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journal homepage: [www.elsevier.com/locate/bar](http://www.elsevier.com/locate/bar)Cross-border regulatory cooperation and cash holdings: Evidence from US-listed foreign firms<sup>☆</sup>Yuyuan Chang<sup>a</sup>, Wen He<sup>b</sup>, Lin Mi<sup>c,\*</sup><sup>a</sup> Department of Financial Management, School of Business Administration, South China University of Technology, China<sup>b</sup> Department of Accounting, Monash Business School, Monash University, Australia<sup>c</sup> UQ Business School, University of Queensland, Australia

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## ABSTRACT

We investigate the effect of cross-border regulatory cooperation on the cash holdings of firms cross-listed on US stock exchanges. The staggered adoption of the Multilateral Memorandum of Understanding (MMoU) facilitates cooperation among securities regulators around the world and expands their enforcement capabilities against foreign firms. Using a difference-in-differences design, we find that US-listed foreign firms significantly reduce their cash holdings after their home countries sign the MMoU, suggesting that the threat of increased SEC enforcement induced by regulatory cooperation disciplines corporate insiders from stockpiling cash holdings to enjoy private benefits of control. Information opacity and the cost of capital are two of the channels through which the threat of increased SEC enforcement affects cash holdings. The reduction in cash holdings is more pronounced for foreign firms from countries with weaker governance. After the MMoU, foreign firms make faster cash adjustments toward target levels, they reduce cash by making payouts, and their cash is valued more by investors.

## 1. Introduction

The past four decades have witnessed financial globalization, with thousands of firms across the globe choosing to cross-list their shares on foreign stock exchanges, particularly the US stock exchanges.<sup>1</sup> By cross-listing in the US, foreign firms are viewed to be bound by stricter securities regulations and disclosure requirements, according to the legal bonding hypothesis conceived by [Coffee \(1999\)](#),

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<sup>1</sup> Data from the World Federation of Exchanges (<https://statistics.world-exchanges.org/>) show that as at December 2021, there were 1,398, 352 and 255 foreign firms listed on NYSE and Nasdaq, the London Stock Exchange and Euronext, accounting for 22.5%, 17.6% and 12.8% of the total firms listed on these stock exchanges, respectively.

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2002) and Stulz (1999) and subsequently supported by many studies (e.g., Ayyagari & Doidge, 2010; Doidge, 2004; Doidge, Karolyi, & Stulz, 2004; Doidge et al., 2009; Doidge, Karolyi, & Stulz, 2009; Hail & Leuz, 2009; Reese Jr & Weisbach, 2002). However, substantial evidence has also shown that foreign firms listed in the US are not subject to the same scrutiny and regulatory enforcement as US firms are (e.g., Cheng, Srinivasan, & Yu, 2014; Frost & Kinney, 1996; Licht, Poliquin, Siegel, & Li, 2018; Mathew, Michayluk, & Kofman, 2007; Shnitser, 2010; Siegel, 2005; Silvers, 2020).<sup>2</sup> Central to the debate is whether regulatory enforcement against foreign firms is effective at constraining these firms' misbehavior.

In this study, we investigate whether the threat of increased SEC enforcement has a disciplinary effect on US-listed foreign firms.<sup>3</sup> The threat of increased SEC enforcement against foreign firms is induced by a cross-border regulatory cooperation framework, namely, the International Organization of Securities Commission's (IOSCO) Multilateral Memorandum of Understanding (MMoU). Prompted by the September 11, 2001 terrorist attacks, the MMoU was established in 2002 aiming to stop terrorist fund transfers and money laundering across national borders. From 2002 to 2019, securities regulators from more than 100 countries joined the MMoU in different years, and the US was one of the first to sign the MMoU in 2002. The MMoU requires signatory countries to provide information and cooperation at the request of foreign regulators of financial markets. It thus facilitates information sharing and cooperation among securities regulators around the world and expands their enforcement capacities for foreign firms listed in their own markets. Importantly, Silvers (2020) documents that after the signing of the MMoU, enforcement actions by the SEC against US-listed foreign firms increased threefold.

The MMoU provides an ideal setting for studying the effect of an increase in SEC enforcement on US-listed foreign firms. First, the signing of the MMoU by US-listed foreign firms' home countries expands only SEC enforcement capabilities against foreign firms; it does not affect these firms' institutional aspects, such as securities laws and accounting standards (Silvers, 2021b). Second, the signing of the MMoU is staggered, which eliminates the possibility of confounding events because any confounding events must perfectly coincide with the signing of the MMoU by different countries in different years. Third, although joining the MMoU is a voluntary decision made by countries' securities regulators,<sup>4</sup> it is beyond any firm's control. Hence, the MMoU represents a plausibly exogenous shock that increases SEC enforcement against US-listed foreign firms.

To examine whether the threat of increased SEC enforcement has a disciplinary effect on US-listed foreign firms after their home countries join the MMoU, we focus on foreign firms' cash holdings, as the deployment of cash is central to the conflict between managers and shareholders (Jensen, 1986). In particular, it has been documented that firms have been hoarding more cash globally than in previous years (Bates, Kahle, & Stulz, 2009; Chen, Dou, Rhee, Truong, & Veeraraghavan, 2015; Pinkowitz, Stulz, & Williamson, 2012), and it is easy for corporate insiders to misuse cash (Myers & Rajan, 1998). Therefore, if there is a disciplinary effect (in other words, improved corporate governance), it should be reflected by changes in cash holdings at first. However, it is theoretically unclear whether US-listed foreign firms' cash holdings increase or decrease as a result of the threat of increased SEC enforcement because agency theory provides conflicting predictions and mixed evidence about the impact of corporate governance on cash holdings.

On the one hand, Jensen (1986) posits that corporate insiders have incentives to accumulate cash to increase their private control benefits (e.g., diverting cash toward personal needs) at the expense of outside shareholders. We call this view the *expropriation incentive*. Consistent with this view, prior studies have shown that in countries with weak investor protection, firms hold more cash, but their cash is valued less by investors (Dittmar, Mahrt-Smith, & Servaes, 2003; Kalcheva & Lins, 2007; Pinkowitz, Stulz, & Williamson, 2006). In a similar vein, nationwide board reforms that improve corporate governance lead to a decrease in cash holdings and an increase in the market value of cash (Chen, Guedhami, Yang, & Zaynutdinova, 2020). In the US, Yun (2009) shows that better corporate governance is associated with a decrease in cash. Therefore, if the threat of increased SEC enforcement disciplines managers from stockpiling cash for their own private benefit, we expect US-listed foreign firms' cash holdings to *decrease* after their home countries join the MMoU network.

On the other hand, according to Myers and Majluf's (1984) pecking order theory, corporate insiders may accumulate cash to provide insurance against future uncertainties to avoid tapping capital markets for costly external funds. This incentive runs counter to the above expropriation purpose and is actually for the benefit of outside shareholders. We call this view the *precautionary incentive*. The precautionary incentive for holding cash has been well documented in the literature (e.g., Dessaint & Matray, 2017 for hurricane risk; Duong, Nguyen, Nguyen, & Rhee, 2020 for political risk; Harford, Klasa, & Maxwell, 2014 for refinancing risk; Javadi, Masum, Aram, & Rao, 2023 for climate risk) and is particularly relevant in our context, as many cross-listed firms originate from countries with higher political risk (Cosset, Martineau, & Samet, 2014) and economic risk (Agyemang, Balli, Gregory-Allen, & Balli, 2024) compared to the US, in which case low cash holdings indicate deviations from the best interests of shareholders (John, Li, & Pang, 2017). If this incentive dominates, then we expect that the threat of increased SEC enforcement, when it improves corporate governance in US-listed

<sup>2</sup> Ferris, Kim, and Noronha (2009) and Karolyi (2012) provide excellent reviews of support for and critics of the bonding hypothesis.

<sup>3</sup> Our sample of US-listed foreign firms includes foreign firms directly listed in the US market and those via American Depositary Receipts (ADRs).

<sup>4</sup> For example, countries closely related to the US in terms of trade and foreign investments may be more likely to join the MMoU.

foreign firms, results in an increase in cash holdings after their home countries sign the MMoU.<sup>5 6</sup>

We employ a difference-in-differences research design to examine the changes in cash holdings in US-listed foreign firms after their home countries sign the MMoU. To construct the sample, we define US-listed foreign firms whose home countries joined the MMoU as *treatment firms*. Each treatment firm is then matched to a *control firm* that is listed only in the home country, in the same industry (2-digit SIC code), and with the closest propensity score estimated using various firm characteristics that are common determinants of cash holdings in the year immediately before the MMoU signing year. Because the control firms are listed only in their home countries, they are not affected by the threat of increased SEC enforcement; therefore, their cash holdings are not expected to change after the MMoU.

Using a sample of 10,292 firm-year observations, including 778 treatment firms and 778 control firms from 33 foreign countries, we find that US-listed foreign firms significantly reduce their cash holdings after their home countries sign the MMoU, while control firms' cash holdings do not change. The magnitude of the decrease is also economically significant. After controlling for firm and year fixed effects, on average, US-listed foreign firms decrease their cash holdings by 15.4% relative to their pre-MMoU cash level. The results support the expropriation incentive of managers and are consistent with the findings of international studies that better corporate governance is related to lower cash holdings (Chen et al., 2020; Dittmar et al., 2003; Kalcheva & Lins, 2007).

Subsample analyses by different cross-listed types reveal that the reduction in cash holdings is evident mainly in level I and level II American Depositary Receipt (ADR) firms but not in directly listed and level III ADR firms, consistent with the fact that the latter must follow the most stringent US regulations and disclosure requirements; as such, the MMoU has no incremental disciplinary effect on their cash holdings.

We next perform channel tests to explore the economic mechanisms that link the threat of increased SEC enforcement with US-listed foreign firms' cash holdings. We first show that after the MMoU, US-listed foreign firms' corporate governance improves, as evidenced by reduced information opacity and a decreased cost of capital. We then document that the reduction in cash holdings is greater for US-listed foreign firms that have higher information opacity and cost of capital before the MMoU, supporting that information opacity and the cost of capital are two of the channels at work.

We also explore differences in home country governance strength, which has been found to shape foreign firms' behavior (Cumming, Hou, & Wu, 2017; Lang, Raedy, & Wilson, 2006; Srinivasan, Wahid, & Yu, 2015). Employing four country-level governance measures covering the facets of legal system (measured by legal origin following La Porta, Lopez-de-Silanes, Shleifer, & Vishny, 2000), self-dealing (measured by the revised anti-director index of Djankov, La Porta, Lopez-de-Silanes, & Shleifer, 2008), disclosure quality (measured by the auditing and enforcement index of Brown et al., 2014), and political environment (measured by the corruption perceptions index from Transparency International), we find consistent evidence that the reduction in cash holdings after the MMoU is more pronounced in the subsamples of US-listed foreign firms whose home countries have weaker corporate governance. This cross-sectional analysis suggests that when home country governance is weak, strong host country governance (e.g., the increased SEC enforcement in our study) can act as an effective substitute for cross-listed firms.

We then perform a battery of robustness tests for our main results. We use alternative control firms and dependent variables and conduct a parallel trend assumption test where we do not find any significant difference in the cash holding patterns among treatment and control firms before the MMoU. We also form an alternative treatment group comprising US-listed foreign firms whose home countries signed the MMoU in 2002 and 2003 (so the sample period is 1997–2008), with the control group consisting of US-listed foreign firms whose home countries had not yet signed the MMoU during the same period. Moreover, recent advances in the econometric literature point out that the staggered DiD method may provide biased estimates when there are heterogeneous treatment effects (Baker, Larcker, & Wang, 2022; Barrios, 2021); we thus adopt a stacked DiD approach following Cengiz, Dube, Lindner, and Zipperer (2019) and Chen, Chris, Tsang, and Xiang (2022).

Furthermore, we rule out an alternative explanation that the reduction in US-listed foreign firms' cash holdings is due to their better access to the capital market after cross-listing and therefore a reduced need to hoard cash. We also control for other potential confounding factors, such as board reforms (which many countries implemented during our sample period), and various national culture variables (i.e., individualism, uncertainty avoidance, and social trust). We then conduct a placebo test by randomly assigning MMoU signing years from 2002 to 2018 to each country in our sample and do not find results similar to our main findings. To ensure that the cross-listing and MMoU enactment do not overlap, we construct an alternative sample requiring all treatment and control firms to have the full 11 firm-years for the sample window of  $[-5, +5]$  (so the firms in this sample have been cross-listed for at least 5 years before the signing of the MMoU). We also carry out a subsample period test covering 2009–2019 to attenuate the impact of the 2007–2008 Global Financial Crisis. Moreover, we exclude countries that have fewer than five US-listed foreign firms to avoid disproportionate influence by firms or countries with relatively few observations and the MMoU signing year due to its transitional nature. We lag all explanatory variables by one year to further mitigate endogeneity concerns. Our main results remain intact after all these tests.

Finally, we conduct several additional analyses. First, we extend our analyses to a dynamic setting and examine how quickly US-

<sup>5</sup> Another possibility is that the increased regulatory cooperation and potential political risk mitigation through the MMoU framework may ease the pressure to repatriate cash in the US back to foreign firms' home countries. However, ex ante, it is unclear about the effect of the ease of repatriation on US-listed foreign firms' cash holdings. If firms choose to repatriate more due to the ease of doing so, their cash holdings would increase after the MMoU. However, the ease of repatriation could also diminish the necessity for large cash reserves, which may lead firms to maintain lower cash holdings.

<sup>6</sup> Bates et al. (2009) show no relation between some measures of corporate governance and cash holdings in the US, so it is also possible that we find no change in US-listed foreign firms' cash holdings after their home countries sign the MMoU.

listed foreign firms adjust their cash holdings toward the target level after the MMoU. We follow [Flannery and Rangan \(2006\)](#), [Gao, Harford, and Li \(2013\)](#) and [Jiang and Lie \(2016\)](#) and use a partial adjustment model. We find that while all US-listed foreign firms show a faster speed of adjustment (SOA) toward target cash levels after the MMoU, this result is driven by the subsample of firms that have excess cash (the subsample of firms that have cash shortfalls shows an insignificant SOA post-MMoU). The finding in the dynamic context reiterates our main results that US-listed foreign firms significantly reduce their cash holdings after the MMoU. Second, as both our static and dynamic settings show that US-listed foreign firms decrease their cash after the MMoU, we examine what they use the cash for. We find that after the MMoU, US-listed foreign firms use cash to make more payouts (both dividends and repurchases) but not more investments (insignificant changes in capital expenditure, acquisitions, and R&D expenditure). Third, we examine the value of cash. We find that after the MMoU, investors attach higher value to cash in US-listed foreign firms. This evidence is consistent with [Frésard and Salva \(2010\)](#) and [Huang, Elkinawy, and Jain \(2013\)](#), who show that cross-listed firms in the US have an excess-cash premium relative to their peers in the home countries.

