



# Corporate taxation and the choice of patent location within multinational firms<sup>☆</sup>

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## ABSTRACT

Corporate patents are important assets in the modern economy, where knowledge is highly valued. In many multinational enterprises (MNEs), they constitute a major portion of the business's value. The intra-firm transfer pricing process for patent-related royalty payments is moreover often highly intransparent and patents thus represent a major source of profit shifting opportunities between multinational entities. For both reasons, MNEs have an incentive to locate their patents at low-tax affiliates to minimize the corporate tax burden. The purpose of our paper is to empirically test for this relationship by exploiting a unique dataset that links information on patent applications to micro panel data for European MNEs. Our results suggest that the corporate tax rate (differential to other group members) exerts a negative effect on the number of patent applications filed by a multinational affiliate. The effect is quantitatively large and robust to controlling for firm size and unobserved heterogeneity between the entities. The findings moreover prevail if we account for royalty withholding taxes and binding 'Controlled Foreign Company' rules.

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## 1. Introduction

Anecdotal evidence suggests that multinational companies strategically locate ownership of their intellectual property at tax-havens, with the intention of minimizing their corporate tax burden. For example, the Wall Street Journal reports that Microsoft, a company which earns three-fourths of its revenue from license fees, is "increasingly setting up units in Ireland that route intellectual property and its financial fruits to the low-tax haven" (Wall Street Journal, 2005). In the UK, the Guardian writes that "three FTSE 100 companies have quietly transferred their valuable intellectual property to low-tax locations", meaning that "they can reduce their UK-based profits and hence their British tax bills" (The Guardian, 2009).

The rationale behind locating intellectual property at low-tax affiliates is two-fold. First, intangible assets are increasingly perceived to be important value-drivers within multinational enterprises (MNEs)

(e.g. see Hall, 2001; Zingales, 2000). Locating them at low-tax affiliates is thus an attractive tax saving strategy as it implies that the intangibles' profits become taxable at a low corporate tax rate. Second, the common good nature of intellectual property involves that it is used as an input factor by several operating affiliates within the multinational group which then pay a royalty or license fee to the intangibles-owner (see e.g. Markusen, 1995). As arm's length-prices for these firm-specific royalty payments are commonly not available to tax authorities, MNEs can distort royalty prices in order to shift profit between the operating entities and the intangibles-owner. Consequently, it pays for the MNE to locate its intellectual property in a low-tax country as this establishes a profit shifting link between all operating affiliates and a tax-haven subsidiary (see also Dischinger and Riedel, 2011).<sup>2</sup>

Tax authorities have raised increasing concerns about the relocation of intangible assets to low-tax countries and the associated reduction in their country's corporate tax base (see Hejazi, 2006). Nevertheless, studies which go beyond anecdotal evidence and investigate the link between corporate taxation and the location of

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<sup>1</sup> Tom passed away in December 2010. His friendship and talent is deeply missed.

<sup>2</sup> On the contrary, if the intangible asset is located at a high-tax subsidiary, the MNE obtains shifting possibilities solely between the tax haven and the intangibles-holding firm whereas other high-tax affiliates remain without a tax-shifting link to a low-tax country.

intellectual property in a systematic empirical framework are scarce as information on intellectual property ownership is commonly not available in standard firm data sets.

In the following, we will investigate this relationship by exploiting a new and unique data source that connects accounting and ownership information for a large panel of European multinational affiliates with data on patent applications to the European Patent Office (EPO). Thus, our analysis focuses on the location of corporate patents as a particular form of intangible property. The data is available for the years 1995 to 2003. To identify the impact of corporate taxes on multinational patent location, we additionally merge information on various aspects of the corporate taxation system. Following our argumentation above, we account for the host country's corporate tax burden (as measured by the statutory corporate tax rate) and the relative attractiveness of an affiliate's corporate taxation scheme compared to other firms in the multinational group (as measured by the corporate tax rate differential between the entities). Moreover, our analysis takes into account that the effective tax burden on patent-related royalty income may be affected by withholding taxes on royalty payments and so-called Controlled Foreign Company (CFC) rules. The latter are designed to refrain MNEs from avoiding taxes in their residence country by making passive (patent) income earned at low-tax subsidiaries taxable at the parent location.

We assess the link between corporate taxation and the number of patent applications in various empirical specifications. Our most preferred model is a negative binomial framework which controls for affiliate fixed effects. The results suggest that both, the corporate tax rate and the tax rate differential to other group affiliates, exert a negative impact on the firm's number of patent applications whereas the effects are robust against the inclusion of time-varying country characteristics and affiliate size controls. Quantitatively, the coefficient estimates are sizable, implying semi-elasticities of around  $-3.5$ . Thus, the regressions indeed suggest that MNEs distort the location of patents in favor of affiliates with relatively low corporate tax rates. Moreover, we find that the negative effect of taxes on the number of patent applications prevails if we construct tax measures that additionally account for withholding taxes on royalty income and binding CFC legislations.

