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Investor valuations of Japan's adoption of a territorial tax regime: quantifying the direct and competitive effects of international tax reform

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Abstract This paper examines the impact of Japan's 2009 adoption of a territorial tax regime using event study methods which leverage individual firm characteristics to identify underlying drivers of market reactions. Differences in Japanese firms' foreign and domestic effective tax rates yield an aggregate capitalization effect of ¥4.3 trillion, while firms with less prior foreign exposure and fewer opportunities for tax avoidance experienced relatively larger abnormal returns. We attribute these results to tax savings on existing undistributed foreign earnings, enhanced opportunities for international expansion, and cultural biases against tax planning. Spillovers to the US (through tax or firm competition) appear insignificant.

Keywords International tax reform · Japanese dividend exemption · Territorial taxation · Multinational tax avoidance · Tax competition · Event study

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1 Introduction

Increased globalization has inevitably led discussions about corporate tax reform to be dominated by consideration of international tax issues, tax avoidance, and tax competition, with much debate focusing specifically on the choice over worldwide (residence-based) versus territorial (source-based) taxation. Despite an extensive normative literature in this area,[1] little is known as to the magnitude of the home country effects resulting from significant changes in the tax treatment of multinational firms. Even less is known about the cross-border transmission of tax reform through tax competition and firm competitiveness.

The purpose of this paper is to quantify these domestic and cross-border effects in the context of one of the most important recent instances of international tax reform: Japan's 2009 adoption of a territorial tax regime exempting Japanese corporations' foreign earnings from domestic taxation.[2] Such changes in tax regime ought to influence corporations' spatial and intertemporal investment and repatriation decisions through their direct effects on the cost of dividend repatriation as well as by affecting firms' ability to compete effectively in a global market and by influencing the outlook for reform elsewhere around the globe through tax competition.[3] Accordingly, the Japanese government's primary objectives in adopting a territorial tax system were to encourage repatriations of accumulated foreign earnings, reduce tax compliance costs, and strengthen the ability of Japanese firms to compete effectively in international markets.

Consistent with the most direct of these anticipated incentives, Egger et al. (2015) and Hasegawa and Kiyota (2015) document the existence of an immediate dividend repatriation reaction among UK and Japanese multinationals after each of these reforms, respectively. However, longer-term dynamic effects of dividend exemption may also play an important role, with resulting consequences for firms' short-term and long-term after-tax profitability.[4] In the absence of financial market frictions, forward-looking investors ought to have immediately incorporated the combination of all such effects into stock prices as soon as new information related to Japan's adoption of

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[1] For a description of optimal international tax systems, including the implications of international taxation for capital export, import, and ownership neutrality, see, e.g., Musgrave (1969), Desai and Hines (2003) or Devereux (2008).

[2] Ten OECD countries have adopted territorial tax systems since 2000 (Dittmer 2012), including Iceland (2003), the Czech Republic, Norway, Slovakia (2004), Estonia, Turkey (2005), Poland (2007), Japan, New Zealand, and the UK (2009). Only seven OECD countries still have worldwide tax systems: Chile, Greece, Ireland, Israel, Korea, Mexico, and the US. Brys et al. (2011) describe several such recent reforms, the net effect of which has been that the US's share of real GDP among OECD countries with worldwide tax systems increased from 56.4 to 78.2% between 2005 and 2010.

[3] Toder (2014) indicates that the timing of the Japanese reform was heavily affected by near-simultaneous passage of a similar law in the UK: "the United Kingdom's adoption of its territorial system when it did may have been a tipping point, because Japanese policymakers always follow what is happening in other countries. They periodically send study groups out from the government [. . .] These groups return to Japan, they draw up their comparison tables, and then consider what other countries are doing and why. They typically look at the United States, the United Kingdom, France, Germany, and a few other jurisdictions" (pp. 23–24).

[4] See Egger et al. (2015), Feld et al. (2016) and Liu (2014) for consideration of the effects of territorial regime adoption on foreign investment.

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the permanent dividend exemption became known. We therefore apply an event study methodology to evaluate changes in stock market valuations around multiple event dates related to Japan's transition from a worldwide to territorial tax system for the largest 25 percent of publicly listed Japanese and US domestic and multinational corporations (MNCs). We exploit information with regard to foreign subsidiary location and other key firm characteristics to obtain more precise estimates of the net present value gains resulting from the adoption of a territorial tax regime, while simultaneously attempting to disentangle changes in firm valuation due to underlying tax savings on undistributed earnings versus longer-term effects on tax avoidance, firm competitiveness, and tax competition.[5]

Although direct effects of the Japanese reform ought to have no bearing on firms in other countries (i.e., through changes in effective tax rates), we nevertheless anticipate that investors should be attentive to these latter two effects in other markets. Indeed, Japan and the UK's adoptions of territorial tax systems have been carefully watched as potential harbingers of what might happen in the US if it were to follow suit, with particular attention being paid to the effect of these reforms on multinational tax avoidance and investment activity. In contrast, we should not expect the Japanese reform to have had a significant impact on firms already subject to territorial taxation except through changes in relative firm competitiveness (based on differences in tax-inclusive costs of production). We consequently also include in our analysis a sample of firms and controls for market returns from a well-established territorial system (Germany) to serve as a benchmark against which to measure investor valuations of current and future tax savings in Japan and—indirectly—the US.[6] We have limited power to estimate separate competitiveness effects among the small set of German firms for which we have complete data, however, and we focus mainly on the set of possible effects of the reform on Japanese and US firms for which the inclusion of German stock returns serves as an additional control for confounding market events.[7]

Among nine potential event dates related to the initial proposal, discussion, and eventual adoption of the Japanese dividend exemption system, we narrow our attention to three dates associated with the outcomes of Cabinet meeting discussions and a fourth date related to the release of specific legal details of the proposed policy. We focus on these dates on the grounds that these ought to have proven most informative and deci-

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[5] For additional applications of event study methods to quantifying the perceived benefits of tax avoidance, see Desai and Dharmapala (2007), Hanlon and Slemrod (2009) or Bradley (2013). Sakurada and Nakanishi (2011) also examine investor reactions to news of the Japanese dividend exemption, albeit for only a single event date and a small selected sample of large Japanese MNCs.

[6] Germany's territorial tax regime was adopted in 1920, and current law (in place since 2001) features a 95% dividend exemption similar to the system adopted in Japan, albeit with a lower corporate tax rate (i.e., 30.2% since 2008 versus 40.69% in Japan during this time period). Germany's economy is also closest in size among all territorial regimes to the Japanese and US economies and thus presents a natural comparison group. Closer to Japan, only Singapore and Australia had territorial tax systems in 2008, but their economies are arguably very different.

[7] Results for the 47 German firms included in our analyses provide no credible evidence of negative investor reactions surrounding the Japanese events. The main purpose of incorporating German data is to better account for global financial market developments. Full results showing German stock market responses are available from the authors upon request.

sive given the structure of Japan's annual tax reform process,[8] thereby ruling out several other events that were coincidentally marked by major developments in the ongoing financial crisis.[9] We find that each of the three events related to Cabinet meetings is associated with significant cumulative abnormal stock returns (CARs) among Japanese firms across a variety of empirical specifications that control for key firm characteristics which ought to be directly impacted by Japan's territorial reform, whereas US firms do not appear to be impacted, at least in any consistent or statistically discernible manner.

Predictably, abnormal returns cumulated over the sequence of these four events support the view that Japanese MNCs facing lower effective tax rates on their foreign operations would stand to benefit disproportionately from the reform. Controlling for firm liquidity, a 10% point increase in our measure of the repatriation tax savings rate is associated with a 0.9% increase in market capitalization as of the last Cabinet meeting prior to the law's enactment. This effect translates to a roughly ¥4.3 trillion increase in aggregate market capitalization for Japanese MNCs, an amount strikingly similar to predictions based on a simple application of the average tax savings rate in our sample to estimates by the Ministry of the Economy, Trade, and Industry (METI) at the time of the reform, which pointed to ¥17 trillion (roughly 3.4% of GDP) in undistributed profits of first- and second-tier subsidiaries as of the end of fiscal year 2006, with anticipated growth of another ¥2–3 trillion per year going forward.[10]

Despite this important source of perceived gains in after-tax profitability among Japanese MNCs, however, the largest beneficiaries of the reform among Japanese firms *as a group* appear to have been domestic firms, with net gains in firm valuation amounting to just over 3% of market capitalization. More broadly, *smaller* firms—including smaller MNCs—experienced relatively larger abnormal stock returns than their larger multinational counterparts.

One explanation for this result is that investors anticipated smaller firms to reap substantial benefits from reduced tax compliance costs and enhanced competitiveness in relation to opportunities for international expansion, consistent with one of the primary objectives of the dividend exemption system. Indeed, 45% of domestic Japanese firms in our analysis established new foreign operations between 2012 and 2015, whereas only 13% of comparable domestic US firms became multinationals over this same period.

Absent the use of more detailed firm attributes we cannot nevertheless rule out that the stock market performance of domestic firms as a group was not also dispropor-

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[8] According to Japanese tax practitioners, there should have been no remaining doubts beyond the final January 2009 Cabinet meeting with respect to both passage of the proposal into law 2 months later and the details of the new policy: "draft legislation is delivered to the Cabinet in January for review and approval. The final legislation is completed in February. It's delivered to the National Diet usually during late February. And, in March, it is virtually always passed to go into effect as of April 1" (Toder 2014, p. 25).

[9] Including our historical estimation period, publicly listed Japanese and US firms of all types experienced cumulative losses of 40–60% of stock market capitalization between April 2007 and April 2009. Identification hence rests on our ability to distinguish event-driven market reactions from a profoundly negative and unstable market environment.

[10] By comparison, US multinationals repatriated a total of $362 billion (about 2.9% of 2006 US GDP) under the terms of the American Job Creation Act's temporary 85% dividends received deduction over the period 2004–2006, most of which occurred in 2005 (Redmiles 2008).

tionately impacted by confounding financial market events; hence, our motivation for examining investor reactions in relation to firm characteristics more narrowly tied to the potential effects of the reform. Among these, Japanese multinationals with at least one subsidiary located in a tax haven jurisdiction or multinationals operating in more intangible-intensive industries tended to be unaffected or even fare worse than other MNCs, suggesting that future tax avoidance opportunities and strategic income reallocation (based on pre-existing tax planning arrangements) were not seen by investors as being beneficial once pre-reform foreign effective rates were taken into account. This corroborates the widespread perception of Japanese firms as dutiful taxpayers with little interest in tax planning.[11] Moreover, the absence of restrictions on related party borrowing combined with the application of anti-avoidance rules involving "Specified Foreign Subsidiaries" (i.e., firms located in low-tax countries) both before and after the reform may have rendered the dividend exemption system largely irrelevant for more sophisticated firms with pre-established tax mitigation strategies, while simultaneously yielding no immediate benefits for more liquidity-constrained firms. Worse yet, firms that were previously reliant on cross-crediting of foreign tax credits between income streams to reduce their Japanese tax obligations may even have expected their tax burden to rise under the dividend exemption regime due to the elimination of foreign tax credits tied to dividend payments (Clausing 2015). For all of these reasons, investors may have only capitalized the shorter-term gains attributable to tax savings on repatriated earnings among cash-rich firms (based on pre-reform foreign effective tax rates) or to lower-cost opportunities for domestic firms to establish new (and tax-efficient) foreign operations.[12]

The remainder of the paper is organized as follows: Part 2 describes the relevant details of the Japanese tax reform, including our choice of event dates leading up to its implementation; Part 3 explains our event study methodology and summarizes our conceptual predictions; Part 4 documents the sources and principal characteristics of the merged parent- and subsidiary-level data and describes the construction of our main variables; Part 5 presents the primary results of our analysis along with a set of robustness checks, and Part 6 concludes.

2 Japan's dividend exemption system

2.1 Tax reform

Prior to April 2009, Japan employed a worldwide tax system to tax Japanese corporations' foreign-source income upon repatriation while allowing tax credits for foreign corporate income taxes and withholding taxes on dividend, royalty, andinterest

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[11] See, for example, Toder (2014, p. 24) and Altshuler et al. (2015, pp. 24–25) or Takashima (2009) who argue that (i) many Japanese corporations lack a full awareness of the importance of international tax and accounting strategies and thus tend to bear extra tax costs that they could otherwise avoid, (ii) Japanese companies tend to assume that taxes are unavoidable and are to be paid to the government as a matter of loyalty or patriotism, and (iii) Japanese corporations lack sufficient human resources for tax planning.

[12] Among the set of foreign subsidiaries established between 2012 and 2015 by formerly domestic-only firms, those owned by Japanese parents were more than 5 times more likely to be located in tax havens than those owned by US parents.

payments. Beginning in early 2008, the Japanese government became increasingly concerned that this system of worldwide taxation was inducing firms to accumulate excessive undistributed foreign earnings to avoid Japanese taxation. A subcommittee on international taxation at the METI—convened to study the possibility of a dividend exemption system—expressed some concern about the increased incentives for multinational tax avoidance and income reallocation that a territorial regime would provide but ultimately concluded that such a system could achieve revenue neutrality. The subcommittee instead emphasized positive aspects of a dividend exemption system, including the elimination of distortions related to the timing of repatriations, the stimulation of dividend remittances and domestic investment, and simplification of the international tax system as it pertained to existing multinationals and smaller firms intent on expanding overseas to remain competitive (e.g., by eliminating evidentiary requirements for the purposes of claiming foreign tax credits associated with dividend remittances).

The Japanese government thus proceeded to adopt a dividend exemption system whereby 95% of dividends remitted by foreign affiliates to their Japanese parents would be exempt from domestic taxation (effective as of the first accounting year beginning on or after April 1, 2009). Under this system, the remaining 5% of nonexempt dividends are regarded as expenses incurred by parent firms for earning foreign income and are included in the calculation of Japanese taxable income.[13] Moreover, in order to qualify for dividend exemption, a parent firm must have held at least 25% of the shares of its affiliate for at least 6 months as of the dividend declaration date, and foreign tax credits no longer apply to any portion of foreign dividends, including dividend withholding taxes imposed by host countries. Other types of foreign-source income, including royalties, interest payments, income earned by foreign branches, and capital gains, remain currently taxable in Japan, with the continued provision of offsetting credits for foreign taxes paid under Japan's direct foreign tax credit system. Controlled foreign corporation (CFC) regulations and other anti-avoidance rules were only slightly modified under the 2009 reform to make the treatment of foreign dividends paid by CFCs (known as "Specified Foreign Subsidiaries" in Japan) consistent with the dividend exemption provisions but otherwise exist to enforce current taxation of CFC income from all sources.[14]

2.2 Event dates

As with most policy reforms, adoption of the Japanese dividend exemption arose over the course of many months out of a series of discussions, proposals, and pronouncements. Table 1 summarizes the key developments identified by Sakurada and Nakanishi (2011) which led to the 2009 reform (corroborated by our reading of Japanese media reports). This yields an initial set of nine candidate event dates upon which to base our

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[13] Expenses corresponding to these 5% of repatriated dividends are assumed to be deducted from the taxable incomes of parent firms at the time of investment, and thus are not exempted upon repatriation under the new exemption system.

[14] For more details about the reform, see, e.g., PricewaterhouseCoopers (2009), Deloitte Touche Tohmatsu (2009), or http://japantax.org/?p=590.

