Tax competition and phantom FDI*

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Abstract

Offshore financial centers are almost never the final destination of the foreign direct investments (FDI) they receive. A large portion of these investments are *phantom FDI*, which ultimately flow to third countries or return back to the source country in a process called *round-tripping*. This paper develops a model in which onshore countries compete internationally with tax instruments to attract capital from abroad, in the presence of an offshore financial center that encourages phantom FDI. We show that the presence of offshore financial centers is beneficial to technologically advanced countries, whereas it is detrimental to others. Finally, we use this framework to analyze the effectiveness of Controlled Foreign Company (CFC) rules against profit shifting recently implemented in Europe and the associated loss of tax base.

Keywords: International tax competition; Offshore financial centers; Round-tripping; Profit shifting; Phantom FDI

JEL Classification: F21, H26, H25, F23.

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1 Introduction

Offshore financial centers (OFCs) are typically not the final destination of the foreign investments they attract. A large portion of offshored capital flows to these jurisdictions—usually for tax avoidance purposes—before being either invested in other countries or redirected back to the source country in a process known as *round-tripping*. Therefore, these capital flows do not represent final investments but rather *phantom FDI* (Damgaard *et al.*, 2019).

In this paper, we analyze the tax competition of homogeneous and heterogeneous onshore countries in the presence of an OFC, which attracts phantom FDI. Our aim is to explore which countries actually benefit from the presence of an OFC and phantom FDI.

OFCs play a significant role in global capital flows. Already in 2012, about 8 percent of total cross-border investments took place in these jurisdictions (UNCTAD, 2015), and more recently Damgaard *et al.* (2019) reported that more than 40 percent of global FDI is hosted in well-known international financial centers such as the Netherlands, Luxembourg, Hong Kong SAR, Switzerland, Singapore, Ireland, Bermuda, the British Virgin Island, and the Cayman Islands. These disproportionate capital flows are central to the policy debate in taxation, and in particular concerning tax avoidance activities, which have led to several measures stemming tax-motivated financial flows (see OECD, 2013a; OECD, 2013b; OECD, 2014; and European Commission, 2016a).

However, a large portion of FDI inflows is not invested in projects based in OFCs. As an example, UNCTAD (2013) reported that "[..] the top three destinations of FDI flows from the Russian Federation - Cyprus, the Netherlands and the British Virgin Islands - coincide with the top three investors in the Russian Federation [..] ". Moreover, UNCTAD (2015) documented that "in 2012, the British Virgin Islands were the fifth-largest FDI recipient globally with inflows at $72 billion [..]" and that "outflows from the British Virgin Islands, at $64 billion, were disproportionally high compared with the size of the economy".

This is also confirmed by Damgaard *et al.* (2019), who find that a large part of the outward FDI from main OFCs is ultimately owned by investors in other economies. They show that *round-tripping* is most significant for China and Russia, where about 25 percent of real FDI is owned by domestic investors, and that countries with large real FDI positions are more exposed to phantom FDI (e.g., the USA and China).

To route capital through an OFC, investors use conduit companies known as "special purpose entities" (SPEs) set up for different purposes. Very often, SPEs facilitate profit shifting.[1] There is ample evidence that multinational corporations engage in international tax planning and profit shifting using OFCs (Hines & Rice (1994), Huizinga & Laeven (2008), Dischinger & Riedel (2011), Karkinsky & Riedel (2012), Dharmapala & Riedel (2013)), with corresponding detrimental effects on tax revenues of onshore countries.[2]

[1] Public debates and media reports (see The Financial Times (2016) for an overview of the recent release of the "Panama Papers" that clarifies how taxation was avoided through OFCs) argue that the function of these conduits is to receive capital and (a portion of) corporate income, which is thus shifted away from high-tax countries for purposes of tax avoidance.

[2] Hines & Rice (1994) show that in 1982, extremely high profits were reported by American companies for their offshore sub-

The previous literature has nonetheless neglected one aspect. What is the final destination of capital flows from offshore financial centers? What countries ultimately benefit from these flows? This paper develops a theoretical framework to answer these questions. Using a classical *round-tripping* scheme, a firm incorporates a company in an offshore financial center and transfers some funds from the home country to this company and back. Funds are converted from domestic to foreign investment since they take the citizenship of the OFC in which the company has been incorporated. The main motivation behind this scheme is to avoid home taxation and/or benefit from special home incentives only offered to foreign agents. As a result, the home tax base is eroded but there is no capital loss since capital returns in the form of investment after being offshored. By contrast, capital investments may be sensibly shrunk when the offshored capital is not *round-tripped* but rather invested in a third country. Hence, although the ultimate destination of the offshored capital does not concern the OFC, these two schemes may affect the behavior of onshore countries differently.[3] We believe a theoretical analysis of phantom FDI is crucial to better qualify the effects of international tax competition in the presence of OFCs.

Accordingly, we first develop a model of homogeneous and then heterogeneous onshore countries competing with tax instruments to attract real investments, in presence of an OFC. This offshore jurisdiction encourages phantom FDI, which facilitates profit shifting, eroding the tax base of onshore countries. To uncover the effects of the OFC, we also consider tax competition in absence of the financial center. We consider that onshore countries can differ in the potential profitability of firms. This difference in profitability can be due to the distance of the country's technology from the technological frontier. Such heterogeneity has been measured using the Economic Complexity Index (ECI) developed by Hidalgo & Hausmann, 2009. In particular, the ECI quantifies the amount of knowledge embedded in the productive structure of a country's economy. Complex economies collect large quantities of relevant knowledge to generate a diverse mix of knowledge-intensive products, leading to higher capital productivity. Whereas simpler economies have a narrower base of productive knowledge and produce fewer products, which requires lower levels of capital productivity. The atlas of ECI documents that while Germany is one of the most advanced technological countries (ranked 3rd at the global level in 2019), France is ranked only 19th worldwide, Italy 15th, Netherlands 25th, and the UK 12th. Therefore, differences in technology also persist among similarly developed countries.

The main result is that not only does the offshore center benefit from phantom FDI, but so does the technologically advanced country. This comes at the expense of the less advanced onshore economy. The

sidiaries. Similarly, Huizinga & Laeven (2008) improve the method by taking into account the different tax rates faced by multinational corporations' affiliates. They find that international profit shifting has a redistribution effect on national corporate tax revenues. Dischinger & Riedel (2011) examine intangible fixed assets from firms' balance-sheets since they are one of the primary sources of profit shifting opportunities. They find that the level of intangible assets of a subsidiary located in an OFC increases as the average tax difference from all other affiliates rises. Karkinsky & Riedel (2012) show that (within a multinational group), a patent application is more likely to be filed by an affiliate facing a lower tax rate. These authors consider income shocks experienced by parent firms and show how they propagate among low-tax and high-tax branches. They demonstrate that these shocks are associated with a significant increase in pre-tax profits for low-tax affiliates.

[3]OFCs are not concerned about where the offshored capital is reinvested since they only care about the fees they can collect from the incorporated companies.

presence of heterogeneous countries increases the incentive for capital to flow to the more advanced economy, which is then able to set even higher corporate taxes than it otherwise would. This is a new result in the literature of international tax competition, which usually sees onshore economies lose from OFCs and phantom FDI. We find that the OFC also benefits from heterogeneity across onshore countries. This is because it can set higher fees to seize part of the efficiency gains that agents in the less advanced country obtain from phantom FDI. Ultimately, our findings suggests that the winners of the international tax competition game are the technologically advanced countries and the OFC, while the less technologically advanced countries lose.

