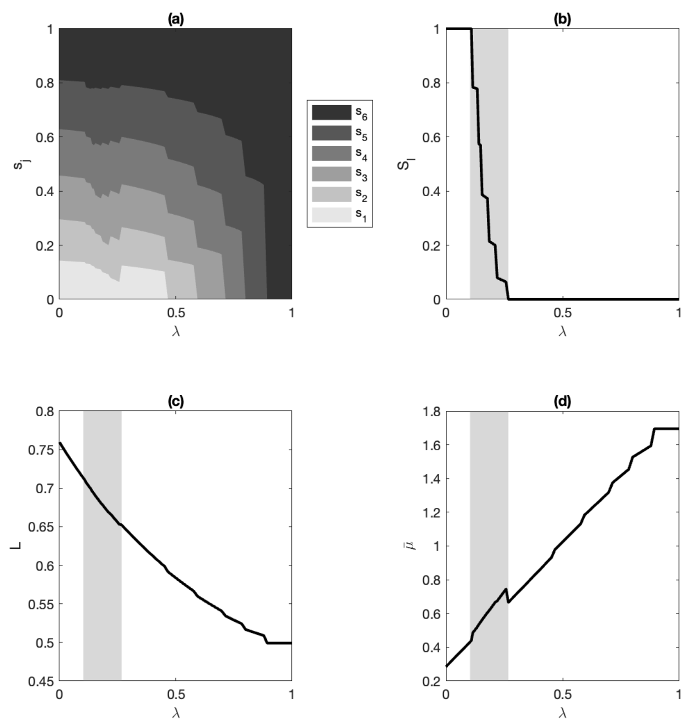

Fig. 2 Comparative statics with respect to common ownership, λ. Panel (a) reports the market share of firms; (b) the aggregate market share of firms locating profits in the large country; (c) the total level of employment; (d) reports the weighted average markdown. The shaded area represents internal equilibria, i.e. $J_l^* \in (0, J)$.

[34]The results according to which high-productivity and larger firms are those engaging in profit shifting is in line with Wier and Erasmus (2023), for example.

Through general equilibrium effects, the total employment in the economy, reported in panel (c), decreases in the level of common ownership. Since high-productivity firms exert more market power over workers and demand less labor, the rise in concentration leads to a contraction of the equilibrium total employment. Finally, panel (c) reports the weighted average markdown for each level of common ownership.[35] Without profit shifting, the weighted average markdown is linearly increasing in the level of common ownership. Notably, the possibility for firms to shift profits creates a discontinuity in the relationship. When the concentration level is such that some firms locate profits in the large country and others in the tax haven (i.e., $J_l^* \in (0, J)$), the average markdown jumps upward because a larger share of economic activity is shifted to high-markdown firms.[36] The results demonstrate the general equilibrium effects of common ownership and the role profit shifting has in distorting such impacts.

3.4.1 Autarky and profit shifting.

To better illustrate the distortion caused by profit shifting, this section compares equilibrium outcomes between two scenarios: the autarky case where firms cannot shift profits, represented by the solid line in figure 3, and the economic integration scenario where firms can shift their profits, represented by the dashed line. Figure 3 shows that for a sufficiently high level of common ownership, the number of active firms, panel (a), in the autarchic economy is higher compared to the integrated economies scenario. In equilibrium, to maintain a positive market share, the minimum productivity of a firm locating profits in the tax haven is higher than the minimum productivity of a firm locating profits in the large country, due to the fixed cost. At certain levels of concentration and market power, shifting profits may be advantageous even for low-productivity firms. However, if concentration and market power increase further, for these firms is optimal to exit the market, leave their market share to more productive ones, and capitalize through ownership.

Moreover, if profit shifting is allowed, the equilibrium employment, reported in panel (b), is lower than the autarchic economy when the level of common ownership is such that (i) the equilibrium

[35]The average markdown is weighted by firms' market share, i.e. $\bar{\mu} \equiv \sum_{j=1}^{J} s_j \mu_j$.

[36]The spikes are associated with profit shifting (shaded area, for relatively low values of λ) and the stop in the production of less productive firms (for relatively high values of λ).

is internal, (ii) the least productive firms exit the market. In internal equilibria, total employment is lower because a larger market share is allocated to high-productivity, high-markdown firms that demand less labor.[37]

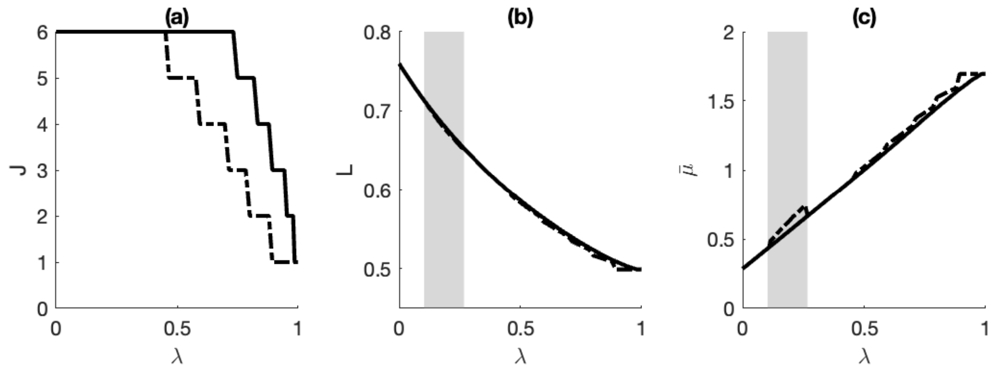

Fig. 3 Comparative statics with respect to common ownership, in autarky (solid line) and with economic integration (dashed line). Panel (a) reports the number of active firms, i.e. firms with a positive market share; (b) the total level of employment; and (c) the weighted average markdown. The shaded area represents internal equilibria, i.e. $J_l^* \in (0, J)$.

Finally, panel (c) reports the weighted average markdown and demonstrates how profit shifting endogenously increases economy-wide firms' market power coherent with the evidence in Martin et al. (2021). The average markdown is higher in internal equilibria and when less productive firms exit. Namely, in an internal equilibrium the difference is due to the distorted reallocation of market share to high-productivity, high-markdown firms that exploit the cost advantage on taxation.[38]

3.4.2 The role of competitors.

The theoretical framework provides a means to explore an additional dimension through which market structure influences competition, distinct from the common ownership channel, that is the number of competitors within the economy. Figure 4 illustrates two scenarios: the dashed line represents the case with 6 firms, while the solid line corresponds to the case with 12 firms.[39] An

[37]The same applies for levels of common ownership such that least productive firms exit, at the end of the lambda distribution.

[38]Whereas, for relatively high levels of concentration ($\lambda > 0.47$), the difference is driven by least productive firms exiting the market and leaving market share to high-productivity, high-markdown firms.

[39]The calibration is such that the average productivity across scenarios remains constant.

exogenous reduction in the number of competitors constitutes another key aspect of the changing market structure, as it reduces competition while increasing concentration.