Table 1 Timeline of prominent events related to Japan's dividend exemption

May 9, 2008	Minister Akira Amari instructs the Ministry of Economy, Trade and Industry (METI) to examine implementation of a foreign income exemption system
June 27, 2008	Cabinet approves "Basic Policies for Economic and Fiscal Reform 2008," including tax reform to stimulate profit repatriation by Japanese multinational corporations (MNCs)
August 18, 2008	The *Nihon Keizai Shimbum* prints advance details of the METI's August 22 interim report, "Repatriations of Foreign Profits by Japanese Enterprises: Toward the Introduction of a Dividend Exemption Regime"
October 1, 2008	Prime Minister Taro Aso indicates support for introduction of a dividend exemption system before full House of Representatives
November 28, 2008	Government Tax Commission releases their "Policy Recommendation for Tax Revisions for Fiscal Year 2009," including introduction of dividend exemption
December 12, 2008	Liberal Democratic Party releases their "Large Package of Tax Revisions for Fiscal Year 2009," including introduction of dividend exemption
December 19, 2008	Ministry of Finance releases their endorsed version of "Large Package of Tax Revisions for Fiscal Year 2009," including introduction of dividend exemption
January 23, 2009	Cabinet approves "The Outline of Tax Revisions for Fiscal Year 2009," including dividend exemption provisions
March 27, 2009	Dividend exemption provisions are passed into law

analysis of stock market reactions. Detailed descriptions of these events are provided in Appendix A, beginning with METI Minister Akira Amari's May 9, 2008, announcement that he had instructed his ministry to examine the possibility of switching from a foreign tax credit system to a foreign income exemption system and ending with the March 27, 2009, passage into law of the resulting reform.

While all nine candidate events should have enhanced the likelihood of enactment of a dividend exemption system, it is likely that investors would have shown stronger reactions to certain events than others given the variation in the amount of new information revealed on each occasion along with the perceived authoritativeness of its source.[15] Indeed, somewhat unique to the Japanese political process is the fact that once set in motion, steps leading to tax reform follow a relatively well-defined sequence as part of Japan's annual tax policy review. We thus expect the Japanese government's first public announcement on May 9, 2008, of its intent to seriously consider the adoption of a territorial tax regime to constitute an especially important

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[15] The absence of events which would have *reduced* the probability of adoption of a territorial tax system does not necessarily imply strictly positive reactions. Certain events may have been viewed in a neutral or even negative manner relative to previous expectations as more concrete details such as those pertaining to CFC rules or foreign tax credits emerged.

event in terms of its informational content, authority, and surprise. Notwithstanding the ruling Liberal Democratic Party's lack of majority control over the Upper House from 2007 to 2009,[16] we expect investors in Japan more generally to be particularly attentive to the results of Cabinet meetings, whose proposed tax reforms are virtually always enacted (Toder 2014) and hence likely to be viewed as decisive. Beyond May 9, these include the events of June 27, 2008, and January 23, 2009. From a purely informational perspective, we also expect the release of details of an August 2008 interim report by the METI to have substantially reduced investor uncertainty regarding the provisions of the proposed reform, though not necessarily in an unambiguously positive or negative manner.

3 Event study methodology

3.1 Standard market model approach

In order to evaluate the magnitude of the change in expected firm after-tax profitability due to the release of news pertaining to the Japanese tax reform as a function of MNC characteristics, we adopt a variant of the standard market model event study approach from Ball and Brown (1968) and Fama et al. (1969) using a dummy variable procedure first proposed by Gibbons (1980) to allow for single-step estimation of cumulative abnormal returns and associated firm characteristic interactions.[17]

Under the standard market model approach, ordinary stock returns r_{it} for listing i in period t are modeled as a function of the average return on an appropriately chosen market portfolio, R_t:

$$r_{it} = \alpha_i + \beta_i R_t + \epsilon_{it} \tag{1}$$

where r and R are each computed net of the risk-free rate on 1-month US Treasury bills. Event-induced abnormal stock returns (AR) over event period E are then calculated as the out-of-sample prediction errors obtained by applying the parameters $\widehat{\alpha}_i$ and $\widehat{\beta}_i$ estimated from Eq. (1) over a pre-event historical estimation period of length T, $t = -T, -T+1, \ldots, -1$ to contemporaneous stock prices and market returns, such that:

$$\widehat{\mathrm{AR}}_{it}^E = r_{it} - \widehat{r}_{it} = r_{it} - (\widehat{\alpha}_i + \widehat{\beta}_i R_t), \quad \forall t = T_0^E, \ldots, T_1^E \tag{2}$$

In order to allow for pre-event information leakage or gradual post-event information dissemination, the duration of the event window, $T_1^E - T_0^E$, is typically greater than a single period, with the resulting statistic of interest being the cumulative abnormal return (CAR): $\widehat{\mathrm{CAR}}_{it}^E = \sum_{s=T_0^E}^t \widehat{\mathrm{AR}}_{is}^E$

Several adjustments have been proposed for the calculation of the corresponding standard errors and test statistics to account for potential intertemporal autocorrelation,

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[16] Because of this situation, referred to as the "twisted" Diet, the passage of the bill for the tax reform of 2008 was delayed from April 1, 2008, to April 30, for example.

[17] See MacKinlay (1997), Binder (1998) or Corrado (2011) for reviews of differing event study methodologies and associated statistical issues.

event-induced return volatility, and cross-sectional correlation of abnormal returns inherent to a study of investor reactions involving clustered events (i.e., affecting multiple firms simultaneously). In the results that follow, we begin by presenting broad evidence of abnormal stock returns around key event dates, emphasizing those that are largely robust to the application of several parametric and nonparametric test statistic corrections designed to address some or all of these econometric concerns, including the Patell (1976) test, the Boehmer et al. (1991), or BMP, test, the Corrado and Zivney (1992) nonparametric rank test, plus cross-sectionally adjusted versions of each of these tests developed by Kolari and Pynnönen (2010). Even the most sophisticated econometric corrections are inappropriate for evaluating the source of these ARs in relation to firm characteristics, however.

3.2 Single-step approach

A better suited methodology for estimating possible such relationships in a single step consists of estimating Eq. (1) with the inclusion of a sequence of event dummy variables D_s for each date s in the event window following the procedure outlined in Salinger (1992) and Binder (1998):

$$r_{it} = \alpha_i + \beta_i \mathbf{R_t} + \sum_{s=T_0^E}^{T_1^E} (\gamma_s D_s + \boldsymbol{\delta_s} \mathbf{X_i} \cdot D_s) + \epsilon_{it}$$

$$\forall i = 1, \ldots, N; \quad \forall t = -T, -T+1, \ldots, -1; \quad T_0^E, \ldots, T_1^E. \qquad (3)$$

Firm-specific average returns α_i and market co-movement β_i over the historical estimation period carry over from the standard model, while $\mathbf{X_i}$ represents a vector of time-invariant pre-reform firm characteristics $x_{i1}, x_{i2}, \ldots, x_{ik}$ which are allowed to affect stock market valuations through their interaction with the event date indicators.[18] Setting D_s to 1 on event date s and 0 otherwise, we can estimate date s abnormal returns directly as $\mathrm{AR}_{is} = \gamma_s + \boldsymbol{\delta_s} \mathbf{X_i}$. Vector element δ_{sk} thus captures characteristic x_k's average effect on firms' date s abnormal returns.

Taken one step further, CARs can be readily recovered as shown in Salinger (1992) by redefining the event dummies such that D_s equals 1 on date s, -1 on date $s+1$, and 0 otherwise.[19] This approach—closely resembling the procedure followed by Auerbach and Hassett (2005)—represents the core econometric technique employed in our analysis and has the important virtue of facilitating the estimation of average CARs in

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[18] This approach allows simultaneous estimation of firm fixed effects and market co-movement parameters alongside event date-specific interaction effects involving firm- or industry-level characteristics.

[19] To see this, consider the simplest case with a 2-period event window. Equation (3) may thus be rewritten (suppressing the idiosyncratic error term for brevity) as $r_{it} = \alpha_i + \beta_i \mathbf{R_t} + \mathrm{AR}_{i1} \cdot W_1 + \mathrm{AR}_{i2} \cdot W_2$, with $W_s = 1$ on date s and 0 otherwise. By definition of cumulative abnormal returns, $\mathrm{CAR}_1 = \mathrm{AR}_1$ and $\mathrm{AR}_s = \mathrm{CAR}_s - \mathrm{CAR}_{s-1}$ for all subsequent dates in the event window, such that this last expression can be transformed into a function of CARs only: $r_{it} = \alpha_i + \beta_i \mathbf{R_t} + \mathrm{CAR}_{i1} \cdot W_1 + (\mathrm{CAR}_{i2} - \mathrm{CAR}_{i1}) \cdot W_2 = \alpha_i + \beta_i \mathbf{R_t} + \mathrm{CAR}_{i1} \cdot (W_1 - W_2) + \mathrm{CAR}_{i2} \cdot W_2$. Specifying $D_1 \equiv W_1 - W_2$ and $D_2 \equiv W_2$ completes the desired transformation.

a single step, including their interactions with key firm characteristics. Furthermore, CAR standard errors estimated in this manner are robust to intertemporal autocorrelation within the event window, thereby eliminating one of the primary econometric concerns affecting most event studies.[20]

R includes separate measures of Japanese as well as US and German market returns. These last returns are used primarily to control for potential confounding factors associated with the global financial crisis but also to allow events in Japan to have repercussions in other markets. This requires that we estimate four fixed effects per firm (i.e., a single α_i plus three β_i's) in our analysis, thereby introducing computational limitations which require that we use a selected sample of firms, as we describe in the next section. Consistent with a majority of event studies focused on these three countries, we use the daily return on the Frankfurt Stock Exchange's (FRA) CDAX; the overall daily value-weighted market return on all New York Stock Exchange (NYSE), NASDAQ, and American Stock Exchange (AMEX) stocks; and the daily return on the Tokyo Stock Exchange's (TSE) Tokyo Stock Price Index (TOPIX) to capture market movements in Germany, the US, and Japan, respectively (Corrado and Truong 2008). Due to differences in market trading hours for the TSE and the US and Frankfurt exchanges, we allow US and German market returns on date t to influence calendar date $t + 1$ stock prices listed on the TSE.[21] Conversely, the fact that US and German markets open after the close of the Japanese markets recommends using date t market data to identify the impact of events surrounding the Japanese dividend exemption on valuations of US and German shares. Stock market holidays in either the Japanese, US, or German markets are recorded as zero-return dates from the perspective of each of the other countries.

3.3 Model predictions

Estimation of (3) enables the decomposition of CARs according to the various channels by which adoption of a territorial tax regime might influence firm after-tax profitability. Among Japanese firms, these include effects on real activity (i.e., dividend repatriations and foreign investment) as well as on reported after-tax profit margins via income

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[20] Smith et al. (1986) estimate Eq. (3) as a system of equations in order to address potential cross-sectional correlation among firm ARs. Lack of contemporaneous (daily) variation in firm characteristics precludes our ability to employ such a technique, which would moreover be constrained by limits on the number of cross-equation restrictions that may be imposed in order to recover average CARs for a large sample of publicly traded firms. The most popular approach to addressing cross-sectional correlation in the event study literature—estimation of aggregate portfolios of stock returns (Kolari and Pynnönen 2010)—assumes away the possibility of heterogeneous policy effects and is consequently equally uninteresting for our purposes. Our panel estimation approach can instead be viewed as a hybrid of these techniques, whereby conditioning on firm characteristics may be viewed as yielding a set of flexibly defined portfolios and should as such largely mitigate—if not eliminate—concerns associated with cross-sectional correlation.

[21] Historically, an additional econometric concern in event studies has been the issue of nonsynchronous trading, whereby the timing of realized market returns and individual stock returns differ. Scholes and Williams (1977) show, for example, that this can yield biased and inconsistent estimates of the degree of co-movement with the market, with the direction of the bias depending on the relative frequency of trading. An extension of this is unavoidable in the present context. Brown and Warner (1985) present evidence that this does not preclude valid inference in the case of the basic market model.

reallocation, tax compliance costs, and firm competitiveness. The standard theory suggests that dividend exemption should encourage current and future repatriation of reported earnings from lower-taxed foreign jurisdictions, where reported earnings depend on both real investment and profit shifting. Hence, as the Japanese reform reduced the tax on repatriated earnings, it should also simultaneously increase dividend remittances, foreign investment, and income reallocation toward low-tax subsidiaries. By reducing tax compliance costs for multinational corporations (e.g., recordkeeping for foreign tax credit purposes), the Japanese reform was also intended to lower fixed costs associated with establishing and maintaining foreign operations. Each of these effects should generate tax and nontax cost savings and thereby enable firms to compete more effectively in foreign markets.

As described in more detail in Sect. 4.2 below, our empirical strategy includes the potential tax savings from dividend repatriation as an important element of vector **X**, and employs proxies for the ability to exploit new tax avoidance opportunities and lower compliance costs for international expansion. The contribution of each of these elements x_k of vector **X** to our date-s average CARs is estimated by $\hat{\delta}_{sk} x_k$. Consequently, $\hat{\gamma}_s$ captures all remaining unobserved sources of variation in anticipated changes in firm after-tax profitability. This includes variation due to firm competitiveness effects, but also unobserved determinants of either income shifting ability or compliance costs. We therefore look to other countries for evidence of effects on firm competitiveness.

The US and Germany span the relevant range of international tax systems matching Japan's pre- and post-reform regimes, respectively. Tax competition might thus induce comparable effects in the US market as in Japan, albeit scaled by the degree to which the Japanese reform was viewed as affecting the likelihood of a similar regime being adopted in the US in the near future. No such response should arise in the German market given its existing 95% dividend exemption regime, however, such that only negative spillovers from Japanese firms' reduced tax-inclusive cost of foreign operations might explain significant reactions in the German market.[22] Japanese firms' improved competitive position in foreign markets could have a similar negative impact on US firms, though tempered by possible offsetting effects associated with tax competition.

4 Data

4.1 Stock returns

Stock market capitalization data on Japanese, US, and German publicly listed companies are drawn from Thomson Reuters Datastream and cover all stocks listed on the TSE, NYSE, NASDAQ, AMEX, and FRA. Listings which did not exist over the entire period 2007–2009 are dropped, as are listings for which market capitalization information remained unchanged for more than 20 consecutive trading days, thereby

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[22] For reasons owing partly to data availability, we are unable to credibly identify the existence of any such negative impacts on German firm valuations. We cannot consequently distinguish firm competitiveness effects from other sources of remaining variation in ARs, despite our intent.

yielding an initial set of 2795 Japanese listings, 2975 US listings, and 585 German listings. Daily stock returns are computed as the percent change in gross market capitalization from the prior trading day, net of the risk-free rate on 1-month US Treasury bills.[23,24] Index data for the Japanese TOPIX and German CDAX are likewise drawn from Datastream, while returns on a value-weighted portfolio of all NYSE, NASDAQ, and AMEX stocks are provided by Kenneth French.

4.2 Firm characteristics

Stock return data are subsequently merged by SEDOL identification number with financial statement data for publicly listed Japanese and US global ultimate owners (i.e., parent corporations) from Bureau van Dijk's Orbis database.[25] In addition to reporting balance sheet and income statement information, the Orbis data also contain information on industrial classification, country, and complete ownership linkages. We are thereby able to link publicly listed firms' financial statements to those of all of their majority-owned domestic and foreign subsidiaries.[26] Matching parent and subsidiary firms in this manner over the period 2005–2009 yields 3588 (11,035) publicly listed Japanese (US) parent corporations along with 44,474 (186,968) linked subsidiaries.

As described in further detail in Appendix B, we exclude a large fraction of firms due to erroneous or missing data, as well as public firms that are not truly self-owned, government contractors, and companies in the financial and real estate sectors (NAICS codes 52 and 53).[27] Due to computational limitations associated with the single-step estimation of multiple market co-movement parameters per firm, we utilize only the largest 25% of firms (based on market capitalization as of January 4, 2008) within each nationality and MNC status pair from the resulting sample for which we have all necessary data. Our core estimation sample hence consists of 462 Japanese firms (of which 201 are MNCs) and 450 US firms (of which 328 are MNCs).

