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Liquidity Effects of Litigation Risk: Evidence from a Legal Shock

Tommaso Oliviero[*], Min Park[†], and Hong Zou[‡]

Abstract
Theory offers two diverging views on the effects of ex-ante litigation risk on corporate liquidity proxied by cash holdings. Ex-ante litigation risk, however, is difficult to measure. We test the liquidity effects of ex-ante litigation risk exploiting the phase-by-phase introduction of securities class actions (SCAs) in Korea. Following the increase in litigation risk, firms significantly increase their internal liquidity, especially in firms without D&O insurance coverage or those that are financially constrained. The results hold robustly in differences-in-differences and regression discontinuity designs. We also find that the increase in ex-ante SCA risk improves firms' stock market liquidity and valuation especially in firms that do not carry D&O insurance. Taken together, the results are consistent with the deterrence and protection effects of SCAs that increase firms' liability risk and lower the risk that investors face in investing in firms.

JEL classification: G30, G32, K22.

Keywords: Liquidity; cash holdings; valuation; litigation risk; class action; difference-in-differences; regression discontinuity.

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Table of contents

1. Introduction

Businesses are operating in an increasingly litigious environment (Norton Rose Fulbright, 2015). According to PricewaterhouseCoopers (2017), the frequency of securities class actions (SCAs) increased by roughly 70% in the U.S. and by 115% worldwide from 2007 to 2016.

Some prior studies have examined a firm's stock price reaction to *actual* lawsuits against the firm or its industry peers and generally reported a negative stock price reaction (e.g., Gande and Lewis, 2009; Hadlock and Sonti, 2012). In this paper, we investigate a less researched question – how do firms' internal liquidity or cash holdings[1] respond to the *perceived* increase in litigation risk (or ex-ante litigation risk)? This question is particularly interesting because theory offers two opposing views. To answer this question, we exploit a unique experiment – Korea's introduction of securities class actions (SCAs) in 2003, which constitutes an exogenous increase in firms' exposure to shareholder litigation risk. While our focus is on the effect of an increase in ex-ante litigation risk on corporate internal liquidity (as measured by cash holdings) that is theoretically ambiguous, we also examine the effect on a firm's stock market liquidity and valuation as supplements.

On the one hand, firms exposed to litigation risk have a *Strategic* motive to reduce internal liquidity in order to lower the expected payoffs to potential litigants in two ways (Scott, 1977). First, ex ante, reducing internal liquidity may lower a firm's likelihood of becoming a litigation target because litigation often targets firms with a deep pocket (Gillan

[1] In addition to cash, firms can also use lines of credit as a liquidity source. However, compared to cash holdings, access to lines of credit is state contingent, thereby subjecting the firm to significant uncertainty in terms of both the available amount and cost of credit when a firm's liquidity need arises. This is because contracts on lines of credit typically contain covenants including material adverse clauses that provide banks rights to reassess the borrower and limit its access to credit lines (Huang, 2017). Following a borrower's covenant violation, banks sometimes withdraw credit lines when they experience a liquidity shortage (Acharya, Almeida, Ippolito, and Orive, 2020). The access to lines of credit as a liquidity source therefore likely becomes uncertain after a firm is sued. Furthermore, the data on line of credit are not available for Korean firms, which is the focus of our study. For these reasons, we do not study lines of credit. Throughout the paper, we use (corporate) liquidity, internal liquidity, and cash holdings interchangeably, we use stock (market) liquidity to refer to how rapidly shares of a stock can be bought or sold without substantially impacting the stock price.

and Panasian, 2015). Second, ex post, even if a firm is sued, lower cash holdings help increase the bargaining power of the firm and limit the payoffs to potential litigants. Crane (2011) reports evidence consistent with this view.

On the other hand, exposure to litigation risk gives rise to a *Precautionary savings* motive, which dates back to Keynes (1936) and Miller and Orr (1966). Under this view, an increase in litigation risk increases a firm's demand for cash because it provides liquidity when the firm may not have sufficient funds to meet its obligations or invest because litigation not only consumes cash, but often increases the costs of external financing and hedging (e.g., insurance). This idea is formalized in Bolton, Chen, and Wang (2011) and is consistent with both survey evidence (Lins, Servaes, and Tufano, 2010; Campello, Giambona, Graham, and Harvey, 2011) and empirical evidence (Opler, Pinkowitz, Stulz, and Williamson, 1999; Almeida, Campello, and Weisbach, 2004; Bates, Kahle, and Stulz, 2009). Consequently, firms exposed to higher litigation risk are likely to increase their cash holdings. Arena and Julio (2015) find evidence supporting the *Precautionary savings* motive, which is different from the finding of Crane (2011) that is based on a different litigation measure and sample.

Testing these opposing arugments, however, is empirically challenging because ex-ante litigation risk is not directly observable and materialized litigation can be endogenous to firms' actions. To address these challenges, we exploit the passage of a law in 2003 that introduced SCAs in Korea in phases. Korea's phase-by-phase approach is unique in that the law was first applied in January 2005 to large firms with total book assets of at least KRW 2 trillion (roughly US$1.67 billion[2]) at the end of 2004 and then expanded to all Korean firms from January 2007. This change in Korea's litigation system represents a quasi-exogenous shock to listed firms in Korea and greatly increases the perceived litigation risk. The introduction of SCAs across varying asset thresholds in phases allows us to conduct both

[2] The asset threshold is converted into U.S. dollars using the exchange rate at the end of 2003 ($1=KRW 1197.5).

difference-in-differences (DID) analyses and regression discontinuity design (RDD) analyses to help identify the causal effect of litigation risk on liquidity. In contrast, other legal changes, such as the Private Securities Litigation Reform Act of 1995 in the U.S., affected all firms simultaneously, making it difficult to identify the effect of litigation risk.

Our sample comprises non-financial Korean companies that are included in the Korea Composite Stock Price Index (KOSPI) at the time the law was enacted. The main analysis is conducted over the period 2000-2005 (with the period 2000-2002 being the pre-event period and the period 2003-2005 being the post-event period).[3] In the DID analysis, the first difference is before and after the law passage in 2003 and the second difference is between treatment firms (with at least KRW 2 trillion in assets) and all other firms (the control group). Regression DID shows that the increase in litigation risk led treatment firms to increase their cash holdings by 59.5% around the law passage relative to control firms. Specifically, treatment firms increased their cash-to-assets ratio by 2.13 percentage points after the law passage compared to the increase of 0.61 percentage point for control firms. While the relative percentage increase of 59.5% in liquidity is gigantic, the context is that Korean firms generally hold a lower level of cash compared to US firms. The average level of cash holdings of treatment firms (control firms) was only 2.8% (5.3%) of assets before the law passage, and was 4.93% (5.91%) after the law passage (Table 2).[4] A dynamic DID analysis shows that the divergence in the trend of cash holdings between treatment and control firms occurred after, but not before, the law passage. The results indicate that firms respond to an increase in litigation risk by increasing their internal liquidity, consistent with the *Precautionary savings* motive.

[3] We stop the DID analysis in 2005 to mitigate the anticipation effect in control firms though the tenor of our results is not changed if we stop the analysis in 2006 instead in an early version.

[4] Pinkowitz, Stulz, and Williamson (2016) report that U.S. firms' cash-to-assets ratio increased similarly by 2 percentage points from 19.24% to 21.43% between 2008 and 2010 despite the high base level of 19.24%, which translates into a relative change of 11.4% in the cash to asset ratio in the period ((0.2143-0.1924)/0.1924*100).

We confirm the above baseline finding in several robustness checks. First, in the main analyses, we define treatment and control firms based on the total value of their assets at the end of 2003 because firms likely start to adjust their liquidity policy after the law passage in preparation for the SCA implementation starting from early 2005. Using the asset value in 2003 also helps mitigate the possibility that some firms may manipulate their 2004 reported asset numbers to be below the threshold so that they can be temporarily exempt from the law. Nevertheless, we show that our results remain similar if we define treatment and control firms based on the total asset values at the end of 2004, and hold after excluding "suspect" firms that may have manipulated their total assets to be below the KRW 2 trillion threshold in 2004.

Second, we also implement RDD analyses in a small bandwidth around the threshold of KRW 2 trillion and find that following the law passage, firms just above the threshold displayed a significantly higher average growth rate in the cash-to-assets ratio than firms just below the threshold. The findings hold in different optimal bandwidths obtained according to the procedure proposed by Imbens and Kalyanaraman (2012). We find a no-result in a placebo test that uses falsified asset size thresholds, which further buttresses the inference. The RDD analysis is invalid if the running variable (i.e., firms' total assets) can be precisely manipulated. We test the discontinuity of the running variable at the cutoff with both McCrary's (2008) test and Cattaneo, Jansson and Ma's (2020) test and find no evidence of manipulation. This result is consistent with our DID results being insensitive to defining treatment firms and control firms with the 2003 asset value or 2004 asset value.

Third, we find qualitatively similar effect when we use a propensity score matched sample of treatment firms and control firms so that these two groups of firms are comparable in common covariates (other than firm size that is different by design), suggesting that differences between treatment and control firms do not appear to drive our finding. While the treatment and control groups are different in size by design, it is important to stress that our

finding that larger treatment firms increase cash holdings more than smaller control firms is obtained after we control for firms' logarithm of sales revenue and is unlikely an artifact of size difference since large firms tend to be less financially constrained than small firms, and so have less need to hoard more cash.

Another concern is that large firms increased cash holdings more quickly than small firms in the aftermath of the 1997 Asian Financial Crisis. To mitigate this concern, we repeat the analyses using Korean treatment firms and their one-to-one propensity score-matched Taiwanese or Japanese companies as alternative control firms. The advantage of this strategy is that it provides a comparison among firms of similar size and so all firms are similarly affected by the 1997 Asian Financial Crisis. We again find results in line with the baseline results, both statistically and economically. We acknowledge that none of the above four robustness checks is perfect. For example, while our RDD analysis helps addresses the concern that firm size differences drive our finding, it uses a small number of firms around the asset size threshold and so only has limited testing power. To the extent that all these tests portray a consistent message, we have strong confidence in our inference.

We also explore the cross-sectional variation in the effect of litigation risk on firms' liquidity. We study the roles of directors' and officers' (D&O) liability insurance (i.e., D&O insurance), operating cash flow volatility, and financial constraints in shaping firms' liquidity response to litigation risk. D&O insurance provides alternative financing in the event of a lawsuit and protects a firm's D&Os. Firms with higher operating cash flow volatility or facing more financial constraints have a greater need to hoard cash to deal with the higher litigation risk following the passage of the law. We therefore expect to find a larger liquidity increase as a response to higher SCA risk in firms without D&O insurance coverage, with higher operating cash flow volatility or facing more financial constraints. This is what we find.