Our study contributes to the literature on multinational income shifting. A growing number of papers have provided empirical evidence which suggests that MNEs transfer profits from high-tax to low-tax affiliates in order to diminish their corporate tax burden (see e.g. Devereux, 2007; Huizinga and Laeven, 2008). Recent work has connected these multinational profit shifting activities to the ownership of intellectual property.<sup>3</sup> The idea is that arm's length prices for intra-firm royalties charged for the use of firm-specific intangible assets are hardly observable to tax authorities and that multinationals can thus easily distort the associated transfer prices and shift profits to low-tax countries. This notion is confirmed by a set of empirical papers which show that profit shifting activities are larger in MNEs with high intellectual property holdings and high R&D intensities (see e.g. Grubert, 2003).

However, in contrast to our work, these papers neglect that corporate taxation may distort the location of intangible assets itself as MNEs have an incentive to ensure that their patent returns are taxable at a low rate and that profit shifting channels to low-tax countries are available to operating affiliates worldwide. In this sense, our analysis is most closely related to two recent papers: Mutti and Grubert (2008) provide evidence that US MNEs structure their operation in such a way that royalty income accrues with foreign subsidiaries in low-tax countries. However, as they do not observe information on patent ownership or license agreements, their evidence is indirect.

<sup>3</sup> Several studies suggest a general link between intangible property ownership and the emergence of multinational firms as the threat of knowledge dissipation tends to favor market entry through foreign direct investment over other entry modes like licensing agreements with third parties (see e.g. Ethier and Markusen, 1996; Saggi, 1996, 1999; Fosfuri, 2000; Markusen, 2001; Gattai and Molteni, 2007).

Dischinger and Riedel (2011) find that the corporate tax rate exerts a negative effect on the size of intangible property assets, as reported on company balance sheets. However, using balance sheet data has limitations as it does, for example, not allow for a disaggregation of the legal assets which constitute the reported intangible asset figure whereas our study focuses on a clearly identified form of intellectual property.

Moreover, our paper is related to a small literature that investigates how the tax system affects the location of R&D activity within multinational companies. For the US, Hall (1993) and Hines (1994) study the responsiveness of corporate R&D to the Research and Experimentation Tax Credit and find significant R&D price elasticities. Similarly, Hines and Jaffe (2001) determine how US R&D expense deduction rules affect the location of R&D by US multinationals.<sup>4</sup> Bloom et al. (2002) confirm a significantly positive effect of R&D tax credits on the level of R&D expenditures using macro data for major OECD countries. However, all of the cited papers focus on the role of R&D tax credits and abstract from potential effects of the corporate tax system on the location of the legally protected *output* to R&D activities, i.e. the corporate patents. Our study fills this gap and assesses the impact of corporate taxation on the choice of patent location accounting for various tax incentives, including the statutory corporate tax rate, withholding taxes and CFC legislations.

The paper is organized as follows. Section 2 presents theoretical considerations to motivate our empirical analysis. Sections 3 and 4 describe the data set and the estimation methodology. In Section 5, we present the empirical results and Section 6 concludes.

## 2. Theoretical considerations

This section explores how the international corporate tax system may affect patent ownership within multinational firms.<sup>5</sup> The discussion then leads on to Section 3, where we construct the tax variables used in our empirical analysis.

The value of a patent stems from its provision of a temporary monopolistic right to exploit the associated technology within a given geographic area. Any party that wishes to use the technology in that geographic area will have to pay a royalty fee to the patent owner. To avoid knowledge dissipation, MNEs have a tendency to sell the right to exploit a patented technology to affiliated companies only (see Introduction) whereas the latter are forced, by the transfer price system, to pay a royalty to the patent owner. While in many cases the inventor of the technology is also the owner of the associated patent, our data suggests that the location of R&D activities and the resulting patents can also be geographically separated within multinational groups, as the locations are split in a non-negligible number of cases.<sup>6</sup>

The MNE's decision where within the group to locate its corporate patents is expected to be influenced by a set of tax considerations. First, patents belong to the most valuable assets within many multinational firms (see e.g. Hall, 2000, 2007; Hall et al., 2005) and as their income becomes part of the owner's corporate tax base, MNEs have an incentive to locate production and ownership of their patents

<sup>4</sup> The study of Hines and Jaffe (2001) is also related to ours in the sense that they use a data set which is the US equivalent to our data as it equally combines firm information and data on patent applications. One important difference though is that Hines and Jaffe (2001) are interested in the location of R&D rather than in the location of the corporate patents. Thus, they exploit the patent office data with respect to the information on the location of the patent inventor while we in contrast use the information on the location of the patent applicant. Note that inventor and applicant location differ for a substantial fraction of the patents in our data set (around 10% of the cases), with an increasing trend over the past decades.

<sup>5</sup> For a simple theoretical model, see an earlier working paper version of this study.

<sup>6</sup> According to practitioners a geographical separation of the R&D and patent location is easy to implement by assigning the project risk to a different affiliate than the one hosting the R&D activity. The risk-bearing unit in charge for the project then pays a fixed fee comprising the development costs and a fixed margin to the R&D department while it receives the resulting patents and the associated patent returns.

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