Our study makes contributions to two streams of literature. First, we contribute to the small but growing number of studies investigating the effect of cross-border regulatory cooperation on financial markets and corporate financial policies. This emerging literature shows that the MMoU increases SEC enforcement actions and enhances equity market liquidity ([Silvers, 2020](#)),<sup>7</sup> facilitates equity market integration ([Silvers, 2021a](#)), fosters foreign portfolio investment ([Lang, Maffett, Omartian, & Silvers, 2020](#)), and reduces analysts' information processing costs ([Tsang, Xiang, & Yu, 2023b](#)). On the corporate side, the MMoU improves earnings quality and firm transparency ([Silvers, 2021b](#)), prompts more accounting restatements ([Chang & He, 2021](#)), increases dividend payouts ([Chen, Chris, et al., 2022](#)), leads to more voluntary disclosures ([Tsang, Xiang, & Yu, 2023a](#)), enhances corporate social responsibility reporting ([Chen, Luo, & Tsang, 2024](#)), and affects firm cross-listing decisions ([Chen, Chen, et al., 2022](#)). Our study adds novel evidence to this stream of literature by showing that the threat of regulatory enforcement through the MMoU has a disciplinary effect on foreign firms' agency problems, hindering attempts by corporate insiders in these firms to stockpile cash holdings to enjoy private benefits of control. As [Stulz \(2005\)](#) argues, the agency problems of corporate insiders expropriating outside investors limit the benefits of financial globalization. Our results show that cross-border regulatory cooperation provides a feasible solution to mitigate this problem. Although our study focuses on firms cross-listed in the US, we expect that the evidence is generalizable to firms cross-listed in other stock exchanges. Overall, our findings add to a better understanding of the economic consequences of the MMoU, which has important implications for regulators and investors around the world.

Second, we contribute to the literature investigating corporate governance and cash holdings. Our study is closely related to two studies on the cash holdings of cross-listed firms. [Huang et al. \(2013\)](#) find that foreign firms hold more cash due to better investor protection after cross-listing in the US,<sup>8</sup> and [Frésard and Salva \(2010\)](#) and [Huang et al. \(2013\)](#) document that cross-listing in the US is related to an increase in the value of cash. While cross-listing represents an interesting setting, firms make cross-listing decisions; thus, there might be a self-selection issue ([Coffee, 2002](#)). Furthermore, cross-listing allows firms to raise more capital, which likely results in more cash holdings after cross-listing. In contrast, our study examines the effect of the MMoU (on firms already cross-listed in the US), the signing of which is beyond a firm's control, thus avoiding the self-selection issue, as the MMoU applies to all foreign firms from signatory countries. In this sense, we also contribute to the mixed evidence in the corporate governance and cash holdings literature (e. g., [Bates, 2009](#); [Harford, Mansi, & Maxwell, 2008](#); [Yun, 2009](#) for US firms; and [Chen et al., 2020](#); [Chen, Chen, Schipper, Xu, & Xue, 2012](#); [Dittmar et al., 2003](#); [Kalcheva & Lins, 2007](#) for non-US and international firms) by providing causal evidence using cross-listed firms. While there is evidence that improved corporate governance can be associated with either an increase or a decrease in cash holdings due to managers' different incentives for hoarding cash, we find that US-listed foreign firms hold less cash as a result of improved corporate governance induced by the MMoU, supporting the expropriation incentive, in contrast to the precautionary incentive due to the higher risk of home countries compared to the US.

The remainder of the paper is organized as follows. Section 2 discusses the details of the MMoU framework and its effect on SEC enforcement and corporate governance. Section 3 describes our research design. Section 4 presents the empirical results and robustness tests. Section 5 provides additional analyses. Section 6 concludes.

## 2. The MMoU and its effect on SEC enforcement and corporate governance

After the terrorist attacks of September 11, 2001 in the US, the International Organization of Securities Commissions (IOSCO) responded immediately to create a way to investigate and deter terrorist financing and money laundering. As a result, the MMoU was forged in May 2002. The main purposes of the MMoU are (1) to facilitate cross-border cooperation and (2) to enable information sharing among participating securities regulators around the world. To facilitate cross-border cooperation, the MMoU standards are tailored to an international scope rather than merely assisting a particular jurisdiction (as in bilateral memoranda). When regulators apply to sign the MMoU, they need to complete a detailed questionnaire about specific local laws that will allow them to comply with the MMoU. This requirement largely extends regulators' enforcement capabilities, as it removes barriers to cooperation due to, for example, domestic secrecy or blocking laws. To enable effective information sharing, the MMoU specifies the content and extent of the

<sup>7</sup> In a similar sense, [Cumming, Hou, and Wu \(2018\)](#) document that the Markets in Financial Instruments Directive (MiFID) strengthens exchange trading rules in the European Union (EU) and increases stock trading.

<sup>8</sup> A key difference between [Huang et al. \(2013\)](#) and our study is that [Huang et al. \(2013\)](#) examine the cross-listing effect on cash holdings (which, as we argue, may suffer from two concerns: (1) a self-selection issue, and (2) a legal bonding debate), whereas our study investigates the MMoU (regulatory enforcement) effect on cash holdings in firms that had already been cross-listed in the US market.

information that can be exchanged and compelled, the permissible uses of the information, and associated confidentiality obligations. For example, regulatory authorities can request information from/provide information to other signatories if the activities in question are related to insider trading and market manipulation, fraud and misconduct regarding securities and derivatives, or the handling of investor funds. In brief, the MMoU represents a common understanding among participating regulators on how they should consult, cooperate and exchange information for the purpose of regulatory enforcement regarding securities and derivatives markets.

The MMoU has attracted a large number of securities regulators from a wide range of jurisdictions. As of December 2019, out of the 159 IOSCO members who are eligible to apply to sign the MMoU, 124 (from 121 countries) are already MMoU signatories. Although the MMoU is a nonbinding arrangement (rather than a treaty), signatories have been actively cooperating by exchanging information for enforcement purposes: 56 information requests were made in 2003, monotonically increasing to 4803 in 2017 and remaining around that level in 2018 and 2019 (4064 in 2018 and 4319 in 2019).<sup>9</sup>

Prior to the MMoU, SEC enforcement over foreign firms was rare and difficult (Licht et al., 2018; Siegel, 2005). Specifically, Siegel (2005) finds that between January 1, 1995, and June 30, 2002, the SEC took enforcement actions against only 13 US-cross-listed firms. The difficulty embedded in SEC enforcement mainly originates from the fact that foreign insiders are located in other jurisdictions and that foreign regulatory agencies are unable or unwilling to cooperate with the SEC to pursue litigation cases (Siegel, 2005). After the establishment of the MMoU in 2002, which facilitates information sharing and cooperation between the SEC and foreign regulators, Silvers (2020) shows that the SEC took enforcement actions against 121 US-listed foreign firms (1.92% of firm-years), representing a threefold increase compared with the corresponding number of 52 US-listed foreign firms (0.63% of firm-years) before the MMoU.<sup>10</sup> Crucially, the MMoU expands only SEC enforcement capabilities against foreign firms but does not change other institutional aspects of these firms, such as their securities laws and accounting standards (Silvers, 2021b). We therefore exploit the signing of the MMoU as an exogenous shock to increased SEC enforcement over US-listed foreign firms.

Research has shown that enforcement actions help reduce agency problems and improve corporate governance in both targeted and nontargeted firms. Specifically, Silvers (2016) finds that during windows of SEC enforcement actions against targeted firms, the stock returns on nontargeted firms increase because enforcement constrains the risk of expropriation. Massa, Wang, Zhang, and Zhang (2020) show that US private enforcement against foreign firms through shareholder-initiated class action lawsuits can discipline foreign firms' home-country industry peers, causing peer firms to reform corporate governance to regain shareholder value. A higher litigation risk also decreases insider trading (e.g., Cheng, Huang, & Li, 2016; Cheng & Lo, 2006; Cohen, Malloy, & Pomorski, 2012) and acts as an effective governance mechanism (Appel, 2019; Ferris, Jandik, Lawless, & Makhija, 2007; Foroughi, Marcus, Nguyen, & Tehranian, 2022). Therefore, we argue that after the MMoU, the threat of increased SEC enforcement reduces the agency problems in US-listed foreign firms and improves their corporate governance. However, agency theory provides contradicting predictions and mixed evidence about how improved corporate governance affects cash holdings following managers' differing incentives for stockpiling cash, i.e., the *expropriation incentive* vs. *precautionary incentive*, as discussed in the Introduction. Therefore, whether the MMoU leads to an increase or decrease in US-listed foreign firms' cash holdings remains an empirical question, and we proceed with the investigation using a staggered DiD approach.

### 3. Research design

#### 3.1. Treatment firms: identification and sampling

Table 1 reports the identification and sampling process of the treatment firms. We define US-listed foreign firms as firms listed on major US exchanges in Compustat but with headquarters (Compustat item: LOC) outside the US. Our sample period is 1997–2019. We start from 1997 because the MMoU was established in 2002, and we focus on a  $[-5, +5]$  window surrounding the MMoU signing year. Our sample ends in 2019 because it was the most recent year for which data were available at the start of the research. The initial sample contains 55,746 firm-year observations for 5553 US-listed foreign firms from 77 foreign countries. We exclude firms in the financial (SIC: 6000–6999) or utility (SIC: 4900–4999) industries and firms whose home countries are not MMoU signatories. After applying these initial filters, we have 4615 US-listed foreign firms from 59 foreign countries remaining in the sample.

#### 3.2. Control firms: matching and sampling

Following our DiD identification strategy, we next match the treatment firms with the control firms using propensity score matching (PSM). The matching process is also reported in Table 1. Specifically, for each US-listed foreign firm, we first identify the year when its home country signed the MMoU. We then match the US-listed foreign firms with non-cross-listed firms in home countries in the same industry (2-digit SIC code) and with nearest neighbor propensity scores, estimated using the firm-year observations in the year immediately before the MMoU signing year. To mitigate the influence of potential confounding events and country-level developments, we further restrict our matched sample to an event window of  $[-5, +5]$  years surrounding the MMoU signing year.<sup>11</sup>

<sup>9</sup> These numbers are obtained from <https://www.iosco.org/about/?subsection=mmou>.

<sup>10</sup> The enforcement actions can be classified into four types: insider trading, financial reporting, Foreign Corrupt Practices Act (FCPA), and miscellaneous (i.e., other alleged violations, such as improper loans or compensation to officers).

<sup>11</sup> The maximum length is  $[-5, +5]$ . Not every firm has 11 firm-year observations. The number of firm-year observations within the  $[-5, +5]$  window varies across firms depending on data availability.

**Table 1**  
Sample selection.

Description	Treatment firms: US-listed foreign firms			Control firms: Home country firms		
	Unique foreign countries	Firm-years	Unique firms	Unique foreign countries	Firm-years	Unique firms
Firms listed in the US in Compustat	77	55,746	5553	120	563,668	42,810
Exclude home country firms with missing or unclear share exchange information or that are listed in both the US and their home countries (dual-listed firms)				113	512,292	41,647
Exclude firms in the financial (SIC: 6000–6999) or utility industries (SIC: 4900–4999)	77	45,826	4691	112	489,805	39,161
Exclude foreign firms whose home countries are not MMoU signatories	59	45,025	4615	81	454,535	36,445
Matching process:						
Identify foreign firms' home country MMoU signing year	45	1288	1288			
Match treatment firms with control firms in their home countries by industry (2-digit SIC code) and the nearest neighbor propensity scores, estimated using the firm-year observations in the year immediately before the MMoU signing year	38	796	796	38	796	796
Keep firm-year observations within a [-5, +5] window around the MMoU signing year	38	7478	796	38	7138	796
Exclude firm-year observations with missing country-level control variables	33	6601	778	33	5462	778
Exclude unmatched firm-year observations	33	5146	778	33	5146	778
<b>Final sample</b>		<b>10,292</b>				

This table reports the sample selection process. The sample period is 1997–2019.

Finally, we exclude firm-year observations with missing country-level control variables and those that are not matched. Our final sample contains 778 US-listed foreign firms from 33 foreign countries (*treatment firms*) and 778 matched non-cross-listed firms in home countries (*control firms*), for a total of 10,292 firm-year observations (5146 for each group).

Given that it is crucial for the treatment and control firms to be similar before the MMoU, we report the detailed PSM procedure and its effectiveness in [Appendix B](#). In Panel A, we estimate a logit regression to model the probability of being a treatment firm using all observable time-varying firm characteristics that are common determinants of corporate cash holdings (i.e., size (*SIZE*), financial leverage (*LEVERAGE*), market-to-book ratio (*MB*), net working capital (*NWC*), R&D expenditure (*R&D*), operating cash flow (*CASH\_FLOWS*), cash flow risk (*INDUSTRY\_SIGMA*), capital expenditure (*CAPEX*) and a dividend dummy (*DIVIDEND\_DUMMY*)). All variables are defined in [Appendix A](#). We also include year and country fixed effects to control for potential differences across years and countries. The propensity score for each firm is calculated as the predicted probability of being a treatment firm from this step, and the treatment and control firms are matched using nearest neighbor propensity scores without replacement. Panel B of [Appendix B](#) reports the effectiveness of the PSM sample. For the sample with no PSM, the differences in the predictors between the treatment group (1288 US-listed foreign firms) and the control group (330,576 unmatched non-cross-listed firms in home countries) are all significant at the 1% level. Importantly, after PSM, the differences across the firm characteristics of net working capital, capital expenditure, R&D expenditure, operating cash flow and the dividend dummy between the treatment group (796 US-listed foreign firms) and the control group (796 matched non-cross-listed firms in home countries) are eliminated, with the differences in size, leverage, market-to-book and cash flow risk all reduced, justifying the effectiveness of the PSM.<sup>12</sup>

### 3.3. Main empirical model

To implement the staggered DiD design to compare the changes in cash holdings in treatment and control firms before and after the MMoU signing, we estimate the following OLS regression model:

$$CASH_{i,t} = \alpha + \beta_1 TREAT_{i,t} \times POST_{i,t} + \beta_2 TREAT_{i,t} + \beta_3 POST_{i,t} + \gamma \cdot Controls + Fixed\ Effects + \varepsilon_{i,t}. \quad (1)$$

Following common practice in the cash holdings literature (e.g., [Huang et al., 2013](#); [Kalcheva & Lins, 2007](#)), *CASH* is measured as the ratio of cash and short-term investments (Compustat item: CHE) to net assets, with net assets computed as total assets (Compustat item: AT) minus cash and short-term investments. *TREAT* is a dummy variable that equals 1 for US-listed foreign firms whose home countries are MMoU signatories, and 0 for matched home country control firms. *POST* is a dummy variable that equals 1 after a foreign country joins the MMoU, and 0 for the period before it joins. *Controls* include both firm and country characteristics identified as important determinants of corporate cash holdings. For firm characteristics, following the prominent level-of-cash models of [Opler, Pinkowitz, Stulz, and Williamson \(1999\)](#) and [Bates et al. \(2009\)](#), we include firm size (*SIZE*), financial leverage (*LEVERAGE*),

<sup>12</sup> To avoid any potential confusion, the 796 treatment firms and 796 control firms are obtained after the PSM, whereas our final sample for the regression analyses of 778 treatment firms and 778 control firms (for a total of 10,292 firm-year observations) is obtained after further excluding firm-year observations with missing country-level control variables and those that are not matched (see [Table 1](#)).

market-to-book ratio (*MB*), net working capital (*NWC*), R&D expenditure (*R&D*), operating cash flow (*CASH\_FLOWS*), cash flow risk (*INDUSTRY\_SIGMA*), capital expenditure (*CAPEX*) and a dividend dummy (*DIVIDEND\_DUMMY*) (the same set as in the PSM process).