Moreover, we use our framework to explore the effect of the recent international efforts against profit shifting. Among the recent and ongoing policy responses to stem tax-motivated financial flows, the Anti-Tax Avoidance Directive (ATAD) of the European Commission (see European Commission, 2016a), which went into effect on January 1, 2019, appears to be relevant for phantom FDI. This directive has implemented a Controlled Foreign Company (CFC) rule that aims to discourage companies from shifting profit from their parent company in a high-tax country to controlled subsidiaries in low-tax jurisdictions to reduce the overall tax liability.[4] Therefore, profit shifted offshore has to be taxed onshore if the actual corporate tax paid overseas is less than half of that which would have been paid in the home country (the European member state). Using our theoretical setting, we study when this rule may apply and is effective in reducing tax base erosion in source countries. We find that when the return on capital is high, the CFC rule is not applicable and the tax and fee solution remains unchanged. In contrast, when the return on capital is low, the CFC rule increases onshore corporate tax without necessarily reducing future phantom FDI.

Our analysis is related to the literature on the economics of offshore centers (see Dharmapala, 2008 and Keen & Konrad, 2013 for a survey). The standard tax competition literature predicts that these jurisdictions reduce welfare in onshore economies since they intensify competition (Slemrod & Wilson, 2009). As in Slemrod & Wilson (2009) and Bucovetsky (2014), we apply the usual simplification that considers tax concealment as the only service OFCs provide. In this interpretation, tax concealment does not involve any movement of a firm's actual production. Bucovetsky (2014) explains how the presence of OFCs may increase tax revenues in onshore countries. The intuition is that these jurisdictions make high-tax countries less willing to set low tax rates and thus mitigate tax competition. Hong & Smart (2010) point out that international tax avoidance schemes erode tax revenues but may also reduce tax burdens on mobile capital, facilitating investments. In particular, they show how income shifting reduces the revenues of high-tax countries, increases tax base elasticities, and tends to make the location of real investment less responsive to tax rate differentials. This allows states to maintain or even increase their tax rates while preventing outflows of FDI. Chu (2014) shows how competition in tax enforcement policies (as an alternative to tax competition) may counter the decline in onshore taxation and thus the under-provision of public goods. We complement this literature by highlighting that not only

[4]CFC rules were first introduced in the US in 1962. Their purpose was to tax income earned in low-tax foreign countries (Dharmapala (2019)).

OFCs but also onshore countries can benefit from mobile tax bases and round-tripping deals. In addition, we depart from the basic model (applied by Slemrod & Wilson, 2009; Johannesen, 2010; and Hong & Smart, 2010) that assumes a system of identical onshore countries that compete for mobile capital. We also endogenize the behavior of the offshore center. This allows us to focus on the impact of heterogeneity on the welfare and tax revenue of onshore countries, given the presence and strategies of an OFC.

Finally, we contribute to the literature on the effects of CFC rules. The increase in the foreign passive income across OECD countries is a signal that CFC rules are becoming used among OECD countries (Dharmapala (2019)). Why has not the CFC rule not been used more widely and earlier in the EU countries? Dharmapala (2019) argues that politicians may have overseen these operations or deals, but as rightly pointed out by the author, this oversight must be quite systematic rather than random.[5] In our setting, we identify which countries win and lose from round-tripping deals. It appears that technologically advanced countries and OFCs benefit from these deals. It is then natural to suspect that the limited use of CFC rules could be attributed to the heterogeneity of countries that are supposed to implement such regulations.

The paper is set out as follows. Section 2 presents the benchmark setting where round-tripping occurs with a single onshore country facing an OFC. Section 3 analyzes what happens when two heterogeneous onshore countries are in the picture. Section 4 develops the analysis in absence of phantom FDI. Finally, Section 5 gauges the effectiveness of the ATAD CFC rule, while Section 6 offers some concluding remarks.

2 Phantom FDI and round-tripping

In this section, consider two *homogeneous* onshore economies denoted by H_z and $z = i, j$ and an OFC denoted by F. Countries H_i and H_j levy taxes on profits of firms and use the tax revenue to produce a local public good $G_z, z = i, j$. The offshore center does not have any domestic population and only offers tax avoidance practices to foreign firms. More precisely, conduit companies can be established in the OFC by onshore companies against the payment of a fee f, proportional to the offshored capital.[6] These conduit companies are vehicles serving the sole purpose of avoiding onshore tax. Capital transferred to these companies either returns home in the form of investment in the onshore firms (*round-tripping*) or is invested in a third country.[7]

There is a unit mass of capital owners - entrepreneurs - in each country, distributed along the interval $[0, 1]$.

[5] Another argument is the coordination failure explored in Haufler *et al.* (2018). Using a standard tax competition framework to model the choice of thin capitalization rules, Haufler *et al.* (2018) interestingly find that the Nash equilibrium taxes will be lower than the globally optimal outcomes. Indeed, in the presence of many onshore countries, tax externalities due to mobile tax bases lead to a coordination problem that puts downward pressure on tax policies.

[6] Note that offshore centers may differ with regard to the fees they charge. For instance, the Cayman Islands (no corporate income tax) charge an annual fee that varies (stepwise) with the conduit capitalization. Similarly, conduits established in Gibraltar pay a set-up fee of 0.5% on authorized capital. In Luxembourg, funds have to pay an annual subscription tax (*taxe d'abonnement*) at the rate of 0.05% on their total assets. Other OFCs like Panama or Anguilla charge a flat fee. However, the application of a different fee scheme does not qualitatively affect the results of our model.

[7] Since we aim to analyze international competition among onshore countries and the offshore financial center, we do not consider the possible competition among offshore banks.

Each agent is endowed with an amount k of capital and owns a firm in which this capital can be invested.[8] Agents are homogeneous in the perception of their home country but heterogeneous in their attitudes towards foreign investment. More precisely, an agent living in H_i or H_j who invests capital in the OFC abroad incurs a cost, which has the nature of a Hotelling-like cost, (see Hotelling, 1929): $cx_l^i > 0$ for agents living in H_i and $cx_l^j > 0$ for those in H_j, and $l \in [0,1]$. The parameter c can be viewed as an inverse measure of the degree of international financial integration: the lower the c, the more integrated the financial markets. [9] The parameter x captures agent heterogeneity within each country and captures the different attitudes that each potential investor may have towards foreign investing.[10] This can also be viewed as a home bias (attachment to the home country), as the greater this cost, the lower the propensity toward foreign investing.[11] Therefore, capital mobility is imperfect for two main reasons: imperfect financial integration and heterogeneous agents.

In countries H_i and H_j, k units of capital generate a pre-tax profit of Π for the agent owner of the firm. To focus the analysis on location decisions of investors about where to set-up their firm, we assume that prices of final outputs, costs and thus profits are exogenous and fixed at a sufficiently high level for all firms to make non-negative profits no matter where they locate.[12] This means that each investor either invests k in country i to obtain Π_i or in country j to obtain Π_j. Notice, however, that net profits are endogenously determined by agents locational choices and by the taxes set by the governments.

In this benchmark setting, the pre-tax profit is the same in both countries. This is due, for instance, to the use of the same technology by firms operating in both countries. Governments of the onshore economies H_i and H_j levy corporate taxes, t_i and t_j respectively, on the profit earned in their territory according to the *territorial* taxation principle. The OFC only charges a fee f on the offshored capital. Hence, finally, all countries compete in capital taxes t_i, t_j, and f.

