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Where Does Multinational Investment Go with Territorial Taxation? Evidence from the United Kingdom[†]

By LI LIU*

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-differences approach. It finds that the territorial reform has increased the investment rate of UK multinationals by 16.7 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. (JEL F23, G31, H25, H32, H87)

Many countries strive to create competitive tax systems to attract internationally mobile capital. The United States, Germany, and the United Kingdom have all used accelerated depreciation to stimulate domestic investments. Many developing countries use generous tax holidays and income tax exemptions to attract foreign investments. The way that foreign earnings of multinational companies (MNCs) are taxed in the home country is another important policy instrument to influence investment. This issue has attracted considerable attention in policy debate over reforming the international tax system. For example, the United States has recently moved toward a territorial tax system following the passage of the Tax Cuts and Jobs Act (TCJA) in December 2017, excluding from US taxation the active business income that is earned abroad.¹ In contrast to the lively policy debate, there is

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¹The move from a worldwide to a more territorial system in the United States is subject to important qualifications, including a one-time transition tax on unrepatriated profits and a minimum tax on overseas income that is in excess of 10 percent of the return on tangible assets abroad (global intangible low-taxed income, or GILTI) (Chalk, Keen, and Perry 2018).

surprisingly little empirical research on the impact of a shift to territorial taxation on multinational investments.²

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, exploiting a 2009 policy reform of international tax rules in the United Kingdom. Prior to the reform, the United Kingdom taxed foreign income upon repatriation and gave credits for corporate income taxes paid to foreign governments under the so-called worldwide tax system. The 2009 reform abolished the worldwide system by allowing UK companies to exclude dividends that they receive from foreign affiliates from domestic taxable income. Thus, with the introduction of dividend exemption, the United Kingdom moved to a territorial system. The reform brought location-specific changes in the dividend tax rate on foreign earnings: while it eliminated dividend tax on earnings repatriation from many low-tax countries, it had little direct impact on repatriation tax for the high-tax countries. This is because the worldwide system capped the dividend tax on foreign earnings at the UK corporate income tax rate; therefore, there was no tax on dividend repatriations from the high-tax countries prior to the reform.

The two distinct approaches in taxing foreign earnings can have very different implications for the allocation of multinational investment between domestic and foreign activities, and on the pattern of investment abroad. In the worldwide regime, UK multinationals have to pay the domestic tax whenever the earnings from low-tax countries are repatriated. In the territorial regime, they can invest in a low-tax country and repatriate the earnings without a dividend tax. Elimination of the dividend tax thus lowers total tax burden on investment in the low-tax countries, if earnings on these investments were eventually repatriated to their UK parents. A simple investment model illustrates these ideas more concretely by showing that the territorial reform would indeed increase investment by UK multinationals that finance with new equity. For these companies, repatriations are essential to pay for the return on equity, so dividend exemption would lower their cost of capital.³ The model also shows that dividend exemption has no impact on the cost of capital for investment financed with retained earnings: with a permanent dividend tax in place, the MNC is indifferent between paying dividend taxes now and paying dividend taxes of the same present value later (Hartman 1985). In contrast, anticipating a forthcoming reduction in the dividend tax, profit-maximizing multinationals

²As of 2018, all the G7 countries and the majority of the OECD countries use a territorial tax system, while the credit-based worldwide taxation remains in place in some major developing economies including China, India, Brazil, and Russia.

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 cuts on domestic investment includes Chetty and Saez (2005), Blouin, Raedy, and Shackelford (2011), and Campbell et al. (2013), while Yagan (2015) finds no evidence that a dividend tax cut increases corporate investment in the United States. Mathur et al. (2016) and Alstadsæter, Jacob, and Michaely (2017) reconcile competing results from the two views by providing empirical evidence on the heterogeneous effects of dividend taxes, which depend 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.

would increase their internal-funded investment prior to the reform and postpone repatriation until after the tax cut.

By using a unique dataset containing more than 100,000 multinational affiliates in EU-27, I test these predictions for the investment effects of the territorial tax reform using a difference-in-differences (DD) approach.⁴ The treatment group is composed of affiliates of UK multinationals, and the control group includes affiliates of non-UK multinationals in the same country and year. I examine the investment patterns before and after 2009 across the two groups 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, which experienced significant reductions in the repatriation tax rates.

I find that investment of UK affiliates in the low-tax countries increased substantially. On average, the introduction of the territorial system increased the gross investment rate of UK affiliates relative to the control firms by 16.7 percentage points in the low-tax countries. There are considerable heterogeneous effects of the territorial tax reform on investments by UK affiliates. Increases in investment are driven mainly by financially constrained *affiliates*. Alternatively, investment increases are stronger for affiliates that are part of larger and more complex *MNC groups*. Results from similar DD approaches suggest that the reform had no effect on investment in affiliates in the high-tax countries or in the United Kingdom. There is therefore no strong evidence of any significant reallocation of investment by UK MNCs from domestic to foreign activities, or from the high- to low-tax countries after the reform. In aggregate, the investment increase in the low-tax countries is estimated to be €5.6 billion and is nine times the amount of revenue forgone by exempting earnings repatriation.⁵

This paper relates to several strands of literature in corporate taxation and corporate finance. First, there is a rich empirical literature on foreign direct investment and taxation, as recently surveyed in de Mooij and Ederveen (2003) and Feld and Heckemeyer (2011), that focuses largely on the influence of host-country taxation. This paper contributes to this literature by quantifying the influence of home-country tax on foreign direct investment. Second, it adds to the literature studying the behavioral responses of multinationals to the taxation of cross-border income (Slemrod 1990; Hines and Rice 1994; Hines 1996; Grubert 1998; Desai, Foley, and Hines 2001; Foley et al. 2007; Bates, Kahle, and Stulze 2009; Graham, Hanlon, and Sheylin 2010; Dharmapala, Foley, and Forbes 2011; Egger et al. 2015; Hasegawa and Kiyota 2017; Bradley, Dauchy, and Hasegawa 2018; Graham

⁴EU-27 member states include Austria, Belgium, Bulgaria, Cyprus, the 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.

⁵The latter is estimated by HM Revenue and Customs (HMRC) as the following: "the amount of tax collected in the period from 2009/10 to 2011/12 is expected to decrease by £650 million." This is a small number, as HMRC estimated the tax base to be the total amount of foreign-source dividends that were liable to UK taxes in 2008, without factoring in the amount of accumulated foreign profits that may eventually be brought back. So the actual foreign tax revenue forgone could be much larger than estimated by HMRC. This caveat aside, under the criteria of global efficiency, the reform is unambiguously efficiency enhancing by stimulating investment above and beyond the amount of taxes collected. Under the criteria of national efficiency, the reform can be good for the United Kingdom if the returns on outbound investment are ultimately paid to the UK shareholders.

and Leary 2018). While most of these papers focus on financing 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 tax on cross-border investment. Fourth and finally, this paper joins a growing literature (Auerbach and Gorodnichenko 2013; Matheson, Perry, and Veung 2014; IMF 2014) that examines the spillover effects of fiscal policy in a global economy.

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

I. Institutional Background

A. Taxation of Foreign Earnings under the Worldwide System

Prior to 2009, the United Kingdom was one of few remaining advanced countries that used a worldwide approach to tax corporate income. Under the worldwide system, foreign profits of UK multinationals were taxed at the domestic rate upon repatriation as dividend payments to the parent company in the United Kingdom. This was known as “deferral,” because the tax owed could be deferred until when the income was repatriated. UK multinationals could claim a credit for taxes paid on foreign earnings to avoid double taxation. The amount of the foreign tax credit was capped at the UK tax liability on those earnings.

For example, a UK-owned affiliate in Ireland would pay an Irish tax of 12.5 percent and a UK tax of 15.5 percent (as the difference between the UK and Irish taxes) when remitting its Irish profits to the UK parent company. In general, the UK tax on each pound of dividend repatriation ($\tau_{UK,div}$) from a low-tax country was the difference between the statutory tax rate in the host country (τ_j) and that in the United Kingdom (τ_{UK}). Because total tax on foreign earnings was capped at the UK rate, there was no additional tax on repatriated earnings from countries with a statutory corporate income tax rate higher than the United Kingdom’s under the worldwide system.

B. Taxation of Foreign Earnings under the Territorial System

Main Features of the Reform.—The 2009 reform fundamentally changed the United Kingdom’s approach of taxing foreign business earnings to a territorial system, thus bringing the UK system into line with many other advanced economies. Under the territorial system (also known as the dividend exemption system), foreign earnings of UK multinationals are exempt from any corporate taxes in the United

Kingdom. The exemption is 100 percent for a wide range of foreign-source dividends, including profits accumulated before the introduction of the new legislation. Unlike the recent territorial reform in the United States, there is no deemed tax imposed on unrepatriated profits, and there is no minimum tax without deferral on profits earned abroad under the new regime.⁶

Timing.—Driven by the consideration that the worldwide system placed UK multinationals at a competitive disadvantage with companies in countries with territorial systems, the UK government issued a discussion document in June 2007 that proposed the United Kingdom to “go territorial” (HM Treasury and HM Revenue and Customs 2007). 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 proposals must be revenue neutral, which required targeted measures to restrict the tax deductibility of interest, and the use of the CFC regime to generate additional tax revenues by including certain capital gains and income from intellectual property. The proposed CFC regime attracted wide criticism, particularly from companies rich in intellectual property, and led to a number of UK multinationals announcing their intentions to leave the United Kingdom. In view of these criticisms, HMRC announced that it would postpone the new CFC regime and, instead, tighten up the existing rules. 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. In retrospect, it was unclear as to precisely when the dividend exemption would come into effect.

The draft legislation to implement the territorial reform was released almost two years later in February 2009. At the time of release, HMRC emphasized that the draft legislation was at an early stage of development and that significant changes should be anticipated. There was no date specified as to when the new legislation would take effect. The territorial tax system was subsequently introduced in the 2009 Finance Bill and went into effect on July 1.

