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## Cross-border cooperation between securities regulators<sup>☆</sup>

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### ARTICLE INFO

#### Article history:

Received 14 August 2018

Received in revised form 28 January 2020

Accepted 29 January 2020

Available online 11 February 2020

#### JEL classification:

K22

G38

F22

F23

### ABSTRACT

The events of September 11, 2001, prompted sweeping cross-border coordination efforts for securities regulators around the globe. After 9/11, the International Organization of Securities Commissions (IOSCO) forged a nonbinding arrangement—the Multilateral Memorandum of Understanding Concerning Consultation and Cooperation and the Exchange of Information (MMoU)—that standardized the protocol for information sharing among participating securities regulators. Because regulators from different countries entered the MMoU at different times, their enlistments created a set of staggered shocks. I use these shocks to show that the resulting cross-border cooperation (a) increases cross-border enforcement and (b) reduces the cost of liquidity provision in the capital markets of participating countries. These results support the conclusion that the MMoU helps fill gaps

<sup>☆</sup> I thank Rachel Hayes and six discussants—Mario Guadamillas, Jose Albuquerque de Sousa, Mary Barth, Hans Christensen, Aiysha Dey, and Rafael Rogo—as well as an anonymous reviewer, Wayne Guay (the editor), Alex Wells, Christian Leuz, Bob Holthausen, Phil Stocken, Josh White, Donald Langvoort, Russ Lundholm, Mo Khan, Lakshmanan Shivakumar, Jennifer Marietta-Westberg, D.J. Nanda, John Hand, Luzi Hail, Dirk Black, Brian Cadman, Mark Maffett, Ole-Kristian Hope, Aida Wahid, Francesco Bova, Richard Carrizosa, Atif Ellahie, Marlene Plumlee, Sugata Roychowdhury, Jeff Schwartz, Iman Sheibany, Yuliya Guseva, Hank Bessembinder, Andrew Karolyi, Karl Lins, Michael Schill, Kumar Venkataraman, Frank Warnock, Andrei Kirilenko, Bin Li, Tilman Leuder (head of Securities Markets at European Commission), Maya Marinov-Shiffer (director of International Affairs Unit-Israel Securities Authority), Ken Nagatsuka (capital markets policy deputy director, MAS), Robert Evans (chief of the Office of International Corporate Finance, SEC), Julie Read (chief executive and director, Serious Fraud Office, New Zealand), and various members of the SEC's Office of International Affairs, including Kurt Gresenz, Marianne Olson, Kathleen Hutchinson, Scott Birdwell, and Estee Levine. The paper benefitted from helpful comments from workshop participants at the University of Utah, University of Toronto, University of Minnesota, University of Maryland, UVA (Darden), the SEC's Division of Economic Risk and Analysis and Office of International Affairs, the Monetary Authority of Singapore, and Israel Securities Authority. I appreciate the comments of conference participants at the Utah Winter Accounting Conference and LBS Accounting Symposium, National Business Law Scholars Conference, Singapore Management University's SOAR, IAS, FARS, Hebrew University Law School's Integrating Corporate Reporting conferences, the 2nd Centre for Economic Policy Research-Imperial Centre for Global Finance and Technology-Plato Market Innovator (MI3), and the 2019 Erasmus Liquidity Conference and the World Bank *Annual Bank Conference on Development Economics (ABCDE)* on multilateralism. I am indebted to the 2nd CEPR-Imperial-Plato Market Innovator (MI3) conference on market structure and the IAS conference where the paper was awarded the "Plato MI3 Best Paper Award, 2018" and "2018 Best Paper," respectively. I appreciate the feedback from regulatory delegates around the globe at the SEC's 28th Annual International Institute for Securities Market Growth and Development. I am particularly grateful for the opportunity to receive feedback from IOSCO's C4 committee for Enforcement and the Exchange of Information and the Multilateral Memorandum of Understanding Screening Group at their meeting in Auckland, NZ and the many helpful conversations with its members—particularly Jean-François Fortin (executive director of Enforcement, AMF [Quebec] and chair of IOSCO's C4), Mark Hilford (manager, Litigation, BSBC [British Columbia]), Christophe Caillot (senior officer, AMF [France]), Isabel Pastor (head of Enforcement & Cooperation [IOSCO]), Anne-Louise Lamarre (AMF [Quebec]), Gillian Tan (executive director/head of Enforcement Department, MAS [Singapore]), Antoine Van Cauwenberge (coordinator for International Affairs, FSMA [Belgium]), Nicoletta Giusto (director/head of the International Relations Office, CONSOB [Italy]), Nick Kynoch (general counsel FMA [New Zealand]), Claire Norfield, (Law, Policy & International/ Enforcement & Market Oversight Division, FCA [United Kingdom]), and Simon Gaudion (director of Enforcement, FSC [Guernsey]). I acknowledge Sergei Sarkissian (Sarkissian and Schill, 2004, 2009) for sharing survey data related to cross-listings used for cross-validating my sample.

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<https://doi.org/10.1016/j.jaccoco.2020.101301>

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F59  
M48

Keywords:

Cross border  
Information sharing  
Networks  
Regulatory cooperation  
Enforcement

in cross-border regulation that historically exposed investors to information asymmetry, agency costs, and expropriation risks.

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## 1. Introduction

In purely domestic settings, regulators are usually (by construction) supplied with the surveillance and enforcement powers necessary to carry out their mandate. The same is not true in cross-border settings. In cross-border settings, information, witnesses, and assets typically reside outside the regulators' jurisdictions. As a result, regulators are often constrained by information shortfalls, jurisdictional complexities, and legal limitations. Thus, cross-border enforcement differs from enforcement within a single regulatory system in that it requires cooperation between regulators operating in different and seemingly incompatible legal systems. Recent increases in the number of cross-border transactions suggest a growing need for better cooperation and more effective cross-border enforcement,<sup>2</sup> but the literature to date tells us little about regulators' attempts to keep pace.

After September 11, 2001, the need to eliminate terrorism-related financing and money laundering compelled regulators in the International Organization of Securities Commissions (IOSCO) to standardize cooperation via a special arrangement—the Multilateral Memorandum of Understanding (MMoU). The MMoU addresses the scope, confidentiality, and use of information shared between signatory regulators.<sup>3</sup> For these regulators, the MMoU is a conduit designed to increase information flows (e.g., transfers of brokerage and beneficial ownership records, depositions, and testimony) and extend enforcement capabilities (e.g., restraining orders that freeze assets, reduce defendant flight risks, force the identification of accounts, and prohibit destruction of critical documents).<sup>4</sup>

The MMoU is not a treaty but rather a cooperative arrangement structured as a *statement of intent*. As such, the MMoU is neither ratified by national legislatures nor approved by executive branches; any disputes that arise from it cannot be arbitrated by (international) courts.<sup>5</sup> Legal scholars are thus skeptical of its effectiveness (Zaring, 2010; Cadmus, 2011), much as they are skeptical of other policy coordination using “soft law” methods (Klabbers, 1996, 1998; Raustiala, 2005).

I begin by studying securities regulators' cross-border enforcement capacities. Using the staggered introduction of the MMoU as a set of potential shocks to cooperative capacity, I find that the US Securities and Exchange Commission's (SEC) enforcement of US-listed foreign firms is around three times as likely when the firms' home country regulators are linked to the SEC by the MMoU.<sup>6</sup> This suggests that the MMoU helps catalyze enforcement, despite its lack of legal force.

Next, I broaden the scope to a global sample and show that the MMoU enhances equity market liquidity. Cross-border shares whose co-supervising (home and host) regulators are united by the MMoU experience an 18%–35% reduction in spreads, depending on the model specification. This finding is consistent with the MMoU fostering effective cross-border cooperation and enforcement, which in turn reduces the risks reflected in liquidity.

Finance and accounting research has paid attention to cross-border enforcement, particularly at the SEC, since the bonding hypothesis was conceived in 1999. This hypothesis proposes that investors in foreign firms benefit from the enhanced disclosure and shareholder protection that accompany a U.S. listing (Coffee, 1999; Stulz, 1999). A key to the hypothesis is the idea that the threat of enforcement deters malfeasance, which reduces agency conflicts and thereby creates value. However, some authors challenge the plausibility of the hypothesis, on the grounds that cross-listed firms face lower and less strict standards of SEC oversight than U.S. firms (Frost and Pownall, 1994; Frost and Kinney, 1996; Siegel, 2005). Licht et al. (2018) suggest that legal obstacles and a laissez-faire approach lead to weaker SEC enforcement against cross-listed firms. Some authors even question

<sup>2</sup> Increased cross-border market activity is illustrated by market liberalization, new technologies (e.g., telephone and internet brokerage relationships), trading configurations (e.g., location-neutral electronic trading platforms), global consolidations of major stock exchanges (e.g., mergers between the NYSE and Euronext, between NASDAQ and OMX, and between the London Stock Exchange and the Borsa Italiana in Milan), mergers of broker-dealers, and initiatives like the European Union's directives, harmonization, and “passporting” efforts (Christensen et al., 2016; Meier, 2017).

<sup>3</sup> The MMoU document (revised in 2012) can be viewed here.

<sup>4</sup> Some capabilities—such as acquiring banking, brokerage, and beneficial ownership records and witness testimony under oath as well as removing impediments to cooperation such as secrecy laws and blocking statutes—are explicitly identified by the MMoU. For other capabilities, Section 7(a) of the MMoU simply suggests that signatories provide each other with the “fullest assistance permissible.”

<sup>5</sup> In practice, even legally binding agreements tend to work very poorly across borders. See, for example, Supreme Court Justice Alito's commentary in the oral argument in *US v. Microsoft* (February 27, 2018), noting that, even under (enforceable) treaties, acquiring information requires months or more typically years—long enough for most cases to go cold. Ederington (2001, p.1580), speaking about legally enforceable contracts, states that “one of the challenges of international cooperation is the absence of a central authority to enforce the terms of an agreement.” Such issues are magnified when the arrangement is, at its outset, known to be unenforceable.

<sup>6</sup> “Foreign” and “cross-border” describe ADRs, dual listings, and foreign firms listed only in the United States. I refer to firms or shares from different countries that are not listed in any other country as “domestic.”

whether the *threat* of SEC enforcement exists for cross-listed firms (Licht et al., 2018; Siegel and Wang, 2013). Yet researchers have not investigated the frictions that lead to weaker SEC enforcement.

Multiple factors can constrain cross-border cooperation, which is often necessary for enforcement. Enforcement can be slowed by ad hoc examinations of requests or halted entirely by confidentiality provisions (e.g., blocking statutes and secrecy laws), dual criminality requirements (which stipulate that assistance is allowed only if the activities in question are illegal in both jurisdictions), or the need for a foreign regulator to have an independent interest in a matter. Even when cooperation occurs, a lack of competence or legal authority in a foreign counterpart can weaken cross-border enforcement.

The MMoU aims to address these issues by standardizing the protocols for cooperation. Dual criminality requirements, confidentiality provisions, and independent interest stipulations are not valid reasons for an MMoU signatory to refuse to cooperate. As a result, the arrangement improves access to local information (e.g., depositions and local regulatory correspondence), auditors (e.g., work papers), banks (e.g., account and transaction identification), brokers, and third parties (e.g., internet/telephone and purchase transaction records). In addition, IOSCO's rigorous assessment requires that applicants demonstrate the requisite legal authority and competence to comply with the arrangement.

Three novel properties of the MMoU setting enable me to draw strong inferences. First, its justification was to combat terrorist financing and money laundering after 9/11, yet its capabilities have direct implications for securities regulation. Unlike most regulatory regime shifts, its establishment is unrelated to market forces and therefore arguably exogenous to firms, investors, and even regulators. Second, because cross-border firms reside in one country (*home*) but trade in another country (*host*), an important linkage is formed when regulators in two countries are united by the MMoU. Importantly, these linkages create shocks to cross-border regulation that occur not only at different times for different countries but also at different times *within* individual countries. That is, the network formation creates a treatment that is staggered in three dimensions, because the links jointly depend on a firm's (i) home-country joining date (ii), host-country joining date, and (iii) time. To my knowledge, this is the first network-created treatment of its kind. Third, in the liquidity analyses, purely domestic observations serve as a counterfactual (benchmark). I compare the liquidity of cross-border (treated) shares with that of domestic (untreated) shares that are exposed to otherwise similar circumstances (in the same country, at the same time), while controlling for industry and liquidity-related fundamentals. These comparisons are made both before and after the MMoU links home and host regulators. This constitutes a triple difference-in-difference design.