Governments are benevolent and aim to maximize the amount of the public good, ultimately maximizing tax revenues. Agents maximize their net after-tax income. Each agent chooses between four strategies: (i) invest capital in the firm (s)he runs in the country of residence, H_z, (ii) invest directly in a firm in the other onshore country H_{-z}, or offshoring the initial endowment $k \in R^+$ by creating a conduit company to then either (iii) round-trip the capital or (iv) invest in H_{-z}. We will see later why out of these four options agents will only consider either investing directly in the home firm (i) or round-tripping the investment after having offshored their capital (iii).

[8] Assuming different capital endowments across countries does not change qualitatively the results, but makes them more complex.

[9] When $c = 0$, there is perfect capital mobility and agents' heterogeneity does not matter.

[10] Importantly, x does not only provide a measure of the geographical distance between an agent' location and the offshore financial center or the other onshore country; rather, it reflects the idiosyncratic preferences of agents regarding foreign investment and offshoring their capital.

[11] Home bias in investing is quite known in the finance literature. It is a multi-faceted phenomenon that can partially be explained by reasons related to informational asymmetries and superior information of domestic conditions. In addition, there may be a cultural component that drives home attachment and makes it cultural and country specific. See for instance French & Poterba (1991), Ardalan (2019) or Gaar *et al.* (2020) While an agent who faces a high cost displays strong reluctance to invest abroad, an agent bearing a low cost is more likely to do so.

[12] This assumption has been previously used by Hindriks (1999); Justman *et al.* (2005); Zissimos & Wooders (2008) or Pieretti & Zanaj (2011).

Production and consumption occur only in onshore economies H_z, and offshore companies are only used for tax purposes. Profits are generated by home firms with capital from conduit companies accruing, untaxed, to onshore agents, who use it for consumption. Then, agents receive the firm's profit net of taxes, $(1 - t_z)\Pi$, $z = i, j$.

The timing of these decisions is as follows. First, countries choose capital taxation and offshoring fees. Then, after observing these choices, agents decide whether or not to offshore their capital in conduit companies and the location of their investment. Finally, production occurs and taxes and fees are collected. Because the investment decisions of agents are completely determined by tax rates and fees, we model the competition for mobile agents as a static simultaneous-move Nash game.

2.1 Investment decision

In each country $H_z, z = i, j$, agent l's preferences are given by

$$U(C_l, G_z) = C_l + v(G_z),\ l \in [0, 1] \text{ and } z = i, j, \tag{1}$$

where $C_l(\cdot)$ represents agent l's private consumption while $v(G_z)$ is the net benefit derived from the public good G_z. An agents' private consumption C_l is the sum of the net profit accruing from their own firm $\Pi(1 - t_z)$, $z = i, j$.

Normalizing private good prices to one, agents have four investment alternatives that yield the following levels of utility:

i) Investing at home $U_l^h(C_l, G)$:

$$U_l^h(C_l, G) = \Pi(1 - t_z) + v(G_z), l \in [0, 1] \text{ and } z = i, j\ ,$$

where the first term indicates net profit, and the second term the utility accruing from public services.

ii) Investing directly in the foreign onshore economy $U_l^d(C_l, G)$:

$$U_l^d(C_l, G) = \Pi(1 - t_{-z}) + v(G_z) - cx_l,\ l \in [0, 1] \text{ and } z = i, j\ ,$$

where x_l is agent l's individual cost of offshoring capital and $c \in R^+$ is the degree of integration of the financial markets.

iii) Investing in the foreign onshore economy through an offshore financial center $U_l^o(C_l, G)$:

$$U_l^o(C_l, G) = \Pi - fk + v(G_z) - cx_l,\ l \in [0, 1] \text{ and } z = i, j\ , \tag{2}$$

where kf is the total offshoring fee for the OFC services, which include all the necessary steps to set-up the firm structure for foreign investing or round-tripping.

iv) Round-tripping the capital through an OFC, $U_l^r(C_l, G)$:

$$U_l^r(C_l, G) = \Pi - kf + v(G_z) - cx_l, l \in [0, 1] \text{ and } z = i, j \ .$$

The level of capital supply in each country is determined by the comparison of the level of utility of the above four expressions. Given that firm profits are constant across onshore countries and there is a possibility to avoid paying onshore taxes, we have that: if capital is offshored, it will always be round-tripped because alternatives *(iii)* and *(iv)* give exactly the same level of utility. It remains to be determined whether *(ii) Direct foreign investment* may be a better alternative to offshoring, i.e., better than alternatives *(iii)* and/or *(iv)*. It turns out that round-tripping is a viable alternative only if the cost of offshoring, fk, is smaller than that of a foreign direct investment, $t_{-z}\Pi$, i.e., $fk < t_{-z}\Pi$.

In other words, agents living in H_i will first offshore their capital and then invest in H_j - rather than investing directly in H_j - as long as the offshoring fee is quite small compared to the net profit in H_j. Notice that the alternative scenario, in which the above condition is not satisfied, will result in the OFC not being able to collect any fees because no investors will be willing to use its services (i.e., $W_F = 0$). As a consequence, it cannot be a Nash equilibrium. The OFC will never set such a high fee, given that any strategy consistent with the condition above, $f \in (0, t_{-z}\frac{\Pi}{k})$, strictly dominates any other for which that condition is not satisfied, $f \in (t_{-z}\frac{\Pi}{k}, +\infty)$. As we can easily check (see footnote 14), at equilibrium taxes and fee, the condition $f < \frac{t_z}{k}\Pi$ always holds. Hence, options *(ii)* is a dominated strategy and therefore the relevant alternatives are *(i)* and *(iii)–(iv)*.

To summarize, agents in each country H_z will compare alternative ***(i)*** with ***(iii)–(iv)*** to decide whether to invest at home directly or round-trip the capital before investing. This comparison implies that the marginal consumer in each country is

$$\tilde{x}_z = \frac{t_z\Pi - fk}{c} \text{ with } z = i, j. \tag{3}$$

Accordingly, the tax base in countries H_z is due to the agents in the intervals $[\tilde{x}_i; 1]$ and $[\tilde{x}_j; 1]$. Agents in the interval $(0, \tilde{x}_z)$ offshore their capital in conduit companies, avoiding taxes, and finally invest in their home country.

As expected, the number of agents willing to offshore increases with the tax gains and with the initial endowment k, while it decreases with the moving cost c.

2.2 Tax choices

Countries interact in a simultaneous Nash game. Governments in the onshore countries select tax rates to maximize revenues derived from taxes on profits. These revenues are entirely allocated to the production of the domestic public good. This assumption is consistent with maximizing the welfare of domestic residents

assigning a high weight to the consumption of public good.[13] The OFC maximizes the total amount of collected fees W_F by charging a fee on offshored capital. We remain silent about the use of such resources in the offshore financial center.

