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IMF Working Paper

Where Does Multinational Investment Go with Territorial
Taxation? Evidence from the UK

by Li Liu

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Fiscal Affairs Department

Where Does Multinational Investment Go with Territorial Taxation? Evidence from the UK**Prepared by Li Liu**

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Abstract

In 2009, the United Kingdom changed from a worldwide to a territorial tax system, abolishing dividend taxes on foreign repatriation from many low-tax countries. This paper assesses the causal effect of territorial taxation on real investments, using a unique dataset for multinational affiliates in 27 European countries and employing the difference-in-difference approach. It finds that the territorial reform has increased the investment rate of UK multinationals by 15.7 percentage points in low-tax countries. In the absence of any significant investment reduction elsewhere, the findings represent a likely increase in total outbound investment by UK multinationals.

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I. INTRODUCTION

Many countries strive to create competitive tax systems to attract internationally mobile capital. The United States, Germany and the United Kingdom have all used forms of accelerated depreciation allowances to encourage domestic investment. Many developing countries have offered lower corporate tax rates and temporary tax holidays to attract foreign investments. The taxation of profits earned overseas in the home country of multinational companies (MNCs) is another important channel for tax policies to influence both domestic and foreign investment. This topic has attracted considerable attention in recent policy debate regarding reforming the international tax system. For example, the US is considering moving to a territorial tax system, following proposals in the 2017 House and Senate's international tax reform packages. In contrast to the lively policy debate, there is surprisingly little empirical evidence on how the taxation of foreign earnings influences multinational investments.¹

This paper provides some of the first micro-level evidence on the causal effect of territorial taxation on the levels and locations of investments by multinationals, based on a 2009 policy reform of international tax rules in the UK. The United Kingdom used a worldwide approach prior to the year 2009, taxing foreign repatriations from countries with a statutory tax rate lower than the UK at a tax differential between the host country and the UK. The 2009 reform abolished the worldwide regime by going territorial and exempting active foreign earnings from UK taxation altogether. The reform thus reduced the dividend tax on foreign earnings in the low-tax countries. In contrast, the reform had little direct impact on foreign earnings in the high-tax countries. This is because the worldwide regime capped the dividend tax on foreign earnings at the UK corporate tax rate, so that there was no additional tax on repatriations from the high-tax countries even before the reform.

In principle, the two distinct approaches in taxing cross-border income can have very different implications on the allocation of multinational investment between domestic and foreign activities, and on the pattern of investment abroad.² I use a simple investment model based on [Bond, Devereux, and Klemm \(2007\)](#) and [Chetty and Saez \(2010\)](#) to understand the effects of

¹As of 2017, 28 out of 34 OECD countries have territorial taxation, while the credit-based worldwide taxation remains in place in some major economies such as China, Russia, and the United States.

²Under worldwide taxation (or a credit system), the home country tax rate is the relevant tax for all income. The firm is indifferent, based on tax consideration, between whether invest at home or abroad (capital export neutrality). On the other hand, firms in high-tax credit countries face higher taxes when competing in foreign markets with other firms that are subject only to the same local (host country) tax burdens, which may distort international cross-ownership of assets ([Desai and Hines, 2003](#)). In addition, firms under the credit system can strategically invest in high-tax countries in order to benefit from cross-crediting, which may also distort international allocations of real investments. Under territorial taxation (or an exemption system), the host country's tax rate is the relevant tax for multinational income, so a firm's investment is sensitive to the host-country tax differences. The optimal taxation of foreign source income theory suggests that with a non-zero adjustment cost, the domestic tax on foreign-source income should always be set to ensure the optimal allocation of the mobile factor between domestic and foreign assets. The home country's taxation should follow the classical rules in the literature: national optimality requires the deduction rule, and global optimality requires the implementation of the credit rule. ([Devereux, Fuest, and Lockwood, 2015](#))

the reform on the level of investment by UK multinationals. The model yields three predictions of how investment would respond to the territorial reform, depending on the source of financing and on whether the tax reform is permanent or temporary. First, dividend exemption following the reform would increase investment by UK multinationals that use new equity to finance new investment.³ Second, dividend exemption would have no impact on the cost of capital for multinational investment financed with retained earnings, which is a result first suggested in [Hartman \(1985\)](#).⁴ Third, the irrelevance result of dividend tax on internal-funded investment would no longer hold when tax changes are anticipated or temporary. Anticipating a forthcoming reduction in the dividend tax, profit-maximizing MNCs would engage in inter-temporal tax planning by postponing repatriation and increasing investment before the reform.⁵

I test these predictions by exploiting the 2009 reform as a quasi-experiment. The basic idea is that a UK-specific reform should have no direct impact on the after-tax return to investment by non-UK multinationals, which can be used as a control group in the difference-in-difference analysis. I analyze the investment responses in the low-tax countries separately from those in the high-tax countries, as the direct investment effect of the reform should concentrate in the low-tax countries. The identifying assumption underlying the research design is that investment by UK and non-UK multinational affiliates would have trended similarly in the absence of the tax reform. Graphical evidence shows similar trends in the investment series before the reform. Results of the placebo tests suggest that there are no differential changes in investment by UK affiliates relative to the control group in the low-tax countries in any of the three years in the pre-reform period. Moreover, should UK multinationals be affected more lightly than non-UK multinationals in the financial crisis, we would expect a similar rebound in their investment in both the low-tax and high-tax countries. However, as

³This result represents the “old view” of dividend taxation in the context of cross-border investment. Key theoretical studies on the effect of dividend taxes on business investments include [Poterba and Summers \(1984\)](#), [King \(1974, 1977\)](#), [Auerbach \(1979, 1981, 1983\)](#), and [Bradford \(1981\)](#). [Hartman \(1985\)](#) extends the analysis to study the effect of dividend taxes on cross-border investment. [Auerbach \(2002\)](#) provides an excellent summary of the debate between the old and new theories of dividend taxation. Recent empirical work providing supportive evidence on the negative effect of dividend tax cut on domestic investment includes [Chetty and Saez \(2005\)](#), [Blouin, Raedy, and Shackelford \(2011\)](#), and [Campbell and others \(2013\)](#), while [Yagan \(2015\)](#) finds no evidence that dividend tax cut increases corporate investment in the U.S. [AlstadsÅeter, Jacob, and Michaely \(2015\)](#) and [Mathur and others \(2016\)](#) reconcile competing results from the two views by providing empirical evidence on the heterogeneous effects of dividend taxes which depends critically on financing. [Gourio and Miao \(2011\)](#) provides similar evidence on the heterogeneous effects of the 2003 dividend tax cut using simulation results from a dynamic general equilibrium model.

⁴The intuition that with a permanent dividend tax in place, the foreign affiliate is indifferent between paying repatriation taxes now and paying repatriation taxes of the same present value later.

⁵The reform can also affect multinational investments by eliminating the costs of tax planning on foreign earnings, which can be viewed as implicit taxes on dividend repatriations. In other words, while the effective tax rate on actual repatriation may be small due to the expert corporate manipulation of foreign tax liability, the implicit repatriation tax rate on the bulk of offshore retained earnings could be much higher due to the implicit costs of tax planning and avoidance ([Kleinbard, 2011](#)).

shown in the empirical analysis below, increases in investment by UK multinationals are only observed in countries with tax rates that are specifically lower than the UK rate.

The empirical analysis uses unconsolidated financial and ownership data on multinational affiliates in EU27 from the AMADEUS database provided by Bureau van Dijk,⁶ complemented by information on country-level corporate tax rates and other economic and governance characteristics. The main sample is an unbalanced panel with annual observations from 131,614 multinational affiliates between 2005 and 2011, of which 30,206 are UK affiliates. I obtain qualitatively similar results in regressions using a balanced panel, a smaller control group of firms with parent companies in the ten largest EU-27 countries, and a matched sample of firms with similar turnover, asset, and turnover growth rate.

I find that dividend exemption increased investment by UK affiliates in the low-tax countries. The finding is robust to controlling for a wide range of non-tax determinants of cross-border investment decisions. Quantitatively, the introduction of territorial system increased the gross investment rate by UK affiliates by 15.7 percentage points in the low tax countries in response to an average reduction of 9 percentage points in dividend taxes. The finding of a significant increase in investment in the low-tax countries is robust to changes in the sample (unbalanced and balanced panels), changes in the control group (with and without parent companies subjecting to worldwide taxation, with parent companies in the ten largest EU-27 countries, and matched panels), inclusion of additional controls (with and without industry- and county-level time trends, and with and without controlling for the euro crisis), investment measures (gross investment and net investment), and outlier winsorization (at the 97.5th and 99th percentiles). The finding of a significant increase in investment in the low-tax countries is also robust to controlling for average potential differential changes in investment between the treated and control group in a triple-difference estimation approach.

There are considerable heterogeneous effects of dividend exemption on investments by UK affiliates. The observed investment increase is mainly driven by financially constrained firms measured by the availability of free cash flow. The same group of cash-constrained firms are also more likely to issue new equity after the reform based on a difference-in-difference linear probability regression analysis. The investment increase is concentrated in larger and more complex multinational groups measured by their total number of related companies and total assets. There is no significant change in employment, labor productivity or profitability in the UK affiliates in the low-tax countries, yet there is a moderate increase in the average affiliate-level wage rate. The evidence suggests that workers may have also benefited from the reform by sharing tax savings with their companies.

The investment effect of the policy reform is estimated to be negative in the high-tax countries and positive in the UK, based on similar difference-in-difference approaches. However, both effects are estimated with imprecision so none of the coefficient estimate is significant at conventional statistical levels. The results therefore do not provide strong evidence of any

⁶EU-27 Member States include: Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Poland, Portugal, Romania, the Slovak Republic, Slovenia, Spain, Sweden and the United Kingdom.

significant reallocation of investment from domestic to foreign activities, or from the high- to low-tax countries following the reform. In aggregate, the investment increase in the low-tax countries is estimated to be €5.6 billion, which is approximately nine times the amount of estimated foregone tax revenue.

This paper relates to several strands of literature in corporate taxation and corporate finance. First, it contributes to the broader literature on FDI and taxation by quantifying the significant role of home country tax.⁷ Second, it adds to the literature studying the behavioral responses of multinationals to the taxation of cross-border income (Bradley, Dauchy, and Hasegawa, 2017; Desai, Foley, and Hines, 2001; Dharmapala, Foley, and Forbes, 2011; Egger and others, 2015; Foley and others, 2007; Graham, Hanlon, and Sheylin, 2010; Grubert, 1998; Hasegawa and Kiyota, 2017; Hines, 1996; Hines and Rice, 1994; Slemrod, 1990). While most of these papers focus on the dividend payouts and tax planning activities of multinationals, this paper joins Grubert and Mutti (2000), Altshuler, Grubert, and Newlon (2000), Altshuler and Grubert (2003), and Hanlon, Lester, and Verdi (2015) by studying the real investment decisions of multinationals. Third, it contributes to the debate between the “old view” and the “new view” of dividend taxation by providing new evidence on the impact of dividend taxation on cross-border investment.⁸ Fourth and finally, this paper joins a growing literature (Auerbach and Gorodnichenko (2013), Matheson, Perry, and Veung (2014), and IMF (2014)) that focuses on the spillover effects of fiscal policy in a global economy.

The paper proceeds as follows. The next section describes the policy reform that provides exogenous changes in the dividend taxes on UK multinationals. Section III provides a simple conceptual framework for the effect of dividend exemption on outbound multinational investment. Section IV describes the data used in empirical analysis. Section V discusses empirical strategy and specification. Section VI presents empirical findings on the effect of dividend exemption on UK investment and discusses the implications of these findings. Section VII briefly concludes.

II. THE 2009 TERRITORIAL TAX REFORM

The current territorial system was introduced in 2009, which exempts UK multinationals’ foreign earnings from additional taxes in the UK. Before then, the UK taxed corporate profits on a worldwide basis; repatriation from lower-taxed countries were liable to additional UK taxes. To avoid double taxation, UK multinationals can claim credits for taxes paid to the host country on foreign earnings, but only up to their UK tax liability on those earnings. For example, if a UK multinational has an investment in Ireland, it will pay Irish tax at a rate of 12.5

⁷The empirical literature on this topic, as recently surveyed in de Mooij and Ederveen (2003) and Feld and Heckemeyer (2011), focuses largely on the influence of host country taxation on FDI.

⁸Most recent studies, including Becker, Jacob, and Jacob (2013), Yagan (2015), and AlstadsÅqter, Jacob, and Michaely (2015), focus on domestic investment and provide mixed evidence on the effect of dividend taxation on domestic investment.

percent. When the Irish profits are remitted as dividends to the UK parent company, they are liable to additional taxes at 15.5 percent, which is the difference between the UK and Irish taxes.⁹

The total tax on foreign earnings is capped at the UK rate so that the amount of corporation taxes on foreign earnings are the same they would be if the profits were earned in the UK. Therefore, there are no additional taxes on repatriated earnings from countries with statutory tax rates higher than the UK's. For example, foreign earnings in France pay a French tax of 35 percent and are not liable for any additional taxes upon repatriation. In general, the additional UK tax on each pound of dividend repatriation ($\tau_{UK,div}$) is the difference between the statutory tax rate in the host country (τ_j) and the UK (τ_{UK}).