These unusual factors—(1) arguably exogenous shocks, (2) these shocks occurring in a three-dimensional stagger, and (3) within-country benchmark shares in a triple diff-in-diff design—yield persuasive inferences about the MMoU's market effects. To affect my inferences, a correlated omitted variable would have to do more than affect the liquidity of a country at a point in time (as occurs with changes in, say, business cycles or laws); it would have to affect certain subsets of treated shares (but not have the same influence on domestic shares) at the precise times when the MMoU links the treated shares' co-supervising regulators. A variable with such specific characteristics seems unlikely.<sup>7</sup>

This is the first empirical study of interactions between securities regulators, and it contributes to the literature in four ways. First, it illuminates cross-border enforcement of securities laws, an increasingly important topic as markets globalize. The literature contends that identifying cross-border frictions and regulators' management of those frictions is critical (Austin, 2012) and—due to confidentiality provisions of the MMoU and the opacity of regulators—empirically challenging (Cadmus, 2011). For almost four decades, cross-border enforcement has remained a black box whose inner workings are obscure even to experts. By documenting a link between enforcement outputs and the MMoU, this study establishes that cross-border cooperation helps catalyze enforcement.<sup>8</sup> Historically, cross-border frictions appear to have limited the SEC's tactics and information. These frictions—and not deliberate indifference—may have led to fewer cross-border enforcement actions. This matters for the bonding literature, which views a U.S. listing as promoting better oversight but struggles to determine whether increased oversight *actually* occurs.

Second, this paper shows that the MMoU is associated with large, measurable reductions in transaction costs. These reductions vary from country to country and between country pairs, and I use this variation to explore factors that condition the MMoU's impact (as inferred from liquidity). I find evidence that country-level legal paradigms (e.g., common vs. code law), laws (e.g., blocking statutes), and economic factors (e.g., economies of scale, and reciprocity) influence the magnitude of the liquidity improvement in predictable ways. These analyses demonstrate that the effect is broader than just the US (and UK)—which indicates that the MMoU is an effective global instrument. The results offer new insights and reinforce the conclusion that cross-border cooperation, made possible by the MMoU, is a key determinant of the cost of liquidity provision.

Third, I establish the appeal of the MMoU setting and develop its institutional details. The MMoU appears to have been politically motivated by the events of 9/11 and is arguably exogenous to the firms and perhaps even to the securities regulators themselves. This property, together with the within-country staggered design, makes this an attractive setting for studies seeking exogenous variation in regulatory enforcement.

Finally, the MMoU's association with enforcement suggests that it is an effective policy tool, despite being legally nonbinding. On the surface, this association might seem unsurprising, since enhanced enforcement is the MMoU's aim. But because cooperation is entirely unenforceable, there exists considerable skepticism regarding the MMoU's effectiveness.

<sup>7</sup> Note that this design substantially reduces the likelihood that various types of endogeneity, including the timing of MMoU entry, explain my findings.

<sup>8</sup> Silvers (2016) identifies the expansion in cross-border SEC enforcement and speculates that cross-border cooperation played a role in more frequent enforcement, but provides no tests that could separate these efforts from the effects of the Sarbanes-Oxley Act, SEC budgetary increases, or regulatory preferences.

Thus, the MMoU's association with enforcement is relevant to parties seeking new soft law transnational regulatory networks, enhanced cooperation, or policy convergence.

## 2. Background and research design

### 2.1. Cross-border enforcement

The literature lacks consensus on whether public oversight can affect contracting and monitoring costs, but many authors argue that it can (Coffee, 1984; Easterbrook and Fischel, 1984; Zingales, 2009). When cross-border oversight is considered, the discussion centers on the bonding hypothesis, which views cross-listing in the US as a way to credibly signal to investors a firm's commitment to enhanced disclosure, governance, and minority shareholder protection (Karolyi, 2006, 2012). Other literature questions the benefit of regulation and the legitimacy of the bonding hypothesis. Several papers contend that public regulators are unnecessary, incapable, corrupt, or swayed by powerful industries and lobbyists (Coase, 1960; Stigler, 1964, 1971; Posner, 1974; Peltzman, 1976). If anything, regulatory shortcomings are magnified in cross-border contexts. More recently, bonding-theory critics have acknowledged valuation benefits associated with secondary listings in the US, but ascribe them to factors other than legal protections, mainly because they view cross-border enforcement as too rare and dysfunctional to provide benefits (Licht, 2003; Licht et al., 2018; Shnitser, 2010; Siegel, 2005).

### 2.2. Enforcement cooperation and information-sharing arrangements

Historically, the tools at the disposal of securities regulators in ad hoc cross-border cases—letters rogatory and mutual legal assistance treaties (MLATs)—were fairly blunt instruments. Letters rogatory are precatory petitions, written by local courts, asking foreign courts to supply information or act on behalf of the requesting court by taking or preventing a legal action based on diplomatic incentives. Requests involving more egregious crimes (human trafficking, murder, etc.) often take priority over requests for securities investigations, but even the “successful” requests must crawl through diplomatic channels, which can take years (Swire and Hemmings, 2015). MLATs can provide criminal enforcement agencies a legal right to information or allow them to extradite criminals, but only under certain conditions. Investigations by securities regulators tend to be civil in nature, and regulators often lack a statutory analog of the alleged crime, which is a common precondition for invoking an MLAT. In sum, letters rogatory and MLATs are cumbersome tools with uncertain efficacy (especially in securities regulation). This helps explain why cross-border efforts during the 1980s and 1990s were protracted, costly, and generally ineffective.

These sorts of difficulties led regulators to seek new ways to facilitate and institutionalize cooperation. This was initially done by signing *bilateral* memoranda of understanding (MOU)—nonbinding (soft law) arrangements that expressed an *intent* to cooperate. Ironically, the early bilateral arrangements routinely acknowledged that both parties lacked the legal authority to share information, but expressed intentions to obtain such authority in the future (Fedders et al., 1984; Levin, 1985; Grassie, 1987). Unlike a treaty, an MOU is not enforceable, so the risk of counterparts not upholding their pledge is high. It is thus not surprising that the effectiveness of MOUs has been questioned. Although the bilateral arrangements of the 1980s and 1990s laid important groundwork for later efforts, academic research still criticized SEC enforcement against foreign firms during this period as “infrequent and ineffective” (Siegel, 2005). This view is consistent with the general skepticism about soft law expressed by prior research (Klabbers, 1996, 1998; Raustiala, 2005).

The terrorist attacks on September 11, 2001, generated widespread political support for information-sharing efforts, which led to an extraordinary exogenous change to cross-border enforcement capacities—the MMoU. Kempthorne (2013) states: “Regulators recognized the limitations to the current network of bilateral MOUs prior to the crisis, but it had not reached a critical point where securities regulators were willing to do something to address it. September 11 was that critical point.”

The MMoU resembles the bilateral memoranda in that it seeks a similar objective (regulatory cooperation) and is not legally enforceable. But it arose for an extraordinary reason and is constructed entirely differently. Problems with ad hoc investigations led to the establishment of many bilateral arrangements, but it was 9/11—or, specifically, top-down political support for cooperation in the wake of 9/11—that motivated the MMoU. IOSCO (2014) explains that “the MMoU was developed by IOSCO following the events of 11 September 2001, when IOSCO created a Special Project Team to explore how securities regulators could expand cooperation and information sharing.”

The MMoU facilitates cross-border enforcement by standardizing the acquisition and sharing of information, by specifying the scope of information gathering, and by defining the confidentiality and acceptable uses of the shared intelligence. These standards allow for an ex ante understanding of how cooperation will take place. Key components of the MMoU are its focus on the regulator's practical ability to provide assistance and its acknowledgement that regulators have widely varying grants of legal authority (Slaughter and Zaring, 2006). Unlike prior cross-border arrangements, which were often aspirational for one or both sides, the MMoU application process requires IOSCO to rigorously review the laws and institutions within each applicant nation to confirm the nation's legal capacity for swift cooperation.<sup>9</sup> Prior to admittance, applicants must remove any

<sup>9</sup> The MMoU application includes detailed questions related to the applicant's capability to obtain and share information. An IOSCO verification team, composed of securities regulators from around the globe, carefully reviews the answers to these questions and assesses applicants' ability to meet a high standard for assistance.

obstacles to cooperation, such as sovereignty issues (Nadelmann, 1993), governmental transparency initiatives (e.g., the Freedom of Information Act), foreign privacy laws that prevent evidence sharing with foreign counterparts (Savarese, 2015), and dual criminality requirements. They must also remediate blocking statutes or secrecy laws by legislating exceptions known as “gateways.” After countries are admitted, the MMoU encourages them not only to comply with requests from other authorities but also to make reasonable efforts to provide *unsolicited* help when they possess potentially useful information. The MMoU's monitoring group provides an ongoing assessment of signatories' performance.

Sometimes applicants must change laws or regulations before they can sign the MMoU, and these changes may contribute to cross-border cooperation. Although the new laws or rules may narrowly predate the signing, the MMoU still motivates them, and their passage does not prevent the MMoU from serving as an instrument for identifying variation in cross-border cooperation. In fact, to the extent that local enforcement capacities simultaneously increase, cross-border enforcement might be less necessary, which would bias against my later findings.

Although the MMoU is soft law, IOSCO members have much stronger incentives to join the MMoU than to enter into bilateral arrangements (Van Cauwenberge, 2012). Unlike in bilateral arrangements, MMoU membership is all but required for participation in the global financial system: the IMF's Financial Sector Assessment Program and the Financial Stability Board each weigh MMoU membership when they consider a country's financial health, and IOSCO penalizes countries that are not part of the MMoU by revoking their IOSCO voting rights and membership (IOSCO, 2005). In most nations, a political motivation to stop money laundering and terrorist financing creates an important push for MMoU participation. One final incentive is that, by joining the MMoU, regulators can use the global support for IOSCO standards to justify needed changes to their laws.

Based on these factors, I propose that the MMoU breaks down significant cross-border barriers and increases the feasibility, in cost and logistics, of cross-border enforcement. My tests focus on SEC enforcement of U.S.-listed foreign firms. In recent decades, few changes have occurred in the basic structure of US securities laws, the SEC's approach to regulatory relief, and how the SEC's cases are made public, so there is a reasonable setting and reliable dataset to support empirical tests.<sup>10</sup> I expect that the application to the MMoU is associated with increased cross-border SEC enforcement.<sup>11</sup>

Although my enforcement tests focus on the SEC, there is evidence that the MMoU's effect on enforcement reaches beyond the commission. Anecdotally, securities regulators credit the MMoU for transforming their cross-border enforcement capacities (IOSCO, 2012). Ashley Alder, former CEO of the Securities and Futures Commission in Hong Kong and current chair of IOSCO, states: “The IOSCO MMoU is a widely used arrangement under which 121 securities regulators have agreed the basis on which they exchange information for the purposes of their enforcement mandates” (ESMA, 2019). Basic statistics from IOSCO and the SEC indicate that, in 2017, 4803 MMoU requests were made; of these, less than 600 were made by the SEC to foreign regulators (SEC Congressional Budget Justification, 2017). Clearly, other regulatory agencies are actively using the MMoU.

### 2.3. Capital market effects of enforcement cooperation

#### 2.3.1. Important share type distinctions and structure of data

By using liquidity as an indicator of market quality, I can assess a global sample—not just firms registered with the SEC—in my tests of the MMoU on capital markets. There are two distinct effects of the MMoU, which affect different subsets of my sample. First are *market-wide* effects, which are common to all shares in a given country's market. These could occur because MMoU admission signifies that the country's regulator has met IOSCO's regulatory standards. Meeting these standards may have required legislative solutions to existing regulatory deficiencies, greater funding for regulators, or simultaneous efforts to cultivate capital markets. Increases in learning between regulators, dissemination of best practices, and regulatory convergence could also happen (Austin, 2012). All of these factors may strengthen markets generally; if they also affect liquidity, then the benefits should accrue to all share types. Consequently, changes that are contemporaneous with the MMoU—not to mention the signal provided by the MMoU admission itself—could affect the country's entire market.

Second are *cross-border* effects, which occur only for certain subsets of shares. Specifically, these effects should be limited to cross-border shares (shares of firms that have a listing outside their home market), and should occur when a link is formed between regulators in the relevant home and host markets. The cross-border shares of a given firm can either be *host* shares, which are listed in foreign markets,<sup>12</sup> or *home* shares, which are listed in a firm's home country. This distinction is important because host shares are the most exposed to both information and regulatory problems (for reasons described below).