Other Changes to the Corporate Tax System.—Since 2009, the UK government has taken several other steps to reform its corporate tax system, including phase-in reduction of the statutory corporate income tax rate and extending the territorial tax treatment to foreign branches in 2011.⁷ The UK government also revised the CFC rules, which took effect in 2013, to be consistent with the territorial tax regime. Under the existing CFC regime at the time of reform, all profits of a CFC, active

⁶The TCJA created a modified territorial tax system by introducing several provisions to reduce the extent of profit-shifting under the new regime, including the GILTI minimum tax—a 10.5 percent minimum tax without deferral on foreign profits that exceed a firm’s “normal” return (defined in the law as 10 percent on the adjusted basis in tangible property held abroad). TCJA also created a new base erosion and anti-abuse tax (BEAT), which imposes a minimum tax on otherwise deductible payments between a US corporation and a foreign affiliate. To transition to the new system, TCJA also created a new deemed repatriation tax for previously accumulated and untaxed earnings of foreign affiliates of US firms, which is 15.5 percent for cash and 8 percent for illiquid assets.

⁷The main rate on corporate taxable profits above £1.5 million was 28 percent during 2008–2010. It was subsequently reduced to 26 percent in 2011, 24 percent in 2012, and 20 percent in 2015.

or passive, were liable to UK taxes on a current basis. However, there were a series of exemptions from the CFC rules, including an exemption for actively trading subsidiaries.⁸ In the 2009 Finance Bill that introduced dividend exemptions, there were minimal changes to the CFC regime in fear of hurting the United Kingdom's ability to attract MNCs. The new CFC regime, which focuses more narrowly on foreign profits that are artificially diverted from the United Kingdom by extending UK taxes to all passive income abroad, was not fully enacted until January 2013. In contrast to the TCJA, which introduced several strong anti-avoidance provisions to limit profit-shifting in the United States, the United Kingdom took a more stepwise approach by strengthening its CFC rules four years later after moving to the territorial system.

C. Predicted Changes in Investment

By abolishing UK taxes on all foreign-source dividend repatriations, the territorial reform introduced differential changes in dividend taxes that are specific to the location of foreign affiliates. While the tax rate on dividends from low-tax countries decreased from τ_{UK} to τ_j , there remained no taxes on repatriation from high-tax countries:

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

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 , due to foreign tax credits that could be used to lower dividend taxes on earnings from low-tax countries. The extent of cross-crediting was restricted, however,⁹ so the actual reduction in the dividend tax rate ranges between zero and the statutory tax differential $\tau_{UK} - \tau_j$.

Intuitively, the territorial regime would increase investment by UK multinationals in the low-tax countries, as they no longer pay the home-country tax when repatriating earnings from these countries. Consequently, investments in low-tax countries are likely to increase following the tax reduction, if they are financed by new equity and are therefore liable to dividend taxes under the worldwide regime. The precise impact of dividend exemption on investment would critically depend on the source of financing and the timing of the reform. These effects are articulated in a simple model in the next section.

⁸Moreover, if a CFC qualifies for one of these exemptions, then the entire income of the CFC is outside the scope of the CFC rules. All UK-owned affiliates in my sample are non-CFCs throughout the sample period.

⁹Specifically, 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 arises only on the highest-level dividend that was taxed at 30 percent, and the rate of credit cannot exceed 45 percent. No relief was available for any capped foreign tax on lower-level dividends.

II. Conceptual Framework

Set-Up.—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 a 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.¹⁰ At the end of period 1, the foreign affiliate returns the entire net wealth to the UK parent company by paying out a dividend. There is a tax rate of t_d^0 and t_d^1 on dividend payments in period 0 and 1, respectively, and a tax rate of t_c on corporate revenue in period 1. For simplicity, the amount of debt finance is assumed to be fixed to focus on the implication of dividend taxation for investment and new share issues.

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 $\beta = 1/(1 + r)$ is the parent company's discount factor, and r is the risk-free interest rate. 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

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

where λ^D and λ^E are shadow values associated with the non-negativity constraints. There are two financial regimes in this model, under which the optimal strategy of finance depends on the level of initial cash flow C relative to firm-specific investment opportunities (Figure 1). Dividend tax rate (t_d) is assumed to be constant; that is, $t_d^0 = t_d^1 = t_d$.

Regime 1: Financed by New Equity.—In 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

¹⁰The 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.

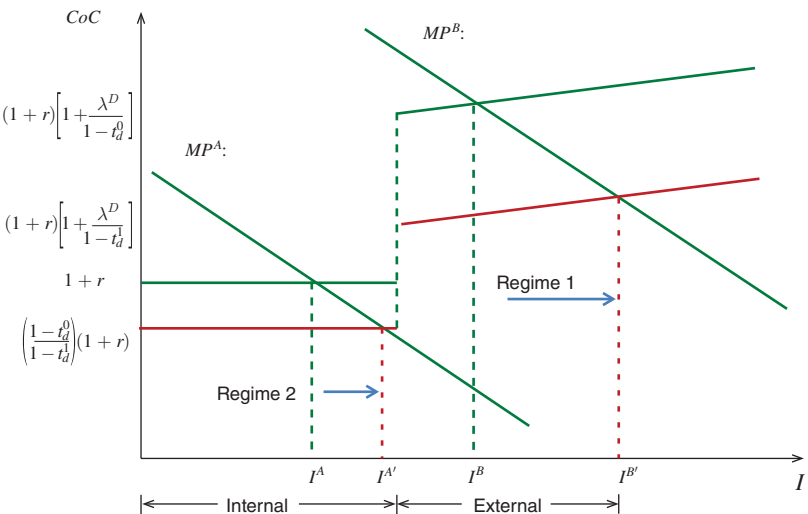


FIGURE 1. THE EFFECTS OF DIVIDEND TAX CUTS IN TWO FINANCIAL REGIMES

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 (CoC) is $1 - r$ under a constant dividend tax but decreases to $((1 - t_d^0)/(1 - t_d^1))(1 - r)$ 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.

the optimal level of investment and pay dividends at the same time. The first-order conditions are

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

and

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

In this case, the foreign affiliate invests all its cash $I = C + E$ and uses new equity to finance investment at the margin.

Implicit differentiating of equations (1) and (2) suggests that $\partial f_I / \partial (1 - t_d) < 0$ and $\partial f_E / \partial (1 - t_d) < 0$. A lower t_d reduces the marginal cost of investment and therefore increases 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.

Consistent with the intuition set out in Section IC, these results are similar to those of the standard “old view” models where marginal investments are financed

by external capital. As gains from these investments are returned to investors and subject to dividend taxes, a higher dividend tax would increase the effective tax rate on these investments (Poterba and Summers 1984). Conversely, a lower dividend tax, as in the case of the 2009 reform, would increase investment by UK multinationals in low-tax countries.

Regime 2: Financed by Retained Earnings.—In the second regime, the initial cash flow C is sufficiently high to finance new investment. This implies that $D > 0$ so that $\lambda^D = 0$, and $E = 0$ so that $\lambda^E > 0$. The first-order condition (1) is now

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

where t_d no longer affects the cost of capital or the optimal level of investment. This makes intuitive sense as in this regime, a dividend tax reduces the cost of investment and its return by the same amount and has no net effect on the cost of capital. This result reproduces the “new view” or the “trapped equity” view of dividend taxation (King 1974, Auerbach 1979, Hartman 1985), which predicts that investment using mature capital does not depend on dividend taxation.

Anticipation Effect of Changes in Dividend Taxes.—Results from Regime 2 hinge on the assumption of a constant dividend tax. Suppose that the foreign affiliate anticipates in period 0 that the rate of dividend tax will decrease in the next period ($t_d^0 > t_d^1$). The first-order condition for optimal investment in Regime 2 now becomes

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

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 $(1+r)/(1-t_c)$ 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. The firm should invest all the retained earnings in period 0. The anticipation effects suggest that investment by UK multinationals would surge in the years immediately preceding the reform. The following sections set out to test these predictions by empirically examining the responsiveness of investments by UK multinationals to the 2009 territorial tax reform.

III. Data

The firm-level data come from the Amadeus database, which is compiled by Bureau van Dijk Electronic Publishing. Amadeus provides firm-level information

on financial statement and basic ownership structure in 38 countries in Europe. Administrative data at the firm level are initially collected by local chambers of commerce and, in turn, are relayed to Bureau van Dijk Electronic Publishing through over 35 different information providers, including official business registers and annual reports. One advantage of focusing on European countries is that company reporting is mandatory even for small private firms (Kalemli-Ozcan et al. 2015).

A limitation of the Amadeus database is its geographic coverage, as it does not include any island haven nations that are the main destinations of base erosion and profit-shifting for many MNCs without attracting any real activities. Given that the primary focus of the analysis is on real investment instead of profit-shifting, exclusion of the island haven countries should be less of a concern here. Though included in the raw dataset, Switzerland is not part of the European Union and is therefore excluded from the main dataset that focuses on the 27 member countries of European Union (at the end of the sample period). Since Switzerland is one of the top destinations with the largest inward UK foreign direct investment and has a statutory corporate tax rate of 18 percent that is always below the UK rate throughout the sample period, one of the sensitivity tests adds all observations from Switzerland to check the robustness of the baseline finding.

Another well-known problem in Amadeus is that, while the number of unique firm identifiers matches the number in official data sources, some variables, such as employment, are often missing for smaller firms that are required to file only simplified accounts with basic financial items. There are also some missing observations, though these are less common, as firms that do not report during the past five years are deleted from the latest vintage of the Amadeus disk even though they can still be active. To mitigate these issues, I follow a comprehensive data cleaning process as in Gopinath et al. (2017) and Dharmapala and Riedel (2013) that partially address these problems. Specifically, I restrict the sample to countries within the EU-27 (the 27 states that were members of the European Union at the end of our sample period), as these countries use the same accounting standards and are the most extensively represented in the database. I exclude companies with missing/zero turnover or total assets, financial companies whose main productive assets typically are not tangible capital, and observations with missing industry or unspecified home-country information.

