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Abstract

Until 2009, the United Kingdom operated a system of worldwide taxation. Taxation of foreign income was deferred until repatriated as dividends, leaving UK-owned multinational firms the possibility of avoiding UK taxation by delaying dividend payments and keeping earnings abroad. In 2009, the UK switched to a system under which all foreign-earned income is exempted from taxation. This fundamental change had a number of straightforward implications for UK-owned multinational firms and particularly changed incentives to repatriate profits. This paper assesses the effects of the reform on the foreign affiliates of UK-owned multinational firms. We use data provided by Bureau van Dijk on 61,738 foreign affiliates located in one of 29 European countries to estimate the impact of the reform on the repatriation pattern and other outcomes of UK-owned affiliates. We use an identification approach that quasi-randomizes over the country of residence of the ultimate firm owners, allowing us to compare outcomes of treated UK-owned foreign affiliates to control non-UK-owned foreign affiliates. Our results suggest that the switch to tax exemption not only changed dividend repatriation behavior of firms but also the conditions under which foreign entities operate in general, for instance, with regard to investment behavior.

JEL-Code: F230, H250.

Keywords: UK Tax Reform 2009, tax exemption system, dividend exemption, foreign direct investment.

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1 Introduction

The debate about efficiency aspects of international taxation has been dominated by two basic concepts: capital export neutrality (CEN) and capital import neutrality (CIN). Both concepts were formulated by Peggy Musgrave in 1963 and 1969, respectively (see Brewer Richman, 1963; Musgrave, 1969). In her model, CEN ensures an efficient international allocation of capital and has therefore been considered for many years as a benchmark for evaluating international tax systems. The concepts of CEN and CIN are reflected in the distinction between tax systems following a residence-based or a source-based approach of taxation. A residence-based system guarantees CEN, because an investor faces only the tax imposed by her residence country so that the decision about which country to invest in is not affected. As the most prominent example, the United States follow this approach by taxing worldwide income of its residents while providing a foreign tax credit (*tax credit system*) for the amount of taxes paid to foreign countries.[1] CIN, on the other hand, ensures that all investors in a market are subject to the same tax and, therefore, there is no distortion of competition between firms active in the same market. At the same time, since taxes differ between jurisdictions, CIN does not satisfy global optimality criteria. In practice, CIN is guaranteed by a source-based tax system, which is the most common approach used by the majority of countries. In such a system, investors are taxed in the source country and exempted in the residence country (*tax exemption system*).

Since the contributions of Musgrave (1963, 1969), other aspects of CEN and CIN as well as alternative systems of taxation and their optimality properties have been discussed in a by now large body of literature (for a survey, see Devereux, 2008a).[2] For instance, it has been pointed out that CEN was consistent with the production efficiency concept of Diamond and Mirrlees (1971). While recognizing the limitations of the production efficiency theorem, Devereux (2008b) argues that it remains a useful benchmark to evaluate tax systems. Others emphasize that production efficiency is not directly ap-

[1] In practice, the observed residence-based systems are *limited* credit systems, since the tax credit granted for foreign tax paid is limited to the home-country tax liability due on foreign-earned income.

[2] Several models account for new challenges associated with the increased international integration and/or consider further dimensions of neutrality (national neutrality, Musgrave, 1969; capital ownership neutrality, Desai and Hines, 2003; market neutrality, Devereux, 1990, 2000; global portfolio neutrality, Desai and Dharmapala, 2009).

plicable in an international setting (Keen and Wildasin, 2004). Some tax experts deny the applicability of CEN in a world with increased international integration (Frisch, 1990; Hufbauer, 1992), while others object this view (Grubert and Mutti, 1995). The very recent discussion in the literature on optimal systems of taxation (Desai and Hines, 2003; Becker and Fuest, 2008, 2010, 2011a,b) shows that eventually too little is known about how investors organize their activities in response to the tax regime under which they operate in order to draw firm conclusions about the optimality of one or the other system.

Relative to the large body of normative work, there is little positive evidence on the matter. One reason for the latter is that countries rarely change their system of taxation, and most countries implemented their system at times before good data were available. Only a few studies have tried to assess the impact of a move towards exemption of dividends. Altshuler and Grubert (2001) investigate how the introduction of dividend exemption would affect location incentives of US corporations. Their findings imply that dividend exemption would not significantly alter the location decisions of US firms. Desai, Foley, and Hines (2001) find that repatriation taxes reduce dividend repatriations by US foreign affiliates and quantify the induced efficiency losses. Smart (2010) exploits variation in dividend repatriation taxes faced by Canadian MNEs and shows that tax exemption of dividend repatriation (through new tax treaties concluded with foreign countries) is associated with an increase in outbound foreign direct investment (FDI) by about 80%.

This paper utilizes a reform of the United Kingdom's tax system in 2009, when the country switched from tax credit to tax exemption, in an attempt to quantify the behavioral responses of foreign affiliates of UK-owned multinational firms (MNEs). This reform provides a unique opportunity to examine the (short-run) impact of such a fundamental change in the taxation of foreign income.[3] Since only repatriated profits were subject to taxation in the UK under the credit system, one obvious implication of the tax reform was that MNEs with foreign affiliates faced new incentives with respect to dividend repatriation after the reform relative to the outset. Empirically, a challenge lies in the identification of the true effects of the reform. For this,

[3]Note that also Germany introduced general tax exemption in 2001. However, foreign income of German-owned MNEs was virtually exempt through the country's extensive bilateral tax treaty network that existed already prior to 2001. The conclusions that could be drawn from the German experiment are therefore limited.

we use an identification approach that quasi-randomizes over the location of residence of ultimate firm owners. Such an approach allows us to compare outcomes of *treated* UK-owned foreign affiliates to *control* non-UK-owned foreign affiliates. We construct a control group of non-treated (non-UK-owned) foreign affiliates that have the same propensity to be UK-owned as the treated (UK-owned) foreign affiliates. For the empirical investigation, we use the Amadeus database provided by Bureau van Dijk. This micro-level database includes balance-sheet information on MNEs in European countries. The data provide information on a number of outcome variables and allow us to identify parent firms and ultimate owners as well as affiliates before and after the tax reform. We investigate effects primarily on dividend policy but also on firms' foreign sales-to-fixed-asset ratios and investment. The latter two variables may be indirectly affected by the fundamental reform of the UK tax system through their relationship to dividend payments as well. Our results suggest that the reform induced firms to pay out significantly more dividends, as expected. The average UK-owned affiliate is estimated to have paid out about US$ 2.15mn more dividends (immediately after the reform) than the counterfactual affiliate in the absence of the reform. Another remarkable finding is that the average UK-owned affiliate cut investment by about US$ 3.05mn in response to the reform. The investment effect implies that the reform indirectly affected real outcomes via the change in incentives for profit repatriation.

The remainder of the paper is structured in the following way. Section 2 summarizes the main aspects of the UK tax reform and its expected effects on UK-owned foreign affiliates. In Section 3, we present the empirical approach and describe the data utilized. Section 4 offers the results including various robustness tests, and the last section concludes with a summary of the key findings.

2 Aims and Expected Effects of UK's Reform of Taxing Foreign-earned Profits

Until 2009, the UK operated a system of worldwide taxation or tax credit system. Under this system, UK residents were taxed on their worldwide income while, for taxes paid in foreign countries, a foreign tax credit was provided to avoid double taxation. Taxation of foreign income was deferred

until repatriated as dividends, leaving UK-owned MNEs the possibility of avoiding UK taxation by delaying dividend payments and keeping earnings abroad.[4] In 2009, the UK abolished the system of worldwide taxation and established a tax exemption system, under which all foreign-earned income is exempted from UK tax.

This fundamental change of the tax system has a number of straightforward implications for UK-based MNEs – particularly for their incentives to repatriate profits. As of 2008, UK companies were subject to a statutory corporation tax rate of 28%. Thus, until 2008, repatriated foreign-source income was taxed at 28% and a tax credit was provided for taxes paid at the foreign locations up to the limit of the UK tax of 28%. Assume, for example, that a UK-owned affiliate located in Poland, where the corporate income tax rate was 19% in 2008, generated a profit of £100 there, so that £19 of tax were due in Poland. Had it repatriated the remaining £81 as dividends to the UK, it would have faced the UK corporate tax rate of 28% on the £100 gross profits and gotten a credit of £19 for the foreign tax, having had to pay £9 tax in the UK. The total tax burden equaled the UK corporate tax rate of 28%, and net dividend income amounted to £72. In this example, the repatriation of the dividends brought about a tax obligation of £9, which could have been avoided by leaving the profits abroad. Thus, under the tax-credit system, UK-owned firms located in foreign countries where the local tax rate was *lower* than in the UK had a disincentive to repatriate profits to the UK. UK-owned foreign affiliates located in countries with a local tax rate that was *higher* than in the UK did not face an additional tax upon repatriating dividends to the UK and had no tax disincentive to repatriate income.[5]

As of 2009, foreign dividends received by UK companies are exempt from taxation in the UK. The tax burden is determined by the foreign corporate tax rate. In the example above, the tax burden amounts to the Polish corporate tax rate of 19%, and the UK parent receives now a net dividend

[4]However, "controlled foreign company" (CFC) rules in the UK restrained this possibility by apportioning undistributed profits of the CFC to the UK parent and taxing them. A foreign affiliate falls under the CFC regime if the foreign tax rate is less than 75% of the UK tax rate and the profits attributed to the UK owner represent 25% or more of the foreign affiliate's profits.