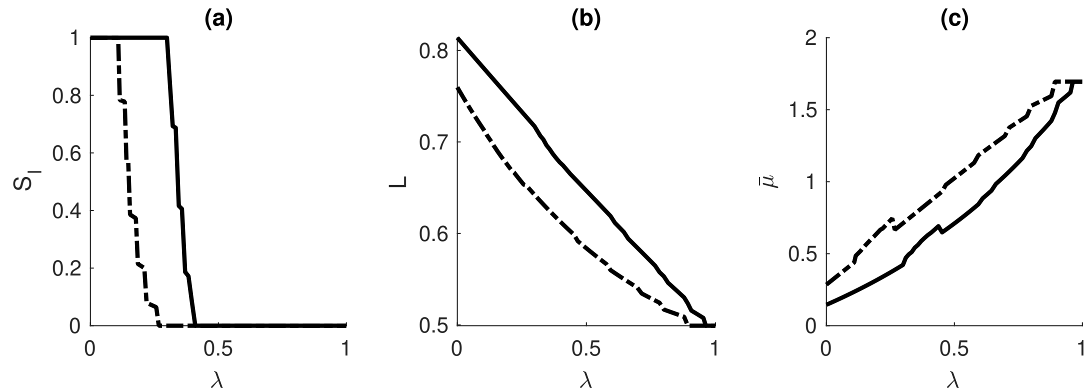

Fig. 4 Common ownership and the number of competitors, J. Panel (a) reports the aggregate market share of firms' locating profits in the large country, S_l; (b) the level of total employment; and (c) weighted average markdown. The solid line represents the scenario with 12 firms in the economy, the dashed line that with 6 firms.

The aggregate market share of firms locating profits in the large country, panel (a), decreases with common ownership, and given a level of common ownership is higher when there are more competitors. Total employment, in panel (c), which corresponds to total production in the model, is higher when more firms compete in the same market. In the latter case, the demand for labor is higher and the intersection with supply results in higher total employment. The difference shrinks as the concentration grows: less productive firms exit and the number of active firms converges in both scenarios up to the point the most productive firm serves the entire market. Therefore, market power exerted by firms is lower when there are more competitors in the same market, as shown in panel (c). The mechanism leading to this result is based on the labor market competition: more firms imply higher demand for labor that turns into a higher equilibrium real wage and total employment.

The research questions can be now addressed. First, how does the economy's market structure influence firms' incentives to shift profits? Profit-shifting incentives intensify with concentrated markets and reduced competition, either through an increase in common ownership or a decrease in the number of competitors. Greater concentration of firm ownership, i.e. common ownership, enhances market power through the reallocation of market share toward high-productivity, high-markdown firms. Such reallocation leads to higher profits and an increase in tax avoidance practices. Qualitatively similar results arise when competition declines due to a reduction in the number of competitors, as highly productive, high-markdown firms gain larger market shares, exert greater market power, and accumulate more profits to shift abroad. Thus, any change in market structure that weakens competition results in heightened profit-shifting incentives. Second, does profit shifting affect the level of market power in the economy? Indeed, the level of market power is higher in the integrated economies scenario compared to the autarchic economy. When firms shift profits, they gain a competitive advantage over those paying taxes domestically. This advantage comes from access to the cost-saving technology, which is available only to highly productive firms that bear the fixed costs of shifting profits. This advantage exacerbates the reallocation of market share from less productive, low-markdown firms—unable to access profit-shifting technology—toward more productive, high-markdown firms. As high-productivity, high-markdown firms demand less labor, the economy's weighted average markdown increases, reflecting a decrease in competition.[40]

3.5 Market structure and international tax competition

This section examines the equilibrium effects of exogenous changes in market structure, specifically shifts in ownership structure, by considering endogenous tax rates and the corresponding optimal strategies of governments. Therefore, it addresses the following research question: does the economy's market structure affect international tax competition?

Figure 5 illustrates governments' best replies as a function of common ownership, and consequently, different degrees of concentration and competition. Notably, in all three scenarios, the governments' best reply functions intersect at a single point, corresponding to $\tau_x = 0$ and the large country setting the maximum tax rate that ensures all firms pay taxes domestically. Maximizing the welfare leads the large country's government to tax them as much as possible while preventing any firm from shifting profits. Through taxation, the government collects revenues necessary to

[40]Appendix K discusses whether changes in agents' preferences produce results that are qualitatively to shifts in market structure, i.e. changes in common ownership or the number of competitors.

produce the public good. Given that the public good yields an higher marginal utility than the private one, the consumption of the former produces greater welfare. For this reason, the government is willing to extract profits from firms and employ those to produce the public good.

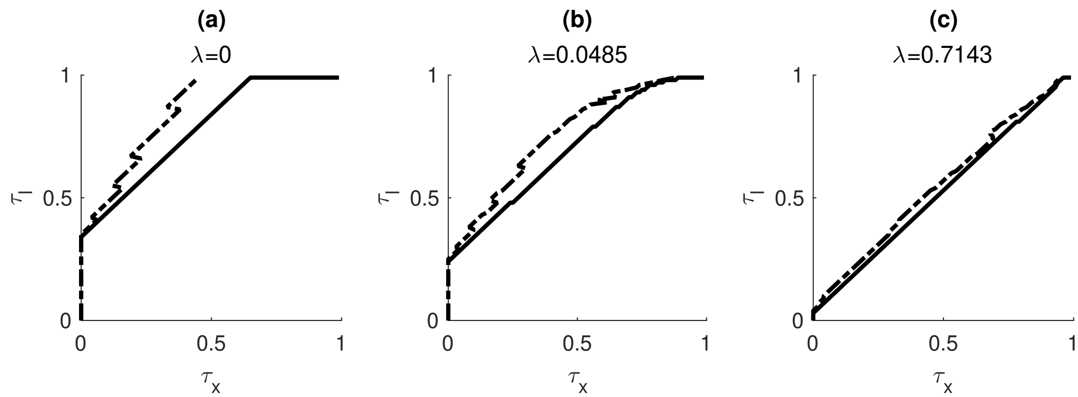

Fig. 5 Equilibrium tax rates and common ownership. Governments' best replies: large country (blue solid line) and tax haven (orange solid line). Plots for three different levels of common ownership in the economy: (i) $\lambda = 0$ implying no common ownership, each firm behaves independently to the others; (ii) moderate level of common ownership with $\lambda = 0.0485$; (iii) high concentration with $\lambda = 0.7143$

Why does the large country's government aim to prevent profit shifting? In principle, lower taxation increases the resources available to firms. However, firms, on aggregate, are worse off with profit shifting because their aggregate profits decrease due to the investment in the fixed cost to open the subsidiary in the tax haven. Lower profits imply smaller owners' consumption and welfare. On the other hand, workers are worse off with profit shifting as well, because market share reallocates toward high-markdown firms which exert more market power and lower the equilibrium real wage. In other words, firms' demand for labor falls due to the reallocation of economic activity, and so does the workers' wage. Profit shifting increases the wedge between the marginal product of labor and the wage, which hurts workers' consumption and, thus, welfare. To sum up, by preventing profit shifting, the large country government preserves the welfare of owners and workers. Owners' welfare is preserved by preventing firms from incurring costs to shift profits abroad, which would result in reduced aggregate profits. Conversely, workers' welfare is preserved by minimizing the markdown.