The primary dataset for empirical analysis consists of an unbalanced panel of 108,516 multinational affiliates in EU-27 countries between 2005 and 2011. The observational units in the empirical analysis are subsidiaries of multinational groups that are located within the EU-27. The criterion for defining a multinational subsidiary is the existence of a foreign corporate ultimate parent that owns at least a 50 percent stake in the subsidiary. Table 1 presents the descriptive statistics of the key variables in the regression analysis. Table A.1 in the online Appendix shows the geographical distribution of multinational affiliates in the main sample.

A related concern is that the information on the ownership structure in Amadeus refers to the latest reporting 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

TABLE 1—DESCRIPTIVE STATISTICS

Variable	Observations	Mean	P10	Median	P90
Investment	320,661	2,159	−44	78	2,812
Fixed asset	483,075	15,831	6	648	17,798
Gross investment scaled by lagged asset	316,399	0.66	−0.07	0.14	1.21
Net investment scaled by lagged asset	354,216	0.29	−0.38	−0.04	0.71
<i>Firm-level controls</i>					
Sales	519,692	49,950	451	5,870	68,776
Cash flow	414,247	4,168	−363	303	5,095
Profit margin	413,679	0.06	−0.07	0.06	0.33
Sales growth rate	404,670	0.21	−0.30	0.04	0.68
<i>Country-level controls</i>					
Population	519,692	44,703,660	8,318,592	60,182,050	64,658,856
GDP per capita	519,692	22,364	6,713	26,638	31,000
Unemployment rate (%)	519,692	7.88	5.30	7.60	10.30
Corporate tax rate	519,692	0.28	0.19	0.30	0.36
Governance quality indicator	519,692	1.04	0.43	1.18	1.48
Financial institution stability indicator	519,692	11.22	5.38	10.28	21.10
<i>Parent-country-level controls</i>					
GDP growth rate (%)	509,570	1.32	−5.03	1.80	4.01
GDP per capita	509,799	32,752.54	22,732.61	29,969.71	46,555.39
Unemployment rate (%)	519,692	7.88	5.30	7.60	10.30
Governance quality indicator	516,040	1.23	0.65	1.35	1.68
Financial institution stability indicator	510,192	12.09	4.62	9.04	23.23

Notes: Unconsolidated values, in thousand euros, current prices. All firm-level ratios winsorized at top and bottom 1 percentile. Country-level controls are from the World Bank’s World Development Indicators 2009. Country-level corporate tax rates are from Oxford University Centre for Business Taxation Tax Database.

is scope for misclassifications of parent–subsidiary connections, introducing attenuation bias against findings of significant policy effects (Budd, Konings, and Slaughter 2005; Dischinger and Riedel 2011; Dharmapala and Riedel 2013). In line with the previous studies, this is not a serious concern since misclassification introduces noise into the estimations that will bias the results toward zero.

A. Firm-Level Variables

The main accounting variables are flows of investment, sales, cash flow, and earnings before interest and tax.¹¹ **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

¹¹ Unfortunately, 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 the territorial reform on dividend repatriation or new share issuance.

TABLE 2—LOW- AND HIGH-TAX COUNTRIES IN EU-27

Statutory corporate income tax rate (%)					
Year	2005	2011		2005	2011
<i>Low tax</i>			<i>UK</i>	30	28
Cyprus	10	10			
Bulgaria	15	10	<i>High tax</i>		
Ireland	12.5	12.5	Germany	39.6	30.95
Lithuania	15	15	Italy	37.25	31.29
Latvia	15	15	Belgium	33.99	33.99
Romania	16	16	France	34.93	34.93
Poland	19	19	Malta	35	35
Slovak Republic	19	19	Spain	40.37	35.25
Czech Republic	26	19			
Hungary	17.52	21	<i>Neither low nor high tax</i>		
Estonia	24	21	Greece	32	24
Slovenia	25	25	Austria	30	25
Denmark	28	25	Netherlands	31.5	25
Sweden	28	25	Luxembourg	30.38	28.8
Finland	26	26	Portugal	29	29

Notes: Low-tax countries refer to EU-27 countries with a corporate tax rate that is always lower than the UK tax rate during the sample period. High-tax countries refer to EU-27 countries with a corporate tax rate that is always higher than the UK rate during the sample period.

fixed capital asset. **Sales** refers to operating revenue. **Profit margin** is calculated as earnings before interest and tax divided by sales. All ratio variables are winsorized at the top and bottom 1 percentile to minimize the influence of outliers.

B. Country-Level Variables

Data on statutory corporate tax rates by affiliate location are provided by the Oxford University Centre for Business Taxation Tax Database.¹² 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. The corporate tax rates within EU-27 range between 0.1 and 0.4, with an average value of 0.28 in the sample period.

To identify the set of low-tax countries, I define an indicator variable *LowTax* that takes the value 1 if a country's statutory corporate tax rate is always below the UK rate in all the years between 2005 and 2011, and 0 otherwise. Similarly, a dummy indicator *HighTax* takes the value 1 if a country's statutory corporate tax rate is always higher than the UK rate throughout the sample period, and 0 otherwise. Table 2 lists the low-tax and high-tax countries in the main sample and their corporate tax rates in 2005 and 2011, respectively.

I further merge data on per capita GDP, population, and unemployment rate to capture the aggregate market characteristics in the host country, and measures of governance quality and financial stability, to capture the quality of the institution in the host country. Home-country characteristics, including the growth rate of per

¹²These data are available at <http://www.ora.ox.ac.uk/objects/uuid:81f28d9a-fe6e-445b-8d34-a641b573d986>.

capita GDP, population, and the unemployment rate, are also included to capture macroeconomic conditions in the parent country.¹³

IV. Empirical Strategy

By exempting dividend taxes on foreign earnings, the 2009 territorial reform has reduced the effective tax rate on 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 between UK and non-UK affiliates in the same country. Formally, I examine the effect of investment in the standard DD specification:

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

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 0 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 II, I expect a positive β_{DE} if a nontrivial fraction of new investment by UK affiliates is financed with new equity.

A set of affiliate fixed effects (a_i) captures unobserved heterogeneity across affiliates and unobserved time-invariant characteristics across parent companies. 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.¹⁴ I include a 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 firms in each year. Further, \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 macroeconomic shocks to corporate 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 firms from different parent countries handle time-varying macro shocks. In this aspect it is also important to

¹³ Subsidiary-level country data are collected from the European Statistical Office (Eurostat), available at <https://ec.europa.eu/eurostat/data/database>. Parent-level country data are collected from the World Development Indicators Database, available at <https://datacatalog.worldbank.org/dataset/world-development-indicators>.

¹⁴ 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 countries.

control for a set of time-varying characteristics (\mathbf{z}_{kt}) in the parent countries, including the growth rate of per capita GDP, population size, and the unemployment rate.¹⁵ Moreover, by pooling data from both the low-tax and high-tax countries, I use a difference-in-difference-in-differences (DDD) approach to control further for unobserved trends that may differentially affect the treated and control groups, therefore obtaining a more unbiased estimate of the tax reform's true effect on investment by UK multinationals.

A. Comparable Treated and Control Groups

As shown in online Appendix Table A.2, panel A, there are fewer affiliates in the treated group, but they are significantly larger than the non-UK affiliates in the control group. UK affiliates 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 add a set of nontax controls 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 output. Because these variables are included, the DD estimate identifies the impact of the tax reform independent of these nontax determinants of investment. Alternatively, I use a matching DD strategy by replicating the DD tests on a subsample of matched firms based on their prereform characteristics (Heckman, Ichimura, and Todd 1997). The treated and control groups in the matched sample are mostly comparable in firm size and profitability (online Appendix Table A.2, panel B).

B. Key Identifying Assumption

The policy variation is at the parent-country-by-year level, so the key identifying assumption is that the United Kingdom's tax reform is independent of other UK-specific shocks. I present empirical evidence to validate this assumption in three aspects. First, Figure 2 shows that private domestic investment (in percent of GDP) trended very similarly in the major economies in EU-27 during the sample period. For example, total private investment in the United Kingdom exhibited a similar pattern to that in France over the entire period of 2005–2012. The pattern of total private investment in the United Kingdom was also very similar to that in Germany around the years of the Great Recession between 2008 and 2012.

Moreover, there are very similar trends between private investment in the United Kingdom and the GDP-weighted average private investment in the rest of the 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,

¹⁵ A similar set of time-varying characteristics in the host countries are also included to control for the effects of local productivity, market size, and demand characteristics on private investment, in specifications without the country-year fixed effects.

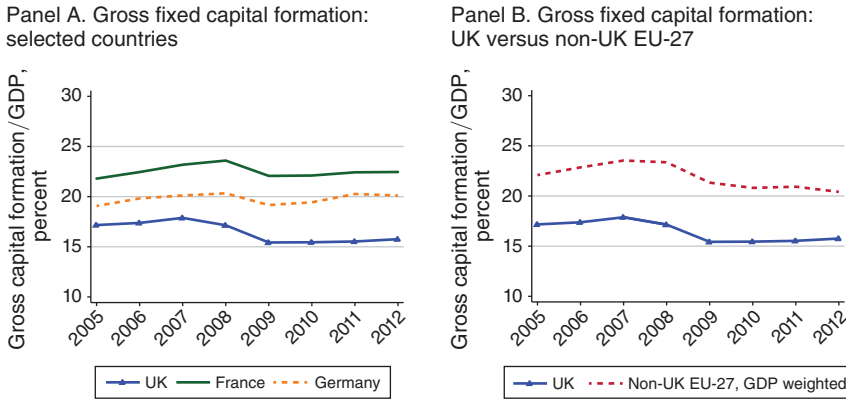


FIGURE 2. COMMON TRENDS IN AGGREGATE INVESTMENT

Notes: Panel A plots the gross fixed capital formation (as a share of GDP), which proxies for total private investment at the national level, for Germany, France, and the United Kingdom, from 2005 to 2012. Panel B compares the gross fixed capital formation (as a share of GDP) in the United Kingdom, and the GDP-weighted average in non-UK EU-27 countries, from 2005 to 2012.