We next naturally extend our analysis from firms' internal liquidity to stock market

liquidity because SCAs may reduce adverse selection in trading, which should in turn result in higher stock liquidity (e.g., Copeland and Galai, 1983; Glosten and Milgrom, 1985; Kyle, 1985; Easley and O'Hara, 1987).[5] Specifically, the increase in litigation risk facilitated by SCA introduction helps discipline company insiders (managers and controlling shareholders) and deter frauds ex ante (the ex-ante governance effect). As a result, informed trading likely decreases and firms' transparency likely improves, which lowers the risk of minority investors (who are often uninformed) in investing in the company's stocks. In addition, if wrongdoing occurs, SCAs provide a more efficient legal recourse to protect investors from incurring losses (the ex-post compensation effect). Therefore, uninformed minority investors are expected to have greater confidence in a firm and are more likely to invest in its stocks after the introduction of SCAs, which results in a higher stock liquidity for the firm. Stock liquidity also has various desirable features for empirical analysis: it can be measured over relatively short intervals and is less anticipatory (Christensen, Hail, and Leuz, 2016). In the spirit of Christensen et al. (2016), we measure a firm's stock liquidity by (-1)*Amihud's (2002) illiquidity (the median of daily absolute stock return divided by trading volume in a year). Our DID analyses suggest that stock liquidity significantly increases after SCA introduction in treatment firms compared to control firms, and the improvement in stock liquidity is concentrated in firms that do not carry D&O insurance before SCA introduction. The results are consistent with the view that D&O insurance protection weakens the disciplinary effects of SCAs (Lin, Officer, and Zou, 2011).

Finally, we also examine the valuation effects of the introduction of SCAs. On the one hand, the introduction may increase firm valuation due to the ex-ante governance effect of higher litigation risk and the ex-post compensation effect if wrongdoing actually occurs

[5] We thank an anonymous reviewer for suggesting the stock liquidity analysis and the examination of firm valuation.

(e.g., Kahan, 1992; Rose, 2010). In addition, the introduction of SCAs lowers the risk that public investors face in investing in a firm, reducing the discount that investors impose in valuing the firm to price protect themselves from being expropriated by controlling shareholders. Consistent with this view, Huang, Wu, Yu, and Zhang (2020) report a positive relation between stock liquidity and firm valuation. On the other hand, the introduction of SCAs may lower firms' valuation because firms exposed to SCA risk tend to hoard more cash that cannot be used for operational investments, or investors anticipate firms' need to pay out cash to compensate some aggrieved parties who are no longer shareholders of SCA-targeted firms (Coffee, 2006). Higher litigation risk may also increase the cost of debt financing (Arena, 2018). Overall, the effect of the introduction of SCAs on firm value is an empirical issue. Employing Tobin's Q as a measure of firm valuation, we find that valuation increases for treatment firms compared to control firms after the introduction of SCAs. The result suggests a net benefit of SCA introduction in Korea. In addition, we find that the improvement in firm valuation is largely concentrated in firms that do not carry D&O insurance before SCA introduction, suggesting that D&O insurance protection weakens the disciplinary effects of SCAs (e.g., Lin et al., 2011).

Overall, this study sheds new light on the ambiguous link between litigation risk and firms' internal liquidity. Limited prior evidence is mixed. Arena and Julio (2015) find that firms targeted by SCAs hoard more cash. Conversely, Crane (2011) shows that firms hold less cash and increase debt in response to higher litigation risk. Due to the difficulty of finding a phase-in legal shock, both papers measure litigation risk using the actual occurrence of lawsuits in a focal firm or its industry, which may be, at least theoretically, entangled with simultaneous economic shocks and spillover effects. In contrast, our paper sheds light on the effect of ex-ante litigation risk on liquidity.

The paper that is closest to ours is Nguyen, Phan, and Sun (2018), which analyzes the

effects of the decrease in ex-ante shareholder *derivative* litigation risk arising from the staggered passages of universal demand laws on cash holdings in the U.S. and report that firms hold less cash in response to lower litigation risk. Donelson, Kettell, McInnis, and Toynbee (2021), however, question universal demand law passages as valid shocks to the derivative litigation risk that firms face. In addition, unlike in SCAs, D&Os are generally protected by the business judgement rule so that shareholders face a higher hurdle in bringing derivative suits than SCAs, and derivative litigation often results in governance changes instead of cash payouts. In addition, recent studies (e.g., Baker, Larcker, and Wang, 2022) highlight the potential inference bias that may arise in staggered DID estimation with two-way fixed effects,[6] and they show that once the bias is corrected, some previously reported DID results reverse in sign or become insignificant. Our paper instead exploits Korea's introduction of SCAs as a sharp single shock and tests the two different hypotheses regarding the effects of litigation risk on liquidity - the *Precautionary savings* motive and the *Strategic* motive. The setting allows us to conduct both a DID analysis and a RDD analysis to establish the causal effect of shareholder litigation risk on corporate liquidity.

Another important difference between our paper and prior studies on the effects of litigation risk on corporate cash holdings (Crane, 2011; Arena and Julio, 2015; Nguyen et al., 2018) is that we not only examine the effect of ex-ante litigation risk on firms' internal liquidity, but also on external market liquidity and firm valuation. In this vein, our study contributes to the literature on investor protection and stock liquidity. Brockman and Chung (2003) provide early evidence that variation in country-level investor protection affects market liquidity of stocks traded in the same stock exchange. Huang et al. (2020) report a positive relation between stock liquidity and valuation in an international sample and that the positive relation is stronger in countries with stronger investor protection. While both studies

[6] The bias often stems from using early-treated observations as controls for newly-treated observations.

show the effects of *cross-country* variation in investor protection, we extend this literature by providing evidence on how investor protection affects stock liquidity *within* a country.

2. Institutional Background

The Korean government passed the law introducing SCAs in 2003 and started to implement it on January 1, 2005. This landmark move was a result of lengthy and controversial discussions that started when the Korean economy was hit hard by the 1997 Asian Financial Crisis. The International Bank for Reconstruction and Development (IBRD), which provided recovery funds to the Korean government, strongly recommended the adoption of SCAs to improve corporate governance. The IBRD argued that by granting minority shareholders legal recourse via SCAs, shareholder discipline of corporate misbehaviors and overall corporate governance would improve.

However, the adoption of the SCA system was not without debates. The bill for SCAs was first presented by the Korean government in November 1998, but it went expired without a conclusion. The bill was resubmitted by an NGO in Korea in October 2000, and the resubmission triggered more rigorous discussions among the government, legal experts, business leaders, and the public than before. In 2001, the government proposed another draft and announced its intention to enact the law in 2002. The announcement was again met with objections and concerns from corporate leaders. After another round of amendments to the draft, the Securities-related Class Action Act (the SCA Act hereafter) was passed on July 23, 2003. The implementation of the SCA Act was in phases. It was first applied to firms with total assets above KRW 2 trillion at the end of 2004, and was then expanded to all public firms from January 1, 2007.

The introduction of SCAs increases corporate litigation risk and expected liabilities. Prior to the SCA Act, court rulings were only applicable to the shareholders who sue the

defendant firm and each aggrieved investor had to initiate an individual lawsuit seeking compensation, even if all the lawsuits shared the same cause of action (Chung, 2004). Under the SCA Act, any investor would be compensated in the same way according to the court ruling as long as they do not opt out of the SCA that by default includes all aggrieved investors into plaintiffs. The SCA Act also lowered the shareholding requirement for investors to bring derivative lawsuits against a firm's D&Os. While the old law had a 5% shareholding requirement for bringing a derivative lawsuit in all firms, the SCA Act provides that fifty shareholders collectively owning 0.01% of shares can bring a derivative lawsuit, and for large firms with assets greater than KRW 2 trillion, the new shareholding requirement was further lowered to 0.005%.

Table IA1 in the Internet Appendix provides a detailed comparison of the elements of SCAs between Korea and the U.S. In general, the SCA "law in the books" in Korea resembles that in the U.S. in terms of causes of actions, standing, the scienter requirement, the application of the fraud-on-the-market principle to reliance presumption, loss causation, and the spirit of class certification (Lee, 2017). However, there are some potentially important differences. In Korea, not only the primary violators who instructed, prepared or issued misleading statements, but also aiders and abettors can be listed as defendants, while in the U.S., only the primary violators can be sued in SCAs though the SEC can hold aiders and abettors liable. In addition, although, both in Korea and in the U.S., the plaintiffs are primarily responsible for proving a link between the damages and the corresponding misrepresentation, unlike the U.S., Korea lacks a discovery system that allows plaintiffs to request relevant evidence materials from the defendant firm. The lack of a discovery system in Korea is partially mitigated by shifting the burden of disproving scienter to defendants as well as by the court's ability to request the related regulatory bodies such as the Financial Supervisory Services or Financial Services Commission to investigate the matter when the court finds it

necessary (Lee, 2017). Moreover, in Korea, the loser pays the litigation fee of both parties, while in the U.S., each party pays its own litigation cost. The lead plaintiff or plaintiff lawyer in Korea needs to pay the filing fee (e.g., costs for notice, announcement, and appraisal) upfront that is calculated as a proportion of not only the amount-at-stake for the lead plaintiff but also the amount-at-stake for the other class members. In contrast, such filing fee is flat in the U.S. There is no restriction on the number of SCA suits that the plaintiff lawyer can represent in the U.S. so that it can diversify its risk by representing multiple SCA suits, but in Korea, a lawyer can generally represent plaintiff in up to three SCA cases over the past three years and so the plaintiff lawyer only has limited ability to diversify its risk. Finally, unlike the U.S. that is a common law country in which case precedents lay an important basis for judges to adjudicate SCA suits, Korea is a civil law country where judges rely on statutory written law.

The introduction of SCAs in Korea as a research setting has both advantages and some limitations, and their effects on our study deserve a careful discussion. In terms of advantages, the passage of the SCA Act in 2003 in Korea introduced SCAs to the country for the first time, and so it represents a large discrete quasi-exogenous increase in firms' perceived litigation risk. More importantly, the two-phase implementation of SCAs in Korea primarily increased the perceived litigation risk for large firms (but not for small firms) before 2007. This serves as a rare regulatory change that provides a control group and enables a relatively clean DID test of the different theoretical arguments regarding the effects of litigation risk on firms' internal liquidity (i.e., the *Strategic* motive and the *Precautionary savings* motive). In contrast, many legal changes regarding SCAs in the U.S. (e.g., the 1934 Securities Exchange Act that originally introduced the SCAs and the 1995 Private Securities Litigation Reform Act that reformed the SCAs) typically affected all firms simultaneously.