At the country level, we include four categories of control variables to account for a country's various aspects: (1) economic development, i.e., GDP growth (*GDP\_GROWTH*) and GDP per capita (*GDP\_PC*), following Dittmar et al. (2003), Kalcheva and Lins (2007) and Chen et al. (2015); (2) governance strength, i.e., board reforms (*CG\_REFORM*, enacted in many countries in the early 2000s; data from Bae, El Ghouli, Guedhami, & Zheng, 2021), disclosure quality (*AUDIT\_ENFORCE*, measured by the auditing and enforcement index of Brown et al., 2014), political environment (*CORRUPTION*, measured by the corruption perceptions index from Transparency International),<sup>13</sup> takeover laws (*TAKEOVER\_LAW*, enacted in many countries during the late 1990s and early 2000s; data from Lel & Miller, 2015), and legal enforcement (*RL\_LAW*, measured by the rule-of-law index of La Porta, Lopez-de-Silanes, & Shleifer, 2006); (3) capital market development, i.e., private credit to GDP (*PRIVATE\_CREDIT*) and stock market capitalization to GDP (*STOCKS\_TRADE*), following Dittmar et al. (2003), Kalcheva and Lins (2007) and Chen et al. (2015); and (4) cash holding determinants that are specific to cross-listed firms, i.e., foreign exchange risk (*FX\_RISK*, measured by the foreign exchange rate stability risk ratings from International Country Risk Guide) following Deng (2020) and inflation (*INFLATION*, computed as the annual percent change in a country's average consumer prices). All variable definitions and data sources are detailed in Appendix A.

In our baseline analysis, we use firm and year fixed effects as the main fixed effects. As robustness checks, we also include alternative sets of fixed effects (year and industry, year and country, and year, industry and country fixed effects) in Equation (1) to capture unobservable differences across years, industries, and countries. Robust standard errors are clustered at the country level to adjust for correlations among observations in each country over time.

The main coefficient of interest is  $\beta_1$ , which captures the change in US-listed foreign firms' cash holdings after the MMoU compared to that of matched non-cross-listed firms in their home countries.

## 4. Empirical results

### 4.1. Descriptive statistics

Table 2 shows the distribution of US-listed foreign firms in our final sample. We present the number of total firms (treatment and control firms) and their firm-year observations for each foreign country in ascending order of the country's MMoU signing date. Australia, Greece, Canada and Portugal were the first few countries to sign the MMoU in October/November 2002, while Indonesia, Argentina, Russia and Chile became signatories most recently in 2014, 2015 and 2018. From the signing dates, we also observe new signatories joining the MMoU almost every year. This staggered feature provides a clean identification of the effect of the MMoU on US-listed foreign firms' cash holdings because it is highly unlikely for any confounding event to perfectly synchronize with the MMoU signing by different countries in different years. In our sample, Canada, the UK and China have the largest number of firm-years, followed by Japan and Hong Kong.

Table 3 reports the summary statistics for all the variables used in our analyses. To mitigate the impact of extreme values, we winsorize all continuous variables at the top and bottom 1% levels. On average, US-listed foreign firms have mean (median) cash holdings (*CASH*) of 35.7% (11.3%) of net assets, indicating a typical heavy right tail. These statistics are larger than those reported in Huang et al. (2013) for ADR firms for the period 1992–2009 (mean of 23% and median of 7%), implying that US-listed foreign firms seem to hold more cash in recent periods (our sample period is from 1997 to 2019).<sup>14</sup> The average (median) of *POST* is 0.532 (1), indicating slightly more firm-years in post-MMoU periods. The firm-level and country-level control variables present mean and median values comparable to those in prior studies (e.g., Chen et al., 2020; Huang et al., 2013).

### 4.2. Baseline results

Table 4 reports the results from estimating Equation (1). Column (1) includes year and firm fixed effects to control for within-year and within-firm changes in the cash holdings of our sample firms. The variable *TREAT* is lost due to firm fixed effects. The coefficient on *TREAT* × *POST* is −0.071 and significant at the 5% level, suggesting that, compared to matched non-cross-listed firms in home countries, US-listed foreign firms significantly reduce their cash holdings after their home countries join the MMoU. *POST* shows a significant and positive coefficient, suggesting that after the MMoU, control firms increase their cash holdings.

In Columns (2) to (4), as robustness tests, we include alternative sets of fixed effects, i.e., year and industry fixed effects, year and country fixed effects, and year, industry, and country fixed effects, respectively. Consistent with Column (1), the estimated coefficients on *TREAT* × *POST* are −0.049, −0.043 and −0.049, respectively, all significant at the 5% or higher level. The reduction in cash holdings in US-listed foreign firms after the MMoU is also economically significant. Taking as an example Column (1), which includes

<sup>13</sup> Political environment has been found to be related to corporate cash holdings. Chen, Li, Xiao, and Zou (2014) find that firms hold less cash when local government quality is high because good government mitigates financial constraints. Thakur and Kannadhasan (2019) document that corruption is positively related to cash holdings in emerging markets.

<sup>14</sup> The trend of increased cash holdings from Huang et al.'s (2013) sample period of 1992–2009 to our sample period of 1997–2019 does not contradict our main findings that US-listed foreign firms reduce their cash holdings, as we focus on a [-5, +5]-year window surrounding the MMoU signing year and therefore, a reduction in cash holdings after the MMoU is relative to the pre-MMoU period, which could still be higher than the average level during 1992–2009.

firm and year fixed effects, after the MMoU, US-listed foreign firms hold 19.9% ( $=0.071/0.357$ ) less cash than the mean cash level of the sample firms or 15.4% ( $=0.071/0.462$ ) less cash than the pre-MMoU mean cash level of treatment firms.

In Columns (2) to (4), *TREAT* has significant and positive coefficients, with a magnitude of at least 0.119. This indicates that before the MMoU, US-listed foreign firms tend to hold more cash than their non-cross-listed counterparts in their home countries.<sup>15</sup> The loadings on *POST* are unexceptionally insignificant, implying that there is no significant change in control firms' cash holdings before and after the MMoU. In all the model specifications in Table 4, the coefficient estimates for the control variables show signs largely consistent with those of prior studies (e.g., Chen et al., 2020; Huang et al., 2013). Specifically, firm size, leverage, net working capital, and GDP per capita are negatively associated with cash holdings, whereas market-to-book, capital expenditure, R&D expenditure, and cash flow volatility are positively related to cash holdings.

Overall, Table 4 provides strong evidence that benchmarking with matched home country firms, US-listed foreign firms significantly decrease their cash holdings after their home countries join the MMoU. This evidence suggests that regulatory cooperation through the MMoU increases the threat of cross-border SEC enforcement, which in turn disciplines managers from hoarding too much cash to enjoy private benefits of control.

#### 4.3. Subsample analyses

As foreign firms can cross-list in the US market via either direct listing or American Depositary Receipt (ADR), to provide deeper insight, we examine whether the MMoU has distinct impacts on the cash holdings of different types of cross-listed firms. We first classify our sample firms into two broad cross-listed types, i.e., direct listing and ADR. For the 778 unique US-listed foreign firms in our sample, we identify 338 ADR firms based on the Compustat variable ADR Ratio (item: ADRR), which is available only for foreign firms that trade ADRs or American Depositary Shares in the US. Accordingly, the remaining 440 foreign firms fall under directly listed firms. We then estimate our baseline model for each type of cross-listed firm and report the results in Table 5. Columns (1) and (2) show that the reduction in cash holdings after the MMoU is evident only in ADR firms (the coefficient on  $TREAT \times POST$  is  $-0.121$  and significant at the 5% level) but not in directly listed foreign firms (the coefficient on  $TREAT \times POST$  is  $-0.034$  but insignificant). This result is reasonable because directly listed foreign firms must comply with the strictest US regulatory and disclosure requirements, whereas ADR firms have different disclosure requirements depending on their levels. Hence, the MMoU has no incremental effect on the cash holdings of directly listed foreign firms.<sup>16</sup>

To validate our expectation, we further consider ADR levels. There are four ADR options: level I, level II, level III, and Rule 144A, all of which have different disclosure requirements, investor perceptions, and operational considerations. Generally, level II and level III ADRs (listed programs) have more restrictive governance and disclosure requirements (with level III at the strictest standards similar to those of domestic US firms) than level I and Rule 144A private placement ADRs (unlisted programs). Another key difference among the four types of ADRs is that only level III and Rule 144A ADRs are eligible for raising capital, whereas level I and level II ADRs are not.<sup>17</sup> Following Boubakri, Cosset, and Samet (2010), we obtain the detailed ADR types from the major depositories of ADRs: the Bank of New York (BNY), Citibank (CB), the Deutsche Bank (DB) and JPMorgan (JPM).<sup>18</sup> For the 338 ADR firms identified in our sample, we are able to obtain detailed type information for 167 firms. Among these 167 ADRs, 84 (50.3%), 38 (22.8%) and 45 (26.9%) are level I, II and III, respectively.<sup>19</sup> This distribution is similar to that in Boubakri et al. (2010), whose sample includes 50.4%, 16.4% and 13.1% levels I, II and III ADRs, respectively. As directly listed firms and level III ADRs similarly share the highest level of reporting requirements, we categorize them in one group and levels I and II ADRs in another group. We then re-estimate our baseline regression for each group. Columns (3) and (4) in Table 5 show that the MMoU leads to a reduction in cash holdings only for levels I and II ADRs but not for directly listed and level III ADR firms, consistent with the corporate governance explanation.

#### 4.4. Channel tests

As the cross-listing type analysis indicates that corporate governance may play a role in how the MMoU affects US-listed foreign firms' cash holdings, in this subsection, we formally test the underlying mechanisms. We first show that US-listed foreign firms'

<sup>15</sup> To ensure that our results are not contaminated by a structural difference in initial cash holdings between the treatment and control groups, in one of the robustness tests, we use an alternative matching method where we match US-listed foreign firms with firms in their home countries in the same industry (2-digit SIC code) and with the closest cash holdings (*CASH*) in the year immediately before the MMoU signing year. The difference in initial cash holdings between the treatment and control groups is insignificant. The results are reported in Table 8 Panel A Column (3) and remain robust.

<sup>16</sup> Among the 440 directly listed foreign firms in our sample, 300 are from Canada. This statistic is consistent with Lang, Lins, and Miller (2003) who find that most direct listings are by Canadian firms. As Canadian firms typically have superior corporate governance, we also exclude Canadian firms from directly listed firms and re-estimate our baseline model. The coefficient on  $TREAT \times POST$  remains negative and insignificant. The results are available upon request.

<sup>17</sup> See Boubakri, Cosset, and Samet's (2010) Table 1 for a summary of the main features of different types of ADRs.

<sup>18</sup> Data sources: <https://www.adrbnymellon.com/directory/dr-directory>; <https://depositoryreceipts.citi.com/adr/guides/uig.aspx?pageID=8&subpageID=34>; [https://www.adr.db.com/drwebrebrand/dr-universe/dr\\_universe\\_type\\_e.html](https://www.adr.db.com/drwebrebrand/dr-universe/dr_universe_type_e.html); and <https://www.adr.com/dr/drdirectory/drUniverse>.

<sup>19</sup> Following Boubakri, El Ghoul, Wang, Guedhami, and Kwok (2016), when we compare the effect of the MMoU across ADR types, we exclude firms that issue multiple types of ADRs. After this step, there is no Rule 144A left in our sample.



**Table 2**  
Sample distribution.

Country	MMoU signing date	No. of unique firms	No. of firm-years	COMMON_LAW	AUDIT_ENFORCE (raw value)	REVISED_ANTI-DIRECTOR_INDEX	CORRUPTION (raw value)	CG_REFORM_YEAR
Australia	2002/10/8	28	180	1	42.200	4.000	86.422	2004
Greece	2002/10/18	4	24	0	20.167	2.000	43.083	2002
Canada	2002/10/23	600	3518	1	43.518	4.000	88.835	2002
Portugal	2002/11/4	2	14	0	22.143	2.500	64.429	2001
France	2003/2/19	48	280	0	40.964	3.500	69.593	2003
Hong Kong	2003/3/3	72	512	1	29.859	5.000	80.621	2005
United Kingdom	2003/3/10	172	1182	1	39.259	5.000	85.604	1998
Mexico	2003/3/14	40	294	0	17.286	3.000	34.946	2001
South Africa	2003/3/18	26	210	1	19.571	5.000	47.629	.
Spain	2003/3/24	6	40	0	29.200	5.000	69.150	2006
India	2003/4/22	14	70	1	18.029	5.000	31.229	2002
Hungary	2003/7/9	2	8	0	16.000	2.000	48.750	2003
Italy	2003/9/15	20	104	0	38.846	2.000	51.462	2006
Poland	2003/11/4	2	4	0	11.000	2.000	41.000	2002
Germany	2003/11/5	42	224	0	30.536	3.500	77.598	2002
Belgium	2005/4/3	4	30	0	35.733	3.000	72.333	2005
Singapore	2005/11/17	18	154	1	28.571	5.000	92.948	2003
Israel	2006/7/2	70	452	1	41.442	4.000	63.173	2000
Denmark	2006/8/17	4	12	0	34.333	4.000	74.333	2001
Norway	2006/12/11	8	76	0	42.789	3.500	86.605	2005
China	2007/5/29	156	1120	0	36.502	1.000	35.005	2001
Finland	2007/11/22	8	24	0	22.667	3.500	97.000	2004
Netherlands	2007/11/22	44	364	0	30.467	2.500	88.154	2004
Japan	2008/2/19	62	644	0	32.435	4.500	74.466	2002
Brazil	2009/10/21	30	184	0	23.587	5.000	37.652	2002
Austria	2009/10/28	2	10	0	26.400	2.500	83.800	2004
Switzerland	2010/2/15	30	228	0	48.421	3.000	88.798	2002
Korea	2010/6/9	10	108	0	27.333	4.500	53.796	1999
Ireland	2012/12/24	2	20	1	41.000	5.000	74.400	.
Indonesia	2014/1/21	4	34	0	14.000	4.000	32.706	2007
Argentina	2014/6/12	4	26	0	11.000	2.000	32.769	2001
Russia	2015/2/16	8	48	0	28.000	4.000	27.750	.
Chile	2018/11/22	14	94	0	9.000	4.000	68.787	2001
Total		1556	10,292	0.709	37.015	3.769	73.809	

This table reports the sample distribution of treatment firms (i.e., US-listed foreign firms whose home countries are MMoU signatories) in ascending order of their home country's MMoU signing date, obtained from the MMoU's official website at <https://www.iosco.org/about/?subSection=mmou&subSection1=signatories>. *COMMON\_LAW* is the legal origin of a country (common law = 1 and civil law = 0), obtained from La porta et al. (1998). *AUDIT\_ENFORCE* is the auditing and enforcement index of Brown et al. (2014). *REVISED\_ANTI-DIRECTOR\_INDEX* is the revised anti-director index of Djankov et al. (2008). *CORRUPTION* is the corruption perceptions index obtained from the Transparency International website. *CG\_REFORM\_YEAR* is the enactment year of a major board reform in a country, obtained from Bae et al. (2021).

corporate governance improves, as evidenced by reduced information opacity and decreased cost of capital after their home countries join the MMoU. We then show that the effect of the MMoU is stronger for firms that have greater information opacity and a higher cost of capital.

We measure firms' information opacity using two proxies. The first proxy is the timely recognition of losses. Following Lang et al. (2006) and Silvers (2021b), we construct *LARGE\_NEG*, an indicator variable that equals 1 for firms whose annual net income scaled by total assets is less than 0.2, and 0 otherwise. A higher likelihood of reporting large negative earnings indicates a better information environment. The second proxy is earnings smoothing. We follow Land and Lang (2002) and Silvers (2021b) and estimate *SMOOTH* as the rolling correlation between cash flows and accruals over the preceding five years. More smooth earnings are consistent with less earnings management and, therefore, greater information transparency. We then regress these two variables on *TREAT* × *POST*, *TREAT*, *POST*, and the same set of firm-level and country-level control variables as in Equation (1). The results are reported in Table 6 Panel A Columns (1) and (2). As seen, the coefficients on *TREAT* × *POST* are both significantly positive, indicating that US-listed foreign firms' information quality improves after the MMoU. This evidence is consistent with Silvers (2021b) and Tsang, Xiang and Yu (2023), who find that the MMoU is associated with improvements in the information environment of US-listed foreign firms.