Source: Eurostat European system of national and regional accounts

we would expect any differential changes in investment by UK multinationals in the low-tax countries also to appear in the high-tax countries and in the United Kingdom. Moreover, given that low-tax countries are defined with respect to the UK tax rate, there is no obvious reason to expect any systematic change in investments by UK multinationals in these countries other than the 2009 tax reform.

Second, I examine any differences in investment trends at the affiliate level in each of the years before the reform, both graphically in Figure 4 (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 3 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. Table 3 further confirms 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. Coefficient estimates of the earlier years provide placebo tests by demonstrating parallel trends in both the full and matched sample. Thus, the key identification assumption passes this alternative placebo test.

V. The Effect of Dividend Exemption on Multinational Investment

A. Graphical Evidence

Following discussions in the previous section, Figure 4 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

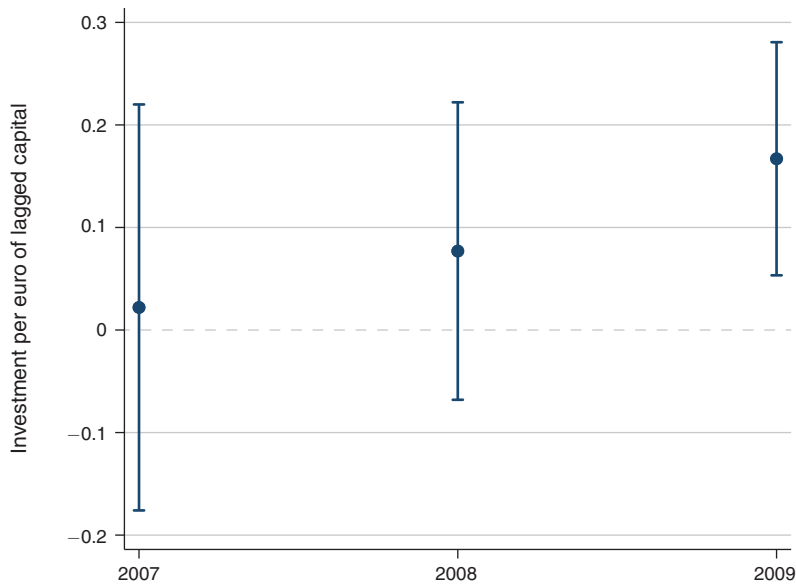


FIGURE 3. INVESTMENT RESPONSES IN LOW-TAX COUNTRIES: TIMING

Notes: This figure reports the regression results from varying the paper’s main investment regression specification (underlying Table 4, 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 95 percent confidence interval.

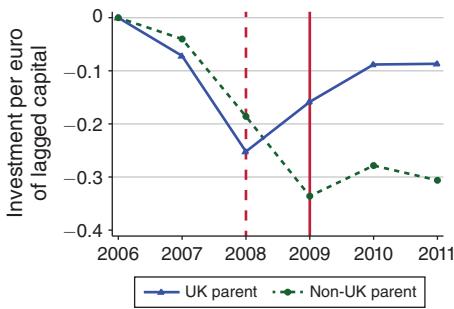
TABLE 3—PLACEBO TESTS OF PREREFORM DIFFERENTIAL TRENDS

Sample: low-tax countries	Full sample			Matched sample		
	(1)	(2)	(3)	(4)	(5)	(6)
$UK_i \times Year_{2006,t}$	−0.022 (0.101)			−0.025 (0.162)		
$UK_i \times Year_{2007,t}$		−0.090 (0.089)			−0.198 (0.154)	
$UK_i \times Year_{2008,t}$			−0.071 (0.075)			−0.009 (0.133)
Affiliate FEs	Yes	Yes	Yes	Yes	Yes	Yes
Industry-year FEs	Yes	Yes	Yes	Yes	Yes	Yes
Host-country-year FEs	Yes	Yes	Yes	Yes	Yes	Yes
Observations	86,738	86,738	86,738	7,900	7,900	7,900
R^2	0.33	0.33	0.33	0.32	0.32	0.32

Notes: This table reports results of placebo tests in the *low-tax* EU-27 countries. Columns 1–3 use the full sample, while columns 4–6 use the matched sample. The indicators $Year_{2006,t}$ – $Year_{2008,t}$ each take the value of 1 in the respective year, and 0 otherwise. Investment is gross investment scaled by book value of fixed capital asset in (end of) previous year. All firm-level ratio variables are winsorized at the top and bottom 1 percentile to remove the influence of outliers. Heteroskedasticity-robust standard errors clustered by firm are shown in parentheses below the estimated coefficient.

some distinct patterns in the two panels. In the low-tax countries, the reduction in real investment (relative to its 2006 level) of UK affiliates closely tracked that of

Panel A. Gross investment rates in low-tax countries



Panel B. Gross investment rates in high-tax countries

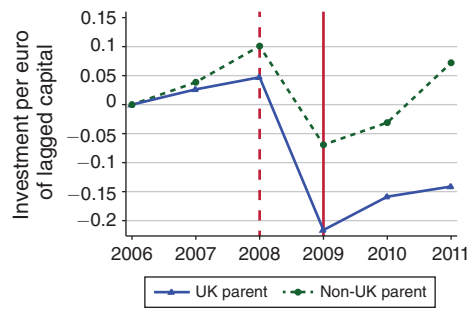


FIGURE 4. GRAPHICAL EVIDENCE

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 the territorial tax system was enacted, and the dashed vertical line depicts the year the policy reform was announced.

non-UK affiliates up to 2008. This pattern was reversed at the time of the reform, when investment by UK affiliates started to increase while the decline in investment continued for the control group. Both groups experienced an increase in their investments after the financial crisis, and the extent of increase was somewhat larger for UK affiliates. This differential increase could potentially be attributed to the territoriality reform. Turning to high-tax countries, while the investments of UK affiliates have decreased more than those of non-UK affiliates since 2006, changes in investment were quite similar in the years prior to 2009. The investment gap widened in 2009 but gradually narrowed in the next two years due to more investment by the UK affiliates.

A key challenge to the identification strategy is the possibility that contemporaneous changes unrelated to the tax reform may have different impacts on UK and non-UK affiliates. For example, UK affiliates might be more resilient to the financial crisis compared with their non-UK peers, which could explain the smaller declines in their investments. This concern 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. In addition, concurrent tax reforms in other countries may 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 out-bound investment of Japanese multinationals may also have increased afterward, resulting in a downward bias in the estimated effect of dividend exemption for UK companies. More generally, investment by firms with parent countries featuring worldwide taxation can be influenced by tax planning considerations following the United Kingdom's territorial tax reform and is less comparable to investment by firms with parent countries under the territorial system. These concerns thus

highlight the importance of focusing on non-UK affiliates with headquarters in countries with a territorial tax system throughout the sample period.

To summarize, Figure 4 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 4 presents regression results from the DD estimation of equation (5), focusing on multinational affiliates operating in the *low-tax* EU-27 countries. All regressions include a full set of firm fixed effects and year fixed effects, with heteroskedasticity-robust standard errors clustered at the firm level.

Discrete Treatment Effects.—Column 1 reports a coefficient estimate of 0.174 for DE_{it} , suggesting that dividend exemption has systematically increased investment by UK affiliates in the 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, column 2 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 exposed to different macroeconomic shocks, column 3 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 per capita GDP, 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 multinational affiliates were exposed to different shocks in their home countries. To address this concern, column 6 adds additional time-variant GDP growth rates, GDP per capita, and employment rate in the home countries. In this preferred specification, which includes the most comprehensive set of controls, the territorial reform is estimated to raise investment of UK affiliates relative to the control group by 16.7 percentage points, with a 95 percent confidence interval of between 0.05 and 0.28.

TABLE 4—INVESTMENT RESPONSE IN LOW-TAX COUNTRIES: BASELINE RESULTS

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
DE_{it}	0.174 (0.059)	0.113 (0.051)	0.119 (0.052)	0.109 (0.052)	0.107 (0.053)	0.167 (0.058)	0.141 (0.071)	
$DE_{it} \times (\widehat{\tau_{UK,t}} - \widehat{\tau_{jt}})$							0.027 (0.012)	
$DE_{it} \times TaxDiff_{Q1}$								0.096 (0.084)
$DE_{it} \times TaxDiff_{Q2}$								0.143 (0.079)
$DE_{it} \times TaxDiff_{Q3}$								0.464 (0.174)
Year FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Affiliate FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Affiliate-level controls	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry-year FEs	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Host-country-level controls	No	No	No	Yes	No	No	No	No
Host-country-year FEs	No	No	No	No	Yes	Yes	Yes	Yes
Parent-country-level controls	No	No	No	No	No	Yes	Yes	Yes
Observations	86,738	61,640	61,640	61,640	61,640	60,314	63,193	60,314
Clusters (firms)	20,897	17,691	17,691	17,691	17,691	17,301	18,039	17,301
R^2	0.319	0.359	0.36	0.361	0.363	0.363	0.366	0.363

Notes: This table reports DD estimates of the effect of the 2009 dividends exemption on investment by UK affiliates in EU-27 countries that tax corporate profit at lower rates than the United Kingdom's. Columns 1–7 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 or later, 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. Column 7 interacts the DE_{it} variable with a de-meaned tax differential $(\widehat{\tau_{UK,t}} - \widehat{\tau_{jt}})$, which is defined as the UK-host-country tax difference net of the average tax difference in the low-tax countries. Column 8 interacts the DE_{it} variable with each of the three tercile dummy indicators for tax differential. “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 capita, as well as indicators of governance quality and financial institution stability in the home country where the ultimate parent company is located. Heteroskedasticity-robust standard errors clustered by firm are shown in parentheses below the estimated coefficient.