<sup>10</sup> In contrast, other countries have changed their laws, evolved in their approach to regulatory relief, and often do not publicize enforcement outputs.

<sup>11</sup> Former SEC Chairman Donaldson highlighted the importance of the MMoU to the commission's enforcement efforts, saying, “The SEC has long recognized that international cooperation is vital to an effective enforcement program. The IOSCO (M)MOU is an important contribution to cross-border enforcement cooperation and a public statement that the world's securities regulators are committed to assisting one another in preventing and prosecuting violations of our securities laws. We are pleased to be a signatory to the (M)MOU and anticipate that this agreement will enhance our ability to obtain information valuable to our enforcement investigations.” (SEC Staff, 2003).

<sup>12</sup> These could take the form of either American or Global Depositary Receipts (“ADRs” or “GDRs”), or regular (full) listings. I depart from the term “cross-listed,” because cross-listed refers to the *firm*, not the *share*, and because shares that are exclusively listed in a foreign market are still considered host shares in my study.

Firms exclusively listed in their home market (non-cross-border shares) are hereafter called *domestic* shares and later serve as a baseline that should reflect any common within-country factors. This structure identifies effects of the MMoU that are common to all stocks in the country's market, as well as incremental effects found in cross-border (home and host) shares.

### 2.3.2. Cross-border regulatory cooperation and its relation to liquidity

Foreign assets offer investors benefits in terms of diversification or yield, but expose them to several risks. These risks arise in part because the regulatory deficiencies (described in Section 2.2) allow agency issues and information problems to proliferate. Therefore, cross-border regulatory gaps (and their resolution) have implications for liquidity.

Firms that pursue a foreign listing typically select host markets with more demanding standards of investor protection and disclosure than their home market requires. In these cases, exposure to the threat of sanctions from a stronger host market regulator is one way to credibly commit to better governance of the firm—thereby resolving agency conflicts and enhancing liquidity and firm value. This is the rationale for the bonding hypothesis. The ability for stronger host market regulators to substitute for weaker home market regulators depends partly on cross-border enforcement capacity—which, in turn, hinges on the assistance that regulators receive from foreign counterparts. When regulators cooperate, managers face a new threat of sanctions, which can increase transparency and constrain opportunism (for example, asset taking, fraud, or related-party transactions).<sup>13</sup> Therefore, the MMoU has clear implications for reducing the risks that arise from agency problems.

Information problems can arise because local investors, even ones who are not insiders, often have advantages over foreign investors in terms of the amount, precision, and timing of information (Gordon and Bovenberg, 1996; Brennan and Cao, 1997; Kang and Stulz, 1997; Bae et al., 2008). For example, lenders, customers, suppliers, analysts, market makers, brokers, journalists, and lawmakers often possess nonpublic, value-relevant information about the firm. This information diffuses into local environments before reaching foreign ones, which subjects foreign investors to adverse selection risks.

Cross-border trading can also raise issues outside the scope of classic bonding/agency problems. For example, host shares' bid-ask spreads are often wide, which makes them targets for price manipulation schemes fueled by bogus orders (pump-and-dump, spoofing, layering, etc.).<sup>14,15</sup>

Gaps in the enforcement capacity of securities regulators magnify foreign investors' exposure to all of these risks. In purely domestic settings, a regulator uses the threat of enforcement to curtail behaviors that illegally exploit information advantages (and/or to return money to harmed investors). But cross-border regulatory gaps create safe havens for abuse. In fact, academics and practitioners argue that miscreants exploit cross-border regulatory vulnerabilities to evade scrutiny. In the absence of regulatory cooperation, cases of insider trading, asset taking, related-party transactions, front running trades, and market manipulation are unlikely to be prevented, discovered, or sanctioned.<sup>16</sup> For example, if regulators fail to cooperate, illegal insider trades can be strategically routed through foreign venues, which can conceal the trader's identity and diminish the chance of sanctions. This creates incremental adverse selection risks for host shares, because counterparties have a systematic advantage.

The tactics enabled by the MMoU should help protect investors from a variety of abusive practices. For example, the MMoU allows regulators to quickly identify, freeze, and repatriate ill-gotten gains regarding insider trading. It does so by promoting swift assistance in obtaining bank, brokerage, and beneficial ownership records and in executing temporary restraining orders that freeze assets, prohibit document destruction, or reduce flight risks.<sup>17</sup> A fast pace is critical, because pursuing insider-trading cases is futile once a trader absconds with the money. In addition, cases involving self-dealing and asset tunneling can be strengthened by intelligence about theft or questionable related-party transactions. Under the MMoU, this type of information can be obtained quickly from regulatory counterparts. The MMoU can also enable access to internet, telephone, and purchase records, which helps regulators establish the occurrence or content of communications between defendants. And it allows signatories to subpoena third parties and depose witnesses within other members' jurisdictions.

<sup>13</sup> Silvers (2018) provides evidence that cross-listed firms provide more transparent financial disclosure and less earnings management after the MMoU connects their home regulator to the SEC. Silvers' finding comports with those of Brockman and Chung (2003, p 927), who argue that the "legal-regulatory environment largely determines the quantity and reliability of publicly available information, particularly at the firm level." Greater transparency, in turn, should improve liquidity. Additionally, Lang et al. (2019) find that the MMoU changes the demand for owning US-cross-listed firms. Foreign investors in third-party countries (unaffiliated with the US or the home country) increase their holdings of US-cross-listed firms after the MMoU. Foreign ownership may prompt liquidity improvements (or vice-versa).

<sup>14</sup> For example, in Germany's (BaFin) investigation of suspicious trading of host shares of Dutch bank ABN Amro, the regulators identified a "comparatively wide bid-ask spread" between markets as something unscrupulous agents can exploit (BaFin, 2007, p. 182–183).

<sup>15</sup> In addition, host shares commonly have identical shares trading in other markets (that is, most have a corresponding home share that trades in the home market), and price formation is likely to occur disproportionately on the home exchange (Hauser et al., 2011). Host-country market makers thus face added risks from home-market informed traders, arbitrageurs, and competing market makers (who privately observe the arrival of information via trade demand by local investors with superior information) (Foucault et al., 2017). contend that prices of identical assets can temporarily diverge, because of differential shocks to an asset's value that derive from either (a) news arrival or (b) liquidity needs. News-based trades achieve profits at the expense of dealers who trade at stale quotes; such trades represent "toxic" arbitrage, because they consume liquidity and widen bid-ask spreads.

<sup>16</sup> For example, Austin (2014, p 41) suggests that perpetrators of market abuse structure their transactions in ways that deliberately conceal their actions and identity: "In the absence of an appropriate response by regulators it is clear that [cross-border changes to markets] have increased the opportunities for persons to engage in market abuse and their ability to hide such abuse from detection."

<sup>17</sup> Appendix A provides specific examples of various types of cases, from around the globe.

### 2.3.3. Firm versus share effects

The tactics and information access enabled by the MMoU provide a comprehensive change in regulatory capacity. This, in turn, helps regulators resolve issues both at the *share level* and the *firm level*. Share-level problems, such as market manipulation, insider trading, front running, arbitrage, and threats from competing market makers, create costs that are borne by specific counterparties in specific transactions in specific markets. Firm-level problems, including asset taking, disclosure, and related-party transactions, are agency related and harm all outside investors.

*Host shares* (cross-border shares listed in foreign markets) suffer from both firm- and share-level issues because adverse selection, information problems, and regulatory deficiencies are inherently more problematic in foreign markets. Foreign investors likely have higher sensitivities to, and lower tolerances for, the risks that the MMoU curtails. Thus, the effect of the MMoU should be strongest in *host shares*. Yet *home shares* (cross-border shares traded in local markets) may also experience certain benefits, including firm-level benefits and second-order effects such as increased competition for order flow from host markets, improved host-country capital-raising opportunities, and a more diverse shareholder base. Relative to *host shares*, however, *home shares* are likely to experience a less pronounced effect, because they are usually subject to fewer information problems and constraints on regulation (local regulators can typically supervise their own markets without cooperation from other regulators).

Some frauds combine several misdeeds and can mix share- and firm-level factors, such as when self-dealing is concealed through false or misleading disclosures.<sup>18</sup> Concealment and deception become more difficult under the MMoU. Ultimately, the MMoU is expected to deter malfeasance in ways that reduce the cost of liquidity provision, particularly for cross-border shares.

### 2.3.4. Cross-sectional factors that condition the magnitude of the liquidity effects

The cross-sectional tests focus on host shares because the effect of the MMoU should be larger and the cross-sectional effect should be more straightforward in these shares. In these tests, I assess country-level features that are likely to condition the liquidity effects of the MMoU linkages. These features, which are discussed in detail below, include regulatory strength, legal origins, laws that hinder information sharing, and economic motivations.

Although the MMoU requires all signatories to meet a threshold regulatory capability, signatories still vary in terms of regulatory strength (e.g., resources, skills, knowledge, and political leverage). Regulatory weakness could reduce the likelihood of cross-border cases being pursued, undermine the effectiveness of the MMoU, and limit the liquidity benefits.

Legal origins are also likely to affect the regulators' ability to cooperate. Prior work views legal origin as an important determinant of property rights, dispute resolution, and shareholder protection (La Porta et al., 2008). In the context of this paper, legal origin is important not only as a surrogate for legal strength but also as a way to understand the *compatibility* between the rules of paired countries. For example, common law countries are familiar with compelled testimony and extensive pre-trial documents discovery, both of which can help regulators build cases. Civil law countries, in contrast, view such requests as unconventional and often deny them if their scope is too broad or poorly defined.<sup>19</sup> A shared legal lineage ensures analogous procedures, doctrines, and standards that can prevent incongruities in how courts treat evidence, discovery, and elements of civil violations. Thus shared legal perspectives could aid in regulators' cooperation and enhance the liquidity effect of the MMoU. Alternatively, the MMoU may be most important in cases where incompatibilities exist, as it could help regulators work around these differences.

Laws that explicitly obstruct the transmission of information could also influence the liquidity effect. For example, pre-emptive jurisdiction (blocking) statutes make it a criminal offense (often punishable with jail time) for citizens to provide information to foreign agents. These statutes aim to protect national interests and sovereignty, but in practice they deter cooperation. Many even prohibit foreign persons, including regulators, from requesting information from citizens or regulatory staff in a given country. This exposes the staffs of the both the requested and the requesting authorities to the risk of criminal liability as they pursue cross-border cases.<sup>20</sup> Secrecy laws pose a similar challenge. Austin (2014) argues that secrecy laws, by shielding the identities of the involved parties, make insider trading particularly hard to detect. Because the MMoU is designed to remedy blocking statutes and secrecy laws, the marginal impact of the MMoU may be higher in these instances.

Finally, economic motivations and economies of scale may also affect cooperation. Host countries may invest more in understanding the nuances of home country laws and may work more closely with home country regulators when the host country investors make more frequent transactions in home country stocks. I call this an "economies of scale" argument, because it relies on host regulators spreading the (fixed) cost of assimilating the separate legal systems across more actual or

<sup>18</sup> Observing larger effects for host shares than home shares is not necessarily evidence that the MMoU is primarily a share-level effect. Home and host shares have different spreads to begin with, and could be subject to complex interrelationships (e.g., better disclosure at the firm level leading to reduced market manipulation—a share-level issue).

<sup>19</sup> For example, depositions are executed very differently in civil law jurisdictions. Questions must often be submitted in writing in advance of the deposition, and are administered by magistrate judges. Cross-examination is often not permitted. Defendants may not be permitted to be present. All of this creates a very unfamiliar process for those trained in a different legal regime. This can be problematic because common-law judges in many jurisdictions require sufficient similarity in the style of deposition for testimony to be admissible in court proceedings.

<sup>20</sup> Therefore there is considerable deference to such laws unless regulators are intimately familiar with, and have a high level of confidence in, how to properly circumvent them. My interactions with the regulatory community suggest that they are keenly aware of the personal and professional risks posed by blocking statutes.

expected interactions. In the other direction, greater trading by home country investors in a host country's market may result in leverage for the host market to acquire information. Conceptually, this dynamic captures reciprocity, which could shape the impact of the MMoU. In fact, formal requests for assistance between regulators commonly refer to reciprocity by name, and authorities often remind counterparts of recent examples where their roles were reversed and the requesting authority provided assistance.