Given the marginal consumers expressions above, the objective functions are

$$W_z = (1 - \tilde{x}_z)(\Pi * t_z) \quad \text{and} \quad W_F = \sum_z \tilde{x}_z k f, \quad z = i, j. \tag{4}$$

With the concavity conditions satisfied, the following first-order conditions yield the best responses of the onshore country and the offshore financial center:[14]

$$t_z(f) = \frac{c + fk}{2\Pi} \quad \text{and} \quad f(t) = \frac{t_z \Pi}{2k}, \quad z = i, j. \tag{5}$$

The best response of the onshore shifts upward when agents become more captive, i.e., c increases, the fee f increases, or the profit Π decreases. Evoking symmetry and solving the system of best response functions relative to the endogenous variables (t_i, t_j, f) of the model yields the following results:[15]

$$t_i^* = t_j^* \equiv t^* = \frac{2}{3}\frac{c}{\Pi} \text{ and } f^* = \frac{1}{3}\frac{c}{k} \tag{6}$$

Consequently,

$$x_i^* = x_j^* \equiv x^* = \frac{1}{3}. \tag{7}$$

In order to get an interior solution, i.e., $t^* < 1$ and $f^* < 1$, the following condition needs to be satisfied:

$$0 < c < \bar{c},$$

where

$$\bar{c} = \begin{cases} \frac{3\Pi}{2} & if \quad \frac{\Pi}{k} < 2 \ , \\ 3k & otherwise \ . \end{cases} \tag{8}$$

Accordingly, from now on we assume that the mobility cost c satisfies (8), i.e., offshoring capital is neither too hard nor too easy, which guarantees non-captive investors. When the mobility cost c is very large, investors are captive and governments can set exorbitant taxes (e.g., $t^* = 1$ and $f^* = 1$). The threshold value $\bar{c}$ is a function of the resources (Π and/or k) available to investors to sustain the mobility costs. Accordingly, the higher these resources, the higher the $\bar{c}$ and thus the larger the interval $0 < c < \bar{c}$ in which investors are not captive.

[13] Similarly to Kanbur & Keen (1993), the onshore government in our paper does not have as its primary interest to maximize tax revenues in order to raise rents/bribes or to enhance the power of government officials. The government taxes to provide the essential public goods G such as schools, transport infrastructure, or hospitals, namely, public goods that positively affect the welfare of citizens.

[14] Maximizing equations (4) yields the following first order conditions, $\frac{\partial W_z}{\partial t_z} = \frac{\Pi(c+fk-2\Pi t)}{c} = 0$ and $\frac{\partial W_F}{\partial f} = \frac{2k(\Pi t_z - 2fk)}{c} = 0$. Also note that second order conditions are always satisfied, $\frac{\partial^2 W_z}{\partial t_z^2} = -\frac{2\Pi^2}{c} < 0$ and $\frac{\partial^2 W_F}{\partial f^2} = -\frac{4k^2}{c} < 0$.

[15] Notice that the condition $f < \frac{t_j}{k}\Pi$ boils down to $\frac{1}{3}\frac{c}{k} < \frac{2}{3}\frac{c}{k}$, which is always satisfied.

The presence of an OFC in this setting may be detrimental because it allows the round-tripping of capital, which decreases the tax revenue available for the production of the public good G (schools, parks, telecommunication and transportation infrastructure, etc.).[16] Through tax avoidance, round-tripping certainly also increases the opportunities of private consumption. In our simple setting that only focus on consumption, the overall impact of offshore activity on onshore economies finally depends on the marginal utility of the public good versus that of private consumption.[17]

To summarize, when onshore countries are homogeneous, fiscal competition in the presence of an OFC is detrimental because it reduces public goods. Tax competition among onshore countries is damaging for the same reason. Still, the presence of an OFC intensifies the horizontal tax externalities, aggravating the detrimental effects. This parasitic effect of the OFC is the classical result in the fiscal competition literature (see, among others, Slemrod & Wilson, 2009).

The framework developed in this section serves as a benchmark comparison to the setup developed in the next, in which two *heterogeneous* onshore countries compete to attract mobile capital in the presence of an offshore financial center. Our aim is to stress the role of heterogeneity of onshore economies.

3 Heterogeneous countries with phantom FDI

Now consider two *heterogeneous* onshore economies H_i and H_j that face the offshore center F. Our aim is to analyze the effects of competition for capital in the presence of an offshore center, when offshored capital ultimately gets invested in a third country. Onshore countries only differ regarding the profitability of firms located in each economy $\Pi_z > 0$, $z = i, j$. A greater value of profit implies a higher profit per firm and may indicate that the technology used in the country is closer to the world technology frontier.[18] Without loss of generality, we assume that $\Pi_j > \Pi_i$: country H_j is more technologically advanced than H_i. As explained before, each country is populated by a unit mass of individuals each having the same capital endowment of k, and agents are heterogeneous with respect to their home attachment $x_l, l \in [0, 1]$ to the onshore countries H_i and H_j, respectively. Agents have to choose where and how to invest their capital considering the profit net of cost of capital in the different onshore countries, Π_z with $z = i, j$. Even when onshore countries are heterogeneous, agents still have four alternatives for investment that yield the following levels of utility:

i) Invest their capital at home:

$$U_z^h = \Pi_z(1 - t_z) + vG_z; \tag{9}$$

[16] There are certainly ethical reasons related to tax avoidance that are relevant, but these are outside the scope of our economic analysis.

[17] It is easy to determine whether or not the presence of an offshore financial center increases overall onshore welfare. These calculations are available upon request.

[18] A similar assumption is made in Hindriks *et al.* (2008).

ii) Invest their capital directly in the other onshore country H_{-z}:

$$U_z^d = \Pi_{-z}(1 - t_{-z}) + vG_z - cx_z; \tag{10}$$

iii) Invest in the other onshore country through the OFC:

$$U_z^o = \Pi_{-z} - fk + vG_z - cx_z; \tag{11}$$

iv) Round-trip the capital through the OFC:

$$U_z^r = \Pi_z - fk + vG_z - cx_z, \tag{12}$$

where the first element in all four alternatives is the firm's net profit. In equations (9) and (12), the firm is located in country H_z and is thus taxed at $t_z = t_z$, while in (10) and (11) the firm is located in country H_{-z}, thus it is taxed at $t_{-z} = t_{-z}$. The second component represents the utility accruing from the public good G_z. Finally, when capital is offshored, a further element cx_z captures the disutility from offshoring.

The level of capital supply in each country is determined by the comparison of the level of utility of the above four expressions. Given the difference in profitability between onshore countries and the possibility of avoiding onshore taxes, we have that if the capital is offshored, then re-investing it in the country with the highest profitability (i.e., H_j*) is a dominant strategy.* As a consequence, agents x_j living in country H_j prefer to round-trip the capital rather than investing in H_i. For these agents, the payoff of alternative (iv) exceeds that of alternative (iii).

Importantly, agents living in H_i prefer to invest in H_j compared to round-tripping their capital. This is because the payoff they get from alternative (iii) exceeds that of (iv). Agents living in country H_i will invest in country H_j directly or through the OFC. To this end, we need to compare the payoff of alternatives (ii) and (iii). It can easily be checked that alternative (iii) is preferred to alternative (ii) as long as $f < \frac{\Pi_j}{k} t_j$ holds. In Appendix A, we analyze the alternative scenario in which $f > \frac{\Pi_j}{k} t_j$ and show that it never arises. Direct investment from country H_i to country H_j is never a Nash equilibrium strategy if an OFC exists. This implies that the OFC will always set a fee so that offshoring is an attractive option.

To summarize, we have that

1. Home agents in country H_i (the less advanced country) may only invest in country H_j through the OFC. They compare alternatives **i)** and **iii)**. This implies that their decision depends on the tax gains $t_i\Pi_i - fk$ and on the efficiency gains, $\Pi_j - \Pi_i$,

$$x_i = \frac{(t_i\Pi_i - fk) + (\Pi_j - \Pi_i)}{c}; \tag{13}$$

2. Home agents in country H_j only aim to lower their tax liabilities, and thus they only consider round-tripping. Hence, they compare alternatives **i)** and **iv)**, which yields

$$x_j = \frac{\Pi_j t_j - fk}{c}\ . \tag{14}$$

Finally, the tax base in country H_i depends on the number of agents distributed along the interval $[x_i; 1]$, whereas that of country H_j is given by the agents distributed along the interval $[x_j; 1]$. Agents distributed along the intervals $(0, x_i)$ and $(0, x_j)$ offshore their capital.