Continuous Treatment Effects.—Intuitively, as the tax difference measures the extent of savings from repatriation taxes under the territorial regime, the larger the repatriation tax relief under territorial, the more the investment in that location. To test this idea, column 7 interacts the discrete policy variable DE_{it} with a de-meaned tax differential variable $(\widehat{\tau_{UK,t}} - \widehat{\tau_{jt}})$, which is defined as the statutory corporate tax rate difference between the United Kingdom and the host country minus the average tax rate difference in the low-tax countries. In this specification, the coefficient estimate of DE_{it} shows the investment change for UK affiliates in a low-tax country with the average tax difference, while the coefficient estimate of the interaction term $DE_{it} \times (\widehat{\tau_{UK,t}} - \widehat{\tau_{jt}})$ shows the additional change in investment for every one percentage point increase in the tax difference above the average. The results show

that in the low-tax countries, the investment increase is around 14.7 percentage points at the average tax difference, while for every one more percentage point increase in the tax difference above the mean, there is another 2.7 percentage point increase in real investment per euro of fixed assets by UK affiliates.

Finally, column 8 splits the sample of low-tax countries into three groups according to low, medium, and high tax difference terciles and interacts the DE_{it} variable with each of the three discrete indicators. The results confirm that the larger the tax difference—that is, the more repatriation taxes avoided under territorial—the more the investment in that location. While the estimated tax effect of 0.096 is insignificant for countries in the first tercile, the coefficient estimate of DE_{it} doubles to 0.143 for countries with a medium tax difference. Moreover, the size of the tax effect increases fivefold to 0.46 for countries with the lowest tax rates, with a 95 percent confidence interval of between 0.12 and 0.81.

C. Robustness

This section assesses whether the findings are robust to a number of alternative specifications and samples. Table 5 summarizes the results. For ease of comparison, column 1 reproduces the results from the preferred specification in column 6 of Table 4. Column 2 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). To ensure that the identified tax effect is not entirely driven by firm entries and exits, column 3 uses a balanced sample of firms that were established before 2005 and survived through 2010. The resulting DE_{it} coefficient estimates from the two regressions are statistically indistinguishable from the preferred estimate in column 1.¹⁶

Column 4 of Table 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 4 replicates the DD analysis on a subsample of matched firms from a Mahalanobis distance matching procedure based on prereform 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 remains positive with a slightly wider confidence interval due to fewer observations. To address the concern that multinationals from smaller countries like Latvia or Cyprus may be differentially affected by the economic uncertainty around 2009, column 5 uses only affiliates from the ten largest EU-27 countries as the control group.¹⁷ The findings remain very similar to those based on the full sample. Column 6 adds observations in Switzerland, which is a low-tax

¹⁶Columns 1 to 3 of Table 5 use the same specification, control variables, and scaling underlying column 6 of Table 4.

¹⁷These 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.

TABLE 5—INVESTMENT RESPONSE IN LOW-TAX COUNTRIES: ROBUSTNESS CHECKS

	Investment (per lagged capital)						
	Unbalanced (1)	SE clustered by home-host country (2)	Balanced (3)	Matched (4)	Top-10 parent countries (5)	Adding Switzerland (6)	Investment 2.5% winsorized (7)
<i>Panel A. Investment</i>							
DE_{it}	0.167 (0.058)	0.167 (0.082)	0.153 (0.060)	0.225 (0.104)	0.119 (0.064)	0.167 (0.058)	0.073 (0.036)
Observations	60,314	60,314	45,710	5,705	46,897	60,365	60,314
Clusters	17,301	13	11,600	1,634	13,370	17,313	17,301
R^2	0.36	0.36	0.32	0.38	0.36	0.36	0.37
	Net investment (per lagged capital) (1)	Net investment 2.5% winsorized (2)	Compensation (per lagged capital) (3)	Employment (4)	Productivity (turnover per worker) (5)	Profitability (EBIT per turnover) (6)	
<i>Panel B. Net investment and other outcome variables</i>							
DE_{it}	0.156 (0.048)	0.068 (0.030)	17.033 (9.768)	1.636 (7.903)	−7.834 (22.971)	0.016 (0.018)	
Observations	60,885	60,885	78,439	75,143	73,382	86,186	
Clusters (firms)	17,467	17,467	19,151	18,861	18,360	20,733	
R^2	0.32	0.33	0.59	0.97	0.88	0.64	

Notes: This table checks the robustness of the DD results, using the same regression specification as in Table 4, column 6. The dependent variable in panel A is the gross investment per euro of lagged capital winsorized at the top and bottom 1 percentile in columns 1–5. Column 1 replicates the results in Table 4, column 6. Column 2 clusters the standard error at the host-country level. Column 3 uses a balanced sample of firms surviving throughout the sample period. Column 4 uses a matched sample of UK and non-UK firms with comparable turnover, turnover growth, employment, and operation profits. Column 5 uses non-UK affiliates with parent companies in the ten largest EU-27 countries as the control group. Column 6 adds observations in Switzerland. Column 7 uses the gross investment rate winsorized at the top and bottom 2.5 percentile. The dependent variable in panel B, columns 1 and 2, is the net investment per euro of lagged capital winsorized at percentiles 1 and 2.5, respectively. Panel B, columns 3–6 examine the impact of the tax reform on compensation, employment, labor productivity, and reported profitability. Unless otherwise mentioned, all ratio variables are winsorized at the top and bottom 1 percentile. All other variables are as previously defined. Heteroskedasticity-robust standard errors clustered by firm are shown in parentheses below the estimated coefficient. EBIT is earnings before interest and tax.

country but is not part of the European Union, and the results remain unchanged. 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 2.5 percentile as the dependent variable, while columns 1 and 2 in the lower panel use net investment rates winsorized at 1 and 2.5 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 column 1. Columns 3–6 of Table 5, panel B, present the estimated effects of the tax reform on other outcome variables in low-tax countries. There is no significant change in employment, labor productivity, or profitability for UK affiliates, 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 the tax savings.

To further address the concern that UK and non-UK affiliates might be subject to different shocks during the sample period, I use a DDD specification that extends

equation (5) by pooling observations from both the 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 DDD approach would control for these omitted variables in the low-tax countries by differencing out average changes in investment between the treated and control groups in the high-tax countries. In particular, I estimate the following equation:¹⁸

$$(6) \quad INVESTMENT_{ikt} = a_i + d_t + \beta_{DE,Low} DE_{it} \times LowTax_k + \beta_{DE} DE_{it} \\ + \beta_{Post,Low} Post_t \times LowTax_k + \beta_x x_{ikt} + \beta_z z_{kt} + \varepsilon_{ikt}.$$

Note that this model contains a full set of firm and year fixed effects and that the interaction effect of UK_i and $LowTax_k$ is subsumed in the firm fixed effects (given that the Amadeus data do not track relocation of affiliates over time). The DDD coefficient $\beta_{DE,Low}$ can be interpreted as changes in investment for UK affiliates in low-tax countries relative to changes in investment for non-UK affiliates in low-tax countries after the territorial tax reform.

Table 6 presents the regression results, where each column follows the same specification as in Table 4, and reports very similar results for the main variable of interest. In the most demanding specification in column 6 of Table 6, the coefficient for the three-way interaction term is positive with a 90 percent confidence interval of between 0.01 and 0.22. The estimated postreform 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 by Degree of Financial Constraint

While the literature offers many possible methods for measuring the severity of financial constraint for independent firms, these measures tend to be more noisy for firms that are part of a multinational group, due to the mitigation of information asymmetry in accessing external finance as well as the existence of internal capital markets. Given these considerations, I use several proxies, both at the affiliate and the company group level, to measure the degree of ex ante financial constraint and to test for differences in investment responses between constrained and unconstrained firms. If the method of financing represents an important consideration for

¹⁸ A full DDD specification would include the following terms (Imbens and Wooldridge 2007):

$$INVESTMENT_{ikt} = \beta_0 + \beta_1 UK_i + \beta_2 LowTax_k + \beta_3 UK_i \times LowTax_k \\ + \delta_0 Post_t + \delta_1 Post_t \times UK_i + \delta_2 Post_t \times LowTax_k + \delta_3 UK_i \times LowTax_k + \varepsilon_{ikt},$$

where UK represents UK affiliate, $LowTax$ represents low-tax countries, and $Post$ represents the postreform period. Inclusion of firm fixed effects in equation (6) subsumes UK_i , $LowTax_k$, and $UK_i \times LowTax_k$. This is because the location of each affiliate is fixed during the sample period given that the Amadeus data do not track relocation of affiliates over time. The time fixed effects (d_t) further subsume $Post_t$ (but not its interaction with other variables). This leaves two double-difference controls in equation (6): DE and $Post \times LowTax$.

TABLE 6—INVESTMENT RESPONSES: DDD ESTIMATION

	(1)	(2)	(3)	(4)	(5)	(6)
$DE_{it} \times LowTax_k$	0.229 (0.072)	0.134 (0.065)	0.133 (0.066)	0.122 (0.065)	0.122 (0.066)	0.115 (0.067)
DE_{it}	−0.050 (0.040)	−0.013 (0.040)	−0.000 (0.041)	0.001 (0.041)	0.020 (0.044)	0.001 (0.041)
$Post_t \times LowTax_k$	−0.231 (0.021)	−0.083 (0.022)	−0.086 (0.022)	−0.025 (0.025)	−0.023 (0.025)	
Year FEs	Yes	Yes	Yes	Yes	Yes	Yes
Affiliate FEs	Yes	Yes	Yes	Yes	Yes	Yes
Affiliate-level controls	No	Yes	Yes	Yes	Yes	Yes
Industry-year FEs	No	No	Yes	Yes	Yes	Yes
Host-country-level controls	No	No	No	Yes	Yes	No
Parent-country-level controls	No	No	No	No	Yes	Yes
Host-country-year FEs	No	No	No	No	No	Yes
Observations	221,572	160,229	160,229	160,229	156,968	160,229
R^2	0.32	0.35	0.35	0.35	0.35	0.35

Notes: This table reports DDD estimates of the effects of the 2009 dividends exemption on multinational investments in the EU-27 countries, based on equation (6). All other variables are as previously defined in Table 4. Heteroskedasticity-robust standard errors clustered by firm are shown in parentheses below the estimated coefficient.