The additional dividend taxes place UK multinationals at a competitive disadvantage with companies in other countries that exempt foreign earnings. This consideration prompted the government to issue a discussion document in June 2007 that proposed that the UK "go territorial."¹⁰ The territorial tax system was subsequently introduced in the 2009 Finance Bill and went into effect on July 1. By abolishing UK taxes on all foreign-source dividend repatriations, the reform introduced differential changes in dividend taxes depending on the location of foreign affiliates.¹¹ Specifically, the reform reduced the tax rate on dividends remitted from low-tax countries from τ_{UK} to τ_j while that from high-tax countries remained unchanged:

$$\text{Dividend Tax Reduction} = \begin{cases} \tau_{UK} - \tau_j, & \tau_j \leq \tau_{UK} \\ 0, & \tau_j > \tau_{UK}. \end{cases}$$

The tax differential $\tau_{UK} - \tau_j$ represents the maximum amount of tax savings on a £1 dividend repatriated from a low-tax country j . This is because under the worldwide system, excess credits arising from low-tax countries (known as "eligible unrelieved foreign tax") can be used to offset dividend taxes on earnings from high-tax countries. There were restrictions on the maximum amount of excess credits that could be used for offsetting,¹² so the reduction in the dividend tax rate is between zero and the tax differential $\tau_{UK} - \tau_j$ accounting for cross-crediting.

⁹The corporate tax rate of 28 percent was the main rate on corporate taxable profit above £1.5 million during 2008-2010. The main rate was reduced to 26 percent in 2011, 24 percent in 2012, and 20 percent in 2015.

¹⁰ HM Treasury and HM Revenue & Customs, *Taxation of the Foreign Profits of Companies: A Discussion Document*, June 2007 (http://www.hm-treasury.gov.uk/media/E/B/consult_foreign_profits210607.pdf). The stated policy objective of this reform is "to enhance the competitiveness and attractiveness of the UK as a location for multinational business." (Parliament Report, 2009)

¹¹Except where the receipt is similar to interest or distributions paid in respect of certain securities.

¹²Specifically, the rate of credit for underlying tax on all foreign dividends paid cross-border is restricted to the main UK rate. Eligible unrelieved foreign tax only arises on the highest-level dividend that suffers the 30 percent, and the rate of credit cannot exceed 45 percent. No relief was available for any capped foreign tax on lower-level dividends.

From a practical perspective, the territorial tax reform can also affect multinational investment by reducing their tax planning costs. This is because only a small amount of revenue was collected on repatriation prior to the reform, for which there are two potential explanations: (1) Either the bulk of foreign earnings were reinvested overseas, or (2) they were brought home via sophisticated tax planning to avoid taxes. To the extent that costly tax planning can be viewed as an implicit tax on repatriation, this additional tax burden was also abolished by the territorial tax reform.

III. CONCEPTUAL FRAMEWORK

I use a simple two-period model based on [Bond, Devereux, and Klemm \(2007\)](#) and [Chetty and Saez \(2010\)](#) to illustrate the effect of dividend taxation on business investment. At the beginning of period 0, a UK affiliate in the foreign country has a cash holding of C . In period 0, it invests an amount of I , which can be financed by retained earnings or by receiving new capital injection of $E \geq 0$ from the parent company. At the end of period 0, the foreign affiliate pays a dividend in the amount of $D = C + E - I$ to its UK parent. During period 1, the foreign affiliate produces output and earns revenue with the production function $f(I, E)$, where $f(\cdot)$ is strictly concave, strictly increasing, continuous, and continuously differentiable.¹³ At the end of period 1, the foreign affiliate returns the entire net wealth to the UK parent company by paying out a dividend. Tax rates of t_d^0 and t_d^1 are levied on dividend payments in periods 0 and 1, respectively.¹⁴ A tax rate of t_c is levied on corporate revenue in the second period.

The foreign affiliate chooses I and E to maximize the present value of net distributions, given by:

$$V = (1 - t_d^0)(C + E - I) - E + (1 - t_d^1)\beta(1 - t_c)f(I, E),$$

where $\beta = \frac{1}{1+r}$ is the parent company's discount factor, and r is the risk-free interest rate between the two periods, subject to the non-negativity constraints on dividend payments and new share issues. The first-order conditions for investment and new equity issues are:

$$f_I = \frac{(1+r)}{(1-t_c)} \left[\frac{1-t_d^0}{1-t_d^1} + \frac{\lambda^D}{1-t_d^1} \right],$$

and:

$$f_E = \frac{(1+r)}{(1-t_c)} \left[\frac{1 - (1-t_d^0) - (\lambda^D + \lambda^E)}{1-t_d^1} \right],$$

¹³Note that the positive dependence of this production function on the level of new capital reflects the possible "control benefits" of subjecting the investment decision to scrutiny and monitoring from the parent company.

¹⁴In order to focus on the implication of dividend taxation for investment and new share issues, the amount of debt finance is assumed to be fixed.

where λ^D and λ^E are shadow values associated with the non-negativity constraints. There are two financial regimes in this model, which are depicted in Figure 1, under which the optimal strategy of finance depends on the level of initial cash flow C relative to firm-specific investment opportunities. Further, assume a constant t_d between the two periods (an assumption to be extended later), that is, $t_d^0 = t_d^1 = t_d$.

A. Regime 1: Financed by New Equity

Under this regime, new investment is financed with new share issuance. Dividend payout is zero ($D = 0$ so that $\lambda^D > 0$) and share issuance is positive ($E > 0$ so that $\lambda^E = 0$). This happens when the initial cash flow C is so low relative to investment opportunities that, if the firm issues the level of new shares set by the optimal condition, it would not be able to finance the optimal level of investment and pay positive dividends in the current period. The first-order conditions are:

$$f_I = \frac{(1+r)}{(1-t_c)} \left[1 + \frac{\lambda^D}{1-t_d} \right], \quad (1)$$

and

$$f_E = \frac{(1+r)}{(1-t_c)} \left[\frac{1-\lambda^D}{1-t_d} - 1 \right]. \quad (2)$$

In this case, the foreign affiliate invests all the cash it has: $I = C + E$ and finances its investment with new equity at the margin. Condition ((2)), which determines the amount of equity injection, indicates that the repatriation tax also plays a role in this decision.

Implicit differentiating of equations ((1)) and ((2)) suggests that $\partial f_I / \partial (1-t_d) < 0$ and $\partial f_E / \partial (1-t_d) < 0$. Under this regime, a reduction in t_d implies a lower marginal cost of investment, and a higher level of investment. A lower t_d also implies a lower marginal cost of issuing new shares, which increases the amount of new shares (with $f_{I,E} > 0$). The firm is considered financially constrained in this regime because a windfall increase in its cash flow would reduce the shadow value of internal funds λ^D , which leads to an increase in both its new share issues and investment.

These results are similar to those of the standard “old view” models where marginal investments are financed by funds from outside investors. Proceeds from these investments are returned to investors and subject to dividend tax rates (Poterba and Summers, 1984). A higher dividend tax rate raises the effective tax rate on investment income and discourages investment, with potentially adverse welfare consequences. Conversely, a reduction in the dividend tax, as in the case of the 2009 reform, would potentially encourage investment by UK multinationals in low-tax countries.

B. Regime 2: Financed by Retained Earnings

In the second regime, the initial cash flow C is sufficiently high relative to investment opportunities. New investment is financed with retained earnings, implying that $D > 0$ so that $\lambda^D = 0$, and $E = 0$ so that $\lambda^E > 0$. The first-order condition ((1)) now becomes:

$$f_I = \frac{(1+r)}{(1-t_c)}, \quad (3)$$

where the cost of capital and optimal level of investment no longer depend on t_d . The intuition is that, with a constant t_d , a dividend tax lowers both the cost of investment and return on the investment by the same amount, and therefore has no effect on the cost of capital. This result reproduces the “new view” or the “trapped equity” view of dividend taxation (Auerbach, 1979; Hartman, 1985; King, 1974), which predicts that investment using mature capital does not depend on the dividend tax.

Comparing equations ((1)) and ((3)) confirms the standard pecking order in which external finance is no less expensive than internal finance. In the context of cross-border investment, the result implies that UK multinationals should first finance their investments by exhausting their internal funds before turning to new capital injections from multinational groups. It is more tax efficient for the foreign affiliate to retain the initial earnings to avoid a tax on dividend repatriation.

C. Anticipation Effect of Changes in Dividend Taxes

The results in Regime 2 hinge on the assumption of a constant dividend tax. The irrelevance result of dividend taxation for internal-funded investment no longer holds when there is temporary change in the tax rate or any expectation of such changes.

Suppose that the foreign affiliate anticipates in period 0 that the rate of dividend tax will decrease in the next period ($t_d^0 > t_d^1$). In this case, the first-order condition that determines the optimal level of investment for firms in Regime 2 becomes:

$$f_I = \left(\frac{1-t_d^0}{1-t_d^1} \right) \left(\frac{1+r}{1-t_c} \right). \quad (4)$$

Equation ((4)) shows that a higher dividend tax in period 0 (relative to the next period) reduces the marginal cost of investment in period 0 to below $\frac{1+r}{1-t_c}$ for firms relying on retained earnings. Consequently, the optimal investment level in period 0 would be higher than that determined by equation ((3)), even for a new investment financed with retained earnings.

The intuition is straightforward. Anticipating a reduction in the dividend tax makes postponing dividend payouts to period 1 more attractive. Instead, the firm should invest all the re-

tained earnings in period 0. In the context of the territorial tax reform, the implication is that UK multinationals would increase their investments in the years immediately preceding the reform, postponing repatriating dividends until afterwards. The following sections set out to test these predictions by empirically examining the responsiveness of investments by UK multinationals to the introduction of the dividend exemption regime in 2009.

IV. DATA

The primary dataset for empirical analysis consists of an unbalanced panel of 131,614 multinational affiliates in EU-27 countries between 2005 and 2011. It is based on the unconsolidated financial statements of multinational subsidiaries in the commercial AMADEUS database, which is provided by Bureau van Dijk.¹⁵ A company is defined as a multinational subsidiary if it has an ultimate parent company owning at least 50 percent of its shares and is in a country different from its parent. The ultimate parent companies are from 158 countries in the dataset.

The main sample excludes companies with missing/zero turnover or total assets, and financial companies whose main productive assets typically are not tangible capital. The main sample also excludes observations with missing industry or unspecified home country information. Table 2 shows the geographical distribution of multinational affiliates in the main sample.

The main accounting variables are flows of investment, sales, cash flow, and earnings before interest and tax (EBIT).¹⁶ Investment spending (I_t) is computed as changes in fixed capital assets based on the net book values of tangible and intangible fixed assets plus depreciation, i.e. $K_t - K_{t-1} + depreciation$, where K_t denotes book value of the fixed asset in year t . Gross investment rate, $Investment_t$, is defined as the ratio between current-year gross investment spending and beginning-of-year net fixed capital asset. Similarly, net investment rate, $Investment_Net_t$, is defined as the ratio between current-year net investment spending and beginning-of-year net fixed capital asset. Sales refers to operating revenue. Profit margin is calculated as earnings before interest and tax (EBIT) divided by sales. All ratio variables are winsorized at top and bottom 1 percentile to minimize the influence of outliers.

A limitation of the AMADEUS data is that information on the ownership structure refers to the latest report year, which is 2011 for most observations in the sample. I assume that the same parent-affiliate ownership structure applies to earlier years. If there are changes of ownership structure over the sample period, there may be potential mis-classifications of parent-subsidiary connections, introducing attenuation bias against findings of significant policy ef-

¹⁵The AMADEUS database includes approximately 8 million public and private companies in 38 European countries. It combines data from over 35 specialist regional information providers and offers information on financial statements and basic ownership structures for medium and large European companies.

¹⁶Unfortunately, there is no information on dividend payment or equity issuance in the affiliate-level unconsolidated financial accounts. The lack of data prevents a direct test of the effect of dividend exemption on dividend repatriation or new share issuance.

fects.¹⁷ Consider that the UK's moving to an exemption system increases the competitiveness of UK parent companies in the international market. As a result, they acquire more foreign subsidiaries in low-tax jurisdictions.¹⁸ By including these newly acquired subsidiaries in the analysis, the estimation results would capture the overall investment response to dividend exemption by allowing for endogenous investment changes in the extensive margin via mergers and acquisitions.

I merge data for the statutory corporate tax rate at the affiliate location provided by the Oxford Centre for Business Taxation Tax Database.¹⁹ This is a measure of total statutory tax rates, including top corporate tax rate at the federal level, any surcharge levied, and any local corporate tax rates in a given country-year. Subsidiaries in the main sample face statutory corporate tax rates that range from 0.10 to 0.404 with a mean of 0.285.

To identify the set of low-tax countries, I define an indicator variable *low tax* which takes the value 1 if a country's corporate tax rate is below the UK's corporate tax rates in both 2005 and 2011, and 0 otherwise. Table 1 lists the low-tax and high-tax countries and their tax rates. I further merge data on GDP per capita, population, and unemployment rate to capture the aggregate market size and demand characteristics in the host country, as well as measures of governance quality and financial stability to capture the quality of the institution in the host country. Home-country characteristics, including growth rate of GDP per capita, population, and the unemployment rate, are also included to capture macroeconomic conditions in the parent country.²⁰ Table 3 presents the descriptive statistics of the key variables that are used in regression analysis.

