

Tax Havens, Accounting Experts, and Fee-Setting Rules*

Thomas A. Gresik[†] and Kai Konrad[‡]

November 14, 2017

Abstract. Tax havens differ in the specific tax planning arrangements multinational firms can use to reduce their tax liabilities. Given the complexity and cost associated with identifying the most effective tax haven to use, an accounting firm can act as an intermediary between tax havens and multinational corporations. We analyze a model with horizontally differentiated multinationals and tax havens to study the role accounting firm intermediation has on tax haven prices, multinational tax planning choices, accounting firm profits, and tax revenues. In equilibrium, uniform accounting firm fees generate higher accounting firm profit, less tax avoidance, and higher tax revenues than either full price discrimination or haven-specific fees.

Keywords: tax haven, accounting firm, horizontal differentiation, double marginalization, fee-setting rules

JEL classification numbers: M41, H26, H73, F38

* We thank Jennifer Blouin, Keith Crocker, Wolfgang Schön and Tim Stopler for helpful discussion and comments in the writing process. The usual caveat applies.

[†] Department of Economics, University of Notre Dame, Notre Dame, IN, USA. email: tgresik@nd.edu

[‡] Max Planck Institute for Tax Law and Public Finance, Munich, Germany. email: Kai.Konrad@tax.mpg.de

1 Introduction

A primary objective of the OECD Base Erosion and Profit Shifting (BEPS) initiative is to reduce the ability of multinationals to shift taxable income into tax haven countries (OECD, 2013). This and other efforts by developed economies are complicated by the lack of transparency regarding how corporations use specific tax haven laws to avoid taxes and the complexities of the business organization corporations must adopt to utilize tax havens without attracting the attention of tax authorities. This same lack of transparency and complexity also makes it costly for any individual corporation to know how best to identify and take advantage of the best tax haven given its global business model.

Accounting firms such as the "big four" play a key role as intermediaries between their customer corporations and tax havens whose laws create tax optimization models for corporations. The accounting firms reduce transaction costs and bridge the information gap between tax haven countries and the tax avoidance opportunities they offer and tax planning multinational corporations. Despite this critical role accounting firms play in the tax avoidance industry, little is known about how the design of tax haven laws and corporation choices are influenced by accounting firms.

We study this interaction between multinational corporations, tax havens, and accounting firms from the viewpoint of 'industrial organization'. Important elements are product differentiation and vertical constraints: Multinational corporations come from different industries and home countries, have different production and distribution models, and differ in their financial architecture. Also, different tax havens generate different tax optimization opportunities. One haven country's tax optimization models may be more suitable for some corporations, whereas another haven country's models may be more suitable for other corporations. A problem each multinational corporation faces is that it is not very transparent as to which haven model it should use. For a single corporation, even if it is of medium or large size, acquiring the information about the design of a tax optimization model, optimizing over all available tax model choices, and learning how to implement the chosen tax optimization model chosen in a "watertight" manner is costly. It is more cost effective if the company purchases this information from experts for whom the investment in this information constitutes their core business. Such experts can exploit economies of scale through the repeated use of their investment in information acquisition on a number of similar cases. And dealing with many cases gives them, over time, experience about which specific implementation of a given optimization model truly is watertight,

what the possible lines of conflict are with tax administrations, and how problems of conflict are addressed optimally when they arise.¹

To illustrate the institutional framework with differentiated products and the choice problems of corporations, consider the tax optimization tool referred to as a patent box / IP box / innovation box as an example. These are tax regulations by which specific types of corporate income stemming from patents / intellectual property is taxed at a significantly reduced rate. Evers, Miller and Spengel (2015) provide an overview of about 13 countries in Europe that offer this tool and a short description of their models. The countries include France, Hungary, the Netherlands, Belgium, Luxembourg, Spain, Malta, Liechtenstein, Niedwalden (in Switzerland), Cyprus and the UK. Tax rates differ, ranging from 0% (Malta) or 2% (Cyprus) to moderate rates of 12% (Spain) and 15.5% (France). Other sources of heterogeneity listed are the scope of intellectual property, and the scope of income included, as well as the expense deductibility rules. Corporations may choose whether to relocate income from where the income is actually generated to a country with an IP/patent box. This choice problem is not that easy, and the alternatives are also not strictly ordered. The optimal choice may differ across corporations according to their country of origin, business model, product markets, type of intellectual property, actual R&D efforts, and other corporation specific characteristics. Moreover, the use of patent box regulations may interact with other constraints, such as CFC regulation (see Griffith, Miller, and O'Connell, 2010) or the deductibility of R&D expenses (Evers, Miller and Spengel, 2015) or with other tax optimization opportunities that may allow for a further reduction in the effective tax rate.

This paper studies the role of an accounting firm as an intermediary between haven countries and multinational corporations. The focus is on the role of its pricing behavior for competition among haven countries. For the analysis we assume that there is one single intermediary who advises a large set of corporations on what the optimal tax optimization solution is for each of them, taking into consideration the different tax optimization models that exist and the specific characteristics of the respective corporation. Each corporation seeks to

¹ Appendix B contains excerpts from the home pages of the big four accounting firms that raise these same issues. All four excerpts emphasize the role of the accounting firm in serving as a problem solver for corporations needing to navigate the complexity of tax optimization models created by both tax haven and corporation heterogeneity.

use a tax optimizing model that reduces its tax bill and the corporations differ in their specific needs and can be sorted along a one-dimensional horizontally differentiated space. We can think of these differences as mapping differences in country origin, type of product, international representation, financial structure, corporate and ownership structure or importance of intellectual property etc. A corporation's choice will also depend on the fees charged by the tax havens and the accounting firm and any adjustment costs the adoption of a specific tax optimization model entails.

We assume that the service of the accounting firm is a necessary input for a corporation to reduce its taxes and that the accounting firm will recommend the tax haven model that suits the corporation best. The corporation can then either adopt the model and pay haven, accounting firm, and adjustment costs or elect to adopt no model. Because the accounting firm will seek to use its fees to extract rents from the corporations, its preferences as to which haven model to recommend aligns with each corporation so the objective of the accounting firm is to choose the fee policy that will maximize its equilibrium profit. The accounting firm's fee policy will also influence the prices chosen by the tax havens as the havens' prices will influence both the accounting firm's recommendation and each corporation's adoption decision.