### 3. The association between the MMoU and enforcement

#### 3.1. Enforcement: sample

To test for changes in enforcement, I use data from Compustat and CRSP as well as from four other sources: IOSCO (for the MMoU), the SEC's website (for bilateral SEC arrangements and data describing enforcement actions against US-listed foreign firms from 1995 to 2010), and the Stanford Class Action Clearinghouse (for data on private litigation). The sample contains all US-listed foreign firms that satisfy the data requirements (described below). This includes cross-listed, dual (full) listings, and foreign incorporated firms that are exclusively listed in the United States. The final sample is a panel of 14,592 total firm-years (1652 unique firms over 16 years).

The SEC has taken 172 enforcement actions against 173 firms (1.19% of the firm-year observations). The data related to SEC enforcement actions were hand-collected. I define enforcement actions in an economic sense—as interventions by the SEC that aim to correct or punish firms or individuals for misreporting, insider trading, or aiding and abetting other firms in the perpetration of fraud, inter alia. The bulk of these events are litigated proceedings or settled cases for alleged violations of securities laws. SEC-prompted restatements without accompanying litigation are also included. [Appendix B](#) describes the sample of SEC actions in detail.

[Table 1](#) describes the sample across 59 countries (Panel A), 10 industries (Panel B), and 16 years (Panel C). Panel A reports that, of the 59 countries with a U.S.-listed foreign firm, 38 have applied to the MMoU by the end of the sample period. The fifth column reports, by country, the percentage of firm-year observations that are subject to SEC enforcement actions (1.19% of firm-years, overall). In Panel D, the enforcement actions are described based on the type of alleged infraction: insider trading, financial reporting, Foreign Corrupt Practices Act (FCPA), and miscellaneous. Miscellaneous includes alleged violations, such as option backdating, aiding and abetting other firms, and improper loans or compensation to officers.

#### 3.2. Enforcement: empirical design and results

##### 3.2.1. Enforcement: main tests

Univariate evidence is consistent with the idea that the MMoU enhances cross-border enforcement. [Table 2](#) shows the frequency of SEC enforcement directed towards U.S.-cross-listed firms, partitioned by the MMoU. Prior to the MMoU, 0.63% of the firm-years are subject to enforcement actions. This rises to 1.92% after the MMoU, a roughly three-fold increase that is economically and statistically significant ( $p < 0.01$ ).

When formally testing this relationship, it is important to control for other factors associated with enforcement. I thus apply the private litigation model of [Kim and Skinner \(2012\)](#), which uses explanatory variables from Compustat and CRSP (page 9). This model preserves a maximum number of observations, making it ideal for the current setting. To predict litigation, it uses industries with historically high litigation rates, firm size, percentage change in sales, share turnover, equity returns, and distributional properties of returns (skewness and standard deviation). These variables are defined more precisely in the appendix. The descriptive statistics in [Table 3](#) show notable differences between MMoU and non-MMoU observations in many of these litigation-related factors. To help rule out changes in malfeasance as an explanation for changes in SEC enforcement across time and countries, I follow [Silvers \(2016\)](#) by including an indicator for private litigation within the previous five years. I also include indicator variables for single- and secondary-bilateral arrangements.

Model (1) below is estimated using logistic and linear regression and takes advantage of the *two-dimensionally* staggered design illustrated in [Fig. 1](#), panel C.

$$SEC\_ACTION_{it} = \alpha_0 + \alpha_1 MMoU\_FILE_{it} + \alpha_2 BILAT_{it} + \alpha_3 2nd\_BILAT_{it} + \alpha_4 CLASS\_ACTION_{it} + \alpha_5 HI\_LIT_{it-1} + \alpha_6 SIZE_{it-1} + \alpha_7 PCT\_CH\_SALES_{it-1} + \alpha_8 RETURN_{it-1} + \alpha_9 SKEW_{it-1} + \alpha_{10} RET\_STD_{it-1} + \alpha_{11} TURNOVER_{it-1} + \varepsilon_{eit} \quad (1)$$

$SEC\_ACTION$  is an indicator equal to 1 when the SEC files an enforcement action and 0 otherwise.  $MMoU\_FILE$  is an indicator equal to 1 when the MMoU is filed by the firm's home regulator and 0 otherwise. My expectation is that the coefficient on  $\alpha_1$  will be positive and significant.<sup>21</sup> I report the descriptive statistics for these control variables in [Table 3](#) and provide their

<sup>21</sup> Positive coefficients on  $\alpha_2$  and  $\alpha_3$  would similarly indicate an increased likelihood of SEC enforcement for firms from foreign countries that have single- and secondary-bilateral arrangements with the SEC.

**Table 1**  
SEC enforcement samples.

Panel A: Sample firms by country						
	MMoU	Firm-Years	Pct. Firm-Years	Enforcement Actions	Pct. Firm-Years w/enforcement	Unique Firms
Antigua And Barbuda	—	10	0.07	—	—	1
Argentina	—	175	1.20	—	—	19
Australia	1	284	1.95	3	1.06%	35
Austria	1	12	0.08	—	—	1
Bahamas	—	50	0.34	—	—	5
Belgium	1	45	0.31	4	8.89%	7
Belize	—	12	0.08	—	—	2
Bermuda	1	860	5.89	16	1.86%	106
Brazil	1	169	1.16	2	1.18%	18
British Virgin Isl.	1	260	1.78	2	0.77%	36
Canada	1	4590	31.46	37	0.81%	496
Cayman Islands	1	521	3.57	—	—	90
Chile	—	235	1.61	1	0.43%	25
China	1	222	1.52	6	2.70%	27
Colombia	—	5	0.03	—	—	1
Curacao	—	44	0.30	—	—	3
Denmark	1	61	0.42	2	3.28%	6
Dominican Republic	—	8	0.05	—	—	1
Finland	1	71	0.49	—	—	8
France	1	397	2.72	7	1.76%	40
Germany	1	288	1.97	13	4.51%	32
Ghana	—	7	0.05	—	—	1
Greece	1	42	0.29	1	2.38%	5
Hong Kong	1	122	0.84	2	1.64%	15
Hungary	1	15	0.10	—	—	1
India	1	150	1.03	—	—	16
Indonesia	—	46	0.32	1	2.17%	5
Ireland	—	311	2.13	3	0.96%	33
Israel	1	1223	8.38	9	0.74%	133
Italy	1	167	1.14	8	4.79%	17
Japan	1	471	3.23	5	1.06%	39
Jersey	1	43	0.29	—	—	4
Jordan	1	5	0.03	—	—	1
Korea	1	129	0.88	—	—	15
Liberia	—	68	0.47	—	—	6
Luxembourg	1	142	0.97	—	—	15
Marshall Islands	—	166	1.14	—	—	29
Mexico	1	359	2.46	6	1.67%	39
Netherlands	1	486	3.33	13	2.67%	50
Netherlands Antilles	—	34	0.23	—	—	3
New Zealand	1	55	0.38	—	—	8
Norway	1	61	0.42	1	1.64%	8
Panama	—	68	0.47	1	1.47%	7
Papua New Guinea	—	14	0.10	—	—	1
Peru	—	22	0.15	—	—	2
Philippines	—	37	0.25	—	—	4
Poland	1	4	0.03	—	—	1
Portugal	1	27	0.19	—	—	2
Puerto Rico	—	5	0.03	—	—	1
Russia	—	48	0.33	—	—	5
Singapore	1	88	0.60	—	—	9
South Africa	1	146	1.00	—	—	16
Spain	1	111	0.76	1	0.90%	10
Sweden	1	136	0.93	1	0.74%	19
Switzerland	1	288	1.97	20	6.94%	24
Taiwan	1	79	0.54	1	1.27%	7
Turkey	1	12	0.08	—	—	1
United Kingdom	1	1066	7.31	7	0.66%	138
Venezuela	—	20	0.14	—	—	3
<b>Total</b>	<b>38</b>	<b>14,592</b>	<b>100.00</b>	<b>173</b>	<b>1.19%</b>	<b>1652</b>

(continued on next page)

**Table 1** (continued)

Panel B: Sample by industry				
	Firm-Years	Pct. Firm-Years	Enforcement Actions	Pct. Firm-Years Enforcement
Agriculture, Forestry, and Fish	102	0.70	0	0.00%
Construction	107	0.74	2	1.87%
Finance, Insurance, and Real Estate	1636	11.27	30	1.83%
Manufacturing	5568	38.37	69	1.24%
Mining	2177	15.00	12	0.55%
Public Administration	119	0.82	11	9.24%
Retail Trade	248	1.71	8	3.23%
Services	1985	13.68	17	0.86%
Transportation & Public Utilities	2339	16.12	18	0.77%
Wholesale Trade	311	2.14	6	1.93%
<b>Total</b>	<b>14,592</b>	<b>100.00</b>	<b>173</b>	<b>1.19%</b>
Panel C: Sample by year				
Years	Firm-Years	Pct. Firm-Years	Enforcement Actions	Pct. Firm-Years Enforcement
1995	674	4.62	2	0.30%
1996	811	5.56	5	0.62%
1997	880	6.03	2	0.23%
1998	904	6.20	4	0.44%
1999	995	6.82	7	0.70%
2000	994	6.81	2	0.20%
2001	979	6.71	6	0.61%
2002	949	6.50	12	1.26%
2003	950	6.51	11	1.16%
2004	958	6.57	14	1.46%
2005	965	6.61	24	2.49%
2006	963	6.60	17	1.77%
2007	948	6.50	23	2.43%
2008	909	6.23	13	1.43%
2009	868	5.95	17	1.96%
2010	845	5.79	14	1.66%
<b>Total</b>	<b>14,592</b>	<b>100.00</b>	<b>173</b>	<b>1.19%</b>
Panel D: Enforcement subject matter				
Enforcement Actions				
Insider Trading				52
Financial Reporting				75
FCPA				20
Miscellaneous				26
<b>Total</b>				<b>173</b>

Panel A reports 14,592 firm-years and distinct firms in the enforcement sample, by country, for observations from 1995 to 2010. Panel B reports the same data by industry. Panel C reveals the occurrence of enforcement events by year, and Panel D breaks down the sample by subject matter. Additional details about the enforcement sample are provided in [Appendix B](#).

**Table 2**

SEC enforcement by governing arrangements.

	Firm-Years	Enforcement Actions	Percent with enforcement
No MMoU	8292	52	0.63%
MMoU	6300	121	1.92%
Total	14,592	173	1.19%
<b>MMoU- No MMoU comparison</b>			
Marginal difference			1.29%***
Marginal Ratio			3.06

This table reports observed proportions of SEC enforcement, measured using the percentage of firm-years with an enforcement action. There are two conditions of multilateral arrangements (firm-years governed by the MMoU and firm-years not governed by the MMoU). To understand these differences, I also present marginal differences and ratios. \*, \*\*, and \*\*\* denote significance at the 10%, 5%, and 1% levels for a two-tailed difference in proportion, respectively.