UK affiliates as suggested in Section II, we should expect to find consistent, systematic differences in investment responses for groups of firms across 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:

(7)
$$INVESTMENT_{ikt} = a_i + d_t + \sum_{j=1}^{10} \beta_{DE,Decile_j} DE_{it} \times \mathbf{1}\{i \in Decile_j\} + \beta_{\mathbf{x}} \mathbf{x}_{ikt} + \beta_{\mathbf{z}} \mathbf{z}_{kt} + \varepsilon_{ikt},$$

where $\mathbf{1}\{i \in Decile_j\}$ 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 dividends exemption on investment by UK affiliates relative to non-UK affiliates in the j th decile of the relevant financial constraint indicator.

Panel A of Figure 5 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 the turnover distribution. This is most likely because these firms are financially unconstrained. Panel B shows a similar though less clear-cut 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 second to seventh deciles of the cash

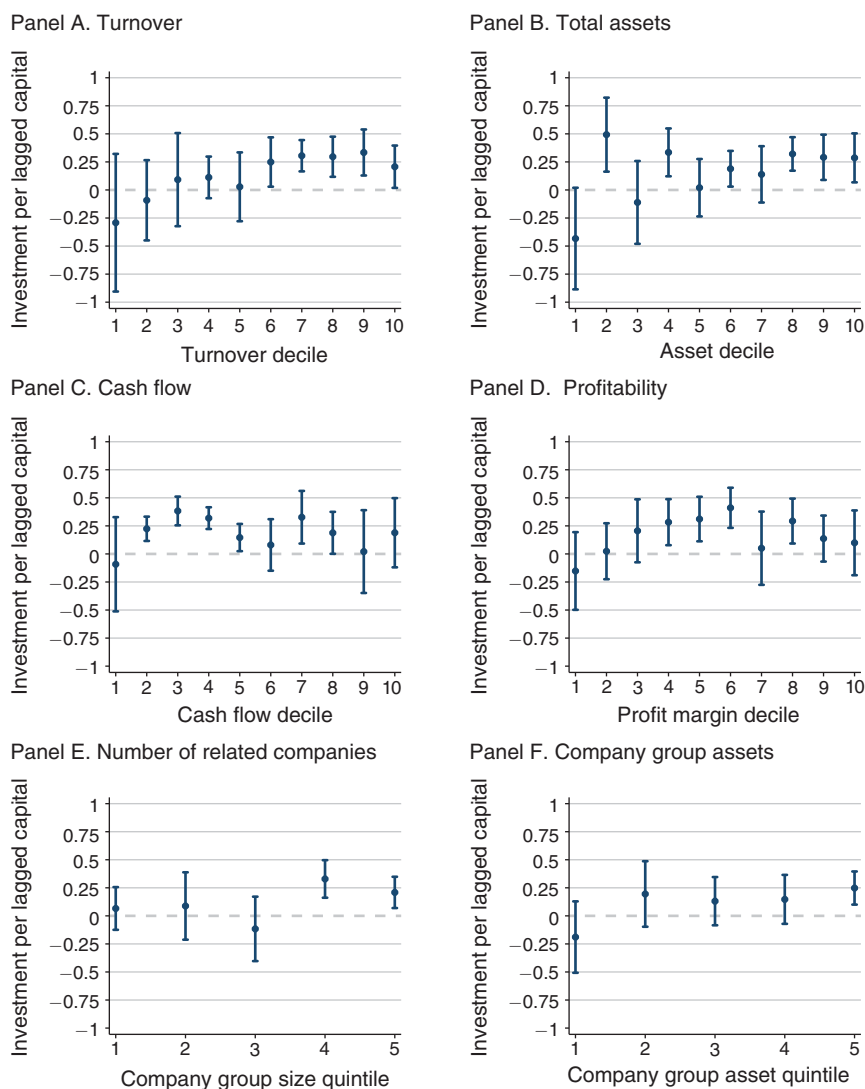


FIGURE 5. HETEROGENEOUS INVESTMENT RESPONSES IN LOW-TAX COUNTRIES

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 in panels A–D, respectively. The DD regressions for panels A–D include ten interaction terms between the DE_{it} and each of the ten decile dummy indicators. Panels E and F report regression results by dividing the main sample into quintiles of ex ante financial constraint indicators based on the number of related companies and total assets of the company group, respectively. The DD regressions for panels D–E include five interaction terms between the DE_{it} and each of the five quintile dummy indicators. All other variables are as previously defined. Each panel reports the coefficient estimates $\beta_{DE,Decile_j}$ and the corresponding 90 percent confidence interval.

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.¹⁹

¹⁹The 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).

Figure 5, panel D, shows that investment increase is mainly concentrated in the fourth to eighth deciles of firm profitability.²⁰ The results suggest that firms with extremely low profitability did not increase their investments after the tax reform, and neither did extremely profitable firms, which are more likely to rely on retained earnings to finance their investments.

Theoretical consideration in Section II suggests that increases in investment by UK affiliates should mainly be funded by new capital. Evidence consistent with this hypothesis would be more prominent investment responses in larger, more liquid company groups with deep internal capital markets.²¹ 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 a 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. Note that Amadeus includes only European affiliates, so the group asset variable is a noisy measure of the worldwide company group asset. The results are roughly consistent: larger MNCs, measured by total asset of the company group, demonstrate a higher sensitivity of investment to the territorial tax reform. Online Appendix A provides additional evidence suggesting UK affiliates are more likely to raise new equity following the territorial reform, by regressing a discrete indicator for receiving any new equity against an indicator for cash-poor affiliates in a fixed-effect linear probability model. The results suggest that the tax reform has increased the probability of raising new equity by 6 percentage points for the cash-poor UK affiliates.

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. Despite this narrow three-month window between the announcement and implementation of the exemption system, UK companies may nevertheless have anticipated in 2008 the coming reduction in dividend taxation. In particular, for internally 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:

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

²⁰ The 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.

²¹ In theory, the parent company can either inject equity with internal funds or raise equity from the external capital market.

TABLE 7—SEPARATING THE ANTICIPATION EFFECT

Dependent variable:	Gross investment (per lagged capital)			Net investment (per lagged capital)		
	(1)	(2)	(3)	(4)	(5)	(6)
$Year_{2008} \times UK_i$	0.139 (0.103)	0.139 (0.103)	0.137 (0.103)	0.116 (0.084)	0.116 (0.084)	0.116 (0.084)
DE_{it}	0.256 (0.095)	0.256 (0.095)		0.231 (0.078)	0.231 (0.078)	
$Year_{2009} \times UK_i$			0.286 (0.099)			0.242 (0.081)
$Year_{2010} \times UK_i$			0.220 (0.105)			0.217 (0.086)
$Year_{2011} \times UK_i$			0.253 (0.147)			0.240 (0.127)
Year FEs	Yes	Yes	Yes	Yes	Yes	Yes
Affiliate FEs	Yes	Yes	Yes	Yes	Yes	Yes
Affiliate-level controls	No	Yes	Yes	No	Yes	Yes
Industry-year FEs	No	Yes	Yes	No	Yes	Yes
Parent-country-level controls	No	Yes	Yes	No	Yes	Yes
Host-country-year FEs	No	Yes	Yes	No	Yes	Yes
Observations	60,314	60,314	60,314	60,885	60,885	60,885
Clusters (firms)	17,301	17,301	17,301	17,467	17,467	17,467
R^2	0.36	0.36	0.36	0.32	0.32	0.32

Notes: This table reports DD 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_{it} variable, which is the interaction between a UK affiliate indicator and an indicator for the year being 2009 or later. Columns 3 and 6 display the coefficients on the interaction terms between UK affiliate indicators and year indicators for 2009, 2010, and 2011, respectively.

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 7 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. Alternatively, timing uncertainty associated with the dividend exemption reform, as described in Section IIB, may also explain the lack of any anticipation effects.

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 coefficients in 2010 and 2011 are also positive and statistically significant. 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. 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, implying that the reform could also have no impact on total investment by UK multinationals. This concern is particularly relevant around the time of the Great Recession, when many companies are resource constrained and have 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 that facilitated tax planning under the worldwide system. To test these two competing hypotheses, I analyze investment by UK multinationals in the high-tax countries as well as in the United Kingdom.

Investment Responses in High-Tax Countries.—Table 8 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 4, with heteroskedasticity-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 nontax firm-level determinants of investment in column 2. It remains insignificant throughout columns 3 to 7, which control for additional industry, host-country, and home-country characteristics. While the negative sign of the DD estimates in the first two columns 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.3 in the online 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.

