# Regulatory cooperation among securities regulators and managerial learning from stock prices

**Xiaoqi Chen**
Xiamen University
chenxiaoqi007@xmu.edu.cn

**Fangfang Hou**
Xiamen University
fangfang.hou@xmu.edu.cn

**Jeffrey Ng**
The University of Hong Kong
jeffngty@hku.hk

**Janus Jian Zhang**
Hong Kong Baptist University
januszhang@hkbu.edu.hk

**Abstract**

The Multilateral Memorandum of Understanding Concerning Consultation and Cooperation and the Exchange of Information (MMoU) enhances cross-border cooperation between securities regulators to facilitate the enforcement of securities laws. We use the MMoU's staggered adoption by countries to study the effect of enhanced regulatory cooperation on managerial learning from stock prices. We find that such learning increases after the firm's home country enters into the MMoU. This finding is consistent with the view that enhanced regulatory cooperation can help improve stock price informativeness, which in turn has the real effect of enhancing managerial learning from stock prices. We also find that the MMoU's positive effect on investment-q sensitivity is stronger for firms in countries where its adoption has fostered regulatory cooperation more effectively and for firms with higher business uncertainty. The study offers the novel insight that cross-border cooperation between securities regulators has positive externalities for corporate investments.

**Keywords**: securities regulation; regulatory cooperation; managerial learning from stock prices; investment-q sensitivity
**JEL Codes**: G14, G38, O30

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## 1. Introduction

In a perfectly efficient market with no financial market friction, firms would optimally choose investments that maximize shareholder value. However, market frictions often distort the efficiency of firm investments. For example, outside investors may possess information unknown to the decision makers. Recent studies suggest that managers can learn from the secondary market because the secondary market gathers information from active trading by many investors, especially informed investors, and the information contained in stock prices can guide managers' investment behavior due to revelatory price efficiency (Bond, Edmans, and Goldstein, 2012; Edmans, Jayaraman, and Schneemeier, 2017).[1] Many non-U.S. firms are listed on stock markets with limited active trading. If such firms are cross-listed on the U.S. stock market, which attracts significant domestic and global trading activities, the potential for revelatory price discovery and managerial learning from stock prices could be significant. Foucault and Frésard (2012) find that cross-listed firms in the United States have a higher investment-to-price sensitivity than do firms that never cross-list and infer from this finding that a cross-listing enhances managers' reliance on stock prices because it makes stock prices more informative to them. However, cross-border regulatory deficiencies may disincentivize investors in the U.S. from trading cross-listed stocks, thereby limiting price discovery (Stulz, 1999). Regulatory cooperation among securities regulators can help combat regulatory deficiencies. Therefore, focusing on non-U.S. firms cross-listed in the U.S., we study the effect of cross-border regulatory cooperation on managerial learning from stock prices.

After 2001, the introduction of the Multilateral Memorandum of Understanding (MMoU) has significantly expanded U.S. regulators' extraterritorial enforcement and cross-border

[1] The term revelatory price efficiency refers to the extent to which prices reveal the information necessary for real efficiency (in the sense that market provides information to guide real investment decisions), as comparison to the traditional forecasting price efficiency – forecasting firm value (Bond et al., 2012).

cooperation between securities regulators. The International Organization of Securities Commission's (IOSCO) developed the MMoU as part of its efforts to enhance cross-border information-sharing and regulatory cooperation following the terrorist attack on September 11, 2001. Early research suggests that the MMoU has improved cross-border information-sharing and regulatory cooperation. Studies using U.S.-listed foreign firms offer initial empirical evidence that SEC enforcement is significantly more likely after a firm's home regulator applies to the MMoU (Silvers, 2016, 2020).

However, the benefits of the MMoU are not limited to improved cross-border cooperation, with an emerging stream of research into their capital market benefits. Studying the effect of cross-border regulatory cooperation in the enforcement of securities laws on global mutual fund portfolio allocations, Lang et al. (2020) find that in signatory MMoU countries, foreign investment in U.S.-cross-listed firms increases significantly relative to non-cross-listed firms. Silvers (2020) find that SEC oversight increases institutional investor demand for U.S.-cross-listed stocks after the investee country enters an arrangement that facilitates enforcement cooperation with the Securities and Exchange Commission (SEC). Silvers (2021b) tests for changes in U.S.-listed foreign firms' disclosure quality when their home-country market regulators signed the MMoU and finds MMoU-driven improvements across various measures of accounting properties and transparency. To our knowledge, the literature on MMoU has not examined the real effects of MMoU such as corporate investments.

We extend the literature by examining whether and how the MMoU affects the investment decisions of U.S. listed foreign firms from the perspective of managerial learning from stock prices. We posit that the MMoU's impact on revelatory price efficiency and thus managerial learning from stock prices is ex ante unclear. On the one hand, enhanced regulatory cooperation due to MMoU can mitigate investors' concerns about adverse selection, information problems, and regulatory deficiencies, and thus enhance stock liquidity (Silvers, 2020). Improved stock liquidity incentivizes investors to invest more effort in private information acquisition, so as to trade on the information. Such trading makes prices become more informative, yielding more managerial learning from stock prices. On the other hand, prior studies document that regulatory cooperation enhances firm disclosures (Silver, 2021b; Tsang et al., 2023). To the extent that enhanced firm disclosures crowd out private information acquisition, the crowding-out of private information acquisition can reduce revelatory price efficiency (Gao and Liang, 2013). Therefore, whether cross-border regulatory cooperation increases managerial learning from stock prices remains an empirical question. We detail the arguments linking the MMoU to managerial learning from stock prices in Section 2.

We exploit the staggered adoption of the MMOU as a shock to cross-border regulatory cooperation to examine whether and how enhanced cross-border regulatory cooperation affects U.S-cross-listed foreign firms' managerial learning from stock prices. In exploring companies' investment behaviour in response to cross-border regulatory changes, we aimed to find out whether regulatory cooperation has real economic benefits in terms of micro-level capital allocations. The MMoU's staggered adoption by countries offers an ideal setting for identifying the effect of cross-border regulatory cooperation. Since 2002, when the U.S. became one of the first countries to sign the MMoU, more than 100 security regulators have joined the arrangement. The staggered signing dates allow us to better distinguish the MMoU's impact from that of other potentially confounding events that could change firms' investment behavior. Furthermore, because the MMoU targets U.S.-cross-listed firms, leaving U.S.-based firms and firms listed only in their home markets unaffected, we can isolate the memorandum's impact on corporate investment from other enforcement shocks in the U.S. or domestic markets.

Using a sample of U.S.-cross-listed foreign firms from 1997 to 2019, we implement a staggered difference-in-differences (DID) design. We find that managerial learning from prices, captured using investment-$q$ sensitivity, increases in response to their home country's MMoU adoption.[2] This finding supports our argument that enhanced regulatory cooperation can improve managerial learning from stock prices. We conducted a series of tests to verify this main finding. First, we performed a parallel trend test to validate the basic assumption that allows a DID model to make causal inferences, and find no pre-existing trends; the treatment firms' investment-q sensitivity begins to improve only in the post-adoption period. Second, our main finding is robust to alternative model specifications and samples. Recent econometric theory suggests that staggered treatment timing may result in the "bad comparisons" problem and that treatment effect heterogeneity can bias the staggered DID estimator (e.g., Callaway and Sant'Anna, 2021; Goodman-Bacon, 2021). Following the recommendations of Baker et al. (2022), we implement a stacked DID design and find qualitatively the same results, suggesting that our finding from the staggered DID design is unlikely to be biased.

Next, we conducted several cross-sectional analyses to shed light on the channels through which the MMoU can affect firms' managerial learning from stock prices. First, we examined the moderating effects of cross-border cooperation. We develop our main hypothesis based on the premise that MMoU adoption enhances cross-border regulatory cooperation. Although we argue that the MMoU has widespread power to ensure signatory members' cooperation and information sharing, signatory countries may differ in the strength of their enforcement or oversight ability, due to variations in resources, knowledge, and political power (McLean, Zhang, and Zhao, 2012). Given that the MMoU's effect on firms' managerial learning from stock prices results from enhanced cross-border regulatory cooperation, we expect a stronger effect for firms in signatory countries, where the MMoU can foster cross-border cooperation more effectively. Consistent with our prediction, we find a stronger effect in countries where

[2] As we discuss in detail in the section on empirical design, focusing on U.S.-cross-listed firms enables us to use these firms' stock prices in the U.S. to compute Tobin's $q$, which captures investors' perception of the firms' investment opportunities. The use of stock prices from a single country's stock market increases the validity of our use of investment-$q$ sensitivity to capture managerial learning from stock prices.

the MMoU effectively removes barriers to cross-border enforcement as well as in those that are more likely to cooperate with U.S. securities regulators based on their relatively closer ties. These results substantiate our argument that the MMoU enhances cross-border regulatory cooperation, promoting managerial learning from stock prices.

We further assessed the managerial learning channel that links the MMoU and investment-q sensitivity. The primary channel linking the MMoU to managerial learning from stock prices is the memorandum's ability to potentially enhance information production by investors and information acquisition by secondary market participants; thus, firms can learn more from the capital market about their investment opportunities. Studies show that when there is greater uncertainty in a firm's production function, managers are more motivated to learn from the secondary market (Allen, 1993; Edmans et al., 2017). In theory, during periods of high industry uncertainty, investors generally have a greater information advantage over firm management when firm-level factors have less impact on firm value (Edmans, Goldstein, and Jiang, 2015). Therefore, we expect the positive impact of the MMoU on managerial learning from stock markets to be stronger for firms faced with greater business uncertainty. Consistent with our prediction, we find that the MMoU's positive effect on managerial learning from stock prices is stronger for firms with greater uncertainty about production function and firms facing higher industry uncertainty. These results corroborate our argument that the enhanced regulatory cooperation induced by the MMoU can improve managerial learning from stock prices, thereby increasing investment-q sensitivity.

Finally, we examined the moderating effect of firms' home country regulatory deficiencies. As in the main hypothesis, enhanced information-sharing can alleviate investors' concerns about adverse selection risks and encourage them to invest in stocks, incorporating information in stock prices. Thus, the MMoU can substitute for home-country regulatory deficiencies and promote managerial learning from stock markets. To the extent that the MMoU enhances firms' managerial learning from stock prices by facilitating investors' information production, we expect its effect to be stronger for firms in countries with more severe regulatory deficiencies. Consistent with our expectations, we find that MMoUs' positive effect on managerial learning from stock prices is more pronounced for countries with lower judicial efficiency and weaker creditor protection. These results corroborate the view that the enhanced regulatory cooperation following MMoU adoption can help improve firms' managerial learning from stock prices by incentivizing investors' information production activities.

This study makes two major contributions. First, we extend the literature on managerial learning from stock prices by providing evidence that enhanced regulatory cooperation is an important factor shaping the learning from stock prices of managers of non-U.S. firms cross-listed in the U.S.. A growing body of the literature investigates how firms' local institutional environment, including investor protection (McLean et al., 2012), insider trading laws (Edmans et al., 2017), mandatory disclosure (Jayaraman and Wu, 2019; Sani, Shroff, and White, 2023), and tick size (Ye, Zheng, and Zhu, 2023) enhances or hinders managerial learning. We show that the MMoU, a key symbol of cross-border regulatory cooperation, can improve managerial learning. To our knowledge, this study is the first to examine the effect of cross-border cooperation on firms' stock price informativeness and resource allocation. By documenting that a firm's managers can learn from the prices of its cross-listed stock (to make better investments), it highlights another benefit of cross-listing, with a focus on the importance of regulatory cooperation in enabling the firm to obtain this benefit.

Second, our study complements the emerging literature on the MMoU's economic outcomes. In general, researchers have found that the MMoU largely benefits stock markets by bringing in more cross-border cooperation and information sharing. Specifically, studies show that it increases cross-border enforcement and reduce the costs of liquidity provision (Silvers, 2020), facilitates global mutual fund portfolio allocations (Lang et al., 2020), raises cross-border investment (Silvers, 2021b), improves financial reporting quality and transparency (Si), and increases firms' dividend payouts (Chang et al., 2022). Our findings differ from and complement these studies by introducing the novel notion that regulatory cooperation in securities can have real effects on firms' investments through managerial learning from the stock prices impacted by such cooperation.

The remainder of this paper is organized as follows. Section 2 details the research background and hypotheses development. Section 3 introduces the data, samples, and research design. Sections 4 to 6 present the empirical results, robustness checks, cross-sectional analyses, and supplementary analyses. Section 7 concludes the paper.