3.1 Tax decision

Similar to Section 2, onshore countries maximize tax revenues and the OFC maximizes the collected fees. The objective functions are

$$W_{H_i} = (1 - x_i)(\Pi_i * t_i), \quad W_{H_j} = (1 - x_j)(\Pi_j * t_j), \quad W_F = (x_i + x_j)kf. \tag{15}$$

Maximizing W_{H_i}, W_{H_j}, and W_F, the optimal tax choices (t_i^{**}, t_j^{**}) are[19]

$$t_i^{**} = \frac{8c - 5(\Pi_j - \Pi_i)}{12\Pi_i} \text{ and } t_j^{**} = \frac{8c + \Pi_j - \Pi_i}{12\Pi_j}, \tag{16}$$

and the optimal fee selected by the OFC is

$$f^{**} = \frac{2c + \Pi_j - \Pi_i}{6k}.$$

Consequently, the marginal agents in country H_i and country H_j are correspondingly given by

$$x_i^{**} = \frac{4c + 5(\Pi_j - \Pi_i)}{12c} \quad \text{and} \quad x_j^{**} = \frac{4c - (\Pi_j - \Pi_i)}{12c}. \tag{17}$$

Hereafter, in order to make the analysis comparable with that of the previous section, we assume that the equilibrium holds in its interior. Namely, in addition to warrant the interior solution for t_i^*, t_j^* and f^*, we assume that $\Pi_j - \Pi_i$ is not too large so that investors (x_i^*, x_j^*) in the two countries remain in their interior values. Hence, c has to satisfy the following condition:

$$\frac{5(\Pi_j - \Pi_i)}{8} < c < \tilde{c},$$

where $\tilde{c} = \min\left\{\frac{7\Pi_i + 5\Pi_j}{8}, \frac{6k - (\Pi_j - \Pi_i)}{2}\right\}$.[20] The RHS of the above inequality is a non-captivity condition in presence of heterogeneous countries. With heterogeneous country the less developed country is under intense pressure to keep investors home. A lower bound on the mobility cost is required to avoid full displacement from country i. The larger the difference $\Pi_j - \Pi_i$, the higher the incentive toward foreign investing, hence, the higher the mobility cost that avoids full displacement.

We can now analyze the equilibrium choices of agents and governments. We first compare the optimal taxes and fees in this heterogeneous case to the benchmark with homogeneous countries solved in Section 2. We

[19] Maximizing equations (16) yields the following system of best responses, $t_i(f) = \frac{c + fk + \Pi_i - \Pi_j}{2\Pi_i}$, $t_j(f) = \frac{c + fk}{2\Pi_j}$, and $f(t_i; t_j) = \frac{\Pi_j - \Pi_i + (t_i\Pi_i + t_j\Pi_j)}{4k}$.

[20] This assumption is an extension of the condition $0 < c < \bar{c}$. Differently from the homogeneous scenario where $x^* = 1/3$, under heterogeneity, an interior solution requires additional conditions that guarantee interior solutions for x_i^{**} and x_j^{**}.

focus on the OFC and the technologically advanced country to show how their equilibrium fee and tax rate compare to those resulting from a competition among countries with similarly advanced technology. We find the following results.

Proposition 1 *Assume heterogeneous onshore countries. The technologically advanced country and the OFC set higher corporate taxes and fees, respectively, than they would in the presence of homogeneous economies.*

Proof. By direct inspection of equations 6 and 16, we directly obtain $f^{**} - f^{*} = \frac{\Pi_j - \Pi_i}{6k} > 0$. In addition, considering countries with the same technology, i.e., $\Pi = \Pi_j$, to characterize t^{*} for country H_j, we obtain $t_j^{**} - t^{*} = \frac{\Pi_j - \Pi_i}{12\Pi_j} > 0$. ■

Furthermore, comparing the capital flows towards the offshore center, we show that

Corollary *The offshore center amplifies the flow of capital invested in the technologically advanced onshore country at the expense of the less advanced economy. The advanced country is able to attract additional capital from abroad, but also to retain more of its domestic capital.*

Proof. By direct inspection of equations 7 and 17, we obtain $\Delta x_i \equiv x_i^{**} - x^{*} = -\frac{5}{12c}(\Pi_i - \Pi_j) > 0$ and $\Delta x_j \equiv x_j^{**} - x^{*} = -\frac{1}{12c}(\Pi_j - \Pi_i) < 0$. ■

A close inspection of the equilibrium rates of this and the benchmark scenario reveals that technological heterogeneity benefits both the more technologically advanced economy and the OFC by increasing the amount of capital they attract and their tax rate and offshoring fee. The reason is that the presence of heterogeneous onshore countries opens the door to efficiency gains for agents living in the less profitable economy. This heterogeneity in profitability affects the offshore financial center behavior and thus the offshoring fees, reflecting the effort of the OFC to appropriate part of agents' efficiency gains (in addition to the tax gains) when offshoring capital. Hence, the incentive of agents in the less profitable country, i.e., to invest in the more profitable country and to avoid paying taxes, increases offshoring fees and taxes in the technologically advanced country. Both the offshore financial center and the technologically advanced onshore economy benefit from the offshored tax base lost by the less advanced economy.

The technologically advanced country H_j is in a winner-takes-all position. Fewer agents living in H_j offshore their capital, despite the potentially higher tax rate. This is because they have no efficiency to gain from offshoring. As a consequence, those who offshore their capital round-trip it back home. These agents only respond to variations in the tax gain. This tax gain ultimately depends on two opposing effects triggered by the efficiency gain possibilities (due to onshore heterogeneity, as explained above): on the one hand, a negative effect determined by the increasing offshoring fee, and on the other hand, a positive one due to the increase in the tax rate in onshore country H_j. However, the former effect dominates and thus their tax gain decreases, making offshoring less attractive ($\Delta x_j < 0$). Hence, compared to the benchmark, smaller amounts of

capital from the most advanced economy are offshored. Finally, compared to the benchmark, the less advanced economy loses more capital, despite the potentially lower taxes.

It is interesting to compare the equilibrium tax rates of the two onshore countries when there is technological heterogeneity. Direct comparisons give:

Proposition 2 *In the presence of an offshore financial center and heterogeneous countries, taxes in the least advanced country are higher than those in the most advanced one if and only if offshoring is costly enough ($c > \widehat{c}$), otherwise, the reverse holds true.*

Proof. By direct inspection of equations in 16:

$$t_i^{**} - t_j^{**} = \frac{1}{12}\left(\Pi_j - \Pi_i\right)\frac{8c - \Pi_i - 5\Pi_j}{\Pi_i \Pi_j} \ .$$