V. EMPIRICAL STRATEGY

By exempting taxes on foreign earnings, the 2009 territorial tax reform reduced the effective tax rate on dividends repatriation and the cost of capital on new investment in many low-tax countries. Identification builds upon the idea that only UK affiliates benefited from this reform, while the investment decisions of non-UK multinationals should not be affected by a UK-specific reform. This differential impact permits a within-year comparison of investments

¹⁷This caveat is acknowledged in previous studies exploring the ownership structure in the AMADEUS data. See, for example, Budd, Konings, and Slaughter (2005), Dischinger and Riedel (2011), and Dharmapala and Riedel (2013).

¹⁸Feld and others (2005) estimate that the abolishment of repatriation taxes in the UK in 2009 has increased the number of acquisitions abroad by British firms by 3.9 percentage points.

¹⁹This data is available at: <http://www.sbs.ox.ac.uk/ideas-impact/tax/publications/data>

²⁰Subsidiary-level country data is collected from the European Statistical Office (Eurostat), available at <http://epp.eurostat.ec.europa.eu/portal/page/portal/eurostat/home/>. Parent-level country data is collected from the World Development Indicators Database, available at <http://data.worldbank.org/data-catalog/world-development-indicators>.

between UK and non-UK affiliates in the same host country. Formally, I examine the effect of investment by UK affiliates in the standard difference-in-difference (DD) specification:

$$INVESTMENT_{ikt} = a_i + d_t + \beta_{DE}DE_{it} + \beta_x \mathbf{x}_{ikt} + \beta_z \mathbf{z}_{kt} + \varepsilon_{ikt}, \quad (5)$$

where i indexes firms, k indexes host country, and t indexes time. The dependent variable $INVESTMENT_{ikt}$ denotes gross investment in fixed capital asset scaled by book value of fixed asset in (end of) year $t - 1$. The main variable of interest, DE_{it} , is an indicator equal to 1 for UK affiliates starting from 2009, and zero otherwise. The coefficient β_{DE} represents the DD estimate of the effect of dividend exemption on investment by UK affiliates. Based on the theoretical discussions in Section III, β_{DE} should be positive and significant if a non-trivial fraction of new investment by UK affiliates is financed with new equity.

A full set of firm fixed effects (a_i) is included to control for the unobserved firm-specific productivity differences and unobserved time-invariant characteristics of the parent company. Firm fixed effects further subsume host-country fixed effects (given that affiliates do not change their location), which control for time-invariant differences across host countries that may affect multinationals' location choices. These may include, for example, perceived average quality of governance during the sample period, common language and/or former colonial ties, and geographical distance between the home and host country. I include a full set of time dummies (d_t) to capture the effects of aggregate macroeconomic shocks, including the effects of the great recession, that are common to all multinational affiliates in each year. \mathbf{x}_{ikt} denotes a possible empty vector of firm-level controls, and ε_{ikt} is the error term.

Most specifications include the statutory corporate tax rates at source to control for the potential confounding effects of concurrent tax reforms in host countries. The most comprehensive specification includes a full set of industry-by-year interactions and country-by-year interactions to control for industry- and country-specific macro-economic shocks to private investment, which would otherwise be captured by the DD estimates. While these controls help address differences between UK and non-UK affiliates, they may not fully capture how affiliates with parents in different countries handle time-varying macro shocks. In this aspect it is also important to control for a set of the parent countries' time-varying characteristics (\mathbf{z}_{kt}), including growth rate of GDP per capita, population size, and unemployment rate.²¹

As shown in Table A.1 Panel A, there are fewer affiliates in the treated group, but they are significantly larger than the non-UK affiliates in the control group. The UK affiliates in the treated group are also more liquid and profitable. I employ two alternative approaches to address the concern that UK and non-UK affiliates may not have identical observable characteristics, and that these differences may explain the different trends in their investment over time. First, I control directly for a set of non-tax variables that should capture firm-specific investment opportunities (\mathbf{x}_{ikt}), which include lagged output, cash flow scaled by lagged asset, lagged profit margin as a measure of profitability, and one-period lagged growth rate of

²¹A similar set of time-varying characteristics at the host country level are included to control for local productivity, market size and demand characteristics on investment.

output. By including these variable, the DD estimate captures the impact of the tax reform independent of these non-tax determinants of investment. Alternatively, I implement a matching DD strategy by replicating the DD tests on a subsample of matched firms based on their pre-reform characteristics (Heckman, Ichimura, and Todd, 1997). The treated and control groups in the matched sample are comparable in firm size and cash flow (Table A.1, Panel B).

(a) Key Identifying Assumption The policy variation is at the parent-country-by-year level, so the key identifying assumption is that the UK's tax reform is independent of other UK-specific shocks.²² I present empirical evidence to validate this assumption in three aspects. First, using data on gross fixed capital formation in the private sector, Figure 2 shows that domestic private investment trended very similarly in the major economies in EU27 during the sample period. For example, total private investment in the UK exhibited a similar pattern to France's over the entire period of 2005-2012. The pattern of total private investment in the UK was also very similar to that of Germany around the years of the great financial crisis between 2008-2012. Moreover, there are very similar trends between private investment in the UK and the GDP-weighted average private investment in the rest of EU-27 countries (Figure 2 Panel B). The lack of evidence on differential trends in domestic investments highlights that, at the aggregate level, the financial crisis affected UK multinationals and non-UK multinationals similarly. Otherwise, we would expect any differential investment trend by UK multinationals in the low-tax countries also to appear in the high-tax countries and in domestic investment. Given that the definition of a low-tax country is based on the corporate tax rate in the UK, there is no reason to expect systematic changes in investments by UK multinationals in these countries other than the implementation of the territorial tax reform.

Second, I examine any differences in investment trends at the affiliate level in each of the years before the legislation, both graphically in Figure 3 (in the next section), and in placebo tests. Specifically, I test whether investments by UK affiliates increased in 2007 or 2008 prior to the tax reform in the low-tax countries, by replacing the DE_{it} variable with an interaction term between a post 2007/2008 dummy indicator and an indicator for a UK affiliate, respectively. Figure 5 summarizes the coefficient estimates of the interaction terms. None of the coefficient estimates are significantly different from zero, except the one for the DE_{it} variable. Columns 1 to 3 of Table 4 confirm that there were no significant differential increases for the treated group in low-tax countries in any year before the reform, a conclusion reached by replacing the DE_{it} variable with an interaction term between a year 2006/2007/2008 dummy indicator and an indicator for UK affiliates. The earlier years provide placebo tests by demonstrating parallel trends. Third, because the tax reform did not change the incentive to use debt financing in the low-tax countries, Column 4 uses firms' leverage ratio as an alternative placebo test. Column 4 reports an insignificant DE_{it} coefficient estimate, suggesting that we

²²The identification assumption is very similar to that in Yagan (2015) and Zwick and Mahon (2017), which explore policy variation across firm ownerships or across industries, respectively, to identify the impact of corporate taxes on business investment.

cannot distinguish the response of leverage from zero. Thus, the key identification assumption passes this alternative placebo test.

VI. THE EFFECT OF DIVIDEND EXEMPTION ON MULTINATIONAL INVESTMENT

A. Graphical Evidence

Following discussions in the previous section, Figure 3 shows the average investment by UK and non-UK affiliates around the dividend exemption reform in the low-tax countries (Panel A), and in the high-tax countries (Panel B). There are some distinct patterns in the two panels. In the low tax countries, the reduction in real investments (relative to its 2006 level) of UK affiliates closely tracked that of non-UK affiliates up to 2009. Both group started to increase their investments after the financial crisis, where there was a greater increase in investments by UK affiliates. This differential increase could potentially be attributed to the territoriality reform. While the investments of UK affiliates have decreased more than those of non-UK affiliates since 2006 in the high-tax countries, changes in investment were quite similar in the years prior to 2009. The investment gap widened in 2009 and diminished within two years because of rapid increases in investment made by UK affiliates in high-tax countries.

There are at least two threats to identification. The first is that contemporaneous change unrelated to the tax reform, which could have differential impact on UK and non-UK affiliates. For example, UK affiliates might be more resilient to the financial crisis compared to their non-UK peers, which could explain the smaller declines in their investments. This highlights the importance of controlling for time-invariant affiliates and parent company characteristics in the regressions, as well as time-varying industry trends that absorb the differential impact of the financial crisis across industries. Second, concurrent tax reforms in other countries are likely to confound the effect of dividend exemption, which is of primary interest in this paper. For example, Japan also switched to territorial taxation in 2009. Given that Japan had a statutory corporate tax rate of 38 percent, the outbound investment of Japanese multinationals may also have increased afterwards, resulting in a downward bias in the estimated effect of dividend exemption for UK companies. This consideration highlights the importance of focusing on non-UK affiliates with headquarters in countries with exemption systems.

To summarize, Figure 3 provides visual evidence of the effect of dividend exemption on UK outbound investment. The following sections use regression analysis to control for a large set of potential confounding factors, and provide conclusive evidence of a link between dividend taxation and outbound investment by UK multinationals in the low-tax countries.

B. Baseline results

Table 5 presents regression results from the difference-in-difference estimation of equation ((5)), focusing on multinational affiliates operating in the *low-tax* EU-27 countries. All re-

gressions include a full set of firm fixed effects and year fixed effects, with heteroscedasticity-robust standard errors clustered at the firm level.

The first column reports a positive and highly significant coefficient estimate for DE_{it} , suggesting that dividend exemption has systematically increased investment by UK affiliates in low-tax countries. The empirical evidence is consistent with the theoretical prediction when a substantial fraction of new UK outbound investment is financed with new equity. To assess the robustness of this finding, the second column adds controls that capture firm-specific investment opportunities, including one-period lagged turnover, cash flow scaled by lagged asset, lagged profit margin, and growth rate of lagged turnover. To control for the difference in the sectoral composition of UK affiliates, which may be subject to different macroeconomic shocks, the third column adds industry by time fixed effects to control for time-varying shocks across industries at the one-digit NACE level. The basic result remains unchanged.

Column 4 includes the host-country's statutory tax rate on corporate income to control for the potential confounding effects of concurrent tax reforms on business investment. Column 4 also adds GDP per capita, population size, unemployment rate, and indicators of governance quality and financial institution stability in the host country in order to control for the impact of local market conditions that would otherwise be captured by the DE_{it} coefficient estimate. To assess the robustness of the results to differential country-specific shocks, Column 5 adds a full set of host-country by year interactions to control for country-specific factors that may affect private investment across host countries. The empirical estimates do not appear to be sensitive to the inclusion of this rich set of control variables.

While time-invariant parent company characteristics and time-invariant home country characteristics are already controlled for through the inclusion of affiliate fixed effects, it is still possible that UK affiliates were exposed to different shocks at home. To address this concern Column 6 adds additional time-variant GDP growth rates, GDP per capita and employment rate in the home countries. The baseline results remain unchanged. Column 7 interacts the DE_{it} variable with the reduction in rate of dividend tax to capture the magnitude of the tax reform. The finding suggests that for every one percentage point decrease in the dividend tax rate, there is a 1.59 percentage point increase in real investment per euro of fixed assets by UK affiliates in low-tax countries. Column (8) restricts firms in the treated group to being part of a UK multinational group with at least one affiliate in the high-tax countries. The estimated effect of the tax reform slightly increases in this subsample, but the difference is not statistically significant. Finally, column (9) interacts the discrete policy variable with a tax differential variable that equals to the statutory corporate tax rate difference between the host country and the UK. Note that the tax differential variable represents the maximum reduction in the dividend tax due to cross-crediting and other planning activities. The estimated tax effect is positive and highly significant, confirming the positive effect of the tax reform on investment by UK multinationals in the low-tax countries.

C. Robustness

This section assesses whether the findings are robust to a number of alternative specifications and samples. Table 6 summarizes the results. First, Column 1 clusters the standard errors by host-home country pair. This is to address the concern that in tax reform studies, the standard errors are understated by assuming independence across firms within the same tax jurisdiction (Bertrand, Duflo, and Mullainathan, 2004). Column 2 excludes non-UK affiliates with parent countries featuring worldwide taxation. To the extent that investment decisions by these firms may be influenced by tax planning consideration under the worldwide system, they may be less comparable to those under the exemption system. Column 3 controls for the potential confounding effect of the eurozone crisis by including an interaction term between an indicator that takes value of 1 for host countries in the eurozone and the post-2009 indicator. Therefore the DE_{it} estimate in Column 3 identifies the impact of the 2009 reform independent of the exchange rate crisis. To ensure that the identified tax effect is not entirely driven by firm entries and exits, Column 4 uses a balanced sample of firms that were established before 2005 and survived through 2010. The resulting DE_{it} coefficient estimates from the four regressions are statistically indistinguishable from the preferred estimate in Table 5 Column 6.²³

Column 5 implements a matching DD strategy (Heckman, Ichimura, and Todd (1997)) to address the concern that companies in the treated UK and control affiliates may not have similar observable characteristics, and that these differences may explain different trends in investment over time. The regression in Column 5 replicates the DD analysis on a subsample of matched firms from a Mahalanobis distance matching procedure based on pre-reform firm-level turnover, turnover growth, employment, and operating profits. The matching DD analysis further controls time-varying industry shocks and host-country macroeconomic conditions. The resulting estimate has a wider confidence interval due to fewer observations, but nevertheless, remains positive and significant at the 10 percent level. To address the concern that multinationals from smaller countries like Latvia or Cyprus may be differentially affected by the economic uncertainty around 2009, Column 6 uses only affiliates from the ten largest EU27 countries as the control group.²⁴ The findings remain very similar to those based on the full sample.