We consider three fee policies: full price discrimination in which the accounting firm's fee can vary with both the recommended haven model and corporation characteristics, partial price discrimination in which the accounting firm's fees can vary only with the recommended haven model but not with corporation characteristics, and uniform pricing in which the accounting firm's fee is independent of the recommended haven model and corporation characteristics.

A full price discrimination policy allows the accounting firm to extract the maximum rents from each corporation, and the optimal fees will never change any corporation's adoption decision. Since the haven countries can anticipate the accounting firm's fees, any increase in haven prices will be fully offset by a reduction in the accounting firm's fees. The rents the accounting firm can earn under full price discrimination are thus limited to those generated by the heterogeneity in corporation adjustment costs.

A partial price discrimination policy cannot extract all available corporation rents, even in the absence of haven prices, so the optimal fees will reduce the measure of corporations that adopt a haven model. This is not surprising given the double marginalization problem generated by this policy. Moreover, any increase in

haven prices is only partially offset by a reduction in accounting firm fees. In equilibrium, the fact that the havens internalize only a fraction of the reduced quantity demanded from higher prices results in no change in haven prices but reduced accounting firm fees, fewer corporations using a tax optimization model, and lower haven and accounting firm payoffs.

A uniform pricing policy affords the accounting firm the lowest level of rent extraction, and given the haven prices, the optimal fee will reduce the measure of corporations that adopt a haven model. However, it also introduces strategic linkages across the havens' pricing decisions that yield the largest equilibrium payoff for the accounting firm. Because the haven countries internalize a larger percentage of a higher price, they set lower prices than under full or partial price discrimination which allows the accounting firm to choose a larger fee. The strategic response of the havens under a uniform pricing policy by the accounting firm increases the quantity demanded of tax optimization models relative to partial discrimination enough to give the accounting firm a higher equilibrium payoff than it can earn even under full price discrimination.² This is the main insight of this paper. It highlights the importance of the role accounting firms play in facilitating the matching of corporations with the best tax planning model. A role we would argue has not been adequately studied.

In the remainder of this paper, we discuss the relationship of our analysis to several parts of the broader IO literature in section 2. In section 3 we describe our model and in section 4 we present the equilibrium analysis. In Section 5 we address the equilibrium consequences for both tax revenues and global welfare.

² In practice, tax consultants are not completely free to choose their fees. Rule 3521 (PCAOB, 2017), for instance, bans contingent fee or variable commission policies based on the net tax savings a corporation will realize. This rule can be seen as a limitation on how fees can be individualized. The ban applies to accounting firms that wish to secure a corporation's audit business (which most do) on the grounds that such fees compromise an auditor's ability to impartially conduct an audit. While Rule 3521 was adopted for ethics reasons, our results show that the optimal fee policy for an accounting firm satisfies this rule for strategic pricing reasons unrelated to auditor independence. If the consultant and the client negotiate their hourly fees before the tax consultant knows the specific characteristics of the client and how the client matches with existing tax optimization models, this may be another reason that limits the use of discriminatory pricing by tax consultants.

We will show that equilibrium tax revenues and global welfare are both higher under a uniform pricing policy than under full price discrimination while the preferred policy by OECD governments would be partial price discrimination. We finish with a discussion of our results in section 6.

2 Literature

Our contribution sits in the intersection of five literatures: the literature on tax havens, the literature on competition with horizontal product differentiation, the literature on intermediaries, the literature on corporate tax avoidance, and the literature on sequential common agency.

Much of the literature on tax havens analyses the role of tax havens as countries or jurisdictions with a low or zero effective tax rate that compete with each other for attracting business profits from general corporate income. Important recent contributions with partially diverging views on the distributional and welfare effects of tax haven activity are Hong and Smart (2010) and Slemrod and Wilson (2009). Dharmapala (2008) and Keen and Konrad (2013) provide overviews. Dharmapala and Hines (2009) and Slemrod (2008) identify several common characteristics of tax havens.³ Our contribution highlights specific aspects of the competition for business profits, in particular, the role of intermediaries in this process. Intermediaries affect the competition between tax haven countries, but also the prices which customers pay in the equilibrium. We also find that the equilibrium outcome depends on the nature of the general rules on setting accounting fees. A complementary literature addresses the role of tax havens as means to hide personal capital income from their own resident country's tax authorities. This literature assesses the size of the phenomenon (e.g., Zucman 2013), addresses issues of relocation of portfolio wealth (Johannesen and Zucman 2014) and discusses, among other things, the role of competition and market power for the sustainability of this business (Elsayyad and Konrad 2011, Konrad and Stolper 2015). While many tax havens are engaged in this income concealment business for private portfolio investors as well as in profit shifting opportunities for corporations, these two business models can largely be studied independently of each other.

³ These include a small size of real economic activity and superior quality of governance, in terms of a well-functioning legal framework, institutions granting sound property rights, governmental stability and the absence of a major expropriation threat for investors.

In the area of international tax competition, product differentiation according to Hotelling (1929) or with spatial price discrimination as in Hoover (1936) and Hurter and Lederer (1985) has few applications. Hohaus, Konrad and Thum (1994) are one of the exceptions. However, they consider municipalities' horizontal differentiation in the type of public good provided, followed by citizens' location choices. A further analysis of jurisdictions' locational choice (in terms of the type of public good chosen) is by Zissimos and Wooders (2008), which has been extended by Kotsogiannis and Serfes (2010), and Perroni and Scharf (2001) consider the interplay between jurisdiction formation and capital taxation in a model with horizontal differentiation. Work in industrial organization covers related competition structures. Seminal contributions on two-sided markets are by Armstrong (2006) and by Rochet and Tirole (2006). They take stock of existing theories, discuss key issues and provide fundamental tools and results for the analysis of two-sided markets. The literature highlights, for instance, the role of network externalities, and the role of the platform for the formation and attribution of pricing components between the providers and the users. Although one can think of the accounting firm in our model as a platform, the specific context we consider is free of network externalities and focusses on the effects of price competition in an upstream market with heterogeneous users (corporations) and with horizontal product differentiation between the providers (haven countries). Further, our analysis considers a consecutive price-setting behavior, by which the haven countries choose their charges (tax rates and administrative fees) first and the platform (accounting firm) reacts to these choices. As we consider a multi-stage game in an otherwise static model, this assumption corresponds to the perspective that the choice of local taxes and business fees by tax havens is less flexible in the short term than the fee-setting behavior of accounting firms. It is not the tax havens responding to the fee structure of accounting firms, but it is the accounting firms who direct their consultancy effort on a search for existing tax loopholes and tax optimization models.