Why does an increase in common ownership intensify competition between governments to attract or retain capital? Among other effects, greater concentration leads to larger profits. Larger profits heighten firms' incentives to shift them to tax havens, making such investments more appealing. At the same time, higher profits fuel competition between governments seeking to capture greater tax revenues. Specifically, as common ownership rises, the large country is compelled to further reduce its tax rate to discourage firms from shifting profits abroad. As a result, the equilibrium tax rate set by the large country declines as concentration increases coherently with the observed trends in figure 1. To illustrate, when there is no common ownership (i.e., $\lambda = 0$; panel a), the equilibrium tax rates are $\tau_l = 0.34$ and $\tau_x = 0$. With a low level of common ownership (i.e., $\lambda \simeq 0.04$; panel b), the equilibrium tax rates shift to $\tau_l = 0.24$ and $\tau_x = 0$. Finally, with a high level of common ownership (i.e., $\lambda \simeq 0.71$; panel c), the equilibrium tax rates drop to $\tau_l = 0.03$ and $\tau_x = 0$.

4 Conclusions

Since the 1980s, firms' market power has increased, leading to a rise in the market share and profits of more productive firms. Concurrently, CIT rates have steadily decreased globally, reflecting fierce competition to attract corporate profits. This paper proposed a general equilibrium theory, consistent with such secular trends, to investigate the mechanism behind and the interplay between market structure, profit shifting and international tax competition. Unlike the existing literature, the employed theoretical framework allows to disentangle agents' preferences and market structure as empirically relevant drivers of competition. Notably, the findings show that profit shifting distorts the reallocation of market share toward high-productivity, high-market power firms,, thereby increasing the economy-level of market power.

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Appendix A Declining CIT rates

Figure 6 reports the average CIT rates for havens and non-havens according to the classification in OECD (2000). It is noted that despite the different classification employed, CIT are decreasing for both groups of countries.

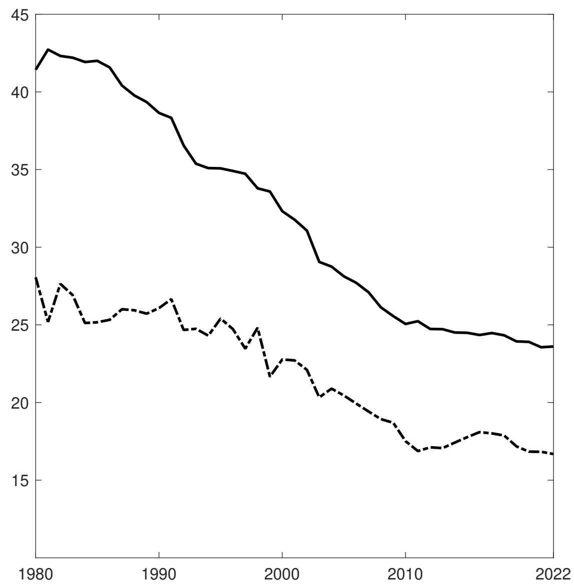

Fig. 6 Average CIT rates of havens and non-havens according to OECD (2000) from 1980 to 2022, in percentage. The solid line represents the average CIT rates of non-haven countries, the dashed line the average CIT rates of haven countries. Source: Enache (2022)

Appendix B Managers objective function

Recalling managers' objective function

$$(1-\phi+\frac{\phi}{J})\left[(1-\phi+\frac{\phi}{J})(1-\tau)\pi_j+\frac{\phi}{J}\sum_{k\neq j}(1-\tau)\pi_k\right] \\ +\sum_{k\neq j}\frac{\phi}{J}\left[(1-\phi+\frac{\phi}{J})(1-\tau)\pi_k+\frac{\phi}{J}\sum_{s\neq k}(1-\tau)\pi_s\right], \tag{29}$$

we can collect π_j, considering that groups $k \neq j$ have a share equal to ϕ/J in firm j, and π_k, considering that group j but also groups s have a ϕ/J share in firm k, we obtain

$$\begin{aligned} &\left[\left(1-\phi+\frac{\phi}{J}\right)^2+(J-1)\left(\frac{\phi}{J}\right)^2\right](1-\tau)\pi_j \\ +&\left[2\left(\frac{\phi}{J}\right)\left(1-\phi+\frac{\phi}{J}\right)+(J-2)\left(\frac{\phi}{J}\right)^2\right]\sum_{k\neq j}(1-\tau)\pi_k. \end{aligned} \tag{30}$$

Dividing the above by the expression in squared brackets before the after-tax profits of firm j as

$$(1-\tau)\pi_j+\frac{\left[2\left(\frac{\phi}{J}\right)\left(1-\phi+\frac{\phi}{J}\right)+(J-2)\left(\frac{\phi}{J}\right)^2\right]}{\left[\left(1-\phi+\frac{\phi}{J}\right)^2+(J-1)\left(\frac{\phi}{J}\right)^2\right]}\sum_{k\neq j}(1-\tau)\pi_k. \tag{31}$$

and simplifying we obtain

$$(1-\tau)\pi_j+\underbrace{\frac{(2-\phi)\phi}{(1-\phi)^2J+(2-\phi)\phi}}_{\lambda}\sum_{k\neq j}(1-\tau)\pi_k. \tag{32}$$

Appendix C Proof of equilibrium existence

This section proves the conditions for the equilibrium existence when profit shifting is introduced in the heterogeneous firms' version of the model in Azar and Vives (2021). The objective of the firm's manager, conditional on profits located in the tax haven, is to maximize

$$\max_{L_{jx}}\zeta: \quad (1-\tau_x)[A_jL_{jx}-\omega(L)L_{jx}]-\gamma \tag{33a}$$

$$+\lambda\sum_{k\neq j}(1-\tau_l)(A_kL_{kl}-\omega(L)L_{kl}) \tag{33b}$$

$$+\lambda\sum_{k\neq j}[(1-\tau_x)(A_kL_{kx}-\omega(L)L_{kx})-\gamma]. \tag{33c}$$

The first derivative is given by

$$\frac{\partial \zeta}{\partial L_{jx}} : (1-\tau_x)[A_j - \omega] - \omega' \left\{ (1-\tau_x)L_{jx} + \lambda \left[(1-\tau_l) \sum_{k \neq j} (L_{kl}) + (1-\tau_x) \sum_{k \neq j} (L_{kx}) \right] \right\}; \tag{34}$$

where the best response of firm j depends on other firms' aggregate response and tax rates. The cross derivative is given by

$$\begin{aligned} \frac{\partial^2 \zeta}{\partial L_{jx} \partial L_m} &: -\omega'[(1-\tau_x) + \lambda(1-\tau_x) + \lambda(1-\tau_l)] \\ &\quad - \omega''\{(1-\tau_x)L_{jx} + \lambda(1-\tau_l)\sum_{k \neq j} L_{kl} + \lambda(1-\tau_x)\sum_{k \neq j} L_{kx}\}. \end{aligned} \tag{35}$$