[5]Those firms got a tax credit equal to 28% of the foreign profits. Unlike in the US, which also has a tax credit system, UK-owned firms were not allowed to average their worldwide foreign income tax payments to claim a tax credit. On-shore pooling of dividends and using excess tax credit against other foreign dividends received by the company were allowed only to some extent.

income of £81. Under the new exemption system, UK companies investing in countries with a *lower* tax rate than in the UK no longer face a tax penalty for dividend repatriation and exhibit higher after-tax returns on their investments. Besides, under the credit system, UK-based MNEs investing in low-tax countries had a disadvantage against MNEs based in countries with an exemption system. This disadvantage vanished with the switch to foreign dividend exemption.

When the first proposal of the reform was presented in 2007 by the UK Treasury, it stated explicitly that the goal of the tax reform was to make UK firms more competitive by simplifying the tax regime for foreign dividends. The government's objective "*that the tax system should not distort commercial decisions*" would be achieved by exempting foreign dividends so that firms would no longer leave profits off-shore for tax reasons and could use repatriated profits to fund other foreign investment from the UK. Further, the switch to exemption would also make firms investing in high-tax countries more competitive by reducing compliance costs, since even in the absence of an additional tax liability upon repatriating highly taxed foreign profits, "*the administrative costs for multinational business of complying with the credit regime can be material*" (HM Treasury, 2007, p. 13). In particular, the government concluded that the old system reduced the competitiveness of UK businesses and resulted in a significant administrative burden for both businesses and HM Revenue & Customs, while it produced only a modest amount of direct tax yield (HM Treasury, 2009, p. 4). As part of the European Union, where most countries operate an exemption system, policy makers as well as economists argued in favor of this move, which was expected to equalize the terms on which UK-owned firms were competing with foreign-owned ones (Griffith, Hines, and Sørensen, 2010).

Table 1 lists and describes the various outcomes of foreign affiliates we examine in the empirical analysis. We broadly distinguish between outcomes affecting the *repatriation pattern* of firms and *other indicators*, capturing likely indirect reform effects. The latter may not only be related to a new repatriation policy but also to the removal of compliance costs by introducing a simpler system of taxation "*enabling multinational business to operate more effectively*" in general (HM Treasury 2009, p. 5).

As for the repatriation pattern, we expect the reform to have induced firms to repatriate foreign-source income that had been kept abroad to avoid taxation. The magnitude of this effect depends on the foreign tax burden relative to the UK and on the availability of profitable investment opportuni-

ties abroad. In fact, to the extent that UK companies deferred UK taxation and kept profits abroad for reasons not related to the tax credit system in the pre-reform period, the reform did not change the actual tax burden of foreign affiliates in the short run (see Gammie, Griffith, and Miller, 2008). Of course, in the long run, upon repatriation of profits to the UK, this is no longer the case.[6]

– Table 1 –

As for other indicators, we might expect indirect effects of the reform. On the one hand, dividend repatriation may affect real outcomes because financing funds are withdrawn from foreign affiliates. This, on the other hand, may improve efficiency of foreign affiliates, since less cash flow is available and over-investment is reduced (see Jensen, 1986). Efficiency may also be improved through the reduction in compliance costs associated with the simpler tax exemption system. To capture these two aspects, we investigate possible effects of the reform on investment and the sales-to-fixed-asset ratio of foreign entities.[7]

[6]While an increase in the flow of repatriated dividends seems to be a natural prediction as the tax system (tax credit vs. tax exemption) of the ultimate owner affects repatriation policy of firms directly, it is not clear for which purposes hitherto deferred foreign-earned income is used in the ultimate owner country in case of repatriation. Although, for example, US MNEs have been pressing the government for a tax break – in which case, so their claim, they would repatriate income accumulated at foreign subsidiaries to the US for investment purposes (see New York Times, June 19, 2011, http://www.nytimes.com/2011/06/20/business/20tax.html?hp) – Dharmapala, Foley, and Forbes (2011) show that the 2005 US one-time tax holiday for the repatriation of foreign income did not lead to more real domestic activity (investment, employment, or R&D) but, instead, "*a $1 increase in repatriations was associated with an increase of almost $1 in payouts to shareholders*" (Dharmapala, Foley, and Forbes, 2011). Our data-set does not permit a rigorous investigation of outcomes at the level of owners in the UK, but it supports an analysis of outcomes at the level of foreign affiliates by identified ultimate owners in the UK.

[7]Of course, efficiency is a rather abstract concept and it is not clear how to measure it in the present context.

3 Empirical Approach

3.1 Some Notation and Concepts

To estimate *treatment* effects of the UK tax reform, we aim at comparing outcomes of *treated* affiliates where the ultimate shareholder is actually located in the UK with *control* affiliates held by non-UK shareholders. Since ultimate owners (and ultimate owner countries) are not randomly assigned to affiliates, the goal of the empirical investigation is to evaluate UK-owned firms relative to non-UK-owned ones that exhibit the same propensity to be UK-owned but whose ultimate owner is actually located somewhere else.

We approach this empirical problem by adopting an approach of *selection on observables* based on matching on the propensity score. In a first step, we estimate the propensity of an affiliate to be UK-owned from a *location choice* model.[8] Let us denote affiliates by $i = 1, \ldots, N$ and countries these affiliates may be held from by $j = 1, \ldots, J$. Each affiliate i may principally be owned ultimately in one of the J countries in the data. For convenience, let us refer to the UK by $j = 1$ and to all other locations (where at least some ultimate owners are located) by $j = 2, \ldots, J$. In general, we focus on the choice of ultimate owner location for affiliate i in the year 2008 and on outcome effects of the tax reform measured in 2009. For the sake of simplicity, we abstract from using a time index. Location choice is modeled as a function of observables as of the year 2008.

Let us denote the actual location of the ultimate owner in 2008 of affiliate i by $C_i \in \Lambda$, where Λ refers to the set of countries that could be chosen in the sample. Furthermore, define the scalar D_i^j which is unity if i's owner is located in j ($C_i = j$) and zero else. Each potential ownership location in J for affiliate i involves a potential outcome $\tilde{y}_i^j$. The latter should be distinguished from actual outcome. Suppose affiliate i is actually owned in j. Then, its actual outcome can be denoted by y_i^j. Hence, no matter where i's owner actually resides, we can determine a potential (hypothetical or imputed) outcome associated with ownership in j.

Our goal is to estimate the average effect of the adoption of the UK's tax exemption system on UK-owned affiliates ($j = 1$) relative to non-UK-

[8] Note that MNEs are faced with two types of location choices, one about affiliates and one about headquarters (or the ultimate owner). Here, we focus on the latter. This seems plausible against the strong evidence of mergers and acquisitions as the dominant form of (foreign and domestic) ownership of affiliates.

owned affiliates ($j \neq 1$) – an *average treatment effect on the treated* (ATT) – on outcome, conditional on observables. The latter invokes the following assumption.

A*ssumption 1. Conditional mean independence*

$$E(y_i^1|D_i^1 = 1, \mathbf{X} = \mathbf{x}_i^j) = E(y_i^1|\mathbf{X} = \mathbf{x}_i^j),$$
$$E(\tilde{y}_i^j|D_i^1 = 1, \mathbf{X} = \mathbf{x}_i^j) = E(\tilde{y}_i^j|\mathbf{X} = \mathbf{x}_i^j) \; \forall \; i = 1, ..., N; j \neq 1,$$

where $\mathbf{x}_i^j$ *is the specific realization of an* $1 \times L$ *random vector of covariates* $\mathbf{X}$. That is, after conditioning on observable characteristics $\mathbf{x}_i^j$, treatment (UK-ownership) is independent of actual or potential outcome.

Define the propensity score for affiliate i to be ultimately owned in country 1 by

$$p_i^1 \equiv Pr(C_i = 1|\mathbf{X} = \mathbf{x}_i^j). \tag{1}$$

The elements p_i^1 can be collected in the $N \times 1$ vector $\mathbf{p}^1$. We further desire all elements $0 < p_i^1 < 1$ of $\mathbf{p}^1$ to comply with the following assumption.

A*ssumption 2. Balancing condition*

$$D_i^1 \perp \mathbf{x}_i^1 | p_i^1(\mathbf{x}_i^j).$$

Then, conditional mean independence implies that outcome with treatment state *UK ownership*, y_i^1, and outcome with counterfactual state *non-UK ownership*, y_i^j for $j = 2, \ldots, J$, are independent of assignment of UK ownership given the propensity score of being UK-owned, p_i^1.