We provide further evidence that the cost of capital for US-listed foreign firms also decreases as a result of their home countries signing the MMoU. We estimate two ex ante cost of equity (COE) capital measures, *COE\_PEG* and *COE\_OJ*. Following Easton (2004) and Lewellen, Mauler, and Watson (2021), *COE\_PEG* is calculated as  $\sqrt{\frac{FEPS_2 - FEPS_1}{P_0}}$ , where *FEPS*<sub>1</sub> is the one-year-ahead mean analysts' earnings forecast per share, *FEPS*<sub>2</sub> is the two-year-ahead mean analysts' earnings forecast per share, and *P*<sub>0</sub> is the price per share in June of year *t*. Following Ohlson and Juettner-Nauroth (2005) and El Ghouli, Guedhami, Kwok, and Mishra (2011), *COE\_OJ* is calculated as  $A + \sqrt{A^2 + \frac{FEPS_1}{P_0}(g - (\gamma - 1))}$ , where  $A = \frac{1}{2} * \left( (\gamma - 1) + \frac{DPS_1}{P_0} \right)$ ,  $g = \frac{STG + LTG}{2}$ ,  $STG = \frac{FEPS_2 - FEPS_1}{FEPS_1}$ , *LTG* is the long-term (5-year) growth forecast in June of year *t*,  $\gamma - 1 = r_f - 0.03$ , *DPS*<sub>1</sub> is assumed to equal *DPS*<sub>0</sub> (the actual dividend per share in year *t*), *r*<sub>*f*</sub> is the yield on 10-year Treasury notes in June of year *t*, and *FEPS*<sub>1</sub>, *FEPS*<sub>2</sub> and *P*<sub>0</sub> are defined the same as above. We then regress *COE\_PEG* and *COE\_OJ* on *TREAT* × *POST*, *TREAT*, *POST*, and the same set of firm-level and country-level control variables as in Equation (1). As reported in Table 6 Panel A Columns (3) and (4), the coefficients on *TREAT* × *POST* are significantly negative for both measures, suggesting that US-listed foreign firms' cost of capital decreases after the MMoU. These results are, by nature, similar to Xu, Pan, and Tian's (2023) finding that the threat of financial regulator enforcement in China reduces the implied cost of equity capital for firms that are subject to the lottery of on-site inspections.

Next, we show that the reduction in cash holdings is more pronounced in US-listed foreign firms that have greater information opacity and a higher cost of capital. Specifically, we partition our sample into high and low information opacity groups (high and low cost of capital groups) based on treatment firms' information opacity measures (cost of capital measures) in the year immediately before the MMoU signing year and re-estimate the effect of the MMoU on cash holdings for each group. As shown in Table 6 Panels B and C, the coefficients on *TREAT* × *POST* are significantly negative (insignificant) for firms with high (low) information opacity and high (low) cost of capital, supporting that information opacity and the cost of capital are two of the channels that transfer the impact of the threat of increased SEC enforcement to US-listed foreign firms' cash holdings.

#### 4.5. Cross-sectional tests

The channel tests confirm that firm-level governance is the economic mechanism through which the threat of regulatory enforcement affects US-listed foreign firms' cash holdings. As Cumming et al. (2017) show that sovereign-governance is equally important for cross-listed firms, we next explore whether there is a heterogeneous effect induced by home country governance. We measure the strength of country-level governance using four proxies to cover various dimensions. The first measure is legal origin (La Porta, Lopez-de-Silanes, Shleifer, & Vishny, 1998, 2000), i.e., whether a country adopts common law (*COMMON\_LAW* = 1) or civil law (*COMMON\_LAW* = 0). The second proxy is the revised anti-director index of Djankov et al. (2008). This measure focuses on the extent to which shareholders are protected against expropriation by corporate insiders. The third proxy is the auditing and enforcement index of Brown, Preiato, and Tarca (2014), which captures a country's auditing quality of financial statements and enforcement of accounting standards. Finally, we use the corruption perceptions index (data from Transparency International) to measure a country's political environment. For the last three measures, we partition our sample into two subsamples based on the median value of each index and re-estimate Equation (1) for each subsample.

Table 7 reports the results of the cross-sectional tests. We find that the reduction in cash holdings is greater for US-listed foreign firms whose home countries have weaker governance, as shown by the significant and negative coefficients on *TREAT* × *POST* across all measures of corporate governance. While the coefficients on *TREAT* × *POST* are also negative for US-listed foreign firms from countries with stronger governance, they are not statistically significant (except for the subsample with a high auditing and

**Table 3**  
Descriptive statistics.

Variables	N	Mean	Std. Dev.	P25	P50	P75
Dependent variables						
<i>CASH</i>	10292	0.357	0.814	0.037	0.113	0.289
<i>Ln(1+CASH)</i>	10292	0.225	0.336	0.036	0.107	0.253
<i>CASH/TA</i>	10292	0.167	0.190	0.036	0.101	0.224
<i>DETTRENDED_CASH</i>	10292	0.000	0.404	-0.233	-0.158	0.019
Variables of interest						
<i>TREAT</i>	10292	0.500	0.500	0.000	0.500	1.000
<i>POST</i>	10292	0.532	0.499	0.000	1.000	1.000
Firm-level control variables						
<i>SIZE</i>	10292	6.235	2.526	4.273	6.114	8.153
<i>LEVERAGE</i>	10292	0.257	0.238	0.065	0.228	0.371
<i>MB</i>	10292	1.851	1.759	1.013	1.312	1.961
<i>NWC</i>	10292	-0.003	0.205	-0.110	-0.003	0.121
<i>CAPEX</i>	10292	0.086	0.100	0.027	0.054	0.102
<i>R&amp;D</i>	10292	0.039	0.082	0.000	0.000	0.027
<i>CASH_FLOWS</i>	10292	0.028	0.253	0.012	0.080	0.138
<i>INDUSTRY_SIGMA</i>	10292	0.524	1.032	0.050	0.116	0.384
<i>DIVIDEND_DUMMY</i>	10292	0.413	0.492	0.000	0.000	1.000
Country-level control variables						
<i>GDP_GROWTH</i>	10292	0.038	0.033	0.018	0.034	0.049
<i>GDP_PC</i>	10292	9.921	0.892	9.950	10.119	10.449
<i>CG_REFORM</i>	10292	0.711	0.453	0.000	1.000	1.000
<i>AUDIT_ENFORCE</i>	10292	37.015	10.843	32.000	40.000	42.000
<i>CORRUPTION</i>	10292	4.264	0.346	4.159	4.454	4.500
<i>TAKEOVER_LAW</i>	10292	0.063	0.243	0.000	0.000	0.000
<i>RL_LAW</i>	10292	1.199	0.820	0.918	1.684	1.726
<i>PRIVATE_CREDIT</i>	10292	1.099	0.340	0.818	1.158	1.266
<i>STOCKS_TRADE</i>	10292	0.827	0.809	0.565	0.633	0.941
<i>FX_RISK</i>	10292	-9.577	0.884	-10.000	-10.000	-9.500
<i>INFLATION</i>	10292	2.260	2.187	1.300	2.100	2.700
Variables used in channel, cross-sectional and robustness tests						
<i>LARGE_NEG</i>	10292	0.109	0.312	0.000	0.000	0.000
<i>SMOOTH</i>	6787	-0.231	0.691	-0.874	-0.410	0.347
<i>COE_PEG</i>	2241	0.169	0.149	0.078	0.128	0.201
<i>COE_OJ</i>	1576	0.098	0.062	0.057	0.091	0.117
<i>COMMON_LAW</i>	10292	0.715	0.451	0.000	1.000	1.000
<i>REVISED_ANTI-DIRECTOR_INDEX</i>	10292	4.094	0.504	4.000	4.000	4.500
<i>HP_INDEX</i>	10028	-3.088	0.764	-3.555	-3.210	-2.627
<i>CREDIT_RATING</i>	10292	0.105	0.307	0.000	0.000	0.000
<i>IDV</i>	5192	4.196	0.356	3.892	4.394	4.394
<i>UAI</i>	5192	4.040	0.291	3.892	3.892	4.407
<i>TRUST</i>	5192	0.346	0.086	0.304	0.370	0.370
Variables used in further analyses						
$\Delta CASH$	10484	-0.009	0.450	-0.040	0.000	0.036
$CASH_t^* - CASH_{t-1}$	10484	-0.218	0.732	-0.190	-0.025	0.076
$\Delta CAPEX$	10292	0.008	0.083	-0.013	0.002	0.022
$\Delta ACQUISITION$	10292	0.001	0.073	0.000	0.000	0.000
$\Delta R\&D$	10292	0.018	0.148	0.000	0.000	0.000
$\Delta DIVIDEND$	10292	0.001	0.018	0.000	0.000	0.001
$\Delta REPURCHASE$	10292	0.0002	0.072	0.000	0.000	0.000
<i>TOBIN'S Q</i>	10292	1.851	1.759	1.013	1.312	1.961

This table reports the descriptive statistics for all the variables used in our analyses. The sample period is from 1997 to 2019. Variable definitions are provided in [Appendix A](#).

**Table 4**  
The effect of the MMoU on cash holdings.

Variables	Baseline model	Alternative fixed effects		
	(1)	(2)	(3)	(4)
	CASH	CASH	CASH	CASH
<i>TREAT</i> × <i>POST</i>	-0.071** (-2.36)	-0.049*** (-3.21)	-0.043** (-2.63)	-0.049*** (-3.29)
<i>TREAT</i>		0.119** (2.33)	0.137** (2.72)	0.121** (2.46)
<i>POST</i>	0.048** (2.67)	-0.011 (-0.44)	0.014 (0.48)	0.022 (0.94)
<i>SIZE</i>	-0.024** (-2.70)	-0.023** (-2.71)	-0.043*** (-5.59)	-0.031*** (-2.81)
<i>LEVERAGE</i>	0.012 (0.10)	-0.371*** (-4.52)	-0.421*** (-6.11)	-0.377*** (-4.76)
<i>MB</i>	0.029** (2.53)	0.044*** (5.68)	0.053*** (7.88)	0.043*** (5.14)
<i>NWC</i>	-0.396*** (-4.61)	-0.515*** (-10.37)	-0.496*** (-6.75)	-0.494*** (-10.70)
<i>CAPEX</i>	1.170*** (4.61)	1.223*** (5.74)	0.730*** (5.99)	1.276*** (6.23)
<i>R&amp;D</i>	0.168*** (7.72)	0.376*** (8.22)	0.375*** (9.42)	0.373*** (8.72)
<i>CASH_FLOWS</i>	0.007** (2.32)	0.005 (1.47)	0.006* (1.81)	0.006 (1.51)
<i>INDUSTRY_SIGMA</i>	0.037*** (4.66)	0.059*** (3.51)	0.076*** (3.57)	0.061*** (3.58)
<i>DIVIDEND_DUMMY</i>	0.009 (0.67)	-0.046 (-1.67)	-0.067** (-2.36)	-0.053* (-1.77)
<i>GDP_GROWTH</i>	-0.282 (-0.80)	0.486 (0.97)	-0.459 (-0.91)	-0.256 (-0.50)
<i>GDP_PC</i>	-0.131** (-2.57)	0.010 (0.29)	-0.163** (-2.12)	-0.163** (-2.30)
<i>CG_REFORM</i>	0.019 (0.78)	0.031 (1.34)	0.025 (1.10)	0.033 (1.17)
<i>AUDIT_ENFORCE</i>	-0.000 (-0.13)	-0.002 (-1.54)	-0.002 (-1.66)	-0.003* (-1.82)
<i>CORRUPTION</i>	0.149 (1.50)	0.197 (1.54)	0.200 (1.46)	0.182 (1.38)
<i>TAKEOVER_LAW</i>	0.050* (1.76)	-0.034 (-0.94)	0.020 (0.57)	0.043 (1.43)
<i>RL_LAW</i>	0.003 (0.04)	-0.091* (-1.81)	0.020 (0.23)	0.017 (0.21)
<i>PRIVATE_CREDIT</i>	0.031 (0.53)	-0.030 (-0.85)	0.015 (0.19)	0.013 (0.19)
<i>STOCKS_TRADE</i>	-0.000 (-0.01)	0.015* (1.91)	-0.002 (-0.17)	-0.000 (-0.03)
<i>FX_RISK</i>	-0.000 (-0.07)	0.001 (0.11)	-0.008 (-0.91)	-0.006 (-0.71)
<i>INFLATION</i>	-0.006* (-1.84)	-0.009* (-1.80)	-0.004 (-1.11)	-0.002 (-0.40)
Constant	0.867 (1.36)	-0.547 (-1.05)	1.003 (1.28)	1.168 (1.57)
Year fixed effects	YES	YES	YES	YES
Firm fixed effects	YES	NO	NO	NO
Industry fixed effects	NO	YES	NO	YES
Country fixed effects	NO	NO	YES	YES
Observations	10,292	10,292	10,292	10,292
Adjusted R <sup>2</sup>	0.693	0.322	0.292	0.328

This table reports the OLS regression results of estimating the effect of the MMoU on corporate cash holdings. The dependent variable, *CASH*, is the ratio of cash and short-term investments to net assets, where net assets are total assets minus cash and short-term investments. The main variable of interest is *TREAT* × *POST*, where *TREAT* is a dummy variable that equals 1 for the treatment firms (US-listed foreign firms whose home countries are MMoU signatories), and 0 for the control firms (matched non-cross-listed firms in treatment firms' home country); and *POST* is a dummy variable that equals 1 after the treatment firms' home country signs the MMoU, and 0 for the period before it signs. In all columns, the explanatory variables are in the same year as the dependent variable. *t*-statistics are reported in brackets, with robust standard errors clustered at the country level. Variable definitions are provided in [Appendix A](#). \*, \*\*, and \*\*\* indicate significance at the 10%, 5%, and 1% levels, respectively.

**Table 5**  
The effect of the MMoU on cash holdings of different cross-listed types.

CASH	Broad cross-listed type		Considering ADR levels	
	(1) Direct listing	(2) ADR	(3) Direct listing or ADR level III	(4) ADR levels I and II
<i>TREAT</i> × <i>POST</i>	−0.034 (−1.26)	−0.121** (−2.31)	−0.042 (−1.49)	−0.072** (−2.01)
Control variables	YES	YES	YES	YES
Year fixed effects	YES	YES	YES	YES
Firm fixed effects	YES	YES	YES	YES
Observations	5716	4576	6414	1970
Adjusted R <sup>2</sup>	0.620	0.805	0.655	0.843
Chow test ( <i>p</i> value)	0.167		0.715	

This table reports the results of the effect of the MMoU on corporate cash holdings of different cross-listed types. Columns (1) and (2) classify the treatment firms (US-listed foreign firms whose home countries are MMoU signatories) into two broad cross-listed types, i.e., via direct listing or an American Depositary Receipt (ADR). Columns (3) and (4) further show the ADR levels (levels I, II and III). Control variables in all the model specifications include firm-level and country-level controls, as specified for Equation (1). Variable definitions are provided in Appendix A. *t*-statistics are reported in brackets, with robust standard errors clustered at the country level. \*, \*\*, and \*\*\* indicate significance at the 10%, 5%, and 1% levels, respectively.

enforcement index, which shows significance at the 5% level). Our findings support that when home countries' governance is weak, governance in host countries plays a substitutional role in disciplining managers in cross-listed firms from hoarding too much cash.