## 2. Research Background and Hypotheses Development

### *2.1. The MMoU and related literature*

Historically, cross-border cooperation between security regulators has been lengthy, costly, and, in many cases, ineffective. Especially during the 1980s and 1990s, investigation requests by securities regulators were often of lower priority than those involving more serious crimes (e.g., murder, drug smuggling, and leaking government secrets). Even if a securities regulator's investigation request was "successful," it had to go through years of cumbersome diplomatic formalities (Swire and Hemmings, 2015). These difficulties led regulators to seek more effective and reliable ways of dealing with cross-border requests. The 9/11 terrorist attacks made such information sharing support an urgent necessity, resulting in an important bilateral memorandum, the MMoU.[3]

[3] Kempthorne (2013) points out: "Regulators recognized the limitations to the current network of bilateral MoUs [memorandum of understandings] 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's primary objective is to facilitate regulatory cooperation and information sharing among signatory parties. Although the memorandum is neither binding nor legally enforceable, it has standardized protocol in several important ways: 1) it specified the types of information shared between securities regulators; 2) it established an international benchmark for enforcement-related cooperation and the exchange of information; and 3) it set standards for confidentiality and suitable use of the shared information. The scope of assistance provided under the MMoU can cover many types of information about firms' securities misconduct, including insider trading, market manipulation, misrepresentation of material information, and other fraudulent or manipulative practices related to securities and derivatives (IOSCO, 2012). Through its information-sharing mechanism, the MMoU can improve regulators' ability to discover and prevent cross-border financial crimes. The memorandum also sends a signal to the markets that cross-border regulators are closely cooperating and monitoring potential securities and derivatives fraud. Being an MMoU signatory means that the country must ensure that its security regulators have the authority to share key information relevant to prosecuting or investigating matters with foreign counterparts. These requirements also indicate that the signatory countries must remove all obstacles to cooperation and provide other authorities with the necessary assistance.

Growing evidence suggests that, despite the MMoU being a soft law, securities regulators actively use it. According to IOSCO's official disclosure, the number of MMoU information exchanges has increased almost 77 times, surging from 56 in 2003 to 4,319 in 2019.[4] Academic research has found that MMoUs largely benefit stock markets by bringing in more cross-border enforcement and information sharing. Silvers (2020) offered the first empirical evidence that the MMoU is effective in facilitating cross-border cooperation between security

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[4] These statistics can be found at https://www.iosco.org/about/?subsection=mmou.

regulators by documenting that the memorandum increases cross-border enforcement threefold and reduces the costs of liquidity provision for U.S.-cross-listed foreign firms. Lang et al. (2020) found that the MMoU facilitates cross-border mutual fund investment, suggesting that cross-border regulatory cooperation brings about significant spillover effects.

### *2.2. Hypothesis development*

With the progress of globalization and the integration of capital markets, many firms choose to cross-list on foreign exchanges, with the U.S. exchanges being a favorite. Research has extensively analyzed the motives behind and benefits of non-U.S. firms cross-listing on U.S. stock markets (see the review paper by Karolyi (2012)). Lins, Strickland, and Zenner (2005) show that non-U.S. firms that issue equity on U.S. stock exchanges have more access to capital than their domestic peers. Moreover, cross-listing on U.S. exchanges subjects non-U.S. firms to U.S. securities law and U.S. GAAP, lending increased protection of their minority shareholders (Reese Jr. and Weisbach, 2002). This improvement in firms' corporate governance could also lead to a better information environment, indicated by a lower bid ask spread (Tinic and West, 1974), greater analyst coverage and media attention (Baker, Nofsinger, and Weaver, 2002), and a higher stock price informativeness (Fernandes and Ferreira, 2008).

Managerial learning from stock prices is an important feature of secondary markets, as managers may not have perfect information about every decision-relevant factor and can learn from investors may have some incremental information that is useful to them (Hayek, 1945; Bond et al., 2012; Bai, Philippon, and Savov, 2016). Managers may collect new information through stock prices to guide their decision-making, such as management forecasts and investments (Chen, Goldstein, and Jiang, 2007; Zuo, 2016; Edmans et al., 2017; Jayaraman and Wu, 2019; Chen, Ng, and Yang, 2021; Ye et al., 2023). For instance, Edmans et al. (2017) show that enforcing insider trading laws increases investment-q sensitivity, suggesting that managers learn from stock prices when outsiders possess unknown information. Jayaraman and Wu (2019) find that mandatory segment reporting reduces investment-q sensitivity, providing supporting evidence for the argument that, by discouraging informed trading, disclosure could reduce managers' capacity to solicit decision-relevant information from prices. Ye et al. (2023) reveal that a larger tick size increases investment-q sensitivity, consistent with the view that managerial learning from stock prices increases as the tick size increases. In addition, information feedback from financial markets to real activities generates natural explanations of phenomena such as manipulative short selling, informed trading, and financial market runs (Bond et al., 2012).

Managers' potential to learn from stock prices becomes more important when stocks are cross-listed in foreign stock markets, especially if there is limited stock trading in their home stock market. First, informed investors have more trading venues to exploit private information when a firm is cross-listed. Second, cross-listing offers access to informed investors located in the foreign market who cannot or are unwilling to trade in the firm's domestic market because of investment restrictions (e.g., foreign ownership limits), prohibitively high trading costs, or a lack of transparency. Trades by these investors can provide managers with new stock price information. For firms cross-listed in the U.S. stock market, which attracts much domestic and global trading, significant trading activities, especially by informed investors, can significantly enhance the potential for revelatory price discovery and managerial learning from stock prices. However, cross-border regulatory deficiencies may disincentivize investors away from cross-listing stocks, thereby preventing them from adding new price information to benefit managers. In cross-listing, investors in a foreign stock market are often at a disadvantage in acquiring information about cross-listed firms relative to investors in the home country, resulting in information asymmetry between these two groups (Gordon and Bovenberg, 1996; Brennan and Cao, 1997; Kang and Stulz, 1997; Bradshaw et al., 2004; Yu and Wahid, 2014). This information asymmetry imposes adverse selection risks on host-country investors, making them reluctant to invest in cross-listed firms.

The MMoU aims to facilitate cross-country cooperation among securities regulators in the exchange of information and procedures for handling information requests among participating regulators worldwide. Although existing empirical evidence on the MMoU indicates improved capital markets after MMoU adoption, including information environment, (e.g., Silvers, 2020; Silvers, 2021a; Silver, 2021b; Tsang, Xiang, and Yu, 2023), there is limited evidence on the real impact of MMoU on corporate activities. In this study in which we examine the effect of the MMoU on managerial learning from stock prices of stocks cross-listed in the U.S., we posit that there is ambiguity in this effect.

One might expect regulatory cooperation among securities regulators to enhance managerial learning from stock prices because there is more trading by informed investors and their trades improve revelatory price efficiency. Silvers (2020) document that linkages across countries due to the countries entering into the MMoU are associated with enhanced liquidity for affected cross-listed shares. Silvers (2021a) and Lang et al. (2020) find that the MMoU facilitates cross-border foreign portfolio investment and mutual fund investment. Greater liquidity in a stock can incentivize informed trading, and enhance market efficiency (Chordia, Roll, and Subrahmanyam, 2008). Specifically, before the MMoU, informed investors who truly want to trade on acquired and processed information are concerned about adverse selection, information problems, and regulatory deficiencies that would work against them trading profitably on their information acquisition and processing. Hence, they have fewer incentives to acquire and process information for trading. As a result, prices before the MMoU are expected to be less informative about the investment opportunities facing the firm, and there is less managerial learning from stock prices. After the MMoU, enhanced regulatory cooperation mitigates informed investors' concerns about adverse securities market conditions. As a result, they are willing to invest more effort in information acquisition and processing to trade on the information. As a result, there would be enhanced revelatory price efficiency and thus, more managerial learning from stock prices for U.S.-cross-listed stocks (Foucault and Frésard, 2012).

However, one might also expect regulatory cooperation among securities regulators to enhance managerial learning from stock prices because of the crowding-out of informed trading due to a better information environment. Several studies have highlighted that a better information environment can disincentivize private information acquisition and thus reduce revelatory price efficiency. Gao and Liang (2013) demonstrate theoretically that partially preempting traders' information advantage established from information acquisition, disclosure reduces private incentives to acquire information, thereby reducing revelatory price efficiency.[5] Consistent with this theory, Jayaraman and Wu (2019) find that investment-q sensitivity decreased after the mandatory disclosure regulation of segment reporting. Bird, Karolyi, Ruchti, and Truong (2021) find that the staggered introduction of EDGAR (Electronic Data Gathering, Analysis, and Retrieval) web platform reduces the sensitivity of firm investment to prices, consistent with prices being less informative to managers due to the crowding out of external information gathering. There is evidence that MMoU enhances the information environment of affected U.S.-cross-listed firms. Silvers (2021b) shows that MMoU is associated with increased cross-border enforcement for financial reporting issues (e.g., accounting and auditing enforcement releases, litigated proceedings, settled actions, and SEC-prompted restatements). for U.S.-cross-listed firms. He also finds that these firms have better

[5] Empirical evidence is largely consistent with this "revelatory price efficiency crowding out channel". Specifically, Chen et al. (2007) show that when there is more informed trading, firm investments are more sensitive to stock prices. Jayaraman and Wu (2019) find that mandatory segment reporting reduces investment-q sensitivity, suggesting that by discouraging informed trading, disclosure could reduce managers' capacity to solicit decision-relevant information from prices. Chen et al. (2021) find that options trading has a stronger positive effect on investment-q sensitivity when management forecasts are fewer, indicating that managers strategically reduce disclosure to avoid crowding out informed trading.

earnings quality after the MMoU. Tsang et al. (2023) find that U.S. cross-listed firms issue significantly more and better-quality management earnings forecasts after their home countries signed the MMoU. To the extent that a better information environment due to MMoU generates the aforementioned crowding-out effect, one might expect less managerial learning from stock prices for affected U.S.-cross-listed firms.

Given the contrasting arguments that predict the different effects of regulatory cooperation among securities regulators on managerial learning from stock prices, we state our central hypothesis in null form:

*Null hypothesis: There is no effect of regulatory cooperation among securities regulators on managerial learning from stock prices.*

## 3. Research Design

### *3.1. Data and sample*

We examine the effect of regulatory cooperation on the managerial learning from stock prices of foreign firms cross-listed on the U.S. stock exchange. Following prior studies (Edmans et al., 2017; Peters and Taylor, 2017; Jayaraman and Wu, 2019), we capture managerial learning from stock prices using investment-$q$ sensitivity. As we focus on foreign firms cross-listed on the U.S. stock exchange, our measure of $q$ is determined by stock prices in the U.S. only. Hence, our investment-$q$ sensitivity measure is better able to capture corporate investment behavior due to managerial learning from stock prices. In particular, it is less likely to be affected by cross-country heterogeneity in capital market conditions.

To construct our sample, we begin with all U.S.-cross-listed foreign firms from 1997 to 2019 in the Compustat database. Our sample period begins in 1997, five years before the earliest MMoU adoption and ends in 2019 to avoid the impact of the COVID-19 pandemic. Following the corporate investment literature (e.g., Peters and Taylor, 2017; Jayaraman and

Wu, 2019), we exclude financial firms (SIC codes 6000–6999) and regulated utilities (SIC codes 4900–4999). Because MMoU adoption dates are spread across different months of the year, we follow Kraft et al. (2018) and drop the observations for the MMoU adoption year. After dropping observations with missing values for the necessary variables, our final sample consists of 14,076 firm-year observations from 1,497 unique firms.

Table 1 presents the distribution of the final sample. Panel A reports the sample distribution by home country and corresponding MMoU adoption year. The earliest adopters, such as Australia, Canada, Greece, Portugal, and Turkey, signed the MMoU in 2002. The most recent signatories were Russia, Panama, and Chile, in 2015, 2017, and 2018, respectively. Panel B reports the sample distribution for the Fama-and-French 10 industry classifications. The business equipment industry had the most observations (3,382, or 24.15%), whereas the consumer durables industry had the fewest (450, or 3.21%). In Panel C, we present the sample distribution by year and find the number of observations broadly stable across the sample period.