The structure of our analysis is also related to work on double vertical constraints, with the haven countries playing the role of competing upstream producers and the accounting firm as the downstream monopoly retailer. Much of this literature considers the role of such competition structures for market efficiency, starting with the seminal work by Mathewson and Winter (1984), McAfee and Schwartz (1994) and Rey and Tirole (1986) on the role of contractual arrangements between upstream and downstream firms. Different structures with one or several firms upstream and/or downstream, the specific mode of competition and the

types of contractual arrangements that are feasible provide a large set of relevant results and a substantial stock of knowledge. There are however critical differences in this paper relative to this literature, which tends to focus on the competitive effects of vertical restraints (in the form of non-linear prices) between producers (tax havens in our model) and intermediaries (the accounting firm). For example, Rey and Stiglitz (1988) emphasize the anti-competitive strategic effects that arise from intermediation. Their main result is that intermediation facilitates collusion and redistributes surplus from consumers to the intermediary and the producers. In our paper, there is no contracting or financial transactions between the tax havens and the accounting firm. Both parties interact only through the customers/corporations. While both full and partial price discrimination serves to shift surplus away from the corporations, it is only when the accounting firm chooses uniform pricing that a strategic effect on tax haven pricing arises and it results in more competitive, not less competitive, prices relative to the full price discrimination case. Thus, our results suggest that the commitment power intermediation creates that yields higher prices in the haven countries is a result not of the accounting firm's monopoly position, but a result of the specific pricing policy the accounting firm uses. Moreover, the preferred pricing policy of the accounting firm results not in higher equilibrium haven prices but lower ones. We are not aware of other papers in the vertical restraint literature that make this point.

Our work is also related to a rapidly developing literature on corporate tax avoidance. This literature, starting with two seminal papers, acknowledges agency problems in corporate enterprises and assesses their role for tax avoidance decisions. Crocker and Slemrod (2005) study the principal-agent problem between shareholders of a company and its chief financial officer who has superior information about tax avoidance opportunities. They consider the different effects of penalties imposed on shareholders versus penalties imposed on the manager. Chen and Chu (2005) start with the observation that illegal tax evasion generates a contracting problem. As contracts that involve some evasion activities may not be enforceable, this induces limits on the type of optimal contracts that can be written and enforced between owners and managers of corporations. Accounting firms may play a key role as specialists or experts in the corporate tax evasion context, creating further types of principal-agent problems as has been discussed by Lipatov (2012). The use of tax optimization models as they are offered by tax havens and administered by accounting firms constitutes tax avoidance as it is not illegal. Tax avoidance using the loopholes that emerge in the network of international tax treaties is not an illegal activity. This makes it systematically different from tax evasion. Our analysis concentrates on this type

of tax optimization and looks at the role of fee setting rules among accountant firms and at the role of market structure for the rents of accounting firms, corporations who use tax optimizing models and tax havens who offer such models.

Theoretically our model can perhaps best be thought of as one of sequential common agency, as in Pavan and Calzolari (2009). Both the tax havens and the accounting firm are trying to influence the decisions of corporations, so both are principals. Our analysis differs from the sequential common agency literature in two ways. First, our model is a hybrid that consists of both simultaneous and sequential common agency because all the tax havens choose their fees simultaneously but before the accounting firm, reflecting the greater flexibility the accounting firm has in setting its fees. We are not aware of other paper that study common agency with simultaneous choices by some principals and sequential choices by others. Second, consistent with observed practice, the tax havens are not permitted to price discriminate. Only the accounting firm can do so. Thus, we believe this paper studies a form of common agency not yet addressed in the literature.

3 The model

Our model consists of three types of agents. First, there is a continuum of multinational corporations of measure 1. They are uniformly distributed on a Salop (1979) circle of circumference 1 with corporation j located at position x_j . The corporations generate profit from operations in a host country.⁴ Second, there are H tax havens indexed by $h \in \{1, \dots, H\}$. Haven h can pass legislation to create and host tax optimization models. Denote the set of models offered by haven h by N_h and denote the number of distinct tax optimization models offered by n_h . Let $n = n_1 + \dots + n_H$ denote the total number of tax optimization models available to corporations. The n models, indexed by i , are located equidistant from each other on the circle. Model i 's location is $a_i \in [0, 1]$. Third, there is a single accounting firm. It provides necessary expertise to the corporations that allows them to implement a tax optimization model in a cost-effective way.

The corporations are potential users of the tax optimization models. If a corporation does not use any of the available models, it incurs no adjustment costs

⁴ To avoid issues of double taxation, which are not relevant for our analysis, we assume the corporations are headquartered in a home country that exempts foreign-earned income.

and pays a tax in its headquarters country equal to $m > 0$. This tax is the same for all corporations and is exogenously given. To reduce its tax liability, each corporation can use at most one model. Depending on the location of the corporation's location, a specific model may require costly adjustments to the corporation's legal and financial structure relative to the structure that would maximize the corporation's pre-tax profit. This reduces the net tax savings a corporation can realize.

If corporation j uses model i , it will incur what we will call an adjustment cost of $\Delta(x_j, a_i) = (x_j - a_i)^2$.⁵ It represents the actual adjustment costs due to a spatial mismatch between the tax haven model and the needs of the corporation. The key properties are that Δ is increasing in the distance between a_i and x_j and $\Delta(x_j, x_j) = 0$. Thus, corporation j will use model i only if $\Delta(x_j, a_i) \leq m$. We will study the case of $n < 1/2\sqrt{m}$, which implies that not all corporations will choose to use a tax optimization model.⁶

A corporation which uses a specific model needs to pay a price to the tax haven that offers the model, which is denoted by

$$q_i \in [0, m) \text{ for } i = 1, \dots, n. \quad (1)$$

These prices can be thought of as the tax rates charged by the respective haven.⁷ Note that we restrict these prices from above by the maximum tax saving as doing so excludes irrelevant choices and eases the description of the equilibrium.

The accounting firm has expertise in implementing tax optimization models, including professional contacts with tax haven officials, which it can provide to many corporations. Because the accounting firm serves a large number of

⁵ The adjustment cost function is scaled so that $x_j - a_i = 1$ incurs a cost equal to 1. Introducing a scaling factor does not alter our results.