Finally, to ensure that the identified tax effect is not driven by any outliers in the outcome variables, Column 7 in the upper panel uses a gross investment rate winsorized at 97.5th percentile as the dependent variable, while Columns 1 and 2 in the lower panel use net investment rates winsorized at 99th and 97.5th percentiles as dependent variables, respectively. The estimated effect of the tax reform remains positive and significant, although the magnitude of the estimate is reduced by half. However, it is not significantly different from the preferred estimate in Table 5 Column 6.

²³Columns 1 to 4 of Table 6 use the same specification, control variables, and scaling underlying Column 6 of Table 5.

²⁴These include non-UK affiliates with parent companies in: Austria, Belgium, Denmark, France, Germany, Italy, Luxembourg, the Netherlands, Spain, Sweden, and Switzerland. The results remain unchanged when excluding observations from Luxembourg or from the Netherlands.

To further address the concern that UK and non-UK affiliates might be subject to different shocks during the sample period, I use a triple-difference specification that extends equation (5) by pooling observations from both low- and high-tax countries and adding main effects and interaction terms for UK affiliates in the low-tax countries. Even if UK and non-UK affiliates were affected differentially around the reform period, the triple-difference approach would control for these omitted variables in the low-tax countries by differencing out average changes in investment between the treated and control group in the high-tax countries. In particular, I estimate the following equation:

$$\begin{aligned} INVESTMENT_{ikt} = & a_i + d_t + \beta_{DE,Low} DE_{it} \times LowTax_k + \beta_{UK,post} UK_i \times Post_t \\ & + \beta_{Post,Low} Post_t \times LowTax_k + \beta_x \mathbf{x}_{ikt} + \beta_z \mathbf{z}_{kt} + \varepsilon_{ikt}. \end{aligned} \quad (7)$$

Note that this model contains a full set of firm and year fixed effects and that the interaction effect of UK_i and Low_k is subsumed in the firm fixed effect (given that the AMADEUS data does not track relocation of affiliates over time). Table 7 presents the regression results, where each column follows the same specification as in Table 5, and reports very similar results for the main variable of interest. In the most demanding specification in Column 6 of Table 7, the coefficient for the three-way interaction term remains positive and significant at the 10 percent level. The estimated post-reform investment increase by UK affiliates in the low-tax countries is more than 11 percentage points higher than for the average non-UK affiliate.

D. Heterogeneity Analysis

I use several proxies for ex ante financial constraints including firm size, liquid asset position, and profitability, to test for differences in investment responses between constrained and unconstrained firms. If the method of financing represents an important consideration for UK affiliates as suggested in Section III, we should expect to find consistent, systematic differences in investment responses for groups of firms based on these proxies. The proxies are defined based on pre-2009 firm-level average characteristics, excluding firms that recently entered or did not survive through 2010. I divide firms in the main sample into deciles (for each indicator), and estimate the effect of the tax reform by interacting the DE_{it} with the decile indicators:

$$INVESTMENT_{ikt} = a_i + d_t + \sum_{j=1}^{10} \beta_{DE,Decile_j} DE_{it} \times \mathbf{I}\{i \in Decile_j\} + \beta_x \mathbf{x}_{ikt} + \beta_z \mathbf{z}_{kt} + \varepsilon_{ikt}, \quad (8)$$

where $\mathbf{I}\{i \in Decile_j\}$ is the j th decile indicator defined above, and all other variables are as previously defined. The coefficient $\beta_{DE,Decile_j}$ represents the quantity of interest: the effect of the 2009 dividends exemption on investment by UK affiliates relative to non-UK affiliates in the j th decile of the relevant financial constraints indicator.

Panel A of Figure 4 reports the coefficient estimates β_{DE} and the 90 percent confidence interval across firm sizes. It shows that only medium-to-large UK affiliates in the upper deciles of the turnover distribution significantly increased their investments in response to the 2009 reform. Interestingly, investment did not increase for firms with the largest turnover, i.e. those in the top decile of turnover distribution. This is most likely because these firms are financially unconstrained. Panel B shows a similar pattern in investment across total assets. Panel C reports the results based on the distribution of free cash flow. The evidence shows a higher sensitivity of investment in the cash-poor sample. The investment increase is predominately concentrated in the 2nd-7th deciles of cash flow distribution. In contrast, there is no significant increase in investment by firms in the lowest cash-flow decile, possibly because these are poorly-performing firms.²⁵

Figure 4 Panel D shows that investment increase is mainly concentrated in the 4th-8th deciles of firm profitability.²⁶ The results suggest that firms with extremely low profitability did not increase their investments in response to the tax reform, neither did extremely profitable firms which are more likely to rely on retained earnings to finance their investments.

Theoretical consideration in Section III suggests that increases in investment by UK affiliates should be mainly due to new capital. Evidence consistent with this hypothesis would be more prominent investment responses in larger, more liquid company groups.²⁷ Panel E reports the results across the distribution of company group sizes (the number of related companies in the same company group), and the results suggest higher investment sensitivity in larger multinational groups. Finally, Panel F reports the results based on the distribution of company group assets. The measure is constructed by summing up the total assets of all affiliates with the same parent company in the main sample.²⁸ The results are roughly consistent. There is higher sensitivity of investment in large MNCs measured by total asset of company group.

²⁵The coefficient estimates of $\beta_{DE,Decile_2}$ to $\beta_{DE,Decile_7}$ are jointly significantly different from zero (p -value=0.000), while the coefficient estimates of $\beta_{DE,Decile_8}$ to $\beta_{DE,Decile_{10}}$ are jointly indistinguishable from zero (p -value=0.639).

²⁶The p -value from the joint test under the null hypothesis that the coefficient estimates of $\beta_{DE,Decile_4}$ to $\beta_{DE,Decile_8}$ are jointly zero is 0.0001. Similarly, the p -values from the joint test under the null hypothesis that the coefficient estimates of $\beta_{DE,Decile_1}$ to $\beta_{DE,Decile_3}$ and $\beta_{DE,Decile_9}$ to $\beta_{DE,Decile_{10}}$ are jointly zero are 0.765 and 0.252, respectively.

²⁷In theory, the parent company can either inject equity with internal funds, or raise equity from the external capital market.

²⁸Note that, as AMADEUS only includes European affiliates, the group asset variable is a noisy measure of the worldwide company group asset.

E. Timing of the Investment Responses

The exemption system was formally introduced in the Financial Bill in April, 2009 and became effective on July 1.²⁹ Despite this narrow three-month window between the announcement and implementation of the exemption system, in 2008, UK companies may nevertheless have anticipated the coming reduction in dividend taxation. The impact of anticipation on investment would again depend on the source of finance. If new investment is financed out of new equity, a forward-looking UK affiliate would delay its investment until after the implementation of the policy. In this case, there would be a temporary reduction in investment by UK affiliates in 2008, followed by an overshoot in 2009 in low-tax countries .

For internal-financed investment, equation ((4)) shows that the cost of capital becomes cheaper in 2008 given a forthcoming reduction in the tax rate. A forward-looking UK affiliate would increase its investment in low-tax countries prior to the tax reform, resulting in a downward bias in the DD estimate. To identify the effect of anticipation on investment, equation ((5)) adds an interaction term between a $Year_{2008}$ dummy and an indicator for UK affiliates:

$$INVESTMENT_{ikt} = a_i + d_t + \beta_{2008} Year_{2008_t} \cdot UK_{MNC_i} + \beta_1 DE_{it} + \beta_x \mathbf{x}_{ikt} + \beta_z \mathbf{z}_{kt} + \varepsilon_{ikt},$$

where all other variables are as previously defined. The β_{2008} coefficient captures any differential change in investment by UK affiliates in 2008, relative to the 2006 base-year level.

Table 8 summarizes the results in low-tax countries. The dependent variable in the first three columns is gross investment. Column 1 includes only firm fixed effects and year fixed effects, while Column 2 follows the most comprehensive specification by including additional controls at firm, host country and home country levels. In both columns the coefficient estimate of β_{2008} is statistically indistinguishable from zero, suggesting the lack of strategic investment responses by UK affiliates prior to the tax reform.³⁰

²⁹This is a 100 percent exemption rule for most dividends payable on or after 1 July 2009, including profits accumulated before the introduction of the new legislation.

³⁰Timing uncertainty associated with the dividend exemption reform may provide an alternative explanation for the lack of any anticipation effects. There are two components of reform proposed in the 2007 consultation: exemption of foreign-sourced income and a new Controlled Foreign Companies (CFC) regime. By 2008, however, implementation of the proposal was already considered “in jeopardy”. This was due to HMRC’s requirement that dividend exemption proposal must be revenue neutral, which required targeted measures to restrict the tax deductibility of interest, and use of the CFC regime to generate additional tax revenues by including certain capital gains and income from intellectual property (IP). The proposed CFC regime has attracted wide criticism particularly from IP-rich companies and has led to a number of UK multinationals (such as Shire Pharmaceuticals and United Business Media) announcing their intentions to relocate to more tax-friendly jurisdictions, such as Ireland. In view of these criticisms and a potentially significant number of companies seeking to leave the UK, the HMRC announced that it would postpone the new CFC regime and instead, tighten up the existing rules. The HMRC also announced its intention to move forward with the dividend exemption, but only if suitable measures to protect UK tax revenues could be found. Therefore, in retrospect, it was unclear as to precisely when the dividend exemption would come into effect.

To examine how quickly investment in low-tax countries reacted to dividend exemption, Column 3 adds two interaction terms between a post-2010/2011 year dummy and an indicator for UK affiliates, respectively. Each coefficient would capture the differential change between investment by UK and non-UK affiliates following the corresponding year, conditioned on any changes that already occurred in 2009. The estimate coefficient of DE_{it} remains positive and highly significant, while the DD coefficient in 2010 is also positive and significant at the 10 percent level. The results suggest that UK affiliates respond to dividend exemption by immediately increasing current investment in low-tax countries. This is plausible given that the tax reform has been well trailed, so firms are ready to respond after the introduction of dividend exemption. Columns 4 to 6 repeat the analysis using net investment as the dependent variable, and the results remain qualitatively similar.

F. The Effect of Dividend Exemption on Other Outcomes

According to the discussions in Section III, new equity should be the major source of finance for new investment following the dividend tax cut. Therefore a higher level of new equity issued to UK affiliates would be consistent with the observed investment increases in low-tax countries. To obtain a rough estimate of the amount of new equity at the affiliate level, I first impute the amount of paid-in capital as the difference between shareholder funds and after-tax profit, as there is no data available on the amount of new equity. This is a very noisy measure of paid-in capital, as it also includes other accumulated comprehensive income or loss as part of the shareholders' fund. The amount of new equity is therefore computed as changes in the paid-capital between two consecutive years. To reduce the amount of measurement errors in this variable, I construct a dummy indicator that takes value of 1 if the imputed new equity is positive, and zero otherwise. I then run a binary discrete choice model of the following form:

$$NewEquity_{it} = a_i + d_t + \beta_{DE}DE_{it} + \beta_{DE,Cash-poor}DE_{it} \times \mathbf{I}\{i \in Cash\ Poor\} + \beta_x \mathbf{x}_{ikt} + \beta_z \mathbf{z}_{kt} + \varepsilon_{ikt}, \quad (9)$$

where $NewEquity_{it}$ represents the binary variable of receiving new equity, $\mathbf{I}\{i \in Cash\ Poor\}$ is an indicator that takes the value of 1 for all subsidiaries in the 2nd-7th deciles of the cash flow distribution, and all other variables are as previously defined. $\mathbf{I}\{i \in Cash\ Poor\}$ is constructed this way as investment increases are concentrated in the subsample of UK affiliates in the 2nd-7th deciles of the cash flow distribution in Section VI VI.D. Bearing in mind the above data caveats as possible limitations, regression results from a fixed-effect linear probability model suggest that the tax reform significantly increases the probability of getting additional paid-in capital for the cash-poor UK affiliates by around 6 percentage points ($\hat{\beta}_{DE,Cash-poor} = -0.060$ with a robust standard error of 0.036). On the other hand, there is no significant change in the probability of obtaining new equity for the cash-rich UK affiliates ($\hat{\beta}_{DE,Cash-rich} = -0.024$ with a standard error of 0.028).

Columns 3 to 6 in Panel B of Table 6 examine the effect of dividend exemption on firm-level wage rate, employment, labor productivity, and profitability in low-tax countries. Wage rate is

the only variable that shows a significant change in the tax reform, conditioned on investment increase. As there are no significant changes in the variables measuring labor productivity or profitability; the increase in affiliate wages can be interpreted as evidence on international rent sharing of the increase in the after-tax profits of the multinational group following the tax reform (see, for example, [Budd, Konings, and Slaughter \(2005\)](#)).

G. Reallocation or Increase in Total Investment?

The increase in investment by UK affiliates in low-tax countries could represent an increase in total investment by UK multinationals due to a lower cost of capital. Alternatively, it may reflect a reallocation of investment from high-tax countries to low-tax countries, thus having no impact on aggregate investment. This concern is particularly relevant around the time of the great recession, when many companies are resource-constrained with limited investment capacity. Another consideration is that if UK multinationals used high-tax affiliates to lower taxes on repatriation, the territorial tax reform may have also lowered the value of high-tax investment, which facilitates such tax planning. To test these two competing hypothesis, I analyze investment by UK multinationals in the high-tax countries, as well as in the UK.