<Insert Table 1 Here>

### *3.2. Research model*

Our identification strategy exploits the MMoU's staggered, country-level adoption. We use the following staggered DID model to study the memorandum's impact on firms' investment-$q$ sensitivity.

$$
\begin{aligned}
I = {} & \beta_0 + \beta_1 Q \times POST + \beta_2 POST + \beta_3 Q + \beta_4 CF + \beta_5 SIZE + \beta_6 AGE + \beta_7 TANGI \\
& + \beta_8 SLACK + \beta_9 LOSS + \beta_{10} ZSCORE + \beta_{11} KSTR + \beta_{12} KIND + \beta_{13} DIV \\
& + \beta_{14} GDPGR + \beta_{15} GDPPC + Firm\ F.E. + Year\ F.E. + \varepsilon. \quad (1)
\end{aligned}
$$

In Eq. (1), the dependent variable (*I*) is a firm's investment in year *t* scaled by the lagged total assets; this investment is the sum of the capital, R&D, and acquisition expenditures less cash receipts from the sale of property, plant, and equipment. To test our central hypothesis, we focus on the two-way interaction term $Q \times POST$. $Q$ is the firm's Tobin's $q$ at the end of year $t$−1, calculated as the market value of the firm's equity plus total assets minus the book value of its equity scaled by the total assets. *POST* is an indicator variable that equals 1 for post-MMoU years and 0 otherwise. We measure all the control variables in Eq. (1) in year $t$−1. This lead-lag model specification is consistent with prior literature on investment-$q$ sensitivity (e.g., McLean et al., 2012; Jayaraman and Wu, 2019). Neoclassical investment theory predicts a significantly positive coefficient on $Q$ ($\beta_3$) because corporate investment should be sensitive to investment opportunities, as captured by Tobin's $q$. To support our hypothesis that enhanced regulatory cooperation facilitates managerial learning from stock prices, we expect the coefficient on the two-way interaction term ($\beta_1$) to be significantly positive.

We follow prior studies (e.g., Chen et al., 2011; García Lara et al., 2016; Jayaraman and Wu, 2019) and control for several firm- and country-level characteristics that may affect investment-$q$ sensitivity. These controls include cash flow (*CF*), firm size (*SIZE*), firm age (*AGE*), asset tangibility (*TANGI*), financial slack (*SLACK*), loss indicator (*LOSS*), Z-score (*ZSCORE*), firm's capital structure (*KSTR*), industry-level capital structure (*KIND*), and dividend payments (*DIV*). We further include the annual growth rate of the real GDP (*GDPGR*), and GDP per capita (*GDPPC*) from the Penn World Table. Appendix A summarizes the variable definitions. The model also includes firm- and year-fixed effects. In the regression analysis, we adjust the standard errors for country-level clustering because the shock in our setting (i.e., MMoU adoption) is at the country level.

### ***3.3. Descriptive statistics***

Table 2 presents the summary statistics for the variables used in our baseline regression. We winsorized all continuous variables at the 1st and 99th percentiles. The distribution of these variables is largely consistent with prior studies (e.g., Chen et al., 2021; Chang et al., 2022; Lang et al., 2020). For example, the average annual investment is 14% of the lagged total assets, and the mean value of Tobin's $q$ is 2.144. The mean of *POST* is 0.630, which confirms that the treated sample comprises more than half of our sample; the control sample constitutes the remaining portion. On average, a firm's cash flow accounts for 4.3% of its total assets. The average firm has an asset-tangibility ratio of 31.1%, and a Z-score of 0.433. For the country-level GDP growth rate (*GDPGR*), both the mean and median values are 2.7%. The mean and median values of GDP per capita (*GDPPC*) are close, suggesting that our sample countries are symmetrically distributed in terms of economic conditions.

<Insert Table 2 Here>

## 4. Empirical Results

### *4.1. Main results*

In our central hypothesis, we argue that information asymmetry between host and home investors imposes adverse selection risks on investors, making them reluctant to invest in cross-listed firms. Nevertheless, the enhanced regulatory cooperation brought about by the MMoU can narrow this information gap and incentivize investors to incorporate information into stock prices. Therefore, we predict that firms in MMoU signatory countries have higher investment-$q$ sensitivity. To test this hypothesis, we estimate Eq. (1), where the dependent variable ($I$) is a firm's investment in year $t$ scaled by the lagged total assets. The variable of interest is the two-way interaction term $Q \times POST$. $Q$ is the firm's Tobin's $q$ at the end of year $t-1$, and *POST* is an indicator variable that equals 1 for post-MMoU years period, 0 otherwise. A significantly positive coefficient on the two-way interaction term $Q \times POST$ would be consistent with our hypothesis.

Column (1) of Table 3 presents the main results. We find a significantly positive coefficient for $Q$, consistent with the classical investment-$q$ literature. This finding suggests that corporate investment for our sample firms is sensitive to investment opportunities, as captured by Tobin's *q*. More importantly, the coefficient of the two-way interaction term $Q \times POST$ is positive and statistically significant at the 1% level, suggesting that corporate investment for firms in MMoU signatory countries is more sensitive to investment opportunities in the post-MMoU period. Therefore, this finding supports our hypothesis that firms in MMoU signatory countries have higher investment-*q* sensitivity. In terms of economic significance, the coefficient of 0.0077 for $Q \times POST$ corresponds to 57% of the coefficient of 0.0135 for *Q*, representing the control group's average investment-*q* sensitivity. This result is economically significant and comparable to the findings of some studies on investment-*q* sensitivity. For example, Foucault and Frésard (2012) found that investment-*q* sensitivity nearly doubles after cross-listing. Ye et al. (2023) document a 58% increase in investment-*q* sensitivity owing to an increase in tick sizes arising from participation in the 2016 Tick Size Pilot Program mandated by the SEC.

The results for the control variables are largely consistent with the literature (e.g., Foucault and Frésard, 2012; Chen et al., 2021). For instance, firms' investments are sensitive to their cash flow (*CF*). We also find that larger, older, and loss-making firms invest less.

<Insert Table 3 Here>

In Column (2) of Table 3, we perform a parallel trend test. We replace *POST* with a series of relative year indicators surrounding the MMoU adoption year to capture the year-by-year dynamic effect of the MMoU on firms' investment-*q* sensitivity. Specifically, we include 5 indicators in the pre-adoption period ($BEFORE^{T=-5}$, …, $BEFORE^{T=-1}$), and another 5 indicators in the post-adoption period ($AFTER^{T=1}$, …, $AFTER^{T=4}$, $AFTER^{T\geq 5}$).[6] This design employs all control and treatment countries' observations that occur six years or more before MMoU adoption as the benchmark. We interact each relative year indicator with Tobin's *q* (*Q*)

[6] Note that our sample excludes observations from the MMoU adoption year.

and focus on the interaction terms.

We find no significant difference between the benchmark and treatment firms' investment-*q* sensitivity five years before the MMoU adoption, suggesting that our DID design satisfies the parallel-trend assumption. This finding is consistent with the notion that the introduction of the MMOU was largely unanticipated and exogenous. Beginning one year after adoption, we find significantly positive coefficients for the interaction terms, suggesting that the treatment firms' investment-*q* sensitivity increases in response to MMoU adoption. As depicted in Figure 1, in the pre-adoption period, the estimated coefficients of the interaction terms are close to zero and show no trend. By contrast, in the post-adoption period, the coefficients of the interaction terms are all significantly positive. Overall, these results validate the parallel trend assumption of our DID design and suggest that the MMoU has a causal effect on firms' investment-*q* sensitivity.

< Insert Figure 1 Here >

### *4.2. Robustness tests*

#### *4.2.1. Alternative fixed effects*

We perform a battery of robustness checks for our main finding that firms in MMoU signatory countries have higher investment-*q* sensitivity. First, we check whether our results are robust to alternative fixed effects. Our baseline regression model includes firm and year fixed effects, and we adjust standard errors by firms' home countries. As an alternative model specification, we include industry-, year-, and country-fixed effects in Column (1) of Table 4, Panel A. We continue to find a significant positive coefficient for the interaction term ($Q \times POST$), which means our main finding is not driven by a specific choice of regression model.

Given that our sample consists of firms from different home countries, it seems that time-variant country-level macroeconomic conditions can be omitted as factors that we should control for. Although we control for GDP growth rate and GDP per capita in our baseline model, in Column (2), we determine whether our results are robust to country × year fixed effects. Given that country × year fixed effects can absorb all time-variant country-specific factors, the significantly positive coefficient of *Q* × *POST* suggests that the omitted macroeconomic variables are less of a concern in our setting. Column (3) shows that our results hold when we include industry × year fixed effects to absorb time-variant industry-level shocks. Taken together, these results suggest that our main finding is robust to various models with alternative fixed effects.

*4.2.2. Alternative samples*

Next, we check whether the main finding is robust to alternative samples. Our primary sample includes all treatment and control countries' firm-year observations from 1997 to 2019. Given our relatively long sample period, confounding events could have biased our results. The unbalanced number of observations for the treatment firms in the pre- and post-adoption periods could be another concern. To mitigate these issues, we follow Fauver et al. (2017) and restrict the treatment firms' observations to a shorter, balanced event window. In the first (second) column of Table 4, Panel B, we construct a sample consisting of treatment countries' observations in [−3, +3] ([−5, +5]) event windows and control countries' observations from the whole sample period. In both columns, we continue to find significantly positive coefficients for *Q* × *POST*, suggesting that neither the unbalanced event window nor confounding events outside the restricted event window drive our results.

In Table 4, Panel B, column (3), we require treatment firms to have at least one observation in both the pre- and post-adoption periods. This requirement helps mitigate the concern that an unbalanced number of observations for the treatment firms in the pre- and post-adoption periods may bias our results. Again, we find a significantly positive coefficient of *Q* × *POST*, suggesting that firms in MMoU signatory countries have higher investment-*q* sensitivity in the post-adoption period.

Another concern is that countries that never signed an MMoU are substantially different from those that did and the differences between these two types of countries might be driving our result. In Table 4, Panel B, column (4), we retain only firms in MMoU signatory countries. We continue to find a positive effect of regulatory cooperation on managerial learning from stock prices.

Taken together, the results in Panel B of Table 4 suggest that our main finding is robust to various alternative samples.

*4.2.3 Alternative investment measures*

We test whether our results are robust to alternative investment measures. In our baseline regression, we follow Biddle et al. (2009) and define investment as the sum of capital, R&D, and acquisition expenditures, less cash receipts from the sale of property, plant, and equipment. As a robustness check, we also follow McLean et al. (2012) and define a firm's investment as the sum of its yearly growth in property, plant, and equipment, inventory, and R&D expenditure, all deflated by the lagged book value of assets (*I_M*). We follow Jayaraman and Wu (2019) and define a firm's investment as the sum of its capital and R&D expenditures scaled by the lagged book value of assets (*I_JW*). Using these alternative measures in Panel C of Table 4, we find significantly positive coefficients for $Q \times POST$. Therefore, our main finding is unlikely driven by a specific measure of corporate investment.

*4.2.4. Stacked difference-in-differences design*

In this subsection, we ascertain whether our finding is robust to an alternative research designs. Our baseline model has a staggered DID design. Recent econometric theory suggests that staggered treatment timing may result in the "bad comparisons" problem and that treatment effect heterogeneity can bias the staggered DID estimator (e.g., Callaway and Sant'Anna, 2021; Goodman-Bacon, 2021). To mitigate this concern, we follow the recommendations of Baker et al. (2022) and implement a stacked difference-in-differences design. We follow the literature (e.g., Gormley and Matsa 2011; Gormley et al. 2013; Cengiz et al. 2019; Deshpande et al., 2019) and construct a cohort of treatment and control firms for each batch of MMoU adoption. For example, for the first batch of adopters in 2002, we construct a cohort of treatment and control firms centered on the event year 2002. The treatment firms have home countries that adopted the MMoU in 2002, and the control firms are from countries that either did not adopt the MMoU in 2002 or adopted it after.[7]

We then pool the constructed cohorts and use the pooled samples to estimate the stacked DID design. Given that a firm can appear in multiple cohorts, we follow the prior literature and include firm- and year-cohort fixed effects in the model. Correspondingly, we cluster standard errors at the home country cohort level. Panel D of Table 4 presents the results. In column (1), we focus on the [$t$−3, $t$+3] event window, with the treatment year ($t$ = 0) excluded. We find a significantly positive coefficient for $Q \times POST$, suggesting that MMoU adoption enhances borrowers' investment-$q$ sensitivity. Columns (2) and (3) respectively repeat the analyses using the [$t$−4, $t$+4] and [$t$−5, $t$+5] event windows. Again, we obtain qualitatively similar results. Therefore, our finding of the positive effect of the MMoU on investment-$q$ sensitivity is robust to the stacked DID design, suggesting that our results from the staggered DID design are unlikely to be biased.

<Insert Table 4 Here>

*4.2.5. Placebo tests*

Finally, we follow the prior literature (e.g., Biggerstaff et al., 2015; Hall et al., 2018; Deng et al., 2021) and conduct a placebo test to ensure that our finding is not driven by chance. Specifically, we randomly select a sample of 8,862 observations (equal to the number of observations with $POST$ = 1 in our primary sample) and assign a value of 1 to $PSEUDO\_POST$.