Hence $t_i^{**} > t_j^{**}$ iff $8c - \Pi_i - 5\Pi_j > 0$ and $t_i^{**} < t_j^{**}$ iff $8c - \Pi_i - 5\Pi_j < 0$. Let $\widehat{c} \equiv \frac{\Pi_i + 5\Pi_j}{8}$. Then, $t_i^{**} > t_j^{**}$ iff $c > \widehat{c}$ and $t_i^{**} < t_j^{**}$ otherwise. This threshold $\widehat{c}$ is smaller than $\tilde{c}$ iff $\frac{3\Pi_j - \Pi_i}{8k} < 1$. In fact, $\frac{\Pi_i + 5\Pi_j}{8} - \frac{5(\Pi_j - \Pi_i) + 12\Pi_i}{8} = -\frac{3}{4}\Pi_i < 0$, $\frac{\Pi_i + 5\Pi_j}{8} - \frac{\Pi_i - \Pi_j + 12\Pi_j}{8} = -\frac{3}{4}\Pi_j < 0$, and $\frac{\Pi_i + 5\Pi_j}{8} - \frac{6k - (\Pi_j - \Pi_i)}{2} = \frac{3}{8}\left(-8k - \Pi_i + 3\Pi_j\right) < 0$ iff $\frac{3\Pi_j - \Pi_i}{8k} < 1$. Therefore, for $\frac{3\Pi_j - \Pi_i}{8k} < 1$, $\widehat{c}$ is in the admissible set of mobility costs, i.e., $\widehat{c} < \tilde{c}$. So, $t_i^{**} > t_j^{**}$ for $\widehat{c} < c < \tilde{c}$, and $t_i^{**} < t_j^{**}$ if $c < \widehat{c} < \tilde{c}$. Finally, if $\widehat{c} > \tilde{c}$ then $t_i^{**} < t_j^{**}$. ■

The above proposition highlights that, despite the lower technology, taxation in the less advanced country can be higher than that in the most advanced country if the cost of mobility is high ($c > \widehat{c}$), i.e., when investors are captive enough. It follows that it is only in this case that country H_i can tax more than country H_j. However, the technologically advanced country benefits from the high degree of financial integration implied by a relatively low mobility cost ($c < \widehat{c}$). In fact, when capital markets are very well integrated, the most advanced economy can tax more than country H_i while still being able to attract significant capital from abroad. This result is reminiscent of a particular strand of the existing literature that analyzes why tax rate differentials between competing jurisdictions may persist in equilibrium (Zissimos & Wooders (2008); Hindriks *et al.* (2008); Pieretti & Zanaj (2011)). These papers develop models of tax and public goods competition. Their focus is on the country asymmetry fueled by differences in size or in the level of public investments. Despite the different research focus, Proposition 2 gives an interesting insight into tax differentials between onshore economies in the presence of an OFC. Interestingly, the threshold $\widehat{c}$ in Proposition 2 increases with Π_i and/or Π_j, which represent the achievable profit for a given k. This means that the higher the profits, the more likely it is that the most advanced country sets higher taxes without losing attractiveness.

We believe our findings are relevant in view of the tremendous increase in capital mobility over recent years. Barriers to international capital mobility have fallen continuously due to deregulation policies, accompanied by the development of new technologies in financial markets. This has further fueled financial integration and capital mobility.

A final remark is in order. OFCs and more technologically advanced economies benefit from increased capital flows fostered by phantom FDI and increased capital mobility. To show this, in the following section we analyze what happens when the OFC ceases the provision of services that enable phantom FDI or it completely exits the tax competition.

4 Heterogeneous countries without phantom FDI

In this section, we study what happens when the offshore center stops providing opportunities for phantom FDI. In this case, the offshore financial center becomes a small country engaged in classical tax competition.[21] Therefore, it aims at attracting foreign investments to collect tax revenues. To be attractive, these investments have to generate some profit within the country, on which a tax can be levied.

Formally, we consider a game with three countries H_i, H_j, H_F. Similar to Section 3, investors are only located in countries H_i and H_j. Conversely, country H_F does not have any population but still provides investment opportunities within its borders. In fact, k units of capital invested in country H_F yield a net profit of $\Pi_F(1-t_F)$, where t_F is the country's corporate tax rate.

The timing of this game is as follows. All countries set their corporate tax rate to maximize their tax revenue, then investors in countries H_i and H_j decide on where to invest by comparing the different investment alternatives in the three countries. As before, foreign investing entails an additional private cost of cx_l (home bias).

The only scenario, consistent with capital flows towards country H_F is that in which the net profit in the country is the most competitive, i.e., $\Pi_F(1-t_F) > \max\{\Pi_i(1-t_i), \Pi_j(1-t_j)\}$. This is because investors decide on whether and where to invest by comparing the utility of *home investing* with that of the best foreign investing alternative (see Appendix B). If country H_F is not able to offer the most competitive net profit, the competition will be restricted to the two onshore countries. This scenario is analyzed in Appendix B.[22]

Consequently, country H_F attracts investments from both the other onshore countries,

$$x_i = \frac{\Pi_F(1-t_F) - \Pi_i(1-t_i)}{c} \quad \text{and} \quad x_j = \frac{\Pi_F(1-t_F) - \Pi_j(1-t_j)}{c} \ .$$

Accordingly, countries decide on the corporate tax rate to maximize their objective functions,

$$W_i = (1-x_i)\Pi_i t_i \ , \qquad W_j = (1-x_j)\Pi_j t_j \ , \qquad W_F = (x_j + x_i)\Pi_F t_F \ .$$

Solving the system of best responses, we get the following equilibrium tax rates

$$t_i^o = \frac{8c + 5\Pi_i - \Pi_j - 4\Pi_F}{12\Pi_i} \ , \quad t_j^o = \frac{8c - \Pi_i + 5\Pi_j - 4\Pi_F}{12\Pi_j} \ , \quad t_F^o = \frac{2\,(c + \Pi_F) - (\Pi_i + \Pi_j)}{6\Pi_F} \ ,$$

[21] This situation may result from compliance with international standards aimed at fighting aggressive tax planning (see Pieretti *et al.*, 2020).

[22] We are thankful to an anonymous referee for pointing out this scenario.

and the equilibrium capital flows

$$x_i^o = \frac{4\left(c+\Pi_F\right)-5\Pi_i+\Pi_j}{12c} \quad \text{and} \quad x_j^o = \frac{4\left(c+\Pi_F\right)-\left(5\Pi_j-\Pi_i\right)}{12c} \ .$$

An interior solution, $0 < t_z < 1 \quad \forall z \in \{i, j, F\}$, $0 < x_i < 1$ and $0 < x_j < 1$, requires that,

$\max\{\frac{1}{2}\left(\Pi_i+\Pi_j-2\Pi_k\right), \frac{1}{8}\left(-5\Pi_i+\Pi_j+4\Pi_k\right)\} < c < \frac{1}{8}\left(7\Pi_i+\Pi_j+4\Pi_k\right)$. The economic interpretation of this condition is analogous to that discussed in Section 3.

Given the above equilibrium, we can now determine the role of the OFC on capital investments in the technologically advanced country.

Proposition 3 *With heterogeneous countries, equilibrium capital investments in the technologically advanced country H_j increase when phantom FDI are promoted by an offshore center.*

Proof. Capital investments in H_j with and without an OFC are

$$\text{Capital investments with OFC} = \overbrace{\left(1-x_j^{**}\right)}^{\text{home investment}} + \overbrace{x_j^{**}}^{\text{round-tripped investment}} + \overbrace{x_i^{**}}^{\text{FDI inflows}} \ , \tag{18}$$

$$\text{Capital investments without OFC} = \left(1-x_j^o\right) \ , \tag{19}$$

$$\text{Difference in capital investments (18 - 19)} = \frac{2c+\Pi_F-\Pi_i}{3c} > 0 \text{ since } c > \frac{1}{8}\left(-5\Pi_i+\Pi_j+4\Pi_F\right) > \frac{1}{2}\left(\Pi_F-\Pi_i\right)$$

■

The intuition behind Proposition 3 results from the fact that when phantom FDI are allowed, home capital investments x_j is round-tripped back to the country, and also additional capital accrues from country H_i. Therefore, the technologically advanced country benefits from the existence of an OFC relative to a situation where the offshore ceases the provision of services promoting phantom FDI in favor of real investment opportunities.