#### 4.6. Robustness tests

##### 4.6.1. Alternative control firms

In our main analysis, we construct the control group using matched home country firms in the same industry and with the closest propensity scores. In our robustness tests, we use four alternative control groups. First, we use an unmatched sample in which the control firms are all non-cross-listed firms in the treatment firms' home country. Second, we match US-listed foreign firms with firms in their home countries using entropy balancing (Hainmueller, 2012), which matches the moment conditions of the variable distributions. Unlike PSM with nearest neighbor matching, which may discard a large number of unmatched firms, entropy balancing imposes weight constraints on each firm and therefore does not require them to be matched or discarded. To construct the entropy-balancing sample, we obtain the entropy weights by requiring that the treatment and control groups have the same mean and variance (i.e., first two moments) for the same set of variables used in the PSM process. We then re-estimate Equation (1) using the entropy-balancing sample, which incorporates the entropy weights. Third, we match US-listed foreign firms with firms in their home countries in the same industry (2-digit SIC code) and with the closest cash holdings (*CASH*) in the year immediately before the MMoU signing year. Fourth, as US firms are also less likely to be affected by enhanced SEC oversight, we construct an alternative control group using PSM-matched US firms. The results, reported in Table 8 Panel A, remain robust, as *TREAT* × *POST* shows consistently significant and negative coefficients for all four alternative control groups.

##### 4.6.2. Alternative treatment firms and DiD approach

Given that the MMoU was signed by various countries at different times, with the earliest signing years being 2002 and 2003, to offer a more targeted examination of the MMoU's impact, we form an alternative treatment group that consists of US-listed foreign firms whose home countries signed the MMoU in 2002 and 2003. As we focus on [−5, +5] years surrounding the MMoU signing year, the sample period becomes 1997–2008. The control group comprises all US-listed foreign firms whose home countries had not yet signed the MMoU during the same sample period. We then use the PSM method to match each treatment firm to a control firm based on the nearest neighbor propensity scores, estimated using the firm-year observations in the year immediately before the MMoU signing year. We exclude treatment firms and their matched control firms from our estimation once the control firms' home countries sign the MMoU. The estimated results, as reported in Table 8 Panel B Column (1), remain intact.

Furthermore, as recent advances in the econometric literature have shown that a staggered DiD design can generate biased estimates when there are heterogeneous treatment effects (e.g., Baker et al., 2022; Barrios, 2021), we perform a robustness test using the stacked DiD approach following Cengiz et al. (2019) and Chen, Chen, et al. (2022). Specifically, we define the year when one or more countries signed the MMoU as the cohort-year. Any country that signed (had not signed) the MMoU in that year becomes a treatment (control) country after the year. For example, in 2005, Belgium and Singapore joined the MMoU. Therefore, firms from Belgium and Singapore form the treatment group for 2005, and firms from other countries that had not signed the MMoU in or before 2005 become

**Table 6**  
Channel tests.

Panel A The effect of the MMoU on information opacity and cost of capital				
Variables	Information opacity		Cost of capital	
	(1)	(2)	(3)	(4)
	<i>LARGE_NEG</i>	<i>SMOOTH</i>	<i>COE_PEG</i>	<i>COE_OJ</i>
<i>TREAT</i> × <i>POST</i>	0.606** (2.11)	0.087** (2.46)	-0.020* (-1.91)	-0.016** (-2.13)
<i>TREAT</i>	-0.304 (-1.47)			
<i>POST</i>	-0.485 (-1.23)	-0.009 (-0.22)	0.005 (0.41)	0.001 (0.16)
Control variables	YES	YES	YES	YES
Year fixed effects	YES	YES	YES	YES
Industry fixed effects	YES	NO	NO	NO
Country fixed effects	YES	NO	NO	NO
Firm fixed effects	NO	YES	YES	YES
Observations	10,292	6787	2241	1576
Pseudo/Adjusted R <sup>2</sup>	0.740	0.452	0.581	0.430
Panel B Subsample analyses based on treatment firms' information opacity				
	<i>LARGE_NEG</i>		<i>SMOOTH</i>	
	(1)	(2)	(3)	(4)
<i>CASH</i>	High information opacity ( <i>LARGE_NEG</i> = 0)	Low information opacity ( <i>LARGE_NEG</i> = 1)	High information opacity ( <i>SMOOTH</i> ≤ P50)	Low information opacity ( <i>SMOOTH</i> > P50)
<i>TREAT</i> × <i>POST</i>	-0.076*** (-4.83)	0.053 (0.46)	-0.083** (-2.81)	-0.047 (-0.96)
Control variables	YES	YES	YES	YES
Year fixed effects	YES	YES	YES	YES
Firm fixed effects	YES	YES	YES	YES
Observations	8714	1578	3566	3524
Adjusted R <sup>2</sup>	0.712	0.632	0.756	0.598
Chow test ( <i>p</i> value)	0.352		0.626	
Panel C Subsample analyses based on treatment firms' cost of capital				
	<i>COE_PEG</i>		<i>COE_OJ</i>	
	(1)	(2)	(3)	(4)
<i>CASH</i>	High cost of capital ( <i>COE_PEG</i> ≥ P50)	Low cost of capital ( <i>COE_PEG</i> < P50)	High cost of capital ( <i>COE_OJ</i> ≥ P50)	Low cost of capital ( <i>COE_OJ</i> < P50)
<i>TREAT</i> × <i>POST</i>	-0.088** (-2.73)	0.006 (0.12)	-0.148* (-1.97)	-0.054 (-1.09)
Control variables	YES	YES	YES	YES
Year fixed effects	YES	YES	YES	YES
Firm fixed effects	YES	YES	YES	YES
Observations	1246	1244	782	790
Adjusted R <sup>2</sup>	0.885	0.727	0.651	0.856
Chow test ( <i>p</i> value)	0.030**		0.367	

This table shows how the MMoU affects the cash holdings in US-listed foreign firms. In Panel A, we report the logistic/OLS regression results of estimating the effect of the MMoU on US-listed foreign firms' information opacity and cost of capital. Information opacity is measured by timely loss recognition (*LARGE\_NEG*), an indicator variable that equals 1 for firms whose annual net income scaled by total assets is less than 0.2, and 0 otherwise, and earnings smoothness (*SMOOTH*), the rolling correlation between cash flows and accruals over the preceding five years. The cost of capital is measured ex ante by *COE\_PEG* following Easton (2004) and *COE\_OJ* following Ohlson and Juettner-Nauroth (2005). In Panels B and C, we partition our sample into subsamples with high and low information opacity and with high and low cost of capital, respectively, and examine whether the effect of the MMoU is stronger among firms with greater information opacity and a higher cost of capital. In all the panels, the main variable of interest is *TREAT* × *POST*, where *TREAT* is a dummy variable that equals 1 for the treatment firms (US-listed foreign firms whose home countries are MMoU signatories), and 0 for the control firms (matched firms in the treatment firms' home country); and *POST* is a dummy variable that equals 1 after the treatment firms' home country signs the MMoU, and 0 for the period before it signs. P50 denotes the sample median. Control variables in all the model specifications include firm-level and country-level controls, as specified for Equation (1). Variable definitions are provided in Appendix A. *t*-statistics are reported in brackets, with robust standard errors clustered at the country level. \*, \*\*, and \*\*\* indicate significance at the 10%, 5%, and 1% levels, respectively.

**Table 7**  
Cross-sectional tests.

CASH	Legal origin		Revised anti-director index		Auditing and enforcement index		Corruption perceptions index	
	(1) Civil Law (COMMON_LAW = 0)	(2) Common Law (COMMON_LAW = 1)	(3) Low (REVISED_ANTI-DIRECTOR_INDEX < P50)	(4) High (REVISED_ANTI-DIRECTOR_INDEX ≥ P50)	(5) Low (AUDIT_ENFORCE < P50)	(6) High (AUDIT_ENFORCE ≥ P50)	(7) High (CPI < P50)	(8) Low (CPI ≥ P50)
<i>TREAT</i> × <i>POST</i>	-0.082** (-2.33)	-0.054 (-1.27)	-0.143*** (-2.83)	-0.048 (-1.32)	-0.093** (-2.40)	-0.028** (-2.27)	-0.127** (-2.30)	-0.015 (-0.61)
Control variables	YES	YES	YES	YES	YES	YES	YES	YES
Year fixed effects	YES	YES	YES	YES	YES	YES	YES	YES
Firm fixed effects	YES	YES	YES	YES	YES	YES	YES	YES
Observations	3994	6298	2830	7462	5052	5240	5126	5166
Adjusted R <sup>2</sup>	0.745	0.676	0.741	0.683	0.721	0.687	0.735	0.691
Chow test ( <i>p</i> value)	0.295		0.017**		0.095*		0.029**	

This table reports the results of cross-sectional tests based on treatment firms' home-country governance. Columns (1) and (2) focus on the legal origins of treatment firms' home countries. Columns (3) and (4) examine the moderating effect of the revised anti-director index of Djankov et al. (2008). Columns (5) and (6) examine the moderating effect of the accounting and enforcement index of Brown et al. (2014). Columns (7) and (8) examine the moderating effect of the corruption perceptions index. *P50* denotes the sample median. Control variables in all the model specifications include firm-level and country-level controls, as specified for Equation (1). Variable definitions are provided in Appendix A. *t*-statistics are reported in brackets, with robust standard errors clustered at the country level. \*, \*\*, and \*\*\* indicate significance at the 10%, 5%, and 1% levels, respectively.

**Table 8**  
Robustness tests.

Panel A Alternative control firms				
	(1)	(2)	(3)	(4)
<i>CASH</i>	Control firms: all firms (unmatched) in treatment firms' home countries	Control firms: matched home country firms by entropy balancing	Control firms: matched home country firms by industry and cash holdings	Control firms: matched US firms by industry and propensity score
<i>TREAT</i> × <i>POST</i>	-0.110***	-0.095***	-0.058***	-0.058**
	(-3.92)	(-4.50)	(-3.22)	(-2.53)
Control variables	YES	YES	YES	YES
Year fixed effects	YES	YES	YES	YES
Firm fixed effects	YES	YES	YES	YES
Observations	299,668	299,668	9888	15,854
Adjusted R <sup>2</sup>	0.574	0.745	0.651	0.663
Panel B Alternative treatment firms and DiD approach				
	(1)	(2)		
<i>CASH</i>	Treatment firms: US-listed foreign firms whose home countries signed the MMoU in 2002 and 2003, with control firms being US-listed foreign firms whose home countries had not yet signed the MMoU during 1997–2008	Stacked DiD approach		
<i>TREAT</i> × <i>POST</i>	-0.403*	-0.238*		
	(-1.88)	(-1.80)		
Control variables	YES	YES		
Year fixed effects	YES	NO		
Firm fixed effects	YES	NO		
Year-cohort fixed effects	NO	YES		
Firm-cohort fixed effects	NO	YES		
Observations	5142	426,338		
Adjusted R <sup>2</sup>	0.555	0.038		
Panel C Alternative dependent variables				
	(1)	(2)	(3)	
Variables	<i>Ln(1+CASH)</i>	<i>CASH/TA</i>	<i>DETRENDED_CASH</i>	
<i>TREAT</i> × <i>POST</i>	-0.024**	-0.011*	-0.019**	
	(-2.15)	(-1.85)	(-2.13)	
Control variables	YES	YES	YES	
Year fixed effects	YES	YES	YES	
Firm fixed effects	YES	YES	YES	
Observations	10,292	10,292	10,292	
Adjusted R <sup>2</sup>	0.744	0.761	0.742	
Panel D Ruling out an alternative explanation				
	HP_INDEX		CREDIT_RATING	
	(1)	(2)	(3)	(4)
<i>CASH</i>	Financially constrained treatment firms ( <i>HP_INDEX</i> > P50)	Financially unconstrained treatment firms ( <i>HP_INDEX</i> ≤ P50)	Financially constrained treatment firms ( <i>CREDIT_RATING</i> = 0)	Financially unconstrained treatment firms ( <i>CREDIT_RATING</i> = 1)
<i>TREAT</i> × <i>POST</i>	-0.100*	-0.039**	-0.079**	-0.004
	(-1.70)	(-2.03)	(-2.41)	(-0.10)
Control variables	YES	YES	YES	YES
Year fixed effects	YES	YES	YES	YES
Firm fixed effects	YES	YES	YES	YES
Observations	5022	5006	9210	1082
Adjusted R <sup>2</sup>	0.660	0.828	0.689	0.848
Chow test ( <i>p</i> value)	0.238		0.095*	
Panel E Controlling for confounding factors				

(continued on next page)



Table 8 (continued)

Panel E Controlling for confounding factors										
	Board reform		Other confounding factors							
	(1)	(2)	(3)	(4)	(5)					
<i>CASH</i>	Preboard reform (including countries with no board reform)	Postboard reform	Restricted [-5, +5] sample	Event window [-3, +3]	Controlling for national culture factors					
<i>TREAT</i> × <i>POST</i>	-0.186** (-2.21)	-0.084** (-2.49)	-0.045** (-2.54)	-0.050** (-2.34)	-0.054** (-2.67)					
<i>IDV</i>					0.040 (0.39)					
<i>UAI</i>					-0.022 (-0.34)					
<i>TRUST</i>					-0.160 (-0.94)					
Control variables	YES	YES	YES	YES	YES					
Year fixed effects	YES	YES	YES	YES	YES					
Industry fixed effects	NO	NO	NO	NO	YES					
Firm fixed effects	YES	YES	YES	YES	NO					
Observations	2972	7320	2134	7832	5192					
Adjusted R <sup>2</sup>	0.779	0.724	0.842	0.718	0.307					
Chow test ( <i>p</i> value)	0.095*									
Panel F Placebo test										
	Actual	Distribution of estimates based on pseudo-MMoU signing years								
		Mean	1%	5%	25%	50%	75%	95%	99%	Std Dev
Coefficients of <i>TREAT</i> × <i>POST_PSEUDO</i>	-0.071	0.002	-0.083	-0.064	-0.023	0.002	0.028	0.060	0.089	0.037
<i>t</i> -statistic of <i>TREAT</i> × <i>POST_PSEUDO</i>	-2.364	0.108	-2.984	-2.237	-0.759	0.060	0.988	2.364	3.579	1.385
Panel G Additional robustness tests										
	(1)	(2)	(3)	(4)	(5)					
<i>CASH</i>	Parallel trend test	Alternative sample period: 2009–2019	Excluding foreign countries that have less than five unique US-cross-listed firms	Excluding the MMoU signing year	Lagging all explanatory variables by one year					
<i>TREAT</i> × <i>POST</i>		-0.052* (-1.88)	-0.068** (-2.23)	-0.090*** (-2.91)	-0.048** (-2.18)					
<i>TREAT</i> × <i>YEARS</i> <sub>-4</sub> <i>_TO</i> <sub>-3</sub>	-0.031 (-0.66)									
<i>TREAT</i> × <i>YEARS</i> <sub>-2</sub> <i>_TO</i> <sub>-1</sub>	-0.076 (-1.41)									
<i>TREAT</i> × <i>YEAR</i> <sub>0</sub>	-0.082 (-1.46)									
<i>TREAT</i> × <i>YEARS</i> <sub>+1</sub> <i>_TO</i> <sub>+2</sub>	-0.123** (-2.20)									
<i>TREAT</i> × <i>YEARS</i> <sub>2+</sub>	-0.168*** (-2.89)									
Control variables	YES	YES	YES	YES	YES					
Year fixed effects	YES	YES	YES	YES	YES					
Firm fixed effects	YES	YES	YES	YES	YES					
Observations	10,292	1650	9922	9018	9817					
Adjusted R <sup>2</sup>	0.693	0.808	0.694	0.688	0.688					