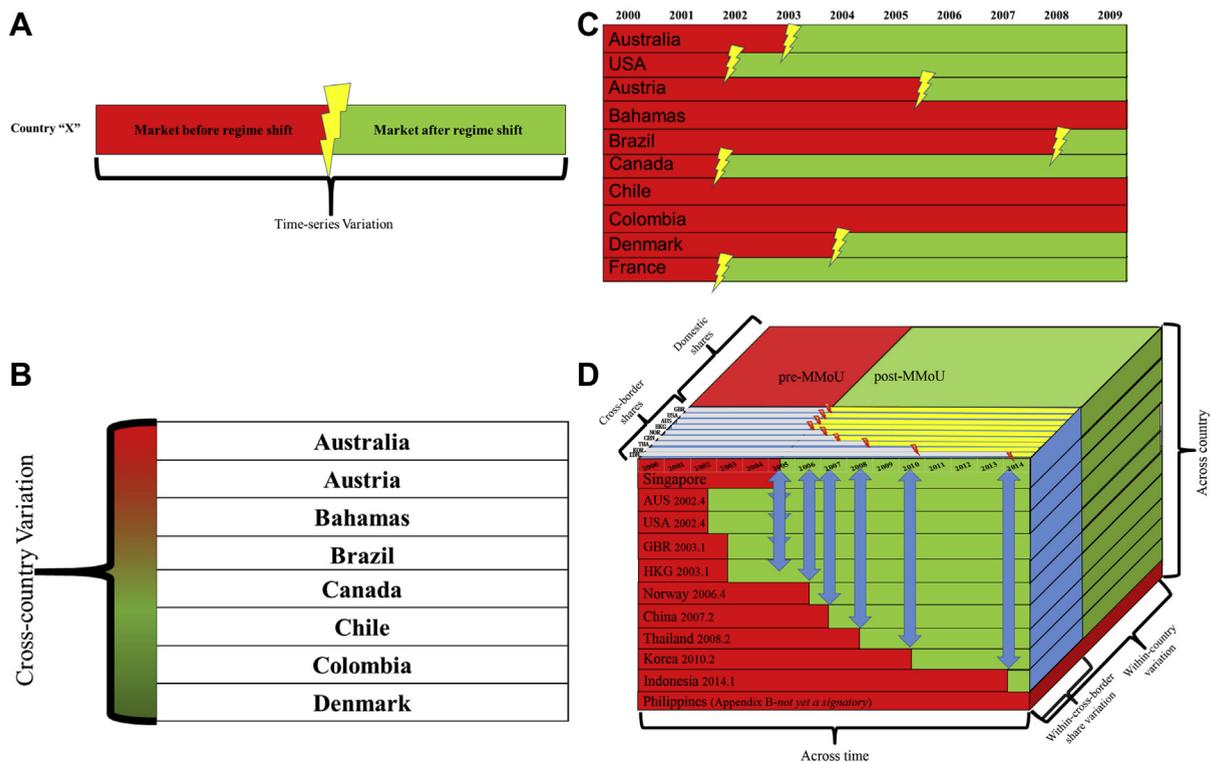
expected sign in [Table 4](#). Thirty-eight of the 173 firms do not have the data required to estimate model 1 and must be discarded from the multivariate analyses.

In [Table 4](#), test 1 indicates that enforcement is significantly more likely after a firm's home regulator applies to the MMoU; this is true even after controlling for factors that could influence SEC litigation rates. The coefficient on *MMoU\_FILE* of 1.03 ( $p < 0.01$ ) indicates that, after home regulators pledge to share information, the odds ratio is 2.79, meaning firms are 279% as likely to be the subject of SEC enforcement action (after controlling for other factors). This finding is consistent with the

**Table 3**  
Descriptive statistics.

	All			No MMoU			MMoU		
	N	Mean	Std	N	Mean	Std	N	Mean	Std
SEC_ACTION	14,554	0.01	0.11	8277	0.01	0.08	6277	0.02***	0.14
MMoU_FILE	14,554	0.43	0.50	8277	0.00	—	6277	1.00***	—
BILAT	14,554	0.71	0.45	8277	0.64	0.48	6277	0.81***	0.39
2nd_BILAT	14,554	0.10	0.30	8277	0.11	0.31	6277	0.09***	0.29
CLASS_ACTION	14,554	0.05	0.22	8277	0.03	0.17	6277	0.08***	0.27
HI_LIT	14,554	0.16	0.37	8277	0.16	0.37	6277	0.17**	0.37
SIZE	14,554	6.74	2.83	8277	6.58	2.64	6277	6.95***	3.05
PCT_CH_SALES	14,554	5.45	3.86	8277	5.98	4.10	6277	4.78***	3.48
RETURN	14,554	0.06	0.62	8277	0.05	0.63	6277	0.08***	0.62
SKEW	14,554	0.24	0.82	8277	0.26	0.83	6277	0.22***	0.81
RET_STD	14,554	0.14	0.09	8277	0.14	0.09	6277	0.14***	0.08
TURNOVER	14,554	0.01	0.28	8277	0.01	0.25	6277	0.01***	0.32

This table presents descriptive statistics for the sample that has the required information for prediction of SEC enforcement. All 14,554 firm-years are shown on the left; the 8277 firm-years unaffected by the MMoU are shown in the middle; and the 6277 firms are shown on the right. \*, \*\*, and \*\*\* denote significance of the difference in means between the MMoU and non-MMoU subsamples at the 10%, 5%, and 1% levels for a two-tailed difference in proportion, respectively.



**Fig. 1.** Research designs. This figure describes the types of research designs often used in studies of regulation, enforcement, and new laws or mandates. These figures are for illustrative purposes only. They do not necessarily reflect the exact dates of MMoU adoption, nor do they accurately depict the fraction of a given country that is cross-listed or the relevant origins of the cross-listed firms. **A:** Across time. Pre-vs. post-event comparisons of a shock to a given country at a point in time. **B:** Across countries. Comparisons of countries across a range on a given dimension (e.g., indices for governance, legal strength, or enforcement). **C:** Two-dimensional time-series/cross-sectional. Shocks are staggered across (occur at) different times in different countries but are common to all firms in a given country (see Section 3.2 Enforcement). **D:** Three-dimensional (my design). Shocks are staggered in three dimensions, creating variation across time, home country, host country, and within home and host shares. Singapore illustrates the design below, with host shares in blue, and the treatment (which occurs at different times) in yellow. Note that Table 5 presents this information about the timing of the shocks for the entire sample. (For interpretation of the references to color in this figure legend, the reader is referred to the Web version of this article.)

MMoU reducing cross-border regulatory frictions. In general, the control variables from Kim and Skinner (2012) are consistent with the expected sign (although size is the only consistently significant predictor).

Other specifications show that the inferences remain the same when controlling for country and time factors. Tests 2 and 3 use logistic regression and a linear probability model, respectively. Each includes country and year fixed effects. Both tests indicate a significant increase in the probability of SEC enforcement after the MMoU. Note that, when using these fixed effects,

**Table 4**  
Probability of cross-border enforcement.

Parameter		(1)		(2)		(3)
		Mainresult		Country & year FEs		Linear Probability Model (country & year FEs)
		Estimate	Odds Ratio	Estimate	Odds Ratio	Estimate
MMOU_FILE	+	1.03***	2.79	0.78***	2.18	0.84***
BILAT	+	-0.16	0.85			
2nd_BILAT	+	1.13***	3.09			
CLASS_ACTION	+	1.38***	3.96	1.37***	3.92	3.37***
HI_LIT	+	0.12	1.13	0.01	1.01	0.02
SIZE	+	0.17***	1.19	0.18***	1.20	0.13
PCT_CH_SALES	+	0.00	1.00	0.00**	1.00	0.00
RETURN	-	0.26	1.30	0.24	1.27	0.15
SKEW	-	-0.08	0.92	-0.02	0.98	-0.01
RET_STD	+	3.23***	25.24	3.23***	25.16	2.82**
TURNOVER	+	0.15	1.16	-1.44	0.24	-0.03
Intercept		-7.33***		-12.73***		-2.07
N		14,554	(135)	14,554	(135)	14,554
Country FEs		N		Y		Y
Year FEs		N		Y		Y
Pseudo-R <sup>2</sup> /R <sup>2</sup>		0.14		0.17		0.03
Area Under ROC Curve		80.3		80.9		*

This table presents the results from regressions with SEC enforcement as an indicator dependent variable (set equal to 1 for firm-years with SEC enforcement actions, 0 otherwise). Columns 1, 2, and 4 present logistic regressions. The third column presents a linear probability model (with coefficients multiplied by 100). The sample includes all foreign firms listed in U.S. markets (described in Table 1). Because most of the variables of interest are binary indicators, odds ratios are reported for the logistic regression. The control variables in the model come from Kim and Skinner (2012) and are defined in Appendix B. I also include indicators for the MMoU, bilateral arrangements, secondary bilateral arrangements, class action litigation in the previous five years, and key interactions of interest. Standard errors are double-clustered by country and year. Because several indicator variables are used, I apply penalized maximum likelihood to the logistic regressions to reduce coefficient bias due to quasi-complete separation (Firth, 1993; Heinze and Schemper, 2002). \*, \*\*, and \*\*\* denote significance at the 10%, 5%, and 1% levels for a two-tailed test, respectively.

I drop the bilateral arrangement indicators. I do this because very few countries engage in new bilateral arrangements with the SEC during the sample period.

### 3.2.2. Enforcement: robustness and identification tests

The internet appendix Tables I–IV presents a battery of additional tests (e.g., simulations and counterfactually shifting the true MMoU dates) that provide evidence consistent with the increase in enforcement corresponding to the precise times and places predicted by the MMoU. The results persist when I use constant samples, which rules out the effect of a changing sample composition.

In theory, countries that join the MMoU early could differ systematically from ones that join late. However, the timing of an applicant's MMoU admission often depends on fairly esoteric laws about capacities to gather and share information with other countries, and these laws do not appear to partition countries on market development.<sup>22</sup> I find that countries that join later in the sample period experience increases of similar magnitudes to those that join early. When I exclude firms whose home country joins the MMoU in 2002, 2002–2003, 2002–2004, and so on, the likelihood of enforcement is similar to the late-joining and early-joining countries. This helps rule out the possibility that the results are concentrated in certain countries in ways that could indicate more sophisticated endogeneity.

The inferences are also similar when potentially influential subsamples have been removed. For example, when I discard observations from two countries that account for the largest fractions of the sample—the United Kingdom and Canada—or from the other seven countries in the G8, the results barely change. Likewise, removal of observations from the banking, insurance, and real estate industries yields similar estimates.

The tests cannot achieve the same standard as a randomized experiment, but the attributes of the setting suggest that the MMoU's shock to cross-border oversight capabilities is plausibly exogenous.

## 4. The association between the MMoU and liquidity

### 4.1. Liquidity: sample

Next, I examine the potential for cross-border enforcement to affect the cost of liquidity provision. For the liquidity assessment, I expand the sample to all World Federation of Exchanges shares that Datastream identifies as equity and that have the information required to estimate model (2) (described below in Section 4.2) from the first quarter of 2000 to the

<sup>22</sup> In addition, there is some unpredictability to the verification-processing time. This could relate to the quality of the application, the workload of the verification team members (who have full-time jobs as regulators in their own markets), or idiosyncratic reasons.

second quarter of 2014. Market data on returns, market value, quoted bid-ask spreads, and volume come from Datastream.<sup>23</sup> To be included, a share must be listed on a regulated exchange, have an ISIN number (or an equivalent), and have a nonmissing value for total assets in the current year (to ensure that it produces accounting data).<sup>24</sup> I identify cross-listed shares via Datastream and use data from JP Morgan and the Bank of New York ADR websites as of January 13, 2016. The MMoU dates come from the IOSCO website.<sup>25</sup>

The staggered design relies on sufficient variation in the linkages between regulators, in terms of both time and country. Table 5 presents the MMoU date for each country (using three-digit abbreviations). Countries begin entering the MMoU in October 2002 and continue to join throughout the sample period.<sup>26</sup> The table is configured as a *matrix* that tabulates the number of unique host shares, reporting the home country ('j') across the top and the host country ('i') on the left, so that each cell represents an 'i-j' country pair.

To illustrate how robust the linkage variation is across country pairs and time, I organize the countries by the quarter in which they signed the MMoU on both the home and host dimensions (instead of alphabetical sorting). This setup conveys the variation in the timing of the shocks to cooperation in my sample. Each first-time shock for country pairs is coded with a different color, so connected colors experience the shock at the same time. The treatment varies substantially across time and country—enough to promote strong identification. Finally, the table indicates considerable separation in linkage dates, even *within* the same column (home country) or row (host country).

Table 6 provides separate descriptive statistics for the full sample as well as for the domestic, home, and host share subsamples. Home and host shares constitute 3.9% and 5.3% of the share-quarters in the sample, respectively. There are more host share observations (59,661) than home share observations (43,980) because i) cross-listed firms can have cross-listings at one or more exchanges, and ii) some firms are listed only in a foreign market (with zero home shares).

Following prior research, I measure liquidity using the quarterly averages of the daily bid-ask spread (Christensen et al., 2013, 2016).<sup>27</sup> The bid-ask spread is one dimension of liquidity that should be sensitive to the risks described in the previous section. Descriptive statistics reported in Table 6 comport with previous research. Spreads range from less than 1%–19% of the share price and are, on average, narrower for home shares (1%) than for host shares (2%) and domestic shares (3%). Home shares are roughly two times more liquid than host shares; this supports the intuition that, on average, adverse selection and informational risks are greater in host shares.