(a) Investment Responses in High-Tax Countries Table 9 presents the DD estimation results based on equation ((5)), focusing on multinational affiliates in the *high-tax* EU-27 countries. Each column follows the same specification as in Table 5, with heteroscedasticity-robust standard errors clustered at the firm level.

Column 1 shows that the territorial tax reform has a somewhat negative effect on UK affiliates' investments in high-tax countries, which may suggest the presence of strategic investment in these countries to benefit from cross-crediting. However the size of the coefficient estimate is much smaller and statistically insignificant after controlling for other non-tax firm-level determinants of investment in Column 2. It remains insignificant throughout Columns 3 to 7, which control for additional industry, and host and home country characteristics, and in Column 8, which excludes affiliates with parents under the worldwide tax system. While the negative sign of the DD estimate is consistent with lower values of investment in high-tax countries that may facilitate tax planning prior to the reform, the regressions fail to find any significant responses of investment by UK multinationals in high-tax countries. Table A.2 in the Appendix presents the estimated effects of the tax reform on other outcome variables in high-tax countries. There is no significant change in compensation, employment, labor productivity or firm-level profitability in high-tax countries. Interestingly, total leverage of UK affiliates in high-tax countries is found to be significantly higher after the tax reform. This finding is consistent with the fact that the tax incentives for profit shifting, including debt shifting to high-tax countries, is larger under the territorial system.

(b) Investment Responses in the UK To analyze the investment responses of UK-owned affiliates at home, I use a similar DD strategy with two alternative control groups: (1) non-UK

multinational affiliates operating in the UK, and (2) UK affiliates that are part of a domestic company group.³¹ Table 10 summarizes the regression results with non-UK multinational affiliates as the control group in Panel A, and with domestic firms as the control group in Panel B.³² Columns 1 to 4 each use the same specification as that in Table 5, while Columns 5 and 6 focus on identifying anticipation effects in 2008. In Panel A, the coefficient estimate of DE_{it} is mostly negative and insignificant, suggesting that there are no differential investment responses by UK-owned affiliates relative to non-UK foreign affiliates. In Panel B, the coefficient estimate of DE_{it} is statistically insignificant across all specifications, suggesting that there is no differential investment response by UK-owned affiliates relative to affiliates of domestic company groups. Regression results in both panels are essentially "no effects", given that the coefficient estimate of the policy variable is associated with large standard errors.

Conceptually, there is no particular reason to expect investment changes at home, given that the tax reform did not change the after-tax rate of return in the UK. This finding is consistent with Dharmapala, Foley, and Forbes (2011), which analyzes the responses of U.S. multinationals following a one-time tax holiday for the repatriation of foreign earnings introduced in the Homeland Investment Act of 2004. Dharmapala, Foley, and Forbes (2011) find that very few firms benefited from the holiday by increasing their domestic investments, employment, or R&D investments. Instead, these firms primarily responded by returning funds to shareholders.³³ To reconcile with Egger and others (2015), which finds that the territorial system induced UK affiliates to pay out significantly more dividends immediately after the reform, the lack of investment response at home may suggest that repatriations were used to pay off debts or were returned to shareholders. Unfortunately, further investigation on the impact of dividend exemption on UK multinational groups requires additional data from a consolidated financial statement at the company group level. I leave this exercise to further research.

H. Discussions

(a) Relabeling or real investment responses? There may be concern that changes by multinationals in reported investment due to taxes is likely to be shifting rather than real behavior. This can be a common perception, but is a questionable one and deserves some clarification. First, this analysis focuses on the affiliates of large multinational companies. Unlike small

³¹ Stand-alone firms, and domestic company groups with all of their subsidiaries in the UK, are identified based on ownership information on all the UK companies in FAME.

³² Figure A.2 in the Appendix presents the graphical evidence.

³³ Two major differences are worth noting. First, the HIA provides U.S. multinationals with a one-time deduction of 85 percent of dividends repatriated by their foreign affiliates. On the other hand, the UK's dividend exemption is permanent. Second, under the HIA, the 85 percent exemption applies only to "extraordinary dividends", which are defined as dividend payments exceeding average repatriations over a five-year period ending before July 1, 2003, excluding the highest and lowest years. Thus the exemption is limited to extraordinary dividends over and above the average level of dividends remitted. The UK's exemption applies to most dividends, as discussed in Section II. The exemption permitted under the new system in the UK is different in nature from, and more generous than, the exemption under the HIA in the United States.

owner-managed businesses, it is highly unlikely for multinational affiliates to relabel personal expenses as capital expenditures. Second, there is no tax incentive to engage in relabeling other expenses as capital expenditure. Doing so implies changing from expensing to accelerated depreciation, which is less tax advantageous in lowering the total tax bill.

In general, common strategies used by multinationals to shift their profits are debt shifting, licensing and royalty payment, and transfer mispricing. None of these activities are captured in capital investment. In fact, while the observed pattern in investment (an increase in low-tax countries and no significant response in high-tax countries) is consistent with changing incentives in investment from the worldwide to the territorial system, the observed pattern in total leverage (no significant responses in the low-tax countries and significant increases in the high-tax countries) is also consistent with increased tax incentives for profit shifting under the territorial system.

(b) Quantitative impact To gauge the quantitative impact of the 2009 reform on outbound investment of UK multinationals in low-tax countries, I calculate the increase in investment at the firm and country levels. First, the pre-reform average fixed asset for the UK affiliates across low-tax countries is around €16.31 million. Given a DD coefficient estimate of 0.157, it implies that the average investment increase in the UK affiliates is around €0.82 million (in real 2006 terms). Second, I estimate the increase in aggregate investment by summing up investment increases across all UK affiliates in each country.³⁴ Figure 6 shows the increase in investment across host countries. In aggregate, the predicted investment increase is around €5.6 billion (in real 2006 terms) in the low-tax countries, where Ireland, the Czech Republic, and Poland benefit the most from additional foreign direct investments resulting from the UK's tax reform. The aggregate investment increase in low-tax countries is approximately 9 times the amount of estimated foregone tax revenue, suggesting that the tax reform has had a strong bang for the buck effect by stimulating £9 of foreign investment by UK multinationals in the low-tax countries for every £1 loss in tax revenue at home.³⁵

VII. CONCLUSION

In this paper I analyze the causal effect of territorial taxation on the outward direct investment of multinationals in a quasi-experimental setting. The 2009 reform switched the UK from a worldwide to a territorial tax system and, as such, lowered effective tax rates on repatriated earnings from countries with tax rates lower than the UK's corporate tax rate.

³⁴Specifically, the increase in firm-level investments is computed as the average pre-2009 fixed asset times the estimated tax differential coefficient and the country-level reduction in the dividend tax rate.

³⁵As previously discussed, the reform may have also reduced investments in high-tax countries as they became less attractive after the elimination of cross-crediting. Given that the effect of the reform on investments in high-tax countries is estimated with imprecision, this calculation does not include the potential reduction in investments in high-tax countries, and therefore represents an upper bound of the true bang for the buck effect.

The findings provide robust evidence that the taxation of foreign earnings in the home country has a strong effect on the level and location of foreign investment. On average, outbound investment by UK multinationals increased by 15.7 percent in reaction to the territorial reform that reduced taxes by 9 percentage points. The results shed light on the debate regarding whether the United States should implement the territorial tax system by showing that in UK, there is no evidence that the investment increase in low-tax countries leads to the reallocation of foreign direct investment from high-tax countries, or results in any significant investment distortion or loss at home. The evidence is suggestive in nature, as the estimated effect of the reform is associated with sizable standard errors. Theoretically, we may also expect investment to decrease in high-tax countries following the reform, as taxes on investment in these countries can no longer be offset against those from low-tax countries. However, unless UK or US multinationals are financially constrained as a group, any investment reduction in the domestic market is unlikely (see, for example, [Dharmapala, Foley, and Forbes \(2011\)](#))

The findings that UK multinationals increased their investments in countries with lower corporation taxes bears further implications for tax policy design in small capital-importing countries. In particular, the UK multinationals' immediate investment responses after the reform suggest that the trend to shift from worldwide to territorial taxation in major capital-exporting countries may put downward pressure on corporate tax rates in small countries that compete with each other to attract inward foreign direct investment. Consistent with these findings, [Matheson, Perry, and Veung \(2014\)](#) also report that the bilateral UK FDI financed from new equity has become more sensitive to a host-country's statutory tax rate following the UK's move to territoriality.

Corporate investment is not the only behavioral margin through which UK multinationals respond to territorial taxation. By exempting foreign-source income from taxation at home, the reform may cost considerable revenue by encouraging profit shifting to abroad. If this is the case, it is important to consider proper anti-avoidance measures to protect the tax base at home. Preliminary findings from the current analysis suggest that the territorial reform did not lead to systematic changes in the reported profitability of UK affiliates abroad. The average response may mask the important heterogeneity of behavioral responses at the firm level, and there are a number of alternative channels for multinationals to shift profit.³⁶ Further analysis of the impact of territorial taxation on the extent of base erosion and profit shifting, together with a more comprehensive welfare analysis of the territorial reform, are forthcoming in future research.

³⁶For example, the preliminary evidence provided in this paper suggests that the territorial reform has increased UK affiliates' leverage in the high-tax countries while having no effect on their leverage in the low-tax countries.

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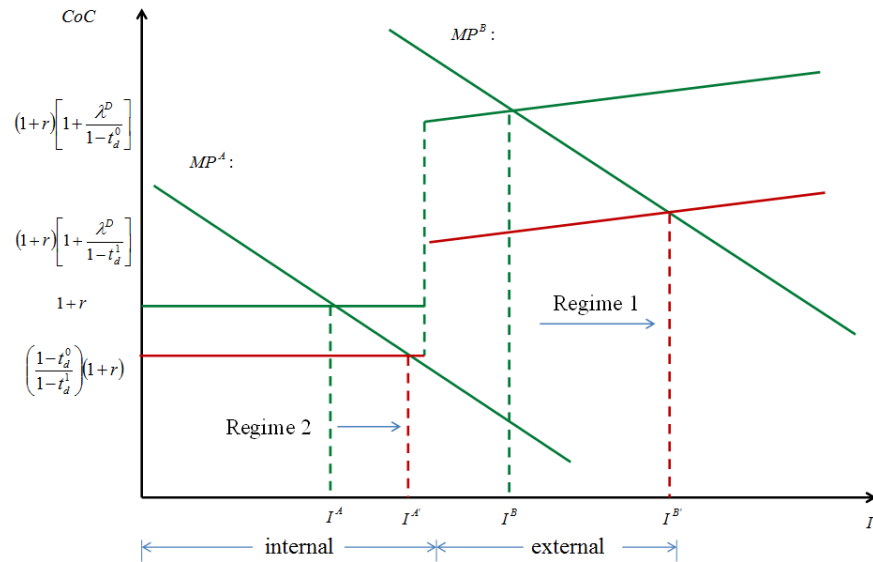
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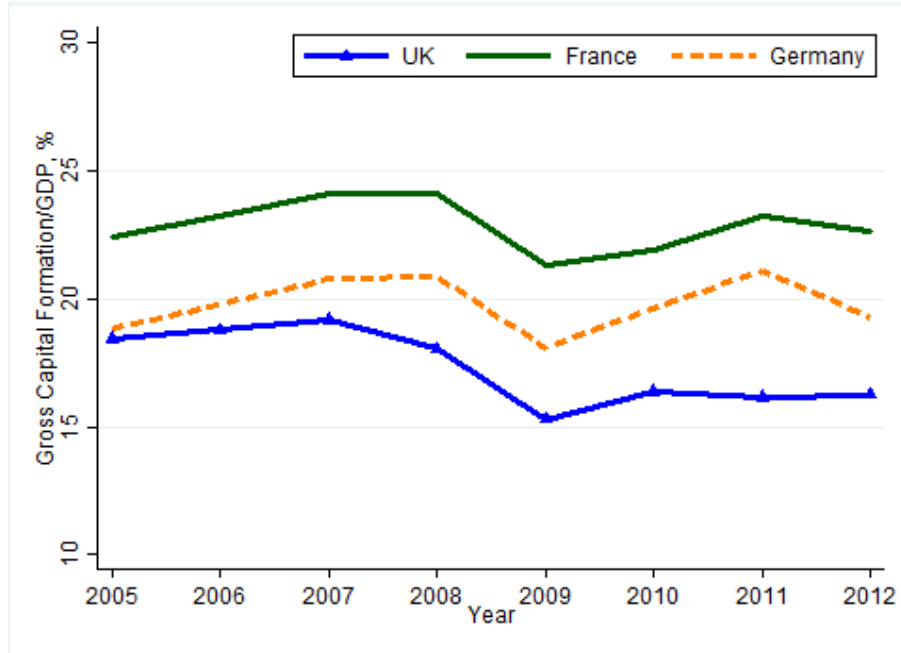
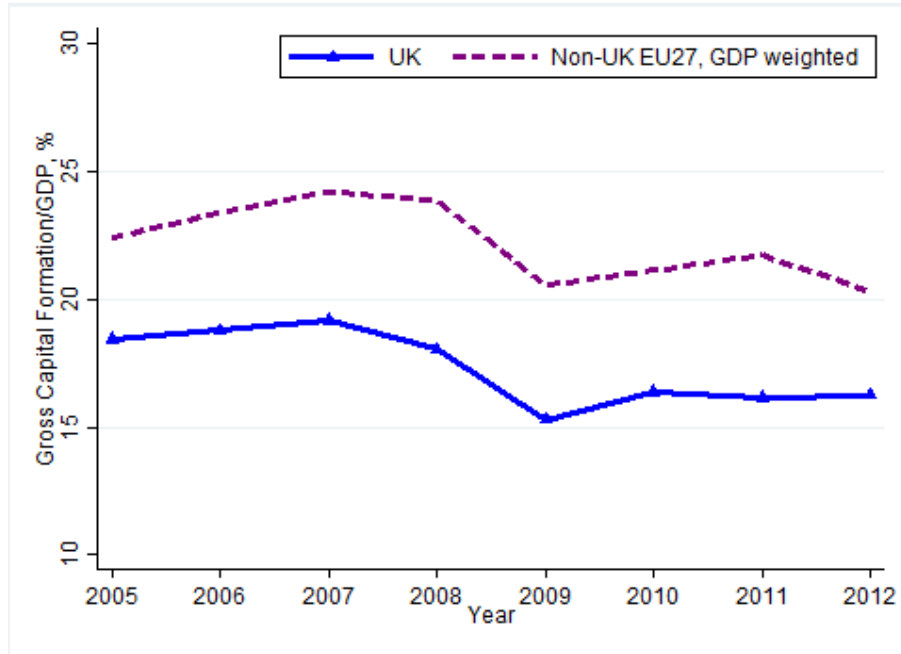
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VIII. FIGURES