Using a combination of income statement and balance sheet data, we construct multiple variables capturing firms' characteristics that relate most closely to the sources

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[23] Datastream does not provide information on ex-dividend returns. Returns based on changes in market capitalization may therefore be influenced by dividend payouts. For this reason (among others) outlying stock market returns and corresponding abnormal return estimates derived from the standard market model are winsorized to the 1st and 99th percentile values from their respective daily distributions. Basic tests suggest only modest sensitivity to the choice of cutoff or outright exclusion of outlying return observations.

[24] Treasury bill rates are courtesy of Kenneth French and interpolated over US stock market holidays for the purposes of stripping out risk-free returns for Japanese and German listings.

[25] We also include analogous information for German parent corporations. The resulting matched sample of publicly traded German firms with complete financial statement information is roughly only one tenth the size of our Japanese or US samples, thereby hindering inference involving German firms. For expositional purposes, we exclude Germany from further discussion.

[26] Due to the static nature of Bureau van Dijk's ownership database, these links are based exclusively on fiscal 2012 ownership information from the time that we accessed the data. We are constrained to treat firm ownership structures as though these were not systematically affected by the Japanese reform in the 3 years following enactment.

[27] We exclude finance and real estate firms from our analysis because of their distinct tax treatment and special sensitivity to market events over the 2008–2009 period.

of cross-sectional variation in abnormal returns discussed in Sect. 3.3.[28] An obvious implication of foreign dividend exemption is that this should favor firms with foreign-source income. Nevertheless, the introduction of territorial taxation may also reduce barriers to the establishment of foreign subsidiaries (e.g., by reducing fixed costs of tax compliance), thereby creating new opportunities for formerly domestic firms. We approach these ambiguous predictions in a preliminary manner by categorizing firms according to a binary indicator of MNC status (I_MNC_i) on the basis of whether firm i was recorded as owning at least one foreign subsidiary. All remaining firms are categorized as domestic-only, with measures of foreign activity coded as zeros where appropriate.[29]

Among multinationals, the benefits from adoption of a territorial tax regime should reflect the rate of tax savings on repatriated earnings. Potential tax savings per dollar of earnings remitted following the reform, TS_i, are hence defined as the difference between pre-reform domestic and foreign effective tax rates (ETRs) measured at the level of the parent firm. Average foreign ETRs ($AETR\_FOR_i$) are computed as the ratio of total tax payments to total taxable income among foreign subsidiaries of parent i, averaged over the 3-year period 2005–2007 to smooth over tax and income realizations and avoid reform-induced endogenous variation in ETRs. Domestic average ETRs ($AETR\_DOM_i$) are calculated analogously as the ratio of total domestic tax payments to total domestic taxable income.[30]

Beyond the immediate tax savings on retained foreign earnings reflected in TS, the nature of the relationship between *long-term* tax savings and the availability of tax minimizing strategies is theoretically ambiguous. On the one hand, the ability to reduce future foreign tax obligations through strategic income reallocation might render a dividend exemption system more valuable by increasing the reward from shifting profits toward low-tax foreign jurisdictions. Intangible-intensive firms, such as those in the pharmaceutical or electronics manufacturing sectors, are commonly believed to have access to more such tax minimization strategies (at lower cost) because of the nature of the underlying assets involved in production (Gravelle 2013). Transactions involving intangible assets present special problems for the application and enforcement of transfer pricing rules due to the nonexistence of comparable goods. The uniqueness of

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[28] See Appendix C for further details on variable construction.

[29] This designation includes MNCs whose foreign operations are deemed immaterial relative to their domestic operations for financial reporting purposes. "Domestic" firms in our sample may therefore include companies with small foreign operations. Conversely, the use of 2012 ownership information due to data limitations implies that certain multinationals may not yet have had foreign operations in 2009. Both sources of mismeasurement will tend to attenuate differences in investor responses vis-à-vis domestic versus multinational firms.

[30] We describe various alternative measures of foreign tax rates in Appendix C.1, which aim to address different concerns associated with possible missing data (e.g., the lack of detailed coverage of minority-owned subsidiaries) and speak to different valuation channels depending on investor expectations about future tax avoidance. Our preferred definition, $TS = AETR\_DOM − AETR\_FOR$, thus reflects the average cost of repatriating pre-reform earnings and implicitly assumes an unchanged future allocation of reported profits between foreign subsidiaries. In contrast, computing tax savings on the basis of the lowest statutory tax rate facing any foreign subsidiary within the MNC group, for example, effectively assumes the adoption of a more aggressive tax planning strategy, whereby *future* foreign profits are reallocated entirely to the parent's lowest-taxed subsidiary.

intangible assets hence makes it difficult to assess appropriate arm's-length transaction prices. Moreover, intangible-intensive firms may also have greater scope for exploiting cross-crediting rules between income sources (e.g., dividends or royalty income) and countries (e.g., high- and low-tax countries) under worldwide taxation.[31] On the other hand, adoption of a territorial regime which only exempts dividend income might mitigate some of the tax benefits associated with cross-crediting and even lead to an increased tax burden among firms that realize a greater proportion of their earnings in the form of royalties (Gravelle 2012; Clausing 2015). More broadly, MNCs that were able to skillfully navigate international tax rules in order to achieve low foreign ETRs and high after-tax rates of return under a worldwide system might see relatively little additional benefit from a reduction in taxes on foreign-source income. We attempt to capture the differential availability of all related tax minimization strategies and the resulting effects of tax reform with a measure of intangible intensity, $INTAN_j$, defined (within country) at the 2-digit industry level.[32, 33]

Along similar lines, we take ownership of at least a single subsidiary in a tax haven jurisdiction as a simple proxy for tax sophistication and thus as a measure of potential gains arising through new opportunities for tax avoidance under a territorial regime. On the one hand, locating a subsidiary in a tax haven increases the benefit from territorial reform because it facilitates funneling of highly taxed foreign profits through low-tax subsidiaries. On the other hand, if ownership of a tax haven subsidiary serves as an indicator of existing (i.e., pre-reform) access to tax minimization strategies, adoption of a dividend exemption system might prove largely unnecessary among these savvier firms (or even detrimental if these strategies are rendered obsolete by the reform). We use existing lists of tax haven jurisdictions based on Hines (2010) and Gravelle (2013) to create a binary indicator to distinguish MNCs with tax haven operations from those without (I_HAVEN_i).[34]

Finally, we also consider the role of liquidity constraints in light of the argument that repatriation taxes inhibit cash constrained firms from exploiting their foreign-source income for purposes of reinvestment. This argument served to motivate a tempo-

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[31] Redmiles (2008) and Gravelle and Marples (2011) report that approximately one half of earnings repatriated under the American Jobs Creation Act of 2004's temporary tax holiday originated in the pharmaceutical and other high technology sectors and were repatriated from predominantly low-tax countries or tax havens. More generally, Altshuler and Grubert (2003) find that about half of the difference in profitability between high- and low-tax countries is due to transfers of intellectual property.

[32] Our preferred measure is adapted from Corrado et al. (2005) and Chen and Dauchy (2017) and is based on aggregate investment in intangible and tangible assets for 19 two-digit industries. See Appendix D for a description of this and alternative proxies for intangible intensity. Measures based on industry-level asset stocks, or defined as asset-weighted averages across subsidiary industries yield qualitatively similar results. Due to the limitations of financial statement information, all such measures are superior to the use of firm-level measures, which necessarily capture only *acquired* intangibles and may be a noisy proxy for firm-level intangible intensity (Lev 2003a, b).

[33] An alternate measure of tax savings based on MNCs' lowest subsidiary tax rate similarly reflects opportunities for future income reallocation (exploiting existing MNC structures) and yields qualitatively similar results. See Appendix C.1 and Appendix F.

[34] Use of an alternate measure of tax haven presence based on the share of all foreign affiliates operating in tax havens yields a similar pattern of results, albeit with less statistical precision.

rary relaxation of US rules with respect to related party borrowing in the midst of the financial crisis and was likewise among the many arguments made in the context of the Japanese tax reform (Tajika et al. 2014).[35] We construct a measure of pre-reform liquidity constraints (LQ_i) based on the average ratio of domestic cash flows to assets, or cash flow "intensity," with larger values denoting less constrained firms.

Beyond the market return terms that are needed to produce reliable estimates of "normal" share price movements and the firm characteristics described above, we also construct a handful of additional variables based on the geographic and sectoral distribution of consolidated assets within MNC groups. Despite our outright exclusion of *parent* firms in the financial and real estate sectors (i.e., NAICS codes 52 and 53, or FIRE) to avoid confounding effects due to the financial crisis, we are reluctant to omit individual subsidiaries (e.g., leasing or finance affiliates) on similar grounds. We consequently define ξ^{FIRE} as measuring the share of total foreign assets attributable to subsidiaries operating in the FIRE sectors in order to account for subsidiaries' direct exposure to the collapse of the global financial sector while simultaneously reflecting variation in possible tax avoidance opportunities involving financial operations. Similarly, we also define ζ^{JP} and ζ^{US} as the share of a parent firm's consolidated worldwide assets held in Japan and the US, respectively (e.g., such that $\zeta^{\text{JP}} = 100\%$ for a domestic Japanese firm), in order to account for variation in the extent of firms' foreign exposure and possible direct bilateral competition across markets.

Each of the above variables is described in Table 2, with additional details given in Appendix C. Table 3 provides summary statistics of the key variables used in our empirical specifications for each country of residence and multinational status among top-quartile firms. Notably, approximately 90% of US firms own at least one subsidiary in a tax haven ($I\_HAVEN = 1$) whereas fewer than 60% of Japanese firms hold tax haven subsidiaries. Because of the high domestic ETRs in Japan, averaging 39.8%, Japanese multinationals on average face relatively large potential tax savings per dollar of repatriated earnings from the reform, larger than the counterfactual amounts for the US ($TS^{\text{JP}} = 0.215$ versus $TS^{\text{US}} = 0.176$).[36]

Not surprisingly, MNCs are significantly larger than their domestic counterparts. MNCs are also generally more intangible-intensive than domestic firms (this latter difference being largest among US firms), and whereas US MNCs are generally less likely to be liquidity-constrained than domestic firms, Japanese MNCs and domestic firms exhibit similar levels of cash flow intensity and are less cash constrained overall than their US counterparts.

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[35] This is despite the fact that Japan has not historically restricted parent corporations from borrowing from their foreign subsidiaries without triggering a repatriation tax on "deemed" dividends, contrary to the United States' use of I.R.C. §956.

[36] Our average AETR measures within domestic or multinational groups are very close to those found by Markle and Shackelford (2012) using Orbis data for a comparable time period.

Table 2 Description of key regression variables

Variable name	Description
I_k	Country indicator, $k \in \{JP, US, DE\}$
I_MNC	Multinational status indicator: $= 1$ for parent firms with at least one foreign subsidiary
I_HAVEN	Tax haven operations indicator: $= 1$ for MNCs with at least one subsidiary in a tax haven
AETR_DOM	Ratio of the sum of taxes paid by all domestic subsidiaries to the sum of all domestic subsidiaries' taxable income over the period 2005–2007
AETR_FOR	Ratio of the sum of taxes paid by all foreign subsidiaries to the sum of all foreign subsidiaries' taxable income over the period 2005–2007
TS	Tax savings rate, defined as the difference between domestic and foreign average effective tax rates, AETR_DOM − AETR_FOR
INTAN	Intangible intensity, defined at the NAICS two-digit industry level for parent firms
LQ[a]	Proxy for *domestic* liquidity constraints measured as cash flow divided by assets, and defined from balance sheet items as the ratio of net income plus depreciation over physical assets, averaged over the period 2005–2007
ζ^k	Ratio of total assets located in country $k \in \{JP, US, DE\}$ to total worldwide assets averaged over the period 2005–2007 (in %)
ξ^{FIRE}	Ratio of total assets held by finance or real estate sector foreign subsidiaries (NAICS codes 52 and 53) to total worldwide assets averaged over the period 2005–2007 (in %)
MC	Market capitalization as of January 3, 2008 (in USD millions)

See Appendix C and Appendix D for details on variable construction and data sources

[a] A more standard approach in the finance literature is to define liquidity constraints as *cash flow intensity* (CF/K) where CF is defined as the sum of earnings before extraordinary items and depreciation, divided by the beginning-of-period net property, plant, and equipment (which proxies for capital stock, K). See, e.g., Fazzari and Peterson (1993), Kaplan and Zingales (1997), Moyen (2004) or Almeida and Campello (2007). This approach is infeasible using Orbis data due to a lack of accurate information on earnings before extraordinary items

5 Results

5.1 Market model returns

An accurate assessment of the potential tax savings of Japanese firms' international operations from the Japanese dividend exemption system requires evaluating the impact of specific firm-level tax and financial characteristics on investor valuations of the Japanese dividend exemption. Before turning to this detailed analysis, we calculate

**Table 3** Summary statistics for Japanese and US firms

Variable	US				Japan			
	Domestic		MNC		Domestic		MNC	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
AETR_DOM	0.299	0.160	0.321	0.157	0.434	0.205	0.398	0.114
AETR_FOR	–	–	0.176	0.208	–	–	0.213	0.206
TS	0	0	0.190	0.184	0	0	0.215	0.176
ζ^{JP}	0	0	0.092	0.599	100	0	94.5	8.37
ζ^{US}	100	0	83.7	22.0	0	0	0.711	5.00
ζ^{DE}	0	0	1.92	5.97	0	0	0.897	2.54
ξ^{FIRE}	0	0	0.814	3.08	0	0	0.455	1.79
I_HAVEN	0	0	0.902	0.297	0	0	0.597	0.492
INTAN	0.223	0.222	0.468	0.195	0.356	0.147	0.383	0.115
LQ	0.289	0.399	0.628	0.572	0.323	0.547	0.397	0.454
MC	4231.2	6070.0	27,071.2	51,459.4	932.1	1270.4	13,581.9	20,098.4
N (subsidiaries)	25.8	41.9	158.1	194.4	11.6	14.0	111.9	125.1
N	122		328		261		201	

Sources: Orbis (financials) and Datastream (market capitalization). Intangible intensity is obtained from the RIETI (Japan) and from the authors' calculations using several sources for the US. All variables are defined in Table 2. See Appendix C and Appendix D for additional details on variable construction and data sources

Summary statistics are shown for firms in the top-quartile sample only, after sample selection. See Appendix B for details

average abnormal returns (AARs) by firm nationality and multinational status as the mean cross-sectional prediction errors derived from estimation of the standard market model (Sect. 3.1) including market portfolio returns drawn from the Japanese, US, and German exchanges over the last 250 trading days ending 20 days before the first May 9, 2008, event. AARs arrayed by country and firm type for our full firm sample are presented for all nine candidate events in Fig. 1 (left column) alongside their corresponding average CARs (ACARs; right column), computed as the running sum of AARs within 5-day event windows centered around each event date. Tests of statistical significance follow Kolari and Pynnönen's (2010) "adjusted BMP" methodology and combine corrections for intertemporal correlation (Patell 1976), event-induced returns volatility (Boehmer et al. 1991), and cross-sectional correlation within firm grouping to avoid invalid inference given our particular event study setting.