⁶ In addition to focusing on this empirically relevant case, for the case of two havens, each with one model, we can show that the accounting firm will always want to set its fees so that no two havens are competing for the same corporations.

⁷ As has been pointed out by legal scholars (see, e.g., Schön (2005)), the interpretation of these net prices as taxes need not be taken literally. These prices need not be taxes in a formal/legal sense, but a tax haven could collect revenues by charging fees and business taxes on the local financial industry that is used to implement the haven's tax-planning model, that then shifts these fees forward to its customers.

corporations, its expertise creates both economies of scale and scope that reduce a corporation's adjustment costs if it hires the accounting firm. Without the accounting firm's services, the adjustment costs associated with any tax optimization model would be prohibitively expensive. Under this assumption, the accounting firm's service is necessary for any corporation that chooses to engage in tax planning. Given this necessity, we assume the adjustment cost function, $\Delta(x_j, a_i)$, already includes the cost-reducing benefits from hiring the accounting firm. The accounting firm provides its service for a fee, and the fee charged by the accounting firm to corporation j for implementing and using model i is $\gamma_{ji} \in [0, m)$. We will distinguish between three different fee policies for the accounting firm:

(CM) The accounting firm can fully price discriminate by charging corporation-model specific fees, γ_{ji} ,

(M) The accounting firm can charge model-specific fees such that $\gamma_{ji} = \gamma_i$ for all corporations that use model i , and

(U) The accounting firm charges all corporations a uniform fee $\gamma_{ji} = \gamma$ regardless of the model any corporation chooses.

The choices of the tax havens, the accounting firm, and the corporations take place in four stages. In stage 0, the accounting firm commits to a fee policy, either CM, M, or U. In stage 1, the havens simultaneously choose their prices. Each haven h , sets q_i for all $i \in N_h$. In stage 2, the accounting firm sets its fees, γ_{ji} , for all j and i consistent with its stage 0 policy choice. Finally in stage 3, the accounting firm recommends one model to each corporation and each corporation chooses either the recommended model or no model. We denote the model choice of corporation j by $\tau_j \in \{0, 1, \dots, n\}$, where $\tau_j = 0$ means that corporation j has chosen not to use any of the models and $\tau_j = i$ for $i \in \{1, \dots, n\}$ means that corporation j has chosen to use the recommended model i . Denote the measure of corporations that uses model i by y_i .

Since all the corporations face the same initial tax liability, m , it can use the fees and the haven prices to choose a tax optimization model. If a corporation decides not to use any model, it pays neither an accounting firm fee nor a haven price.

The payoff to tax haven h is equal to prices paid by corporations that use its models or

$$G_h = \sum_{i \in N_h} y_i q_i . \quad (2)$$

Eq. (2) reflects the simplifying assumption that the havens have zero cost of providing any of their models to an additional corporation. The payoff of the accounting firm is

$$\pi = \sum_{i=1}^n \int_{\tau_j=i} \gamma_{ji} dx_i. \quad (3)$$

With policy (ii) for which $\gamma_{ji} = \gamma_i$ and policy (iii) for which $\gamma_{ji} = \gamma_i = \gamma$, the accounting firm's payoff can be written more simply as

$$\pi = \sum_{i=1}^n y_i \gamma_i. \quad (4)$$

A corporation's payoff depends on its location, the haven prices, the accounting firm fees, and its choices. For corporation j its payoff is

$$u(x_j, \tau_j) = \begin{cases} m - q_i - \gamma_{ji} - \Delta_{ji} & \text{if } \tau_j = i \neq 0 \\ 0 & \text{if } \tau_j = 0. \end{cases} \quad (5)$$

If the accounting firm recommends model i to corporation j , corporation j will select the recommended model as long as $u(x_j, i) \geq 0$.

4 Equilibrium outcomes

In this section, we consider the subgame perfect Nash equilibria of the game defined in section 3.

Beginning with the corporations' stage 3 choices, let $i^*(j)$ denote the model corporation j would optimally choose in the absence of any haven prices or accounting firm fees if it had sufficient information to make such an assessment. Given the spatial model differentiation and our tie-breaking rule, $i^*(j)$ is equal to the model for which it incurs the lowest adjustment cost. Including prices and fees will only reduce the net benefit to a corporation of using a model. Thus, corporation j will either choose model $i^*(j)$ or nothing. Corporation j will choose

model $i^*(j)$ if, and only if, $\Delta_{ji^*(j)} \leq m - q_{i^*(j)} - \gamma_{ji^*(j)}$ or⁸

$$a_{i^*(j)} - \sqrt{m - q_{i^*(j)} - \gamma_{ji^*(j)}} \leq x_j \leq a_{i^*(j)} + \sqrt{m - q_{i^*(j)} - \gamma_{ji^*(j)}}. \quad (6)$$

Ineq. (6) implies that the corporation will choose model $i^*(j)$ if it is different between model $i^*(j)$ and choosing no model.⁹

Working backward to stage 2, the accounting firm will then choose the fees that maximize eq. (3). With policy CM, under which the accounting firm perfectly price discriminates, accounting firm profits are maximized by extracting all of the surplus from the corporations. It does this by setting

$$\gamma_{ji} = \max\{0, m - q_i - \Delta_{ji}\}, \quad (7)$$

which will make corporation j indifferent between model i^* and no model. Given the haven prices, the fees in eq. (7) will never cause a corporation to switch from using model i^* to using no model, as doing so would weakly reduce the accounting firm's payoff. The marginal firm that chooses i^* will pay the accounting firm zero. Thus, in stage 1 each haven can set its model prices independently. The measure of corporations choosing each model then equals $2\sqrt{m - q_i}$ and the optimal price is $q_i = 2m/3$.

With policy M, the choice of fees creates a trade-off between the fee a corporation pays and the measure of corporations that use a model. Given the havens' prices, the measure of corporations in stage 2 choosing model i will now equal $2\sqrt{m - q_i - \gamma_i}$ so the accounting firm will choose its fee for model i to maximize $2\gamma_i\sqrt{m - q_i - \gamma_i}$ or $\gamma_i = 2(m - q_i)/3$. In stage 1, the payoff to a haven from model i equals $2q_i\sqrt{(m - q_i)/3}$, which is maximized at $q_i = 2m/3$. In equilibrium each γ_i equals $2m/9$.