#### 4.2. Liquidity: empirical design

The next tests evaluate the association between the MMoU and liquidity. I use quoted bid-ask spreads as a proxy for transaction costs (an inverse proxy for liquidity). Bid-ask spreads—the difference between market makers' posted buy and sell quotations for a quantity of shares—compensate market makers for adverse selection (as well as order processing, inventory holding, and other costs) (Glosten and Milgrom, 1985). An important indicator of market quality, bid-ask spreads should narrow whenever investor-perceived risks decline (demonstrating enhanced liquidity). In the setting of the MMoU, such a decline would occur when regulatory enhancements improve a firm's information environment and reduce the risk of trading against informed investors. To test my expectation that the MMoU improves liquidity, I estimate a model based on prior literature, notably Christensen et al. (2013, 2016). Shown below, model (2) uses a quarterly time interval, which balances the need to discern the timing of the liquidity-MMoU association with the need to accurately measure liquidity.

$$\log(BAS) = \beta_0 + \beta_1 Home + \beta_2 Home * Link + \beta_3 Host + \beta_4 Host * Link + \sum_{k=1}^K \beta_k Controls + \sum_{l=1}^L \beta_l Fixed\ effects + \varepsilon. \quad (2)$$

The model allows for separate effects across the home and host shares, as outlined in Section 2.3.1. I expect home and host shares to be influenced by the linking of securities regulators. In the model, indicators for home and host shares capture their unconditional effects, relative to domestic shares (i.e., non-cross-border firms). (Depending on the model used, these indicators are sometimes subsumed by fixed effects, as described below.) The primary variables of interest capture the effects of linking regulators that cosupervise home and host shares, captured by  $\beta_2$  and  $\beta_4$ , respectively. The *Link* variable is set equal to 1 when both the home and host regulators are MMoU signatories, and is essentially a post-treatment indicator. The

<sup>23</sup> I supplement this dataset with CRSP data for US-listed shares.

<sup>24</sup> Because I intend to test for public oversight, I exclude "unlisted" shares, whether sponsored or unsponsored, since they do not have the same regulatory oversight or filing requirements. (These shares are generally trading in OTC markets, alternative/growth boards, traded-not-listed boards, or multilateral trading facilities.) Details about separating listed and unlisted shares, along with Datastream coverage issues, can be found in Appendix C.

<sup>25</sup> For the interested reader, Internet Appendix Table VI describes the 1,128,392 share-quarters by country (Panel A) and by year (Panel B). Panel A shows wide variation across countries, while Panel B shows wide variation across time, both for the fraction of the sample affected by the MMoU and for the links between regulators connected by the MMoU.

<sup>26</sup> There is no obvious clustering in the timing of the MMoU adoptions; nor is adoption obviously correlated with the liquidity-related events documented previously (e.g., changes in country-level enforcement, EU directives, or IFRS (Christensen et al., 2013, 2016)).

<sup>27</sup> Daily bid-ask spread is the difference between the daily closing ask and the bid divided by the midpoint. I discard daily spreads that are negative or greater than a third of the midpoint. To minimize the influence of extreme observations, all continuous variables are winsorized at the 1% tails. This captures the price concessions required to execute a trade within a short period (Bessembinder and Venkataraman, 2010) and is frequently used as a proxy for market quality.



**Table 6**  
Descriptive statistics.

	FULL SAMPLE							DOMESTIC (non-cross-border)						
	N = 1,128,392							N = 1,024,751						
	MEAN	STD	P1	Q1	MEDIAN	Q3	P99	MEAN	STD	P1	Q1	MEDIAN	Q3	P99
BAS	0.02	0.04	0.00	0.00	0.01	0.03	0.19	0.03	0.04	0.00	0.00	0.01	0.03	0.19
ln(BAS)	-4.45	1.25	-6.86	-5.4	-4.5	-3.52	-1.64	-4.42	1.25	-6.86	-5.4	-4.5	-3.52	-1.64
frac_vol	0.95	0.19	0.48	1	1	1	1	0.98	0.09	0.48	1	1	1	1
ln(Market value <sub>t-4</sub> )	5.13	2.15	0.45	3.5	4.87	6.24	9.81	4.91	1.99	0.45	3.5	4.87	6.24	9.8
ln(Turnover <sub>t-4</sub> )	3.85	2.16	-1.16	2.53	4.15	5.45	8.06	3.96	2.06	-1.15	2.53	4.15	5.45	8.06
ln(Return variance <sub>t-4</sub> )	-6.24	0.53	-6.87	-6.63	-6.39	-6	-4.33	-6.24	0.53	-6.87	-6.63	-6.39	-6	-4.33
	HOME							HOST						
	N = 43,980							N = 59,661						
	MEAN	STD	P1	Q1	MEDIAN	Q3	P99	MEAN	STD	P1	Q1	MEDIAN	Q3	P99
BAS	0.01	0.03	0.00	0.00	0.00	0.01	0.13	0.02	0.03	0.00	0.00	0.01	0.02	0.19
ln(BAS)	-5.01	1.13	-6.77	-5.86	-5.23	-4.3	-1.97	-4.58	1.25	-6.7	-5.61	-4.61	-3.68	-1.67
frac_vol	0.77	0.3	0.01	0.57	0.94	1	1	0.43	0.42	0.00	0.01	0.29	0.96	1
ln(Market value <sub>t-4</sub> )	7.53	2.33	1.93	5.84	7.77	9.42	10.76	7.07	2.46	1.38	5.23	7.11	9.13	10.76
ln(Turnover <sub>t-4</sub> )	4.46	1.67	-0.58	3.62	4.89	5.6	7.28	1.42	2.66	-3.21	-0.39	1.71	3.31	6.58
ln(Return variance <sub>t-4</sub> )	-6.35	0.46	-6.86	-6.67	-6.48	-6.17	-4.55	-6.27	0.5	-6.84	-6.63	-6.42	-6.06	-4.42
link	0.61	0.49	0.00	0.00	1	1	1	0.61	0.49	0.00	0.00	1	1	1

This table reports the descriptive statistics for the bid-ask spread and independent variables used in subsequent tests. The top left panel describes the entire sample. The top right panel describes domestic (noncross-border) shares. The bottom panels describe the two types of cross-border shares (home and host). Home shares are the primary listings that have shares cross-listed in other countries and are sometimes called primary or parent shares. Host shares—sometimes called cross-listed, foreign, dual, or secondary shares—are either subsidiary listings to a home share or listings outside of a firms' home market that trade on a host exchange. I report the raw and log-transformed values for *BAS* (the quarterly mean of the closing asking price minus the closing bid, divided by the midpoint). *ln(Market value<sub>t-4</sub>)*, *ln(Turnover<sub>t-4</sub>)*, and *ln(Return variance<sub>t-4</sub>)* are lagged and logged values for market value, turnover, and return variability, respectively. Continuous variables are winsorized at the 1% tails.

*uninteracted* indicator does not appear in the model, because, as described later, I include country-quarter fixed effects. (*Link* would be a linear combination of these fixed effects.) Therefore, the design represents a generalized (triple) difference-in-difference approach.

To elaborate, the  $\beta_2$  coefficient allows me to compare the difference between the bid-ask spread of home and domestic shares *before* the MMoU to the difference between the bid-ask spread of home and domestic shares *after* the MMoU. That is,  $\beta_2$  represents the *change* in the *difference* between the bid-ask spread of home and domestic shares that occurs with the MMoU linkage. A negative  $\beta_2$  coefficient indicates a narrowing of spreads, relative to what takes place for the benchmark domestic shares.  $\beta_4$  analogously represents the *change* in the *difference* between the bid-ask spread of host and domestic shares that occurs with the MMoU linkage. Thus both  $\beta_2$  and  $\beta_4$  compare cross-border shares to a benchmark (domestic shares) that should not be exposed to cross-border problems or their resolution via cooperation. Because domestic shares are the referent group for both home and host shares, I pool them in the same regression for parsimony. Although the design has more dimensions of variation than most empirical studies, the interpretation is that  $\beta_2$  and  $\beta_4$  represent the effect of the MMoU linkage for *home* and *host* shares, respectively, relative to domestic shares in the same market at the same time.<sup>28</sup>

The continuous control variables are size, turnover, and return variance from the same quarter in the previous year; all are known determinants of liquidity. The literature proposes that liquidity issues related to venue trading preferences are an important determinant of valuation benefits (King and Segal, 2004). To control for these issues, I also include the share's fraction of total firm trading volume that takes place in a given quarter.

The primary tests use country-quarter fixed effects to identify the effect of cooperation using within-country variation in treatment events.<sup>29</sup> This explicitly controls for time-invariant country-level factors. It also controls for time-variant changes in a particular market that would affect all shares' liquidity, which may be the biggest threat to the validity of my inferences. Thus, the fixed effects should remove the liquidity effects of changes in monetary policies, economic cycles, IFRS, central counterparty clearing, laws, computerized surveillance, exchange rules, systems of spread measurement, etc., as well as any

<sup>28</sup> *Link* cannot be included by itself in the model because it will always be 0 for purely domestic shares. (Domestic shares do not have a second regulator and therefore cannot have linkages.) I do not use "effect coding" that compares home to domestic shares and host to home shares, because this would complicate the interpretation unnecessarily.

<sup>29</sup> Alternative fixed-effect structures offer different advantages: country and quarter fixed effects control for time-invariant characteristics at the country level as well as secular changes in liquidity, have low dimensionality, are consistent with many other cross-country studies, and allow for estimations of the broad effect of the MMoU on all shares (not just the effect of linkages on home/host shares). Country-quarter, plus home-country-quarter and host-country-quarter, control for time trends for home and host shares within each individual market (rather than assuming that time trends are common to all home and all host shares), at a point in time. Share and quarter fixed effects control for time-invariant determinants of liquidity at the share level and changing sample composition over time as well as for secular changes in liquidity. These and other specifications yield the similar inferences as the primary tests. For completeness, I present alternative fixed effect options in Internet Appendix Table VII.

market-wide regulatory improvements that are required by the MMoU. I include additional fixed effects for the treatment shares (home-quarter, home-country, host-quarter, and host-country fixed effects) to control for temporal and cross-sectional variation in the liquidity of home and host shares, respectively. I estimate standard errors clustered at the country level. Because there are only 58 clusters, this choice is more conservative than outcomes from other justifiable estimation techniques.

The treatment events are scattered across time and country, similar to the work of Christensen et al. (2013, 2016). This scattering reduces the likelihood of one or more concurrent events driving the results (a concern in many studies of regulatory, legal, or enforcement changes). Distinct features of the MMoU setting offer additional strength to the identification strategy. Foremost is that the treatment falls only on cross-border shares instead of on all shares in a country. This within-country variation adds a layer of complexity that reduces the likelihood of endogenous factors driving the results.

In Fig. 1, I illustrate my design and contrast it with others in the literature. My design exploits variation across time, across countries, and within country. The treatment employs all three sources of variation, so the shock is staggered in three dimensions (as opposed to being common to all firms in all countries at the same time or all firms in a given country at the same time). In addition, benchmark (domestic) shares—an enrichment of the within-country variation—help rule out the effects of possibly endogenous factors. These factors include observed and unobserved countrywide events that have been shown to affect liquidity (e.g., MiFID (Cumming et al., 2011), changes in enforcement (Christensen et al., 2013), International Financial Reporting Standards (IFRS) application (Daske et al., 2008), and European Union directives related to market abuse and transparency (Christensen et al., 2016; Meier, 2017)). None of these factors appear to be collinear with the MMoU, and all affect entire countries instead of only cross-listed firms. Therefore country-quarter fixed effects should control for these and other similar events.