This result is consistent with the findings of Hong & Smart (2010), who show that the presence of international tax planning may allow countries to retain foreign direct investment. Similarly, we find that, when countries offer heterogeneous profit opportunities, the presence of an OFC enabling phantom FDI results in additional capital investment towards technologically advanced countries.

5 The ATAD and CFC rule

In the above sections, we have explored how the presence of an OFC amplifies the amount of capital that flows from less advanced countries to technologically advanced ones. In this section, we turn to evaluating the effectiveness of a famous policy intervention in the European Union aimed at stopping this capital leakage. In 2015, the European Commission adopted the Anti-Tax Avoidance Package, which included a proposal for

an Anti-Tax Avoidance Directive (ATAD) (see European Commission, 2016a).[23] This directive was adopted on 20 June, 2016, and all member states applied these measures from 1 January, 2019. The ATAD sets three key anti-avoidance standards, which came into force on 1 January, 2019. These are (i) the Controlled Foreign Company (CFC) rule, to deter profit shifting; (ii) Interest Limitation, to discourage companies from artificial debt arrangements; and (iii) the General Anti-Abuse Rule, to tackle any remaining issues.

The CFC rule is relevant for our setting because if applied, it may change the optimal tax policy of onshore countries as well as the offshoring fee. The CFC rule aims to discourage companies from shifting profit from their parent company in a high-tax country to controlled subsidiaries in low-tax jurisdictions such as OFCs in order to reduce their overall tax liability. This rule ensures that the home country (an EU member state) of the parent company can tax the profits that the company has shifted to a low-tax country. In particular, profit shifted offshore has to be taxed onshore if the actual corporate tax paid overseas is less than half of that which would have been paid in the home country (the European member state).[24] It is worth mentioning that the ATAD being a European directive only, our setting remains unchanged if all countries involved are not EU member states.

To uncover when the CFC rule is applicable and changes the optimal taxes and fees in our setting with round-tripping, we concentrate on the benchmark scenario in which an OFC interacts with two homogeneous onshore economies. How does the CFC rule change the optimal taxes in this case? Interestingly, the optimal choices in (6) and (7) may remain invariant even if a country adopts the ATAD directive. It is easy to show that there exists a constellation of parameters for which the optimal offshoring fee f^* exceeds half of the onshore corporate tax. It is readily verified that $f^* > \frac{1}{2}t^*$ if and only if

$$\frac{\Pi}{k} > \frac{3}{2}. \tag{20}$$

Hence, if the return on capital Π/k is relatively high, then the CFC is not applicable and the equilibrium discussed in previous sections holds.

In contrast, if the return on employed capital is relatively low, i.e., $\Pi/k < \frac{3}{2}$, the fee of the onshore center is smaller than 50% of the tax in the onshore economy; therefore, the CFC rule applies and the onshore country will further tax the capital. It follows that the optimal solution in terms of taxes and fees is no longer the interior solution. The choices of the countries adapt to the new regulations. In this set of parameters, the regulations impose a lower bound to the choice of the offshoring fee

$$\bar{f} = \frac{t_z}{2},\ z = i, j,$$

[23] In addition to the ATAD, the EC package consists of three other documents: a Communication for an External Strategy for Effective Taxation, the amendment to the directive on mutual assistance to apply automatic exchange of information to country-by-country reporting, and the recommendation on tax treaties adding the "genuine economic activity" test to the Principal Purpose Test (PPT) rule (see European Commission, 2016b; European Commission, 2016c; European Commission, 2016d).

[24] Member states can apply stricter rules. The ATAD provides two options under which member states can impose the CFC rule, and it also allows for some exceptions for activities with substance that we do not address in this paper.

where we assume for simplicity that the onshore countries exactly apply the lower tax bound requested by the ATAD, the 50% threshold. The onshore jurisdictions require shifted profit to be taxed at a rate that is higher than the rate imposed by ATAD. The game remains a Nash simultaneous move game as before. Solving for the Nash outcome, we find that the best reply of the onshore countries to $\bar{f}$ is

$$t(\bar{f}) \equiv \bar{t}_z = \frac{c}{2\Pi - k} > 0 \text{ with } \frac{\Pi}{k} > \frac{1}{2}, z = i, j.$$

Hence, in the set $1/2 < \Pi/k < 3/2$, the optimal tax and fee solution in the presence of a CFC rule is given by

$$\bar{t}_i = \bar{t}_j = \bar{t} = \frac{c}{2\Pi - k} \text{ and } \bar{f} = \frac{1}{2}\frac{c}{2\Pi - k}.$$

The corresponding marginal investor has the following expression:

$$\bar{x} = \frac{1}{2}.$$

We are now in a position to investigate whether the CFC rule achieves its goal by increasing the capital remaining in the onshore economy, thereby reducing offshoring. Direct comparisons lead to the following result:

Proposition 4 *If the return to capital is high (i.e., $\Pi/k > 3/2$), the CFC rule is not applicable and the optimal tax and fee are not affected. In contrast, if the return to capital is low (i.e., $1/2 < \Pi/k < 3/2$), the CFC rule is applied, but the amount of offshored capital does not decrease.*

Proof. By direct inspection of optimal choices. ■

It may appear paradoxical that the introduction of a CFC rule does not decrease the amount of offshored capital. However, this result is not at all surprising if policy decisions are made strategically by rational policymakers. In fact, the CFC rule always leads to an increase in onshore taxes and, for lower levels of return to capital (i.e., $1/2 < \Pi/k < 5/4$), also in offshoring fees. A generalized increase in tax rates and fees does not necessarily expand the onshore tax base. Accordingly, in this case, the CFC rule would be effective in reducing offshored capital only if the increase of the fee was not fully offset by the increase in taxes in onshore economies.[25] While Proposition 4 focuses on the level of offshored capital, it is worth mentioning that CFC rules perform well with respect to onshore tax revenues. Despite these rules may reduce the tax base in onshore countries, they result in increased tax revenue because the remaining tax base is taxed at a higher rate. Therefore, if CFC rules are introduced to increase tax revenues in onshore countries, then it could be optimal for all of these countries to introduce them. However, some countries may be reluctant to introduce such rules if their concern is the total tax base.

To conclude, the introduction of CFC rules may not affect tax revenues of onshore countries as long as they are not applicable. This scenario occurs when the return on capital is high and, therefore, the potential loss of

[25] Obviously, when the CFC rule leads to an increase of the taxes but a decrease of the offshore fee (i.e. when $5/4 < \Pi/k < 3/2$), capital flows increase because of the larger gap between taxes and fee.

onshore tax revenue is highest. When CFC is applicable, it does not necessarily decrease the offshored capital but it does increase the total amount of tax revenues.

As a final remark, in the setting with two heterogeneous onshore countries, similar results to Proposition 4 hold. The CFC rules may lead to a generalized increase in taxes and fees. Moreover, if the productivity of capital differs greatly across onshore countries, the flow of capital from one economy may altogether stop flowing towards an OFC due to the CFC rule. This outcome resembles the description of the scenario in Proposition 4.

6 Conclusions

A paramount concern of public economics and the political economy literature relates to the fact that tax competition and offshore centers may reduce tax revenues, erode tax bases, and have other harmful effects through the inefficient allocation of resources across space. These concerns are exacerbated when tax competition takes place among onshore countries and OFCs. Globalization and the progressive removal of barriers to capital mobility have made it easier for capital to be relocated to OFCs. However, OFCs are typically not the final destination for the foreign investments they attract. The offshored capital often represents phantom FDI, which is not invested into projects based in OFCs. Instead, the offshored capital is often reinvested into real operations of firms located in other countries. Onshore capital flows to an OFC, and then it is either invested in high-tax countries or redirected back to the source country, a process known as "round-tripping".