We, nevertheless, acknowledge that the Korean setting also has two limitations. First,

while the phase-in nature of the SCA implementation provides a necessary control group for the DID analysis, it is important to note that the control group is not ideal because they may not be completely free from the impacts of SCAs. Control firms already knew that in 2003 that they would be subject to SCAs from early 2007. Therefore, it is likely for these control firms to alter their liquidity policy before 2007, which implies an anticipation effect. We, however, do not believe the likely anticipation effect invalidates our DID analysis designed around the 2003 law passage for three reasons. First, we stop the DID analysis in 2005 to mitigate the anticipation effect in control firms. Second, to the extent that control firms started to increase their cash holdings even before 2006, it biases against us finding a large increase in the cash holdings of the first batch of firms affected by the SCA Act. Third, even if the control firms may be subject to some anticipation effects of SCA implementation, our DID analysis can still be valid as long as the control firms are less treated by the 2003 event than the treatment firms, which is so in our setting. Indeed, many DID papers in the literature have examined legal changes that affect all firms simultaneously but exploited the differences in the extent of the treatment received by firms (e.g., see Duchin, Matsusaka, and Ozbas (2010) and Guo and Masulis (2015) for the effects of stock exchange requirement on board independence).

Second, class action claims against public firms in South Korea had totaled KRW 550 billion (approximately US$459.3 million) by 2021, with the average claim size being KRW 50 billion (approximately US$41.8 million).[7] Therefore, the actual incidence of class actions in Korea was fairly low since the introduction of SCAs, which might be due to three reasons. One, some barriers exist for the use of SCAs. Jeong (2011) argues that the low incidence of SCAs is due in part to a lack of compensation for the class representative's time and efforts. According to Lee (2017), in SCAs in Korea, the lead plaintiff or its attorney has

[7] See https://www.scourt.go.kr/portal/notice/securities/securities.jsp.

to prepay the filing fee, notice and announcement fee, and appraisal fee not only for itself but also for other class members, and these fees are also proportional to the total amount-at-stake. This fee prepayment requirement, together with Korea's loser-pay fee rule, lowers the incentives of using SCAs for both the plaintiffs and their attorney. In contrast, in the U.S., the case filing fee is flat and each party pays its own legal fee. Two, the lack of the discovery system in Korea discourages potential plaintiffs' initiation of cases, because plaintiffs' costs of collecting the information to establish a case may become too high. Furthermore, the disadvantaged position of plaintiffs in obtaining information increases the risk aversion of plaintiff attorneys and incentivizes them to take on only those cases with high winning probabilities (Ko, 2007). Finally, to the extent that the threat of SCAs helps discipline company management and improve corporate governance and performance, actual occurrence of SCAs can become infrequent.[8]

However, we would like to emphasize that our analysis is predicated on the *perceived* increase in SCA risk induced by the passage of the SCA Act in 2003, rather than on actual lawsuits received or material losses caused by them. Indeed, our analysis stops in 2005 when the SCA Act was just implemented for large firms and the actual occurrence of SCAs should be still rare. Since it is difficult for firms to predict the frequency of the lawsuits at the introduction of SCAs and it is uncertain whether a lawsuit, if received, can be dismissed by the court or not, firms still need to take actions to get prepared for the perceived increase in litigation risk. In addition, an eventually failed lawsuit can still have a deterrence effect before it dismissed by the court. We therefore argue that the actual infrequent occurrence of SCAs does not necessarily invalidate our analysis based on a short window around SCA

[8] We acknowledge that there might be a declining effect of SCA introduction on corporate cash holdings over time if firms observe that few lawsuits are filed. However, firms need time to observe how SCAs unfold in Korea before they realize that the litigation risk is not as high as expected and therefore start reducing their liquidity hoarding. This possibility is likely beyond what is captured by our short-window analysis. We thank an anonymous editor for suggesting this point.

introduction.

3. Sample and Descriptive Statistics

In this section, we describe the sample and provide descriptive statistics for the sample. We include all non-financial public firms in the Korea Composite Stock Price Index (KOSPI) that have the necessary financial information for the period 2000-2005 (with the law passage year being 2003).[9] The resulting sample represents over 90% of the capitalization of the KOSPI. The financial data come from the KisValue database. We also hand collect D&O insurance purchase from firms' annual reports.

Examining a short event window (up to three years) helps us conduct a cleaner DID test and avoid the potential confounding events that may occur in a long-period analysis. In addition, this is necessary in our setting because the application of the law was expanded to all other firms beginning in January 2007 and there were no clean control groups from 2007.

We split the sample firms into two groups. Firms in the first group have total book assets over KRW 2 trillion at the end of 2003 (hereafter the "treatment group" or "treatment firms"). Firms in the other group include the remaining firms whose book value of total assets at the end of 2003 is below the KRW 2 trillion asset threshold (hereafter the "control group" or "control firms"). We define treatment firms based on their assets at the end of 2003 because after the passage of the SCA Act in mid-2003, some firms may theoretically have an incentive to manipulate accounting numbers and underreport their asset size to temporarily defer the compliance with the SCA Act.[10] We define the pre-event period as the period from 2000 to 2002 and the post-event period as the period from 2003 to 2005. We stop the post-event period

[9] The Korea Stock Exchange was the 14th largest stock market in the world based on its market capitalization as of 2016, with an average daily trading volume of roughly $60 billion. Its most representative stock market index, the KOSPI, which consists of all publicly traded firms in Korea and is one of the most actively traded indices in the world.

[10] We show in robustness tests that our key finding is robust to defining treatment firms based on their assets as of the end of 2004. Please refer to Section 4.3.2 for details.

in 2005 to mitigate the anticipation effect on the control group: since the application of the law was expanded to all other companies in January 2007, it is likely that the control group already started to respond in 2006. The final sample includes 692 companies, of which 52 firms belong to the treatment group.

Table 1 compares firm characteristics across the treatment and control groups in the pre-event period from 2000 to 2002. Detailed variable definitions appear in Appendix 1. All variables are winsorized at the 1% level in both tails. As expected, treatment firms are larger than control firms. The average size of book assets is KRW 7.358 trillion for treatment firms and KRW 268.17 billion for control firms, and the difference is statistically significant at the 1% level. Treatment firms also have higher sales, financial leverage, (operating) cash flows to assets ratio, and stock liquidity, but lower cash-to-assets ratio, cash flow volatility, net working capital (net of cash and equivalents) to assets ratio compared to control firms in the pre-event period. These differences are consistent with economies of scale and lower financial constraints at larger firms.

The average market-to-book ratio (M/B) of equity for treatment firms and control firms in the KOSPI index is 0.98 and 0.91, respectively. The low equity valuation of large Korean firms is not unique to our sample, but is comparable to the average M/B of 0.70 for the largest 93 Korean firms between 1980 and 1990 reported in Booth, Aivazian, Demirguc-Kunt, and Maksimovic (2001). It is also similar to the average M/B of 0.917 for a sample of large Korean firms between 1998 and 2004 reported in Almeida, Park, Subrahmanyam, and Wolfenzon (2011). This feature is likely to reflect the potential inefficiencies of *Chaebols* that are large family business groups with mutually held shareholdings and an internal capital market. The average financial leverage ratio (the book value of total debt over equity) is around 2 for both groups, and this indicates a total liability ratio of 60-70%. Again, this average figure is comparable to the mean liability ratio of 74% for the largest 93 Korean firms between 1980 and 1990 reported in Booth et al. (2001). In addition, Table 1 shows that

roughly 60% of firms in both the treatment and control groups are dividend payers.

Importantly, following Fang, Tian, and Tice (2014), we compare the pre-trend in the average growth rates of the cash-to-assets ratios (or their logged form) between treatment and control firms. We find that the differences in the growth rates prior to the passage of the SCA Act between the two groups are statistically insignificant. This is *prima facie* evidence for the no-violation of the parallel trend assumption that we will further test later.

Given that the treatment and control groups exhibit some differences in some pre-event financial characteristics, we also control for lagged financial characteristics in our DID analyses to mitigate the concern that any divergent trend in cash holdings between the two groups of firms observed in the post-event period is merely due to the differences in some pre-event financial characteristics. We also perform propensity score matching between treatment and control firms and use the matched sample as a robustness check.

[Insert Table 1 here]

4. Empirical Results

In this section, we conduct both univariate DID and multivariate regression DID analyses to assess the impact of an increase in SCA risk on corporate liquidity. On the one hand, firms may increase their cash holdings as a response to the anticipated increase in litigation risk. On the other hand, they might strategically decrease their cash holdings to lower the likelihood of being targeted by lawsuits and to strengthen their bargaining power in case they are sued.

We define an indicator variable *Post,* which equals 1 in the three years affected by the announcement of the law passage (2003-2005) and 0 in the three years before the announcement (2000-2002). We also define an indicator variable *Treat,* which equals 1 for firms with book assets of at least KRW 2 trillion at the end of 2003 and 0 otherwise.

4.1 Univariate evidence

We begin with univariate DID analyses to understand the patterns of the data, and the results are reported in Table 2. In Panel A, we report the results from examining the changes in the cash-to-assets ratio. From the pre-event to the post-event period, treatment firms increased their mean cash-to-assets ratio from 2.80% in the pre-event period to 4.93% in the post-event period (i.e., by 2.13 percentage points), and the change is statistically significant at the 1% level. In contrast, the increase in the cash-to-assets ratio for control firms in the same period is only about 0.61 percentage point (statistically significant at the 1% level).

Recall that these two groups of firms exhibited no statistically significant difference in the growth rate of the cash-to-assets ratio in the pre-event period. Therefore, the introduction of SCAs engenders a DID of 1.52 percentage points (= 2.13 – 0.61) in *Cash/TA* between the two groups, which is statistically significant at the 10% level. This suggests that when treatment firms become exposed to SCAs, they significantly increase their cash holdings, relative to control firms. This result is more consistent with the *Precautionary savings* motive than the *Strategic* motive. Despite the dramatic increase in the cash-to-assets ratio of treatment firms, it is important to note that in the three years following the introduction of SCAs, the mean cash-to-assets ratio of the treatment firms (4.93%) only came close to, but was still below, that of control firms (5.91%). This can also be seen in Figure 1 where we plot the patterns in annual average of *Log(Cash/TA)* for the treatment and the control firms, respectively, in the period 2000-2008. Between year 2003 and 2005, the cash-to-assets ratio of treatment firms continued to increase and almost reached control firms' average level of cash holding in 2005, though it slightly retreated in 2006 and started to increase again after 2007 when all firms were exposed to higher litigation risk.