Perhaps the most notable feature of the results shown in Fig. 1 is the fact that most events do not appear to have induced significant investor reactions in the Japanese (JP) market, at least within basic firm groupings. Focusing on estimated ACARs (rightmost plots) to capture stock market participants' evolving reactions over a sequence of multiple trading days, only the May 9, October 1, and December 19, 2008, events (subfigures i, iv, and vii, respectively) are characterized by any statistically significant responses, such that the remaining events do not appear to have provided extraordi-
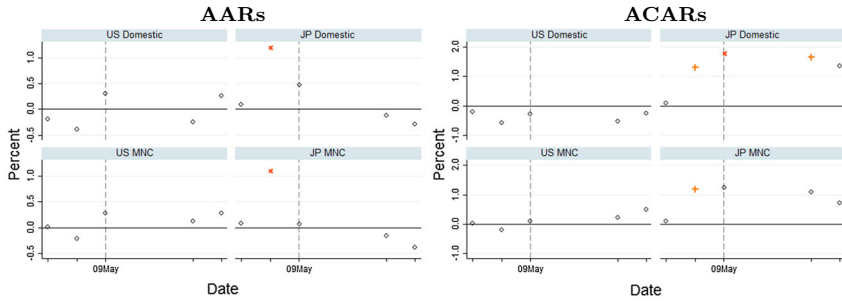
(i) May 9, 2008
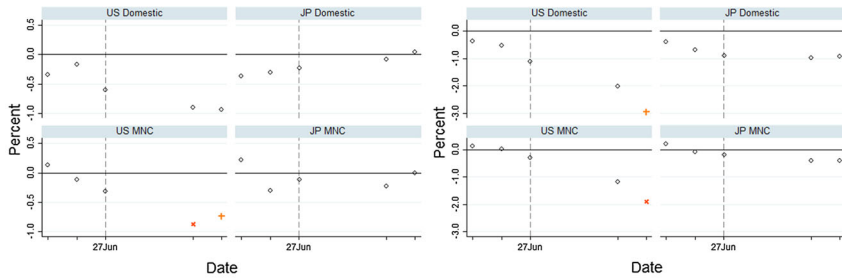
(ii) June 27, 2008
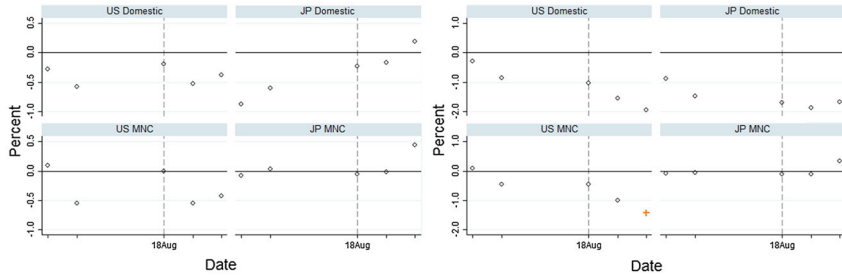
(iii) August 18, 2008
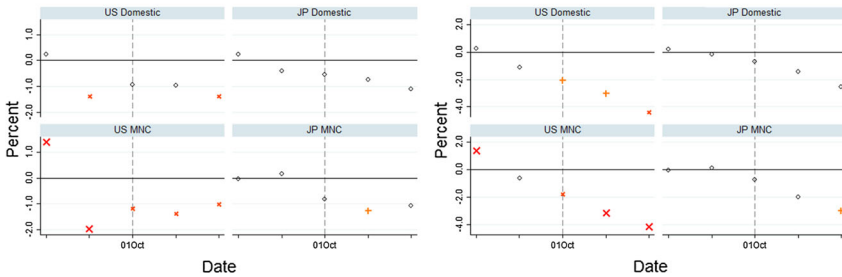
(iv) October 1, 2008

Fig. 1 Average abnormal and cumulative abnormal returns within 5-day event windows by firm nationality and multinational status. +, x, and X denote statistically significant average ARs and CARs at the 10, 5, and 1% levels, respectively, where the corresponding test statistics are based on scaled ARs and CARs and adjusted BMP standard errors following Kolari and Pynnönen (2010). ° are not statistically significant

AARs   ACARs
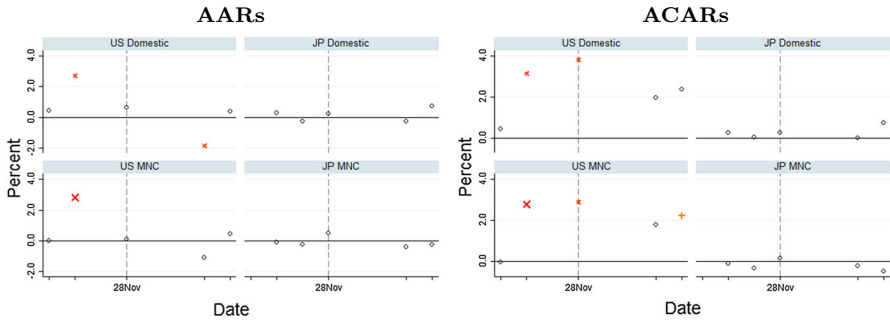
(v) November 28, 2008
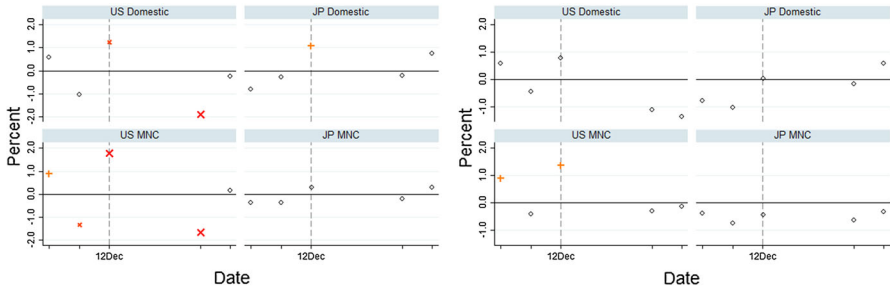
(vi) December 12, 2008
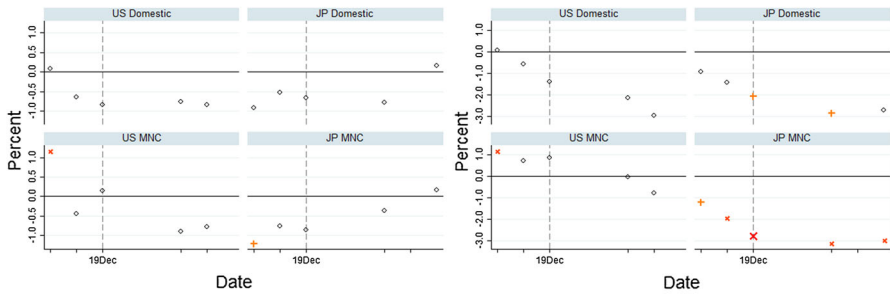
(vii) December 19, 2008
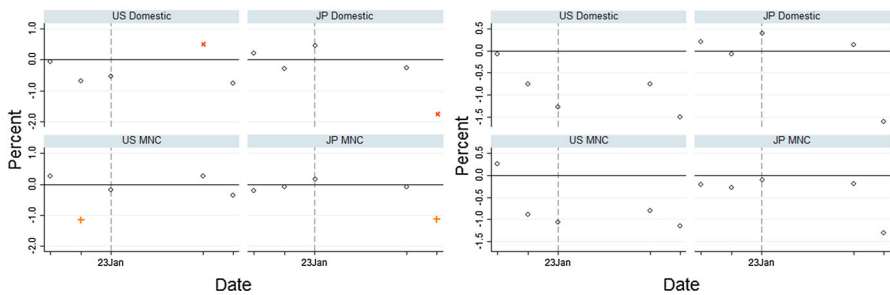
(viii) January 23, 2009

Fig. 1 continued
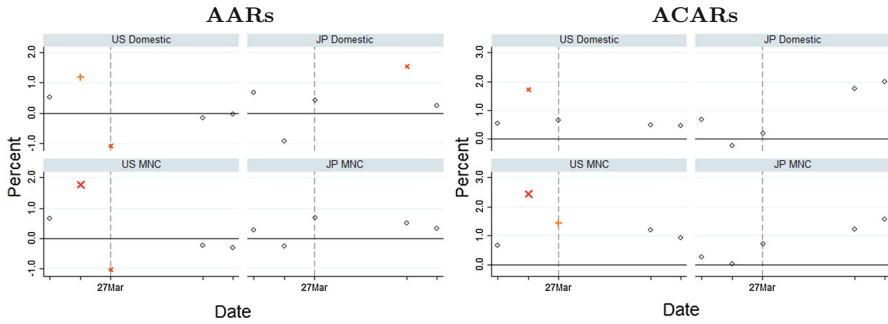
(ix) March 27, 2009

Fig. 1 continued

nary new information regarding the prospects for Japanese tax reform in the aggregate. Of the statistically significant Japanese market reactions—including additional scattered significant AARs on December 12, 2008, and March 27, 2009—these generally appear larger in magnitude among domestic firms than MNCs, which may lend some credence to the idea that one of the objectives of the Japanese tax reform was to facilitate expansion of smaller firms into overseas markets (Toder 2014). Without utilizing more detailed firm financial characteristics, these differences are merely suggestive, however, and we cannot reject the possibility that differences in abnormal returns across domestic and multinational firms may be due to differential impacts of broader movements in financial markets (e.g., such as if MNCs were disproportionately negatively impacted by events associated with the global financial crisis).

Differences in AARs and ACARs across Japanese and US markets in turn provide more compelling evidence of event-induced reactions given the indirect nature of the possible effects of the Japanese reform on US firms. It is therefore noteworthy that the statistically significant 1–2% CARs observed in the Japanese market surrounding the first event (i) are unmet by comparable reactions in the US market, such that the observed effects in Japan are more credibly attributable to the METI announcement—itself evidently either ignored or perceived as unimportant for US firm profitability. In contrast, significant negative CARs in the Japanese market surrounding the Prime Minister's and Ministry of Finance's October 1 and December 19, 2008, dividend exemption endorsements (iv and vii) exhibit similar trends to those in the US. Comparisons between Japanese and German AARs and ACARs (not shown) yield similar implications, albeit with larger swings in the magnitude of German abnormal returns.

Similarities in investor reactions across markets and the high degree of statistical precision of certain US AAR estimates point to the existence of common shocks as a serious concern, even while differences in the *magnitude* of abnormal returns may still indicate partially-offsetting event responses in Japan. Disentangling these event-induced reactions from coincident market developments for which the market model cannot fully account represents the central challenge in this analysis and thus the primary motive for examining abnormal returns in relation to specific firm attributes beyond whether or not firms simply have foreign operations. Indeed, a majority of

our nine candidate events fall within one trading day of extraordinary developments related to the US-led global financial crisis and auto sector bailout, the latter having had potentially divergent impacts across our sets of US and Japanese firms. A thorough discussion of possible competing events is given in Appendix E. Suffice it to say here that aggregate CAR estimates for the October 1, November 28, December 12, December 19, and March 27 events are virtually certain to be affected by confounding factors.[37] Coincidentally, this leaves only the three Cabinet meeting-related events and the August 2008 METI report date as being relatively uncontaminated by specific events due to the financial crisis or to additional contemporaneous domestic policy developments. These are precisely those dates which knowledge of the Japanese tax reform process suggests ought to have proven decisive for adoption of the dividend exemption system. We consequently proceed by concentrating our main analysis on the CAR effects of firm characteristics which ought to have been specifically associated with anticipated effects of the dividend exemption system surrounding the May 9, June 27, August 18, and January 23 events while striving to control for firms' remaining financial sector exposure.[38] We return to consideration of auto sector-specific concerns in later robustness checks.

5.2 Modulating effects of firm characteristics

As described in Sect. 4.2, we examine the impact of the following key firm characteristics on firm CARs: (a) an indicator for tax haven subsidiary ownership, I_HAVEN; (b) the tax savings rate on repatriated foreign earnings, TS; (c) intangible intensity, INTAN; and (d) cash flow intensity, LQ. Applying the single-step dummy variable approach described in Sect. 3.2, each of these attributes is allowed to have differential impacts by country and multinational status of the parent firm, where applicable, as well as by the share of consolidated worldwide assets held in Japan, the US and Germany (ζ^{JP}, ζ^{US}, and ζ^{DE}, respectively) to account for variation in the extent of firms' foreign exposure and possible direct bilateral competition across markets. Estimation of Eq. (3) thus incorporates multiple layers of interactions whose effects on day-three ACARs for the events of May 9, June 27, August 18, and January 23 are summarized in Panels 1–4 of Table 4, with specifications (1)–(4) for each date consisting of simple combinations of characteristics (a)–(d).[39] Due to the large number of underlying

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[37] For a brief (truncated) timeline of the financial crisis, see, e.g., http://www.washingtonpost.com/wp-srv/business/economy-watch/timeline/.

[38] All results for the full set of events are available upon request. Consistent with the discussion of confounding factors in Appendix E, CARs surrounding these other dates show little significant association with firm attributes.

[39] As illustrated in the 5-day event windows in Fig. 1, a majority of statistically significant abnormal returns occurred within plus or minus 1 day of their respective event dates. As a result, we focus hereinafter on 3-day event windows, as in Hanlon and Slemrod (2009). Allowing longer 5-day event windows does not qualitatively alter our main results (not shown).

interactions, we only report aggregated average marginal effect estimates for our key firm characteristics as well as overall day-three ACARs.[40]

Average marginal effects of tax haven subsidiary ownership on day-3 ACARs are shown as specification (1) in Table 4 and stem from estimation of Eq. (3) using a vector of firm covariates $\mathbf{X}$ defined as

$$\mathbf{X} = \xi^{\text{FIRE}} + \left\{I\_DE, I\_US, I\_JP\right\} + \left\{I\_DE, I\_US, I\_JP\right\} \times I\_MNC$$
$$+ \left\{I\_DE, I\_US, I\_JP\right\} \times I\_MNC \times \left[I\_HAVEN + \zeta^{\text{DE}} + \zeta^{\text{US}} + \zeta^{\text{JP}}\right]$$
$$+ \left\{I\_DE, I\_US, I\_JP\right\} \times I\_MNC \times I\_HAVEN \times \left[\zeta^{\text{DE}} + \zeta^{\text{US}} + \zeta^{\text{JP}}\right] \quad (4)$$

with $\left\{I\_DE, I\_US, I\_JP\right\}$ representing a set of binary indicators for parent firm nationality.[41] Specification (2) follows a similar form of interactions, substituting TS for I_HAVEN as a more precise measure of potential gains due to the tax savings effect of dividend exemption on repatriated foreign earnings, where TS should implicitly reflect the application of firms' existing tax mitigation strategies, including the use of tax havens, to firms' fundamental operating results and tax liabilities. Specifications (3) and (4) add a full set of interactions of specification (2) with INTAN or LQ, such that intangible intensity or liquidity constraints are allowed to affect firms' CARs both directly and through the tax savings channel, thereby allowing, for example, investors to attribute larger gains to firms with higher relative cash flow out of which to finance future dividends or to firms with relatively lower costs of income reallocation.

As expected, day-three ACARs by MNC status in Table 4 largely corroborate the depictions in Fig. 1. Beyond these aggregate effects, however, specification (1) also reveals that among Japanese MNCs, firms with more sophisticated tax avoidance strategies (i.e., those that owned at least one tax haven subsidiary prior to May 9, 2008) performed relatively worse than those without. Anecdotally, Japanese corporate culture is believed to be responsible for weak tax planning, such that the 2009 tax reform may have been viewed as merely enabling Japanese firms to compete on equal footing with their more tax-savvy international competitors (Toder 2014, p. 24; Altshuler et al. 2015).[42] Larger abnormal returns among the set of smaller firms (i.e.,

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[40] By design, these last figures are equivalent to ACAR estimates obtained from estimation of the standard market model for identical firm groups, albeit with standard errors from the single-step approach that account for intertemporal correlation and cross-group correlation directly. In contrast to the preliminary results presented in Fig. 1, our single-step estimates apply exclusively to the top quartile of domestic and multinational firms by market capitalization.