Figure 1. THE EFFECTS OF DIVIDEND TAX CUTS IN TWO FINANCIAL REGIMES



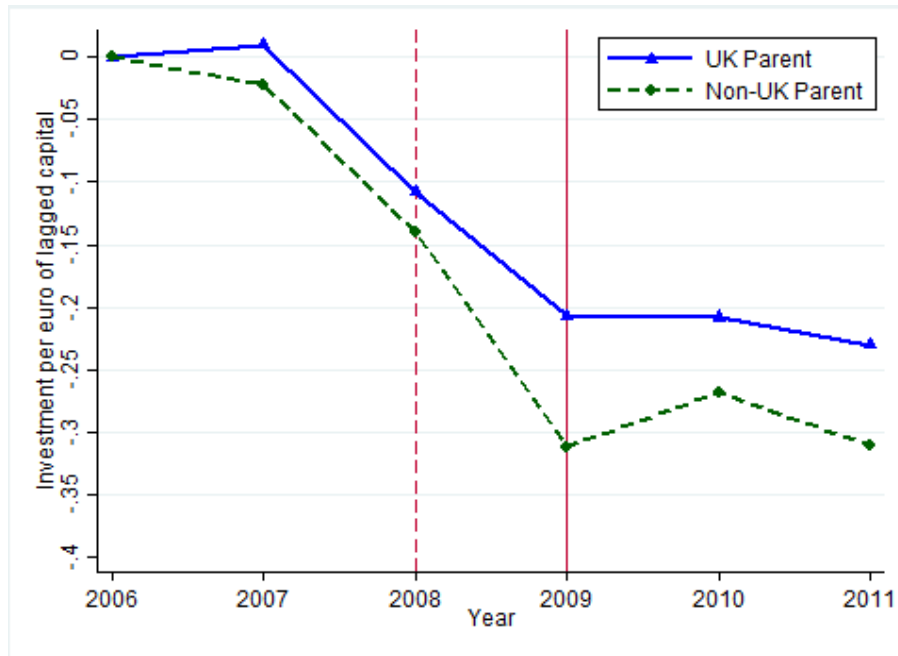
Notes: This figure depicts the two financial regimes under which reduction in the dividend tax rates would have different effects on investments. In Regime 1, a multinational affiliate with a marginal productivity of type B (MP^B) finances its marginal investment out of new equity. Following a decrease in the dividend tax rate from t_d^0 to t_d^1 , the optimal investment level would increase from I^B to $I^{B'}$. In Regime 2, a multinational affiliate has a marginal productivity of type A (MP^A) and finances its marginal investment out of retained earnings. Its cost of capital is $1 - r$ under a constant dividend tax but decreases to $\left(\frac{1-t_d^0}{1-t_d^1}\right)(1 - r)$ when there is a temporary change in the rate of dividend tax, or when such changes are expected. Anticipating a decrease in the dividend tax rate, firms in the second regime would increase their investments in the current period.

Figure 2. COMMON TRENDS IN AGGREGATE INVESTMENT**A. Gross Fixed Capital Formation: Selected Countries****B. Gross Fixed Capital Formation: UK vs Non-UK EU27**

Notes: Panel A plots the gross fixed capital formation (as a share of GDP), which proxies for total private investment at the national levels, for Germany, France, and the UK, from 2006-2012. Panel B compares the gross fixed capital formation (as a share of GDP) in the UK, and the GDP-weighted average in non-UK EU27 countries, from 2006-2012.

Figure 3. GRAPHICAL EVIDENCE

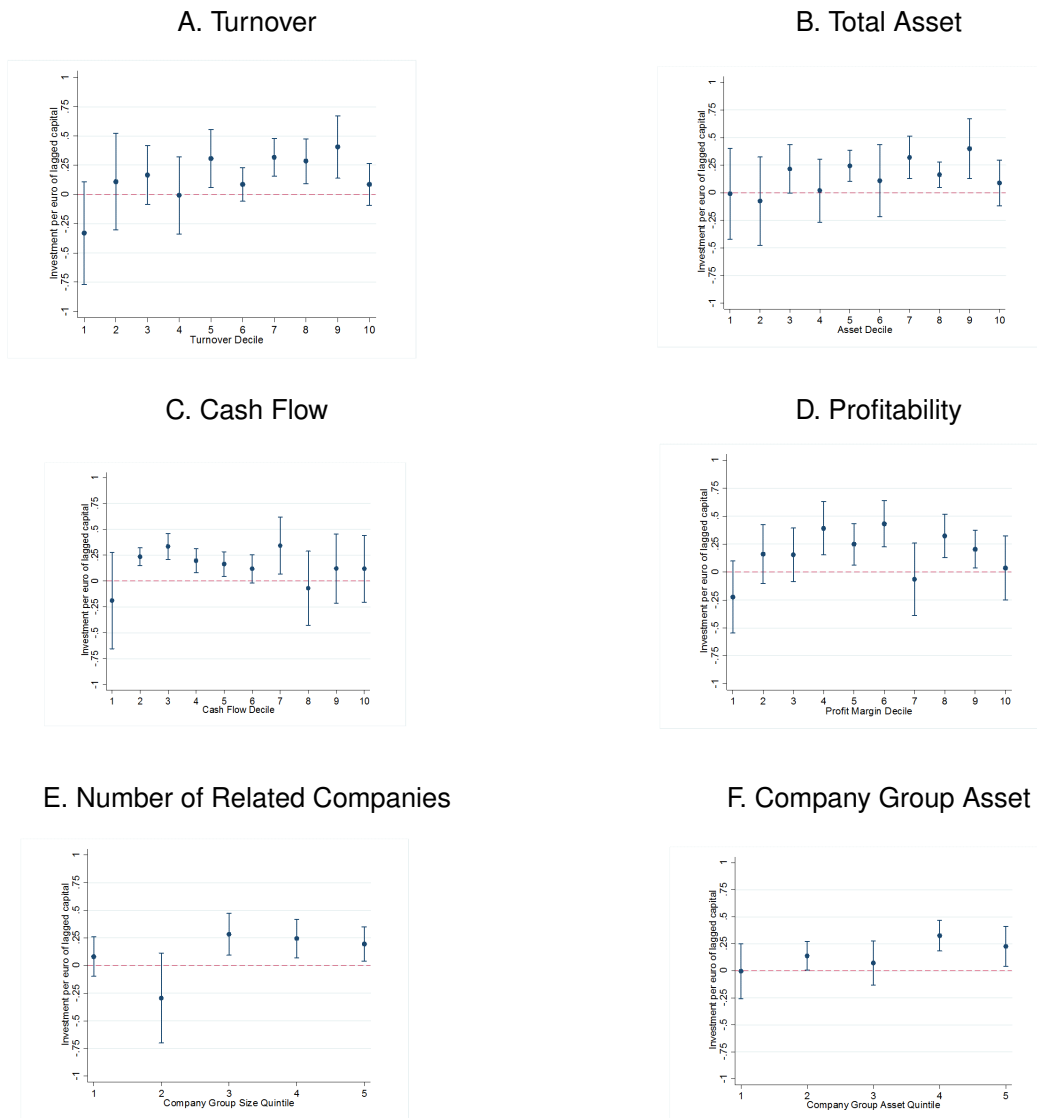
A. Gross Investment Rates in Low-Tax Countries



B. Gross Investment Rates in High-Tax Countries

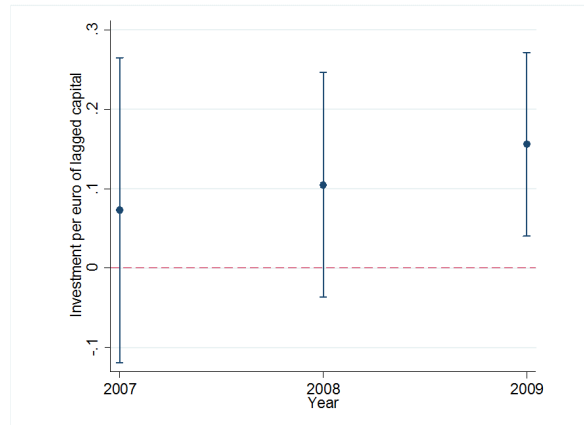


Notes: Panel A plots the average investment rate during 2006-2011 (relative to the 2006 investment level) for UK and non-UK multinational affiliates in the *low-tax* countries. Panel B plots the average investment rate during 2006-2011 (relative to the 2006 investment level) for UK affiliates and non-UK affiliates in the *high-tax* countries. The solid vertical line depicts the reform year when territorial tax system was enacted, and the dashed vertical line depicts the year the policy reform was announced.

Figure 4. HETEROGENEOUS INVESTMENT RESPONSES IN LOW-TAX COUNTRIES

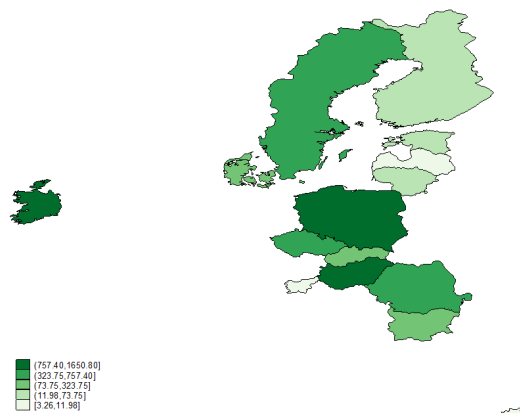
Notes: This figure reports regression results by dividing the main sample into deciles of ex ante financial constraint indicators based on firm size, total assets, cash flow (as a fraction of lagged fixed asset), and profitability. The DD regressions include ten interaction terms between the DE_t and each of the ten decile dummy indicators. All other variables are as previously defined. Each panel reports the ten coefficient estimates $\beta_{DE,Decile_j}$ and the corresponding 90th confidence interval.

Figure 5. INVESTMENT RESPONSES IN LOW-TAX COUNTRIES: TIMING



Notes: This figure reports the regression results from varying the paper's main investment regression specification (underlying Table 5, Column 6) in order to conduct placebo tests. For each year y between 2007 and 2009, the figure reports the coefficient estimate for the interaction term between a post-year- y indicator and an indicator that takes the value of 1 for UK-owned affiliates, and the corresponding 95th confidence interval.

Figure 6. PREDICTED INVESTMENT INCREASES IN LOW-TAX COUNTRIES



Notes: This figure reports the predicted investment increase in the low-tax countries, using the coefficient estimates in Table 3, Column 7, and the actual decrease in dividend tax in each country following the UK's change from the worldwide to the territorial tax system.

IX. TABLES

Table 1. LOW- AND HIGH-TAX COUNTRIES IN EU27

Country	2005	2011	Country	2005	2011
Low-Tax:			High-Tax:		
Cyprus	10	10	Portugal	29	29
Ireland	12.5	12.5	Austria	30	25
Bulgaria	15	10	Luxembourg	30.38	28.8
Latvia	15	15	Netherlands	31.5	25
Romania	16	16	Greece	32	24
Hungary	17.52	21	Belgium	33.99	33.99
Poland	19	19	France	34.93	34.93
Slovakia	19	19	Malta	35	35
Estonia	24	21	Italy	37.25	31.29
Slovenia	25	25	Germany	39.6	30.95
Finland	26	26	Spain	40.37	35.25
Czech Republic	26	19			
Denmark	28	25			
Sweden	28	25	UK	30	28

Notes: Low-tax countries refer to those with corporate tax rates lower than the UK tax rate in both 2005 and 2011, and high-tax countries refer to the rest of the EU-27 countries.