In Panel B, following Opler et al. (1999), Dittmar, Mahrt-Smith, and Servaes (2003) and Harford, Mansi, and Maxwell (2008), we measure the level of cash holdings as *Log(Cash/TA)*, defined as the natural logarithm of the cash-to-assets ratio. This measure offers

two advantages. First, it mitigates the effect of outliers in the cash-to-assets ratio. Second, it allows the subsequent DID regression coefficients to be interpreted as an approximate percentage change in the cash-to-assets ratio and thereby facilitates the assessment of the economic magnitude. The results reported in Panel B are in line with what we observe in Panel A: for example, from the pre-event to the post-event period, treatment (control) firms increased their mean logged cash-to-assets ratio by 0.69 (0.15). The univariate DID estimate, which captures the difference in the pre-to-post change of mean *Log(Cash/TA)* between the treatment and control groups, is also statistically significant at the 1% level. In the next section, we provide estimates from DID regressions that control for time fixed effects and firm-level attributes.

[Insert Table 2 here]

4.2 Regression analysis

We estimate the following DID regression model:

$$y_{it} = \alpha + F_i + \lambda_t + \beta Treat_i \times Post_t + \eta X_{i,t-1} + \epsilon_{it} \qquad (1)$$

Following Opler et al. (1999), Dittmar et al. (2003), and Harford et al. (2008), the dependent variable y_{it} is the natural logarithm of the cash-to-asset ratio of firm *i* measured at the end of year *t*; *Post* equals 1 for year 2003-2005 and 0 in the three years before the announcement (2000-2002);[11] *Treat* equals 1 for firms with book assets of at least KRW 2 trillion at the end of 2003 and 0 otherwise. F_i and λ_t represent firm and year fixed effects, respectively; and $X_{i,t-1}$ is a vector of firm-level attributes lagged by one year relative to the dependent variable to account for the possibility that the differences in firm characteristics lead to differences in

[11] In unreported analyses, we obtain similar results if we include 2006 in the post-event period.

the cash-to-assets ratio. We follow prior studies on cash holdings (e.g., Opler et al., 1999; Dittmar and Mahrt-Smith, 2007) and control for firm size proxied by the natural logarithm of sales,[12] the cash flow-to-assets ratio, the volatility of the cash flow-to-assets ratio, the ratio of net working capital (NWC) excluding cash and cash equivalents to assets, the market-to-book ratio of equity, financial leverage, capital expenditure scaled by assets (Capex/TA), and a cash dividend payout dummy in the regression models. Please refer to Appendix 1 for the details of the variable definitions.

Since lagged time-varying firm-level control variables could be contaminated by the legal change, we first report the results from the baseline DID regressions without these control variables, and then add them in the regressions for robustness check. In column (1) of Table 3, we estimate Equation (1) without the control variables. In column (2), we add control variables described above. Both columns show an increase in the logged cash-to-assets ratio of treatment firms relative to the control firms around the introduction of SCAs. The point estimate of the DID item in column (2) implies an increase in the cash-to-assets ratio by 59.5% (=*exp*(0.467)-1) relative to control firms after the introduction of SCAs. The evidence is consistent with the *precautionary savings* motive – firms increase their internal liquidity as a response to the perceived increase in litigation risk.

Among the control variables, consistent with Opler et al. (1999), we find that a higher cash-to-assets ratio is associated with smaller firm size proxied by sales revenue and a higher operating cash flow. But different from the finding of Opler et al. (1999), a Korean firm with a higher net working capital excluding cash holdings also appears to hold more cash. In addition, firms with a larger capital expenditure have lower cash holdings. Other variables are not statistically significant.

[12] Since our treatment and control firms are classified based on book assets, we use sales revenue as a proxy for firm size. Controlling for firm size mitigates the concern that our results are merely due to different firm size between the treatment and control groups. Please see more on this in Section 4.3.2.

[Insert Table 3 here]

In columns (3) and (4) of Table 3, we provide estimates from dynamic DID regressions where we interact the indicator variable *Treat* with individual year dummies to capture the time-varying effects of the law on cash holdings before and after its passage. Note that in the regression specifications, year 2000 is the omitted reference period. Specifically, the model we estimate is as follows:

$$y_{it} = \alpha + F_i + \lambda_t + \beta_1 Treat_i \times Y2001 + \beta_2 Treat_i \times Y2002 + \beta_3 Treat_i \times Y2003 + \beta_4 Treat_i \times Y2004 + \beta_5 Treat_i \times Y2005 + \eta X_{t-1} + \epsilon_{it} \quad (2)$$

The results from estimating Equation (2) are reported in columns (3) and (4) of Table 3. The results reported in column (3) show that there is a parallel trend in cash holdings between treatment and control firms as evidenced by the insignificant coefficients on *Treat*Y2001* and *Treat*Y2002*. The divergence in the evolution of the cash-to-assets ratio between treatment and control firms emerged in 2003, and continues through 2005 despite a small correction in 2004 after the sharp increase in 2003, suggesting that the effects can be attributed to the introduction of SCAs in 2003. A graphical demonstration of these dynamics in trend is shown in Figure 2 that is based on the coefficient estimates of the interaction terms between year dummies and *Treat* similar to column (3) of Table 3 but including years up to 2008. It is evident that there is no evidence of a violation of the parallel trend assumption.

In column (4), we add a large vector of lagged firm-level control variables and the results are generally similar though the coefficient of *Treat*Y2004* becomes statistically insignificant (with a *t*-value of 1.50) perhaps because the liquidity effect of SCA risk is partially captured by changes in the control variables.

Note that, in our DID baseline analysis, we focus on the first event because we argue

that this is the only event that has a clear control group for identifying the causal effect of SCA introduction on the first batch of compliant firms. The extension of the law to the second group of firms was clearly planned ahead with a long lead time before implementation. This presents two difficulties for conducting a DID analysis of the second SCA event. First, when the second group of firms become formally treated by the SCA Act, all listed Korean firms have already been subject to the effect of the law, leaving no clean control group for the second group of firms. Recent studies (e.g., Baker et al., 2021) highlight the potential inference bias that may arise in a staggered DID estimation, and a major source of such bias is the use of early-treated firms as the control group for newly-treated firms. According to these authors, only never-treated firms and not-yet-treated firms are the clean control group in staggered DID estimations.

Second, due to the long waiting period for firms smaller than KRW 2 trillion, it is uncertain when this group of firms actually started to change their financial policies in preparation for the scheduled compliance with the SCA Act. Figure 1 shows that the average cash holdings in control firms exhibited a significant increase in 2005 followed by a small reversal in 2006 and a flat-out in 2007, but then a significant increase in 2008 again. So, it appears that the second phase of SCA implementation also influences the liquidity of the second group of firms. In addition, since control firms are smaller, it is well known that it is more lucrative for SCAs to target large firms due to their deeper pockets. This, coupled with the already higher cash holdings in control firms, means that control firms may have less need to dramatically increase their cash holdings after 2007.

Subject to the above caveat, we have performed a staggered DID analysis over the period 2000-2008 that exploits both events. We find that the estimates reported in Table IA2 of the Online Appendix deliver consistent results and show an economic magnitude of 27%

increase in liquidity (=*exp*(0.239)-1).[13]

4.3 Robustness and extensions

In this section, we conduct several robustness checks of our baseline results and provide some extensions to the above analysis.

4.3.1 Redefining treatment firms using asset size in 2004

In the baseline regression analysis in Table 3, we define treatment firms as those that report at least KRW 2 trillion assets at the end of 2003 to mitigate the effects of potential firm size manipulation to defer compliance. In practice, however, the application of the SCA Act relied on reported assets at the end of 2004 to determine which firms were subject to SCAs starting from January 2005. We thus use the 2004 asset size for a robustness check and report the DID results in columns (1) and (2) of Table 4 Panel A. The estimates remain similar in terms of both the economic magnitude and statistical significance, suggesting that there is no evidence of firm size manipulations in our sample. In unreported analyses, we find that most of the treatment and control firms remain in the same classification bucket (688 firms) if we measure asset sizes in 2004 rather than in 2003, with only 4 firms switching their classification of the control and treatment status.

A related concern is that firms whose asset size was below KRW 2 trillion at the end of 2003 may have managed their asset growth to report an asset size below KRW 2 trillion at the end of 2004, thereby temporarily exempting themselves from the exposure to SCAs. To address this concern, we exclude 18 firms that may have suppressed their asset growth, defined as firms whose asset growth rate in 2004 was lower than that in 2003, and whose total asset size in 2003 was between KRW 1 and 2 trillion. The DID results after dropping these 18

[13] In the staggered DID test, the event year indicator *SCA(0)* is equal to 1 for 2003 (the SCA Act passage year) for firms with at least KRW 2 trillion assets or is equal to 1 for 2007 when the remaining firms become treated. *SCA(-1)* stands for one year prior to the event year, and *SCA(+1)* stands for one year after the event year. Other SCA dummy variables are defined analogously.

firms are reported in columns (3) and (4) of Panel A and they are again qualitatively similar. Taken together, the results in Panel A of Table 4 indicate that our observed DID results are not driven by firms' strategic behaviors in avoiding becoming the first batch of compliant firms.

[Insert Table 4 here]

4.3.2 Results from the regression discontinuity analysis

To mitigate the concern about the confounding effects of the difference in firm size between treatment and control firms, we provide estimates from a regression discontinuity design (RDD) that takes advantage of the law-specified firm size threshold. This analysis focuses on a narrow bandwidth around the asset size threshold (KRW 2 trillion) used to classify firms into the treatment and control firms. In particular, for firm *i*, we define the outcome variable to be the average annual change in the cash-to-assets ratio in the period from 2000 to 2005. We define the running variable as the total assets at the end of 2003, normalized to take the value of zero when total assets are equal to KRW 2 trillion. Since the RDD estimation allows for non-linear effects of the running variable on the outcome variable around the KRW 2 trillion threshold, we also cut the 5% and 95% tail of the distribution of assets to estimate the effects in a sample that is closer to the threshold.