Using Assumptions 1 and 2, we may define the ATT of the inception of tax exemption in the UK on UK-owned foreign affiliates as

$$ATT^{1j} = E(y_i^1 - \tilde{y}_i^j | D_i^1 = 1, \mathbf{X} = \mathbf{x}_i^1).$$

3.2 Implementation

There is a number of options for modeling the multinomial choice problem determining p_i^j in general and p_i^1 in particular through nonlinear multinomial probability models. Examples thereof are the classes of multinomial probit-type models and multinomial logit-type models. With a huge number of

foreign affiliates N each with an ultimate owner in one of J potential parent countries, it is natural to resort to multinomial logit-type models due to their tractability and numerical stability.[9] In the class of logit-type models, the mixed-logit or random-coefficients logit is a natural candidate since it allows for heteroskedasticity and correlation across alternatives.[10]

We postulate that affiliate i would receive latent net profits π_i^j from having an ultimate owner located in country j according to

$$\pi_i^j = \mathbf{x}^j \boldsymbol{\beta}_i + \alpha_i^j, \quad i = 1, ..., N, \; j = 1, ..., J, \tag{2}$$

where the $1 \times L$ vector $\mathbf{x}^j$ contains determinants of profits which are alternative-(country-)specific. α_i^j represent unobservable variables affecting the choice. The $L \times 1$ vector of random weights $\boldsymbol{\beta}_i$ on $\mathbf{x}^j$ are unknown and vary in the population. We postulate them to depend on both observables and unobservables in the following way

$$\boldsymbol{\beta}_i = \mathbf{y}_i \boldsymbol{\gamma} + \boldsymbol{\delta}_i, \tag{3}$$

where the $1 \times L$ vector $\mathbf{y}_i$ contains determinants of profits which are affiliate specific, and $\boldsymbol{\delta}_i$ is unobserved and randomly distributed over firms with density $f(\boldsymbol{\theta})$.[11]

The actual choice $C_i \in \{1, ..., J\}$ is based on the maximum attainable profit, $\arg\max(\pi_i^1, ..., \pi_i^J)$. Assuming that the α_i^j are independently distributed across alternatives with a type I extreme value distribution, that the $\boldsymbol{\delta}_i$ are normally distributed, and using the functional form of the logit model, we obtain the probability of the actual choice to be $C_i = j$ as

$$p_i^j = \int \frac{\exp(\mathbf{x}^j \mathbf{y}_i \boldsymbol{\gamma} + \mathbf{x}^j \boldsymbol{\delta}_i)}{\sum_{j=1}^J \exp(\mathbf{x}^j \mathbf{y}_i \boldsymbol{\gamma} + \mathbf{x}^j \boldsymbol{\delta}_i)} \phi(\boldsymbol{\delta}_i | \mu, \Omega) d\boldsymbol{\delta}, \quad \text{for all } i, j, \tag{4}$$

[9] Multivariate probit-type models require integrating numerically a multivariate normal whose dimensions are determined by the number of choices taken. In spite of the efficient simulation algorithms available nowadays, it is computationally extremely demanding to estimate p_i^j by multinomial probit-type models in a choice problem that is as large as the one here.

[10] The computationally more convenient conditional logit is restrictive due to the well-known property of independence from irrelevant alternatives. This means that the choices taken with regard to alternatives j versus ℓ are not affected when adding further alternatives, and the model predicts that a change in an attribute of alternative j will change the probabilities of all other alternatives in the same proportion.

[11] Hence, we specify latent profits as $\pi_i^j = \mathbf{x}^j \mathbf{y}_i \boldsymbol{\gamma} + \mathbf{x}^j \boldsymbol{\delta}_i + \alpha_i^j$ with fixed coefficients $\boldsymbol{\gamma}$ on interactions of country-and-affiliate-specific variables and random coefficients $\boldsymbol{\delta}_i$ on country-specific variables.

where $\phi(.)$ is the normal density with mean μ and covariance Ω.

The mixed logit model in (2) is estimated by simulated maximum likelihood[12] and delivers estimates $\hat{p}_i^1$ for being owned by an ultimate owner in the UK. Notice that these choice probabilities depend in part on country- (i.e., UK-)specific observables in $\mathbf{x}_i^1$ and in part on ones specific to affiliate i which is actually or potentially (but, in any case, likely) owned in the UK. Notice that, by design, the former fulfill the balancing property Assumption 2: when focusing on ATT^{1j} – i.e., the average treatment effect of being treated on average foreign affiliate outcome from being owned in the UK (superscript 1) relative to elsewhere (superscript j) – we only compare affiliates that are actually UK-owned with potentially (but not actually) UK-owned ones. The i-specific variables involve the total assets (TA_i) of affiliate i in interactive terms. Hence, it will suffice to illustrate the suitability of the i-specific variable total assets TA_i in terms of the balancing condition.

In terms of the matching algorithm to construct the control group, we employ radius matching with a radius of one percent – a special form of kernel matching based on a uniform kernel with the radius as the bandwidth. Provided that the balancing condition holds, this ensures a certain quality of matching, because it requires the estimated propensities of control units to lie within a specific radius around the estimated propensity of a treated unit. For estimating the ATT^{1j} we require for every affiliate i' with an ultimate owner in $j \neq 1$ which is matched onto affiliate i with an ultimate owner in $j = 1$ that $|\hat{p}_i^{1,j=1} - \hat{p}_{i'}^{1,j\neq 1}| \leq 0.01$.

3.3 Data

We use data on $N = 61,738$ affiliates which are located in one of 29 European countries as provided by Bureau van Dijk's Amadeus database. The data contain information not only about the country of location of the affiliate and associated balance-sheet data but also on the nationality of their ultimate owner. The ultimate owners in the data locate in one of $J = 72$ countries. As said before, we utilize information about the location of ultimate owners in 2008 and measure observables determining this location as in (2) in the same year.

The vector $\mathbf{x}_i^j$ contains the following observable regressors determining ultimate owner location choice. *Statutory tax rate*$_j$ is the statutory corporate

[12] See Train (2009) for details on the mixed-logit model and its estimation.

profit tax rate in country j. The tax data are collected from databases provided by the International Bureau of Fiscal Documentation (IBFD) and tax surveys provided by Ernst&Young, PricewaterhouseCoopers, and KPMG. *log GDP per capita*$_j$ and *log GDP*$_j$ measure real GDP per capita and real GDP in country j in 2008 at constant US dollars (base year 2000) and are taken from the World Bank's World Development Indicators 2009. These variables measure aggregate market size and demand characteristics at market j. Moreover, we include a number of variables measuring the perceived quality of governance in country j as available from the World Bank's Worldwide Governance Indicators (WGI) 2011. *Voice and accountability*$_j$ captures the extent to which citizens are able to participate in selecting their government, as well as freedom of expression, association, and press. *Control of corruption*$_j$ measures the perceived extent to which public power is exercised for private gain. *Government effectiveness*$_j$ captures the perceived quality of public and civil services and the independence of the latter from political pressures, the quality of policy formulation, and implementation and the credibility of the government's commitment to such policies. *Political stability*$_j$ measures the perceived likelihood of a coup or government destabilization by unconstitutional or violent means. *Regulatory quality*$_j$ measures perceived government ability to formulate and implement sound policies and regulations that permit and promote the development of a private sector. *Rule of law*$_j$ captures perceptions of the extent to which agents have confidence in and abide the rules of society, in particular, the quality of contract enforcement, property rights, police, and courts. *Common language*$_{lj}$ and *Colony*$_{lj}$ are indicators for common language and former colonial ties between countries l (the host country of the affiliate) and j (the potential residence of the ultimate owner), and *log Distance*$_{lj}$ is the log of the distance (in kilometer) between the most populated cities in countries l and j. These bilateral geographical and cultural variables are published by the Centre d'Études Prospectives et d'Informations Internationales. Finally, our location choice model includes interaction terms of the listed country-j-specific variables with affiliate-i-specific characteristics to improve the precision of the propensity score estimates. To capture affiliate characteristics, we employ the total assets (TA$_i$) of foreign affiliates.

Beyond the observables (summarized in Table 2) determining ultimate ownership location and, hence, treatment status after adoption of tax exemption, the Amadeus data-set also contains information on outcomes of interest as listed in Table 3.

– Tables 2 and 3 –

4 Effects of the 2009 UK Tax Reform

4.1 Aggregate Effects and Macro Environment around the Reform

While the quasi-experimental approach as suggested in Section 3 relies on subsidiary-firm-level information, it may be interesting to take a look at different macro variables around the time of the tax reform first. Of course, the purpose of the approach using micro data is to find out about the real effects associated with the switch to tax exemption that are concealed when looking at aggregate statistics. The first such statistic depicts dividend income of UK residents on investments abroad over time (data source: Office for National Statistics, UK Balance of Payments, 2011). Figure 1 suggests that dividends increased sharply from 2008 to 2009 and then decreased slightly in 2010. This pattern would be in line with the 2009 switch to tax exemption. But we should note that the figure includes non-corporate residents, for which tax incentives did not change.

– Figure 1 –

Figures 2, 3, and 4 are produced by aggregating over all units in our micro-level data-set (using all corporate entities in the Amadeus data-set for which ultimate owners are known). First, Figure 2 depicts the total assets aggregated over all affiliates over time. It seems that foreign direct investment measured in total assets increased slightly for US foreign affiliates. For the other countries included, the total assets did not change in a noticeable way from 2008 to 2009. Second, Figure 3 depicts how aggregated dividends changed over time. All countries but France experienced a drop in dividends from 2008 to 2009. However, there is no change of notable significance in the UK data compared with other countries. Finally, we may look at the total number of foreign entities over time. Figure 4 reveals that the number of foreign affiliates of multinational firms remained fairly constant over the period of investigation, which is a reassuring result.

– Figures 2, 3 and 4 –

Since we identify treatment with UK-ownership, it is important to make sure that UK-owned firms did not have better investment opportunities in the UK relative to other countries in the year of the reform on average. This would have induced dividend repatriations for non-tax reasons, otherwise. To see that this was not the case, consider the macro-economic environment in the UK and other countries at the time around the reform. Figure 5 shows that exchange rates of different currencies before and after the July 2009 reform were relatively stable and lacked large fluctuations (data source: OECD). Hence, drastic currency exchange rate movements do not seem to be of concern.