Denoting $s_{jx} \equiv L_{jx}/L$, without loss of generality, it is possible to rewrite it as

$$\begin{aligned} \frac{\partial^2 \zeta}{\partial L_{jx} \partial L_m} &: -[(1-\tau_x) + \lambda(1-\tau_x) + \lambda(1-\tau_l)] \\ &\quad - \frac{\omega''}{\omega'} L\{(1-\tau_x)s_{jx} + \lambda(1-\tau_l)\sum_{k \neq j} s_{kl} + \lambda(1-\tau_x)\sum_{k \neq j} s_{kx}\}. \end{aligned} \tag{36}$$

If $E_{\omega'} \equiv -\omega'' L/\omega' < 1$ then the cross derivative is negative because

$$[(1-\tau_x) + \lambda(1-\tau_x) + \lambda(1-\tau_l)] > \{(1-\tau_x)s_{jx} + \lambda(1-\tau_l)\sum_{k \neq j} s_{kl} + \lambda(1-\tau_x)\sum_{k \neq j} s_{kx}\}, \tag{37}$$

provided that $\tau_x, \tau_l \in [0,1]$ and $\lambda \in [0,1)$. The same holds for the maximization of a firm locating profits in the large country. As in Azar and Vives (2021), Theorem 2.7 of Vives (1999) ensures the existence of an equilibrium.

Appendix D Firms' maximization problem

The objective of a firm's manager is to choose the level of labor L_j and location a_j that maximize a weighted average of its shareholders' indirect utilities. This section proceeds with the derivation of the optimal response by taking the location of profits as given.

D.1 Profits located in the large country

Provided that firm j's profits are located in the large country, recall the manager's maximization problem

$$\max_{L_{jl}} \quad (1-\tau_l)[A_j L_{jl} - \omega(L) L_{jl}] \tag{38a}$$

$$+ \lambda \sum_{k \neq j} [(1-\tau_l)(A_k L_{kl} - \omega(L) L_{kl})] \tag{38b}$$

$$+ \lambda \sum_{k \neq j} [(1-\tau_x)(A_k L_{kx} - \omega(L) L_{kx}) - \gamma]. \tag{38c}$$

Considering there is a finite number of firms, large relative to the economy, their decision about the level of input to employ affects the aggregate demand of labor and equilibrium real wage. While taking the first derivative, must be considered that the real wage $\omega(L)$ depends on aggregate labor and in turn it depends on L_{jl} too. Thus, the FOC is given by

$$(1-\tau_l)[A_j - \omega' L_{jl} - \omega] - \lambda \left[(1-\tau_l) \sum_{k \neq j} (\omega' L_{kl}) + (1-\tau_x) \sum_{k \neq j} (\omega' L_{kx}) \right]. \tag{39}$$

Collecting ω'

$$(1-\tau_l)[A_j - \omega] - \omega' \left\{ (1-\tau_l) L_{jl} + \lambda \left[(1-\tau_l) \sum_{k \neq j} (L_{kl}) + (1-\tau_x) \sum_{k \neq j} (L_{kx}) \right] \right\}; \tag{40}$$

dividing by $1-\tau_l$ and ω

$$\frac{A_j - \omega}{\omega} = \frac{\omega'}{\omega} \left\{ L_{jl} + \lambda \left[\sum_{k \neq j} (L_{kl}) + \frac{1-\tau_x}{1-\tau_l} \sum_{k \neq j} (L_{kx}) \right] \right\}, \tag{41}$$

Denoting the market share of firm j locating profits in the large country as $s_{jl} \equiv L_{jl}/L$, multiplying and dividing the right hand side by L

$$\frac{A_j - \omega}{\omega} = \frac{\omega'}{\omega} L \left\{ s_{jl} + \lambda \left[\sum_{k \neq j} (s_{kl}) + \frac{1-\tau_x}{1-\tau_l} \sum_{k \neq j} (s_{kx}) \right] \right\}. \tag{42}$$

where $\omega' L/\omega = 1/\eta$ is the inverse of the labor supply elasticity. Solving for ω

$$\omega = \frac{\eta A_j}{s_{jl} + \lambda\left[\sum_{k\neq j} s_{kl} + \frac{1-\tau_x}{1-\tau_l}\sum_{k\neq j} s_{kx}\right] + \eta}. \tag{43}$$

Defining $S_l \equiv \sum_{k\neq j} s_{kl}$ as the market share of firms that allocate profits in the large country, the inverse demand of labor for firm j becomes

$$\omega = \frac{\eta A_j}{s_{jl}(1-\lambda) + \lambda\left[\frac{1-\tau_x}{1-\tau_l} + S_l(\frac{\tau_x-\tau_l}{1-\tau_l})\right] + \eta}. \tag{44}$$

To find the market share of the representative firm j, which locates profits in the large country, its inverse demand of labor has to be equal to the inverse demand of another representative firm k locating profits in the large country too, hence

$$\frac{\eta A_j}{s_{jl}(1-\lambda) + \lambda\left[S_l + \frac{1-\tau_x}{1-\tau_l}(1-S_l)\right] + \eta} = \frac{\eta A_k}{s_{kl}(1-\lambda) + \lambda\left[S_l + \frac{1-\tau_x}{1-\tau_l}(1-S_l)\right] + \eta}. \tag{45}$$

Summing across all k paying taxes at home and solving for s_{jl}

$$s_{jl} = S_l\left[\frac{A_j}{\bar{A}_l J_l} + \left(\frac{A_j}{\bar{A}_l} - 1\right)\left(\frac{\lambda\left(\frac{\tau_x-\tau_l}{1-\tau_l}\right)}{1-\lambda}\right)\right] + \left(\frac{A_j}{\bar{A}_l} - 1\right)\left(\frac{\lambda\left(\frac{1-\tau_x}{1-\tau_l}\right)+\eta}{1-\lambda}\right), \tag{46}$$

where J_l is the number of firms locating profits in the large country and $\bar{A}_l = \sum_{k=1}^{J_l} s_{kl}/J_l$ is the average productivity in the large country. Plugging the market share s_{jl} into the inverse demand of firms locating profits to the large country

$$\omega = \frac{\eta \bar{A}_l}{S_l\left[\frac{1-\lambda}{J_l} + \lambda(\frac{\tau_x-\tau_l}{1-\tau_l})\right] + \lambda(\frac{1-\tau_x}{1-\tau_l}) + \eta}. \tag{47}$$

D.2 Profits located in the tax haven

Analogously, the maximization problem of the manager provided that firm j locates profits into the tax haven is

$$\max_{L_{jx}} \quad (1-\tau_x)[A_j L_{jx} - \omega(L)L_{jx}] - \gamma \tag{48a}$$

$$+ \lambda \sum_{k \neq j} [(1-\tau_l)(A_k L_{kl} - \omega(L)L_{kl})] \tag{48b}$$

$$+ \lambda \sum_{k \neq j} [(1-\tau_x)(A_k L_{kx} - \omega(L)L_{kx}) - \gamma]. \tag{48c}$$