The RDD analysis can be invalid if the running variable can be precisely manipulated. A jump or fall in the density at the threshold likely implies the existence of sorting that threatens the RDD analysis. Cattaneo et al. (2020) provide a refined manipulation test constructed using the results for local polynomial distribution estimators. We run the Cattaneo et al. (2020) test with a null hypothesis that there is no discontinuity of the density at the threshold and present it graphically in Figure 3. The *p*-value derived from the robust version of the test is 0.393 and so the null hypothesis cannot be rejected. This result is also confirmed by a "standard" McCrary test with a *p*-value of 0.234. We therefore conclude that there is no

evidence of asset manipulation at the asset size cutoff. This also echoes the previous finding reported in Section 4.3.1 that our DID results are insensitive to defining the treatment and control groups with the 2003 or 2004 asset value.

In Table 4 Panel B, we present the RDD regression results. In the first row, we report the estimation results within the optimal bandwidth determined by Imbens and Kalyanaraman's (2012) approach, and we end up with a small local sample of 60 firms around the KRW 2 trillion threshold; in rows (2) and (3) we report the coefficient estimates within the half and double of the optimal bandwidth reported in row (1), respectively. In column (2) of Panel B, we report the total number of firms used for the estimates for each bandwidth. In the RDD regressions, we do not include firm fixed effects given that the dependent variable is measured using annual changes. The results are based on regressions without control variables due to the small sample size in some rows.[14] The baseline results in row (1) show that firms above the threshold increased liquidity more than those under the threshold. The estimates are statistically significant and robust to different bandwidths.

Figure 4 presents these estimates graphically, both regarding the average annual change in cash (the left-hand panel) and the average annual change in the cash-to-assets ratio (the right-hand panel). The figure confirms the presence of a significant discontinuity in the annual change in cash holdings around the asset threshold but also reveals a structural limitation of our regression discontinuity analysis: most of our sample firms are smaller and further away from the asset threshold of KRW 2 trillion. This means that we only use a small sample of firms in the RDD estimation (i.e., within the baseline bandwidth, we have 60 firms with 15 of them belonging to the treatment group). As a result, we only view the RDD results as suggestive and supplementary to our DID analysis.

[14] Including the average changes in control variables (i.e., *Log(Sales)*, *Cash flow/TA*, *Cash flow volatility*, *NWC/TA*, *Market-to-book of equity*, *Financial leverage*, *Capex/TA*, *Dividend payment dummy*) in row 1 (Baseline bandwidth) and row 3 (double of bandwidth) of Table 4 Panel B produces similar results. However, we cannot include these control variables in row 2 (half of bandwidth) due to the very small sample size.

4.3.3 Placebo tests using false size thresholds

We also conduct placebo tests that redefine the treatment and control groups based on false thresholds of asset sizes at the end of 2003: KRW 1 trillion, KRW 0.5 trillion, KRW 0.1 trillion. If the increase in liquidity of the treatment firms is due to the increase in shareholder litigation risk at the asset threshold prescribed by the law, we should not observe similar changes in liquidity for treatment and control firms defined based on false asset size cutoffs. The no-results reported in Table 4 Panel C are in line with our expectation.

4.3.4 Results from using matched treatment and control firms

Given that there are significant pre-event differences between the treatment and control firms, we generate a matched sample with propensity score matching to mitigate the concern that differences in firm characteristics between treatment and control firms lead to our observed DID results.

We start from our initial baseline sample of treatment and control firms. We keep firms with non-missing financial information and implement the matching procedure using pre-event observations (2000-2002). Specifically, we run a propensity score matching algorithm with the following covariates (averaged over the pre-event period 2000-2002): NWC over total assets, cash flow over total assets, cash flow volatility, and the market to book ratio.[15] We then use the nearest neighbor matching procedure and select firms that belong to the same industry (defined at the equivalent of two-digit SIC code) and are closest in propensity score.

Following the above matching strategy, we identify two balanced samples of 39 treatment and control firms. The descriptive statistics of the matched sample are reported in

[15] Note that we cannot match on total assets or net sales, as these variables, by design, quasi-perfectly identify the assignment to the treatment and control groups. For size difference, we still rely on controlling for lagged logged sales revenue in our DID models, the regression discontinuity analysis in Section 4.3.2, and the use of matched Japanese or Taiwanese firms as control firms in Section 4.3.5.

Table 5 Panel A. The summary statistics confirm that the two groups in the matched sample do not display significant differences with regard to the covariates used in matching as well as firm observables not used in matching in the pre-event period except for the size-related variables (i.e., logged total assets and logged sales) and the level of cash holdings that is largely driven by size difference. DID estimations do not require treatment firms and control firms to have the same level of the dependent variable before the event, as long as there is no violation of the parallel trend assumption. We then report in Panel B the DID estimation results using the matched sample. Column (1) repeats the baseline analysis and shows that the estimated effect is qualitatively similar to the baseline result. Column (2) displays the results of the dynamic DID and shows that the divergence in the trend of cash holdings between treatment and control firms occurred after, but not before, the law passage in 2003.

[Insert Table 5 here]

4.3.5 Results from using matched Japanese and Taiwanese firms as control firms

Lastly, we consider propensity score-matched firms from Japan and Taiwan as an alternative control group. Japanese and Taiwanese firms are natural control firms for Korean firms because they often operate in similar lines of business (e.g., manufacturing and exporting of electronics) (see Kuznets, 1988; Liu and Hsu, 2006), are located in the same region, and were all affected by the 1997 Asian Financial Crisis. By showing that the sharp increase in liquidity after 2003 is specific to Korean treatment firms that are subject to the newly introduced SCAs, we can rule out the concern that the increase in liquidity is merely due to a general trend for large firms in the aftermath of the 1997 Asian Financial Crisis.

We obtain data on Korean, Japanese, and Taiwanese firms from Compustat Global. Since the variables in Compustat Global are denominated in each country's local currency, we convert them into U.S. dollars using the average exchange rates in a year. We start from our initial sample of 52 Korean treatment companies over the period from 2000 to 2005 and

merge it with all Taiwanese and Japanese firms available in Compustat Global with non-missing financial information throughout the period from 2000 to 2005.

To implement the matching procedure, we run a propensity score matching algorithm with the following covariates averaged over the pre-event period: logged total assets, the cash-to-assets ratio, and the cash flow-to-assets ratio. We also match on the quintile dummies based on the distribution of the growth rate in the cash-to-assets ratio in the pre-event period, and industry membership. We then use the nearest neighbor matching procedure and select firms that belong to the same industry and are closest in propensity score.

The above matching procedure identifies a control group of 31 Japanese companies and 4 Taiwanese companies from the same industry for a sample of 35 Korean treatment firms. We report the DID estimation results from using the matched sample in Table 6. Column (1) repeats the baseline analysis in Equation (1) and shows that the estimated effect is both statistically significant and quantitatively comparable to our baseline results reported in column (2) of Table 3 using only Korean control firms. The results in column (2) provide estimates from dynamic DID analyses, which show that there was no pre-trend in cash holdings prior to 2003 and a persistent increase in cash holdings of treatment firms following the introduction of SCAs in Korea.

[Insert Table 6 here]

5. Cross-Sectional Analyses

In this section, we provide evidence regarding the heterogeneities in the effect of SCA introduction on firms' cash holdings along three dimensions: the presence of D&O insurance coverage, operating cash flow volatility, and the presence of financial constraints. Importantly, we measure the cross-sectional variation in these variables during the pre-event period to avoid using variables that are endogenously affected by the litigation risk shock.

First, we investigate whether firms that carried D&O insurance and firms that did not

carry D&O insurance in the year prior to the passage of the SCA Act responded differently to the increase in litigation risk. Since D&O insurance provides coverage against litigation costs and damage awards when a firm and its D&Os are sued by shareholders (Chalmers, Dann, and Harford, 2002), we hypothesize that insured firms likely increase their cash holdings to a lesser extent following the SCA introduction. We hand collect the information on D&O insurance purchase from mandatory disclosures in firms' annual reports.

Columns (1) and (2) of Table 7 report the regression results separately for firms that did, and did not, carry D&O insurance in 2002. The estimates indicate that the increase in cash holdings is concentrated in firms that did not carry D&O insurance coverage before the law change. This result supports the view that D&O insurance provides a hedge against litigation risk and is consistent with the *Precautionary saving* motive of holding cash amid an increase in litigation risk when there is no D&O insurance coverage.[16] The difference between the coefficients on the interaction term *Treat*Post* displays a *p*-value of 0.113 from a Wald-test of difference as reported at the bottom of the table.

[Insert Table 7 here]

Next, we consider the possibility that firms with different levels of operating cash flow volatility would react differently with liquidity policy to the increase in litigation risk. On the one hand, firms subject to a higher level of cash flow volatility are riskier and more prone to a stock price crash that often triggers an SCA; on the other hand, firms with volatile operating cash flows are less able to withstand the high legal defense costs and/or damage awards after being targeted by an SCA. Therefore, cash flow volatility exacerbates the higher liquidity

[16] Although firms without D&O insurance prior to the law may initiate the insurance after the law change, the price of the coverage increased significantly after the law change as shown in Park (2018). The increase in price was because insurance firms were cautious about insuring many risky new clients that are prone to adverse selection, and this price increase together with the tightened-up underwriting standard should have prevented some firms from securing such insurance.

demand arising from higher litigation risk, consistent with prior studies that show a positive relation between precautionary savings and cash flow volatility (e.g., Opler et al., 1999; Han and Qiu, 2007). To test for this possibility, we compute the standard deviation of the ratio of annual operating cash flow to total assets over the five-year period 1998-2002 before the event year. We then divide the sample into high-volatility firms (i.e., *High*) and low-volatility firms (i.e., *Low*) based on the median operating cash flow volatility measured before the introduction of SCAs.

Columns (3) and (4) of Table 7 report the regression results separately for the *Low* and *High* groups. As expected, the estimates suggest that the increase in cash holdings is more pronounced in firms that exhibited a high volatility of operating cash flows before the law change (column (4)). The DID coefficient estimate for firms with more volatile operating cash flows more than doubles that for firms with less volatile operating cash flows. We note that, although sizeable, the difference between the coefficients on the interaction term *Treat*Post* is not statistically significant at conventional levels (p-value = 0.280).

Lastly, we investigate the role of financial constraints in moderating the effect of litigation risk on firms' liquidity. We follow Almeida et al. (2004) in defining financially constrained firms and unconstrained firms. Constrained firms are those firms that have positive amounts of debt on their books, but with no bond or commercial paper ratings. Unconstrained firms are those that have bond or commercial paper ratings, or those without ratings nor debt.