– Figure 5 –

Another aggregate statistic to be considered are long-term interest rates. Figure 6 suggests slight fluctuations of long-term interest rates (data source: OECD). However, over the whole year 2009, UK interest rates did not change significantly relative to Euro area interest rates, so that investors did not face significant changes in investment opportunities which might confound the effect of the tax regime change.

– Figure 6 –

Overall, apart from Figure 1, the aggregate statistics in Figures 2-6 look generally stable and do not exhibit noticeable changes so that the change in Figure 1 is likely attributable to the tax reform. An empirical approach that exploits micro-level information is called for in the present context in order to condition out not only country-level but also some firm-level interactive determinants of the selection of affiliates into UK ownership for the sake of identifying the effects of the reform. Such an approach principally permits heterogeneous responses of affiliates with differing characteristics, and it then helps avoiding an associated aggregation bias of the ATT of the reform.

4.2 Parametric Unconditional and Conditional Treatment Effects

Before turning to the main results of our analysis, let us provide preliminary results regarding average treatment effects on outcome of interest of

UK-owned firms.[13] Two types of average treatment effects are of particular interest to our analysis: an unconditional (mean) comparison of outcome of UK-owned versus non-UK-owned firms outside of the UK from a linear regression model of outcome on a binary indicator variable for UK ownership along with a constant, and a conditional comparison from a linear regression model of outcome on a binary indicator variable for UK ownership along with a constant and relevant covariates.

In the sample at hand, the parametric unconditional mean comparison of dividends paid in 2009 ($DIV_{i,2009}$) between UK-owned and non-UK-owned firms outside of the UK amounts to US$ 2mn, which is not significantly different from zero at a standard error of about US$ 1.6mn. The conditional mean comparison based on a linear regression yields an average treatment effect of about US$ 1.03mn at a standard error of US$ 1.7mn. The unconditional and conditional parametric mean comparisons point to average treatment effects of UK ownership in the reform year of about 5 percentage points (significant at 1%) on the dividend payout ratio $DIVREL_{i,2009}$, which captures actually distributed dividends relative to the maximum amount that could have been distributed. In view of an average value of $DIVREL_{i,2009}$ of about 13%, this is a sizable average treatment effect (which is quantitatively consistent with the change in Figure 1 relating to aggregate dividend payments).

Two further variables considered in the analysis are the ratio of sales to fixed assets of unit i in 2009 ($SA/FA_{i,2009}$) and the level of net investment as a change in fixed assets between 2008 and 2009 ($INV_{i,2009}$). The unconditional mean comparisons for $SA/FA_{i,2009}$ and $INV_{i,2009}$ are 88.7 and US$ -2.2mn with standard errors of 48.04 and US$ 2.8mn, respectively. The corresponding parametric conditional mean comparisons for $SA/FA_{i,2009}$ and $INV_{i,2009}$ are 83.8 and US$ -2.8mn with standard errors of 48.4 and US$ 2.7mn, respectively.

[13]Of course, it would be very interesting to examine parent-level outcomes using the same empirical approach. We tried to do so, but the present version of Amadeus on unconsolidated balance sheets of multinational firms does not provide a sufficient number of foreign-affiliate-UK-parent matches, for which information on outcomes is available.

4.3 Nonparametric Conditional Average Treatment Effects on the Treated

The remainder of the paper is concerned with ensuring a better comparability of treated and untreated units than in unconditional or parametric conditional mean comparisons. Such comparability is ensured by a nonparametric identification strategy for ATTs implemented by a matching approach as described in Section 3. Matching is based on predicted probabilities (or propensities) from ownership-location-choice-model estimates. We always enforce a common probability support of the treated and control units in order to ensure better comparability of matched units.

– Table 11 –

Table 11 reports ownership-location-choice-model estimates for two alternative econometric models: a conditional logit model and a mixed logit model. While the conditional logit model assumes an independence of irrelevant alternatives, the mixed logit model relaxes this assumption by allowing for correlation in unobserved factors over alternatives. Hence, the mixed logit model is less restrictive than the conditional logit. Either model includes three types of covariates: country-pair (between any potential ownership residence country j and the foreign affiliate's host country l) specific covariates; parent country j-specific covariates; and interactive terms between affiliate i-specific characteristics and parent country j-specific variables.[14] Among the parent-country-specific regressors, there are *Statutory tax rate*$_j$, *log GDP per capita*$_j$, *log GDP*$_j$, *Voice and accountability*$_j$, *Control of corruption*$_j$, *Government effectiveness*$_j$, *Political stability*$_j$, *Regulatory quality*$_j$, and *Rule of law*$_j$, as introduced in Subsection 3.3. All of those are – in addition to entering as main effects – interacted with the affiliate i-specific total assets (TA_i). Finally, the ownership location choice models include three potential parent-by-host (l-by-j) country specific variables: *Common language*$_{lj}$, *Colony*$_{lj}$, and *log Distance*$_{lj}$.[15]

[14]The location choice model used is per se an alternative-specific estimation approach. Therefore, the specifications include country (alternative-specific) variables as well as interaction terms thereof with affiliate-specific variables, but not affiliate-specific variables on their own. While we do not aim at interpreting coefficients, the controls are useful to obtain precise estimates for the location probabilities used in the matching approach.

[15]We have estimated more parsimonious models than the ones in Table 11. However, we suppress them for the sake of brevity here.

For estimating the location choice models, it is elemental to construct a data-set which allows each affiliate to be principally owned in any one of the 72 ownership countries in the sample. With $61,738$ affiliates, this leads to $72 \cdot 61,738 = 4,445,136$ choices. It turns out that the relaxation of the assumption of independence of the estimated propensities of irrelevant alternatives does not have an important impact on the findings, here. For instance, Spearman's rank correlation coefficient between the propensities as estimated from the mixed logit model and the conditional logit amounts to 0.77 and Kendall's τ amounts to 0.58. Hence, there is a high correlation of propensities which leads to similar control groups for the treated selected from one or the other model (see Subsection 4.5 for further evidence on this matter). However, we will base our main findings on propensities estimated from the mixed logit model since it is less restrictive than the conditional logit model.

– Table 4 –

ATTs derived from matching-based conditional mean comparisons are presented in Table 4 for the four different outcomes as of 2009: dividends paid in 2009 ($DIV_{i,2009}$); the dividend payout ratio ($DIVREL_{i,2009}$); the sales-to-fixed-asset ratio ($SA/FA_{i,2009}$); and net investments in fixed assets ($INV_{i,2009}$). The findings indicate that a randomly chosen foreign affiliate with a UK owner distributes about US$ 2.15mn more on dividends in 2009 ($DIV_{i,2009}$) than a comparable counterfactual affiliate with an ultimate owner outside of the UK. This (about 35% margin over the untreated) is an economically significant effect when considering that these funds are withdrawn from foreign entities in response to a change in tax policy in the home country.[16] The effect is also statistically significant at conventional levels. There is also a positive and significant effect of the UK reform on the dividend payout ratio $DIVREL_{i,2009}$. The coefficient implies that UK-ownership is associated with a five percentage points higher ratio than non-UK-ownership after the reform (but, as we will see, not prior to it). Again, this is a sizeable effect when considering that the average value of $DIVREL_{i,2009}$ for the whole sample equals 13%. Hence, as expected, the new incentives generated by the reform seem to have induced firms to adjust their repatriation policy.

[16]Notice that the change in aggregate earnings of UK residents on investment income abroad rose by about 70% in the comparison year, according to Figure 1. However, the latter includes income of non-corporate entities (private residents) so that the two figures are not directly comparable.

As argued in Section 2, effects beyond those on dividend policy are likely. On the one hand, new repatriation incentives may translate into real investment effects since financial funds are withdrawn from foreign affiliates (with less attractive investment opportunities than ones in the UK). This is a short-run effect. On the other hand, in the long run, this may reduce inefficiencies at the level of foreign affiliates, especially if the reform reduced compliance costs associated with the old tax credit system in a significant way. Considering the sales-to-fixed-assets ratio as one efficiency measure, we find a positive and statistically significant ATT of about 82 on that outcome. This nonparametric, conditional mean comparison is of a similar magnitude as the unconditional mean comparison reported in the previous subsection.

Such efficiency gains should be expected to translate into investment effects. The estimated ATT on real investment of foreign entities implies that UK-owned foreign affiliates invested on average about US$ 3mn (or about 88%) less than their counterfactual affiliates in 2009. This ATT is larger than its unconditional mean comparison counterpart reported in the previous subsection. In combination with the finding for dividend repatriation, this indicates that tax incentives indeed may have induced firms to avoid repatriation so that free cash flow was available for investments in unproductive projects.[17]

4.4 Heterogeneous Conditional Average Treatment Effects on the Treated

While the previous two subsections focused on *average* treatment effects on the treated across *all* comparable treated and untreated control units, one would expect the effects to vary (rise in magnitude) with the tax incentives in place. This subsection is devoted to shed light on this conjecture. Before doing so, recall that the nonparametric propensity score matching approach could be cast as a weighted linear regression that regresses outcome on a constant and a binary treatment indicator for UK ownership of foreign affiliates with the weights being the Kernel weights from the matching procedure (see Robins and Rotnitzky, 1995; Hirano and Imbens, 2002; Blundell and Costa Dias, 2009).[18] If the ATT would vary systematically with the host

[17]This argument is aligned with Jensen (1986), who argues that free cash flow may be used to invest below the cost of capital.