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[7] For each cohort, we require both the treatment and control firms to have at least one observation in both the pre- and post-adoption periods.

For the remaining observations, we assign a value of zero to *PSEUDO_POST*. After replacing *POST* with *PSEUDO_POST*, we re-estimate Eq. (1) and record the estimated coefficient of the interaction term $Q \times PSEUDO\_POST$. This procedure is repeated 1000 times to obtain the distribution of the estimated coefficients. In most cases, we expect the estimated coefficients to be not statistically significant from zero.

Figure 2 plots the distribution of these estimated coefficients on $Q \times PSEUDO\_POST$. Consistent with our expectation, the mean value of these estimated coefficients is very close to zero (= −0.0001). More importantly, the true estimate in our baseline regression (= 0.0077, see column (1) of Table 3) is much larger than these pseudo estimates. For the 1000 estimates, the maximum coefficient on $Q \times PSEUDO\_POST$ is 0.0060, which is smaller than 0.0077. Therefore, this placebo test suggests that our finding that the MMoU has a positive effect on investment-$q$ sensitivity is not a chance one.

< Insert Figure 2 Here>

## 5. Cross-sectional Analyses

This section presents several cross-sectional analyses that provide richer insights into this relationship between regulatory cooperation among securities regulators and managerial learning from stock prices. We employ a subsample approach. First, we split the primary sample into two subsamples based on the median value of the partitioning variables. We then separately estimate the baseline model for each subsample and perform a Fisher's permutation test to compare the two estimated coefficients on $Q \times POST$.

### *5.1. Test on the cross-border cooperation effect*

We first examine whether the effect of regulatory cooperation among securities regulators on managerial learning from stock prices is moderated by the likelihood of cross-border cooperation. Our main hypothesis is based on the premise that MMoU adoption enhances cross-border regulatory cooperation. Although the memorandum has broad power to ensure signatory members' cooperation and information sharing, we acknowledge that signatories nevertheless differ in their oversight ability and enforcement strength, as a result of variations in resources, knowledge, and political power (McLean et al., 2012). Moreover, the incremental effect of SEC oversight in relation to the MMoU is also likely to differ depending on the pre-existing relationship between the U.S. and the cross-listed firm's home country (Lang et al., 2020). Given that the MMoU's effect on managerial learning from stock prices results from enhanced cross-border regulatory cooperation among securities regulators, we expect a stronger effect for firms in signatory countries where the MMoU fosters cross-border cooperation more effectively.

To test this hypothesis, we identify various conditions under which the MMoU is arguably more likely to produce enhanced regulatory cooperation between U.S. securities regulators and their counterparts in a firm's home country. We first follow Silvers (2020) and identify whether a country has pre-existing blocking statutes (*BLOCK*). Blocking statutes present the most formidable obstacle to cross-border securities enforcement. Because the MMoU effectively removes these barriers, we expect its effect on investment-q sensitivity to be stronger in countries that previously had such statutes. Next, we measure each country's ties to the U.S. from three perspectives. We expect countries closely tied to the U.S. to be more likely to improve cooperation under the MMoU. First, we use Fernández et al.'s (2016) overall inflow restrictions index (*RESTRICTION*) as an inverse measure of cross-country capital flows. Second, we measure the level of economic connections by focusing on the importance of the U.S. trade (*USTRADE*). Third, we measure military ties through membership of the North Atlantic Treaty Organization (*NATO*). NATO member countries should have greater familiarity with and more trust in U.S. oversight and would be more likely to cooperate.

The results are summarized in Table 5. results. In the first two columns, we only find a significantly positive coefficient on $Q \times POST$ for the subsample of countries with pre-existing blocking statutes, which is consistent with our expectation. In columns (3) and (4), we find that the MMoU's positive effect on investment-$q$ sensitivity is pronounced only in countries with a lower level of capital controls. This finding is consistent with the idea that countries with lower capital controls are likely to have closer ties to the U.S. in terms of their capital flows which can facilitate regulatory cooperation under the MMoU.[8] In Columns (5) and (6), we use international trade to measure economic ties, and find that the MMoU has a more pronounced effect on countries that rank the U.S. as an important trading partner. In the last two columns, we find that the memorandum has a more pronounced effect on firms from NATO member countries, suggesting that military ties facilitate regulatory cooperation. Taken together, we find a stronger effect in countries where the MMoU effectively removes barriers to cross-border enforcement as well as in those that have closer ties to the U.S., which makes them more likely to cooperate with U.S. securities regulators. These results substantiate our argument that the MMoU enhances cross-border regulatory cooperation, thereby promoting managerial learning from stock prices.[9]

<Insert Table 5 Here>

### *5.2. Test on the managerial learning channel*

In this subsection, we conduct cross-sectional analyses to assess the managerial learning channel. Specifically, we test whether our main effect is moderated by the need for managerial learning from stock prices due to business uncertainty. As argued in the main hypothesis, the primary channel linking the MMoU with managerial learning from stock prices is that the

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[8] This finding may be explained from another angle. Because capital controls are a friction that is not resolved by regulatory cooperation (see Silvers (2021a, p.1284)), capital flows from the U.S. to a firm's home country may complement the MMoU's ability to promote U.S. listed foreign firms' investment-$q$ sensitivity.

[9] These results also echo the finding in Lang et al. (2020) that the effect of the MMoU on foreign portfolio investment is stronger for investors from countries closely linked to the U.S.

memorandum can potentially facilitate information production and acquisition by secondary market participants, and firms can thus learn more from the capital market about their investment opportunities. To the extent that the MMoU enhances firms' investment-*q* sensitivity by facilitating managerial learning, we expect this effect to be stronger for firms facing greater business uncertainty, and managers have greater incentives to learn from secondary markets.

First, in theory, when there is greater business uncertainty in a firm's production function, managers are more motivated to learn from the secondary market (Allen, 1993; Edmans et al., 2017). To test this prediction, we use several firm-level proxies to capture uncertainty. Specifically, we construct three measures based on several prior studies (e.g., Chen et al., 2021; Sani et al., 2023). The first proxy is earnings volatility (*SD_ROA*), which reflects firms' financial uncertainty. A higher index value indicates that the firm has more volatile earnings, implying greater reliance on managerial learning. The second indicator is return volatility (*SD_RET*), constructed as the standard deviation of daily stock returns in the fiscal year. A higher value for this measure indicates that the firm has high return volatility. The third measure is analyst forecast dispersion (*DISPERSION*). Studies suggest that firms with higher pre-MMoU analyst forecast dispersion have higher incentives to learn from the secondary market.

Second, theory suggests that during periods of high industry uncertainty, when firm-level factors have less of an impact on firm value, investors have a greater information advantage over firm management (Edmans et al., 2015). Empirically, we follow Rajan and Zingales (1998) and construct two industry-level measures of uncertainty: investment intensity (*INVINTENSITY*), calculated as the median industry ratio of capital expenditure to net property, plant, and equipment, and R&D intensity (*RDINTENSITY*), calculated as the median industry ratio of R&D spending scaled by total assets. We conjecture that if a firm is in an industry that focuses heavily on investment or R&D, the benefit of learning from stock prices, which are more informative because of regulatory cooperation, is higher.

The results are summarized in Table 6. Columns (1) to (6) depict the results obtained by partitioning samples based on firm-level measures of uncertainty about their production function. Columns (7) to (10) show the results obtained by partitioning samples based on industry-level measures of uncertainty. Across all columns, the coefficients of $Q \times POST$ are all significantly larger for firms with greater uncertainty about production function or those facing greater industry uncertainty (i.e., firms for which *SD_ROA*, *SD_RET* and *DISPERSON* are higher than the sample median, and firms in industries with a higher *INVINTENSITY* or *RDINTENSITY*). Fisher's permutation tests also indicate that the coefficients estimated from the subsamples are all significantly different at the 1% level, which is consistent with our hypothesis that the effect of MMoU adoption on managerial learning from stock prices is stronger for firms that are more uncertain about their own production functions or industry trends. Using these five measures of business uncertainty, we provide evidence consistent with the idea that the effect of the MMoU on managerial learning from stock prices is stronger for firms facing greater business uncertainty (i.e., they have more incentives to learn from the secondary market). These results corroborate that the managerial learning channel that enhances regulatory cooperation owing to the MMoU can help managers learn more from the secondary market, especially when faced with higher business uncertainty.

<Insert Table 6 Here>

### *5.2. Heterogeneity in home country regulatory deficiencies*

Next, we investigate whether our main effect is moderated by home country's regulatory deficiencies. The primary channel that links the regulatory cooperation among securities regulators to managerial learning from stock prices is the help it provides to mitigate potential regulatory deficiencies that may disincentivize investors to invest in cross-listed stocks, thereby preventing these investors from incorporating information new to managers in the stock price. The MMoU can enhance cross-border regulatory cooperation by breaking down significant cross-border barriers and setting standards for information sharing (Silvers 2020, 2021a). This enhanced cooperation can, in turn, substitute for the home country's institutional deficiencies and promote managerial learning from stock markets. For instance, investors would be less concerned about the likelihood that managers could divert corporate assets to themselves through theft, excessive salaries, or other unobserved forms of diversion (Shleifer and Vishny, 1997), and be more willing to incorporate information into stock prices. To the extent that the reduction in institutional deficiencies drives the MMoU's effect on managerial learning from stock prices, we expect the effect to be stronger for firms that suffer more from regulatory inefficiency in their home countries.

To test this prediction, we use two country-level measures of regulatory inefficiency. The first is La Porta et al.'s (1998) judicial efficiency measure (*EFFJUD*), which captures the efficiency and integrity of the legal environment in a firm's home country. The second measure is Djankov et al.'s (2007) index of creditor rights (*CRINDEX*). In countries with inefficient legal systems or weak investor protection, investors' unwillingness to provide information is likely to increase.

The results are summarized in Table 7. In Columns (1) and (2), we split our sample into two subsamples based on the median value of country-level judicial efficiency (*EFFJUD*): We find that the coefficient of $Q \times POST$ is significantly larger for the subsample of firms from countries with less efficient judicial systems. In Columns (3) and (4), the partitioning is based on the creditor rights index (*CRINDEX*), and we find a significantly larger coefficient of $Q \times POST$ for the subsample of firms from countries with a lower level of creditor protection. These results are consistent with our prediction that the MMoU's effect on investment-q sensitivity is stronger for firms in countries with less efficient judicial systems or weaker creditor protection.

These results corroborate our argument that the enhanced regulatory cooperation induced by the MMoU can mitigate the home country's regulatory deficiencies and facilitate investors' information production, thereby promoting managerial learning from stock prices.

<Insert Table 7 Here>

## 6. Supplementary Analysis

This section provides an analysis that complements our earlier finding that regulatory cooperation improves managerial learning from stock prices. To the extent that regulatory cooperation improves managerial learning, one might expect a firm to generate higher returns for capital providers. Specifically, we expect higher profitability after MMoU adoption. To examine this issue, we rely on commonly used measures of profitability and return on assets and modify Equation (1)'s dependent variable as follows.

$$\begin{aligned} ROA = {} & \beta_0 + \beta_1 POST + \beta_2 CF + \beta_3 SIZE + \beta_4 AGE + \beta_5 TANGI + \beta_6 SLACK + \beta_7 LOSS \\ & + \beta_8 ZSCORE + \beta_9 KSTR + \beta_{10} KIND + \beta_{10} DIV + \beta_{11} GDPGR + \beta_{12} GDPPC \\ & + Firm\ F.E. + Year\ F.E. + \varepsilon. \quad (2) \end{aligned}$$

*ROA* is measured in two ways: *ROA1* is the ratio of net income to average total assets and *ROA2,* which is the ratio of income before extraordinary items to average total assets. The other variables are as defined in Equation (1). The dependent variable is measured in year *t* and all control variables are measured in year *t*-1.

Table 8 reports the results of the effect of MMoU adoption on firms' profitability. In both columns, the coefficients on *POST* are positive and statistically significant, indicating that firm performance significantly increases after MMoU adoption. These results are consistent with firms generating greater returns for capital providers when there is enhanced managerial learning from stock prices due to regulatory cooperation.