[41] Note that we estimate the full complement of matching terms for each country in our analysis (including, e.g., ζ^{DE}), the purpose being to control for and test—rather than assert—certain logical outcomes, such as the tax savings rate of German firms having zero effect on German CARs or the share of US MNC consolidated assets held in Germany having no influence (beyond the tax savings rate) on US stock market reactions to the Japanese reform.

[42] Altshuler et al. (2015) note that "A notable feature of the Japanese tax environment is a compliant international tax-planning culture. [...] Although changes in attitudes are occurring, many Japanese companies consider paying taxes a matter of loyalty, and the amount of taxes paid are considered a measure of the company's success" (pp. 24–25). Tax practitioners point out, for example, that the Japanese tax system does not restrict parent firms from borrowing from foreign subsidiaries, contrary to the US's treatment of

Table 4 Day-three ACAR marginal effects by nationality and MNC status

Margin	Firm type	Country	(1) Haven		(2) TS		(3) INTAN		(4) LQ	
			Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.
Panel 1: May 9, 2008										
$\frac{\partial r}{\partial T\_HAVEN}$	MNC	US[a]	1.161**	0.459	–	–	–	–	–	–
		JP	−0.297	0.196	–	–	–	–	–	–
$\frac{\partial r}{\partial TS}$	MNC	US	–	–	−0.080	0.796	0.716	1.010	0.341	0.783
		JP	–	–	0.883	1.024	0.360	1.391	3.080**	1.391
$\frac{\partial r}{\partial INTAN}$	Domestic	US	–	–	–	–	−0.972	1.420	–	–
		JP	–	–	–	–	1.773	1.779	–	–
	MNC	US	–	–	–	–	−1.657	1.386	–	–
		JP	–	–	–	–	−1.228	2.796	–	–
$\frac{\partial r}{\partial LQ}$	Domestic	US	–	–	–	–	–	–	0.709	1.027
		JP	–	–	–	–	–	–	0.091	0.498
	MNC	US	–	–	–	–	–	–	0.072	0.236
		JP	–	–	–	–	–	–	1.923**	0.794
Day-three ACARs										
$\frac{\partial r}{\partial D3}$	Domestic	US	0.160	0.326	0.160	0.326	0.160	0.325	0.238	0.309
		JP	1.803***	0.237	1.803***	0.237	1.803***	0.236	1.812***	0.238
	MNC	US	0.560***	0.139	0.560***	0.140	0.560***	0.138	0.620***	0.134
		JP	0.143	0.206	0.143	0.207	0.143	0.205	0.143	0.204

Table 4 continued

Margin	Firm type	Country	(1) Haven		(2) TS		(3) INTAN		(4) LQ	
			Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.
Panel 2: June 27, 2008										
$\frac{\partial r}{\partial I\_HAVEN}$	MNC	US[a]	−1.285	0.796	—	—	—	—	—	—
		JP	−0.168	0.194	—	—	—	—	—	—
$\frac{\partial r}{\partial TS}$	MNC	US	—	—	1.154	1.233	1.741	1.332	1.751	1.351
		JP	—	—	4.801***	1.204	4.044***	1.391	5.350***	1.473
$\frac{\partial r}{\partial INTAN}$	Domestic	US	—	—	—	—	−6.447***	1.792	—	—
		JP	—	—	—	—	−1.472	1.561	—	—
	MNC	US	—	—	—	—	−5.151***	1.529	—	—
		JP	—	—	—	—	2.982	3.886	—	—
$\frac{\partial r}{\partial LQ}$	Domestic	US	—	—	—	—	—	—	−0.345	0.833
		JP	—	—	—	—	—	—	−0.028	0.428
	MNC	US	—	—	—	—	—	—	−0.910***	0.351
		JP	—	—	—	—	—	—	−0.509	0.702
Day-three ACARs										
$\frac{\partial r}{\partial D3}$	Domestic	US	0.479	0.448	0.479	0.447	0.479	0.426	0.623	0.453
		JP	0.540**	0.218	0.540**	0.218	0.540**	0.218	0.594***	0.217
	MNC	US	−0.368*	0.209	−0.368*	0.209	−0.368*	0.195	−0.319	0.208
		JP	−0.234	0.216	−0.234	0.209	−0.234	0.193	−0.234	0.201
Observations			239,148		239,148		239,148		234,108	

Table 4 continued

Margin	Firm type	Country	(1) Haven Coeff.	S.E.	(2) TS Coeff.	S.E.	(3) INTAN Coeff.	S.E.	(4) LQ Coeff.	S.E.
Panel 3: August 18, 2008										
$\frac{\partial r}{\partial I\_HAVEN}$	MNC	US[a]	-1.740***	0.435	–	–	–	–	–	–
		JP	-0.010	0.184	–	–	–	–	–	–
$\frac{\partial r}{\partial TS}$	MNC	US	–	–	-0.438	0.949	-0.566	1.162	-1.398	1.083
		JP	–	–	1.298	1.023	1.525	1.339	-1.570	1.490
$\frac{\partial r}{\partial INTAN}$	Domestic	US	–	–	–	–	-2.032	1.418	–	–
		JP	–	–	–	–	-1.273	1.614	–	–
	MNC	US	–	–	–	–	-0.655	1.487	–	–
		JP	–	–	–	–	-4.276	3.541	–	–
$\frac{\partial r}{\partial LQ}$	Domestic	US	–	–	–	–	–	–	-1.699	1.101
		JP	–	–	–	–	–	–	-0.220	0.454
	MNC	US	–	–	–	–	–	–	-0.590**	0.299
		JP	–	–	–	–	–	–	-3.867***	0.856
Day-three ACARs										
$\frac{\partial r}{\partial D3}$	Domestic	US	0.494	0.369	0.494	0.369	0.494	0.366	0.518	0.372
		JP	0.048	0.231	0.048	0.231	0.048	0.231	-0.016	0.233
	MNC	US	-0.237	0.163	-0.237	0.165	-0.237	0.162	-0.221	0.165
		JP	-0.234	0.166	-0.234	0.166	-0.234	0.160	-0.234	0.157

Table 4 continued

Margin	Firm type	Country	(1) Haven Coeff.	S.E.	(2) TS Coeff.	S.E.	(3) INTAN Coeff.	S.E.	(4) LQ Coeff.	S.E.
Panel 4: January 23, 2009										
$\frac{\partial r}{\partial I\_HAVEN}$	MNC	US[a]	−2.341***	0.732	–	–	–	–	–	–
		JP	−0.293	0.224	–	–	–	–	–	–
$\frac{\partial r}{\partial TS}$	MNC	US	–	–	1.714	1.389	2.417	1.548	−0.266	1.899
		JP	–	–	3.474**	1.479	1.261	1.959	1.760	2.413
$\frac{\partial r}{\partial INTAN}$	Domestic	US	–	–	–	–	−3.258*	1.822	–	–
		JP	–	–	–	–	−4.178*	2.235	–	–
	MNC	US	–	–	–	–	3.331**	1.558	–	–
		JP	–	–	–	–	−8.274**	3.724	–	–
$\frac{\partial r}{\partial LQ}$	Domestic	US	–	–	–	–	–	–	0.308	0.968
		JP	–	–	–	–	–	–	0.176	0.903
	MNC	US	–	–	–	–	–	–	0.127	0.484
		JP	–	–	–	–	–	–	−1.011	1.821
Day-three ACARs										
$\frac{\partial r}{\partial D3}$	Domestic	US	2.498***	0.403	2.498***	0.403	2.498***	0.397	2.515***	0.413
		JP	0.714**	0.313	0.714**	0.313	0.714**	0.310	0.751**	0.315

Table 4 continued

Margin	Firm type	Country	(1) Haven		(2) TS		(3) INTAN		(4) LQ	
			Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.
	MNC	US	0.295	0.257	0.295	0.259	0.295	0.252	0.292	0.253
		JP	−0.621**	0.259	−0.621**	0.256	−0.621**	0.244	−0.621**	0.250
Observations			239,148		239,148		239,148		234,108	

Significance levels are designated as *** $p < 0.01$; ** $p < 0.05$, and * $p < 0.1$, with standard errors clustered by firm.

All panel regressions include firm-specific intercepts and German (DE), US, and Japanese (JP) market co-movement slope parameters, plus a full set of day one through three event date interaction terms ($D1 - D3$), as defined in Sect. 3.2, as well as further interactions with the proportion of foreign subsidiary assets held in DE, US, and JP. Only day-three marginal effects are shown (i.e., evaluated at $D3 = 1$). Complete variable descriptions appear in Table 2.

[a] Exceptionally, $\partial r / \partial I\_HAVEN$ for the US is calculated directly as the interaction coefficients from a model estimated without foreign subsidiary asset shares ζ^{JP}, ζ^{US}, and ζ^{DE} due to the fact that $\zeta^{JP} = 0$ for all US MNCs without tax haven subsidiaries

most "domestic" firms, including firms with small foreign operations, and "nonhaven" MNCs) may be at least partially explained by the reform's anticipated effects on reducing compliance burdens and facilitating foreign expansion. Indeed, updated foreign subsidiary ownership linkages in Orbis indicate that 45% of Japanese domestic firms in our sample of top-quartile firms—classified according to fiscal 2012 ownership information—had become multinationals as of February 2016, whereas only 13% of comparable domestic US firms made this same transition.[43]

Among US firms, more sophisticated MNCs fared significantly better around the May 9 event than their domestic counterparts or than those MNCs without a single tax haven subsidiary, consistent with the notion that more effective tax planning on the part of US MNCs might insulate such firms from enhanced Japanese competition while simultaneously yielding larger tax savings from the eventual adoption of a territorial tax regime in a world of heightened tax competition.

Naturally, MNC status and ownership of tax haven subsidiaries remain relatively coarse measures of international exposure and tax aggressiveness, and we cannot completely refute confounding effects due to global market developments. Specifications (2)–(4) hence allow a more nuanced examination of investor reactions through the introduction of continuous measures of TS, INTAN, and LQ. Considered in isolation, the rate of anticipated tax savings resulting from the elimination of domestic tax on repatriated foreign earnings is associated with substantial positive effects on day-three CARs among Japanese MNCs across all four events, with the largest such contributions arising around the June 27 and January 23 Cabinet meetings. The interpretation of $\partial r/\partial \text{TS}$ for this first date under specification (2) is that a 10 percentage point increase in the repatriation tax savings rate would produce abnormal returns equal to 0.48% of market capitalization (i.e., ¥5.9 billion ($56 million) for the average Japanese MNC in our sample).

Focusing on future tax avoidance and the role of liquidity constraints through the introduction of controls for industry-level intangible intensity and firm-level cash flow intensity yields a reduction in magnitude and statistical precision of the January 23 tax savings effect among Japanese MNCs but yields robust positive effects on June 27 (Panel 2, specifications (3) and (4)) and a significant positive tax savings effect on May 9 (Panel 1, specification (4)). Holding constant the existing distribution of tax savings rates, the results of specification (3) moreover reveal that if anything, greater income shifting ability was perceived by investors as having almost universally negative (or at best, positive and insignificant) implications for future firm profitability across all four events, regardless of nationality or MNC status. Indeed, the near-uniformity of the negative $\partial r/\partial \text{INTAN}$ effects of intangible intensity raises the possibility that once

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Footnote 42 continued

"deemed" dividends under I.R.C. §956, but instances of Japanese corporations availing themselves of this tax avoidance opportunity are unheard of.

[43] Ownership data for our full 100% sample of parent firms from Orbis indicate that 29% of formerly domestic Japanese firms in the 2012 sample had become MNCs by 2016, suggesting that the reform facilitated international expansion at a higher rate for the larger domestic firms in our top-quartile sample. This contrasts with the fact that only 12% of formerly domestic US firms in the full sample had become MNCs by 2016, such that international expansion opportunities were more nearly uniform across the market capitalization distribution of US domestic firms over the same period.

variation in foreign ETRs has been accounted for through TS, remaining variation in intangible intensity may serve primarily to capture industry effects, with more intangible-intensive firms potentially being in industries more severely affected by the financial crisis. If so, assuming a common impact of global market developments on Japanese and US firms, then the larger point estimates among Japanese firms for the first two events could suggest a slight *relative* tendency toward positive valuation of tax avoidance capabilities around these events, albeit not in a statistically significant manner. However, subsequent large negative CAR effects of intangible intensity among Japanese firms after the release of the METI's August 2008 report, which clarified that foreign royalty payments would remain subject to Japanese taxation (yet without the benefit of cross-creditability against foreign taxes on dividend remittances), may reflect intangible-intensive firms' disproportionate reliance on tax-efficient methods for allocating income that would be relatively tax-disadvantaged under the new regime.

Separate from tax motives, the Japanese dividend exemption may have also favored more financially constrained firms, including those facing more serious cash constraints in the midst of the financial crisis. Indeed, many investors view the adoption of permanent foreign dividend exemption in the US as an efficient way to alleviate liquidity constraints facing US firms by facilitating access to cash out of which to fund long-term operations.[44] This view, however, is largely premised on the notion that parent corporations cannot access foreign cash without triggering a significant repatriation tax, which may be appropriate for the US as a result of the application of I.R.C. §956 to the treatment of deemed dividends, but Japanese MNCs prior to the reform faced no such obstacle. As such, it is perhaps less surprising that our measure of liquidity constraints, LQ, for which larger values denote firms with greater relative cash flow, is shown to have been associated with significant positive abnormal returns among Japanese MNCs at the time that the government's intention to consider a dividend exemption system was first reported by the METI. All else held constant, a one standard deviation increase in Japanese MNC cash flow intensity of 0.45 points would have thereby raised the average firm's market capitalization by $(0.45)(1.92) = 0.87\%$ relative to the overall market. By comparison, a one standard deviation increase in TS among Japanese MNCs surrounding the May 9 event would imply a $(0.18)(3.08) = 0.55\%$ ACAR.

Contrary to the conventional view—perhaps tainted by the US's dominant perspective on international taxation issues—investors' initial perception of the benefits from adoption of a dividend exemption regime for Japanese firms was thus that this might prove more advantageous for those firms with relatively greater cash flow. Subsequent events tended to reverse this result as firms with relatively *lower* cash flow (measured

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[44] See, for example, "Promote Dividend Repatriation," by Joseph M. Calianno and Fred F. Murray, *Tax Analysts*, 2009. http://www.taxanalysts.com/www/freefiles.nsf/Files/CALIANNOandMURRAY-8.pdf/\protect\LY1\textdollarfile/CALIANNOandMURRAY-8.pdf. The US government implicitly recognized this argument by temporarily relaxing restrictions on US parent borrowing from foreign subsidiaries at the peak of the financial crisis. Faulkender and Petersen (2012) examine the extent to which liquidity constraints played a role in the repatriation and reinvestment behavior of US firms following the enactment of the American Jobs Creation Act of 2004. Constrained firms were more likely to exploit the temporary repatriation tax holiday for the purpose of reinvesting in the US, yet unconstrained firms were the primary beneficiaries of the policy in terms of total remittances.

prior to the financial crisis) experienced more positive abnormal returns, though in a manner not entirely unique to Japan. These negative abnormal returns attributable to the partial effect of LQ for Japanese MNCs on the last three of our events—the largest of these arising around August 18—are consistent with investors tempering their expectations with respect to the perceived advantages of increased cash flow as additional details of the proposed reform became known and as the financial crisis worsened.[45]

5.3 Cumulated event returns

Given the incremental nature of the sequence of events leading up to adoption of Japan's dividend exemption system and the possibility of swings in investor valuations as new information became available, a natural extension of the foregoing discussion is to consider the sum of stock market reactions across multiple events. We consequently adapt the single-step approach in a manner similar to Auerbach and Hassett (2005), treating each 3-day event *window* in our sequence of four events as part of a single contiguous event period.[46]

We thus redefine the event dummies in Eq. (3) such that $D1 = 1$ for all days within the 3-day event window around May 9, $D2 = 1$ for all 3 days in the June 27 event window, etc. As such, $D1$ and its associated interactions identifies the AAR for the May 9 event *averaged* across all 3 days in the first event window, while $D2$, $D3$, and $D4$ capture the cumulated sum of average AARs incurred across the first two, three, or four events, respectively.