### 4.3. Liquidity: results

#### 4.3.1. Liquidity: main tests

Table 7 presents the results of estimating the log-linear model from Section 4.2. I begin with a subsample that includes only the treatment (home and host) shares. This ensures that any improvement measured in the full sample results from

**Table 7**  
Liquidity effects of MMoU linkages.

Description:	(1) Treatment sample only	(2) Main test (country-quarter plus additional FEs)
Sample:	Home and Host Shares	Full sample
Home	(Absorbed)	(Absorbed)
Home*link	-0.069* (-1.84)	-0.062* (-1.80)
Host	(Absorbed)	(Absorbed)
Host*link	-0.292*** (-3.80)	-0.433*** (-2.99)
Fraction of volume	-0.499 (-5.89)	-0.360** (-2.65)
ln(Market Value <sub>t-4</sub> )	-0.230*** (-17.10)	-0.294*** (-20.33)
ln(Turnover <sub>t-4</sub> )	-0.190*** (-11.38)	-0.194*** (-8.06)
ln(Return variance <sub>t-4</sub> )	0.449*** (6.69)	0.298*** (8.82)
Observations	103,641	1,128,392
Industry FE	Yes	Yes
Home-quarter FE	Yes	Yes
Host-quarter FE	Yes	Yes
Home-country FE	Yes	Yes
Host-country FE	Yes	Yes
Country-Quarter FE	No	Yes
R <sup>2</sup>	0.746	0.746

This table reports the estimates of Model (2) on page 22. The dependent variable (bid-ask spread) is log transformed. *Home* is an indicator for shares that have affiliated shares cross-listed in other countries. *Host* is an indicator for host-listed shares. *MMoU* is an indicator for shares that are listed on an exchange whose regulatory agency has signed the MMoU. *Link* is an indicator variable equal to 1 when both the home and host regulators for a given cross-border share have adopted the MMoU. Several variables are subsumed as linear transformations of the control variables. Controls for size (year-lagged market value in US dollars), trading volumes (year-lagged turnover in US dollars), and (year-lagged) return variability are included as predictors of liquidity. Fixed effects that serve as controls are unreported. \*, \*\*, and \*\*\* denote significance at the 10%, 5%, and 1% level for two-tailed tests, respectively, using standard errors that are clustered at the country level.

changes in the treatment shares and not a deterioration in benchmark domestic shares' liquidity (which could be mistakenly interpreted as an improvement on a relative basis). Column (1) estimates the effect of the MMoU linkage using industry, home-quarter, home-country, host-quarter, and host-country fixed effects to control for cross-sectional and temporal variation in bid-ask spreads that are common to certain industries, as well as countries or periods (for all shares and within the groups of home and host shares, respectively). The MMoU's effect on home and host shares is estimated by the *Home\*link* and *Host\*link* coefficients, respectively. *Home\*link* is  $-0.069^*$  and *Host\*link* is  $-0.292^{***}$ , indicating that bid-ask spreads narrow when home and host regulators are linked. These changes represent improvements of about 6% for home shares and about 25% for host shares.<sup>30</sup> This provides preliminary support for the idea that the MMoU facilitates improvement in liquidity and that the largest improvements occur in host shares.

Because the treatment is staggered even within countries, the setting allows me to use domestic observations in the same market as a counterfactual (benchmark) and include *country-quarter* fixed effects to control for country-wide effects in liquidity. Column 2 shows that the estimates, when using this specification, are comparable to previous tests: they show 9% and 35% improvements for home and host shares, respectively. Note that the Internet [Appendix Table VII](#) deploys other fixed effect structures (described in footnote 28), each with different assumptions that rule out certain threats. The results from those tests are largely consistent with the inferences above, with fairly similar estimated magnitudes.

These results provide support for the idea that MMoU-enabled cross-border cooperation improves liquidity of cross-border shares. Home shares experience liquidity improvements of about 6–9%. Host shares experience larger and statistically stronger improvements, ranging from 25% to 35%. Note that the improvements to home and host shares are over and above the MMoU-related improvements for all shares in a market.<sup>31</sup> These results support the notion that because shares trading in a foreign venue are most exposed to information and regulatory problems, the MMoU most affects host shares.

To put these estimates in context, the effect for host shares is about twice as large as the effects for other capital market events on domestic shares reported by [Daske et al. \(2008\)](#), [Cumming et al. \(2011\)](#), and [Christensen et al. \(2013, 2016\)](#). This seems reasonable, given that host shares (i) start with wider spreads, (ii) are more likely to be exposed to expropriation risk, and (iii) are most deprived of regulatory oversight. The enhanced liquidity associated with MMoU links is consistent with investors perceiving value in public oversight (a key view of the bonding hypothesis). It cannot be explained by alternative causes such as market segmentation, competition in liquidity provision, or other firm changes that accompany a secondary listing, because the treatment is uncorrelated with these factors.

Finally, the control variables using firm-level characteristics (market value) and share-level characteristics (turnover and return variance) are comparable to prior research in sign, magnitude, and significance. A 1% increase in market value, turnover, and return variance is associated with changes of  $-0.29\%$ ,  $-0.18\%$ , and  $0.30\%$ , respectively, in bid-ask spreads. And, not surprisingly, the fraction of total trading in a given firm that occurs in the share's market is associated with liquidity—a 1% increase in the fraction of trading decreases spreads by about 0.39%.

In sum, [Table 7](#) shows that the MMoU linkages increase the liquidity of cross-border shares, with host shares improving the most. Although the magnitude of the effect varies slightly based on the fixed-effect structure, the implications of the results remain consistent. The effects are large and economically important but not implausibly so.

#### 4.3.2. Liquidity: other tests

This section evaluates the parallel trend assumption and timing of the effect. To determine whether the parallel trend assumption is reasonable and to assess whether the improvements occur at the expected times, I plot bid-ask spreads in event time relative to the link dates. When assessing the timing, it is important to understand that the median time from a country's MMoU application to its MMoU signing is about 14 months, and that, during this time, countries sometimes pass new MMoU-related laws. When countries initiate joining the MMoU, market participants may observe changes in cooperative capacity and start to change their behavior and expectations in ways that affect spreads, leading to liquidity effects that predate the MMoU linkages. Following the linkage, market makers may further adjust bid-ask spreads if they observe changes in cross-border enforcement and update their expectations accordingly. This could generate effects that endure after the signing of the MMoU. Accounting for both of these timing issues, I expect the changes in bid-ask spreads to be *proximate* to the linkage dates and not sharp structural breaks centered at time zero.

To assess the parallel trends assumption, I plot the geometric mean of bid-ask spreads in event time for home and host shares.<sup>32</sup> I also plot various control groups (country, industry, and world spreads) to determine whether the treatment shares

<sup>30</sup> Transforming the coefficient to an economic interpretation requires the expression  $\hat{g} = \exp(\hat{\theta}) - 1$ , where  $\hat{\theta}$  is the coefficient estimate from the tables. The interpretation is that a one-unit change in the independent variable is associated with a  $\hat{g}$  percent change in the dependent variable ([Halvorsen and Palmquist, 1980](#); [Kennedy, 1981](#); [van Garderen and Shah, 2002](#)). When the independent variable is also in log form, the interpretation is that a 1% change in the independent variable is associated with a “ $\hat{g}\%$ ” change in the dependent variable. For interacted indicator terms, one can first add up the coefficients and then transform the sum of the coefficients to obtain estimates that are conditional on multiple indicators.

<sup>31</sup> Tests that do not use country-quarter fixed effects (reported in [appendix Table VII](#)) allow for an estimate of the MMoU on all shares in a market. They indicate a 7%–13% improvement, consistent with a market-wide effect described in 2.3.1, although they are not as well identified, given that omitted country-level factors may contribute to this result.

<sup>32</sup> Geometric means have several favorable properties for this setting, including the fact that the value represents the exponentiated arithmetic mean of the logged values—analogue to the transformations in the empirical tests. Also, geometric means strike a balance between being entirely unaffected by the information in extreme observations (as medians are) and overly influenced by them (as arithmetic means are).

exhibit parallel patterns in liquidity as domestic shares outside the event periods. The results in Table 7 indicate that these control groups, particularly the country group, may be partially treated by the MMoU. That is, the MMoU's standard-setting effect may create a bias *against* finding a result.

Fig. 2 presents *home* shares in Panels A and B and *host* shares in Panel C. Panel A shows that *home* shares have much lower bid-ask spreads than benchmark shares throughout the event-time period. Panel A's common y-axis compresses the variation in *home* shares, and the scales differ so much between groups that it is difficult to fairly evaluate the bid-ask spread behavior. Panel B reproduces the graph using a version with separate axes. It indicates a pattern of liquidity that, by and large, supports the parallel trend assumption. In terms of timing, bid-ask spreads for *home* shares begin to narrow three quarters before the MMoU linkage. This also appears to be the same point at which liquidity of the *host* shares diverges in Panel C (described below). The graphs should be interpreted with caution, however, because they do not account for other known predictors of liquidity or properly weight the observations.

The results for *host* shares, reported in Panel C, dovetail with the results in Table 7, showing that (i) the effect occurs proximate to the linkage and (ii) the parallel trend assumption seems reasonable. Spreads drop from roughly 115 basis points (1.15% of asset values) before the link to roughly 80 basis points (0.80% of asset values) afterward. Both before and after, *host* shares appear to support the parallel trend assumption, moving in tandem with all of the control groups. The effect appears to be proximate to the MMoU linkage, indicating a drop in bid-ask spreads that is concentrated in the three quarters before and after the event. That is, the departure from the other groups appears to begin about three quarters prior to the MMoU linkage and continue for another three quarters afterward. Outside of the treatment period, the liquidity pattern in the benchmark shares seems to match the pattern for treatment shares. Thus, the benchmarks seem to be a useful counterfactual, showing what might happen in the absence of the treatment (the MMoU linkage). Therefore country-quarter fixed effects appear to be a suitable way to control for unobserved heterogeneity in liquidity.

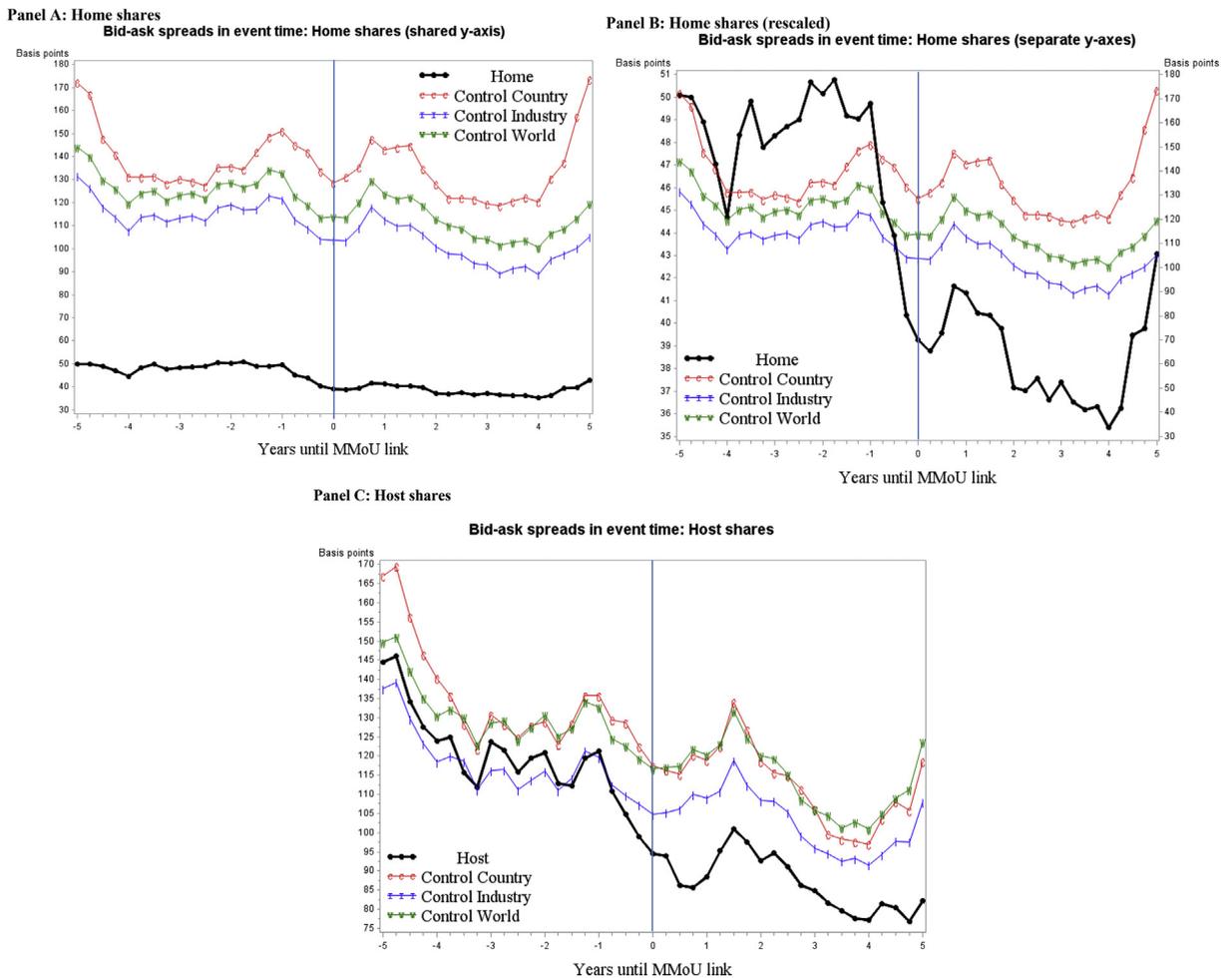


Fig. 2. Liquidity in event time. This figure presents the average bid-ask spread in event time (by quarter) for the treatment group (home or host, respectively) and three other groups (shares from the same country, same industry, or the entire world). Time '0' is the first quarter in which the MMoU links the home regulator to the host regulator.