<Insert Table 8 Here>

## 7. Conclusion

In our study, we use countries' staggered adoption of the MMoU to examine the effect of enhanced regulatory cooperation among securities regulators on managerial learning from stock prices, with such learning captured by investment-*q* sensitivity. The MMoU was introduced to enhance regulatory cooperation among securities regulators and facilitate cross-border securities enforcement. While prior research on regulatory cooperation among securities regulators have examined the impact of such cooperation on various capital market outcomes, there is limited research on the real effects of such cooperation. We fill the research gap with our study. Use a sample of U.S. listed foreign firms and a staggered DID design with MMoU as the setting, we find robust evidence that investment-*q* sensitivity increases after a firm's home country adopts the MMoU, indicating that enhanced regulatory cooperation among securities regulators helps facilitate managerial learning from stock prices.

We perform additional analyses to shed light on the channel through which the regulatory cooperation among securities regulators can affect managerial learning from stock prices. First, we posit and find evidence that the effect is stronger for firms in signatory countries, where the memorandum can foster cross-border cooperation more effectively. Second, as a primary channel linking the regulatory cooperation among securities regulators to managerial learning from stock prices, we argue that such cooperation can incentivize investors to impound information into stock prices, enabling managers to learn from the secondary market about their own investment opportunities. Consistent with this managerial learning channel, we find that the positive effect of regulatory cooperation among securities regulators on investment-*q* sensitivity is more pronounced for firms with greater industry-level and production-function uncertainty. Finally, the positive effect regulatory cooperation among securities regulators on managerial learning from stock prices is stronger for countries with a lower judicial efficiency and with weaker creditor protections, suggesting that it substitutes for home country regulatory deficiencies and incentivizes investors into stock price information production. Collectively, our study offers the novel insight that cooperation between securities regulators has positive externalities for corporate investment decisions.

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## Appendix A. Variable definitions

This appendix provides the definitions of the variables used in the analyses. Unless otherwise noted, Compustat North America (our primary data source) was used. Italics in parentheses indicate Compustat items.

| Variables (in alphabetical order) | Definitions |
|---|---|
| $AFTER^{T=x}$ | Indicator variable equal to 1 for the treatment firms' observations in the year that is *x* years after MMoU adoption (i.e., $T = x$, while year $T = 0$ refers to the MMoU adoption year), 0 otherwise. |
| *AGE* | Firm age at the end of year *t*-1, measured as the number of years since the firm first appeared in the Compustat database. |
| $BEFORE^{T=-x}$ | Indicator variable equal to 1 for the treatment firms' observations in the year that is *x* years before MMoU adoption (i.e., $T = -x$, while year $T = 0$ refers to the MMoU adoption year), 0 otherwise. |
| *BLOCK* | Pre-existing blocking statutes (BLOCK) provided by Silvers (2020) in Table VI of the online Appendix. |
| *CF* | Cash flow, calculated as the sum of net income (*ni*), R&D expenses (*xrd*), and depreciation and amortization (*dp*), and then scaled by the beginning of the year total assets (*at*). |
| *CRINDEX* | Country-level creditor right index ranging from 0 to 4, with lower scores indicating lower level of creditor protection. Source: Djankov et al. (2007). |
| *DISPERSION* | Analyst forecast dispersion, calculated as the standard deviation of the earnings per share forecast, divided by the stock price at the beginning of the year. |
| *DIV* | A dummy variable that equals one if the firm paid a dividend, and zero otherwise. |
| *GDPGR* | Annual percentage growth rate of the real GDP at market prices based on constant local currency for each firm in year t-1. Aggregates are based on constant 2017 prices, expressed in U.S. dollars. Source: Penn World Table. |
| *GDPPC* | GDP per capita is the real domestic product divided by population for each firm in year-1 t divided by 10,000. Source: Penn World Table. |
| *I* | A firm's investment in year *t* scaled by lagged total assets (*at*), where investment is calculated as the sum of capital expenditure (*capx*), R&D expenditure (*xrd*), and acquisition expenditure (*aqc*) less cash receipts from the sale of property, plant, and equipment (*sppe*). |
| *I_M* | Mclean et al.'s (2012) investment measure for a firm in year *t*, calculated as the sum of the yearly growth in property, plant, and equipment (*ppegt*), plus growth in inventory (*invch*), plus R&D expenditure (*xrd*), all deflated by the lagged book value of assets (*at*). |
| *I_JW* | Jayaraman and Wu's (2019) investment measure for a firm in year *t*, calculated as the sum of capital expenditures (*capx*) and R&D expenditure (*xrd*), scaled by the lagged book value of assets (*at*). |
| *INVINTENSITY* | Industry-level investment intensity, measured as the median industry ratio of capital expenditure to the net property, plant and equipment for all U.S. public firms. |

| | |
|---|---|
| *JUDEFF* | Judicial efficiency index that assesses the "efficiency and integrity of the legal environment as it affects business, particularly foreign firms." It ranges from 0 to 10, with lower scores indicating lower efficiency levels. Source: La Porta et al. (1998). |
| *KIND* | Industry-level capital structure in year $t-1$, calculated as the mean of *KSTR* for firms in the same SIC 3-digit industry. |
| *KSTR* | A firm's capital structure in year $t-1$, measured as long-term debt (*dltt*) divided by the sum of long-term debt and the market value of equity (*prcc_f* × *csho*). |
| *LOSS* | An indicator variable that equals 1 if the firm's income before extraordinary items (*ib*) is negative and 0 otherwise. |
| *NATO* | Indicator of whether the firm's home country is a NATO member before the MMoU adoption year, which indicates a country's military connection with the U.S. Source: https://www.nato.int/cps/en/natohq/nato_countries.htm. |
| *POST* | An indicator variable that equals 1 for years after the firm's home country adopting MMoU, and 0 otherwise. Source: Silvers (2021a, 2021b). |
| *Q* | Tobin's *q* in year *t*-1, calculated as the firm's market value divided by its total assets (*at*). We calculate a firm's market value as the market value of its outstanding equity (*prcc_f* × *csho*) minus the book value of its equity (*ceq*) plus total assets (*at*). |
| *RDINTENSITY* | Industry-level R&D intensity, calculated as the median industry ratio of R&D expenditures to total assets for all U.S. public firms. |
| *RESTRICTION* | Fernández et al.'s (2016) overall inflow restrictions index, a country-level measure of capital control. Source: http://www.columbia.edu/~mu2166/fkrsu/. |
| *ROA1* | Return on assets in year *t*, measured as the ratio of net income(*ni*) of average total asset ((total asset at beginning of the fiscal year end + total assets at the end of fiscal year end) /2) |
| *ROA2* | Return on assets in year *t*, measured as income before extraordinary items(*ib*) scaled by average total asset ((total asset at beginning of the fiscal year end + total assets at the end of fiscal year end)/2). |
| *SD_ROA* | Volatility of sales, measured as the standard deviation of sales scaled by total assets in the previous five years. |
| *SD_RET* | Volatility of stock return, measured as the standard deviation of daily stock return in the fiscal year. |
| *SIZE* | Firm size in year $t-1$, measured as the natural logarithm of the firm's total assets (*at*). |
| *SLACK* | A firm's financial slack in year $t-1$, measured as the ratio of cash and short-term investment (*che*) to total assets (*at*). |
| *TANGI* | A firm's asset tangibility in year $t-1$, calculated as the net value of property, plant, and equipment (*ppent*) divided by the total assets (*at*). |
| *USTRADE* | U.S. trade importance, measured as the percentile rank for trade flows for each country i, as reported from IMF scaled by the destination country's GDP. We then percentile rank the export destinations for each country i by scaled exports, with the most important partner ranked at 100. Source: CEPII. |
| *ZSCORE* | A measure of distress computed following the methodology in Altman (1968), calculated as 3.3(pi/at) + (sale/at) +0.25(re/at) +0.5((act−lct)/at). |

**Figure 1: Parallel trend test and dynamic effect of the MMoU**

This figure illustrates the year-by-year effect of MMoUs on firms' investment-*q* sensitivity, corresponding to the results in Column (2) of Table 3. We create 5 indicators in the pre-adoption period ($BEFORE^{T = -5}$, …, $BEFORE^{T = -1}$), and another 5 in the post-adoption period ($AFTER^{T = 1}$, …, $AFTER^{T = 4}$, $AFTER^{T \geq 5}$). Our sample excludes observations from the MMoU adoption year. This design employs all control and treatment countries' observations that occur 6 years or more before MMoU adoption as the benchmark. We interact each relative year indicator with Tobin's *q* (*Q*) and focus on the interaction terms. This figure presents the estimated coefficients and confidence intervals of the interaction terms.

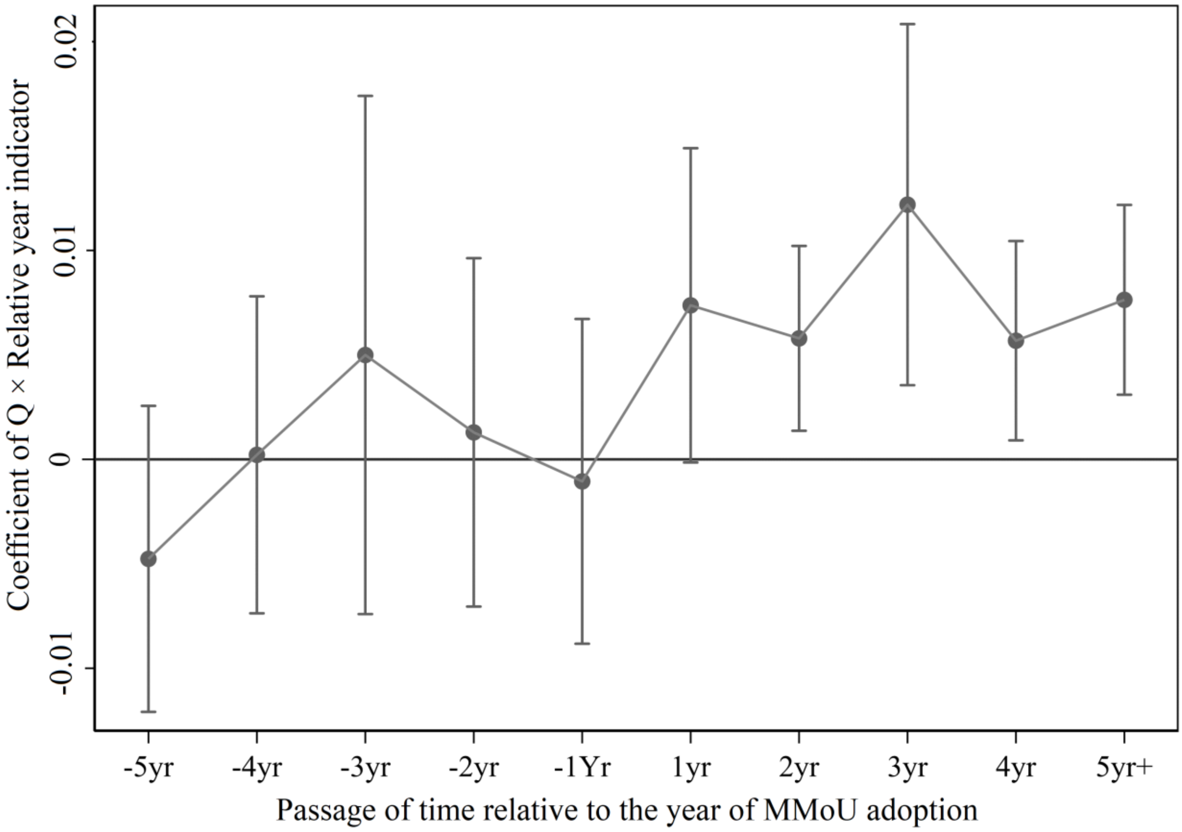

**Figure 2: Placebo test**

This figure shows the results of the placebo tests. We dispel the concern that our main finding is a product of chance by randomly reassigning treated firms to our sample. We repeat this procedure 1000 times and this graph shows the distribution of the estimated coefficients of the interaction term between Tobin's *q* (*Q*) and the pseudo *POST* dummy. The dashed line on the right side represents the actual coefficient estimated from our baseline model, which is 0.0077.