Investment Responses in the United Kingdom.—To analyze the investment responses of UK-owned affiliates at home, I use a similar DD strategy with two

TABLE 8—INVESTMENT RESPONSE IN HIGH-TAX COUNTRIES

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
DE_{it}	−0.039 (0.043)	−0.010 (0.043)	0.002 (0.043)	0.004 (0.043)	0.002 (0.048)	0.001 (0.048)	−0.0003 (0.048)
$DE_{it} \times (\overline{\tau_{UK,t}} - \tau_{jt})$							0.026 (0.025)
Year FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Affiliate FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Affiliate-level controls	No	Yes	Yes	Yes	Yes	Yes	Yes
Industry-year FEs	No	No	Yes	Yes	Yes	Yes	Yes
Host-country-level controls	No	No	No	Yes	Yes	No	No
Parent-country-level controls	No	No	No	No	Yes	Yes	Yes
Host-country-year FEs	No	No	No	No	No	Yes	Yes
Observations	117,635	86,700	86,700	86,700	85,057	85,057	85,057
Clusters (firms)	26,012	22,842	22,842	22,842	22,396	22,396	22,396
R^2	0.31	0.34	0.34	0.34	0.34	0.34	0.34

Notes: This table reports DD 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 United Kingdom’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 or later, from a regression of investment rate on this interaction, affiliate fixed effects, year fixed effects, and additional controls. Column 7 further interacts the DE_{it} variable with a de-meaned tax differential $(\overline{\tau_{UK,t}} - \tau_{jt})$, which is defined as the UK-host-country tax difference net of the average tax difference in the high-tax countries. 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, lagged turnover growth, cash flow scaled by lagged asset, and lagged profit margin. All firm-level ratio variables are winsorized at the top and bottom 1 percentile 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 capita at the parent-country level. Heteroskedasticity-robust standard errors clustered by firm are shown in parentheses below the estimated coefficient.

alternative control groups: (i) non-UK multinational affiliates operating in the United Kingdom and (ii) UK affiliates that are part of a domestic company group.²² Table 9 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.²³ Columns 1 to 4 each use the same specification as that in Table 4, while columns 5 and 6 focus on identifying anticipation effects in 2008. In panel A, the coefficient estimate of DE_{it} is mostly insignificant, suggesting that there are no differential investment responses by UK-owned affiliates relative to non-UK foreign affiliates. The coefficients are generally negative, which is somewhat consistent with shifting of investment from domestic to foreign activities. Panel B shows a very similar pattern, suggesting that there is no differential investment response by UK-owned affiliates relative to affiliates of domestic company groups.

²² Stand-alone firms, and domestic company groups with all of their subsidiaries in the United Kingdom, are identified based on ownership information on all the UK companies in Financial Analysis Made Easy (FAME).

²³ Figure A.2 in the online Appendix presents the graphical evidence.

TABLE 9—INVESTMENT RESPONSE IN THE UNITED KINGDOM

	(1)	(2)	(3)	(4)	(5)
<i>Panel A. Control group: non-UK multinational affiliates</i>					
DE_{it}	−0.054 (0.043)	−0.035 (0.046)	−0.021 (0.046)	−0.021 (0.056)	−0.007 (0.084)
$Year_{2008} \times UK_i$					0.020 (0.084)
Observations	45,245	33,531	33,531	31,992	31,992
Clusters (firms)	9,997	8,687	8,687	8,265	8,265
R^2	0.25	0.28	0.29	0.29	0.29
<i>Panel B. Control group: UK domestic group affiliates</i>					
DE_{it}	−0.029 (0.043)	0.004 (0.046)	−0.000 (0.048)	−0.000 (0.048)	0.010 (0.063)
$Year_{2008} \times UK_i$					0.019 (0.072)
Observations	36,854	26,517	26,517	26,517	26,517
Clusters (firms)	8,442	7,000	7,000	7,000	7,000
R^2	0.27	0.30	0.30	0.30	0.30
<i>Both panels include:</i>					
Year FEs	Yes	Yes	Yes	Yes	Yes
Affiliate FEs	Yes	Yes	Yes	Yes	Yes
Affiliate-level controls	No	Yes	Yes	Yes	Yes
Industry-year FEs	No	No	Yes	Yes	Yes
Host-country-level controls	No	No	Yes	Yes	Yes
Parent-country-level controls	No	No	No	Yes	Yes

Notes: This table reports the DD estimates of the effect of the 2009 dividends exemption on investment by UK affiliates in the United Kingdom. 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 or later, 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 United Kingdom as a control group. Panel B reports results using stand-alone firms and affiliates of domestic company groups in the United Kingdom as a control group. All variables are as previously defined in Table 4. Heteroskedasticity-robust standard errors clustered by firm are shown in parentheses below the estimated coefficient.

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, investment at home may either increase or decrease, depending on whether home and foreign investments are substitutes or complements. This finding echoes with similar evidence in the United States following a one-time tax holiday for the repatriation of foreign earnings that was introduced in the 2004 Homeland Investment Act (HIA). As shown in Dharmapala, Foley, and Forbes (2011), very few US MNCs increased their domestic investments, employment, or R&D investments after the tax holiday. Instead, these firms primarily responded by returning funds to shareholders.²⁴

²⁴Two major differences are worth noting. First, the HIA provides US multinationals with a one-time deduction of 85 percent of dividends repatriated by their foreign affiliates. In contrast, the United Kingdom’s dividend

TABLE 10—PREDICTED INVESTMENT INCREASES IN LOW-TAX COUNTRIES

Country	Total increases in investment by UK MNCs (million euros)
Bulgaria	96
Cyprus	4
Czech Republic	524
Denmark	82
Estonia	9
Finland	96
Hungary	359
Ireland	2,093
Lithuania	9
Latvia	14
Poland	546
Romania	318
Sweden	1,142
Slovenia	5
Slovak Republic	167
Total	5,464

Note: This table reports the predicted investment increase in the low-tax countries, using the coefficient estimates in Table 4, column 7, and the reduction in country-specific dividend tax rates following the territorial tax reform in the United Kingdom.

G. 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. Noting that all the quantitative effects are measured relative to the control group, the prereform average fixed asset for the UK affiliates across low-tax countries is around €16.31 million. Given a DD coefficient estimate of 0.167, this implies that the average investment increase in the UK affiliates is around €2 million. Second, I estimate the increase in aggregate investment by summing up investment increases across all UK affiliates in each country. Table 10 shows the increase in investment across host countries. In aggregate, the predicted investment increase is around €5.5 billion (in real 2006 terms) in the low-tax countries, where Ireland, Sweden, the Czech Republic, and Poland benefited the most from additional foreign direct investments resulting from the United Kingdom's territorial reform. The aggregate investment increase in low-tax countries is approximately nine times the amount of estimated forgone tax revenue, suggesting that the tax reform has had a strong effect in stimulating £9 of foreign investment by UK multinationals in the low-tax countries for every £1 loss in tax revenue at home.²⁵

exemption is 100 percent and 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 United Kingdom's exemption applies to most dividends, as discussed in Section I. The exemption permitted under the new system in the United Kingdom is different in nature from, and more generous than, the exemption under the HIA in the United States.

²⁵ As 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.

VI. 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 United Kingdom 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 United Kingdom's corporate tax rate.

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 16.7 percent in reaction to the territorial reform. The results shed light on the likely investment effect of the United States' implementation of a partial territorial tax, by showing that in the United Kingdom, there is no evidence that the investment increase in low-tax countries led to the reallocation of foreign direct investment from high-tax countries. Nor did the reform result 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 offset against those from low-tax countries. However, unless UK or US multinationals are financially constrained as a group, it is unlikely that there will be any reduction in investment in the domestic economy.

The findings that UK multinationals increased their investments in the low-tax countries also have implications for tax policy design in small, capital-importing countries. The trend to shift from worldwide to territorial taxation in major, capital-exporting countries may bring 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) reports that the bilateral UK foreign direct investment financed from new equity has become more sensitive to a host country's statutory tax rate after the territorial reform.

Corporate investment is not the only channel through which UK multinationals can 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. For example, Liu, Schmidt-Eiesenlohr, and Guo (2019) finds that the extent of transfer mispricing in tangible goods by UK multinationals has intensified after the territorial reform. It is therefore important to consider proper anti-avoidance measures to protect the tax base at home. On the other hand, changes in profit-shifting can also interact with changes in investment. If a shift to territorial taxation increases profit-shifting abroad, this may lower the effective tax rate on real activity in the United Kingdom and abroad as well. The exact impact will likely depend on the technology of profit-shifting; for example, whether increases in investment abroad help shift profits abroad as well. 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, is forthcoming in future research.

APPENDIX A. THE EFFECT OF DIVIDEND EXEMPTION ON OTHER OUTCOMES

According to the discussions in Section II, 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 are 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 then calculated as changes in the paid-in capital between two consecutive years. To reduce the amount of measurement error in the new equity variable, I construct a dummy indicator that takes the value of 1 if the imputed new equity is positive, and 0 otherwise. I then run a binary discrete choice model of the following form:

$$\begin{aligned} (A1) \quad \mathbf{1}[NewEquity_{it} > 0] = & a_i + d_t + \beta_{DE} DE_{it} \\ & + \beta_{DE, Cash Poor} DE_{it} \times \mathbf{1}[i \in Cash Poor] \\ & + \beta_x \mathbf{x}_{ikt} + \beta_z \mathbf{z}_{kt} + \varepsilon_{ikt}, \end{aligned}$$

where $\mathbf{1}[NewEquity_{it} > 0]$ represents the binary variable of receiving new equity for firm i in year t , $\mathbf{1}[i \in Cash Poor]$ is an indicator that takes the value of 1 for all affiliates in the second to seventh deciles of the cash flow distribution, and all other variables are as previously defined. Note that $\mathbf{1}[i \in Cash Poor]$ is constructed this way as investment increases are concentrated in the subsample of UK affiliates in the second to seventh deciles of the cash flow distribution in Section VD. Noting 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 ($\hat{\beta}_{DE} = -0.024$ with a standard error of 0.028).

Columns 3 to 6 in panel B of Table 5 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. 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 after-tax profits within the multinational group (see, for example, Budd, Konings, and Slaughter 2005).