**Table 8**

Cross-sectional tests of the MMoU's effect on liquidity.

LAW-Strength				
(1) Common Law				
		Home		
		No	Yes	0.23
Host	No	-0.12	-0.32**	-0.20**
	Yes	-0.56***	-0.32**	0.24
		-0.44*	0.01	-0.19
(2) Disclosure Strength				
		Home		
		Low	High	0.60*
Host	Low	-0.21*	0.16	0.37
	High	-0.44***	-0.30	0.14
		-0.23**	-0.46	-0.09
LAW-Attributes				
(3) Non-EU Blocking Statute				
		Home		
		No	Yes	-0.66***
Host	No	-0.44***	-0.53***	-0.09
	Yes	0.13	-0.01	-0.14
		0.57**	0.520***	0.43***
(4) EU Blocking Statute				
		Home		
		No	Yes	-0.48**
Host	No	-0.44***	-0.83***	-0.40***
	Yes	-0.35**	-0.25*	0.10
		0.08	0.58***	0.18

This table constructs four  $2 \times 2$  tables to understand the circumstances where the MMoU yields the largest (smallest) effects—one  $2 \times 2$  for each of the four partitioning variables. The sample is the same as in Table 7, and all the control variables and fixed effects from Table 7 are included (but unreported for brevity). The numerical values represent the untransformed sums of the appropriate coefficients from regressions that include the control variables and fixed effects. The statistical significance of the pre- and post-MMoU differences for each cell and pairwise contrasts between cell differences (denoted in italics) are indicated using \*, \*\*, and \*\*\*, which denote significance at the 10%, 5%, and 1% levels for two-tailed tests, respectively, using standard errors clustered at the country level. No adjustments are applied for multiple comparisons.

In sum, these additional tests provide evidence that the liquidity effect occurs proximate to the treatment date.<sup>33</sup> They reveal no signs that omitted variables, time trends, or other violations of parallel trend assumptions distort my inferences.

#### 4.3.3. Liquidity: country-level factors that condition the effectiveness of the MMoU

How much a linkage increases cross-border oversight and, in turn, liquidity may partly depend on country-level factors. As described in Section 2, I expect regulatory strength, legal paradigms, and impediments to cooperation to condition the amount of cross-border oversight—and the magnitude of the liquidity effect of the MMoU. Because the results are strongest and the theoretical arguments are clearest for host shares, the cross-sectional tests focus on these shares. I include a full set of interactions between the *link* variable and the various country-level variables. Because the scale of the variables is different, interactions of continuous measures can be difficult to interpret jointly. To simplify, continuous variables are first transformed into dichotomous variables that denote high (1) or low (0) on the various dimensions using a median split.

The MMoU's effect can then be observed in four different conditions, depending on home and host country attributes, both of which can take on yes/no (or high/low) values. The sum of the appropriate coefficient estimates is used to create a  $2 \times 2$  table that reports the MMoU's liquidity effect in each of the four conditions. Table 8 reports the effect of the MMoU on host shares in each condition and provides statistical tests of the pre-versus post-MMoU differences as well as between-cell contrasts. This table identifies the conditions (cells) in which the MMoU provides the most (or least) benefit to cross-border shares. Note that this is a multivariate test that controls for the other factors in previous regressions (although those estimates are not reported in Table 8).

The first tests assess the strength of a country's legal systems, first using legal origins and then using disclosure quality measures. With respect to securities regulation, common law origins are often considered stronger than code law legal systems (LaPorta et al., 2008).<sup>34</sup> Legal origins split home and host countries into common law and code law origins, making up the four conditions. Several patterns are worth noting. First, host regulators with common law origins achieve greater improvements in liquidity, which is consistent with public regulation driving the results. The largest liquidity improvement, -0.56 (or about a 43% reduction), occurs when home markets are code law and host markets are common law—a result consistent with the bonding hypothesis. Furthermore, the tests shown in the top right and bottom left cells are consistent with the MMoU facilitating cooperation between countries with different legal customs. The only situation in which liquidity is unaltered is when both the home and host markets are code law. Unreported tests indicate that shares hosted by the US and UK contribute considerably to the common law results (as one might expect). Yet, the effects persist even after discarding US/UK-related observations. Thus, cross-border cooperation appears to be a truly global phenomenon (rather than confined exclusively to the US/UK).

A second measure of regulatory strength involves the disclosure requirements index (LaPorta et al., 2006). Like the previous tests, this measure yields the strongest result when the home market is weak—regarding disclosure, in this case—and the host market is strong. In contrast, when shares of firms from strong disclosure countries are listed in weak disclosure countries, the shares experience no significant changes in liquidity (although this could be an issue of low statistical power, particularly in the case of high home disclosure paired with high host disclosure strength). This makes sense, because firms from strong home markets are less likely to receive incremental oversight from a weak host regulator. These results add to

<sup>33</sup> Appendix Table VIII and its discussion explore the concept that bilateral arrangements also relate to transaction costs. Although there is some evidence that bilateral arrangements also condition the cost of liquidity provision, the inclusion of bilateral arrangements does not subsume the effect of the MMoU.

<sup>34</sup> The results are similar using the anti-self-dealing index (LaPorta et al., 2006), rule of law index (LaPorta et al., 1998), case law as a source of law (David, 1973; LaPorta et al., 2004), and the World Bank's measure of the rule of law.

**Table 9**  
Impact of economic motivations.

	[VAR] = Economies of scale	[VAR] = Reciprocity
	(1)	(2)
Home	(Absorbed)	(Absorbed)
Home*link	-0.000 (-0.00)	0.015 (0.35)
Home*[VAR]	-0.000 (-0.06)	0.003 (0.77)
Home*link*[VAR]	-0.008 (-0.88)	-0.013*** (-2.80)
Host	(Absorbed)	(Absorbed)
Host*link	0.494 (1.10)	-0.362** (-2.64)
Host*[VAR]	-0.109*** (-2.71)	-0.025 (-1.47)
Host*link*[VAR]	-0.089** (-2.38)	-0.014 (-0.99)
Fraction of volume	-0.343** (-2.54)	-0.361** (-2.60)
ln(Market Value <sub>t-4</sub> )	-0.294*** (-19.85)	-0.295*** (-19.98)
ln(Turnover <sub>t-4</sub> )	-0.193*** (-7.75)	-0.193*** (-7.86)
ln(Return variance <sub>t-4</sub> )	0.296*** (8.87)	0.297*** (8.83)
N	1,129,721	1,129,721
Fixed effects	I, C–Y–Q	I, C–Y–Q
R <sup>2</sup>	0.732	0.731
R <sup>2</sup> -within	0.530	0.527

This table reports the estimates from tests that build on Model (2), including the controls described in Section 4.3.4. The dependent variables are in log form. *Economies of scale* is the log of host country portfolio ownership of home country stocks at year  $t-1$ . *Reciprocity* is the log of home country portfolio ownership of host country stocks at year  $t-1$ . Fixed effects are unreported. \*, \*\*, and \*\*\* denote significance at the 10%, 5%, and 1% levels for two-tailed tests, respectively, using standard errors that are clustered at the country level.

research showing that institutional features from firms' home markets continue to condition liquidity, even when those firms are cross listed within the same host country (Eleswarapu and Venkataraman, 2006).

The third and fourth tests involve a direct impediment to cooperation: blocking statutes.<sup>35</sup> The results indicate that blocking statutes strongly condition the liquidity effects of the MMoU. Improvements are largest where historically the most formidable obstacles to cooperation existed. Sections (3) and (4), show that the largest increases in host share liquidity occur when home regulators have blocking statutes and host regulators do not. The  $-0.53$  estimate translates into a 41% reduction in spreads. When neither the home nor the host country has blocking statutes, liquidity increases by a smaller magnitude—about 35%. And when the *host* country has blocking statutes, the effect of the MMoU on liquidity is insignificant. This makes sense if countries with blocking statutes defer the pursuit of cross-border cases (even when the MMoU enables it), out of respect for privacy and sovereignty.

Overall, the tests show empirical support for the theoretical arguments presented in Section 2.3.4 and are consistent with cross-border cooperation being the mechanism driving the effect. Even so, these results come with the caveat that the identification of an attribute such as legal strength is imperfect and subject to substantial collinearity with other country-level measures (Isidro et al., 2016).

#### 4.3.4. Liquidity: economic motivations

Economic incentives may also help determine the effectiveness of cross-border cooperation. I test for two such incentives: economies of scale and reciprocity. As a measure of economic incentives, I use annual portfolio ownership data from the IMF's Coordinated Portfolio Investment Survey (CPIS), which measures portfolio investment "involving debt or equity securities" (IMF, 2009, p110).

My economies of scale prediction is that, when the host country investors have more frequent transactions in home country stocks, the host country regulator will be more likely to work to understand the nuances of home country laws, since the (fixed) cost of this can be spread across more interactions. This exposure to a given market occurs when the host country's

<sup>35</sup> I classify the existence of blocking statutes using information from the Hague Evidence Convention and from various articles in the legal literature. This variable is tabulated in Internet Appendix Table VI.

ownership of the home country's securities is high. Therefore economies of scale is the log of host country portfolio ownership of home country stocks at year  $t-1$ .

In Table 9, the interaction of the *Economies of scale* variable with the *Home (Home\*link)* indicator captures the cross-sectional variation in liquidity before (after) the MMoU linkages. The same structure is used to separately measure cross-sectional variation in the host shares. The coefficients on *Home\*link\*economies of scale* is small and insignificant. The *Host\*link\*economies of scale* estimate is significantly negative, indicating that a 1% increase in the amount of host country ownership of home market shares yields an incremental  $-0.089\%$  reduction in spreads. This is consistent with economies of scale shaping the effectiveness of the MMoU.

Reciprocity may also come into play. When an authority deliberates whether to provide regulatory assistance to a requesting authority, reciprocity is often an explicit consideration. My prediction is that, when the home country has a high ownership of a host country's market, the host country can use this as leverage when it requests assistance from the home market regulator, based on reciprocity. Reciprocity is the log of home country portfolio ownership of host country stocks at year  $t-1$ . The effects are similar in magnitude for home shares ( $-0.013$ ) and host shares ( $-0.014$ ), but only the home shares reach conventional significance levels. Given measurement error, extensive fixed effects, and the interactions, failure to reach statistical significance is unsurprising. The results are broadly consistent with reciprocity helping determine the effectiveness of the arrangement.

## 5. Conclusion

This paper evaluates cross-border cooperation between regulators under IOSCO's MMoU. It examines the effects of this cooperation on enforcement capacity, then assesses how the observed changes in enforcement capacity affect the cost of liquidity provision. In doing so, the paper extends literature streams in economics, law, finance, accounting, and international relations.

It makes four major contributions. First, it illuminates an important but poorly understood topic: cross-border enforcement of securities laws. It shows that enforcement is significantly more likely for firms whose home and host regulators share information via the MMoU. This finding suggests that, by reducing cross-border regulatory frictions, interagency coordination and information flows can enhance enforcement. Second, it shows that cooperation enabled by the MMoU reduces the cost of liquidity provision. Cross-sectional tests reinforce the idea that the effects arise, at least in part, from remediation of cross-border regulatory frictions. Third, the use of the MMoU as a proxy for cross-border regulatory capacities seems sensible, and the research design reduces the likelihood of reverse causality or omitted variables affecting the results. This setting can therefore serve as a model for future studies that seek a better identification of the enforcement construct. Fourth, this paper shows that soft law has important consequences and helps identify factors that may determine its effectiveness.

These results are timely, given the rapid expansion in cross-border investment and the global interconnectedness of capital markets. They have implications for firms, markets, regulators, and investors and offer novel insights about how legal systems interact. An important caveat is that my study is not intended to capture the costs associated with the MMoU, which could be incurred by regulators, firms, broker-dealers, market makers, or certain investor classes. Nor does it consider social costs that could result when regulators have greater access to information and can more easily execute enforcement tactics. Such costs could include diminished financial privacy for individuals or an erosion of national sovereignty.

## Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.jacceco.2020.101301>.

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