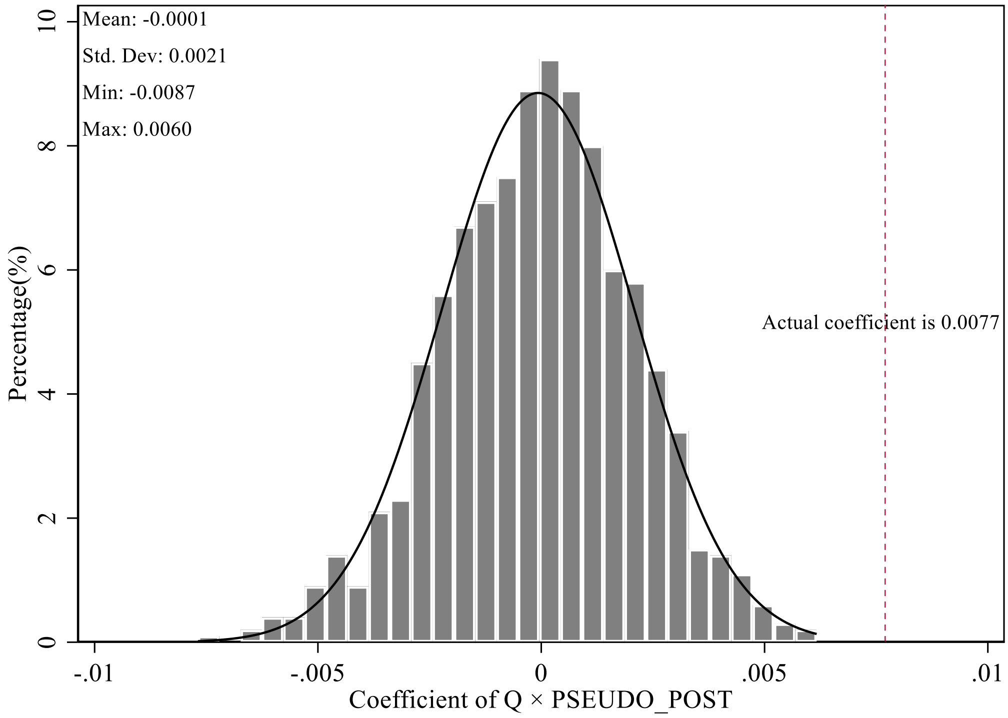

**Table 1. Sample description**

This table presents the sample distribution by country, year, and industry type. Our sample includes 14,076 firm-year observations for 1, 497 firms from 1997 to 2019. All continuous variables were winsorized at the 1st and 99th percentiles to mitigate the impact of outliers. All variables are defined in Appendix A.

Panel A. Sample distribution by home country

| Country/Region | MMoU Year | # of firm-year observations | % of firm-year observations |
|---|---|---|---|
| Antigua and Barb | − | 19 | 0.13 |
| Argentina | 2014 | 112 | 0.80 |
| Australia | 2002 | 315 | 2.24 |
| Belgium | 2005 | 59 | 0.42 |
| Bermuda | 2007 | 633 | 4.50 |
| Brazil | 2009 | 317 | 2.25 |
| Canada | 2002 | 2,455 | 17.44 |
| Cayman Islands | 2009 | 1,185 | 8.42 |
| Chile | 2018 | 190 | 1.35 |
| China | 2007 | 212 | 1.51 |
| Curacao | − | 26 | 0.18 |
| Denmark | 2006 | 59 | 0.42 |
| Finland | 2007 | 88 | 0.63 |
| France | 2003 | 391 | 2.78 |
| Germany | 2003 | 313 | 2.22 |
| Greece | 2002 | 32 | 0.23 |
| Hong Kong | 2003 | 125 | 0.89 |
| Hungary | 2003 | 21 | 0.15 |
| India | 2003 | 163 | 1.16 |
| Indonesia | 2014 | 45 | 0.32 |
| Ireland | 2012 | 614 | 4.36 |
| Israel | 2006 | 1,497 | 10.64 |
| Italy | 2003 | 133 | 0.94 |
| Japan | 2008 | 656 | 4.66 |
| Korea | 2010 | 104 | 0.74 |
| Liberia | − | 65 | 0.46 |
| Luxembourg | 2007 | 192 | 1.36 |
| Mexico | 2003 | 436 | 3.10 |
| Netherlands | 2007 | 525 | 3.73 |
| New Zealand | 2003 | 37 | 0.26 |
| Norway | 2006 | 102 | 0.72 |
| Panama | 2017 | 70 | 0.50 |
| Peru | 2012 | 41 | 0.29 |
| Philippines | 2007 | 33 | 0.23 |
| Portugal | 2002 | 19 | 0.13 |
| Russia | 2015 | 108 | 0.77 |
| Singapore | 2005 | 98 | 0.70 |
| South Africa | 2003 | 201 | 1.43 |
| Spain | 2003 | 97 | 0.69 |
| Sweden | 2011 | 179 | 1.27 |
| Switzerland | 2010 | 260 | 1.85 |
| Taiwan | 2011 | 119 | 0.85 |
| The Bahamas | 2012 | 52 | 0.37 |
| Turkey | 2002 | 18 | 0.13 |
| United Kingdom | 2003 | 1,153 | 8.19 |

| | | | |
|---|---|---|---|
| Venezuela | – | 13 | 0.09 |
| Virgin Islands | 2007 | 494 | 3.51 |
| Total | | 14,076 | 100.00 |

Panel B. Sample distribution by industry

| Fama-French industry code (10 industries) | # of firm-year observations | % of firm-year observations |
|---|---|---|
| Consumer Non-Durables -- Food, Tobacco | 942 | 6.73 |
| Consumer Durables -- Cars, TV's, Furniture | 450 | 3.21 |
| Manufacturing -- Machinery, Trucks, Plant | 2,144 | 15.31 |
| Oil, Gas, and Coal Extraction and Production | 994 | 7.10 |
| Business Equipment -- Computers, Software | 3,382 | 24.15 |
| Telephone and Television Transmission | 1,279 | 9.13 |
| Wholesale, Retail, and Some Services | 695 | 4.96 |
| Healthcare, Medical Equipment, and Drug | 1,554 | 11.10 |
| Other -- Mines, Constr, BldMt, Trans | 942 | 6.73 |
| Total | 14,076 | 100.00 |

Panel C. Sample distribution by year

| Year | # of firm-year observations | % of firm-year observations |
|---|---|---|
| 1997 | 418 | 2.97 |
| 1998 | 505 | 3.59 |
| 1999 | 531 | 3.77 |
| 2000 | 570 | 4.05 |
| 2001 | 640 | 4.55 |
| 2002 | 558 | 3.96 |
| 2003 | 489 | 3.47 |
| 2004 | 650 | 4.62 |
| 2005 | 615 | 4.37 |
| 2006 | 552 | 3.92 |
| 2007 | 546 | 3.88 |
| 2008 | 621 | 4.41 |
| 2009 | 558 | 3.96 |
| 2010 | 620 | 4.40 |
| 2011 | 637 | 4.53 |
| 2012 | 641 | 4.55 |
| 2013 | 684 | 4.86 |
| 2014 | 693 | 4.92 |
| 2015 | 708 | 5.03 |
| 2016 | 715 | 5.08 |
| 2017 | 721 | 5.12 |
| 2018 | 716 | 5.09 |
| 2019 | 688 | 4.89 |
| Total | 14,076 | 100.00 |

**Table 2. Summary statistics** ($N$ = 14,076)

This table reports the summary statistics and correlations. Panel A reports the sample size, mean, percentile, and standard deviation for our sample variables. Panel B reports the Pearson correlations for the variables in the baseline regression. Our sample includes 14,076 firm-year observations for 1,497 firms from 1997 to 2019. All continuous variables were winsorized at the 1st and 99th percentiles to mitigate the impact of outliers. All variables are defined in Appendix A.

| Variable | Mean | S.D. | P25 | P50 | P75 |
|---|---|---|---|---|---|
| *I* | 0.140 | 0.166 | 0.045 | 0.090 | 0.169 |
| *Q* | 2.144 | 2.348 | 1.058 | 1.443 | 2.264 |
| *POST* | 0.630 | 0.483 | 0.000 | 1.000 | 1.000 |
| *CF* | 0.043 | 0.264 | 0.024 | 0.092 | 0.152 |
| *SIZE* | 6.941 | 2.684 | 4.979 | 7.116 | 9.063 |
| *AGE* | 2.248 | 0.823 | 1.609 | 2.303 | 2.833 |
| *TANGI* | 0.311 | 0.256 | 0.092 | 0.239 | 0.504 |
| *SLACK* | 0.722 | 2.642 | 0.016 | 0.053 | 0.267 |
| *LOSS* | 0.353 | 0.478 | 0.000 | 0.000 | 1.000 |
| *ZSCORE* | 0.433 | 2.114 | 0.275 | 0.861 | 1.326 |
| *KSTR* | 0.173 | 0.207 | 0.000 | 0.100 | 0.268 |
| *KIND* | 0.173 | 0.182 | 0.032 | 0.116 | 0.254 |
| *DIV* | 0.485 | 0.500 | 0.000 | 0.000 | 1.000 |
| *GDPGR* | 0.027 | 0.028 | 0.012 | 0.027 | 0.040 |
| *GDPPC* | 4.158 | 1.664 | 3.388 | 4.169 | 4.841 |

## Table 3. The effect of regulatory cooperation among securities regulators on managerial learning from stock prices

This table presents the results of an examination of how regulatory cooperation among securities regulators affects managerial learning from stock prices. *POST* is an indicator that equals one for the year of MMoU entry and for all years after it, and zero otherwise. The dependent variable is corporate investment (*I*), measured as the sum of research and development, capital, and acquisition expenditures less cash receipts from the sale of property, plant, and equipment scaled by lagged total assets. *Q* is estimated as the market value of equity minus the book value of equity plus the book value of assets, scaled by the book value of assets, following McLean et al. (2012). All other variable definitions are detailed in Appendix A. Robust *t*-statistics, adjusted for country-level clustering, are reported in parentheses. All continuous variables were winsorized at the 1st and 99th percentiles. Constant terms were estimated but omitted for brevity. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

| Dep. Var. = *I* | (1)<br>Baseline model | (2)<br>Parallel trend test |
|---|---|---|
| ***Q* × *POST*** | **0.0077*****<br>**(3.11)** | |
| *Q* × *BEFORE* $^{T=-5}$ | | -0.0048<br>(-1.31) |
| *Q* × *BEFORE* $^{T=-4}$ | | 0.0002<br>(0.06) |
| *Q* × *BEFORE* $^{T=-3}$ | | 0.0050<br>(0.81) |
| *Q* × *BEFORE* $^{T=-2}$ | | 0.0013<br>(0.31) |
| *Q* × *BEFORE* $^{T=-1}$ | | -0.0011<br>(-0.27) |
| ***Q* × *AFTER*** $^{T=1}$ | | **0.0074***<br>**(1.97)** |
| ***Q* × *AFTER*** $^{T=2}$ | | **0.0058****<br>**(2.64)** |
| ***Q* × *AFTER*** $^{T=3}$ | | **0.0122*****<br>**(2.84)** |
| ***Q* × *AFTER*** $^{T=4}$ | | **0.0057****<br>**(2.40)** |
| ***Q* × *AFTER*** $^{T\geq5}$ | | **0.0076*****<br>**(3.38)** |
| *POST* | -0.0127**<br>(-2.52) | |
| *Q* | 0.0135***<br>(6.89) | 0.0127***<br>(5.35) |
| *CF* | 0.0303**<br>(2.18) | 0.0293**<br>(2.07) |
| *SIZE* | -0.0324***<br>(-14.76) | -0.0326***<br>(-14.02) |
| *AGE* | -0.0124*<br>(-1.73) | -0.0119<br>(-1.61) |
| *TANGI* | -0.0088<br>(-0.42) | -0.0088<br>(-0.41) |
| *SLACK* | -0.0024*<br>(-1.92) | -0.0025*<br>(-1.97) |
| *LOSS* | -0.0127*** | -0.0128*** |

| | | |
|---|---|---|
| | (-4.81) | (-4.76) |
| *ZSCORE* | -0.0051 | -0.0046 |
| | (-1.44) | (-1.30) |
| *KSTR* | -0.1164*** | -0.1171*** |
| | (-9.65) | (-10.26) |
| *KIND* | 0.0017 | 0.0030 |
| | (0.11) | (0.21) |
| *DIV* | 0.0027 | 0.0027 |
| | (0.67) | (0.69) |
| *GDPGR* | 0.0234 | 0.0069 |
| | (0.26) | (0.08) |
| *GDPPC* | -0.0122** | -0.0121** |
| | (-2.49) | (-2.63) |
| Relative year indicators | No | Yes |
| Firm and year FE | Yes | Yes |
| *N* | 14,076 | 14,076 |
| Adj. $R^2$ | 0.465 | 0.465 |