REFERENCES

- Alstadsæter, Annette, Martin Jacob, and Roni Michaely. 2017. "Do Dividend Taxes Affect Corporate Investment?" *Journal of Public Economics* 151: 74–83.
- Altshuler, Rosanne, and Harry Grubert. 2003. "Repatriation Taxes, Repatriation Strategies and Multinational Financial Policy." *Journal of Public Economics* 87 (1): 73–107.
- Altshuler, Rosanne, Harry Grubert, and T. Scott Newlon. 2000. "Has U.S. Investment Abroad Become More Sensitive to Tax Rates?" In *International Taxation and Multinational Activity*, edited by James R. Hines Jr., 9–38. Cambridge, MA: NBER.
- Auerbach, Alan J. 1979. "Wealth Maximization and the Cost of Capital." *Quarterly Journal of Economics* 93 (3): 433–46.
- Auerbach, Alan J. 1981. "A Note on the Efficient Design of Investment Incentives." *Economic Journal* 91 (361): 217–23.
- Auerbach, Alan J. 1983. "Taxation, Corporate Financial Policy and the Cost of Capital." *Journal of Economic Literature* 21 (3): 905–40.
- Auerbach, Alan J. 2002. "Taxation and Corporate Financial Policy." In *Handbook of Public Economics*, Vol. 3, edited by Alan J. Auerbach and Martin Feldstein, 1251–92. Amsterdam: Elsevier.
- Auerbach, Alan J., and Yuriy Gorodnichenko. 2013. "Output Spillovers from Fiscal Policy." *American Economic Review* 103 (3): 141–46.
- Bates, Thomas W., Kathleen M. Kahle, and Rene M. Stulze. 2009. "Why Do U.S. Firms Hold So Much More Cash Than They Used To?" *Journal of Finance* 64 (5): 1985–2021.
- Bertrand, Marianne, Esther Dufo, and Sendhil Mullainathan. 2004. "How Much Should We Trust Differences-in-Differences Estimates?" *Quarterly Journal of Economics* 119 (1): 249–75.
- Blouin, Jennifer L., Jana S. Raedy, and Douglas A. Shackelford. 2011. "Dividends, Share Repurchases, and Tax Clienteles: Evidence from the 2003 Reductions in Shareholder Taxes." *Accounting Review* 86 (3): 887–914.
- Bond, Steve R., Michael P. Devereux, and Alexander Klemm. 2007. "Dissecting Dividend Decisions: Some Clues about the Effects of Dividend Taxation from Recent UK Reforms." In *Taxing Corporate Income in the 21st Century*, edited by Alan J. Auerbach, James R. Hines, and Joel Slemrod, 41–75. Cambridge: Cambridge University Press.
- Bradford, David F. 1981. "The Incidence and Allocation Effects of a Tax on Corporate Distributions." *Journal of Public Economics* 15 (1): 1–22.
- Bradley, Sebastian, Estelle Dauchy, and Makoto Hasegawa. 2018. "Investor Valuations of Japan's Adoption of a Territorial Tax Regime: Quantifying the Direct and Competitive Effects of International Tax Reform." *International Tax and Public Finance* 25 (3): 581–630.
- Budd, John W., Jozef Konings, and Matthew J. Slaughter. 2005. "Wages and International Rent Sharing in Multinational Firms." *Review of Economics and Statistics* 87 (1): 73–84.
- Campbell, John L., James A. Chyz, Dan S. Dhaliwal, and William C. Schwartz Jr. 2013. "Did the 2003 Tax Act Increase Capital Investments by Corporations?" *Journal of the American Taxation Association* 35 (2): 33–63.
- Chalk, Nigel A., Michael Keen, and Victoria J. Perry. 2018. "The Tax Cuts and Jobs Act: An Appraisal." IMF Working Paper 18/185.
- Chetty, Raj, and Emmanuel Saez. 2005. "Dividend Taxes and Corporate Behavior: Evidence from the 2003 Dividend Tax Cut." *Quarterly Journal of Economics* 120 (3): 791–833.
- Chetty, Raj, and Emmanuel Saez. 2010. "Dividend and Corporate Taxation in an Agency Model of the Firm." *American Economic Journal: Economic Policy* 2 (3): 1–31.
- de Mooij, Ruud A., and Sjef Ederveen. 2003. "Taxation and Foreign Direct Investment: A Synthesis of Empirical Research." *International Tax and Public Finance* 10 (6): 673–93.
- Desai, Mihir A., C. Fritz Foley, and James R. Hines. 2001. "Repatriation Taxes and Dividend Distortions." *National Tax Journal* 54 (4): 829–51.
- Dharmapala, Dhammika, C. Fritz Foley, and Kristin J. Forbes. 2011. "Watch What I Do, Not What I Say: The Unintended Consequences of the Homeland Investment Act." *Journal of Finance* 66 (3): 753–87.
- Dharmapala, Dhammika, and Nadine Riedel. 2013. "Earnings Shocks and Tax-Motivated Income-Shifting: Evidence from European Multinationals." *Journal of Public Economics* 97: 95–107.
- Dischinger, Matthias, and Nadine Riedel. 2011. "Corporate Taxes and the Location of Intangible Assets within Multinational Firms." *Journal of Public Economics* 95 (7–8): 691–707.
- Egger, Peter, Valeria Merlo, Martin Ruf, and Georg Wamser. 2015. "Consequences of the New UK Tax Exemption System: Evidence from Micro-Level Data." *Economic Journal* 125 (589): 1764–89.

- Feld, Lars P., and Jost H. Heckemeyer.** 2011. "FDI and Taxation: A Meta-study." *Journal of Economic Surveys* 25 (2): 233–72.
- Foley, Fritz C., Jay C. Hartzell, Sheridan Titman, and Garry Twite.** 2007. "Why Do Firms Hold So Much Cash? A Tax-Based Explanation." *Journal of Financial Economics* 86 (3): 579–607.
- Gopinath, Gita, Şebnem Kalemli-Özcan, Loukas Karabarbounis, and Carolina Villegas-Sanchez.** 2017. "Capital Allocation and Productivity in South Europe." *Quarterly Journal of Economics* 132 (4): 1915–67.
- Gourio, Francois, and Jianjun Miao.** 2011. "Transitional Dynamics of Dividend and Capital Gains Tax Cuts." *Review of Economic Dynamics* 14 (2): 368–83.
- Graham, John R., Michelle Hanlon, and Terry J. Sheylin.** 2010. "Barriers to Mobility: The Lockout Effect of U.S. Taxation of Worldwide Corporate Profits." *National Tax Journal* 63 (4): 1111–44.
- Graham, John R., and Mark T. Leary.** 2018. "The Evolution of Corporate Cash." *Review of Financial Studies* 31 (11): 4288–344.
- Grubert, Harry.** 1998. "Taxes and the Division of Foreign Operating Income among Royalties, Interest, Dividends and Retained Earnings." *Journal of Public Economics* 68 (2): 269–90.
- Grubert, Harry, and John Mutti.** 2000. "Do Taxes Influence Where U.S. Corporations Invest?" *National Tax Journal* 53 (4): 825–39.
- Hanlon, Michelle, Rebecca Lester, and Rodrigo Verdi.** 2015. "The Effect of Repatriation Tax Costs on U.S. Multinational Investment." *Journal of Financial Economics* 116 (1): 179–96.
- Hartman, David G.** 1985. "Tax Policy and Foreign Direct Investment." *Journal of Public Economics* 26 (1): 107–21.
- Hasegawa, Makoto, and Kozo Kiyota.** 2017. "The Effect of Moving to a Territorial Tax System on Profit Repatriation: Evidence from Japan." *Journal of Public Economics* 153: 92–110.
- Heckman, James J., Hidehiko Ichimura, and Petra E. Todd.** 1997. "Matching as an Econometric Evaluation Estimator: Evidence from Evaluating a Job Training Programme." *Review of Economic Studies* 64 (4): 605–54.
- Hines, James R. Jr.** 1996. "Altered States: Taxes and the Location of Foreign Direct Investment in America." *American Economic Review* 86 (5): 1076–94.
- Hines, James R. Jr., and Eric M. Rice.** 1994. "Fiscal Paradise: Foreign Tax Havens and American Business." *Quarterly Journal of Economics* 109 (1): 149–82.
- HM Treasury and HM Revenue and Customs.** 2007. "Taxation of the Foreign Profits of Companies: A Discussion Document." <https://www.treasury.org/ACTmedia/TaxationForeignProfits.pdf>.
- Imbens, Guido W., and Jeffrey M. Wooldridge.** 2007. "What's New in Econometrics? Lecture 10: Differences-in-Differences Estimation." Speech, NBER Summer Institute Methods Lectures, East Lansing, MI, July 31, 2007.
- IMF.** 2014. *Spillovers in International Corporate Taxation*. Washington, DC: IMF.
- Kalemli-Ozcan, Şebnem, Bent Sørensen, Carolina Villegas-Sanchez, Vadym Volosovych, and Sevcen Yesiltas.** 2015. "How to Construct Nationally Representative Firm Level Data from the ORBIS Global Database." NBER Working Paper 21558.
- King, Mervyn A.** 1974. "Taxation and the Cost of Capital." *Review of Economic Studies* 41 (1): 21–35.
- King, Mervyn A.** 1977. *Public Policy and the Corporation*. London: Chapman and Hall.
- Liu, Li, Tim Schmidt-Eisenhohr, and Dongxian Guo.** 2019. "International Transfer Pricing and Tax Avoidance: Evidence from Linked Trade-Tax Statistics in the UK." *Review of Economics and Statistics*.
- Matheson, Thornton, Victoria Perry, and Chandara Veung.** 2014. "Territorial versus Worldwide Corporate Taxation: Implications for Developing Countries." In *Taxation and Development: The Weakest Link?* edited by Richard M. Bird, 147–69. Cheltenham, UK: Edward Elgar Publishing.
- Mathur, Aparna, Nirupama S. Rao, Michael R. Strain, and Stan A. Veuger.** 2016. "Dividends and Investment." *Public Finance Review* 44 (6): 769–87.
- Poterba, James M., and Lawrence H. Summers.** 1984. "New Evidence That Taxes Affect the Valuation of Dividends." *Journal of Finance* 39 (5): 1397–415.
- Slemrod, Joel.** 1990. "Tax Effects on Foreign Direct Investment in the United States: Evidence from a Cross-Country Comparison." In *Taxation in the Global Economy*, edited by Assaf Razin and Joel Slemrod, 79–122. Chicago: University of Chicago Press.
- Yagan, Danny.** 2015. "Capital Tax Reform and the Real Economy: The Effects of the 2003 Dividend Tax Cut." *American Economic Review* 105 (12): 3531–63.