With policy U, the optimal fee will depend on all the model prices as

⁸ Although the square root terms are undefined whenever $q_i + \gamma_{ji} > m$, no corporation would ever choose a model with such a large total cost so we can ignore this issue in writing ineq. (6).

⁹ For brevity, we will henceforth simply refer to i^* .

$$\pi = \sum_i 2\gamma \sqrt{m - q_i - \gamma} . \quad (8)$$

The optimal stage-2 fee must solve the first-order condition

$$\partial \pi / \partial \gamma = 2 \sum_i (m - q_i - \gamma)^{-1/2} (m - q_i - 3\gamma / 2) = 0 . \quad (9)$$

We denote the solution to eq. (9) as $\gamma(q_1, \dots, q_n)$. In stage 1, each haven h will choose its prices to maximize

$$G_h = \sum_{i \in N_h} 2q_i \sqrt{m - q_i - \gamma(q_1, \dots, q_n)} . \quad (10)$$

For each $j \in N_h$, haven h 's prices will satisfy

$$2(m - q_j - \gamma) - q_j(1 + \gamma_j) = (m - q_j - \gamma)^{1/2} \gamma_j \sum_{\substack{i \in N_h \\ i \neq j}} (m - q_i - \gamma)^{-1/2} q_i , \quad (11)$$

where the formula for $\gamma_j \equiv \partial \gamma / \partial q_j$ is derived in Appendix A. Unlike with the CM and M policies, a uniform-pricing policy by the accounting firm creates a strategic linkage between what are otherwise havens with disjoint client bases. The equilibrium prices will reflect this strategic linkage. Proposition 1 reports the equilibrium prices and fees for all three policies.

Proposition 1. (i) *If the accounting firm chooses corporation-model specific fees, then in equilibrium all havens charge $q^{CP} = 2m/3$ for each of their models and the accounting firm fee equals $\gamma_{ji}^{CP} = m/3 - \Delta_{ji}$.*

(ii) *If the accounting firm chooses model specific fees, then in equilibrium all havens charge $q^P = 2m/3$ for each of their models and the accounting firm fee equals $\gamma^P = 2m/9$ for each model.*

(iii) *If the accounting firm chooses a uniform fee, then in equilibrium all havens charge $q^U = 2mn / (5n - 2n_h)$ and $\gamma^U = (2m/3)(3n - 2n_h) / (5n - 2n_h)$.*

Unlike with the first two policies, the equilibrium prices and fee under uniform pricing depend on the number of tax optimization models as well as the number

offered by each haven. Because $n_h \leq n$, a uniform fee policy decreases each product's price and increases the accounting firm's fee relative to those under policy M. If there is only one haven so that $n_h = n$, then policies M and U are identical.

Proposition 1 suggests that the structure of the accounting firm's fee-setting policy can have an impact on the equilibrium outcomes in the market for tax optimization models, including the rents that accrue from tax saving, and how they are divided between the tax haven, the accounting firm, and the taxpayers.

If the accounting firm adopts full price discrimination as in policy CM, it sets its fee for each corporation to extract all the rent generated by tax planning. Its prices do not affect which corporations use each tax model but only how the rents from each tax optimization model are distributed between the accounting firm and a tax haven. This policy induces full offset as $d\gamma_{ji}/dq_i = -1$. If the tax havens could compete directly for corporations, the absence of the accounting firm would result in the same equilibrium haven prices and quantities demanded by corporations. Thus, full price discrimination has no efficiency effects but serves to redistribute surplus from the corporations to the accounting firm.

If the accounting firm adopts policy M, a form of third-degree price discrimination, it causes "double marginalization". From the accounting firm's reaction function, an increase in a tax haven's price induces the accounting firm to reduce its fee. Because the accounting firm does not price discriminate among corporations, its fee adjustment is $d\gamma_i/dq_i = -2/3$, which is less than a full offset. A tax haven can anticipate that two-thirds of a price increase will be counteracted by a fee reduction so that only one-third of the price increase will be passed on to corporations. Given the accounting firm's reaction to a model price, the adoption of policy M instead of policy CM lowers the quantity demanded of the haven's model from $2\sqrt{m-q_i}$ to $2\sqrt{(m-q_i)/3}$. Because a tax haven internalizes a constant fraction of the reduction in the quantity demanded, the price it charges in equilibrium is the same under both policies CM and M.

If the accounting firm adopts policy U, the accounting firm's optimal fee now depends on the prices set by all the tax havens. If one haven changes the price of one of its models, the accounting firm's reaction must take into account how its new fee will affect the quantity demanded of all the models. Starting from identical model prices, it is shown in Appendix A that $\partial\gamma/\partial q_i = -2/(3n)$. As the number of tax optimization models increases, each haven bears a larger share of

the reduction in the quantity demanded of its model from a price increase, which makes it more reluctant to charge as high a price as under policies CM and M.

The effects of uniform pricing also depend on the overall number of tax models and the number offered by each tax haven. From eq. (10), note that

$$dG_h = n_h \sqrt{\frac{3}{m - q^U}} \cdot \frac{4m(n - n_h)}{3(5n - 2n_h)} \cdot \left(\frac{\partial q^U}{\partial n} dn + \frac{\partial q^U}{\partial n_h} dn_h \right) + 2q^U \sqrt{\frac{m - q^U}{3}} dn_h. \quad (12)$$

An increase in the number of havens, holding n_h fixed, decreases q^U , increases γ^U , and decreases each haven's payoff. Alternatively, an increase in the number of models offered by each haven, holding the number of havens fixed so that n/n_h is unchanged, has no effect on q^U nor γ^U . The proportional increase in n and n_h creates offsetting effects on q^U leaving only the last term in eq. (12). With a positive direct effect on haven profit, an increase in the number of models offered holding the number of havens fixed increases each haven's payoff. This result parallels the Baye, Crocker, and Ju (1996) results on divisionalization, although in our model the haven chooses its prices to maximize total haven profit as opposed to choosing all its prices non-cooperatively.