The FOC is given by

$$(1-\tau_x)[A_j - \omega' L_{jx} - \omega] - \lambda \left[(1-\tau_l) \sum_{k \neq j} (\omega' L_{kl}) + (1-\tau_x) \sum_{k \neq j} (\omega' L_{kx}) \right]. \tag{49}$$

Following the same manipulations as from equation (39) to equation (44), the inverse demand of labor for a firm locating profits into the tax haven becomes

$$\omega = \frac{\eta A_j}{s_{jx}(1-\lambda) + \lambda \left[S_l (\frac{\tau_x - \tau_l}{1-\tau_x}) + 1 \right] + \eta}. \tag{50}$$

Comparing the inverse demand of two representative firms locating profits in the tax haven, summing across all firms paying taxes abroad and solving for s_{jx} leads to

$$s_{jx} = S_l \left[\left(\frac{A_j}{\bar{A}_x} - 1 \right) \left(\frac{\lambda \left(\frac{\tau_x - \tau_l}{1-\tau_l} \right)}{1-\lambda} \right) - \frac{A_j}{\bar{A}_x (J - J_l)} \right] + \frac{A_j}{\bar{A}_x (J - J_l)} + \left(\frac{A_j}{\bar{A}_x} - 1 \right) \left(\frac{\lambda + \eta}{1-\lambda} \right), \tag{51}$$

where $\bar{A}_x = \sum_{k \neq j} s_{kx}/(J - J_l)$ is the average productivity of firms locating profits in the tax haven. Plugging the market share s_{jx} into the inverse demand of firms locating profits to the tax haven

$$\omega = \frac{\eta \bar{A}_x}{S_l \left[\frac{\tau_x - \tau_l}{1-\tau_x} - \frac{1-\lambda}{J-J_l} \right] + \frac{1-\lambda}{J-J_l} + \eta + \lambda}. \tag{52}$$

D.3 Aggregate market shares

To find the aggregate market share of the large country S_l, in a candidate equilibrium where firms locate profits in both countries, the two inverse demands for labor has to be equal, hence

$$\frac{\eta \bar{A}_l}{S_l\left[\frac{1-\lambda}{J_l} + \lambda(\frac{\tau_x - \tau_l}{1-\tau_l})\right] + \lambda(\frac{1-\tau_x}{1-\tau_l}) + \eta} = \frac{\eta \bar{A}_x}{S_l\left[\frac{\tau_x-\tau_l}{1-\tau_x} - \frac{1-\lambda}{J-J_l}\right] + \frac{1-\lambda}{J-J_l} + \eta + \lambda}. \tag{53}$$

Solving for S_l

$$S_l = \frac{\bar{A}_l\left(\frac{1-\lambda}{J-J_l} + \eta + \lambda\right) - \bar{A}_x\left(\lambda\frac{1-\tau_x}{1-\tau_l} + \eta\right)}{\bar{A}_x\left[\frac{1-\lambda}{J_l} + \lambda\left(\frac{\tau_x-\tau_l}{1-\tau_l}\right)\right] - \bar{A}_l\left[\lambda\left(\frac{\tau_x-\tau_l}{1-\tau_l}\right) - \left(\frac{1-\lambda}{J-J_l}\right)\right]}. \tag{54}$$

The aggregate market share of firms locating profits in the tax haven is $S_x = 1 - S_l$.

Appendix E Proof of Proposition 1

Recall the expression for the aggregate market share of firms paying taxes domestically

$$S_l = \frac{\bar{A}_l\left(\frac{1-\lambda}{J-J_l} + \eta + \lambda\right) - \bar{A}_x\left(\lambda\frac{1-\tau_x}{1-\tau_l} + \eta\right)}{\bar{A}_x\left[\frac{1-\lambda}{J_l} + \lambda\left(\frac{\tau_x-\tau_l}{1-\tau_l}\right)\right] - \bar{A}_l\left[\lambda\left(\frac{\tau_x-\tau_l}{1-\tau_l}\right) - \left(\frac{1-\lambda}{J-J_l}\right)\right]}. \tag{55}$$

Defining the numerator as Γ and the denominator as Θ, the first derivative of the above expression with respect to the level of common ownership, i.e. λ, taking fixed J_l, is

$$\frac{\partial S_l}{\partial \lambda} = \frac{\frac{\partial \Gamma}{\partial \lambda}\Theta - \frac{\partial \Theta}{\partial \lambda}\Gamma}{\Theta^2}, \tag{56}$$

where

$$\frac{\partial \Gamma}{\partial \lambda} = \frac{-\bar{A}_l}{J-J_l} + \bar{A}_l - \bar{A}_x\left(\frac{1-\tau_x}{1-\tau_l}\right) < 0, \tag{57}$$

provided Lemma 2 and that more productive firms self-select into profit shifting, i.e. $\bar{A}_x > \bar{A}_l$, and

$$\frac{\partial \Theta}{\partial \lambda} = \frac{-\bar{A}_x}{J_l} + \bar{A}_x \left(\frac{\tau_x - \tau_l}{1 - \tau_l} \right) - \bar{A}_l \left(\frac{\tau_x - \tau_l}{1 - \tau_l} \right) + \frac{\bar{A}_l}{J - J_l} > 0. \tag{58}$$

Provided Assumption 1 and given that both the numerator and denominator are positive, it follows that

$$\frac{\partial S_l}{\partial \lambda} < 0 \tag{59}$$

Appendix F Proof of Proposition 2

In equilibrium, all firms can adjust their individual demand for labor, i.e. L_k, and the location of their profits, i.e. a_k. Both dimensions have an impact on general equilibrium variables such as the total employment, i.e. L, and the real wage paid to workers, i.e. ω. Therefore, while deciding to move profits to the tax haven, a generic firm j knows that its labour demand will possibly change, i.e. $L_j \neq L_j^{'}$, but also the demand of the other firms, i.e. $L_k \neq L_k^{'}$ for $k \neq j$, and their location of profits which all together influence the real wage, i.e. $\omega \neq \omega^{'}$, the total employment, i.e. $L \neq$ and the number of firms paying taxes at home, i.e. $J_l^{*'} \neq J_l^{*}$. The condition that determines the decision about the location of firm j profits is

$$(1-\tau_x)(A_j L_j^{'} - \omega^{*'} L_j^{'}) - \gamma + \lambda \left\{ \sum_{k=1}^{J_l^{*'}} (1-\tau_l)(A_j L_k^{'} - \omega^{*'} L_k^{'}) + \sum_{k=J_l^{*'}+1}^{J} (1-\tau_x)(A_j L_k^{'} - \omega^{*'} L_k^{'}) - \gamma \right\} >$$
$$(1-\tau_l)(A_j L_j - \omega^{*} L_j) + \lambda \left\{ \sum_{k=1}^{J_l^{*}} (1-\tau_l)(A_j L_k - \omega^{*} L_k) + \sum_{k=J_l^{*}+1}^{J} (1-\tau_x)(A_j L_k - \omega^{*} L_k) - \gamma \right\}.$$