Table 5 reports the resulting average AARs cumulated across events for the basic tax haven, tax savings, and liquidity constraint specifications previously shown for individual days as specifications (1), (2), and (4) in Table 4. By design, the May 9 results in the first column of the table closely replicate the results shown in Panel 1 of Table 4, albeit expressed as an average effect spread over 3 days in the first event window rather than the sum of three daily effects measured each with some sampling variation. Thus, for example, the 3-day average AAR (i.e., $\partial r/\partial D1$) of 0.593 for Japanese domestic firms is approximately one third of the day-three ACAR for Japanese domestic firms of 1.803 discussed previously. The more substantive component of this analysis therefore lies in the subsequent accumulation of AARs and importantly, the degree of statistical precision surrounding these cumulated effects. For instance, the statistically significant

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[45] These latter responses are also more closely aligned with Tajika et al. (2014), who find that liquidity-constrained Japanese MNCs responded to the enactment of the dividend exemption system by increasing dividend receipts from their foreign subsidiaries throughout 2009 to a greater degree than other MNCs.

[46] This approach assumes a full realization of investor expectations over the course of the 12 days defined by the May 9, June 27, August 18, and January 23 events, without allowing for offsetting investor reactions on excluded dates. This assumption is broadly validated in the results of a comparable analysis applied to the full sequence of nine event dates (not shown). We remain reluctant to place too much weight on dates that were so clearly impacted by major global market developments in the context of the financial crisis, and though we cannot fully exclude the occurrence of even more gradual dissemination of information beyond the dates considered, this nevertheless provides some assurance that incorporating the set of most likely additional events to our analysis does not change the overall estimated impact of the reform through the January 23 event.

negative ACARs among Japanese MNCs seen around January 23 (Table 4, Panel 4) are partially attenuated when taken in conjunction with investor reactions from the previous three events. Over the same time period, Japanese domestic firms experienced a significant positive average cumulated AAR of 1.04 (equivalent to a 3.1% 3-day ACAR). This effect is virtually identical to the point estimate for US domestic firms, however, and may speak to the existence of generalized confounding market events related to firms' exposure to the global financial crisis (and domestic firms' relative lack thereof). Likewise, stronger abnormal returns among US MNCs at the time of the May 9 METI announcement became no longer distinguishable from zero over the course of subsequent events (and hence more comparable to the effects on Japanese firm valuations).

For those firm characteristics more closely associated with specific impacts of the tax reform on firm after-tax profitability, I_HAVEN, TS, and LQ, their partial effects on cumulated average AARs across countries bring added clarity to overall investor responses. As shown in the upper portion of Table 5, ownership of at least a single tax haven subsidiary ultimately contributed to larger reductions in MNC market capitalization in the US, the result being that—contrary to the immediate May 9 reaction—more tax sophisticated Japanese MNCs may have ultimately been perceived as facing disproportionately *smaller* losses over this time period than their US counterparts. Net of the US effects (presumably due to a combination of non-reform related global market developments, effects on international competitiveness, and spillovers to prospects for US reform), Japanese MNCs with tax haven operations may have *eventually* been viewed by investors as benefiting by comparison insofar as they might better exploit new tax avoidance opportunities rendered more explicit as details of the reform's proposed anti-avoidance measures became known.

Further underlying these cumulated AAR results by multinational status and tax haven ownership was a pronounced strengthening of the estimated tax savings effect among Japanese MNCs, without which their stock market performance would have been substantially lower. Controlling for cash flow intensity and allowing for heterogeneous tax savings effects as a function of LQ, estimates of $\partial r/\partial \mathrm{TS}$ imply that a 10% point increase in the tax savings rate (e.g., through a comparable reduction in average effective foreign tax rates) was associated with AARs cumulated across all four event dates and averaged across 3 days surrounding the last event of 0.29%, for the equivalent of a final 0.87% ACAR as of the last day in the January 23 event window. Applied to the complete distribution of TS among Japanese MNCs (i.e., with a mean tax savings rate of 0.215) and weighted by average market capitalization at each event date, this would translate to an aggregate gain in market capitalization attributable to the sequence of tax savings effects of ¥4.3 trillion in the group of Japanese MNCs in our sample.

Assuming a similar average tax savings rate of 21.5% across all Japanese MNCs, this is just slightly in excess of predicted tax savings on the repatriation of ¥17 trillion in undistributed earnings held by first- and second-tier foreign subsidiaries of Japanese firms as of the end of fiscal 2006, as reported in the METI's report (2008).[47]

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[47] Both measures of estimated tax savings, whether based on investor reactions or back-of-the-envelope calculations, are likely understated either because of our inability to incorporate the universe of Japanese MNCs, or in the case of the latter, because of the omission of lower-tier subsidiaries' undistributed earnings

Table 5 Cumulated event date AAR effects by nationality and MNC status

	Margin	Firm type	Country	May 9, 2008 (d = 1)		Jun. 27, 2008 (d = 2)		Aug. 18, 2008 (d = 3)		Jan. 23, 2009 (d = 4)	
				Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.
Haven	$\frac{\partial r}{\partial I\_HAVEN}$	MNC	US[a]	0.384**	0.156	−0.025	0.265	−0.600*	0.342	−1.373***	0.449
			JP	−0.089	0.065	−0.140	0.096	−0.147	0.112	−0.231	0.150
TS	$\frac{\partial r}{\partial TS}$	MNC	US	−0.008	0.267	0.383	0.492	0.235	0.646	0.804	0.572
			JP	0.357	0.346	1.955***	0.542	2.38***	0.684	3.495***	0.181
LQ	$\frac{\partial r}{\partial TS}$	MNC	US	0.115	0.263	0.704	0.509	0.239	0.687	0.152	1.023
			JP	1.066**	0.473	2.856***	0.763	2.334**	1.085	2.895***	1.115
	$\frac{\partial r}{\partial LQ}$	MNC	US	0.020	0.080	−0.283**	0.143	−0.478**	0.186	−0.431	0.270
			JP	0.629**	0.268	0.474	0.382	−0.809	0.809	−1.130*	0.583
		Domestic	US	0.242	0.353	0.118	0.563	−0.454	0.875	−0.347	0.885
			JP	0.027	0.168	0.011	0.275	−0.064	0.222	−0.006	0.454
Three-day average cumulated AARs											
	$\frac{\partial r}{\partial Dd}$	Domestic	US	0.046	0.109	0.186	0.180	0.356	0.234	1.172***	0.254
			JP	0.593***	0.079	0.773***	0.106	0.79***	0.137	1.036***	0.192
		MNC	US	0.184***	0.046	0.066	0.084	−0.013	0.109	0.088	0.143
			JP	0.050	0.069	−0.026	0.101	−0.104	0.119	−0.315*	0.162

Significance levels are designated as *** $p < 0.01$; ** $p < 0.05$, and * $p < 0.1$, with standard errors clustered by firm

All panel regressions include firm-specific intercepts and German (DE), US, and Japanese (JP) market co-movement slope parameters, plus a full set of event *window* dummy interaction terms (one per 3-day event *window*), as well as further interactions with the proportion of foreign subsidiary assets held in DE, US, and JP. Cumulated marginal effects measure AARs averaged over each 3-day event window and summed across event dates. Complete variable descriptions appear in Table 2

[a] Exceptionally, $\partial r / \partial I\_HAVEN$ for the US is calculated directly as the interaction coefficients from a model estimated without foreign subsidiary asset shares ζ^{JP}, ζ^{US}, and ζ^{DE} due to the fact that $\zeta^{JP} = 0$ for all US MNCs without tax haven subsidiaries

Though positive initially, estimates of the cumulated effect of $\partial r / \partial LQ$ decrease over the course of all four events and imply significant stock market gains for liquidity-constrained firms by the end of the event sequence, consistent with the pattern inferred from specification (4) in Table 4. Expectations of larger gains in after-tax profitability among less constrained firms in response to the May 9 METI announcement were thus reversed over the course of the subsequent events all the while emphasizing the benefits from dividend exemption accruing to MNCs with operations in relatively low-tax jurisdictions.

5.4 Robustness checks

In spite of our emphasis on event dates which should have proven decisive given the Japanese tax reform process and which should not have been explicitly associated with major developments related to the financial crisis, conditions in the global financial markets during this time period nevertheless remain a challenge for an event study analysis predicated on the ability to accurately predict normal stock returns based on historical market comovement. In conjunction with the sample selection criteria required for computational tractability, this raises a natural concern that the results of our core analyses are unduly influenced by external factors. Accordingly, Table 6 presents a comparison of our benchmark tax haven and tax savings results for the first May 9 event with a series of robustness checks intended to dispel the most serious of these concerns.

Results involving the full sample of *all* firms for which we have sufficient stock market and financial statement data to perform the core analyses are presented in the second column and yield CAR estimates for the US that are generally driven toward zero relative to those obtained using the top-quartile sample only. For Japan, in contrast, the introduction of the larger firm sample mostly accentuates abnormal return patterns, the most notable of these effects being the pronounced increase in magnitude of estimated day-three ACARs among the set of MNCs without tax haven operations. Indeed, in the full sample, these smaller and less tax sophisticated MNCs appear to have been viewed by investors in a nearly identical manner to their domestic counterparts, perhaps reaping similar gains from their enhanced prospects for foreign expansion.[48] As a consequence, Japanese MNCs as a group are seen to experience significantly greater ACARs in the full sample, with a portion of this effect more clearly attributable to the rate of tax savings on repatriated earnings than in the benchmark results.

Footnote 47 continued

and the lack of more up-to-date information. Furthermore, even with better information, the back-of-the-envelope calculation necessarily ignores tax savings on anticipated *future* earnings altogether. Due to missing information in Orbis, we cannot verify the amount of foreign undistributed earnings held by firms in our sample. However, the largest 25% of Japanese MNCs do hold 85% of total assets in our full sample, and it is reasonable to expect that their undistributed foreign earnings would likewise constitute a disproportionate share of the total given our selection criteria.

[48] The corollary to this observation is the aforementioned result that 45% of domestic firms in the top quartile sample became new MNCs between 2012 and 2015, with attributes resembling those of the smaller 75% of MNCs included in our full sample.

Table 6 Robustness checks—May 9, 2008

Margin	Firm type	Country	Benchmark Top Quartile[a]		Full Sample[b]		Robust Regressions		Auto & Finance Indices[c]	
			Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.
Panel 1: Haven specifications										
Day-three ACARs										
$\frac{\partial r}{\partial D3}$	Domestic	US	0.16	0.326	−0.32	0.304	0.618***	0.228	0.015	0.321
		JP	1.803***	0.237	1.649***	0.130	1.671***	0.179	1.809***	0.246
$\frac{\partial r}{\partial D3}$	Nonhaven	US	−0.485	0.418	0.022	0.289	−0.490	0.426	−0.690	0.454
		JP	0.402	0.247	1.51***	0.160	0.404	0.321	0.217	0.274
	Haven	US	0.673***	0.147	0.359**	0.139	0.518***	0.141	0.392***	0.148
		JP	−0.032	0.301	0.257	0.256	0.05	0.264	−0.379	0.303
Panel 2: Tax savings specifications										
$\frac{\partial r}{\partial TS}$	MNC	US	−0.080	0.796	0.988	0.641	−0.101	0.757	0.008	0.822
		JP	0.883	1.024	1.100*	0.633	1.113	1.262	0.886	1.045
Day-three ACARs										
$\frac{\partial r}{\partial D3}$	Domestic	US	0.160	0.326	−0.312	0.294	0.624***	0.221	0.119	0.309
		JP	1.803***	0.237	1.653***	0.130	1.669***	0.179	1.809***	0.246
	MNC	US	0.56***	0.14	0.253*	0.132	0.427***	0.132	0.251*	0.136
		JP	0.143	0.207	1.175***	0.137	0.210	0.204	−0.138	0.212

Significance levels are designated as *** $p < 0.01$; ** $p < 0.05$, and * $p < 0.1$, with standard errors clustered by firm

All panel regressions include firm-specific intercepts and German (DE), US, and Japanese (JP) market co-movement slope parameters, plus a full set of day one through three event date interaction terms ($D1 - D3$), as defined in Sect. 3.2, as well as further interactions with the proportion of foreign subsidiary assets held in DE, US, and JP. Only day-three marginal effects are shown (i.e., evaluated at $D3 = 1$). Complete variable descriptions appear in Table 2

[a] Benchmark specifications are those shown in models (1) and (2) in Table 4

[b] The complete firm sample consists of 1042 Japanese, 446 US, and 30 German domestic firms, and 801 Japanese, 1310 US, and 153 German MNCs

[c] Includes stock market indices for the US automobile industry (DJUSAT) and the worldwide financial industry (Dow Jones Global Financial Index) obtained from Global Financial Data (available at https://www.globalfinancialdata.com)

    Despite our explicit winsorizing of firms' stock market returns above and below the 1st and 99th percentiles of the returns distribution, individual observations may nevertheless exert undue influence on our estimated results (e.g., MNCs with infinitesimal shares of foreign assets held in Japanese or US subsidiaries; auto manufacturers). The robust regression results presented in the third column of Table 6 take an alternate approach to mitigating the effects of potential outliers within the top-quartile sample in which regression residuals are iteratively applied to re-weighting observations so as to put proportionately less weight on points further from the fitted regression line. As shown, this methodology yields very similar results as ordinary least squares in the benchmark specifications, the only noteworthy difference being an increase in the magnitude and precision of day-three ACARs among US domestic firms. Overall, this

suggests that outliers are unlikely to be responsible for the more pronounced investor reactions identified in our core results.

Focusing on the remaining possible confounding effects of the global financial crisis and developments related to the US auto sector bailout, we consider as a final robustness check the introduction of returns on two additional stock market indices as additional determinants of normal stock returns. Beyond the exclusion of financial and real estate sector parent firms and controls for the proportion of subsidiary assets attributable to these sectors already present in our core analyses, the final column of Table 6 thus depicts results based on an augmented market model consisting of five market return portfolios: the Japanese, US, and German market return measures used previously, plus returns on the Dow Jones US Automobile and Parts Index and World Financial Index.[49] We leverage information from these additional sectoral indices in order to predict share price movements with greater accuracy for firms whose operations are closely tied to developments in these sectors, thereby reducing the portion of actual stock returns estimated to constitute ARs. In fact, Japanese and US ACARs appear largely unaffected in qualitative terms, regardless of multinational status, ownership of tax haven subsidiaries, or TS.

Taken together, each of these specifications tends to emphasize rather than attenuate the differential impacts of the tax reform in Japan relative to those in the US, consistent with the view that investor reactions in the latter market serve as valuable counterfactuals against which to contrast the Japanese results. By the same token, the general attenuation of ACARs among US firms across specification tests suggests that evidence of any significant reactions in the US should be more cautiously viewed as an artifact of global financial market conditions rather than real responses to the Japanese tax reform.