In Table 1, we report the symmetric equilibrium payoffs under each pricing policy for the case of two havens each offering only one model ($n = 2, n_h = 1$). Not surprisingly policy CM generates larger payoffs for the accounting firm and the havens than policy M, because the latter reduces the measure of corporations using each tax planning model. Note however that the accounting firm's payoff with policy CM is smaller than its payoff with policy U. This occurs because policy U strategically links the havens' pricing decisions causing the haven prices to fall from $2m/3$ to $m/2$. The measure of corporations using a tax planning model also falls, which means the increase in the accounting firm's payoff comes at the expense of the havens. For other values of n and n_h , the accounting firm will earn a larger payoff under policy U as long as there are at least two havens. With only one haven, a uniform pricing policy cannot create the strategic effect that results in lower haven prices and policies M and U have identical equilibrium outcomes. From these calculations we can state Proposition 2.

Policy	Accounting Firm Payoff (π)	Haven Payoff (G_h)	Accounting Firm Fee (γ)	Haven Product Price (q)	Quantity Demanded per Model (y_i)
CM	$\frac{8m}{9} \sqrt{\frac{m}{3}}$	$\frac{4m}{3} \sqrt{\frac{m}{3}}$	$\frac{m}{3} - \Delta_{ji}$	$\frac{2m}{3}$	$2\sqrt{\frac{m}{3}}$
M	$\frac{8m}{9} \frac{\sqrt{m}}{3}$	$\frac{4m}{3} \frac{\sqrt{m}}{3}$	$\frac{2m}{9}$	$\frac{2m}{3}$	$\frac{2\sqrt{m}}{3}$
U	$\frac{4m}{3} \sqrt{\frac{m}{6}}$	$m\sqrt{\frac{m}{6}}$	$\frac{m}{3}$	$\frac{m}{2}$	$2\sqrt{\frac{m}{6}}$

Table 1. Symmetric equilibrium outcomes for two havens, each offering one product.

Proposition 2. *If there are at least two tax haven countries, then in equilibrium the accounting firm prefers policy U to policy CM to policy M, while in equilibrium each tax haven prefers policy CM to policy M to policy U.*

Proposition 2 does depend on the functional form of the corporations' adjustment costs. With linear adjustment costs, the accounting firm's equilibrium payoff would be the largest under policy CM, but policy U would still generate a larger equilibrium payoff under policy M. This partial reversal of the accounting firm's payoff rankings of policies CM, M, and U occurs because the demand for tax planning is less elastic with linear adjustment costs than it is with quadratic adjustment costs. It remains to be the case that the strategic linkage among the tax havens created by policy U improves the accounting firm's payoff relative to policy M.

5 Global welfare and waste

The countries in which corporate headquarters are based, which we will refer to as OECD countries, have not been active players in the formal analysis of the previous section. However, the equilibrium outcomes have implications for their welfare under the different policies. In particular, the equilibrium actions of the corporations, the tax havens, and the accounting firm determine the tax revenues of the non-haven countries, the consumer surplus of the corporations that use a tax model, and the level of global welfare. For fee policy k with the quantity demanded per product, y^k , aggregate tax revenue is defined as

$$T^k = (1 - ny^k)m \quad (13)$$

so the preferences of the OECD countries are inversely related to the aggregate measure of corporations using a tax optimization model.

Consumer (corporation) surplus for corporation j that uses tax model i under policy k is defined as

$$CS_{ji}^k = m - q_i - \gamma_{ji} - (x_j - a_i)^2. \quad (14)$$

Consumer surplus per tax model, CS^k , is then calculated by integrating CS_{ji}^k over all corporations that use each model.

By global welfare we mean the sum of all rents, including tax revenues. Thus, maximizing global welfare is equivalent to minimizing social waste, which we measure by the aggregate adjustment costs corporations incur. For fee policy k , social waste is defined as

$$\Omega^k = 2n \int_{x=a_i}^{a_i+y^k} \Delta_{ji} dx = 2n \int_{z=0}^{y^k} x^2 dx = 2n(y^k)^3 / 3. \quad (15)$$

Proposition 3. *With at least two tax havens, in equilibrium $T^M > T^U > T^{CM}$, $CS^U > CS^M > CS^{CM}$, and $\Omega^{CM} > \Omega^U > \Omega^M$ so that policy M generates the most tax revenue and the least social waste, policy U generates the largest consumer surplus, and policy CM generates the least tax revenue and the most social waste.*

From Proposition 3, we learn that full price discrimination results in the lowest tax revenues and the greatest economic burden while model-specific fees results in the largest tax revenues and the lowest economic burden. Uniform pricing is viewed by the OECD countries as an intermediate policy relative to these two dimensions. A uniform pricing policy also is preferred by corporations as it allows them to earn the largest surplus from tax planning. These rankings are unaffected when adjustment costs are linear.

6 Discussion

This paper offers a new perspective on the interaction between tax havens, accounting firms, and client multinational corporations. Tax havens may offer one

or several tax optimization opportunities. Multinational corporations may use one of these opportunities, but need external accounting advice and expertise. Our approach highlights the role of accounting firms that "sell" tax optimization models to the users. The users differ with respect to location and local tax rules, their business model, product type, financial needs and financial and corporate structure. The accounting firm which often has long-standing business relations with a corporation has detailed knowledge about the specific characteristics of each of its clients and about existing tax optimization models. It can identify if there is a tax optimization model that best suits the client and charges fees for this advice. This haven-client information gives an accounting firm market power that it can exploit.

We analyze the vertical market relationship that emerges in this framework. We show that the general type of accounting fee is important for the taxes and administrative charges havens levy for using their tax avoidance models, for the generation of surplus (including tax revenues paid to non-haven countries), and the distribution of this surplus among multinational firms, the tax havens, and the accounting firm. To maximize its equilibrium payoff the accounting firm prefers to eschew price discrimination policies and instead charge its clients uniform fees. Uniform fees could also arise because of industry ethics rules or because the accounting firm might not have complete information about the client when negotiating the contract. It is important to know that what is seemingly a limitation arises in our model as the optimal pricing policy. Whereas the ethics rules are intended to preserve auditor independence, and information hurdles at the contracting stage may impose practical limitations, in our paper uniform fees arise as the preferred fee policy of the accounting firm because it creates strategic linkages among tax havens that result in lower haven prices, and hence higher accounting firm profit. This result is in sharp contrast with the vertical restraint literature emphasizing that vertical restraints result in higher prices. In our paper, it is the lack of vertical restraint that generates higher prices for the accounting firm. As a result, the unique position accounting firms have in the market for tax avoidance services creates novel strategic and welfare effects.