Columns (5) and (6) of Table 7 report the regression results separately for financially unconstrained and constrained firms. The estimates suggest that the increase in cash holdings is more pronounced in firms that are financially constrained (column (6)), although the increase in cash holdings in less constrained treatment firms is also statistically significant (column (5)). The difference in the DID estimate is statistically significant at the 1% level as

indicated by the Wald-test reported at the bottom of the table.

Taken together, the above findings indicate that the increase in cash holdings is larger in firms that have no protection of D&O insurance coverage, have more volatile operating cash flows, or face more financial constraints. These firms have a stronger demand for precautionary savings and hence respond more significantly to the increase in litigation risk.

6. Additional Results

Thus far, we have examined the effects of an increase in ex-ante litigation risk induced by SCA introduction on firms' internal liquidity. In this section, we extend the analysis to the impacts on firms' stock market liquidity, firm valuation as well as investment.

6.1 The effects of SCA introduction on stock liquidity

Examining the effects of SCA introduction on firms' stock liquidity is not only theoretically important but also empirically desirable. Theoretically, SCA introduction helps discipline company insiders (managers and controlling shareholders) and deter frauds ex ante (the ex-ante governance effect). As a result, firms' transparency likely improves, and informed trading likely decreases, which lowers the risk that minority investors (who are often uninformed) face in investing in stocks. In addition, if wrongdoing occurs, SCAs provide a more efficient legal recourse to compensate for investors' losses. In turn, uninformed minority investors are expected to have greater confidence in a firm's stocks and are more likely to buy its stocks, which results in a higher stock liquidity. Indeed, Brockman and Chung (2001) and Huang et al. (2020) provide evidence with cross-country data that stronger country-level investor protection helps improve stock liquidity. Empirically, stock liquidity also has desirable attributes: it can be measured over relatively short intervals and is less anticipatory.

In the spirit of Christensen et al. (2016) and Huang et al. (2020), we measure a firm's

stock liquidity by (-1)* Amihud's (2002) illiquidity (the median of daily absolute stock return divided by trading volume in a year) and a higher value of the transformed measure indicates higher liquidity. We expect an increase in stock liquidity following the SCA introduction in 2003 for the treatment firms. The DID results, reported in column (1) of Table 8 Panel A, suggest that stock liquidity significantly increased following the introduction of SCAs in treatment firms compared to control firms.

The dynamic DID analysis reported in column (2) of Table 8 Panel A shows that the divergence in stock liquidity between the treatment firms and control firms appears after the passage of the SCA Act in 2003 but not before. The positively significant interaction terms before 2005 show that there is still a sort of anticipation effect in stock liquidity in the Korean setting, perhaps because Korea's introduction of SCAs in 2003 is such a landmark shock to the traditionally weak protection of public minority investors in Korea firms that market participants already start to factor the significant governance effects on firms in their trading before the formal implementation of the law.[17] Indeed, Korean firms typically have a governance structure that exposes to public minority investors to significant expropriation risk because the ownership structure is highly concentrated. The negative coefficient of *Treat*2005* is likely due to the anticipatory response in control firms that would become formally compliant with the SCA Act from the beginning of 2007.

To shed more light on the dynamics in stock liquidity changes, we alternatively estimate a dynamic staggered DID estimation over a longer window from 2000 to 2008 using actual implementation years. Specifically, we code the event year indicator *SCA(0)* as one for 2005 (the actual implementation year for firms at least KRW 2 trillion assets) and as one for

[17] Incidentally, in examining the economic consequences of a regulatory change mandating firms quoted on the Over-The-Counter Bulletin Board (OTCBB) to comply with the reporting requirements under the 1934 Securities Exchange Act, Bushee and Leuz (2005) also find that treatment firms experienced a significant increase in stock liquidity two months *before* the phase-in implementation of the reporting requirement (see p.257).

2007 (the implementation year for firms with assets below KRW 2 trillion). The staggered DID results reported in Table IA3 (in the Internet Appendix) show that two years before the formal implementation of the SCA Act, stock liquidity of the large firms already exhibit a significant increase, confirming the existence of anticipatory changes (as indicated by the positive and statistically significant coefficients of *SCA(-2)* and *SCA(-1)*) and corroborating the significant results in 2003 reported in column (2) of Table 8 Panel A. Overall, we view this anticipation as a phenomenon largely because our Korean setting represents a sharp transition from a low-litigation-risk regime to a perceived high-litigation-risk regime after the passage of the SCA Act in 2003.

In addition, we also conduct a split-sample DID analysis to examine whether the effect of D&O insurance protection before the event moderates the effect of SCA introduction on stock liquidity. Table 8 Panel B shows that the improvement in stock liquidity is largely concentrated in uninsured firms but not in firms that carry D&O insurance. This result is again consistent with the view that D&O insurance protection weakens the disciplinary effects of SCAs.

[Insert Table 8 here]

6.2 The effects of SCA introduction on firm valuation

We also assess the effect of an increase in ex-ante litigation risk on firm valuation as proxied by Tobin's Q.[18] There are, however, different arguments regarding the change in Tobin's Q around SCA introduction. On the one hand, the threat of SCA risk may deter insiders' misbehavior (i.e., the ex-ante governance effect), and if wrongdoing occurs, SCAs

[18] As we have discussed in Section 2, the process to adopt SCAs in Korea was long and full of debate. Such a long process makes it difficult to identify clear event dates, and the setbacks and progresses make an event study of stock market reactions prone to the confounding effects of changes in the expectation over the likelihood of introducing SCAs rather than cleanly reflect the wealth effects of SCA introduction to investors. For these reasons, a short-term event study of stock price reactions to SCA introduction announcements is not appropriate in our study.

provide an efficient mechanism to compensate investors for the losses incurred (i.e., the ex-post compensation effect) (e.g., Kahan, 1992; Rose, 2010). In addition, allowing investors to bring SCAs lowers the risk that investors face in investing in a firm, thereby reducing the discount that investors impose in price-protecting themselves. Consistent with this view, Huang et al. (2020) report a positive relation between stock liquidity and firm valuation. On the other hand, the introduction of SCAs may lower firms' valuation because firms exposed to SCA risk tend to hoard more cash that cannot be used for productive investments or investors anticipate firms' need to pay out cash to aggrieved parties who may no longer be shareholders of the firm when settling or losing an SCA suit (Coffee, 2006). Higher litigation risk can also increase the costs of debt financing (Arena, 2018). Overall, the effect of the introduction of SCAs on firm value is an empirical issue.

Using the same DID research design as that in Table 3, we find that in the first column of Table 9 Panel A, Tobin's Q significantly increases for treatment firms compared to control firms after the introduction of SCAs. The DID coefficient estimate reported in column (1) implies an economic magnitude of 10.2% (=*exp*(0.097)-1), which suggests a net benefit of SCA introduction. Note that this positive change in stock valuation induced by an increase in ex-ante shareholder litigation risk is different from the typical finding of a negative stock price reaction to *actual* litigation suits on firms concerned and their industry peers as shown in prior studies (e.g., Gande and Lewis, 2009; Hadlock and Sonti, 2012).

We also conduct a dynamic DID analysis in column (2) of Table 9 Panel A and find that the divergence in firm valuation between the treatment firms and control firms appears after SCA introduction but not before. We note that the DID effect becomes smaller and statistically insignificant in 2005, likely reflecting the anticipation effect in control firms that would soon become compliant with the SCA Act.

We further conduct a split-sample analysis to examine how the changes in firm

valuation differ between firms whose D&Os were protected by D&O insurance and firms that did not carry D&O insurance in the year before SCA introduction. Results reported in Table 9 Panel B show that the improvement in firm valuation is largely concentrated in firms that did not carry D&O insurance coverage before SCA introduction, corroborating the results on the moderating role of D&O insurance in blunting the effects of SCAs that we have previously reported in Tables 7 and 8.

[Insert Table 9 here]

6.3 The effects of SCA introduction on corporate investment

Finally, we analyze the impacts of SCA introduction on corporate investments. Again theory offers different views on the predicted changes in corporate investment following an increase in ex-ante shareholder litigation risk. On the one hand, when cash is piled up in the firm, the level of investment likely decreases (Arena and Julio, 2015), resulting in lower investment after SCA introduction. On the other hand, SCA introduction is likely to strengthen firms' governance and incentives to maximize shareholder value. Firms' stock market valuation likely improves as we show in Section 6.2. Firms may therefore respond to a higher Tobin's Q by investing more according to a large literature on managerial learning from stock prices when making investment decisions (e.g., Bond, Edmans, and Goldstein, 2012; Foucault and Frésard, 2012; McLean, Zhang, and Zhao, 2012). Therefore, overall, the effect of SCA introduction on firms' investment is an empirical matter.

We measure corporate investment by capital expenditure (Capex) scaled by total assets, cash spending on M&As scaled by total assets, or their sum.[19] We do not find statistically significant results on the change in total corporate investment or its two components, and we interpret the no-results as being due to the above opposing arguments.

[19] We do not include R&D investment because such data are unavailable for Korean firms in our sample period.

These results can be found in Table IA4 in the Internet Appendix.

7. Conclusion

There are two opposing theoretical arguments on the effects of ex-ante litigation risk on firms' internal liquidity, the *Precautionary saving* motive which predicts that firms would hoard more cash in response to higher ex-ante litigation risk, and the *Strategic* motive which posits that firms may strategically reduce cash holdings to reduce the appeal to potential litigants and/or secure an advantageous bargaining position in litigation. Reflecting this theoretically ambiguous link between litigation risk and cash holdings, Crane (2011) and Arena and Julio (2015) report mixed evidence.

We investigate the effect of ex-ante litigation risk on corporate liquidity by exploiting the passage of a law in 2003 that introduced securities class actions (SCAs) in Korea. The law's phase-by-phase implementation results in a clear control group before 2007. Examining three years before and after the law was passed, our difference-in-differences analysis shows that treatment firms hoard more cash as a response to the higher SCA risk. This result is more consistent with the *Precautionary saving* motive than the *Strategic* motive. The increase in liquidity is concentrated in treatment firms that carried no D&O insurance coverage before the law change and more pronounced in firms that had more volatile cash flows or were financially constrained before the law change. Using matched control firms and a regression discontinuity analysis exploiting the variations in firms within the narrow band of the asset threshold prescribed by the law yield similar results.