This table reports the results from the robustness tests of the MMoU's effect on corporate cash holdings. In Panel A, we use four alternative control groups, including all firms (unmatched) in treatment firms' home countries (Column (1)), matched home country firms by entropy balancing (Column (2)), matched home country firms by industry (2-digit SIC code) and cash holdings (the closest *CASH* in the year immediately before the MMoU signing year) (Column (3)), and matched US firms by industry (2-digit SIC code) and closest propensity score (estimated using the firm-year observations in the year immediately before the MMoU signing year) (Column (4)). In Panel B, we use alternative treatment firms (defined as US-listed

foreign firms whose home countries signed the MMoU in 2002 and 2003, with control firms being US-listed foreign firms whose home countries had not yet signed the MMoU during 1997–2008) and the stacked DiD approach. In Panel C, we use three alternative cash holding measures as the dependent variables:  $\ln(1+CASH)$  (the natural logarithm of one plus the ratio of cash and short-term investments to net assets),  $CASH/TA$  (the ratio of cash and short-term investments to total assets), and  $DETRENDED\_CASH$  (detrended cash holdings, estimated as the residuals from a regression model:  $CASH_{i,t} = TIME\_TREND_{i,t} + \varepsilon_{i,t}$ , where  $TIME\_TREND$  is a time trend variable). In Panel D, we rule out a possible explanation that the reduction in US-listed foreign firms' cash holdings is due to better access to capital markets as a result of cross-listing rather than the effect of the MMoU. Specifically, we partition our sample firms into two subsamples based on whether US-listed foreign firms are financially constrained (the HP (Hadlock & Pierce, 2010) index is higher than the sample median, or if firms do not have a credit rating from the S&P Global Ratings database) or financially unconstrained (the HP index is lower than the sample median, or if firms have a credit rating from the S&P Global Ratings database). In Panel E, we control for potential confounding factors. Columns (1) and (2) examine whether the effect of the MMoU on cash holdings is distinct from that of country-level board reforms. Specifically, we partition our sample into two subsamples, preboard reform and postboard reform. The preboard reform subsample includes all US-listed foreign firms whose home countries have never enacted a board reform and firm-year observations before countries implement board reforms. The postboard reform subsample includes firm-year observations after countries implement board reforms. Column (3) requires the treatment firms to have data for the entire period within the [-5, +5] window. Column (4) uses a shorter event window of [-3, +3] years around the MMoU signing year. Column (5) controls for three national culture factors. In Panel F, we conduct a placebo test by randomly assigning MMoU signing years from 2002 to 2018 to each country in our sample. In Panel G, we perform several additional robustness tests: Column (1) reports the results of the parallel trend test, where we replace  $POST$  with five indicator variables to track the evolution of cash holdings of both treatment and control firms before and after the MMoU:  $YEARS\_4\_TO\_3$  (years -4 and -3 before the MMoU);  $YEARS\_2\_TO\_1$  (years -2 and -1 before the MMoU);  $YEAR\_0$  (the MMoU signing year);  $YEARS\_1\_TO\_2$  (years 1 and 2 after the MMoU); and  $YEARS\_2+$  (years 3–5 after the MMoU); Column (2) uses an alternative sample period of 2009–2019 (i.e., after the Global Financial Crisis); Column (3) excludes foreign countries that have fewer than five unique US-cross-listed firms; Column (4) excludes the transition year (i.e., the MMoU signing year); and Column (5) lags all explanatory variables by one year. Control variables in all the model specifications include firm-level and country-level controls, as specified for Equation (1). Variable definitions are provided in Appendix A.  $t$ -statistics are reported in brackets, with robust standard errors clustered at the country level. \*, \*\*, and \*\*\* indicate significance at the 10%, 5%, and 1% levels, respectively.

**Table 9**  
The effect of the MMoU on the dynamic adjustment of cash holdings.

$\Delta CASH$	(1)	(2)	(3)
	Full sample	Excess cash subsample	Cash shortfall subsample
$TREAT \times POST \times (CASH_t^* - CASH_{t-1})$	0.230** (2.37)	0.289** (2.16)	-0.288 (-0.54)
$TREAT \times (CASH_t^* - CASH_{t-1})$	-0.036 (-0.52)	-0.010 (-0.08)	-0.009 (-0.02)
$POST \times (CASH_t^* - CASH_{t-1})$	-0.074 (-0.91)	-0.122 (-1.12)	0.364 (0.82)
$CASH_t^* - CASH_{t-1}$	0.595*** (11.64)	0.583*** (6.16)	0.447 (1.32)
$TREAT \times POST$	-0.008 (-0.55)	0.149 (1.46)	0.021 (0.29)
$POST$	0.030 (1.48)	0.030 (0.28)	-0.050 (-0.81)
Constant	0.192*** (6.76)	0.741*** (4.53)	-0.040 (-0.63)
Year fixed effects	YES	YES	YES
Firm fixed effects	YES	YES	YES
Observations	10,484	2621	2621
Adjusted $R^2$	0.340	0.235	0.594

This table reports the OLS regression results of estimating the effect of the MMoU on the adjustment speed of corporate cash holdings. The dependent variable,  $\Delta CASH$ , is the one-year change in cash holdings.  $CASH_t^* - CASH_{t-1}$  is the deviation of actual cash holdings ( $CASH_{t-1}$ ) from the target cash holding ( $CASH_t^*$ ) at the beginning of the year. The details of the estimation of target cash holdings are discussed in Appendix C. Column (1) reports the results for the full sample. Column (2) reports the results for the subsample with excess cash, defined as the bottom quartile of  $CASH_t^* - CASH_{t-1}$ . Column (3) reports the results for the subsample with a cash shortfall, defined as the top quartile of  $CASH_t^* - CASH_{t-1}$ . Variable definitions are provided in Appendix A.  $t$ -statistics are reported in brackets, with robust standard errors clustered at the country level. \*, \*\*, and \*\*\* indicate significance at the 10%, 5%, and 1% levels, respectively.

**Table 10**  
The effect of the MMoU on the use of cash.

Variables	Investment			Payout	
	(1)	(2)	(3)	(4)	(5)
	$\Delta CAPEX$	$\Delta ACQUISITION$	$\Delta R\&D$	$\Delta DIVIDEND$	$\Delta REPURCHASE$
<i>TREAT</i> × <i>POST</i>	0.001 (0.20)	-0.003 (-1.29)	-0.006 (-0.97)	0.001* (1.69)	0.001* (1.75)
<i>POST</i>	-0.008 (-1.31)	-0.001 (-0.25)	0.003 (0.51)	-0.001 (-1.44)	-0.000* (-1.89)
<i>SIZE</i>	0.015*** (8.28)	0.004*** (5.10)	0.022*** (3.80)	0.001* (1.87)	-0.000** (-2.34)
<i>LEVERAGE</i>	-0.023* (-1.87)	0.005 (0.83)	-0.047*** (-3.32)	-0.003*** (-2.97)	-0.000 (-0.47)
<i>MB</i>	0.009*** (8.72)	0.000 (0.00)	0.006*** (5.83)	0.001*** (4.09)	-0.000*** (-3.07)
<i>NWC</i>	-0.010 (-1.54)	-0.016** (-2.48)	-0.030* (-1.73)	-0.005*** (-2.61)	0.000 (0.45)
<i>CASH_FLOWS</i>	0.034*** (3.88)	0.017** (2.16)	-0.056*** (-2.90)	0.008*** (4.98)	0.001** (2.43)
<i>INDUSTRY_SIGMA</i>	0.000 (0.04)	-0.002** (-2.05)	-0.001 (-0.14)	-0.000 (-1.24)	0.000 (0.27)
<i>GDP_GROWTH</i>	-0.112 (-1.03)	0.006 (0.09)	-0.027 (-0.39)	0.024 (1.38)	0.008** (2.19)
<i>GDP_PC</i>	0.004 (0.83)	-0.005 (-0.90)	-0.019** (-2.16)	0.002 (1.07)	0.001 (1.16)
<i>CG_REFORM</i>	-0.011** (-2.73)	-0.001 (-0.39)	-0.018*** (-3.83)	-0.002** (-2.23)	0.000 (0.09)
<i>AUDIT_ENFORCE</i>	-0.000 (-0.58)	0.000 (1.29)	-0.000 (-0.80)	-0.000 (-0.08)	0.000 (0.07)
<i>CORRUPTION</i>	-0.036 (-1.65)	0.015 (0.61)	-0.002 (-0.09)	0.007 (1.63)	0.003* (1.89)
<i>TAKEOVER_LAW</i>	0.004 (0.76)	0.019*** (4.90)	0.017* (1.98)	-0.003 (-1.07)	0.002*** (9.32)
<i>RL_LAW</i>	-0.007 (-0.54)	-0.005 (-0.95)	-0.011 (-1.24)	0.001 (0.46)	-0.000 (-0.23)
<i>PRIVATE_CREDIT</i>	-0.031*** (-3.38)	0.008 (1.41)	-0.028*** (-4.46)	0.003 (0.92)	-0.000 (-0.13)
<i>STOCKS_TRADE</i>	-0.002 (-1.63)	-0.001 (-0.99)	0.000 (0.02)	-0.001 (-0.99)	-0.000 (-0.12)
<i>FX_RISK</i>	-0.002 (-1.25)	0.001 (1.18)	-0.000 (-0.59)	-0.001** (-2.07)	-0.000 (-1.60)
<i>INFLATION</i>	0.001 (1.50)	-0.001** (-2.08)	0.001 (0.72)	-0.000 (-1.48)	0.000 (0.12)
Constant	0.071 (0.60)	-0.022 (-0.19)	0.144 (1.47)	-0.060*** (-2.61)	-0.019* (-1.86)
Year fixed effects	YES	YES	YES	YES	YES
Firm fixed effects	YES	YES	YES	YES	YES
Observations	10,292	10,292	10,292	10,292	10,292
Adjusted R <sup>2</sup>	0.054	0.101	0.330	0.047	0.074

This table reports the OLS regression results of the effect of the MMoU on the use of cash. The dependent variables are  $\Delta CAPEX$  (one-year change in the ratio of capital expenditure to net assets),  $\Delta ACQUISITION$  (one-year change in the ratio of acquisitions to net assets),  $\Delta R\&D$  (one-year change in the ratio of R&D expenditure to sales),  $\Delta DIVIDEND$  (one-year change in the ratio of dividends to net assets) and  $\Delta REPURCHASE$  (one-year change in the ratio of share repurchase amounts to net assets). Variable definitions are provided in [Appendix A](#). *t*-statistics are reported in brackets, with robust standard errors clustered at the country level. \*, \*\*, and \*\*\* indicate significance at the 10%, 5%, and 1% levels, respectively.

the control group. For the cohort-year 2005, we then keep all firm-years of the treatment and control firms for the period 2000–2010 (i. e., [-5, +5] window). For control firms that signed the MMoU during 2005–2010, we keep only their pre-MMoU firm-year observations. We repeat this process for all the other cohort-years. Our final sample using this event-based stacked DiD approach consists of 426,338 firm-year observations for 154,674 unique firms from 43 foreign countries during the period from 1997 to 2019.<sup>20</sup> We then separately estimate the treatment effects for each of the cohort-years. In line with prior work (e.g., [Chen, Chen, et al., 2022](#); [Gormley & Matsa, 2011](#)), we control for firm-cohort fixed effects to ensure that we exploit only within-firm variation in each treatment-control

<sup>20</sup> The number of 43 foreign countries is greater than the 33 foreign countries in our main analyses, because the latter is based on matched samples where a country could be excluded if it is not successfully matched to a counterpart, or it only has control firms. In contrast, in the stacked DiD test, we start with the 59 foreign countries after applying the initial filters (see [Table 1](#)) and construct a new sample including all firms that satisfy the stacked DiD requirements.

**Table 11**  
The effect of the MMoU on the value of cash.

Variables	(1)	(2)
	<i>TOBIN'S Q</i>	<i>TOBIN'S Q</i>
<i>TREAT</i> × <i>POST</i> × <i>CASH</i>	0.093** (2.15)	
<i>TREAT</i> × <i>CASH</i>	-0.092** (-2.25)	
<i>POST</i> × <i>CASH</i>	-0.206*** (-5.45)	
<i>CASH</i>	0.205*** (5.45)	
<i>TREAT</i> × <i>POST</i> × <i>DIVIDEND</i>		-3.522** (-2.38)
<i>TREAT</i> × <i>DIVIDEND</i>		6.085** (2.34)
<i>POST</i> × <i>DIVIDEND</i>		1.574* (1.70)
<i>DIVIDEND</i>		1.611 (0.80)
<i>TREAT</i> × <i>POST</i>	-0.227*** (-4.25)	-0.197 (-0.79)
<i>POST</i>	0.363*** (5.65)	0.299 (1.38)
<i>SIZE</i>	-0.743*** (-28.29)	-0.738*** (-4.30)
<i>LEVERAGE</i>	0.274*** (3.05)	0.284 (1.66)
<i>NWC</i>	0.150 (1.30)	0.126 (0.58)
<i>CAPEX</i>	2.290*** (11.69)	2.477*** (5.89)
<i>CASH_FLOWS</i>	0.405*** (4.99)	0.308 (0.66)
<i>GDP_GROWTH</i>	2.728*** (2.58)	2.534 (1.49)
<i>GDP_PC</i>	0.087 (0.72)	0.073 (0.47)
<i>CG_REFORM</i>	0.139** (2.35)	0.129 (1.16)
<i>AUDIT_ENFORCE</i>	0.005 (1.03)	0.005 (1.16)
<i>CORRUPTION</i>	-0.697** (-2.00)	-0.601 (-1.08)
<i>TAKEOVER_LAW</i>	-0.061 (-0.24)	-0.013 (-0.11)
<i>RL_LAW</i>	0.095 (0.56)	0.114 (0.37)
<i>PRIVATE_CREDIT</i>	-0.083 (-0.55)	-0.066 (-0.25)
<i>STOCKS_TRADE</i>	0.102*** (3.69)	0.102* (1.89)
<i>FX_RISK</i>	0.047** (2.55)	0.049* (1.95)
<i>INFLATION</i>	-0.021** (-2.12)	-0.022** (-2.50)
Constant	8.640*** (5.02)	8.256*** (3.29)
Year fixed effects	YES	YES
Firm fixed effects	YES	YES
Observations	10,292	10,292
Adjusted R <sup>2</sup>	0.560	0.560

This table reports the OLS regression results of estimating the effect of the MMoU on the value of cash. The dependent variable, *TOBIN'S Q*, is the ratio of market value of equity plus total assets less book value of equity to total assets. *CASH* is the ratio of cash and short-term investments to net assets, where net assets are total assets minus cash and short-term investments. *DIVIDEND* is the ratio of dividends to net assets. Variable definitions are provided in [Appendix A](#). *t*-statistics are reported in brackets, with robust standard errors clustered at the country level. \*, \*\*, and \*\*\* indicate significance at the 10%, 5%, and 1% levels, respectively.

group and year-cohort fixed effects to control for any secular time trend. Finally, we take the average of the treatment effects across the cohort-years. The results, reported in Table 8 Panel B Column (2), show that our results remain robust to this alternative DiD method.