References

- Armstrong, Mark, 2006, Competition in two-sided markets, *Rand Journal of Economics*, 37(3), 668-691.
- Baye, Michael, Keith Crocker, and Jiandong Ju, 1996, Divisionalization, franchising, and divestiture incentives in oligopoly, *American Economic Review* 86:223 – 36.
- Chen, Kong-Pin, and C.Y. Cyrus Chu, 2005, Internal control versus external manipulation: a model of corporate income tax evasion, *Rand Journal of*

- Economics* 368(1), 151-164.
- Crocker, Keith J. and Joel Slemrod, 2005, Corporate tax evasion with agency costs, *Journal of Public Economics*, 89(9-10), 1593-1610.
- Dharmapala, Dhammika, 2008, What problems and opportunities are created by tax havens? *Oxford Review of Economic Policy*, 24(4), 661-679.
- Dharmapala, Dhammika, and James R. Hines, Jr., 2009, Which countries become tax havens? *Journal of Public Economics* 93, 1058-1068.
- Evers, Lisa, Helen Miller, and Christoph Spengel, 2015, Intellectual property box regimes: effective tax rates and tax policy considerations, *International Tax and Public Finance* 22(3), 502-530.
- Elsayyad, May, and Kai A. Konrad, 2012, Fighting multiple tax havens, *Journal of International Economics*, 86(2), 295-305.
- Griffith, Rachel, Helen Miller, and Martin O'Connell, 2010, Corporate taxes and intellectual property: Simulating the effect of patent boxes, IFS Briefing Note 112, Institute of Fiscal Studies.
- Hohaus, Bolko, Kai A. Konrad, and Marcel Thum, 1994, Too much conformity - a Hotelling model of local public-goods supply, *Economics Letters*, 44(3), 295-299.
- Hong, Qing, and Michael Smart, 2010, In praise of tax havens: International tax planning and foreign direct investment, *European Economic Review*, 54(1), 82-95.
- Hoover, Edgar M. Jr. 1936, Spatial price discrimination, *Review of Economic Studies* 4(3), 182-191.
- Hotelling, Harold, 1929, Stability in competition, *Economic Journal* 39(153), 41-57.
- Hurter, Arthur P., and Phillip J. Lederer, 1985, Spatial duopoly with discriminatory pricing, *Regional Science and Urban Economics* 15, 541-553.
- Johannesen, Niels, 2010, Imperfect tax competition for profits, asymmetric equilibrium and beneficial tax havens, *Journal of International Economics*, 81(2), 253-264.
- Johannesen, Niels, and Gabriel Zucman, 2014, The end of bank secrecy? An evaluation of the G20 tax haven crackdown. *American Economic Journal: Economic Policy* 6(1), 65-91.
- Keen Michael, and Kai A. Konrad, 2013, The theory of international tax competition and coordination, in: Alan J. Auerbach, Raj Chetty, Martin Feldstein, and Emmanuel Saez (eds.), *Handbook of Public Economics* Vol. 5, Elsevier, Amsterdam, 257-328.
- Konrad, Kai A., and Tim Stolper, 2015, Coordination and the fight against tax havens, *Journal of International Economics* 103, 96-107.
- Kotsogiannis, Christos, and Konstantions Serfes, 2010, Public goods and tax competition in a two-sided market, *Journal of Public Economic Theory*, 12(2),

281-321.

Lipatov, Vilen, 2012, Corporate tax evasion: the case for specialists, *Journal of Economic Behavior and Organization* 81(1), 185-206.

Mathewson, G.F., and R.A. Winter, 1984, An economic theory of vertical restraints, *Rand Journal of Economics* 15(1), 27-38.

McAfee, R. Preston, and Marius Schwartz, 1994, Opportunism in multilateral vertical contracting: nondiscrimination, exclusivity, and uniformity, *American Economic Review* 84(1), 210-230.

OECD (2013), *Addressing Base Erosion and Profit Shifting*, OECD Publishing, Paris. <http://dx.doi.org/10.1787/9789264192744-en>

Pavan, Alessandro and Giacomo Calzolari, 2009, Sequential contracting with multiple principals, *Journal of Economic Theory* 144, 503-531.

Perroni, Carlo, and Kimberley A. Scharf, 2001, Tiebout with politics: Capital tax competition and constitutional choices, *Review of Economic Studies* 68(1), 133-154.

PCAOB, 2017, Section 3. Auditing and related professional practice standards, https://pcaobus.org/Rules/pages/section_3.aspx. Accessed on November 10, 2017.

Rey, Patrick, and Joseph Stiglitz, 1988, Vertical restraints and producers' competition, *European Economic Review* 32, 561-568.

Rey, Patrick, and Jean Tirole 1986, The logic of vertical constraints, *American Economic Review* 76(5), 921-939.

Rochet, Jean-Charles; Tirole, Jean, 2006, Two-sided markets: a progress report, *Rand Journal of Economics* 37(3), 645-667.

Salop, Steven C., 1979, Monopolistic competition with outside goods, *Bell Journal of Economics* 10(1), 141-156.

Schön, Wolfgang, 2005, Playing different games? Regulatory competition in tax and company law compared, *Common Market Law Review* 71(1), 242-247.

Slemrod, Joel, 2008, Why is Elvis on Burkina Faso postage stamps? Cross-country evidence on the commercialization of state sovereignty, *Journal of Empirical Legal Studies* 5(4), 683-712.

Slemrod, Joel, and Wilson, John D., 2009, Tax competition with parasitic tax havens. *Journal of Public Economics* 93(11-12), 1261-1270.

Zissimos, Ben, and Myrna Wooders, 2008, Public good differentiation and the intensity of tax competition, *Journal of Public Economics* 92(5-6), 1105-1121.

Zucman, Gabriel, 2013, The missing wealth of nations: Are Europe and the US net debtors or net creditors? *The Quarterly Journal of Economics* 128(3), 1321-1364.

Appendix A

Derivation of $\partial\gamma / \partial q_j$ from eq. (9).