Table 2. COUNTRY STATISTICS

Number of Subsidiaries in	with Ultimate Parent in							
	Host Country:	Total	UK	Europe	North America	Asia	Africa	South America
Austria	3,218	128	2,530	397	136	11	7	9
Belgium	3,817	247	2,539	743	238	13	5	32
Bulgaria	1,098	35	798	100	157	6	0	2
Cyprus	15	2	6	5	0	1	0	1
Czech Republic	6,040	238	4,807	611	327	39	3	15
Germany	13,965	986	8,875	2,602	1,339	51	19	93
Denmark	1,183	104	794	230	50	1	0	4
Estonia	1,393	68	1,112	129	81	1	0	2
Spain	7,602	643	5,249	1,163	434	18	50	45
Finland	1,699	103	1,272	243	71	1	1	8
France	13,429	1,091	8,671	2,600	822	154	26	65
United Kingdom	41,787	24,246	7,883	7,109	1,754	223	25	547
Greece	1,147	83	858	146	34	17	0	9
Hungary	979	34	787	112	42	2	0	2
Ireland	1,485	294	533	581	58	3	1	15
Italy	7,367	613	4,996	1,286	379	23	15	55
Lithuania	635	19	540	49	24	1	0	2
Luxembourg	1,305	189	719	349	30	9	1	8
Latvia	1,043	43	804	81	103	8	0	4
Malta	67	8	46	8	3	1	0	1
Netherlands	2,453	272	1,129	715	292	12	15	18
Poland	6,820	303	5,511	672	299	11	2	22
Portugal	1,628	70	1,279	177	60	18	11	13
Romania	8,147	227	6,248	570	992	85	4	21
Sweden	1,774	125	1,303	270	62	0	1	13
Slovenia	293	10	250	23	6	2	0	2
Slovakia	1,225	25	1,037	100	57	1	2	3
Total	131,614	30,206	70,576	21,071	7,850	712	188	1,011

*Notes:*The country in each row refers to the host country where the multinational affiliate is located. The country/region in each column refers to the home country/region where the ultimate parent of the multinational affiliate is located.

Table 3. DESCRIPTIVE STATISTICS

Variable	Obs.	Mean	P10	Median	P90
Investment	395,771	1,273	- 41	83	2,969
Fixed Asset	590,648	15,368	6	609	17,305
Gross Investment scaled by Lagged Asset	395,771	0.21	- 4.19	0.34	0.30
Net Investment scaled by Lagged Asset	395,771	0.08	- 5.05	0.13	0.16
<i>Firm-level controls</i>					
Sales	634,601	52	0	6	74
Cash Flow	509,668	4,432	- 398	339	5,800
EBIT Margin	597,762	0.05	- 0.14	0.04	0.29
Sales Growth Rate	495,536	0.20	- 0.30	0.04	0.65
<i>Country-level controls</i>					
Population	634,601	45,361,335	8,355,260	60,182,050	64,658,856
GDP per Capita	634,601	22,811	6,911	26,638	31,000
Unemployment Rate	634,601	0.08	0.05	0.08	0.10
Corporate Tax Rate	634,601	0.28	0.19	0.30	0.36
Governance Quality Indicator	634,601	1.06	0.48	1.18	1.48
Financial Institution Stability Indicator	634,601	11.2	5.3	10.3	21.1
<i>Parent-country-level controls</i>					
GDP growth rate (%)	624,479	1.29	- 3.82	1.80	4.01
GDP per Capita	624,708	32,828.78	23,752.86	30,963.23	43,453.36
Unemployment Rate	634,601	7.87	5.30	7.70	10.30
Governance Quality Indicator	630,949	1.20	0.67	1.25	1.64
Financial Institution Stability Indicator	625,101	13.847108	4.8564801	12.1894	25.6315

Notes: Unconsolidated values, in thousand Euros, current prices. All ratios winsorized at top and bottom 1 percentile. Country-level controls from the World Bank's World Development Indicators 2009. Country-level corporate tax rates collected from Oxford CBT Tax Database.

Table 4. PLACEBO TESTS OF PRE-REFORM DIFFERENTIAL TRENDS

Dependent Variable:	Investment per lagged capital			Leverage Ratio
	(1)	(2)	(3)	(4)
$UK_i \times Year_{2006,t}$	-0.014 (0.099)			
$UK_i \times Year_{2007,t}$		-0.075 (0.087)		
$UK_i \times Year_{2008,t}$			-0.067 (0.073)	
DE_{it}				0.002 (0.005)
Affiliate FEs	x	x	x	x
Industry-Year FEs	x	x	x	x
Host-Country-Year FEs	x	x	x	x
N	100,186	100,186	100,186	114,744
R^2	0.322	0.322	0.322	0.784

Notes: This table reports results of placebo tests in the *low-tax* EU-27 countries. The DE_{it} variable is the interaction between a UK affiliate indicator (UK_i) and an indicator for the year being 2009 onwards. The indicators $Year_{2006,t} - Year_{2008,t}$ each take the value of one in the respective year, and zero otherwise. Investment is gross investment scaled by book value of fixed capital asset in (end of) previous year. Leverage ratio is long-term debt relative to total asset. All firm-level ratio variables are winsorized at the top and bottom 1 percentile to remove the influence of outliers. Heteroskedasticity-robust standard errors are clustered at firm level. ***, **, * denotes significance at the 1%, 5%, and 10% levels, respectively.

Table 5. INVESTMENT RESPONSE IN LOW-TAX COUNTRIES: BASELINE RESULTS

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
DE_{it}	0.156*** (0.059)	0.112** (0.051)	0.120** (0.051)	0.110** (0.051)	0.096* (0.052)	0.157*** (0.057)		0.203*** (0.065)	
$DE_{it} \times (\tau_{UK} - \tau_j)$							1.595*** (0.578)		2.136*** (0.778)
Year FEs	x	x	x	x	x	x	x	x	x
Affiliate FEs	x	x	x	x	x	x	x	x	x
Affiliate-Level Controls		x	x	x	x	x	x	x	x
Industry-Year FEs			x	x	x	x	x	x	x
Host-Country-Level Controls				x	x	x	x	x	x
Parent-Country-Level Controls					x	x	x	x	x
Host-Country-Year FEs						x	x	x	x
N	102,901	74,416	74,416	74,416	74,416	73,014	73,014	71,714	71,714
Clusters (firms)	26,808	23,541	23,541	23,541	23,541	23,075	23,075	22,645	22,645
R^2	0.317	0.353	0.354	0.354	0.356	0.356	0.356	0.356	0.356

Notes: This table reports difference-in-difference estimates of the effect of the 2009 dividends exemption on investment by UK affiliates in EU-27 countries that tax corporate profit at a lower rate than the UK. All columns display the coefficient on the DE_{it} variable, which is the interaction between a UK affiliate indicator and an indicator for the year being 2009 onwards, from a regression of investment on this interaction, affiliate fixed effects, year fixed effects and additional controls. Investment is gross investment scaled by book value of fixed capital asset in (end of) previous year. "Affiliate-Level controls" indicates that the regression includes lagged turnover, lagged turnover growth rate, cash flow scaled by lagged asset, and lagged profit margin. All firm-level ratio variables are winsorized at top and bottom 1 percentile to remove the influence of outliers. "Host-Country-Level controls" indicates that the regression includes statutory corporate tax rate, GDP per capita, population size, unemployment rate, and indicators of governance quality and financial institution stability in the host country. "Host-Country-Year FEs" indicates that the regression includes two-way host country and year fixed effects. "Parent-Country-Level controls" indicates that the regression includes GDP growth rate and GDP per capital, and indicators of governance quality and financial institution stability in the home country where the ultimate parent company is located. Heteroskedasticity-robust standard errors are clustered at firm level. ***, **, * denotes significance at the 1%, 5% and 10% levels, respectively.

Table 6. INVESTMENT RESPONSE IN LOW-TAX COUNTRIES: ROBUSTNESS CHECKS

<i>A. Investment</i>							
Dependent variable:	Investment (per lagged capital)						
Dep. Var. winsorized at:	P99			P97.5			
Panel:	Unbalanced			Balanced	Matched	Top-10 Parent Countries	Unbalanced
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
DE_{it}	0.157*** (0.050)	0.167*** (0.058)	0.157*** (0.057)	0.147** (0.059)	0.183* (0.094)	0.119* (0.064)	0.069* (0.035)
N	73,014	62,953	73,014	53,641	6,457	48,848	73,014
Clusters	548	19,940	23,075	14,039	2,021	15,321	23,075
R^2	0.408	0.413	0.408	0.33	0.373	0.407	0.405
<i>B. Net Investment and Other Outcome Variables</i>							
Dependent variable:	Net Investment		Compensation	Employment	Productivity	Profitability	
	(per lagged capital)		(per lagged capital)		(Output per worker)	(EBIT per turnover)	
Dep. Var. winsorized at:	P99	P97.5	P99	P99	P99	P99	
	(1)	(2)	(3)	(4)	(5)	(6)	
DE_{it}	0.141*** (0.047)	0.058** (0.029)	18.862** (9.620)	2.804 (7.806)	-9.053 (22.534)	0.013 (0.017)	
N	73,689	73,689	93,097	89,736	87,737	102,250	
Clusters (firms)	23,286	23,286	24,844	24,842	24,204	26,595	
R^2	0.361	0.365	0.636	0.967	0.893	0.684	

Notes: This table checks the robustness of the DD results, using the same regression specification as in 5 Column 6. The dependent variable in Panel A is the gross investment per euro of lagged capital winsorized at the top and bottom 1th percentile in Columns 1 to 5. The first column clusters the standard error at the host-home country-pair level. Column 2 excludes affiliates subject to a worldwide tax system in the home country. Column 3 controls the impact of the euro crisis by adding an interaction term between an indicator that takes the value of 1 for Eurozone countries and the post-2009 year indicator. Column 4 uses a balanced sample of firms surviving throughout the sample period. Column 5 uses a matched sample of UK and non-UK firms with comparable turnover, turnover growth, employment, and operation profits. Column 6 uses non-UK affiliates with parent companies in the ten largest EU-27 countries as the control group. Column 7 uses the gross investment rate winsorized at the top and bottom 2.5th percentiles. The dependent variable in Panel B, Columns 1-2 is the net investment per euro of lagged capital winsorized at the 1th and 2.5th percentiles, respectively. Panel B, Columns 3-6 examine the impact of the tax reform on compensation, employment, labor productivity, and reported profitability. All other variables are as previously defined. Heteroskedasticity-robust standard errors are clustered at the firm level unless otherwise indicated. ***, **, * denotes significance at the 1%, 5%, and 10% levels, respectively.

Table 7. INVESTMENT RESPONSES: TRIPLE-DIFFERENCE Estimation

	(1)	(2)	(3)	(4)	(5)	(6)
$DE_{it} \times LowTax_k$	0.233*** (0.071)	0.143** (0.065)	0.140** (0.065)	0.132** (0.065)	0.131** (0.065)	0.111* (0.065)
$Post_t \times UK_i$	-0.071* (0.040)	-0.023 (0.040)	-0.008 (0.040)	-0.008 (0.040)	0.009 (0.043)	-0.008 (0.040)
$Post_t \times LowTax_k$	-0.233*** (0.019)	-0.094*** (0.020)	-0.095*** (0.020)	-0.050** (0.023)	-0.047** (0.023)	
Year FEs	x	x	x	x	x	x
Affiliate FEs	x	x	x	x	x	x
Affiliate-Level Controls		x	x	x	x	x
Industry-Year FEs			x	x	x	x
Host Country-Level Controls				x	x	x
Parent Country-Level Controls					x	x
Host Country-Year FEs						x
N	0.313	0.346	0.347	0.347	0.346	0.348
R^2	272,644	197,569	197,569	197,569	194,308	197,569

Notes: This table reports triple-difference estimates of the effects of the 2009 dividends exemption on multinational investments in the EU-27 countries, based on equation (7). All other variables are as previously defined in Table 5. Heteroskedasticity-robust standard errors are clustered at firm level. ***, **, * denotes significance at the 1%, 5%, and 10% levels, respectively.

Table 8. SEPARATING THE ANTICIPATION EFFECT

Dependent var:	Gross Investment			Net Investment		
	(1)	(2)	(3)	(4)	(5)	(6)
	(per lagged capital)					
$Year_{2008} \times UK_i$	0.003 (0.089)	0.094 (0.098)	0.092 (0.098)	0.004 (0.065)	0.077 (0.081)	0.076 (0.081)
DE_{it}	0.157** (0.074)	0.216** (0.090)		0.147*** (0.056)	0.190** (0.074)	
$Year_{2009} \times UK_i$			0.259*** (0.094)			0.214*** (0.077)
$Year_{2010} \times UK_i$			0.166* (0.100)			0.161** (0.082)
$Year_{2011} \times UK_i$			0.207 (0.140)			0.187 (0.122)
Year FEs	x	x	x	x	x	x
Affiliate FEs	x	x	x	x	x	x
Affiliate-Level Controls		x	x		x	x
Industry-Year FEs		x	x		x	x
Host-Country-Level Controls		x	x		x	x
Parent-Country-Level Controls		x	x		x	x
Host-Country-Year FEs		x	x		x	x
N	73,014	73,014	73,014	73,689	73,689	73,689
Clusters (firms)	23,075	23,075	23,075	23,286	23,286	23,286
R^2	0.354	0.354	0.354	0.356	0.356	0.356

Notes: This table reports difference-in-difference estimates of the effects of the 2009 dividends exemption on UK outbound investment on low-tax countries. Columns 1-3 report results using gross investment rates as dependent variables, and Columns 4-6 report results using net investment rates as dependent variables. All columns display the coefficients on the interactions between UK affiliate indicators and indicators for the year 2008 when the reform was announced. Columns 1-2 and 4-5 each display the coefficient on the DE variable, which is the interaction between a UK affiliate indicator and an indicator for the year being 2009 onwards. Columns 3 and 6 display the coefficients on the interaction terms between UK affiliate indicators and year indicators for 2009, 2010, and 2011, respectively.