#### 4.6.3. Alternative measures of cash holdings

We next test whether our main results are sensitive to different cash holding measures. We use three alternative cash measures:  $LN(1+CASH)$ , the natural logarithm of one plus the ratio of cash and short-term investments to net assets;  $CASH/TA$ , the ratio of cash and short-term investments to total assets (following Acharya, Almeida, & Campello, 2013; Almeida, Campello, & Weisbach, 2004; Dittmar et al., 2003; Han & Qiu, 2007; Palazzo, 2012); and  $DETRENDED\_CASH$ , detrended cash holdings, calculated as the residuals from a regression model:  $CASH_{i,t} = TIME\ TREND_{i,t} + \varepsilon_{i,t}$ , where  $TIME\ TREND$  is a time trend variable (following Iskandar-Datta & Jia, 2012). The summary statistics of these alternative cash holding measures are reported in Table 3. The results are reported in Table 8 Panel C and remain robust.

#### 4.6.4. Ruling out an alternative explanation

An alternative explanation for why US-listed foreign firms reduce their cash holdings could be that cross-listing provides them with better access to the capital market and a lower cost of capital; thus, there is less need to hoard too much cash. If this is the working mechanism behind our main findings, we would observe the reduction in cash holdings to be more pronounced in nonfinancially constrained US-listed foreign firms. Specifically, we partition our sample into two subsamples based on two financial constraints measures in the year immediately before the MMoU signing year: *financially constrained (unconstrained) treatment firms* if a firm's HP (Hadlock & Pierce, 2010) index (detailed definition in Appendix A) is higher (lower) than the sample median, or if a firm does not (does) have a credit rating (item: ratingsymbol) in the S&P Global Ratings database (following Farre-Mensa & Ljungqvist, 2016). We then re-estimate Equation (1) for these subsamples. The results are reported in Table 8 Panel D. We find that both financially constrained and unconstrained US-listed foreign firms significantly reduce their cash holdings after the MMoU. Importantly, the reduction is much more pronounced among financially constrained firms, which contradicts the prediction of the better-access-to-capital-markets explanation. This finding indicates that the decrease in cash holdings is due to the effect of the MMoU rather than cross-listing.

#### 4.6.5. Controlling for confounding factors

It is also possible that the reduction in cash holdings in US-listed foreign firms after the MMoU is driven by confounding events and institutional factors. We address this concern using four methods. First, Chen et al. (2020) use worldwide board reforms as a quasi-natural experiment and find that firms in 41 countries significantly reduce their cash holdings after board reforms. As board reforms occurred for most countries in the early 2000s, which overlaps with our sample period of 1997–2019, we need to ensure that the effect of the MMoU on corporate cash holdings is distinct from that of board reforms. Specifically, we collect data on each foreign country's board reform year from Bae et al. (2021) (reported in the rightmost column of Table 2) and partition our sample into two subsamples: *pre- and postboard reforms*. The preboard reform subsample includes all US-listed foreign firms whose home countries have never enacted a board reform and firm-year observations before countries implement board reforms. The postboard reform subsample includes firm-year observations after countries implement board reforms. The results of re-estimating Equation (1) for each subsample are reported in Table 8 Panel E Columns (1) and (2). We find that the coefficients of  $TREAT \times POST$  are significant and negative for both subsamples. However, the coefficient magnitude is two times greater in the preboard reform subsample, where only the MMoU comes into effect. This evidence reassures us that the reduction in cash holdings in US-listed foreign firms is due to the effect of the MMoU, which is distinct from the effect of board reforms.<sup>21</sup>

Second, to ensure that firms' cross-listing dates are not too close to the MMoU signing dates to confound our results, in Column (3), we construct a restricted  $[-5, +5]$  sample requiring all treatment and control firms to have the full 11 firm-years for the sample window (so that the firms in this sample had already been cross-listed for at least 5 years before the signing of the MMoU). Third, to mitigate the impact of any other potential changes in the institutional environment, in Column (4), we further restrict our sample window to  $[-3, +3]$  years surrounding the MMoU signing year. Fourth, although we include numerous country institutional factors in the baseline model, we re-estimate Equation (1) while controlling for three additional factors related to a country's cultural dimensions, i.e., individualism, uncertainty avoidance, and social trust. This is because prior studies have shown that corporate cash holdings are negatively associated with individualism (Chen et al., 2015) and positively associated with uncertainty avoidance (Chen et al., 2015) and societal trust (Dudley & Zhang, 2016). The results in Column (5) still show significant and negative coefficients on  $TREAT \times POST$ , indicating that our results are robust to these cultural factors.

#### 4.6.6. Placebo test

To alleviate the concern that our DiD design may not capture the effect of the MMoU but rather a time trend of cash holdings that is not related to the MMoU, we conduct a placebo test. In line with prior studies (e.g., Bae et al., 2021; Xu, Xuan, & Zheng, 2021), we first

<sup>21</sup> During our sample period, another major regulatory change is the Lamfalussy process introduced by the European Union first in 2001 and then upgraded after the Global Financial Crisis. While the purpose of this regulatory process is to mitigate market abuse (i.e., market manipulation and insider trading) through information sharing and cross-market surveillance (similar to that of the MMoU), it mainly applies to the financial service industry, which is excluded from our sample. More information about the Lamfalussy process can be found at [https://finance.ec.europa.eu/regulation-and-supervision/regulatory-process-financial-services\\_en](https://finance.ec.europa.eu/regulation-and-supervision/regulatory-process-financial-services_en).

randomly assign MMoU signing years from 2002 to 2018 to each country in our sample. We then construct  $POST\_PSEUDO$  as a dummy variable that equals 1 after a foreign country joins the pseudo-MMoU, and 0 for the period before it joins. We then re-estimate Equation (1) by replacing  $POST$  with the randomized  $POST\_PSEUDO$ . We repeat the process 1000 times and generate a simulated distribution of the coefficients and  $t$ -statistics of  $TREAT \times POST\_PSEUDO$  under the null hypothesis that there is no MMoU effect on US-listed foreign firms' cash holdings.

Table 8 Panel F presents the results of the placebo test. The simulated distribution shows that the coefficient estimates of  $TREAT \times POST\_PSEUDO$  have mean and median values of 0.002, which are much higher than the actual estimate of  $-0.071$  (Table 4 Column (1)). The  $p$  value of the actual estimate in the simulated distribution is less than 5%, which means that we can reject the null hypothesis that the decrease in US-listed foreign firms' cash holdings following the signing of the MMoU is random at the 5% level. The distribution of the  $t$ -statistics of  $TREAT \times POST\_PSEUDO$  presents a similar pattern, with a mean and a median of 0.108 and 0.060, respectively, both of which are far above the actual  $t$ -statistic of  $-2.364$ . The  $p$  value of the actual  $t$ -statistic in the simulated distribution is also less than 5%.

#### 4.6.7. Additional robustness tests

In Table 8 Panel G, we conduct several additional robustness checks. In Column (1), we test the parallel trend assumption to validate whether the treatment and control firms exhibit similar trends of cash holdings before the MMoU. We replace  $POST$  with five indicator variables to track the evolution of cash holdings of both treatment and control firms before and after the MMoU:  $YEARS_{-4\_TO_{-3}}$ , years  $-4$  and  $-3$  before the MMoU;  $YEARS_{-2\_TO_{-1}}$ , years  $-2$  and  $-1$  before the MMoU;  $YEAR_0$ , the MMoU signing year;  $YEARS_{+1\_TO_{+2}}$ , years 1 and 2 after the MMoU; and  $YEARS_{2+}$ , years 3–5 after the MMoU. We then interact these indicator variables with the variable  $TREAT$  and regress cash holdings on the interaction terms as well as the five indicator variables. Year  $-5$  before the MMoU thus serves as the benchmark period in the regression. The coefficients on  $TREAT \times YEARS_{-4\_TO_{-3}}$ ,  $TREAT \times YEARS_{-2\_TO_{-1}}$  and  $TREAT \times YEAR_0$  are all insignificant, whereas the coefficients on  $TREAT \times YEARS_{+1\_TO_{+2}}$  and  $TREAT \times YEARS_{2+}$  are both significantly negative. This evidence suggests that US-listed foreign firms and their matched home country counterparts have similar trends of cash holdings before the MMoU; therefore, the parallel trend assumption is met.

To address the concern that quite a few countries signed the MMoU around the Global Financial Crisis (GFC), in Column (2), we use an alternative sample period from 2009 to 2019 (i.e., after the GFC). To avoid disproportionate influence by firms or countries with relatively few observations, in Column (3), we exclude foreign countries that have fewer than five US-listed foreign firms. In Column (4), we exclude the MMoU signing year because during the signing (transition) year, regulators had applied to sign the MMoU, but administrative approval might not be complete; therefore, it is less clear whether the threat of increased SEC enforcement has affected US-listed foreign firms' cash holdings. In Column (5), we lag all explanatory variables by one year to further alleviate endogeneity concerns. All the results in Table 8 Panel G remain robust.

## 5. Additional analyses

### 5.1. Dynamic cash holding adjustment

We next extend our analyses to a dynamic setting and examine how quickly US-listed foreign firms adjust their cash toward the target level after the MMoU. Following Flannery and Rangan (2006), Gao et al. (2013) and Jiang and Lie (2016), we estimate the following partial adjustment model of cash holdings:

$$\begin{aligned} \Delta CASH_{i,t} = & \alpha + \beta_1 TREAT_{i,t} \times POST_{i,t} \times (CASH_{i,t}^* - CASH_{i,t-1}) + \beta_2 (CASH_{i,t}^* - CASH_{i,t-1}) + \beta_3 TREAT_{i,t} + \beta_4 POST_{i,t} + \beta_5 TREAT_{i,t} \\ & \times POST_{i,t} + \beta_6 TREAT_{i,t} \times (CASH_{i,t}^* - CASH_{i,t-1}) + \beta_7 POST_{i,t} \times (CASH_{i,t}^* - CASH_{i,t-1}) + \varepsilon_{i,t} \end{aligned} \quad (2)$$

where  $\Delta CASH_{i,t}$  is the change in cash holdings from year  $t-1$  to year  $t$ .  $CASH_{i,t}^*$  is the target level of cash holdings, estimated by regressing cash on variables that proxy for genuine motives for holding cash, such as investment opportunities, hedging needs, and liquidity substitutes (Dittmar et al., 2003; Harford et al., 2008; Opler et al., 1999). The details of the estimation of target cash holdings are discussed in Appendix C. In Equation (2), the main coefficient of interest is  $\beta_1$ , which captures the difference in the speed of adjustment (SOA) of cash holdings between the treatment and control firms after the MMoU.

The results are reported in Table 9. Column (1) shows the results for the full sample. The coefficient on  $TREAT \times POST \times (CASH_{i,t}^* - CASH_{i,t-1})$  is 0.230 and significant at the 5% level, suggesting that US-listed foreign firms adjust their cash holdings more actively than their non-cross-listed peers after the MMoU. As the literature documents that the SOA of cash holdings may be asymmetric, we follow Gao et al. (2013) and divide our sample into two subsamples based on whether firms' actual cash holdings fall above or below the target level. To mitigate the concern that the true model of target cash level is unknown, we include only observations in the bottom (top) quartile of  $CASH_{i,t}^* - CASH_{i,t-1}$  in the excess cash (cash shortfall) subsample. We then separately estimate Equation (2) for each subsample.

The subsample results are reported in Table 9 Columns (2) and (3). The columns reveal that, after the MMoU, only the subsample of US-listed foreign firms that have excess cash reduces their cash level toward the target at a faster speed, whereas US-listed foreign firms that have cash shortfalls do not actively increase their cash level toward target levels. The heterogeneity of the SOA of cash echoes our

main finding that US-listed foreign firms significantly reduce their cash holdings after the MMoU. This finding is also consistent with prior studies (e.g., [Jiang & Lie, 2016](#)) that disgoring cash is cheaper (e.g., by making payouts or retiring some debt, which are viewed favorably by the stock market) than raising cash (e.g., through equity issues, the announcements of which are typically associated with stock price declines).

### 5.2. The use of cash

Thus far, we have shown that US-listed foreign firms significantly reduce their cash holdings after the MMoU in both static and dynamic settings. A natural question that follows is how do US-listed foreign firms spend cash? We examine whether, after the MMoU, they use cash to increase their investment or make payouts. Specifically, we follow [Chen et al. \(2015\)](#) and regress changes in capital expenditure, acquisitions, R&D, dividends, and share repurchases, respectively, on  $TREAT \times POST$ ,  $POST$  and the same set of control variables included in the cash holding regression (Equation (1)) excluding  $CAPEX$ ,  $R\&D$  and  $DIVIDEND\_DUMMY$ . The results are reported in [Table 10](#). We find that after the MMoU, US-listed foreign firms mainly use their cash to make payouts in the form of both dividends and share repurchases and not to increase investments ( $TREAT \times POST$  shows insignificant coefficients for changes in capital expenditure, acquisitions and R&D). This finding suggests that the threat of increased SEC enforcement through the MMoU reduces agency problems in US-listed foreign firms, causing managers to disgorge cash to shareholders using dividends and share repurchases. This evidence is consistent with [Chen, Chris, et al. \(2022\)](#) who find that US-listed foreign firms significantly increase their dividends after their home countries sign the MMoU. In the meantime, as reduced agency problems do not necessarily indicate more investments, we do not find any significant change in the investment measures.

### 5.3. The value of cash

[Frésard and Salva \(2010\)](#) and [Huang et al. \(2013\)](#) show that cross-listing in the US increases the value attached to firms' (excess) cash reserves due to, as they argue, the stricter legal rules and better investor protection in the US. Consequently, our final analysis examines whether cash in US-listed foreign firms after the MMoU increases firm value. Following [Kalcheva and Lins \(2007\)](#) and [Chen et al. \(2020\)](#), we estimate the following Tobin's Q regression model:

$$TOBIN'S\ Q = \alpha + \beta_1 TREAT \times POST \times CASH + \beta_2 TREAT \times CASH + \beta_3 POST \times CASH + \beta_4 TREAT \times POST + \beta_5 POST + \beta_6 CASH + \beta_7 SIZE + \beta_8 LEVERAGE + \beta_9 NWC + \beta_{10} CAPEX + \beta_{11} CASH_{FLOWS} + \gamma \cdot Country\text{-}level\ Controls + \varepsilon, \quad (3)$$

where *TOBIN'S Q* is the market value of the firm, computed as the sum of market value of equity plus total assets less book value of equity, all divided by total assets. All the explanatory variables are defined in [Appendix A. Table 11](#) reports the results of estimating Equation (3). We find that the coefficient on  $TREAT \times POST \times CASH$  is 0.093 and significant at the 5% level, suggesting that the cash of US-listed foreign firms is valued more after the MMoU relative to that of their home country counterparts.

To reinforce our finding that, after the MMoU, cash in US-listed foreign firms is valued more due to the lower risk of managerial misappropriation, we also test the effect of dividends on firm value before and after the MMoU. The intuition is that if the MMoU mitigates the risk of manager misuse or waste cash, then outside shareholders are less likely to pressure firms to disgorge cash via dividends; consequently, the valuation of dividends should decrease after the MMoU. We re-estimate Equation (3) by replacing the variable *CASH* with *DIVIDEND*. The results are reported in [Table 11](#) Column (2). We find that the coefficient on  $TREAT \times POST \times DIVIDEND$  is  $-3.522$ , significant at the 5% level. The lower dividend valuation after the MMoU corroborates our cash premium results.