We then extend the analysis from firms' internal liquidity to stock market liquidity and stock valuation. SCA risk may result in higher stock liquidity and a higher valuation through the ex-ante governance effect and the ex-post loss compensation effect that increase the confidence of uninformed investors in a firm and likely lower the price discount uninformed

investors impose on the firm's stocks. On the other hand, the introduction of SCAs may lower firms' valuation because firms exposed to SCA risk tend to hoard more cash that cannot be used for productive investments or investors anticipate firms' need to pay out cash to some aggrieved parties who are no longer shareholders of the firm in the event of an SCA suit. Higher litigation risk may also result in more costly debt financing. We find that both stock liquidity and firm valuation increase after the introduction of SCAs, more specifically, in firms that are not protected by D&O insurance. The evidence speaks to the net benefits of SCAs as well as the attenuating effects of D&O insurance. We also test the theoretically ambiguous effects of SCA risk on corporate investment and find the net effect is statistically insignificant.

Overall, we provide novel causal evidence on the liquidity effects (both internal and external) of ex-ante shareholder litigation risk and relatedly the effects on firm valuation. The study extends the literature that has thoroughly investigated the effects of actual litigation on the firms being sued or their peers and the mixed results on the effects of ex-ante litigation risk on corporate liquidity. It also extends prior studies examining the effects of variation in country-level investor protection on stock liquidity by providing evidence on the effects of investor protection within a country.

It is worth pointing out that while the by-phase application of the SCA Act to firms with different asset size in Korea enables us to perform a DID analysis and a RDD analysis. A limitation of the setting is that the control group is potentially subject to the anticipation effect and therefore not free from the influences of SCAs. A further limitation for the external validity of the analysis is that the treatment sample is composed of a small number of the largest Korean companies. These limitations leave room for further research in the future on the effects of SCAs.

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Table 1: Summary statistics: Pre-event period (2000-2002)

This table reports the summary statistics of the variables used for the pre-event period (2000-2002). Continuous variables are winsorized at 1% at both tails. Treatment firms are firms that have at least 2 trillion KRW assets at the end of 2003; otherwise, they are control firms. The last column reports the Student *t*-tests of the mean difference in variables between the treatment group and control group in the pre-event-period. Cash denotes cash and cash equivalents. Please refer to Appendix 1 for the details of the variable definitions. ∗∗ $p<0.05$, ∗∗∗ $p<0.01$ (two-tailed).

	Treatment (T)		Control (C)		Diff (T-C)
	Mean	SD	Mean	SD	
Log(Total assets (TA))	8.54	0.75	4.77	1.43	3.77***
Total Assets (bn KRW)	7358.76	9054.44	268.17	378.70	7090.59***
Log(Sales)	8.20	0.95	4.67	1.40	3.53***
Cash/TA (%)	2.80	3.41	5.30	6.79	-2.50***
Log(Cash/TA)	0.18	1.54	0.81	1.55	-0.63***
Growth of cash/TA$_{2000\text{-}2002}$	3.17	6.86	4.75	18.13	-1.58
Growth of Log(cash/TA)$_{2000\text{-}2002}$	0.43	1.48	0.29	1.50	0.14
Financial leverage	2.33	2.47	1.72	2.80	0.60***
Market-to-book of equity	0.98	0.36	0.91	0.57	0.07
Capex/TA	0.04	0.10	0.04	0.09	0.00
Dividend payment (0/1)	0.64	0.48	0.58	0.49	0.06
Cash flow/TA	0.09	0.09	0.07	0.09	0.02***
Cash flow volatility	0.06	0.03	0.07	0.05	-0.01***
NWC/TA	-0.11	0.17	0.06	0.21	-0.17***
Tobin's Q	1.02	0.40	0.97	0.61	0.05
Amihud illiquidity(-1)*	-0.02	0.03	-0.92	3.09	0.90***
Observations	153		1,809		

Table 2: The effect of litigation risk on cash holdings: Univariate (DID) tests

This table reports the results from univariate DID tests of the change in the cash-to-assets ratio (or its logged version) of treatment firms relative to that of control firms around the introduction of the securities class actions. Cash-to-assets ratio is defined as (cash & cash equivalents/total assets (TA))*100. The pre-event period is 2000-2002 and the post-event period is 2003-2005. Treatment firms are firms that have at least 2 trillion KRW assets at the end of 2003; otherwise, they are control firms. Student *t*-tests are performed to test the significance of the differences between the two groups. ∗ p<0.10, ∗∗ p<0.05, ∗∗∗ p<0.01 (two-tailed).

Panel A:

	Cash/TA(%)				
	Treatment (T)		Control (C)		Diff (T-C)
	Mean	SD	Mean	SD	
Pre	2.80	3.41	5.30	6.79	-2.50***
Post	4.93	4.64	5.91	7.21	-0.98*
Diff (Post – Pre)	2.13***		0.61***		1.52*

Panel B:

	Log(Cash/TA(%))				
	Treatment (T)		Control (C)		Diff (T-C)
	Mean	SD	Mean	SD	
Pre	0.18	1.54	0.81	1.55	-0.63***
Post	0.87	1.51	0.96	1.51	-0.09
Diff (Post – Pre)	0.69***		0.15***		0.54***

Table 3: The effect of litigation risk on cash holdings: DID estimations

This table presents the DID results from estimating Equation (1) for the period from 2000 to 2005. The dependent variable is *Log(cash/TA)*. *Post* equals 1 if an observation is in the post-event period (2003-2005) and 0 for otherwise. The SCA Act was passed in 2003. *Treat* equals 1 if a firm has at least 2 trillion KRW assets at the end of 2003 and 0 for otherwise. *Y2001* is a dummy variable that takes the value of one for year 2001, and zero for otherwise. Other year dummies are defined analogously. All control variables are lagged by one year with respect to the dependent variable. All regressions include a constant term whose coefficient estimates are not tabulated. Please refer to Appendix 1 for detailed variable definitions. Standard errors clustered at the firm level are reported in parentheses. $*$ $p<0.10$, $**$ $p<0.05$, $***$ $p<0.01$ (two-tailed).

Y = *Log(Cash/TA)*	(1)	(2)	(3)	(4)
*Treat * Post*	0.539***	0.467**		
	(0.177)	(0.188)		
*Treat * Y2001*			0.189	0.182
			(0.182)	(0.197)
*Treat * Y2002*			0.099	0.116
			(0.241)	(0.252)
*Treat * Y2003*			0.626***	0.558**
			(0.241)	(0.257)
*Treat * Y2004*			0.546*	0.484
			(0.296)	(0.322)
*Treat * Y2005*			0.734***	0.664**
			(0.245)	(0.264)
Log(Sales)		-0.210***		-0.211***
		(0.075)		(0.075)
Cash flow/TA		0.675**		0.668**
		(0.313)		(0.314)
Cash flow volatility		1.289		1.293
		(0.785)		(0.785)
NWC/TA		0.549**		0.553**
		(0.267)		(0.268)
Market-to-book of equity		0.062		0.064
		(0.049)		(0.049)
Financial leverage		-0.337		-0.348
		(1.196)		(1.201)
Capex/TA		-0.454*		-0.459*
		(0.251)		(0.250)
Dividend payment (1/0)		0.102		0.103
		(0.074)		(0.074)
Observations	4,011	3,430	4,011	3,430
Adjusted R-square	0.542	0.555	0.542	0.555
Firm and Year FE	Y	Y	Y	Y

Table 4. Robustness checks

Panel A presents the results of two robustness tests in relation to firms' total assets. In columns (1) and (2), we redefine *Treat* using firms' total assets at the end of 2004 (instead of the assets at the end of 2003 used in our baseline regressions), and *Treat* equals one if a firm has at least 2 trillion KRW assets at the end of 2004. In columns (3) and (4), we provide the estimation results after excluding suspect firms that may have manipulated their total assets to be below KRW 2 trillion at the end of 2004. These suspect firms include firms whose total assets at the end of 2003 is between KRW 1 and 2 trillion and whose asset growth rate in 2004 is lower than that in 2003. Panel B presents the estimation results of regression discontinuity analyses. The dependent variable is the average annual change in cash over total assets in the period 2000-2005. The baseline bandwidth is measured as the optimal bandwidth designed by Imbens and Kalyanaraman (2012); estimates in rows (2) and (3) of Panel B provide robustness checks by using alternative bandwidths. Panel C provides the estimation for the placebo tests using some falsified asset thresholds instead of the true threshold of KRW 2 trillion. *Treat (placebo − KRW 1 tr)* equals 1 if a firm has assets over KRW 1 trillion at the end of 2003, and 0 for otherwise. *Treat (placebo − KRW 0.5 tr)* equals 1 if a firm has assets over KRW 0.5 trillion at the end of 2003, and 0 for otherwise. *Treat (placebo − KRW 0.1 tr)* equals 1 if a firm has assets over KRW 0.1 trillion at the end of 2003, and 0 for otherwise. Regressions include a constant whose coefficient estimates are not tabulated. Standard errors clustered at the firm level are in parentheses. $*$ $p<0.10$, $**$ $p<0.05$, $***$ $p<0.01$ (two-tailed).

Panel A: Reclassify treatment firms using the 2004 asset value & excluding "manipulators"

Y = *Log(Cash/TA)*	(1)	(2)	(3)	(4)
	Reclassified treatment		Excluding "manipulators"	
*Treat * Post*	0.547***	0.444**	0.545***	0.443**
	(0.172)	(0.182)	(0.172)	(0.182)
Observations	4,011	3,430	3,903	3,323
Adjusted R-squared	0.542	0.555	0.542	0.555
Firm and Year FE	Y	Y	Y	Y
Controls variables in Table 3	N	Y	N	Y

Panel B: Regression discontinuity analysis

	(1) Y = *Average annual change (Cash/TA)*	(2) Observations
Baseline Bandwidth	0.724***	60
	(0.168)	
Half of Bandwidth	0.685**	22
	(0.283)	
Double of Bandwidth	0.438***	612
	(0.138)	

Panel C: Placebo tests with falsified asset thresholds

Y = *Log(Cash/TA)*	(1)	(2)	(3)
*Treat (placebo - KRW 1 tr) * Post*	-0.109		
	(0.196)		
*Treat (placebo - KRW 0.5 tr) * Post*		0.189	
		(0.150)	
*Treat (placebo - KRW 0.1 tr) * Post*			0.082
			(0.112)
Observations	3,138	3,138	3,138
Adjusted R-square	0.550	0.550	0.550
Firm and Year FE	Y	Y	Y
Controls variables in Table 3	Y	Y	Y

Table 5: DID results from using the matched sample

Panel A reports the mean comparison of the firm characteristics between treatment and control firms after the propensity score matching in the pre-event period (2000-2002). Continuous variables are winsorized at 1% at both tails. We use the following covariates (averaged over the pre-event period 2000-2002) in matching: NWC over total assets, cash flow over total assets, cash flow volatility, and the market to book ratio. We select firms that belong to the same industry (defined at the equivalent of two-digit SIC code) and are closest in propensity score, applying a caliper of 0.1. The last column reports the mean difference in variables between the treatment and control groups in the pre-event-period. Cash denotes cash and cash equivalents. In Panel B, *Treat* equals 1 if a firm has at least 2 trillion KRW assets and 0 for otherwise. *Post* equals 1 if an observation is in the post-event period (2003-2005) and 0 for otherwise. Standard errors clustered at the firm level are reported in parentheses. All regressions include a constant term whose coefficient estimates are not tabulated. Please refer to Appendix 1 for the details of the variable definitions. $*$ $p<0.10$, $**$ $p<0.05$, $***$ $p<0.01$ (two-tailed).