[18]In principal, that weighted regression could condition on the observables as included in the ownership location choice model. However, this appears to be unnecessary and

country's corporate tax rate, one could use this weighted least squares approach to propensity score matching and regress outcome on a constant, a binary treatment indicator for UK ownership of foreign affiliates, and an interactive term between that binary treatment indicator and the *demeaned* corporate tax rates. The latter would subtract the average corporate tax rate among the treated from the original value of the corporate tax rate to ensure that the parameter on the uninteracted treatment indicator variable still measures the ATT (see Wooldridge, 2002, p. 613; Blundell and Costa Dias, 2009; Abadie and Imbens 2011; Fitzenberger, Sommerfeld and Steffes, 2012). Again, the weights of this regression model are the Kernel weights from the matching procedure.

– Figure 7 –

Figure 7 illustrates the variability of ATTs across affiliate-country tax rates as estimated by the aforementioned weighted regression approach (using the mixed logit regression model as in Table 11 and uniform Kernel weights corresponding to radius matching with a radius of 0.01). The solid flat line indicates the ATT on dividends for the average affiliate and applied corporate tax rate in a host country. This ATT amounts to about US$ 2.13mn which is statistically indistinguishable from the ATT of about US$ 2.15mn based on propensity score matching and reported in Table 4. The negatively sloped line indicates how the ATT varies across host country statutory corporate tax rates. Notice that the two lines cross at a value of the corporate tax rate of about 0.28 (28%). With the UK's corporate tax rate of 28%, this is exactly the point where foreign tax incentives to repatriate remained unchanged (zero) before and after the reform. To the left of that point, the treatment effect on dividends is *higher than the average* for affiliates located in lower-tax countries. For affiliates located in countries with a higher tax rate than the UK, the treatment effect is also positive albeit *lower than the average*. The latter finding is in line with arguments that a tax exemption system tends to reduce compliance costs in general. However, we should admit that this interpretation does not pay attention to details regarding the actual tax status of parent firms in the UK.

only would lead to an efficiency loss here, since there is no indication of a violence of the balancing property, by which the treated and matched control units do not differ (on average) in any of the dimensions of the included vector of observables.

4.5 Sensitivity Analysis

A number of issues appear of particular interest when thinking about the sensitivity of the above results. First, the most important consideration here is the question of whether the results on endogenous UK ownership may indeed be interpreted as reform effects. Notice that we have estimated ATTs as of the year 2009 when the reform took place, but it could be that the same effect had occurred already in 2008, so that the ATT should not be ascribed to the reform. We shed light on this question by illustrating that there is no evidence of significant ATTs (of UK ownership) in the pre-reform year, 2008. The corresponding set of results is presented for all outcomes in Table 5.

– Table 5 –

Clearly, the table suggests that the *placebo* treatment in 2008 does not lead to significant ATTs with the same sign in Table 5 as in Table 4.[19] Hence, the ATT may indeed be interpreted as a UK ownership times reform treatment ATT as proposed rather than just an ATT for UK ownership per se.

Second, we estimate the ATTs separately for countries whose corporate tax rate is lower than the one in the UK. To some extent, this is similar to the question asked in Subsection 4.4. However, in that subsection we enforced linearity in the variability of ATTs with corporate tax rates so that the ATT for below-UK corporate tax rates may have been driven by affiliates in countries with quite high tax rates. This problem can be avoided by relaxing the assumption of poolability of data for affiliates with below-UK and above-UK corporate tax rates. In other words, let us look at those foreign affiliates where the tax disincentive of the tax credit system was particularly high before the introduction of tax exemption of corporate profits. Although we do not know the exact tax status of multinational firms – for example, whether firms had unused foreign tax credit before the reform, whether firms could offset losses, whether dividend payments were channeled through intermediate entities, or whether affiliates operated under preferential tax regimes – we would expect that the ATT was more pronounced for this subgroup.

– Table 6 –

Table 6 presents the estimated ATTs suggesting that treatment effects on $DIV_{i,2009}$ and $DIVREL_{i,2009}$ are indeed bigger for affiliates located in lower-tax countries than the UK. Note, however, that the number of treated entities

[19] An interesting finding is the positive ATT for $INV_{i,2009}$, which is in line with the above argument about inefficient investment when free cash flows are available.

is now less than half of what it was before. Consequently, the confidence intervals are overlapping between the subsample in Table 6 and the overall sample in Table 4, akin to the result in Figure 7.

Third, we explore whether the effects prevail in different subsamples in terms of characteristics beyond the statutory corporate tax rates. As we are interested in treatment effects associated with switching into tax exemption, we may want to construct a control group that consists of affiliates located in countries using the tax exemption system, too. In other words, we exclude control affiliates with ultimate owners located in countries that apply a tax credit system from the sample.[20] Naturally, this leads to a reduction in potential control units on which we can match treated units in Table 7.

– Table 7 –

However, the results in the associated Table 7 show that all ATTs have the same sign compared with the benchmark results in Table 4, with slightly larger estimates of the ATTs.

Fourth, we exclude all control affiliates for which related entities in the UK are observed. In fact, if a UK entity is related to an entity of the control group, the former unit might be used as a vehicle to channel dividends to other locations (to other affiliates or to the ultimate owner). In this sense, these controls are indirectly treated, and it makes sense to restrict attention to units for which this possibility is ruled out.

– Table 8 –

Except for investment, the results in Table 8 suggest that this leads to significantly bigger ATTs. The effect on dividends exceeds the benchmark estimate by about US$ 1.4mn, the estimated effect on the payout ratio exceeds the benchmark estimate by about 1.4 percentage points. By excluding firms with affiliates in the UK we can guarantee that the control group is not confounded by reform effects.

Another test relates to the size of multinationals' affiliate networks. Table 9 distinguishes between multinational firms consisting of only one entity, ones that have 2 to 5 entities, and ones with more than 5 entities. Of course, this approach results in drastically smaller subsamples, which is particularly the case when focusing on single-entity multinationals. For example, in the analysis of dividends, 187 treated are matched onto 7,023 control units. For

[20]The list of such countries is reported in the notes to Table 7.

these 187 treated single-entity firms, we can ensure that dividends are not repatriated to some other intermediate affiliate but only to the ultimate UK owner.

– Table 9 –

Apparently, the size of the treatment effect concerning the level of dividends largely depends on the size of the affiliate network, with the *more-than-5-affiliate* multinationals exhibiting the biggest treatment effect. However, Table 9 also demonstrates that the findings are qualitatively very robust across the different subsamples, and treatment effects are mostly statistically significant and estimated with the correct sign.

Finally, we shed light on the qualitative insensitivity of the results to using a conditional logit ownership location choice model instead of the mixed logit model. Recall that the rank correlation coefficient between the two propensity score vectors is quite high (Spearman's rank correlation coefficient amounted to 0.77 and Kendall's τ was 0.58). While this makes similar results for conditional logit based and mixed logit based propensity score matching likely, it does not ensure such similarity.

– Table 10 –

The ATT estimates based on conditional logit corresponding to the ones based on mixed logit in Table 4 are presented in Table 10. These results confirm all findings presented in Table 4. Magnitudes of ATTs seem to be slightly underestimated when using conditional logit propensity scores in Table 10 compared to the benchmark ATTs in Table 4.

5 Conclusions

This paper evaluates how the 2009 UK tax reform affected the behavior of foreign affiliates of UK-owned multinational firms immediately after the reform. One key element of the reform was to introduce a new *tax exemption system*, replacing the *tax credit system* which was in place before. This change had fundamental implications for the tax incentives for multinational firms' behavior: while foreign earnings of UK-owned firms were taxed under the tax credit system, the tax exemption system entails that foreign income is taxed at foreign entities but repatriated income remains tax-exempt in the UK under the new regime.

We suggest an identification strategy to assess the impact of the tax reform on foreign affiliates of UK-owned multinational firms that relies on matching on observables based on propensity scores that are estimated from a multivariate location choice model. This approach allows comparing outcomes of *treated* foreign affiliates which are ultimately owned in the UK with imputed outcomes of counterfactual *control* foreign affiliates which are ultimately owned outside of the UK but exhibit a propensity to be UK-owned which is very similar to the treated units.

Our results imply that foreign affiliates of UK owners responded to the reform by repatriating more foreign dividends than without the reform. The responses are not only statistically but also economically significant with an average effect on the treated firms' dividends of more than US$ 2mn. Apart from dividend repatriation, which was directly affected by the reform, other economic outcomes are found to be affected too. For example, the reform affected affiliate-level investment negatively and the affiliate-level sales-to-fixed-assets ratio positively. However, the latter are only examples of indirect effects of the reform. A more encompassing (short- and long-run) analysis thereof would require an in-depth theoretical analysis to provide more-thoroughly informed empirical work as we can deliver here. Placebo treatments using the same approach in the year prior to the reform provide statistically insignificant estimates for different outcomes, confirming that the identified effects do not represent statistical artifacts. Further robustness tests are reassuring and suggest that measured firm responses are indeed caused by the implementation of the tax reform.