6 Conclusion

Tax competition and tax base erosion have become a major concern among OECD countries as countries have turned increasingly to tax policy as a way to incentivize economic activity. Moreover, countries with worldwide tax regimes have seen a considerable expansion of firms' unrepatriated earnings over time, in part due to the increasingly intangible nature of worldwide business income, and increased global scope of MNC operations. Out of this environment, ten OECD countries have adopted territorial tax regimes since 2000, the most prominent of these having occurred in 2009 in Japan, the UK, and New Zealand. Our analysis of stock market valuations of Japan's 2009 tax reform hence has broad implications both for Japan and for remaining worldwide tax regimes—primarily the US—where territorial taxation has been repeatedly proposed as an option for tax reform, as well as for other nations having recently implemented similar reforms.

Starting from a preliminary set of nine potential event dates related to the eventual adoption of Japan's dividend exemption system, we ultimately focus our analysis on

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[49] Indices for the US auto industry (DJUSAT) and the financial industry (Dow Jones Global Financial Index) are obtained from Global Financial Data (available at https://www.globalfinancialdata.com).

four dates which we argue should have been viewed as speaking most authoritatively with respect to the substance of the reform given the nature of Japan's streamlined annual tax policy review process. This choice is largely corroborated by an initial examination of abnormal returns in the Japanese market relative to the US market based on standard event study methods and has the added virtue of avoiding event dates which simultaneously involved major known developments in the global financial crisis. As we show, each of the three Cabinet meeting-related events in our analysis is associated with significant market reactions in Japan, which collectively confirm the importance of the most direct source of gains from adoption of a territorial tax regime. These include an aggregate market capitalization effect of ¥4.3 trillion in relation to the rate of tax savings on repatriated earnings—slightly in excess of the savings predicted to result from the elimination of repatriation taxes on undistributed earnings of ¥17 trillion based on simple back-of-the-envelope calculations—along with further gains associated with an eventual easing of liquidity constraints. Larger relative ACARs among domestic Japanese firms and smaller multinationals, meanwhile, are suggestive of gains accruing to smaller firms as a result of reductions in tax compliance costs and enhanced competitiveness in foreign markets. Notably missing are any results to suggest important anticipated gains from an acceleration of income reallocation and tax avoidance, at least not on the basis of *pre-reform* markers for tax aggressiveness.

In contrast to the US treatment of "deemed" repatriations under I.R.C. §956, the absence of restrictions on Japanese parent corporations' ability to borrow from foreign subsidiaries without triggering domestic taxation either before or after the reform suggests that even moderately sophisticated Japanese MNCs might have easily avoided taxes on foreign-source income under Japan's worldwide regime, thereby making the reform largely irrelevant for tax avoidance purposes. These features of the Japanese tax system and anecdotal evidence of Japanese corporations' tax morale may also explain our findings that intangible intensity of parent firms had no significant impact (if not a negative one) on Japanese MNCs' stock returns surrounding each of the Cabinet meeting dates, or that the reform initially tended to favor *less* liquidity constrained firms prior to the unfolding of the financial crisis.

In comparison to Japanese market reactions, our analysis of US abnormal returns surrounding the same sequence of events yields no discernible patterns of consistent responses which could be tied to perceived effects of firm competitiveness or international tax competition, despite the fact that corporate tax policy discussions in the US consistently revolve around reducing the burden of international taxation. Policy discussions in the US were heavily dominated during this time period by crafting responses to the financial crisis, however, and even media reports in the US of the Japanese or UK tax reforms were relatively rare. This is indicative in and of itself of the probable importance of direct spillovers onto US firms, suggesting that these may be immeasurably small.

As in all event studies, especially those involving "clustered" events, a natural concern involves the occurrence of confounding market developments, and indeed, results involving several of our excluded dates appear to confirm the existence of major effects of this type. In addition to excluding these dates from our analysis, excluding parent firms in the financial and real estate sectors and controlling for subsidiary exposure to these same industries, and leveraging data on specific firm attributes to avoid the most

severe such sources of concern, we perform a final series of robustness checks intended to specifically address remaining sample and outlier issues or a lack of industry-specific predictive ability. Each of these tests confirms or even accentuates the importance of Japanese market reactions while mitigating potentially spurious reactions in the US. Nevertheless, we cannot fully exclude the possibility of remaining confounding factors influencing our broader results, such as the pattern of larger positive ACARs attributed collectively to domestic firms. Evidence of abnormal returns tied to specific firm characteristics associated with the reform are far less susceptible to this concern.

Our findings also show that domestic (smaller) firms may have significantly gained from the reform as a result of reductions in tax compliance costs and enhanced competitiveness in foreign markets. Although suggestive, this evidence is corroborated by the fact that nearly half of Japanese domestic firms in our sample established new foreign operations over the period 2012–2015.

From a Japanese perspective, our results suggest that policymakers' objectives were largely matched by investors' expectations of how firms would behave under a territorial regime. Attempts to extend these findings to other countries having recently enacted or contemplated similar reforms ought to take careful account of possible differences in cultural attitudes toward tax compliance and general tax morale. Nevertheless, these should prove highly instructive for evaluating the likely costs and benefits of switching to a territorial tax system.

Compliance with ethical standards

Appendix A: Event date details

While the possibility of switching from a worldwide tax system to some type of territorial tax system had been discussed by policymakers and industry executives on earlier occasions, the first clear indication of the government's intent to *seriously* consider such a reform came when the head of the METI, Akira Amari, announced in an interview immediately following a May 9, 2008, Cabinet meeting that he had instructed his ministry to examine the possibility of switching from a foreign tax credit system to a foreign income exemption system.

Basic Policies for Economic and Fiscal Reform 2008 was approved in a subsequent Cabinet meeting on June 27, 2008, among its expressed objectives being to stimulate profit repatriation by Japanese MNCs so as to prevent excessive foreign profit accumulation and to limit outflows of Japanese employment and R&D investment. On August 22, 2008, the subcommittee on international taxation at the METI released their interim

report, *Repatriations of Foreign Profits by Japanese Enterprises: Toward the Intro-duction of a Dividend Exemption Regime* which described the main characteristics of the proposed dividend exemption in greater detail than previously. The report thus highlighted four key elements of the dividend exemption that finally went into effect on April 1, 2009: (1) the dividend exemption system would permit Japanese resident corporations to deduct from taxable income a set proportion of dividends received from foreign affiliates, (2) in order to qualify for dividend exemption, a parent firm would have to have held at least 25% of the shares of its affiliate for at least 6 months, (3) exemption would apply only to foreign income in the form of paid dividends but not to other types of foreign-source income, including royalties, interest payments, and income earned by foreign branches, and (4), foreign tax credits would no longer apply to withholding taxes on repatriated dividends imposed by host countries. Details of this report were published prior to their official release in Japan's leading business newspaper, the *Nihon Keizai Shimbun*, on August 17, such that we consequently use August 18, 2008 (i.e., the first business day after these details appeared in the press) as the relevant event date.

Following the release of the METI's interim report, the Cabinet, Ministry of Finance, and Liberal Democratic Party (the ruling party in the House of Representatives) each released separate tax reform plans containing the adoption of a territorial tax regime. On October 1, 2008, Prime Minister Taro Aso mentioned before the full House of Representatives that he supported the implementation of a dividend exemption system. On November 28, 2008, the Government Tax Commission released their *Policy Recommendation for Tax Revisions for Fiscal Year 2009* which proposed the introduction of a dividend exemption regime, while on December 12, 2008, the Liberal Democratic Party released their *Large Package of Tax Revisions for Fiscal Year 2009* which like-wise included the introduction of dividend exemption. This last package added more detailed information on dividend exemption to the proposal by the METI, including the heretofore-unspecified proportion of dividends eligible for tax exemption (95%) and the treatment of foreign subsidiaries subject to the controlled foreign corporation (CFC) legislation. One week later, on December 19, 2008, the Ministry of Finance released their endorsed version of the *Large Package of Tax Revisions for Fiscal Year 2009* followed on January 23, 2009, by the Cabinet's approval of *The Outline of Tax Revisions for Fiscal Year 2009*. Each of these last three tax reform proposals contained almost exactly the same provisions regarding dividend exemption, such that from an investor's perspective, the real substance of the latter two events would have largely been in terms of the prominence of the endorsements. At the same time, the legislative bill including the dividend exemption provisions was submitted by the Cabinet to the Diet on January 23, 2009, and finally passed into law on March 27, 2009, before coming into effect on April 1, 2009.

Appendix B: Sample selection

Detailed steps leading to our selection of the final sample of Japanese, US, and German publicly traded firms and their subsidiaries are described in Table 7. We start with 1311 MNCs and 2277 domestic publicly traded firms in Japan matched to 44,474 foreign

Table 7 Selection criteria for parent firms

	Observations remaining		
	Japan	US	Germany
Initial sample			
Publicly traded			
All	3588	11,035	999
MNCs	1311	3638	462
Domestic	2277	7397	537
Subsidiaries			
All	44,474	186,968	29,353
Foreign	15,482	73,648	17,018
Domestic	28,992	113,320	12,335
Exclude firms with less than 5% of nonmissing observations, government contractors, and firms with no industry indicator			
Publicly traded			
All	3572	10,547	995
MNCs	1309	3576	462
Domestic	2263	6971	533
Exclude if not self-owned			
Publicly traded			
All	3248	10,185	802
MNCs	984	2814	271
Domestic	2264	7371	531
Exclude if nonmatching SEDOL or missing subsidiaries[a]			
Publicly traded			
All	2528	4290	340
MNCs	913	2064	217
Domestic	1615	2226	123
Exclude finance and insurance firms and firms with missing variables of interest			
Publicly traded			
All	1843	1756	183
MNCs	801	1310	153
Domestic	1042	446	30

[a] Most publicly traded firms excluded at this step are dropped because they have no matching domestic subsidiaries

and domestic subsidiaries, 3638 MNCs and 7397 domestic publicly traded firms in the US linked to 186,968 subsidiaries, and 999 MNCs and 537 domestic publicly traded firms in Germany linked to 29,353 subsidiaries. From there, we exclude companies

for which key financial variables at the subsidiary level are missing for more than 95% of observations.

We next exclude 9% of Japanese firms, 3% of US firms, and 19% of German firms that are not their own ultimate owners, since these are not otherwise the final beneficiaries of international tax reform. We also exclude government contractors, companies in the financial and real estate sectors (NAICS codes 52 and 53), and firms with inconsistent SEDOLs (about 1–2% of observations). A further lack of accurate financial information at the parent or subsidiary level (e.g., no SEDOL identification code to match stock market information from Datastream, missing financial statement consolidation indicators) serves as justification to discard yet additional firms from the sample.

To ensure the validity of the remaining observations from the Orbis database, we perform a careful firm-by-firm examination of the top 200 companies' financial statements in Japan, the US, and Germany, comparing key information from individual financial statements with their database counterparts in Orbis. Several inconsistently defined "domestic" firms based on missing subsidiary information in Orbis are consequently thrown out. In particular, since linking a firm to its foreign subsidiaries is key to our definition of MNC status and further MNC-specific variables, we drop all firms that had some international exposure (e.g., nonzero foreign income) according to their annual statements but could not be matched to foreign subsidiaries based on Orbis ownership data, leading to the removal of 30% of Japanese firms, 49% of US firms, and 56% of German firms (mostly domestic firms).

Finally, the exclusion of firms with no matched domestic subsidiaries is required to perform additional robustness checks based on relative numbers of foreign and domestic subsidiaries rather than asset shares and moreover largely coincides with the exclusion of the smallest 75% of domestic and multinational firms that is necessitated by the computational methods used in our core analyses.

Appendix C: Variable definitions and financial data

C.1 Effective tax rates

Potential tax savings, TS, are based on the difference between a firm's domestic and foreign effective tax rates. To address various data issues, we consider several possible measures of average ETRs in addition to our benchmark measure, which is defined as:

$$TS_i = AETR\_DOM_i - AETR\_FOR_i,$$

where AETR_FOR is the sum of tax payments by foreign subsidiaries divided by the sum of foreign subsidiaries' taxable income over the period 2005–2007. AETR_DOM is the difference between worldwide tax payments and tax payments by all foreign subsidiaries (2005–2007) divided by the difference between worldwide taxable income and all foreign subsidiaries' taxable income over the same period.

$$\text{AETR\_FOR}_i = \frac{\sum_{t=2005}^{2007} \sum_{k=1}^{N_{i,f}} \text{tax}_{i,k,t}}{\sum_{t=2005}^{2007} \sum_{k=1}^{N_{i,f}} pti_{i,k,t}},$$

$$\text{AETR\_DOM}_i = \frac{\sum_{t=2005}^{2007} \left(\text{tax}_{i,t}^w - \sum_{k=1}^{N_{i,f}} \text{tax}_{i,k,t} \right)}{\sum_{t=2005}^{2007} \left(pti_{i,t}^w - \sum_{k=1}^{N_{i,f}} pti_{i,k,t} \right)}, \quad \text{(consolidated financials), OR}$$

$$= \frac{\sum_{t=2005}^{2007} \sum_{k=1}^{N_{i,d}} (\text{tax}_{i,k,t})}{\sum_{t=2005}^{2007} \sum_{k=1}^{N_{i,d}} (pti_{i,k,t})}, \quad \text{(unconsolidated financials)}$$

$N_{i,f}$ ($N_{i,d}$) is the number of foreign (domestic) subsidiaries owned by company i, $\text{tax}_{i,t}^w$ is worldwide tax payments by multinational parent i, $\text{tax}_{i,k,t}$ are tax payments reported by a foreign or domestic subsidiary, $pti_{i,t}^w$ is i's worldwide taxable income, and $pti_{i,k,t}$ is taxable income reported by a foreign or domestic subsidiary k. Each sum of tax payments or taxable income is restricted to be nonnegative, and resulting values of AETR_FOR$_i$ and AETR_DOM$_i$ are censored to fall within the interval [0, 1].

To address Orbis's poor coverage of subsidiaries owned by less than 25% as well as misreporting by observed subsidiaries, we experiment with other measures of ETRs based on statutory tax rates. In a first case we define a marginal combined ETR ($METR$) based on subsidiaries' countries of residence combined with information on corporate tax rates and withholding tax rates for each such country. A complete description of the statutory rate data sources and compilation is available from the authors upon request. Marginal ETRs are measured as follows:

$$\text{METR\_FOR}_i = \frac{1}{3} \sum_{t=2005}^{2007} \sum_{c \in N_{i,f}} w_{i,c} \text{CTR}_{i,c,t},$$

$$\text{METR\_DOM}_i = \text{CTR}_{i,h},$$

where $\text{CTR}_{i,c,t}$ is country c's combined statutory tax rate in year t, $\text{CTR}_{i,h}$ is the combined statutory tax rate of the country where the parent is located ($h \in$ JP, US, DE), and $w_{i,c}$ is a weight equal to the 2005–2007 average ratio of i's foreign-based taxable income located in country c to i's total foreign-based taxable income:

$$w_{i,c} = \frac{\sum_{t=2005}^{2007} \sum_{k \in N_{i,f}} pti_{i,k,t} \cdot I_{i,k,c}}{\sum_{t=2005}^{2007} \sum_{k=1}^{N_{i,f}} pti_{i,k,t}}, \quad \text{if } i \text{ is a multinational, and}$$

$$w_{i,c} = 0, \quad \text{otherwise.}$$

$I_{i,k,c}$ is a dummy equal to 1 if subsidiary k is located in country c and 0 otherwise.

Results based on earnings-weighted $METRs$ do not radically alter our fundamental findings and are available upon demand.