Table 9. INVESTMENT RESPONSE IN HIGH-TAX COUNTRIES

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
DE_{it}	-0.071*	-0.025	-0.010	-0.010	-0.009	-0.010		-0.0004
	(0.040)	(0.040)	(0.040)	(0.040)	(0.040)	(0.044)		(0.045)
Tax Differential $\times DE_{it}$							-0.304	
							(0.751)	
Year FEs	x	x	x	x	x	x	x	x
Affiliate FEs	x	x	x	x	x	x	x	x
Affiliate-Level Controls		x	x	x	x	x	x	x
Industry-Year FEs			x	x	x	x	x	x
Host Country-Level Controls				x	x	x	x	x
Parent Country-Level Controls					x	x	x	x
Host Country-Year FEs						x	x	x
N	176,678	130,341	130,341	130,341	130,341	128,330	128,330	104,536
Clusters (firms)	42,666	37,550	37,550	37,550	37,550	36,948	36,948	30,167
R^2	0.311	0.343	0.344	0.344	0.343	0.343	0.343	0.343

Notes: This table reports difference-in-difference estimates of the effects of the 2009 dividend exemption on investment by UK affiliates in EU-27 countries that tax corporate profits at higher rates than the UK's. Each column displays the coefficient on the DE_{it} variable, which is the interaction between a UK affiliate indicator and an indicator for the year being 2009 onwards, from a regression of investment rate on this interaction, affiliate fixed effects, year fixed effects and additional controls. Investment rate is gross investment scaled by book value of fixed capital asset in (end of) previous year. "Affiliate-Level controls" indicates that the regression includes lagged turnover, cash flow scaled by lagged asset, lagged profit margin, and firm age. All firm-level ratio variables are winsorized at top and bottom 2.5 percentiles to remove the influence of outliers. "Host-Country-Level control" indicates that the regression includes statutory corporate tax rate, GDP per capita, population size, and unemployment rate at the host country level. "Host-Country-Year FEs" indicates that the regression includes two-way host country and year fixed effects. "Parent-Country-Level controls" indicates that the regression includes GDP growth rate and GDP per capital at the parent country level. Heteroskedasticity-robust standard errors are clustered at the firm level. ***, **, * denotes significance at the 1%, 5%, and 10% levels, respectively.

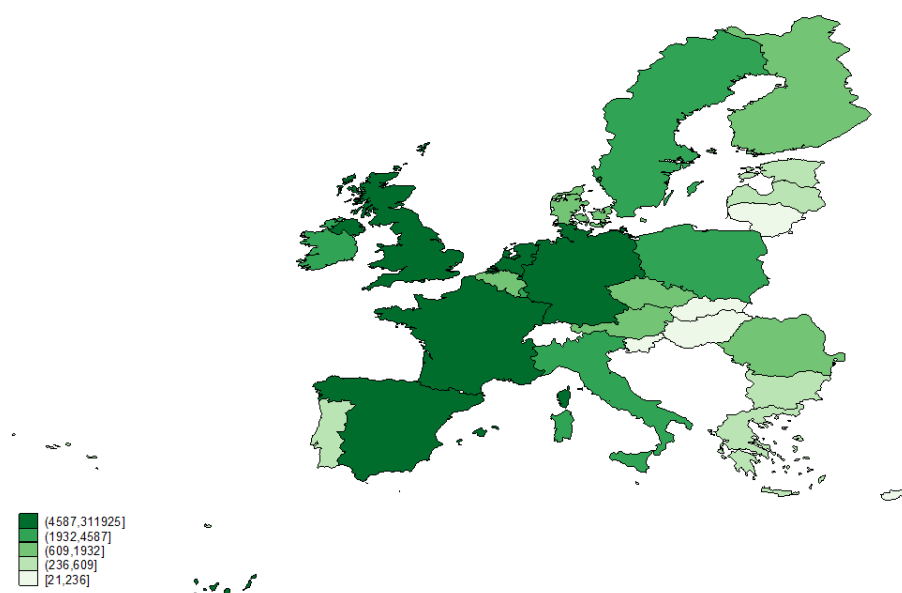
Table 10. INVESTMENT RESPONSE IN THE UK

	(1)	(2)	(3)	(4)	(5)	(6)
A. Control Group:	Non-UK Multinational Affiliates					
DE_{it}	-0.059 (0.040)	-0.038 (0.043)	-0.023 (0.043)	-0.017 (0.054)	-0.020 (0.076)	0.037 (0.083)
$Year_{2008} \times UK_i$					-0.003 (0.074)	-0.006 (0.074)
$Post_{2010} \times UK_i$						-0.109* (0.065)
$Post_{2011} \times UK_i$						0.006 (0.086)
N	68,679	51,474	51,474	49,863	49,863	49,863
Clusters (firms)	16,535	14,702	14,702	14,208	14,208	14,208
R^2	0.256	0.285	0.285	0.286	0.286	0.286
B. Control Group:	UK Domestic Group Affiliates					
DE_{it}	-0.029 (0.043)	0.004 (0.046)	-0.000 (0.048)	-0.000 (0.048)	0.010 (0.063)	0.058 (0.073)
$Year_{2008} \times UK_i$					0.019 (0.072)	0.019 (0.072)
$Post_{2010} \times UK_i$						-0.096 (0.068)
$Post_{2011} \times UK_i$						0.042 (0.083)
N	38,253	27,875	27,875	27,875	27,875	27,875
Clusters (firms)	9,841	8,358	8,358	8,358	8,358	8,358
R^2	0.268	0.296	0.298	0.298	0.298	0.298

Note: This table reports the difference-in-difference estimates of the effect of the 2009 dividends exemption on investment by UK affiliates in the UK. All columns display the coefficient on the DE_{it} variable, which is the interaction between a UK affiliate indicator and an indicator for the year being 2009 onwards, from a regression of investment rate on this interaction, affiliate fixed effects, year fixed effects, and additional controls. Panel A reports results using non-UK multinational affiliates that operate in the UK as a control group. Panel B reports results using stand-alone firms and affiliates of domestic company groups in the UK as a control group. All variables are defined as they are in Table 1. Heteroskedasticity-robust standard errors are clustered at firm level. ***, **, * denotes significance at the 1%, 5%, and 10% levels, respectively.

APPENDIX A. SUPPLEMENTARY MATERIALS

Figure A.1. SPATIAL DISTRIBUTION OF UK SUBSIDIARIES

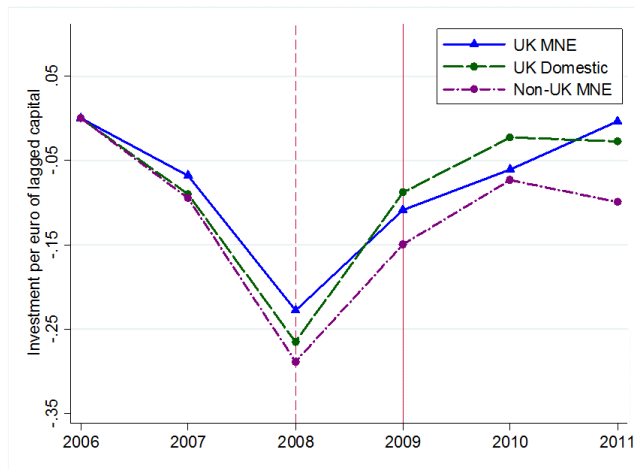


Notes: This figure shows the distribution of UK-owned affiliates in the EU-27 countries. Numbers in the square brackets refer to the five quantiles of the sample distribution. The top ten industries for the UK and non-UK affiliates in the host countries are the following:

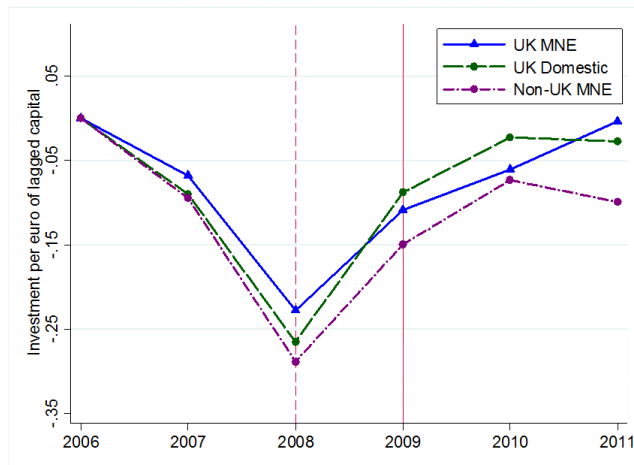
Top-10 Industries of Multinational Affiliates in Host Countries (NACE)			
Low-Tax Countries		High-Tax Countries	
UK Affiliates	Non-UK Affiliates	UK Affiliates	Non-UK Affiliates
2,120	2,910	4,671	4,671
7,311	2,932	1,920	4,511
4,730	4,671	4,675	1,920
4,635	4,646	6,120	2,910
1,200	4,511	2,120	3,511
4,711	6,202	4,672	4,646
4,673	4,651	1,200	7,010
4,719	4,711	4,646	4,669
4,646	4,730	6,190	4,651
1,920	4,690	7,311	4,711

Figure A.2. GRAPHICAL EVIDENCE ON INVESTMENT IN THE UK

A. Gross Investment Rate



B. Net Investment Rate



Notes: The figure plots the average gross investment rate from 2006-2011 for UK MNE affiliates, UK affiliates of domestic company groups, and non-UK multinational affiliates in the UK. The solid vertical line depicts the year the exemption system became effective, and the dashed vertical line depicts the year the policy reform was announced.

Table A.1. MEAN CHARACTERISTICS BY TREATED AND CONTROL GROUP

A: Full Sample	UK Affiliates		Non-UK Affiliates		Mean Difference
	Variable	Obs.	Mean	Obs.	Mean
Investment	18,728	2,685	265,232	737	0.19
Fixed Asset	27,807	16,502	396,023	12,894	0.01
Gross Investment scaled by Lagged Asset	18,421	0.167	261,158	0.059	0.00
Net Investment scaled by Lagged Asset	20,424	-0.042	295,490	-0.060	0.00
<i>Firm-level controls</i>					
Sales	28,998	69,610	412,417	50,291	0.00
Cash Flow	23,636	6,118	339,381	3,338	0.00
EBIT Margin	26,962	-0.079	379,458	-0.055	0.00
Sales Growth Rate	22,605	0.211	321,607	0.222	0.04
B: Matched Sample					
Investment	4,952	1,854	3,958	2,181	0.43
Fixed Asset	7,342	15,820	5,664	12,984	0.09
Gross Investment scaled by Lagged Asset	4,877	0.124	3,928	0.190	0.05
Net Investment scaled by Lagged Asset	5,440	- 0.007	4,399	0.080	0.00
<i>Firm-level controls</i>					
Sales	7,778	52,029.18	6,043	53,959	0.628
Cash Flow	6,359	5,920.06	5,084	4,690	0.424
EBIT Margin	7,562	- 0.120	6,016	- 0.010	0.000
Sales Growth Rate	6,040	0.241	4,945	0.205	0.011

Notes: Unconsolidated values, in thousand euros, current prices. All ratios winsorized at top and bottom 0.01 percentiles.

Table A.2. OTHER OUTCOME RESPONSES IN HIGH-TAX COUNTRIES

Dependent variable:	Compensation		Employment		Productivity		Profitability		Total Leverage	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
DE_t	-9.177 (6.013)	-9.181 (6.012)	5.238 (5.899)	5.242 (5.899)	-1.984 (14.656)	-1.708 (14.663)	0.002 (0.011)	0.002 (0.011)	0.009* (0.005)	0.009* (0.005)
Number of workers	0.003 (0.002)	0.003 (0.002)								
Turnover (thous Euro)	0.024 (0.019)	0.023 (0.017)	0.117*** (0.041)	0.115*** (0.040)						0.000* (0.000)
Total Assets (thous Euro)		0.005 (0.005)		0.004 (0.013)		0.069** (0.029)		-0.000 (0.000)		
Year FEs	x	x	x	x	x	x	x	x	x	x
Affiliate FEs	x	x	x	x	x	x	x	x	x	x
N	158,266	158,266	211,420	211,420	187,067	187,067	245,889	245,889	254,121	254,121
Clusters (firms)	37,701	37,701	44,354	44,354	43,250	43,250	49,131	49,131	52,792	52,792
R^2	0.309	0.309	0.278	0.278	0.30	0.30	0.407	0.407	0.411	0.411

Notes: This table reports difference-in-difference estimates of the effects of the 2009 dividends exemption on other outcomes in the high-tax countries. Compensation is the average company wage and salary per worker, productivity is the total output per worker, profitability is the EBIT relative to total output, and total leverage is the ratio of total liability relative to total asset. All other variables are as previously defined in Table 5. Heteroskedasticity-robust standard errors are clustered at firm level. ***, **, * denotes significance at the 1%, 5%, and 10% levels, respectively.