**Table 4. Robustness checks**

This table presents the results of the robustness checks of our earlier examination of how regulatory cooperation among securities regulators affects managerial learning from stock prices. Panel A presents the results for alternative fixed effects. In Column (1), we use industry-, year-, and country-fixed effects. In Column (2), we control for the firm- and country-time-varying fixed effects. Column (3) adds firm- and industry-time-varying fixed effects. Panel B presents the alternative sample. Columns (1) and (2) present the results of our main models, restricting the treatment firms to a short window of 3 and 5 years before and after the MMoU. Column (3) requires that the treatment firms have at least one observation in both the pre- and post-MMoU periods. In Column (4), we restrict the sample to countries that have adopted an MMoU to date. In Panel C, we use alternative investment measures as the dependent variables. Panel D shows the regression results for the stacked difference-in-differences design using window samples of 3, 4, and 5 years before and after the MMoU. All other variable definitions are detailed in Appendix A. Robust *t*-statistics, adjusted for country-level clustering, are reported in parentheses. All continuous variables were winsorized at the 1st and 99th percentiles. Constant terms were estimated but omitted for brevity. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A. Alternative fixed effects

| Dep. Var. = *I* | (1)<br>Industry, year, and country fixed effects | (2)<br>Firm and country × year fixed effects | (3)<br>Firm and industry × year fixed effects |
|---|---|---|---|
| ***Q* × *POST*** | **0.0118*****<br>**(3.78)** | **0.0082*****<br>**(3.40)** | **0.0071****<br>**(2.61)** |
| *POST* | -0.0182***<br>(-2.85) | | -0.0117**<br>(-2.07) |
| *Q* | 0.0122***<br>(8.04) | 0.0130***<br>(6.94) | 0.0131***<br>(6.37) |
| Baseline control variables | Yes | Yes | Yes |
| Fixed effects as indicated | Yes | Yes | Yes |
| *N* | 14,002 | 13,911 | 13,901 |
| Adj. $R^2$ | 0.270 | 0.464 | 0.471 |

Panel B. Alternative samples

| Dep. Var. = *I* | (1)<br>Restricted treatment firms to [−3, +3] | (2)<br>Restricted treatment firms to [−5, +5] | (3)<br>Restricted treatment firms to have both pre- and post-MMoU observations | (4)<br>Restricted to MMoU adoption country |
|---|---|---|---|---|
| ***Q* × *POST*** | **0.0087****<br>**(2.57)** | **0.0074*****<br>**(3.68)** | **0.0047****<br>**(2.26)** | **0.0078*****<br>**(3.16)** |
| *POST* | -0.0274**<br>(-2.29) | -0.0157<br>(-1.64) | -0.0140**<br>(-2.08) | -0.0132**<br>(-2.67) |
| *Q* | 0.0151***<br>(4.18) | 0.0138***<br>(5.81) | 0.0137***<br>(6.05) | 0.0135***<br>(6.82) |
| Baseline control variables | Yes | Yes | Yes | Yes |
| Firm and year FE | Yes | Yes | Yes | Yes |
| *N* | 3,958 | 6,507 | 9,187 | 13,953 |
| Adj. $R^2$ | 0.452 | 0.425 | 0.397 | 0.471 |

Panel C: Alternative investment measures

| | (1) | (2) |
|---|---|---|
| Dep. Var. = | *I_M* | *I_JW* |
| ***Q* × *POST*** | **0.0119*** ** | **0.0076** ** |
| | **(3.74)** | **(2.16)** |
| *POST* | -0.0153 | -0.0275*** |
| | (-1.43) | (-2.95) |
| *Q* | 0.0150*** | 0.0211*** |
| | (4.65) | (5.72) |
| Baseline control variables | Yes | Yes |
| Firm and year FE | Yes | Yes |
| *N* | 13,797 | 11,422 |
| Adj. $R^2$ | 0.343 | 0.396 |

Panel D. Stacked difference-in-differences design

| | (1) | (2) | (3) |
|---|---|---|---|
| Dep. Var. = *I* | Window [−3, +3] | Window [−4, +4] | Window [−5, +5] |
| ***Q* × *POST*** | **0.0076** ** | **0.0081** ** | **0.0085** ** |
| | **(2.30)** | **(2.35)** | **(2.56)** |
| *POST* | -0.0130 | -0.0113 | -0.0112 |
| | (-1.42) | (-1.30) | (-1.29) |
| *Q* | 0.0144*** | 0.0142*** | 0.0142*** |
| | (6.04) | (5.64) | (6.18) |
| Baseline control variables | Yes | Yes | Yes |
| Firm-cohort and year-cohort FE | Yes | Yes | Yes |
| *N* | 23,911 | 26,634 | 29,072 |
| Adj. $R^2$ | 0.391 | 0.384 | 0.378 |

**Table 5. Cross-sectional analysis based on the likelihood of cross-border cooperation**

This table presents the results of cross-sectional analysis examining whether the effect of regulatory cooperation among securities regulators on managerial learning from stock prices is moderated by the likelihood of cross-border cooperation. In Columns (1) and (2), *BLOCK* captures pre-existing blocking statutes for cross-listed firms, provided by Silvers (2020). *RESTRICTION* in columns (3) and (4) is Fernandez et al.'s (2016) overall inflow restrictions index, which captures the extent of capital controls. *USTRADE* in columns (5) and (6) is the percentile rank for trade flows for each country i, as reported by the IMF scaled by the destination country Gross Domestic Product (GDP). We then ranked the export destinations for each country by scaled exports, with the most important partner ranked at 100. Following Lang et al. (2020), the U.S. trade importance measure for country i is the percentile rank of the U.S. as an export destination. Yes (No) is defined based on whether the indicator equals 1(0). *NATO* in Columns (7)–(8) is an indicator of whether the firm's home country is a NATO member before the MMOU year, which indicates that the home country is strongly aligned with the U.S.. High (Low) is defined based on whether the firm in a given year is from a country with a higher (lower) value than the median. All other variable definitions are detailed in Appendix A. Robust *t*-statistics, adjusted for country-level clustering, are reported in parentheses. All continuous variables were winsorized at the 1st and 99th percentiles. Constant terms were estimated but omitted for brevity. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

| | Pre-existing blocking statutes (*BLOCK*) | | Overall inflow restrictions index (*RESTRICTION*) | | U.S. trade importance (*USTRADE*) | | NATO membership (*NATO*) | |
|---|---|---|---|---|---|---|---|---|
| Dep. Var. = *I* | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| | Yes | No | High | Low | High | Low | Yes | No |
| ***Q* × *POST*** | **0.0109***** | **0.0017** | **0.0056** | **0.0092***** | **0.0125***** | **0.0073** | **0.0096***** | **0.0046** |
| | **(3.94)** | **(0.46)** | **(1.16)** | **(4.46)** | **(8.55)** | **(1.55)** | **(3.64)** | **(1.41)** |
| *POST* | -0.0213** | -0.0034 | -0.0032 | -0.0162*** | -0.0110* | -0.0230* | -0.0209** | -0.0077 |
| | (-2.45) | (-0.38) | (-0.24) | (-3.22) | (-2.02) | (-1.84) | (-2.73) | (-0.89) |
| *Q* | 0.0136*** | 0.0130*** | 0.0158*** | 0.0165*** | 0.0115*** | 0.0169*** | 0.0154*** | 0.0116*** |
| | (4.05) | (6.85) | (2.88) | (7.87) | (6.79) | (5.50) | (4.45) | (5.31) |
| *CF* | 0.0151 | 0.0564*** | 0.1289*** | 0.0245*** | 0.0317** | 0.0394 | 0.0308** | 0.0325 |
| | (0.78) | (4.28) | (3.28) | (2.87) | (2.55) | (0.77) | (2.21) | (1.46) |
| *SIZE* | -0.0346*** | -0.0305*** | -0.0295*** | -0.0345*** | -0.0302*** | -0.0424*** | -0.0322*** | -0.0330*** |
| | (-10.86) | (-11.09) | (-5.50) | (-11.83) | (-19.10) | (-10.86) | (-17.26) | (-9.38) |
| *AGE* | -0.0238*** | 0.0045 | -0.0214** | -0.0101 | -0.0217** | 0.0016 | -0.0134 | -0.0092 |
| | (-3.75) | (0.45) | (-2.23) | (-1.15) | (-2.59) | (0.14) | (-1.36) | (-1.07) |
| *TANGI* | -0.0108 | 0.0037 | -0.0246 | 0.0118 | -0.0195 | 0.0064 | 0.0090 | -0.0238 |
| | (-0.41) | (0.14) | (-0.57) | (0.28) | (-1.19) | (0.13) | (0.24) | (-0.93) |
| *SLACK* | -0.0029*** | -0.0018 | -0.0051** | -0.0014 | -0.0042*** | -0.0048** | -0.0040*** | -0.0015 |
| | (-3.54) | (-0.81) | (-2.57) | (-0.88) | (-9.95) | (-2.64) | (-3.72) | (-0.83) |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| *LOSS* | -0.0155*** | -0.0081** | -0.0142** | -0.0139*** | -0.0135*** | -0.0111* | -0.0171*** | -0.0101*** |
| | (-6.40) | (-2.48) | (-2.66) | (-3.66) | (-3.35) | (-2.00) | (-7.17) | (-3.29) |
| *ZSCORE* | -0.0041 | -0.0048 | -0.0304*** | -0.0061* | -0.0048 | -0.0135 | -0.0056 | -0.0040 |
| | (-0.82) | (-1.06) | (-4.58) | (-1.80) | (-1.48) | (-1.38) | (-1.03) | (-0.77) |
| *KSTR* | -0.1346*** | -0.0945*** | -0.0655* | -0.1235*** | -0.1138*** | -0.1285*** | -0.1246*** | -0.1080*** |
| | (-8.49) | (-5.15) | (-1.90) | (-8.70) | (-14.22) | (-4.88) | (-7.31) | (-6.70) |
| *KIND* | 0.0270 | -0.0285 | -0.0163 | 0.0184 | -0.0098 | 0.0301 | 0.0192 | -0.0083 |
| | (1.19) | (-1.16) | (-0.49) | (0.69) | (-0.58) | (1.11) | (0.55) | (-0.55) |
| *DIV* | 0.0012 | 0.0039 | 0.0168*** | -0.0002 | 0.0024 | 0.0119** | -0.0024 | 0.0061 |
| | (0.23) | (0.72) | (3.25) | (-0.03) | (0.33) | (2.21) | (-0.38) | (1.37) |
| *GDPGR* | 0.1101 | -0.0864 | 0.0564 | 0.2241* | 0.0722 | -0.0444 | 0.1066 | 0.0152 |
| | (1.61) | (-0.73) | (0.52) | (1.95) | (0.68) | (-0.48) | (0.53) | (0.15) |
| *GDPPC* | -0.0048 | -0.0112*** | -0.0115 | -0.0230*** | -0.0222*** | 0.0029 | -0.0257** | -0.0109* |
| | (-0.35) | (-2.86) | (-0.85) | (-6.33) | (-4.52) | (0.34) | (-2.80) | (-2.00) |
| Firm and year FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| *N* | 7,137 | 6,939 | 3,218 | 7,928 | 3,089 | 8,104 | 5,569 | 8,507 |
| Adj. $R^2$ | 0.485 | 0.442 | 0.583 | 0.468 | 0.426 | 0.489 | 0.481 | 0.443 |
| Fisher's permutation test for the coefficient difference: (p-value) | 0.0000*** | | 0.0300** | | 0.0540* | | 0.0220** | |