Future research should focus not only on how the change in repatriation policy of UK multinationals affected their operations in the home market in general but in particular whether firms became more competitive (in the home and foreign markets). The latter would be interesting since UK tax authorities emphasized this as one important goal of the reform. But of course, while the reform changed repatriation incentives in a fundamental way, it is not clear how productivity or real investment behavior at home is affected by such a reform and how this is to be measured in a reliable way.

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Tables and Figures

Table 1: Outcome Variables

	Repatriation Pattern:
$DIV_{i,2009}$	is dividends (DIV) paid in 2009
$DIVREL_{i,2009}$	is defined as the ratio of the actual dividends paid in 2009 relative to the maximum payable amount of dividends in 2009
	Other Indicators:
$SA/FA_{i,2009}$	is defined as the sales-to-fixed-asset ratio of affiliate i
$INV_{i,2009}$	is affiliate i's investment in fixed assets

Notes: Since dividend payments are not directly observed in the data, we calculate $DIV_{i,2009}$ as the difference between available shareholder funds for distribution after current profits in 2008 (Amadeus codes: $SHFD_{i,2008} + PL_{i,2008}$) and available shareholder funds for distribution before current profits in 2009 ($SHFD_{i,2009}$). In case we observe negative values, $DIV_{i,2009}$ is set to zero. Investment is defined as the change in the fixed assets from 2008 to 2009.

Table 2: Descriptive Statistics (Determinants of Ultimate Owner Location)

	Mean	Std. Dev.	Min.	Max.
Statutory tax rate$_j$	0.263	0.084	0.100	0.550
log GDP per capita$_j$	9.657	0.856	7.169	11.326
log GDP$_j$	26.177	1.580	22.934	30.182
Voice and accountability$_j$	0.431	0.960	-1.889	1.568
Control of corruption$_j$	0.544	1.075	-1.337	2.421
Government effectiveness$_j$	0.656	0.930	-1.236	2.194
Political stability$_j$	0.223	0.896	-2.756	1.444
Regulatory quality$_j$	0.656	0.857	-1.689	1.835
Rule of law$_j$	0.565	0.968	-1.586	1.937
Common language$_{lj}$	0.037	0.188	0	1
Colony$_{lj}$	0.031	0.147	0	1
log Distance$_{lj}$	7.995	1.083	1.900	9.883
TA$_i$ × Statutory tax rate$_j$	3.438	37.419	-0.282	6,532.679
TA$_i$ × *log* GDP$_j$	342.077	3,550.793	-15.516	358,490.800
TA$_i$ × *log* GDP per capita$_j$	126.201	1,312.758	-5.823	134,529.500
TA$_i$ × Voice and accountability$_j$	5.640	143.161	-22,440.860	18,623.990
TA$_i$ × Control of corruption$_j$	7.117	163.755	-15,875.910	28,758.940
TA$_i$ × Government effectiveness$_j$	8.573	152.659	-14,686.230	26,059.570
TA$_i$ × Political stability$_j$	2.921	125.688	-32,739.400	17,146.470
TA$_i$ × Regulatory quality$_j$	8.575	146.605	-20,059.380	21,797.330
TA$_i$ × Rule of law$_j$	7.389	152.422	-18,835.240	23,006.310

Notes: Descriptive statistics for all variables based on 4,445,136 observations used in the location choice model (see Table 11); TA denotes the total assets of affiliate i in 10mn US$; for a detailed description of the variables used (including data sources), see Section 3.3.

Table 3: Descriptive Statistics (Outcome Variables)

Whole Sample

	All affiliates			UK-owned (Treated)			Non-UK-owned (Control)		
	Mean	Std. Dev.	N	Mean	Std. Dev.	N	Mean	Std. Dev.	N
$DIV_{i,2009}$	6,290.806	116,736.800	58,345	8,097.743	73,683.920	2,393	6,213.526	118,228.800	55,952
$DIVREL_{i,2009}$	0.132	0.233	58,331	0.181	0.267	2,393	0.129	0.231	55,938
$SA/FA_{i,2009}$	125.986	1,879.337	60,044	202.652	2,207.152	2,517	122.632	1,863.628	57,527
$INV_{i,2009}$	5,956.385	288,649.600	61,620	2,470.110	129,624.600	2,585	6,109.041	293,651.100	59,035

Matched Sample

	All affiliates			UK-owned (Treated)			Non-UK-owned (Control)		
	Mean	Std. Dev.	N	Mean	Std. Dev.	N	Mean	Std. Dev.	N
$DIV_{i,2009}$	4,022.099	55,816.830	58,050	6,064.583	37,399.970	2,382	3,934.702	56,469.620	55,668
$DIVREL_{i,2009}$	0.132	0.233	58,036	0.182	0.267	2,382	0.129	0.231	55,654
$SA/FA_{i,2009}$	126.532	1,884.266	59,723	203.613	2,212.390	2,505	123.157	1,868.535	57,218
$INV_{i,2009}$	3,443.149	97,963.31	61,292	430.031	38,082.610	2,573	3,575.181	99,766.710	58,719

Notes: Dividends and Investment are measured in 1,000 US$.