In order to solve for the fixed cost

$$\gamma < (1-\tau_x)(A_j L_j^{'} - \omega^{*'} L_j^{'}) + \lambda \left\{ \sum_{k=1}^{J_l^{*'}} (1-\tau_l)(A_j L_k^{'} - \omega^{*'} L_k^{'}) + \sum_{k=J_l^{*'}+1}^{J} (1-\tau_x)(A_j L_k^{'} - \omega^{*'} L_k^{'}) - \gamma \right\}$$
$$-(1-\tau_l)(A_j L_j - \omega^* L_j) - \lambda \left\{ \sum_{k=1}^{J_l^*} (1-\tau_l)(A_j L_k - \omega^* L_k) + \sum_{k=J_l^*+1}^{J} (1-\tau_x)(A_j L_k - \omega^* L_k) - \gamma \right\},$$

and rearranging

$$\gamma < [(1-\tau_x)(A_j L_j^{'} - \omega^{*'} L_j^{'}) - (1-\tau_l)(A_j L_j - \omega^* L_j)] +$$
$$\lambda\{[\sum_{k=1}^{J_l^{*'}} (1-\tau_l)(A_j L_k^{'} - \omega^{*'} L_k^{'}) + \sum_{k=J_l^{*'}+1}^{J} (1-\tau_x)(A_j L_k^{'} - \omega^{*'} L_k^{'}) - \gamma] -$$
$$[\sum_{k=1}^{J_l^*} (1-\tau_l)(A_j L_k - \omega^* L_k) + \sum_{k=J_l^*+1}^{J} (1-\tau_x)(A_j L_k - \omega^* L_k) - \gamma]\}.$$

Moving the fixed cost to the L.H.S.

$$\gamma[1 - \lambda(J_l^{*'} - J_l^*)] < [(1-\tau_x)(A_j L_j^{'} - \omega^{*'} L_j^{'}) - (1-\tau_l)(A_j L_j \omega^* L_j)] +$$
$$\lambda\{[\sum_{k=1}^{J_l^{*'}} (1-\tau_l)(A_j L_k^{'} - \omega^{*'} L_k^{'}) + \sum_{k=J_l^{*'}+1}^{J} (1-\tau_x)(A_j L_k^{'} - \omega^{*'} L_k^{'})] -$$
$$[\sum_{k=1}^{J_l^*} (1-\tau_l)(A_j L_k - \omega^* L_k) + \sum_{k=J_l^*+1}^{J} (1-\tau_x)(A_j L_k - \omega^* L_k)]\}.$$

Defining firm j's after-tax profits as $\Delta\pi_j \equiv (1-\tau_x)\pi_{jx}^{*'} - (1-\tau_l)\pi_{kl}^*$, and the differential of the other firms' after-tax profits, weighted by the λ coefficient as $\Delta\pi_k \equiv \{[(1-\tau_l)\pi_{kl}^{*'} + (1-\tau_x)\pi_{kx}^{*'}] - [(1-\tau_l)\pi_{kl}^* + (1-\tau_x)\pi_{kx}^*]\}$, it is possible to rewrite the above expression as

$$\gamma < \frac{\Delta\pi_j + \lambda \sum_{k \neq j} \Delta\pi_k}{1 - \lambda(J_l^{*'} - J_l^*)}. \tag{60}$$

Appendix G Proof of Lemma 1

When $J_l^* = J$ and $J_l^* = 0$, firms' production plans are independent of taxation and markdown and level of total employment are the same as Azar and Vives (2021). Now, this section shows the equilibrium characterization when all firms locate their profits in the large country, i.e. $J_l^* = J$, and proves that the equilibrium is independent of taxation. The same applies to the case where all firms locate profits in the tax haven.

The maximization problem of a firms manager becomes

$$\max_{L_{jl}} \quad (1-\tau_l)[A_j L_{jl} - \omega(L)L_{jl}] + \lambda \sum_{k \neq j} [(1-\tau_l)(A_k L_{kl} - \omega(L)L_{kl})], \tag{61}$$

because there are no firms placing profits in the tax haven. Thus FOC is given by

$$(1-\tau_l)[A_j - \omega' L_{jl} - \omega] - \lambda \sum_{k \neq j} (1-\tau_l)(\omega' L_{kl}). \tag{62}$$

Collecting ω'

$$(1-\tau_l)[A_j - \omega] - \omega' \left[(1-\tau_l)L_{jl} + \lambda(1-\tau_l) \sum_{k \neq j} (L_{kl}) \right]; \tag{63}$$

dividing by $1-\tau_l$ and ω

$$\frac{A_j - \omega}{\omega} = \frac{\omega'}{\omega} \left[L_{jl} + \lambda \sum_{k \neq j} L_{kl} \right], \tag{64}$$

where tax rates are cancelled out since all firms are subject to the same tax rate. Denoting the market share of firm j as $s_{jl} \equiv L_{jl}/L$, multiplying and dividing the right hand side by L

$$\frac{A_j - \omega}{\omega} = \frac{\omega'}{\omega} L \left[s_{jl} + \lambda \sum_{k \neq j} s_{kl} \right]. \tag{65}$$

where $\omega' L/\omega = 1/\eta$ is the inverse of the labor supply elasticity. Note that $\sum_{k \neq j} s_{kl} = 1 - s_{jl}$, since all firms locate profits in the large country and $\sum_{k \neq j} s_{kx} = 0$. Without loss of generality, it is possible to drop the subscripts indicating the location a_j since it is equal for all firms. Solving for ω

$$\omega = \frac{\eta A_j}{s_j + \lambda(1 - s_j) + \eta}. \tag{66}$$

To find the market share of the representative firm j, its inverse demand of labor must be equal to the inverse demand of another representative firm k:

$$\frac{\eta A_j}{s_j + \lambda(1 - s_j) + \eta} = \frac{\eta A_k}{s_k + \lambda(1 - s_k) + \eta}. \tag{67}$$

Summing across all k and solving for s_j

$$s_j = \frac{1}{J}\frac{A_j}{\bar{A}} + \left[\frac{A_j}{\bar{A}} - 1\right]\left(\frac{\eta + \lambda}{1 - \lambda}\right). \tag{68}$$

where $\bar{A} = \sum_{k=1}^{J} A_k/J$ is the average productivity. Plugging the market share s_j into the inverse demand of labor

$$\omega = \frac{\eta \bar{A}}{\eta + \lambda + \frac{1}{J}(1 - \lambda)}. \tag{69}$$

Equating the inverse demand and the inverse supply of labor

$$L^{1/\eta} = \frac{\eta \bar{A}}{\eta + \lambda + \frac{1}{J}(1 - \lambda)}, \tag{70}$$

and the total level of employment is

$$L^* = \left[\frac{\eta \bar{A}}{\eta + \lambda + (1 - \lambda)/J}\right]^{\eta}. \tag{71}$$