## Table 6. Cross-sectional analysis based on the need for managerial learning from stock prices

This table presents the results of cross-sectional analysis examining whether the effect of regulatory cooperation among securities regulators on managerial learning from stock prices is moderated by the need for managerial learning from stock prices due to business uncertainty. We use several proxies of firm-level uncertainty about production function. In Columns (1) and (2), we use sales volatility (*SD_ROA*), measured as the standard deviation of sales scaled by total assets in the previous five years. In Columns (3) and (4), we use the volatility of stock returns (*SD_RET*) measured as the standard deviation of daily stock returns in the fiscal year. In Columns (5) and (6), we use analyst forecast dispersion (*DISPERSION*), defined as the standard deviation of the earnings per share forecast divided by the stock price at the beginning of the year. We also use two proxies for industry-level uncertainty. Specifically, we use industry-level investment intensity (*INVINTENSITY*) in Columns (7) and (8), and industry-level R&D intensity (*RDINTENSITY*) in Columns (9) and (10). High (low) is defined based on whether the firm belongs to a group with a value that is higher (lower) than the sample median. All the variables are defined in Appendix A. Robust *t*-statistics adjusted for firm-cohort-level clustering are reported in parentheses. All continuous variables were winsorized at the 1st and 99th percentiles. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

| | Earnings Volatility (*SD_ROA*) | | Return Volatility (*SD_RET*) | | Analyst Forecast Dispersion (*DISPERSION*) | | Industry-level investment intensity (*INVINTENSITY*) | | Industry-level R&D intensity (*RDINTENSITY*) | |
|---|---|---|---|---|---|---|---|---|---|---|
| Dep. Var. = *I* | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) |
| | High | Low | High | Low | High | Low | High | Low | High | Low |
| ***Q × POST*** | **0.0111**** | **-0.0011** | **0.0101***** | **0.0025** | **0.0119***** | **0.0064** | **0.0101***** | **-0.0035** | **0.0084***** | **0.0010** |
| | **(2.33)** | **(-0.22)** | **(3.10)** | **(0.63)** | **(3.72)** | **(1.30)** | **(3.23)** | **(-0.90)** | **(3.51)** | **(0.29)** |
| *POST* | -0.0200 | 0.0042 | -0.0017 | -0.0176* | -0.0237*** | -0.0113 | -0.0251*** | 0.0115 | -0.0207** | -0.0030 |
| | (-1.66) | (0.43) | (-0.17) | (-1.70) | (-3.09) | (-1.13) | (-3.31) | (1.18) | (-2.52) | (-0.44) |
| *Q* | 0.0133*** | 0.0112* | 0.0169*** | 0.0120*** | 0.0113*** | 0.0105*** | 0.0127*** | 0.0207*** | 0.0144*** | 0.0139*** |
| | (3.03) | (1.87) | (6.46) | (3.49) | (5.01) | (4.98) | (4.07) | (4.08) | (6.02) | (5.25) |
| *CF* | 0.0293** | 0.0166 | 0.0026 | 0.0656* | 0.0736*** | 0.0810 | 0.0338* | -0.0080 | 0.0217 | 0.0448** |
| | (2.20) | (0.42) | (0.14) | (1.92) | (3.65) | (1.01) | (1.90) | (-0.30) | (1.08) | (2.40) |
| *SIZE* | -0.0393*** | -0.0305*** | -0.0342*** | -0.0360*** | -0.0423*** | -0.0435*** | -0.0335*** | -0.0360*** | -0.0345*** | -0.0315*** |
| | (-8.12) | (-6.56) | (-8.81) | (-8.34) | (-14.57) | (-9.75) | (-9.45) | (-6.30) | (-11.13) | (-6.64) |
| *AGE* | -0.0134 | -0.0116 | -0.0060 | -0.0081 | -0.0064 | -0.0086 | -0.0053 | -0.0225*** | -0.0077 | -0.0075 |
| | (-1.55) | (-1.04) | (-0.90) | (-0.76) | (-0.90) | (-0.69) | (-0.58) | (-4.12) | (-0.74) | (-1.21) |
| *TANGI* | -0.0459 | -0.0109 | -0.0079 | -0.0499 | -0.0439 | 0.0097 | 0.0268 | -0.0201 | 0.0016 | -0.0081 |
| | (-1.67) | (-0.34) | (-0.28) | (-1.57) | (-1.33) | (0.20) | (0.76) | (-0.78) | (0.06) | (-0.22) |
| *SLACK* | -0.0022 | 0.0042 | 0.0004 | -0.0015 | -0.0065*** | -0.0026 | -0.0033* | -0.0008 | -0.0026 | -0.0026 |
| | (-1.17) | (0.62) | (0.24) | (-0.77) | (-3.76) | (-0.83) | (-1.97) | (-0.16) | (-1.16) | (-1.29) |
| *LOSS* | -0.0136** | 0.0039 | -0.0201*** | -0.0038 | -0.0098*** | 0.0026 | -0.0172** | -0.0077** | -0.0238*** | 0.0031 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | (-2.49) | (0.76) | (-4.00) | (-1.15) | (-3.70) | (0.29) | (-2.63) | (-2.44) | (-4.41) | (1.16) |
| *ZSCORE* | -0.0049 | 0.0243*** | -0.0049 | -0.0075 | -0.0062 | -0.0114 | -0.0147*** | 0.0137*** | -0.0105** | 0.0028 |
| | (-1.27) | (3.93) | (-1.32) | (-1.08) | (-1.40) | (-1.03) | (-3.38) | (2.79) | (-2.64) | (0.56) |
| *KSTR* | -0.1167*** | -0.1251*** | -0.0828** | -0.1476*** | -0.1116*** | -0.1819*** | -0.1448*** | -0.0921*** | -0.1723*** | -0.0787*** |
| | (-7.24) | (-3.89) | (-2.08) | (-9.83) | (-6.38) | (-5.00) | (-5.59) | (-3.48) | (-5.54) | (-6.26) |
| *KIND* | -0.0107 | 0.0228 | 0.0012 | -0.0173 | 0.0068 | -0.0071 | 0.0205 | -0.0137 | 0.0239 | -0.0155 |
| | (-0.40) | (0.99) | (0.03) | (-0.75) | (0.42) | (-0.21) | (0.75) | (-0.72) | (0.80) | (-0.93) |
| *DIV* | -0.0027 | 0.0188*** | 0.0178*** | -0.0093 | -0.0014 | -0.0045 | 0.0018 | 0.0030 | 0.0035 | 0.0088** |
| | (-0.47) | (4.42) | (3.26) | (-1.59) | (-0.20) | (-0.53) | (0.27) | (0.70) | (0.38) | (2.10) |
| *GDPGR* | -0.0247 | 0.1419* | 0.0575 | -0.0126 | 0.1512* | 0.0495 | 0.0102 | 0.0563 | 0.0274 | -0.0007 |
| | (-0.18) | (1.92) | (0.44) | (-0.19) | (1.90) | (0.64) | (0.10) | (0.85) | (0.23) | (-0.01) |
| *GDPPC* | -0.0098 | -0.0144** | -0.0298*** | 0.0009 | -0.0060 | -0.0111** | -0.0164** | -0.0033 | -0.0197*** | 0.0052 |
| | (-1.09) | (-2.55) | (-4.76) | (0.16) | (-1.06) | (-2.51) | (-2.18) | (-0.43) | (-3.19) | (0.96) |
| Firm and year FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| *N* | 5,308 | 5,341 | 6,651 | 6,673 | 5,115 | 5,131 | 6,920 | 6,943 | 6,879 | 6,819 |
| Adj. $R^2$ | 0.487 | 0.323 | 0.470 | 0.504 | 0.532 | 0.450 | 0.527 | 0.373 | 0.469 | 0.408 |
| Fisher's permutation test for the coefficient difference: (p-value) | 0.0020** | | 0.0060** | | 0.0380** | | 0.0000*** | | 0.0000*** | |

## Table 7. Cross-sectional analysis based on home country regulatory deficiencies

This table presents the results of cross-sectional analysis examining whether the effect of regulatory cooperation among securities regulators on managerial learning from stock prices is moderated by home country's regulatory deficiencies. In columns (1)-(2), we use *JUDEFF*, an index that assesses the "efficiency and integrity of the legal environment as it affects business, particularly foreign firms" (La Porta et al., 1998). The index ranges from 0 to 10, with lower scores indicating lower efficiency. In Columns (3) and (4), we use Djankov et al.'s (2007) country-level creditor rights index (*CRINDEX*) ranging from 0 to 4, with lower scores indicating lower credit protection levels. High (Low) is defined based on whether the firm belongs to a group with a value that is higher (lower) than the sample median. All the variables are defined in Appendix A. Robust *t*-statistics adjusted for firm-cohort-level clustering are reported in parentheses. All continuous variables were winsorized at the 1st and 99th percentiles. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

| | Judicial efficiency (*JUDEFF*) | | Creditor rights index (*CRINDEX*) | |
|---|---|---|---|---|
| Dep. Var. = *I* | (1) | (2) | (3) | (4) |
| | High | Low | High | Low |
| ***Q × POST*** | **0.0080*** | **0.0129***** | **0.0046** | **0.0142***** |
| | **(1.89)** | **(9.27)** | **(1.00)** | **(8.90)** |
| *POST* | -0.0230** | -0.0055 | -0.0004 | -0.0155*** |
| | (-2.49) | (-0.78) | (-0.03) | (-3.03) |
| *Q* | 0.0179*** | 0.0112*** | 0.0204*** | 0.0102*** |
| | (8.87) | (7.26) | (10.38) | (7.60) |
| *CF* | 0.0465* | 0.0227*** | 0.0449 | 0.0241*** |
| | (1.80) | (3.57) | (1.74) | (3.52) |
| *SIZE* | -0.0332*** | -0.0318*** | -0.0335*** | -0.0310*** |
| | (-8.48) | (-17.15) | (-9.51) | (-14.82) |
| *AGE* | -0.0028 | -0.0187 | -0.0091 | -0.0139 |
| | (-0.28) | (-1.71) | (-0.63) | (-1.40) |
| *TANGI* | 0.0792** | -0.0193 | 0.1034** | -0.0269* |
| | (2.38) | (-1.30) | (2.90) | (-1.87) |
| *SLACK* | -0.0029*** | -0.0055*** | -0.0027*** | -0.0055*** |
| | (-4.89) | (-3.32) | (-4.21) | (-3.53) |
| *LOSS* | -0.0126** | -0.0131** | -0.0149*** | -0.0117** |
| | (-2.70) | (-2.50) | (-3.11) | (-2.18) |
| *ZSCORE* | -0.0163*** | -0.0010 | -0.0160*** | -0.0009 |
| | (-3.35) | (-0.90) | (-3.21) | (-0.86) |
| *KSTR* | -0.1452*** | -0.0889*** | -0.1261*** | -0.0967*** |
| | (-6.78) | (-4.33) | (-4.82) | (-6.00) |
| *KIND* | 0.0575** | -0.0100 | 0.0291 | 0.0058 |
| | (2.40) | (-0.61) | (0.87) | (0.42) |
| *DIV* | 0.0054 | 0.0051 | 0.0041 | 0.0039 |
| | (0.85) | (0.88) | (0.63) | (0.72) |
| *GDPGR* | 0.2686 | 0.0738 | 0.1496 | 0.1244 |
| | (1.49) | (1.05) | (0.79) | (1.65) |
| *GDPPC* | -0.0239** | -0.0259*** | -0.0230** | -0.0248*** |
| | (-2.42) | (-9.41) | (-2.92) | (-9.41) |
| Firm and year FE | Yes | Yes | Yes | Yes |
| *N* | 5,153 | 5,846 | 4,510 | 6,900 |
| Adj. $R^2$ | 0.494 | 0.485 | 0.472 | 0.492 |
| Fisher's permutation test for the coefficient difference: (p-value) | 0.0560* | | 0.0020** | |

## Table 8. The effect of regulatory cooperation on firm profitability

This table presents the results of examining the effect of the MMoU on firms' profitability. In Column (1), the dependent variable is *ROA1* in year *t*, measured as the ratio of net income to average total assets. In Column (2), the dependent variable is *ROA2* in year t, measured as income before extraordinary items to average total assets. The variable of interest, *POST*, is an indicator that equals one for the year of MMoU entry and for all years after it, and zero otherwise. All control variables are measured in year *t*-1. All the variable definitions are detailed in Appendix A. Robust *t*-statistics adjusted for country-level clustering are reported in parentheses. All continuous variables were winsorized at the 1st and 99th percentiles. Constant terms were estimated but omitted for brevity. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

| Dep. Var. = | (1)<br>*ROA1* | (2)<br>*ROA2* |
|---|---|---|
| ***POST*** | **0.0161**** | **0.0153**** |
| | **(2.34)** | **(2.17)** |
| *CF* | -0.1073 | -0.1494 |
| | (-0.51) | (-0.73) |
| *SIZE* | -0.0243*** | -0.0188** |
| | (-3.48) | (-2.44) |
| *AGE* | -0.0023 | -0.0019 |
| | (-0.12) | (-0.10) |
| *TANGI* | 0.1278 | 0.1056 |
| | (1.64) | (1.39) |
| *SLACK* | -0.0020 | -0.0018 |
| | (-0.31) | (-0.31) |
| *LOSS* | -0.0009 | -0.0033 |
| | (-0.10) | (-0.33) |
| *ZSCORE* | 0.1025** | 0.1049*** |
| | (2.66) | (2.74) |
| *KSTR* | 0.0266 | 0.0117 |
| | (0.40) | (0.20) |
| *KIND* | -0.0187 | -0.0190 |
| | (-0.30) | (-0.37) |
| *DIV* | -0.0026 | -0.0035 |
| | (-0.22) | (-0.29) |
| *GDPGR* | 0.1142 | 0.1082 |
| | (1.39) | (1.48) |
| *GDPPC* | -0.0068 | -0.0002 |
| | (-0.44) | (-0.03) |
| Firm and year FE | Yes | Yes |
| *N* | 14,074 | 14,074 |
| Adj. $R^2$ | 0.506 | 0.516 |