Alternatively, to the extent that the foregoing weighting scheme is distorted by missing or mismeasured subsidiary earnings data, we construct another proxy for foreign ETRs equal to the lowest foreign statutory tax rate faced by multinational i as follows:

$$\text{ETR}_i^{\min} = Min_{c \in N_{i,f}}(\text{CTR}_{i,c}).$$

This latter measure implicitly assumes aggressive foreign income reallocation, whereby foreign earnings are attributed exclusively to multinationals' least-taxed subsidiary.

When multinationals' foreign operations are fully observed, $TS = \text{AETR\_DOM} - \text{AETR\_FOR}$ most accurately reflects the average reform-induced tax savings associated with repatriating retained earnings plus future foreign profits assuming an unchanged allocation of earnings among foreign subsidiaries. $\text{TS}^{\max} = \text{AETR\_DOM} - \text{ETR}^{\min}$, in contrast, represents an upper bound on potential savings from future foreign income reallocation and repatriation. A comparison of our main empirical results from Tables 4 and 5 involving TS versus $\text{TS}^{\max}$ is given in Appendix F.

C.2 Liquidity constraints

Liquidity constraints are calculated at the parent level following Fazzari and Peterson (1993), Kaplan and Zingales (1997), Moyen (2004), Almeida and Campello (2007) and Edgerton (2010), such that

$$\text{LQ}_i = \frac{\sum_{t=2005}^{2007}(\text{Net income}_{i,t} + \text{Depreciation}_{i,t})}{\sum_{t=2005}^{2007} \text{PPE}_{i,t}}.$$

We use Orbis variables "P/L for period [=Net income]," "Depreciation," and "Net Property, Plant and Equipment." Domestic net income, depreciation, and assets are recovered from the difference between worldwide amounts and the sum of unconsolidated foreign subsidiaries' amounts.

There is a large degree of variation between countries in the extent to which companies are required to report negative net income, as well as outliers at the top. We exclude negative values of LQ and winsorize values at the 99th percentile.

C.3 Asset shares

The share of firm i's assets located in country c is defined as the average ratio of total assets held by all subsidiaries of parent i located in country c relative to the parent's consolidated worldwide assets:

$$\zeta^c = \frac{\sum_{t=2005}^{2007} \sum_{k=1}^{N_i} \text{assets}_{i,k,t} \cdot I_{i,k,c}}{\sum_{t=2005}^{2007} \sum_{k=1}^{N_i} \text{assets}_{i,k,t}}, \quad \text{if } i \text{ owns a firm in } c$$

$$\zeta^c = 0, \quad \text{otherwise}.$$

where $\text{assets}_{i,k,t}$ is subsidiary k's total assets and N_i is i's total number of subsidiaries ($N_i = N_{i,f} + N_{i,d}$).

The share of firm i's *foreign* assets held by subsidiaries in the finance, insurance, or real estate, rental, and leasing sectors ("FIRE") is defined as the average ratio of

total assets of *foreign* subsidiaries classified under NAICS codes 52 and 53 divided by i's worldwide assets:

$$\xi^{\text{FIRE}} = \frac{\sum_{t=2005}^{2007} \sum_{k \in N_{i,f}} \text{assets}_{i,k,t} \cdot I\_\text{FIRE}_{i,k}}{\sum_{t=2005}^{2007} \sum_{k=1}^{N_i} \text{assets}_{i,k,t}}, \quad \text{if } i \text{ is a multinational and}$$

$$\xi^{\text{FIRE}} = 0, \quad \text{otherwise.}$$

where $I\_\text{FIRE}_{i,k}$ equals one for FIRE subsidiaries and 0 otherwise.

Appendix D: Intangible intensity

Intangible intensity is defined at the industry level based on investment and stocks in intangible assets and in physical assets, averaged over 3 years, 2005–2007. Intangible intensity data are obtained for 107 industries in Japan from the Research Institute of Economy, Trade, and Industry (RIETI), described in detail in Miyagawa and Hisa (2013), while US data are obtained at the 2-digit level from various sources listed in Chen and Dauchy (2017).[50] Because of the lack of a measure of intangible assets at the industry level in Germany, we use information on the sale of observed intangible assets. Specifically we use the EU KLEMS database from 2005 to 2007 to construct a proxy for intangible intensity based on the share of investment in computing equipment, communications equipment, and software (in the EU KLEMS database, these variables are I_IT, ICT, and I_software).[51]

Our proxy for intangible intensity is

$$\text{INTAN}_j = \frac{\sum_{t=2005}^{2007} \text{INT}_{j,t}}{\sum_{t=2005}^{2007} (\text{INT}_{j,t} + \text{TAN}_{j,t})}, \tag{D.1}$$

where INTAN_j is the 3-year average intangible intensity measure in industry j, $\text{INT}_{j,t}$ is intangible stock (respectively, investment) in industry j and in year t, and $\text{TAN}_{j,t}$ is physical assets stock (respectively, investment), where physical assets are national accounts assets, which include equipment and machinery, and buildings and structures. Table 8 shows average intangible intensity in the US and in Japan (based on investment). Table 9 shows average intangible intensity in Japan and in Germany based on the more limited measure of investment obtained from reported intangibles.[52] Comparing the RIETI's comprehensive measure of intangible intensity in Table 8 and the KLEMS-based measure of intangible intensity in Table 9 for Japan, one can notice that the "limited" measure is about three times smaller than the broader measure, which is expected since the KLEMS-based measure only includes intangible assets reported in firms' financial statement. However, the ranking across industries is similar.

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[50] See http://www.rieti.go.jp/en/database/. We use tables on "Capital inputs," and "Investment and capital stock in intangible assets."

[51] KLEMS data can be found at www.euklems.net.

[52] KLEMS data are available for a number of countries including Japan and Germany, but not the US.

Table 8 Intangible intensity in Japan and in the US, by industry, 2005–2007 (investment-based)

NAICS codes	United States		Ratio JP/US	Rank (1 = Highest intensity)	
	US	Japan (JP) [RIETI]		US	Japan
11	0.020	0.053	2.6	21	20
21	0.063	0.210	3.3	18	14
22	0.034	0.161	4.6	20	15
23	0.318	0.404	1.2	14	8
31	0.654	0.328	0.5	2	10
32	0.528	0.367	0.6	7	9
33	0.572	0.430	0.7	4	5
42	0.647	0.407	0.6	3	7
44	0.515	0.286	0.5	8	11
48	0.122	0.098	0.8	17	17
49	0.055	0.159	2.8	19	16
51	0.558	0.629	1.1	6	2
52	0.736	0.539	0.7	1	3
53	0.268	0.028	0.1	15	21
54	0.561	0.654	1.1	5	1
56	0.483	0.271	0.5	9	12
61	0.481	0.092	0.1	10	18
62	0.246	0.091	0.3	16	19
71	0.320	0.449	1.4	13	4
72	0.333	0.214	0.6	12	13
81	0.344	0.410	1.1	11	6

We match this measure to each company in our sample (both parents and foreign subsidiaries) based on their reported industry classification. We match NAICS codes (used in Orbis) with Japan Industrial Productivity (JIP) codes (used by the RIETI) and NACE codes (used in the EU KLEMS database) by hand. Investment and stocks for NAICS codes 54 and 55 (respectively, professional and management services) are combined because JIP codes do not differentiate between these business services.

Although we experiment with various measures of intangible intensity based on subsidiary- or parent-level industry classification, we ultimately employ only the parent-level investment-based measure in our preferred analyses for several reasons. First, our industry measures of intangible assets are based on Japanese (respectively, US and German) investment and therefore may not apply to those countries in which subsidiaries operate. Second, the measure based on subsidiaries requires the use of a weighted average of each subsidiaries' intangible intensity to arrive at single parent-level figure, with weights based on financial statement data on total assets or retained earnings, and these data are frequently missing at the subsidiary level. We also experiment with measures of intangible intensity based on stocks rather than investment flows, which are available on demand. The results based on other measures of intangible intensity do not generally change our conclusions.

Table 9 Intangible intensity in Japan and Germany, by industry, 2005–2007 (Investment-Based)

NAICS codes	Japan (JP) [KLEMS]	Germany (DE) [KLEMS]	Ratio JP/DE	Rank (1 = Highest intensity)	
				Japan	Germany
11	0.005	0.021	2.4	21	20
21	0.042	0.061	3.4	19	19
22	0.096	0.091	1.7	14	16
23	0.077	0.144	2.8	15	10
31	0.131	0.146	2.2	10	8
32	0.186	0.120	3.0	8	13
33	0.184	0.143	3.0	9	11
42	0.232	0.253	1.6	6	4
44	0.254	0.234	1.2	5	5
48	0.107	0.069	1.4	12	17
49	0.555	0.468	0.3	2	1
51	0.452	0.284	2.2	3	3
52	0.724	0.394	1.3	1	2
53	0.009	0.003	9.2	20	21
54	0.375	0.210	3.1	4	6
56	0.067	0.098	2.7	16	15
61	0.049	0.144	0.6	18	9
62	0.127	0.130	0.7	11	12
71	0.050	0.098	4.5	17	14
72	0.102	0.162	1.3	13	7
81	0.205	0.064	6.3	7	18

Appendix E: Market developments

Serious manifestations of the US-led financial crisis first emerged in early September 2008 with the negotiated rescues of numerous major financial institutions, including Fannie Mae and Freddie Mac, Bear Stearns, AIG, and Merrill Lynch. Investor reactions surrounding our first three events on May 9, June 27, and August 18, 2008, should thereby avoid being spuriously conflated with responses to major subsequent developments of the crisis. Several later events were more clearly impacted, however. Around our fourth event, the $700 billion Troubled Assets Relief Program (TARP), passed the US Senate on October 1, 2008, in the midst of considerable policy and financial market uncertainty after an earlier version was rejected on September 29, and the final version was enacted on October 3 as part of the Emergency Economic Stability Act of 2008 (Bajaj and Grynbaum 2008). November 28, 2008, was marked by the UK's first bank nationalization while the next trading day produced the news that the US had officially entered into recession. December 12 and December 19, 2008, were associated with a series of alternating breakthroughs and failures in discussions between the US Administration and Congress with respect to the US autobailout, the

terms of which were finally agreed upon on December 19 (Dombey 2008). On March 30, 2009, the first trading day after enactment of the Japanese reform, the US Administration reported that General Motors and Chrysler had failed to meet their viability conditions, thereby pushing both automakers toward bankruptcy and Chrysler into an alliance with Fiat (Stolberg and Vlasic 2009).

Economic news was broadly negative over this entire time period, as captured in the Bank of Japan's worsening GDP growth outlook, reported in the *Nihon Keizai Shimbun* on August 19, 2008, and January 23, 2009. Even if these reports surprised investors, however, their effects should likely have been distributed fairly uniformly without producing differential ARs as a function of firm characteristics. Toyota Motor Company's worst sales and earnings forecast in 9 years, released on May 9, 2008 (*Nihon Keizai Shimbun*), is more concerning as a surprise announcement from the largest firm in Japan's vital autoindustry. Robustness checks involving the exclusion of all auto-related manufacturing firms imply only a very slim reduction in the differential between aggregate CAR effects for domestic versus multinational firms surrounding the May 9 event (not shown), whereas the introduction of controls for auto industry-specific portfolio returns tend to imply the opposite (Sect. 5.4), suggesting at most a limited impact of the Toyota announcement.

Among the set of tax reforms implemented alongside Japan's adoption of a dividend exemption regime, the extension of dividend and capital gains tax cuts and the creation of individual savings accounts collectively represent a remaining source of potential confounding variation in the Japanese market. However, this should not be a significant concern for our results for several reasons. First, and most simply, specific discussions regarding these individual tax provisions did not arise until August 2008 and happened over a period of several days falling around—but not overlapping—our August 18 event window, including statements by the incoming and current prime ministers on August 9, 12, and 13 and by the minister in charge of financial affairs on August 25. Of the four events that we focus on, only the January 23, 2009, Cabinet approval of "The Outline of Tax Revisions for Fiscal Year 2009" consequently included information about both the adoption of a territorial tax system and these individual investment-related provisions. Even so, the original reduction in dividend and capital gains tax rates from 20 to 10%, first enacted in 2003, had already been extended as part of each of the previous 2 years' tax reform packages, such that expectations of a further extension were presumably well-established long before this last event, especially given prevailing economic conditions. Moreover, given the symmetric tax treatment of dividends and capital gains, the expected tax savings resulting from these policies aimed at increasing private investment should have had a uniform proportional impact on firm market capitalization regardless of firm characteristics, thereby only affecting the average level of "normal" market-wide returns. At a more disaggregated level, scrutiny of differences in NAICS 3-digit industry-specific AARs between Japanese and US firms coupled with an examination of Japanese newspapers' major business headlines surrounding the May 9, June 27, August 18, and January 23 events does not point to the existence of any confounding events in the Japanese market.

Proving nonexistence is naturally virtually impossible. A remaining possibility that we cannot refute, for example, is that the developments leading up to the adoption of the dividend exemption regime were interpreted as a signal of the government's

willingness to stimulate economic activity more broadly. Nevertheless, there is little reason to believe that such expectations should be systematically correlated with the set of firm characteristics that we exploit in our analysis.

Appendix F: Investor valuations of maximal tax savings

Tables 10 and 11 contrast our main empirical results from Tables 4 and 5 for TS with investors' valuations of the maximal potential tax savings rate (assuming no change in firm structure), TS^{max}. Lower minimum subsidiary tax rates (ETR^{min})—and thus, greater maximum tax savings from dividend exemption—do not have a statistically significant impact on day-three ACARs or on cumulated AARs. This result mirrors the lack of a significant effect of intangible intensity on abnormal returns, consistent with TS^{max} serving as a proxy for potential future income reallocation and tax aggressiveness.

Table 10 Day-three ACAR marginal effects by nationality: average versus maximal tax savings

Margin	Country	May 9, 2008		Jun. 27, 2008		Aug. 18, 2008		Jan. 23, 2009	
		Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.
$\frac{\partial r}{\partial TS}$	US	−0.080	0.796	1.154	1.233	−0.438	0.949	1.714	1.389
	JP	0.883	1.024	4.801***	1.204	1.298	1.023	3.474**	1.479
$\frac{\partial r}{\partial TS^{max}}$	US	1.104	0.998	1.289	1.413	−1.084	1.003	−0.027	1.413
	JP	−0.405	1.12	1.231	1.5	−0.052	1.207	−0.147	1.772
Observations		239,148		239,148		239,148		239,148	

Significance levels are designated as *** $p < 0.01$;** $p < 0.05$, and * $p < 0.1$, with standard errors clustered by firm. Figures for TS are replicated from Table 4

Table 11 Cumulated event date AAR effects by nationality: average versus maximal tax savings

Margin	Country	May 9, 2008 ($d = 1$)		Jun. 27, 2008 ($d = 2$)		Aug. 18, 2008 ($d = 3$)		Jan. 23, 2009 ($d = 4$)	
		Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.
$\frac{\partial r}{\partial TS}$	US	−0.008	0.267	0.383	0.492	0.235	0.646	0.804	0.806
	JP	0.357	0.346	1.955***	0.542	2.380***	0.684	3.495***	0.879
$\frac{\partial r}{\partial TS^{max}}$	US	0.356	0.332	0.772	0.591	0.416	0.75	0.387	0.889
	JP	−0.143	0.381	0.264	0.611	0.248	0.765	0.207	0.967
Observations		247,689							

Significance levels are designated as *** $p < 0.01$;** $p < 0.05$, and * $p < 0.1$, with standard errors clustered by firm. Figures for TS are replicated from Table 5

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