Whereas, the markdown of real wages for firm j is

$$\mu_j \equiv \frac{A_j - \omega(L^*)}{\omega(L^*)} = \frac{s_j^* + \lambda(1 - s_j^*)}{\eta}. \tag{72}$$

Appendix H Proof of Proposition 4

In autarky, firms are all established in the large country and are subject to a unique tax rate, τ. As a result, agents' optimal decisions are independent of taxation and the equilibrium is identical to that in Azar and Vives (2021) with heterogenous firms, as shown in Appendix G. This implies that the private good consumption of workers, C^W, the total level of employment, L, are independent of taxation because optimal production plans are not affected by tax rates. Therefore, the objective function of the large country government is a linear function of private good consumption of owners and public good consumption. Recalling the maximization problem of the large country government

$$\max_{\tau} \; W(C^W, C^O, L, G^W, G^O) = (1-\kappa)\left[C^W - \frac{L^{1+1/\eta}}{1+1/\eta} + \beta G^W\right] + \kappa\left[C^O(\tau) + \beta G^O\right]$$

$$s.to$$

$$G^W + G^O = \tau\Psi$$

As long as the government attributes equal weights to the utilities of workers and owners, i.e. $\kappa = 0.5$, implying that $G_i = G_j = G$ for any $i \neq j$, substituting the budget constraint and the level of the owner's private good consumption, which is equal to the financial wealth of owners and thus net profits, leads to

$$\max_{\tau} \; (1-\kappa)\left[C^W - \frac{L^{1+1/\eta}}{1+1/\eta} + \beta\tau\Psi\right] + \kappa\left[(1-\tau)\Psi + \beta\tau\Psi\right] \tag{73}$$

which is linearly increasing in the tax rate, τ. Therefore, since the tax rate is bounded between 0 and 1, the government chooses the maximum tax rate possible that is $\tau = 1$.

Appendix I Proof of Proposition 3

Given the proof of the existence of equilibrium when $\lambda < 1$ in Appendix C, this section proves every point of Proposition 3.

(a) Given a firm locates profits in the large country and $J_l^* \in (0, J)$, its FOC is given by

$$(1-\tau_l)[A_j - \omega' L_{jl} - \omega] - \lambda \left[(1-\tau_l) \sum_{k \neq j} (\omega' L_{kl}) + (1-\tau_x) \sum_{k \neq j} (\omega' L_{kx}) \right]. \tag{74}$$

Collecting ω'

$$(1-\tau_l)[A_j - \omega] - \omega' \left\{ (1-\tau_l) L_{jl} + \lambda \left[(1-\tau_l) \sum_{k \neq j} (L_{kl}) + (1-\tau_x) \sum_{k \neq j} (L_{kx}) \right] \right\}; \tag{75}$$

dividing by $1-\tau_l$ and ω

$$\frac{A_j - \omega}{\omega} = \frac{\omega'}{\omega} \left\{ L_{jl} + \lambda \left[\sum_{k \neq j} (L_{kl}) + \frac{1-\tau_x}{1-\tau_l} \sum_{k \neq j} (L_{kx}) \right] \right\}, \tag{76}$$

Denoting the market share of firm j locating profits in the large country as $s_{jl} \equiv L_{jl}/L$, multiplying and dividing the right hand side by L

$$\frac{A_j - \omega}{\omega} = \frac{\omega'}{\omega} L \left\{ s_{jl} + \lambda \left[\sum_{k \neq j} (s_{kl}) + \frac{1-\tau_x}{1-\tau_l} \sum_{k \neq j} (s_{kx}) \right] \right\}. \tag{77}$$

Provided the equilibrium market share of firm j locating profits in the large country is $s^*_{jl} \equiv L^*_{jl}/L^*$, the inverse of the labor supply elasticity is $\omega' L/\omega = 1/\eta$, the markdown fo real wage of firm j is

$$\mu_{jl} = \frac{A_j - \omega(L^*)}{\omega(L^*)} = \frac{s^*_{jl} + \lambda \left[\frac{1-\tau_x}{1-\tau_l} \sum_{k \neq j} s^*_{kx} + \sum_{k \neq j} s^*_{kl} \right]}{\eta}, \tag{78}$$

(b) Given that a firm locates profits in the tax haven and $J^*_l \in (0, J)$, its FOC is given by

$$(1-\tau_x)[A_j - \omega' L_{jx} - \omega] - \lambda \left[(1-\tau_l) \sum_{k \neq j} (\omega' L_{kl}) + (1-\tau_x) \sum_{k \neq j} (\omega' L_{kx}) \right]. \tag{79}$$

Following the same manipulations from equation (74) to equation (78), the markdown of real wages for a firm locating profits in the tax haven is

$$\mu_{jx} \equiv \frac{A_j - \omega(L^*)}{\omega(L^*)} = \frac{s_{jx}^* + \lambda\left[\sum_{k\neq j} s_{kx}^* + \frac{1-\tau_l}{1-\tau_x}\sum_{k\neq j} s_{kl}^*\right]}{\eta}. \tag{80}$$

(c) The total level of employment, when $J_l^* \in (0, J)$, is obtained by equating the inverse demand of labor in equilibrium and the inverse labor supply. Recalling the inverse demand for labor

$$\omega = \frac{\eta \bar{A}_x}{S_l^*\left[\frac{\tau_x-\tau_l}{1-\tau_x} - \frac{1-\lambda}{J-J_l}\right] + \frac{1-\lambda}{J-J_l} + \eta + \lambda}, \tag{81}$$

and the inverse of the labor supply

$$\omega(L) = L^{1/\eta}. \tag{82}$$

Note that, the inverse demands for labor of firms locating profits in the large country and the inverse demands for labor of firms locating profits in the tax haven are equal by definition, once S_l^* is plugged in. Furthermore, the inverse demands for labor are independent of the level of labor and they coincide with the real wage offered in equilibrium. Equating the two

$$L^{1/\eta} = \frac{\eta \bar{A}_x}{S_l^*\left[\frac{\tau_x-\tau_l}{1-\tau_x} - \frac{1-\lambda}{J-J_l}\right] + \frac{1-\lambda}{J-J_l} + \eta + \lambda}, \tag{83}$$

and solving for L, the total level of employment in equilibrium is

$$L^* = \left[\frac{\eta \bar{A}_x}{S_l^*[\lambda(\frac{\tau_x-\tau_l}{1-\tau_x}) - \frac{1-\lambda}{J-J_l}] + \frac{1-\lambda}{J-J_l} + \eta + \lambda}\right]^{\eta}. \tag{84}$$

Appendix J Proof of Proposition 5

Recall the expression for the aggregate market share of firms paying taxes domestically

$$S_l = \frac{\bar{A}_l\left(\frac{1-\lambda}{J-J_l} + \eta + \lambda\right) - \bar{A}_x\left(\lambda\frac{1-\tau_x}{1-\tau_l} + \eta\right)}{\bar{A}_x\left[\frac{1-\lambda}{J_l} + \lambda\left(\frac{\tau_x-\tau_l}{1-\tau_l}\right)\right] - \bar{A}_l\left[\lambda\left(\frac{\tau_x-\tau_l}{1-\tau_l}\right) - \left(\frac{1-\lambda}{J-J_l}\right)\right]}. \tag{85}$$