In this paper, we analyze how these schemes affect the welfare and tax revenue in onshore countries when they face an OFC. In particular, we develop a model in which heterogeneous onshore countries compete internationally for mobile capital with an offshore financial center, and compare it to a benchmark that considers a similar competition but with homogeneous onshore regions. We demonstrate that an onshore country engaged in tax competition with an OFC benefits from the presence of a less advanced onshore jurisdiction. This result follows from the heterogeneity between onshore countries. When onshore countries are heterogeneous, the OFC responds by increasing its fees to appropriate a portion of the efficiency gains that agents in the less advanced country can reap from offshoring.

Finally, we qualify the conditions under which the CFC rules included in the EU regulation against aggressive tax planning (i.e., the ATAD) can be effective. We find that CFC rules are less likely to be applicable when the return on capital is high. By contrast, when the return on capital is low, these rules induce higher onshore corporate taxes without necessarily reducing phantom FDI.

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Appendix A

Agents in $\mathbf{H}_i$ never invest in H_j using the OFC

In this Appendix, we explore the hypothetical scenario in which the OFC selects such a high fee as to induce agents located in country H_i to invest directly in H_j rather than offshoring their capital first. This scenario would happen if

$$f > \frac{\Pi_j}{k} t_j.$$

In this case, agents in country H_i would prefer alternative (iii) to alternative (ii), meaning that no capital of investors of H_i is offshored ($x_i \leq 0$). Accordingly, these investors will ultimately compare home investment with direct investment in country H_j. The corresponding marginal consumer is

$$\bar{x}_i = \frac{\Pi_j - \Pi_i + (\Pi_i t_i - \Pi_j t_j)}{c}.$$

The set of alternatives of investors in country H_j does not change. They would still compare home investment vs. round-tripping.

It follows that the governments' objective functions would be

$$W_{H_i} = (1 - \bar{x}_i)\, \Pi_i t_i, \tag{21}$$

$$W_{H_j} = (1 - x_j + \bar{x}_i) \Pi_j t_j, \tag{22}$$

$$W_F = x_j k f. \tag{23}$$

Maximizing W_{H_i}, W_{H_j}, and W_F, the optimal government choices would be

$$\begin{aligned} f^{**} &= \frac{(3c - \Pi_i + \Pi_j)}{12k}, \\ t_i^{**} &= \frac{(9c + 5\Pi_i - 5\Pi_j)}{12\Pi_i}, \\ t_j^{**} &= \frac{(3c - \Pi_i + \Pi_j)}{6\Pi_j}. \end{aligned}$$

However, this equilibrium cannot exist because the fundamental condition $f > \frac{\Pi_j}{k} t_j$ does not hold for f^{**} and t_j^{**}. Indeed, evaluated at these equilibrium values, the condition boils down to $\frac{1}{12} \frac{-3c + \Pi_i - \Pi_j}{k} > 0$, which is never satisfied as by assumption $\Pi_i < \Pi_j$.

Appendix B

Heterogeneous countries without phantom FDI

Investors decide on whether and where to invest by comparing the utility of *home investing* with that of the best foreign investing alternative.

Therefore, depending on the net profit in the three countries (i.e., $\Pi_z(1-t_z),\ \forall z \in \{i,j,F\}$), we can identify three different cases to consider,

1. The net profit in country H_F is the least competitive, i.e., $\Pi_F(1-t_F) < \min\{\Pi_i(1-t_i), \Pi_j(1-t_j)\}$. In this case no capital would flow towards H_F, resulting in $W_F = 0$.

2. Intermediate cases, i.e., $\Pi_i(1-t_i) > \Pi_F(1-t_F) > \Pi_j(1-t_j)$ or $\Pi_j(1-t_j) > \Pi_F(1-t_F) > \Pi_i(1-t_i)$. Also in these cases no investors from country H_i or H_j would have any incentive to invest in country H_F. In fact, only investors in the least competitive country would consider foreign investing. Moreover, these investors will only consider the most competitive country as destination country, resulting in $W_F = 0$.

3. The net profit in country H_F is the most competitive, i.e., $\Pi_F(1-t_F) > \max\{\Pi_i(1-t_i), \Pi_j(1-t_j)\}$. In this case, H_F will be able to attract capital from both H_i and H_j. This will yield the following capital flows and H_F tax revenues: $x_i = \frac{\Pi_F(1-t_F)-\Pi_i(1-t_i)}{c}$, $x_j = \frac{\Pi_F(1-t_F)-\Pi_j(1-t_j)}{c}$ and $W_F = (x_i + x_j)\Pi_F t_F \geq 0$.

From the above discussion, it is clear that the best strategy for country H_F is to set a tax rate so that it can provide a competitive net profit,

$$0 < t_F \leq \min\left\{1 - \frac{(1-t_i)\Pi_i}{\Pi_F}, 1 - \frac{(1-t_j)\Pi_j}{\Pi_F}\right\} < 1 \ .$$

The scenario in which the above condition is satisfied is developed in Section 4 of the paper. However, it could also be that the above condition cannot be satisfied because country H_F, the *former OFC*, may not be able to provide an environment interesting enough for real business opportunities. If this is the case, competition will be restricted to the two original and heterogeneous onshore countries. We analyze this scenario below.

Tax-competition among heterogeneous countries without OFC

In this framework, agents in both countries compare the utility of foreign direct investment with that of investing at home, $U_z^d = \Pi_{-z}(1-t_z) + vG_z - cx_z$ vs $U_z^h = \Pi_z(1-t_z) + vG_z$ $\forall z \in \{i,j\}$. In each country, the agent indifferent between these two choices is,

$$x_z = \frac{\Pi_{-z}\left(1-t_{-z}\right) - \Pi_z\left(1-t_z\right)}{c} \ , \quad \forall z \in \{i,j\} \ .$$

Therefore, if $x_z > 0$ then $x_{-z} \leq 0$. In other words, only agents from one country will have incentive to invest abroad. Assuming heterogeneous countries (i.e., $\Pi_j > \Pi_i$), it can be easily verified that the Nash equilibrium of

this game is only consistent with investment flowing towards the technologically advanced country (i.e., $x_i > 0$, $x_j = 0$).

Accordingly, countries decide on the corporate tax rate to maximize their objective functions,

$$W_i = (1 - x_i)\Pi_i t_i \ , \quad W_j = (1 + x_i)\Pi_j t_j \ .$$

Solving the system of best responses, we get the following equilibrium tax rates and capital flows,

$$t_i^{oo} = \frac{3c - (\Pi_j - \Pi_i)}{3\Pi_i}, \quad t_j^{oo} = \frac{3c + \Pi_j - \Pi_i}{3\Pi_j}, \quad x_i^{oo} = \frac{\Pi_j - \Pi_i}{3c} \ .$$

From the above equilibrium outcome, we see that capital investment in the technologically advanced country always increases when phantom FDI are fostered by an OFC. This is because, in the presence of an OFC, home capital investment x_j are round-tripped back to the country, while capital accruing from the other country H_i increases. Formally,

$$x_i^{oo} = \frac{\Pi_j - \Pi_i}{3c} < \frac{1}{3} + \frac{5}{4}\frac{\Pi_j - \Pi_i}{3c} = x_i^{**} \ .$$

Therefore, the technologically advanced country benefits from the existence of an OFC promoting phantom FDI relative to a situation where the offshore is not present.