## 6. Conclusion

We investigate whether the threat of increased SEC enforcement has a disciplinary effect on US-listed foreign firms' cash holdings. Exploiting the staggered signing of the MMoU as an exogenous shock to the increased SEC enforcement on US-listed foreign firms, we find significant reductions in these firms' cash holdings after the MMoU. The reduction in cash holdings is evident for level I and level II ADRs but not for directly listed foreign firms and level III ADRs. Channel tests suggest that increased SEC enforcement improves corporate governance, as evidenced by reduced information opacity and a decreased cost of capital, which in turn lead to a lower level of cash holdings in US-listed foreign firms. Our cross-sectional tests reveal that home country governance also plays a role, as the decrease in cash holdings is more pronounced for US-listed foreign firms whose home countries have weaker governance. Our findings hold after a battery of robustness tests, such as using alternative control firms and cash holding measures, alternative treatment firms and the stacked DiD approach, ruling out other possible explanations, and controlling for various potential confounding factors.

We also conduct three further analyses. First, the results of the dynamic adjustment of cash holdings show that after the MMoU, US-listed foreign firms make a faster adjustment toward target cash levels. Second, US-listed foreign firms use cash to make dividend payouts and share repurchases but not to increase their investments. Third, the cash in US-listed foreign firms contributes to increased firm value after the MMoU.

Overall, our results show that cross-border regulatory cooperation plays a significant role in cross-listed firms' cash holdings. As [Stulz \(2005\)](#) documents, the agency problem of corporate insiders expropriating outside investors limits the benefits of financial globalization. Our findings suggest that cross-border regulatory cooperation can be an effective way of reducing this problem in cross-listed firms, thus providing benefits to financial globalization.

While we have made every effort to show that our results are causal and robust, our study still has some limitations. First, there might be other cross-border regulations and international conflicts that are driving forces. Second, we could also investigate the moderating effect of other country-level laws and regulations (e.g. competition laws by [Cephas Simon Peter Dak-Adzaklo, 2024](#); employment protection laws by [Beuselincx, Markarian, & Verriest, 2021](#); [Karpuz, Kim, & Ozkan, 2020](#)). Third, motivated by footnote 5, future research could examine whether regulatory cooperation mitigates political risk and eases the pressure to repatriate cash in the US back to foreign firms' home countries. This investigation would be interesting as ex-ante, it is unclear whether the ease of repatriation increases or decreases US-listed foreign firms' cash holdings (see the competing arguments in footnote 5). We leave these interesting topics for future research.

## Data availability

Data will be made available on request.

## Appendix A. Variable definitions

Variable	Definition	Data source
Dependent variables		
<i>CASH</i>	Ratio of cash and short-term investments to net assets. Net assets are total assets minus cash and short-term investments.	Compustat
$\ln(1+CASH)$	Natural logarithm of one plus the ratio of cash and short-term investments to net assets.	Compustat
<i>CASH/TA</i>	Ratio of cash and short-term investments to total assets.	Compustat
<i>DETTRENDED_CASH</i>	Detrended cash holdings, estimated as the residuals from a regression model: $CASH_{i,t} = TIME\ TREND_{i,t} + \varepsilon_{i,t}$ , where <i>TIME TREND</i> is a time trend variable.	Compustat
Variables of interest		
<i>TREAT</i>	Dummy variable that equals 1 for US-listed foreign firms whose home countries are MMoU signatories, and 0 for matched home country firms.	Compustat & MMoU website
<i>POST</i>	Dummy variable that equals 1 after a foreign country joins the MMoU, and 0 for the period before it joins.	MMoU website
Control variables		
Firm-level:		
<i>SIZE</i>	Natural logarithm of total assets in millions of US dollars.	Compustat
<i>LEVERAGE</i>	Ratio of total debt to net assets.	Compustat
<i>MB</i>	Ratio of market value of equity plus total assets less book value of equity to total assets.	Compustat
<i>NWC</i>	Ratio of net working capital to net assets, where net working capital is computed as current assets minus current liability and cash and short-term investments.	Compustat
<i>CAPEX</i>	Ratio of capital expenditure to net assets.	Compustat
<i>R&amp;D</i>	Ratio of R&D expenditure to sales.	Compustat
<i>CASH_FLOWS</i>	Ratio of income before extraordinary items plus depreciation to net assets.	Compustat
<i>INDUSTRY_SIGMA</i>	Standard deviation of <i>CASH_FLOWS</i> in a firm's industry during the previous three years.	Compustat
<i>DIVIDEND_DUMMY</i>	Dummy variable that equals 1 for firms paying dividends, and 0 otherwise.	Compustat
Country-level:		
<i>GDP_GROWTH</i>	GDP growth, computed as the annual percentage change in a country's GDP.	World Development Indicators
<i>GDP_PC</i>	Natural logarithm of GDP per capita of a country.	World Development Indicators
<i>CG_REFORM</i>	Dummy variable that equals 1 after the enactment of a major board reform in a country, and 0 otherwise.	<a href="#">Bae et al. (2021)</a>
<i>AUDIT_ENFORCE</i>	Natural logarithm of one plus the auditing and enforcement index that captures the quality of the audit environment and regulators' accounting enforcement activities in a country. The index is only for 2002, 2005 and 2008, so for gap years during our sample period, we use the value of the closest year.	<a href="#">Brown et al. (2014)</a>
<i>CORRUPTION</i>	Natural logarithm of one plus the corruption perceptions index that captures a country's perceived levels of public sector corruption according to experts and businesspeople. A higher value indicates less corruption.	Transparency International
<i>TAKEOVER_LAW</i>	Dummy variable that equals 1 after the enactment of a takeover law in a country, and 0 otherwise.	<a href="#">Lel and Miller (2015)</a>
<i>RL_LAW</i>	Rule-of-law index that captures perceptions of the extent to which agents have confidence in and abide by the rules of society, particularly contract enforcement, property rights, the police, and the	World Governance Indicators

(continued on next page)



(continued)

Variable	Definition	Data source
<i>PRIVATE_CREDIT</i>	courts, and the likelihood of crime and violence. The index starts in 1996 and is time-varying. For gap years (1997, 1999, and 2001), we use the values from 1996, 1998, and 2000, respectively. Ratio of a country's domestic credit to the private sector to its GDP.	World Development Indicators
<i>STOCKS_TRADE</i>	Ratio of a country's stock trading volume to its GDP.	World Development Indicators
<i>FX_RISK</i>	Foreign exchange rate stability risk rating of a country. The rating is based on the appreciation or depreciation of a currency against the US dollar in a given year. It ranges from 0 (the lowest level of currency stability) to 10 (the highest level of currency stability). We multiply the ratings by -1, so a higher value indicates greater foreign exchange risk.	International Country Risk Guide (ICRG)
<i>INFLATION</i>	Inflation rate, computed as the annual percent change in a country's average consumer prices.	International Monetary Fund
Variables in channel tests		
<i>LARGE_NEG</i>	Indicator variable that equals 1 for firms whose annual net income scaled by total assets is less than 0.2, and 0 otherwise.	Compustat
<i>SMOOTH</i>	Rolling correlation between cash flows and accruals over the preceding five years.	Compustat
<i>COE_PEG</i>	Ex ante cost of equity capital measure following Easton (2004), calculated as $\sqrt{\frac{FEPS_2 - FEPS_1}{P_0}}$ , where $FEPS_1$ is the one-year-ahead mean analysts' earnings forecast per share, $FEPS_2$ is the two-year-ahead mean analysts' earnings forecast per share, and $P_0$ is the price per share in June of year $t$ .	I/B/E/S
<i>COE_OJ</i>	Ex ante cost of equity capital measure following Ohlson and Juettner-Nauroth (2005), calculated as $A + \sqrt{A^2 + \frac{FEPS_1}{P_0}(g - (\gamma - 1))}$ , where $A = \frac{1}{2} \times \left( (\gamma - 1) + \frac{DPS_1}{P_0} \right)$ , $g = \frac{STG + LTG}{2}$ , $STG = \frac{FEPS_2 - FEPS_1}{FEPS_1}$ , $LTG$ is the long-term (5-year) growth forecast in June of year $t$ , $\gamma - 1 = r_f - 0.03$ , $DPS_1$ is assumed to equal $DPS_0$ (the actual dividend per share in year $t$ ), $r_f$ is the yield on 10-year Treasury notes in June of year $t$ , and $FEPS_1$ , $FEPS_2$ and $P_0$ are defined the same as above.	I/B/E/S
Variables in cross-sectional tests		
<i>COMMON_LAW</i>	Dummy variable that equals 1 for common law countries, and 0 for civil law countries.	La porta et al. (1998)
<i>REVISED_ANTI-DIRECTOR_INDEX</i>	An index that captures the extent to which shareholders are protected against expropriation by corporate insiders. The index is constructed by summing six aspects of shareholder rights: (1) vote by mail; (2) shares not deposited; (3) cumulative voting; (4) oppressed minority; (5) preemptive rights; and (6) capital to call a meeting.	Djankov et al. (2008)
Variables in robustness tests		
<i>HP_INDEX</i>	Hadlock and Pierce (2010) index, computed as $-0.737 \times \text{Size} + 0.043 \times \text{Size}^2 - 0.040 \times \text{Age}$ , where $\text{Size}$ is the natural logarithm of inflation-adjusted book assets (in 2004 dollars) capped at \$4.5 billion, and $\text{Age}$ is the number of years a firm is listed with a nonmissing stock price on Compustat capped at 37 years. A higher HP index indicates more financially constrained firms.	Hadlock and Pierce (2010)
<i>CREDIT_RATING</i>	Dummy variable that equals 1 for firms that have a credit rating (item: ratingsymbol), and 0 for firms that do not.	S&P Global Ratings
<i>IDV</i>	Natural logarithm of a country's individualism score. A higher score indicates a higher degree of individualism.	Hofstede (1980, 2001)
<i>UAI</i>	Natural logarithm of a country's uncertainty-avoidance score. A higher score indicates a higher degree of uncertainty-avoidance.	Hofstede (1980, 2001)
<i>TRUST</i>	Following Ahern, Daminelli, and Fracassi (2015), we obtain a country's social trust score using question number A165 from the WVS: <i>Generally speaking, would you say that most people can be trusted or that you need to be very careful in dealing with people?</i>	World Values Survey (WVS)
Variables in further analyses		
$\Delta CASH$	One-year change in <i>CASH</i> .	Compustat
$CASH_t^* - CASH_{t-1}$	Deviation of actual cash holdings ( $CASH_{t-1}$ ) from target cash holdings ( $CASH_t^*$ ) at the beginning of the year. The details of the estimation of target cash holdings ( $CASH_t^*$ ) are discussed in Appendix C.	Authors' calculation
$\Delta CAPEX$	One-year change in the ratio of capital expenditure to net assets.	Compustat
$\Delta ACQUISITION$	One-year change in the ratio of acquisitions to net assets.	Compustat
$\Delta R\&D$	One-year change in the ratio of R&D expenditure to sales.	Compustat
$\Delta DIVIDEND$	One-year change in the ratio of dividends to net assets.	Compustat
$\Delta REPURCHASE$	One-year change in the ratio of share repurchase amounts to net assets.	Compustat
<i>TOBIN'S Q (same as MB above)</i>	Ratio of market value of equity plus total assets less book value of equity to total assets.	Compustat

## Appendix B. Propensity score matching procedure and effectiveness

This appendix describes the propensity score matching procedure and evaluates its effectiveness. To construct the propensity score-matched sample, we first estimate a logit regression to model the probability of being a treatment firm using the firm-year observations in the year immediately before the MMoU signing year. The propensity score for each firm is calculated as the predicted probability of being a treatment firm from this step. We then match each treatment firm to a control firm in its home country in the same industry (2-

digit SIC code) and with the nearest neighbor propensity score without replacement. Panel A reports the results of estimating the logit regression. Panel B reports the results of testing the effectiveness of propensity score matching. Variable definitions are provided in Appendix A. t-statistics are reported in parentheses. \*, \*\*, and \*\*\* indicate significance at the 10%, 5%, and 1% levels, respectively.

Panel A Logit regression										
Variables	TREAT									
SIZE	0.506*** (17.35)									
LEVERAGE	-0.281* (-1.95)									
MB	0.271*** (8.43)									
NWC	-0.390*** (-5.17)									
CAPEX	-1.081*** (-2.94)									
R&D	1.323*** (4.25)									
CASH_FLOWS	-0.451*** (-2.73)									
INDUSTRY_SIGMA	0.847*** (11.29)									
DIVIDEND_DUMMY	-0.230*** (-2.60)									
Constant	-21.122*** (-15.13)									
Year fixed effects	YES									
Country fixed effects	YES									
Observations	318,864									
Pseudo R <sup>2</sup>	0.542									
Panel B Effectiveness tests										
Variables	Full sample					Propensity score-matched sample				
	Treatment group		Control group		Treatment – Control	Treatment group		Control group		Treatment – Control
	N	Mean	N	Mean	Difference	N	Mean	N	Mean	Difference
SIZE	1288	5.274	330576	4.902	0.372***	796	6.008	796	5.696	0.312**
LEVERAGE	1288	0.297	330576	0.256	0.041***	796	0.241	796	0.267	-0.027**
MB	1288	2.005	330576	1.591	0.414***	796	1.889	796	1.548	0.342***
NWC	1288	-0.183	330576	-0.006	-0.177***	796	-0.010	796	-0.013	0.003
CAPEX	1288	0.094	330576	0.064	0.030***	796	0.089	796	0.095	-0.006
R&D	1288	0.079	330576	0.017	0.061***	796	0.054	796	0.034	0.020
CASH_FLOWS	1288	-0.096	330576	0.036	-0.132***	796	-0.007	796	0.001	-0.008
INDUSTRY_SIGMA	1288	0.605	330576	0.200	0.405***	796	0.776	796	0.516	0.259***
DIVIDEND_DUMMY	1288	0.315	330576	0.454	-0.139***	796	0.363	796	0.376	-0.013

### Appendix C. Estimation of target cash holdings

This appendix describes the estimation of target cash holdings (CASH\*). Following Fresard and Salva (2010), we first estimate the following regression model country by country:

$$\begin{aligned}
 CASH_{i,t} = & \beta_0 + \beta_1 SIZE_{i,t} + \beta_2 LEVERAGE_{i,t} + \beta_3 MB_{i,t} + \beta_4 NWC_{i,t} + \beta_5 CAPEX_{i,t} + \beta_6 R\&D_{i,t} + \beta_7 CASH\_FLOWS_{i,t} \\
 & + \beta_8 INDUSTRY\_SIGMA_{i,t} + \beta_9 DIVIDEND\_DUMMY_{i,t} + Fixed\ Effects + \varepsilon_{i,t},
 \end{aligned} \tag{A1}$$

where  $i$  and  $t$  index firms and years, respectively;  $CASH$  is the ratio of cash and short-term investments to net assets, with net assets computed as total assets minus cash and short-term investments;  $SIZE$  is the natural logarithm of total assets in millions of US dollars;  $LEVERAGE$  is the ratio of total debt to net assets;  $MB$  is the ratio of market value of equity plus total assets less book value of equity to total assets;  $NWC$  is the ratio of net working capital to net assets, with net working capital computed as current assets minus current liability and cash and short-term investments;  $CAPEX$  is the ratio of capital expenditure to net assets;  $R\&D$  is the ratio of R&D expenditure to sales;  $CASH\_FLOWS$  is the ratio of income before extraordinary items plus depreciation to net assets;  $INDUSTRY\_SIGMA$  is the standard deviation of  $CASH\_FLOWS$  in a firm's industry during the previous three years;  $DIVIDEND\_DUMMY$  is a dummy variable that equals 1 for firms paying dividends, and 0 otherwise; and  $Fixed\ Effects$  are year and industry fixed effects.

The target cash holdings of each firm (CASH\*) is then estimated as the fitted cash holdings from Equation (A1). The sample period is from 1997 to 2019. Variable definitions are provided in Appendix A.

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