Defining the numerator as Γ and the denominator as Θ, the first derivative of the above with respect to the tax rate imposed by the tax haven, i.e. τ_x, taking fixed J_l, is

$$\frac{\partial S_l}{\partial \tau_x} = \frac{\frac{\partial \Gamma}{\partial \tau_x}\Theta - \frac{\partial \Theta}{\partial \tau_x}\Gamma}{\Theta^2}, \tag{86}$$

where

$$\frac{\partial \Theta}{\partial \tau_x} = \frac{\bar{A}_x \lambda}{1-\tau_l} - \frac{\bar{A}_l \lambda}{1-\tau_l}, \tag{87}$$

and

$$\frac{\partial \Gamma}{\partial \tau_x} = \frac{\bar{A}_x \lambda}{1-\tau_l}. \tag{88}$$

Studying the numerator of the derivative which is

$$\left(\frac{\bar{A}_x \lambda}{1-\tau_l}\right)\Theta - \left(\frac{\bar{A}_x \lambda}{1-\tau_l} - \frac{\bar{A}_l \lambda}{1-\tau_l}\right)\Gamma, \tag{89}$$

rearranging

$$\frac{\bar{A}_x \lambda}{1-\tau_l}(\Theta - \Gamma) + \Gamma\left(\frac{\bar{A}_l \lambda}{1-\tau_l}\right) > 0, \tag{90}$$

which is always positive as long as the aggregate market share is bounded between zero and one, implying $\Theta \geq \Gamma > 0$.

Similarly, the first derivative of S_l with respect to the tax rate imposed by the large country, i.e. τ_x, taking fixed J_l, is

$$\frac{\partial S_l}{\partial \tau_l} = \frac{\frac{\partial \Gamma}{\partial \tau_l}\Theta - \frac{\partial \Theta}{\partial \tau_l}\Gamma}{\Theta^2}, \tag{91}$$

where

$$\frac{\partial \Theta}{\partial \tau_l} = \bar{A}_l \lambda \frac{1-\tau_x}{(1-\tau_l)^2} - \bar{A}_x \lambda \frac{1-\tau_x}{(1-\tau_l)^2}, \tag{92}$$

and

$$\frac{\partial \Gamma}{\partial \tau_l} = -\bar{A}_x \lambda \frac{1-\tau_x}{(1-\tau_l)^2}. \tag{93}$$

Rearranging the numerator of the derivative

$$\lambda \frac{1-\tau_x}{(1-\tau_l)^2} \left(\bar{A}_x \Gamma - \bar{A}_x \Theta - \bar{A}_l \Gamma \right) < 0, \tag{94}$$

which is always negative as long as the aggregate market share is bounded between zero and one, implying $\Theta \geq \Gamma > 0$.

Appendix K Preferences and Profit Shifting

This section investigates whether changes in individuals' preferences produce results qualitatively similar to changes in market structure, leveraging the possibility to disentangle the effects of preferences from those of common ownership and number of competitors. Figure 7 presents the comparative statics with respect to labor supply elasticity. In the model, labor supply elasticity synthesizes workers' preferences over labor and consumption.[41]

Panel (a) of figure 7 reports the average markdown as a function of the elasticity of the labor supply. As the elasticity decreases, i.e. a lower η, firms can increase their pressure on workers' wages because the labor supply reacts less to changes in wage. When $\eta \to \infty$, the labor supply curve becomes infinitely elastic, and workers would infinitely react to changes in the real wage. In this case, the equilibrium average markdown approaches one, and the labor market becomes perfectly competitive. Coherently, the number of firms paying taxes at home, depicted in panel (b), is increasing in the labor supply elasticity. As workers become more sensitive to wage changes, i.e. the labor supply elasticity increases, the market power exerted by firms and, thus, their aggregate profits decrease as shown in panel (d). If firms' profits decrease, they will be less inclined to pay the fixed cost and shift profits. Because, given a tax differential, lower profits imply a lower advantage

[41] Recalling the notation, labor supply elasticity is denoted by $\eta \equiv \omega/(\omega' L)$.

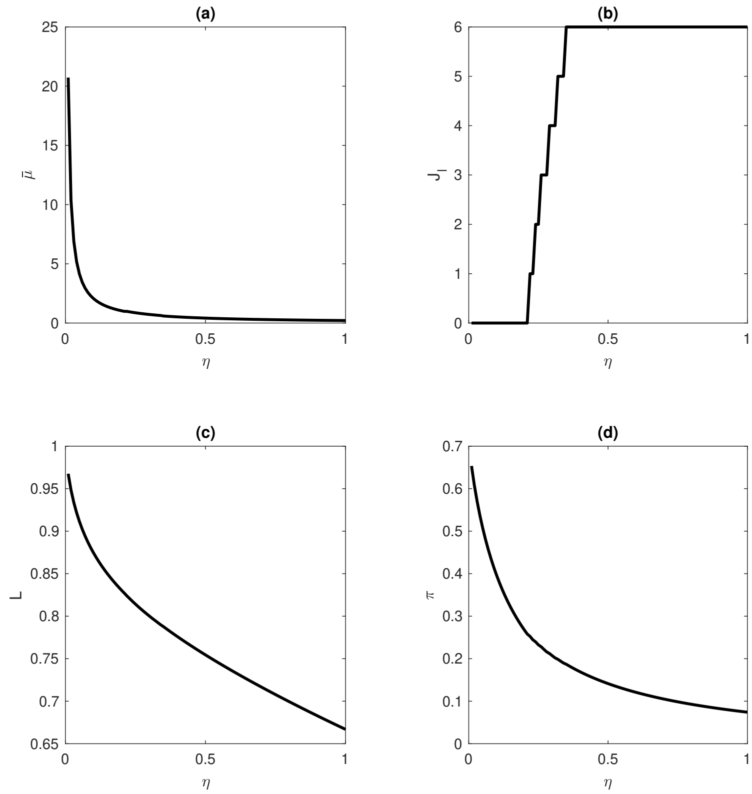

Fig. 7 Comparative statics with respect to the elasticity of labor supply, η. Panel (a) reports the average markdown; (b) the number of firms locating profits in the large country; (c) the level of total employment; (d) the aggregate profits.

in taxation. Hence, with a more elastic labor supply, more firms pay taxes at home. The levels of total employment, in panel (c), and aggregate profits, in panel (d), linearly decrease with labor supply elasticity. When workers are more sensitive to wage changes, the equilibrium level of total employment decreases, while the equilibrium real wage increases. Consequently, the market power exerted by firms diminishes, reducing the wedge between the marginal product of labor and the equilibrium wage, which in turn implies lower profits for firms. As a result, changes in agents' preferences affect all firms equally. Crucially, variations in these elasticities do not lead to the *distorted* reallocation of market share toward high-productivity, high-markup firms that results from shifts in market structure.