Eq. (9) is the first-order equation that defines $\gamma(q_1, \dots, q_n)$. Totally differentiating eq. (9) with respect to q_j implies

$$\begin{aligned} & -\left(1 + \frac{3\gamma_j}{2}\right)(m - q_j - \gamma)^{-1/2} + \frac{1 + \gamma_j}{2}\left(m - q_j - \frac{3\gamma}{2}\right)(m - q_j - \gamma)^{-3/2} \\ & + \sum_{i \neq j} \left[\frac{-3\gamma_j}{2}(m - q_i - \gamma)^{-1/2} + \frac{\gamma_j}{2}\left(m - q_i - \frac{3\gamma}{2}\right)(m - q_i - \gamma)^{-3/2} \right] = 0, \end{aligned} \quad (\text{A.1})$$

where $\gamma_j \equiv \partial\gamma / \partial q_j$. Collecting terms in eq. (A.1) then yields

$$\begin{aligned} & \gamma_j \left\{ \frac{-3}{2}(m - q_j - \gamma)^{-1/2} + \frac{1}{2}\left(m - q_j - \frac{3\gamma}{2}\right)(m - q_j - \gamma)^{-3/2} \right. \\ & \quad \left. + \sum_{i \neq j} \left[\frac{-3}{2}(m - q_i - \gamma)^{-1/2} + \frac{1}{2}\left(m - q_i - \frac{3\gamma}{2}\right)(m - q_i - \gamma)^{-3/2} \right] \right\} \\ & = (m - q_j - \gamma)^{-1/2} - \frac{1}{2}\left(m - q_j - \frac{3\gamma}{2}\right)(m - q_j - \gamma)^{-3/2} \end{aligned}$$

or

$$\begin{aligned} & \gamma_j \left\{ -(m - q_j) + \frac{3\gamma}{4} + (m - q_j - \gamma)^{3/2} \sum_{i \neq j} (m - q_i - \gamma)^{-3/2} \left[-(m - q_i) + \frac{3\gamma}{4} \right] \right\} \\ & = \frac{1}{2}(m - q_j) - \frac{\gamma}{4}. \end{aligned} \quad (\text{A.2})$$

Eq. (A.2) implies that $\gamma_j < 0$. If in addition all havens charge the same prices for all their models, then $\gamma = 2(m - q) / 3$ and $\gamma_j = -2 / (3n)$.

Proof of Proposition 3. To establish the tax revenue and social waste rankings, note that since $y^U = 2 \sqrt{\frac{m(3n - 2n_h)}{3(5n - 2n_h)}}$, $y^{CM} > y^U$ and if there are at least two tax havens $y^U > y^M$.

To establish the consumer surplus rankings, note that $CS^{CM} = 0$,

$$CS^M = (m - 2m/9 - 2m/3)(2\sqrt{m}/3) - \int_{x=a_i-\sqrt{m}/3}^{a_i+\sqrt{m}/3} (x-a_i)^2 dx = 4m^{3/2}/81, \text{ and}$$

$$CS^U = (m - m/3 - m/2)(2\alpha\sqrt{m}) - \int_{x=a_i-\alpha\sqrt{m}}^{a_i+\alpha\sqrt{m}} (x-a_i)^2 dx, \text{ where}$$

$\alpha = \sqrt{(3n - 2n_h)/(15n - 6n_h)}$. If there are H tax havens each with n_h products, then $\alpha = \sqrt{(3H - 2)/(15H - 6)}$. Integration implies that

$CS^U = \alpha(1 - 2\alpha^2)m^{3/2}/3$. To show that $CS^U > CS^M$ we can choose H to minimize CS^U and check that this minimum value exceeds CS^M . Because CS^U is strictly concave in α and α is strictly increasing in H , CS^U will be minimized at $H = 1$ or in the limit as $H \rightarrow \infty$. Direct calculation shows that $\alpha(1 - 2\alpha^2) = .259$ at $H = 1$ and that $\lim_{H \rightarrow \infty} \alpha(1 - 2\alpha^2) = .268$. Thus, CS^U is minimized at $H = 1$ with a value of $7m^{3/2}/81 > 4m^{3/2}/81$. *Q.E.D.*

Appendix B

PWC UK [<http://www.pwc.co.uk/tax/transfer-pricing-index.jhtml>], as of Monday, July 14, 2014, 17:12 CET]: "Globalisation and the continued growth of international trade have made intercompany pricing a material and challenging issue for many businesses. The increasing complexity of business, more aggressive tax authority audits, more comprehensive documentation requirement and harsher penalties regimes mean that making sure your transfer pricing strategy and execution are fit for purpose has become more important than ever before.

We can help you manage your transfer pricing risks and identify opportunities for sustainably improving the tax efficiency of your business."

KPMG UK

[<http://www.kpmg.com/UK/en/services/Tax/CorporateTax/pages/transferpricing.aspx>], as of Monday, July 14, 2014, 17:19 CET]: "In the UK, our Global Transfer Pricing Services (GTPS) business helps clients transform their business models, adapt to shifting international environments, manage transfer pricing risk, and help them develop transfer pricing strategies that underpin their wider commercial objectives. The GTPS team includes economists, tax practitioners, lawyers and financial analysts who work across our network to provide essential local knowledge within a global framework. We have a pragmatic and scalable approach that can provide businesses of all sizes with a transfer pricing service and solution.

We use our experience of working with businesses to help clients ensure their transfer pricing compliance and reduce reputational risk."

Deloitte Touche Tohmatsu UK,

[http://www.deloitte.com/view/en_GB/uk/services/tax/cross-border-ax/index.htm, as of Tuesday, July 15, 2014, 14:26]: "A big challenge .and great opportunity .for a multinational group is managing local and foreign taxes to achieve sustainable outcomes aligned with the business. A fast moving global economy requires a close relationship between a company's tax and business operations to respond to business change and ensure a group's tax strategy is appropriately aligned with the business. Our International Tax professionals provide a comprehensive range of inbound and outbound tax services, including structuring international operations, tax aspects of financing, cash and profit repatriation, reorganisations, mergers, acquisitions and joint ventures."

Ernst & Young UK[<http://www.ey.com/UK/en/Services/Tax/Transfer-pricing-and-tax-effective-supply-chain-management>, as of Tuesday, July 15, 2014, 14:33]: "We bring you a global perspective based on our long-standing experience of what really works in transfer pricing and operating model effectiveness (OME). Our multi-disciplinary Operating Model Effectiveness teams work with you on operating model design, business restructuring, systems implications, transfer pricing, direct and indirect tax, customs, human resources, finance and accounting. We can help you build and implement the structure that makes sense for your business, improve your processes and manage the cost of trade. Our transfer pricing professionals help you build, manage, document, review and defend your transfer pricing policies and processes – aligning them with your business strategy. Our talented people work with you to build the proactive, pragmatic and integrated strategies that address the tax risks of today's businesses and help your business achieve its potential.