Figure 1: Earnings of UK Residents on Investment Income Abroad

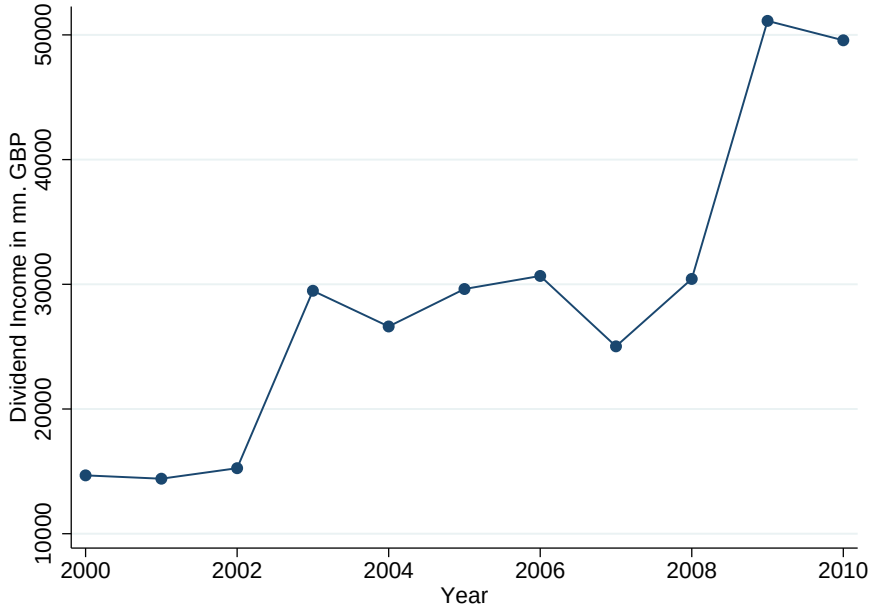

Figure 2: Aggregate Total Assets of Foreign Affiliates

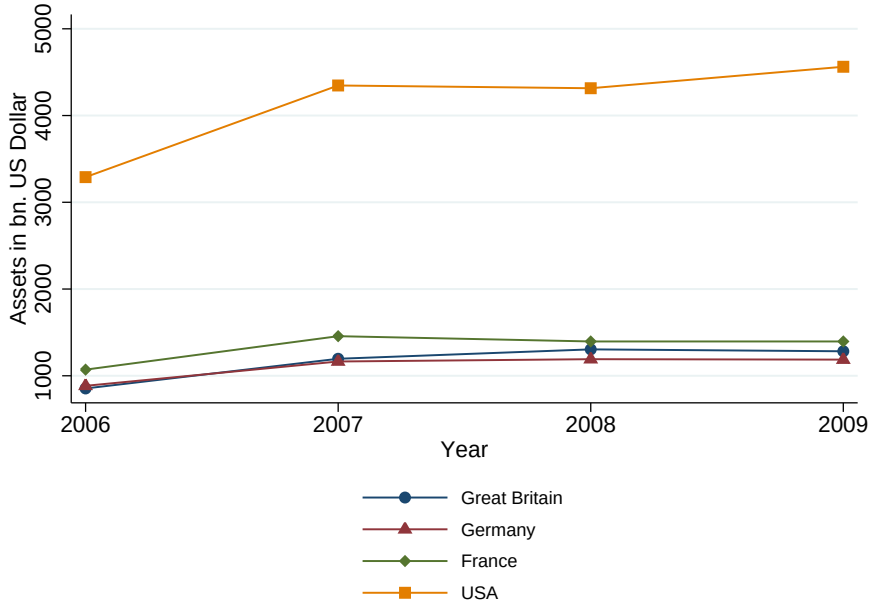

Figure 3: Aggregate Dividends of Foreign Affiliates

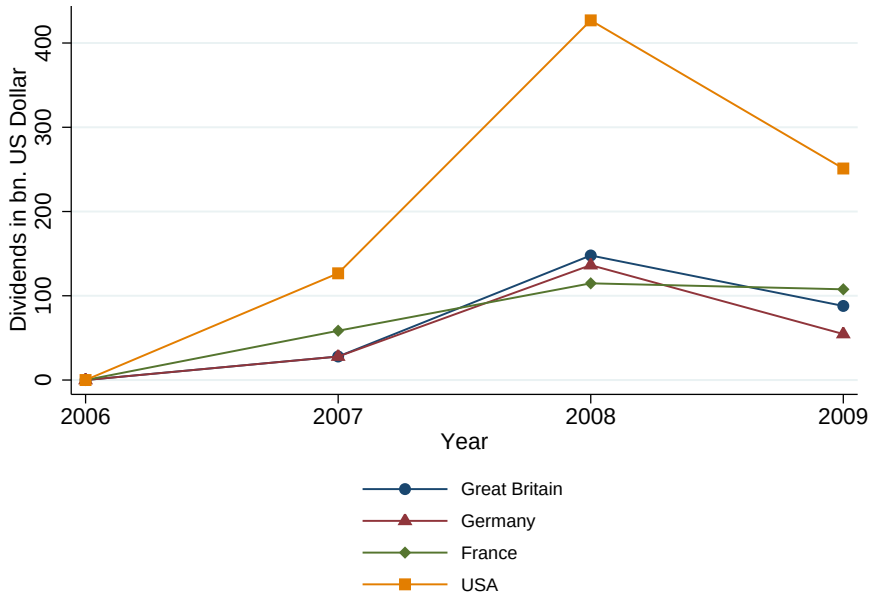

Figure 4: Total Number of Foreign Affiliates

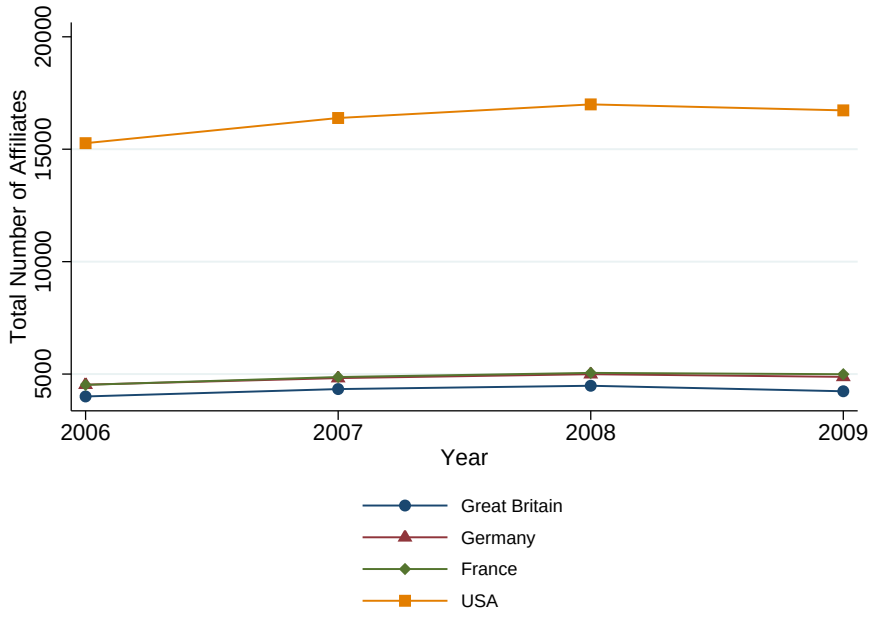

Figure 5: Currency Exchange Rates

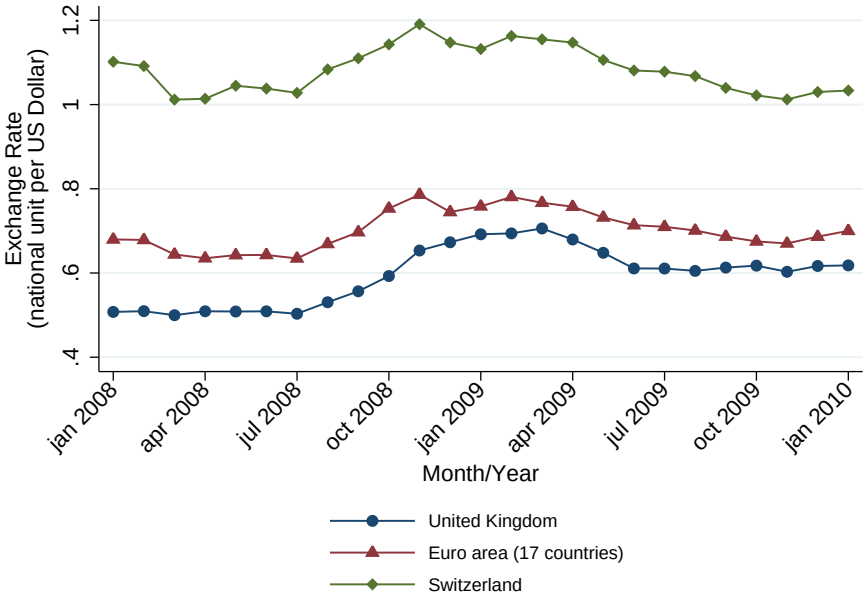

Figure 6: Long Term Interest Rate

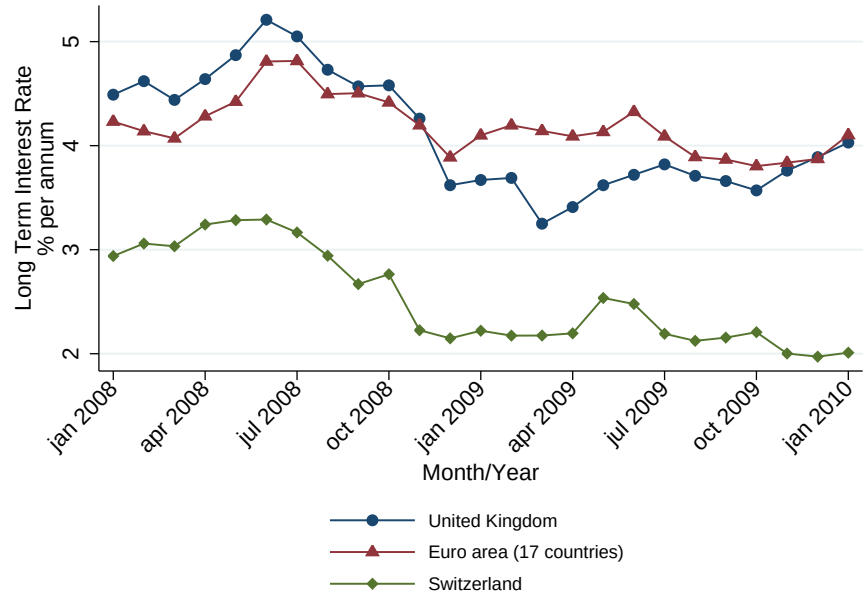

Table 4: ATTs for Different Outcomes

Outcome	ATT	Std. Error	# Treated	# Untreated
$DIV_{i,2009}$	2,150.574***	(804.009)	2,382	55,668
$DIVREL_{i,2009}$	0.051***	(0.005)	2,382	55,654
$SA/FA_{i,2009}$	82.559*	(44.913)	2,505	57,218
$INV_{i,2009}$	-3,050.042***	(859.802)	2,573	58,719

Notes: Coefficients correspond to the average treatment effect on the treated (ATT); # Treated is the number of treated firms and # Untreated the number of matched untreated firms; Matching is on the propensity score from the mixed logit model for the ultimate owner's location choice reported in Table 11; The balancing condition is fulfilled for each outcome, tests available upon request; ***, **, and * indicate significance at 1, 5, and 10 percent, respectively.

Figure 7: Allowing for Heterogeneous Tax Effects

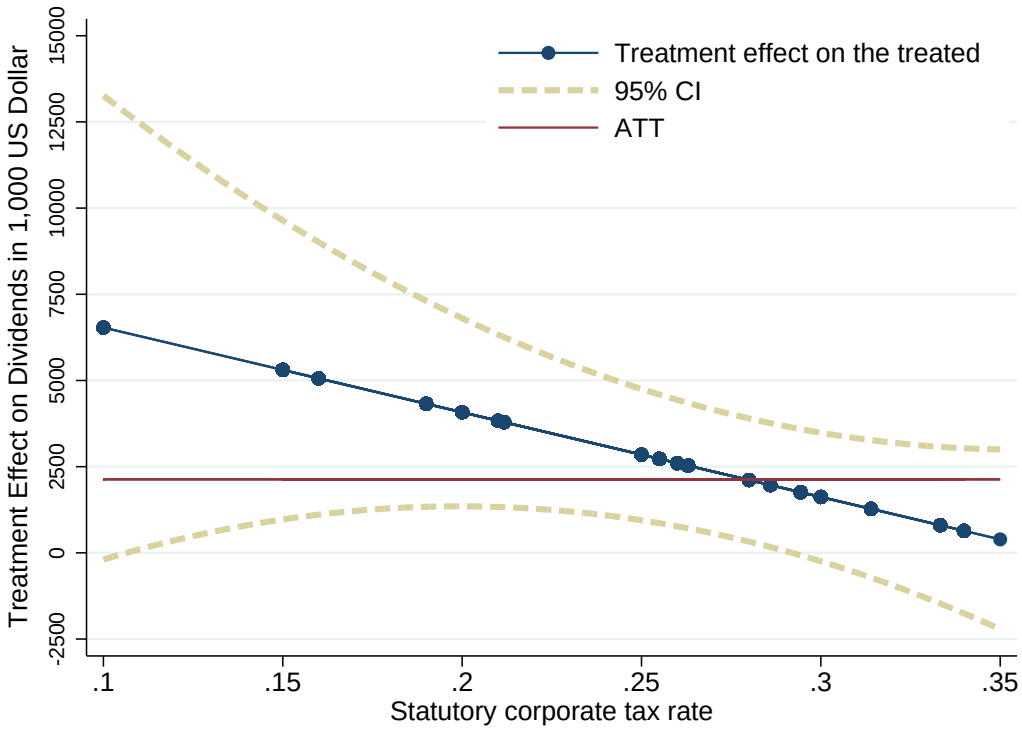

Table 5: Placebo Treatment

Outcome	ATT	Std. Error	# Treated	# Untreated
$DIV_{i,2008}$	-65.445	(2,206.294)	2,191	52,079
$DIVREL_{i,2008}$	0.005	(0.005)	2,191	52,055
$SA/FA_{i,2008}$	33.057	(65.970)	2,444	55,534
$INV_{i,2008}$	4,179.767**	(1,792.085)	2,395	55,264

Notes: Coefficients correspond to the average treatment effect on the treated (ATT); # Treated is the number of treated firms and # Untreated the number of matched untreated firms; Matching is on the propensity score from the mixed logit model for the ultimate owner's location choice reported in Table 11; The balancing condition is fulfilled for each outcome, tests available upon request; ***, **, and * indicate significance at 1, 5, and 10 percent, respectively.

Table 6: ATTs for Different Outcomes ($Tax_j > Tax_i$)

Outcome	ATT	Std. Error	# Treated	# Untreated
$DIV_{i,2009}$	3,153.790**	(1,368.667)	902	50,872
$DIVREL_{i,2009}$	0.055***	(0.008)	902	50,861
$SA/FA_{i,2009}$	88.773	(101.461)	878	52,586
$INV_{i,2009}$	-3,210.492***	(972.145)	903	53,923

Notes: Coefficients correspond to the average treatment effect on the treated (ATT); # Treated is the number of treated firms and # Untreated the number of matched untreated firms; Matching is on the propensity score from the mixed logit model for the ultimate owner's location choice reported in Table 11; The balancing condition is fulfilled for each outcome, tests available upon request; ***, **, and * indicate significance at 1, 5, and 10 percent, respectively.

Table 7: ATTs for Different Outcomes (Excluding affiliates from owner countries applying a tax credit system)

Outcome	ATT	Std. Error	# Treated	# Untreated
$DIV_{i,2009}$	2,442.054***	(817.541)	2,382	46,144
$DIVREL_{i,2009}$	0.052***	(0.005)	2,382	46,131
$SA/FA_{i,2009}$	91.852**	(44.956)	2,505	47,436
$INV_{i,2009}$	-3,280.160***	(898.955)	2,573	48,710

Notes: Coefficients correspond to the average treatment effect on the treated (ATT); # Treated is the number of treated firms and # Untreated the number of matched untreated firms; ***, **, and * indicate significance at 1, 5, and 10 percent, respectively; These results exclude affiliates whose ultimate owner is located in the following countries, which apply a tax credit system: Brazil, Chile, China, Colombia, India, Ireland, Japan, Korea, Malaysia, Malta, Mexico, New Zealand, Poland, Romania, Singapore, Thailand, and United States.

Table 8: ATTs for Different Outcomes (Excluding affiliates which have affiliated companies located in the UK)

Outcome	ATT	Std. Error	# Treated	# Untreated
$DIV_{i,2009}$	3,604.311***	(611.732)	2,369	30,454
$DIVREL_{i,2009}$	0.065***	(0.005)	2,369	30,446
$SA/FA_{i,2009}$	108.801**	(45.750)	2,493	31,390
$INV_{i,2009}$	-1,758.992***	(544.45)	2,560	32,122

Notes: Coefficients correspond to the average treatment effect on the treated (ATT); # Treated is the number of treated firms and # Untreated the number of matched untreated firms; ***, **, and * indicate significance at 1, 5, and 10 percent, respectively; These results exclude affiliates which have affiliated companies (subsidiaries with the same ultimate owner) located in the UK.

Table 9: ATTs for Different Outcomes (By size of the multinationals' affiliate network)

Single affiliates

Outcome	ATT	Std. Error	# Treated	# Untreated
$DIV_{i,2009}$	414.421*	(249.064)	187	7,023
$DIVREL_{i,2009}$	0.041**	(0.019)	187	7,022
$SA/FA_{i,2009}$	-4.677	(38.663)	215	7,369
$INV_{i,2009}$	-422.912*	(253.663)	220	7,515

2-5 affiliates

Outcome	ATT	Std. Error	# Treated	# Untreated
$DIV_{i,2009}$	796.597**	(319.192)	305	10,215
$DIVREL_{i,2009}$	0.061***	(0.015)	305	10,215
$SA/FA_{i,2009}$	32.217	(62.581)	345	10,698
$INV_{i,2009}$	488.798	(713.915)	352	10,974

More than 5 affiliates

Outcome	ATT	Std. Error	# Treated	# Untreated
$DIV_{i,2009}$	1,804.904*	(1,027.304)	1,885	38,315
$DIVREL_{i,2009}$	0.047***	(0.006)	1,885	38,302
$SA/FA_{i,2009}$	96.695*	(56.852)	1,940	39,029
$INV_{i,2009}$	-4,070.565***	(1,139.650)	1,996	40,135

Notes: Coefficients correspond to the average treatment effect on the treated (ATT); # Treated is the number of treated firms and # Untreated the number of matched untreated firms; ***, **, and * indicate significance at 1, 5, and 10 percent, respectively; *Single affiliate* refers to the group of affiliates which do not have any other affiliated enterprizes (other than the ultimate owner), *2-5 affiliates* refers to the group of affiliates with 2 to 5 other affiliated enterprizes, and *More than 5 affiliates* refers to the group of affiliates with more than 5 other affiliated enterprizes.

Table 10: ATTs for Different Outcomes (Matching based on a Conditional Logit Model)

Outcome	ATT	Std. Error	# Treated	# Untreated
$DIV_{i,2009}$	1,615.473**	(805.890)	2,382	55,679
$DIVREL_{i,2009}$	0.048***	(0.005)	2,382	55,665
$SA/FA_{i,2009}$	78.035*	(44.952)	2,505	57,229
$INV_{i,2009}$	-3,549.242***	(865.783)	2,573	58,730

Notes: Coefficients correspond to the average treatment effect on the treated (ATT); # Treated is the number of treated firms and # Untreated the number of matched untreated firms; Matching is on the propensity score from a conditional logit model for the ultimate owner's location choice; The balancing condition is fulfilled for each outcome, tests available upon request; ***, **, and * indicate significance at 1, 5, and 10 percent, respectively.

Table 11: Ultimate Owner Location Decision

	Mixed logit		Conditional logit
	Mean	Standard Deviation	
Statutory tax rate$_j$	-1.236***	-9.507***	6.382***
	(0.203)	(0.273)	(0.133)
log GDP per capita$_j$	0.938***	-0.004	0.159***
	(0.031)	(0.039)	(0.024)
log GDP$_j$	1.273***	0.496***	0.872***
	(0.010)	(0.012)	(0.005)
Voice and accountability$_j$	1.693***	0.001	0.557***
	(0.039)	(0.024)	(0.024)
Control of corruption$_j$	0.317***	0.011	-0.210***
	(0.043)	(0.021)	(0.033)
Government effectiveness$_j$	1.781***	-0.013	0.049
	(0.058)	(0.032)	(0.040)
Political stability$_j$	-0.259***	0.009	0.337***
	(0.023)	(0.030)	(0.015)
Regulatory quality$_j$	-1.903***	0.004	-0.693***
	(0.049)	(0.022)	(0.041)
Rule of law$_j$	-0.937***	-0.001	0.385***
	(0.064)	(0.020)	(0.048)
Common language$_{lj}$	-0.369***	0.097	-0.504***
	(0.024)	(0.063)	(0.020)
Colony$_{lj}$	-0.209***	0.098	0.007
	(0.028)	(0.062)	(0.022)
log Distance$_{lj}$	-2.664***	1.926***	-1.648***
	(0.015)	(0.016)	(0.005)
TA$_i$ × Statutory tax rate$_j$	-0.003		-0.002*
	(0.002)		(0.001)
TA$_i$ × *log* GDP$_j$	0.001***		0.000***
	(0.000)		(0.000)
TA$_i$ × *log* GDP per capita$_j$	0.001**		0.001***
	(0.000)		(0.000)
TA$_i$ × Voice and accountability$_j$	0.001*		0.000*
	(0.000)		(0.000)
TA$_i$ × Control of corruption$_j$	-0.001		-0.001**
	(0.001)		(0.000)
TA$_i$ × Government effectiveness$_j$	0.003***		0.003***
	(0.000)		(0.000)
TA$_i$ × Political stability$_j$	0.000		0.000
	(0.000)		(0.000)
TA$_i$ × Regulatory quality$_j$	-0.001**		-0.001*
	(0.000)		(0.000)
TA$_i$ × Rule of law$_j$	-0.002**		-0.002**
	(0.001)		(0.001)

Notes: 4,445,136 observations; TA denote the total assets of affiliate i; Standard errors reported in parenthesis; For the mixed logit model, the estimated standard deviation of the coefficient is reported for those variables with random coefficients; ***, **, and * indicate significance at 1, 5, and 10 percent, respectively.