Panel A: Covariate comparison between treatment and control firms of the matched sample

	Treatment (T)		Control (C)		Diff (T-C)
	Mean	SD	Mean	SD	
Log(Total assets (TA))	8.44	0.62	5.45	1.23	2.99***
Total Assets (bn KRW)	7326.25	9854.83	443.57	490.01	6882.68***
Log(Sales)	8.06	.96	5.37	1.34	2.69***
Cash/TA (%)	2.50	3.11	5.13	7.12	-2.63***
Log(Cash/TA)	0.05	1.54	0.55	1.72	-0.50**
Growth of cash/TA$_{2000\text{-}2002}$	3.99	7.56	5.40	18.14	-1.41
Growth of Log(cash/TA)$_{2000\text{-}2002}$	0.59	1.55	0.36	1.51	0.23
Financial leverage	2.39	2.48	2.52	3.47	-0.13
Market-to-book of equity	0.90	0.25	0.99	0.79	-0.09
Capex/TA	0.03	0.13	0.04	0.10	-0.01
Dividend payment (0/1)	0.64	0.48	0.61	0.49	0.03
Cash flow/TA	0.08	0.08	0.08	0.07	0.00
Cash flow volatility	0.05	0.04	0.06	0.04	-0.01
NWC/TA	-0.08	0.16	-0.07	0.17	-0.01
Observations	117		117		

Panel B: Regression DID results from the matched sample

Y = *Log(Cash/TA)*	(1)	(2)
*Treat * Post*	0.532**	
	(0.251)	
*Treat * 2001*		0.300
		(0.352)
*Treat * 2002*		0.221
		(0.385)
*Treat * 2003*		0.670*
		(0.380)
*Treat * 2004*		0.734*
		(0.435)
*Treat * 2005*		0.713*
		(0.422)
Observations	468	468
Adjusted R-square	0.620	0.617
Firm and Year Fixed Effects	Y	Y

Table 6: DID results from the matched Japanese and Taiwanese firms as control firms

This table reports the DID results from using Korean treatment firms and their propensity score matched Japanese or Taiwanese control firms. The propensity score matching model includes the following covariates: average logged total assets in the pre-event period, average cash-to-assets ratio in the pre-event period, average cash flow-to-assets ratio in the pre-event period, quintile dummies based on the distribution of the growth rate in the cash-to-assets ratio in the pre-event period, and industry membership (defined at the one-digit SIC code). We then use the nearest neighbor matching procedure and select firms that belong to the same industry and are closest in propensity score. Panel A reports the mean comparison of the firm characteristics between treatment and control firms after the propensity score matching in the pre-event period (2000-2002). The last column reports the mean difference in variables between Korean treatment firms and their one-to-one propensity score matched Japanese or Taiwanese control firms in the pre-event-period. In Panel B, column (1) reports the baseline DID, while column (2) shows the dynamic DID results. *Treat* equals 1 if a Korean firm has at least 2 trillion KRW assets at the end of 2003 and 0 for matched Japanese or Taiwanese firms. *Post* equals 1 if an observation is in the post-event period (2003-2005) and 0 for otherwise. Standard errors clustered at the firm level are reported in parentheses. All regressions include a constant term whose coefficient estimates are not tabulated. $*$ $p<0.10$, $**$ $p<0.05$, $***$ $p<0.01$ (two-tailed).

Panel A: Covariate comparison between treatment firms and control firms in the matched sample

	Treatment (T)		Control (C)		Diff (T-C)
	Mean	SD	Mean	SD	
Log(Total assets)	8.58	0.82	8.76	1.66	-0.18
Cash/TA	0.04	0.04	0.04	0.03	0.00
Cash flow/TA	0.09	0.05	0.09	0.06	0.00
Observations	105		105		

Panel B: Regression DID results using the matched sample

Y = *Log(Cash/TA)*	(1)	(2)
*Treat * Post*	0.456***	
	(0.167)	
*Treat * 2001*		0.011
		(0.184)
*Treat * 2002*		0.191
		(0.232)
*Treat * 2003*		0.585**
		(0.259)
*Treat * 2004*		0.418*
		(0.241)
*Treat * 2005*		0.574**
		(0.239)
Observations	414	414
Adjusted R-square	0.699	0.698
Firm and Year Fixed Effects	Y	Y

Table 7: Litigation risk and cash holdings: The moderating effect of D&O insurance, cash flow volatility, and financial constraints

This table reports the results from examining the moderating effect of the presence of D&O insurance coverage, operating cash flow volatility, and financial constraints on firms' cash holding response to the increase in litigation risk. The sample is partitioned using the corresponding splitting variable measured before the law change. In columns (1) and (2), a firm is classified as 'Yes' if it purchased D&O insurance in 2002, and 'No' otherwise. In columns (3) and (4), a firm is classified as a 'Low' volatility firm if its operating cash flow volatility computed over 1998-2002 is below the sample median, and a 'High' volatility firm for otherwise. In columns (5) - (6), we follow Almeida et al. (2004) in defining financially constrained firms and unconstrained firms. "Constrained firms" are those firms having no bond rating and no commercial paper rating but having a positive amount of debt. "Unconstrained firms" are those firms that have a bond rating, or a commercial paper rating, or those firms without a bond rating and without a commercial paper rating but also having no debt. *Treat* equals 1 if a firm has at least 2 trillion KRW assets at the end of 2003 and 0 for otherwise. *Post* equals 1 if an observation is in the post-event period (2003-2005) and 0 for otherwise. Please refer to Appendix 1 for detailed variable definitions. Standard errors clustered by firm are in parentheses. All regressions include a constant term whose coefficient estimates are not tabulated. $*$ $p<0.10$, $**$ $p<0.05$, $***$ $p<0.01$ (two-tailed).

	With D&O insurance or not		By operating cash flow volatility		Financially constrained or not	
Y = *Log(Cash/TA)*	(1)	(2)	(3)	(4)	(5)	(6)
	Yes	No	Low	High	Unconstrained	Constrained
*Treat * Post*	0.075	0.843*	0.344*	0.772*	0.355*	1.426***
	(0.247)	(0.472)	(0.185)	(0.393)	(0.190)	(0.119)
Log(Sales)	-0.198	-0.214***	-0.352***	-0.159	-0.215***	-0.112
	(0.164)	(0.081)	(0.131)	(0.097)	(0.078)	(0.148)
Cash flow/TA	1.208	0.495	1.292**	0.501	0.745**	0.265
	(0.813)	(0.331)	(0.612)	(0.371)	(0.359)	(0.583)
Cash flow volatility	3.975*	0.792	3.147**	0.816	2.816***	-1.840
	(2.039)	(0.814)	(1.552)	(0.919)	(0.928)	(1.209)
NWC/TA	-0.159	0.700**	1.126**	0.201	0.362	0.963**
	(0.632)	(0.294)	(0.435)	(0.344)	(0.320)	(0.464)
Market-to-book of equity	-0.060	0.080	0.054	0.081	0.092	-0.060
	(0.114)	(0.055)	(0.092)	(0.063)	(0.057)	(0.107)
Financial leverage	3.747	-1.054	-0.445	-0.120	0.525	-2.126
	(2.731)	(1.312)	(1.302)	(2.090)	(1.493)	(1.773)
Capex/TA	-1.463**	-0.293	-0.184	-0.670*	-0.881***	0.255
	(0.604)	(0.283)	(0.334)	(0.405)	(0.324)	(0.361)
Dividend payment (1/0)	0.113	0.107	0.130	0.069	0.168*	-0.050
	(0.172)	(0.078)	(0.098)	(0.110)	(0.094)	(0.110)
Diff. in coefficients (*p*-value)	0.113		0.280		0.000	
Observations	707	2,702	1,670	1,662	2,362	1,050
Adjusted R-square	0.530	0.564	0.599	0.508	0.567	0.536
Firm and Year FE	Y	Y	Y	Y	Y	Y

Table 8: Litigation risk and stock liquidity

Panel A reports the regression results for the change in stock liquidity. Stock liquidity is measured by (-1)*the median of daily Amihud illiquidity (daily absolute stock return divided by trading volume) in a year following Amihud (2002). *Treat* equals 1 if a firm has at least 2 trillion KRW assets at the end of 2003 and 0 for otherwise. *Post* equals 1 if an observation is in the post-event period (2003-2005) and 0 otherwise. Control variables are lagged by one year relative to the dependent variable. Panel B reports the moderating effect of the presence of D&O insurance coverage in 2002 on firms' liquidity change as a response to the increase in litigation risk. Regressions include a constant whose coefficient estimates are not tabulated. Standard errors clustered at the firm level are in parentheses. ∗ p<0.10, ∗∗ p<0.05, ∗∗∗ p<0.01 (two-tailed).

Panel A: Change in stock liquidity

Y = *(-1)*Amihud illiquidity*	(1)	(2)
*Treat * Post*	0.694***	
	(0.211)	
*Treat * 2001*		-0.266
		(0.227)
*Treat * 2002*		-0.057
		(0.256)
*Treat * 2003*		0.931***
		(0.340)
*Treat * 2004*		1.407***
		(0.392)
*Treat * 2005*		-0.610**
		(0.296)
Ln(Market value)	0.297***	0.308***
	(0.104)	(0.105)
Ln(Share turnover)	0.566***	0.569***
	(0.113)	(0.114)
Ln(Stock return volatility)	0.453***	0.442***
	(0.171)	(0.171)
Observations	2,716	2,716
Adjusted R-square	0.387	0.388
Firm and Year FE	Y	Y

Panel B: The moderating effect of D&O insurance on the change in stock liquidity

	With D&O insurance or not			
Y = *(-1)*Amihud illiquidity*	(1)	(2)	(3)	(4)
	Yes	No	Yes	No
*Treat*Post*	0.325	1.154***	0.244	0.601**
	(0.246)	(0.273)	(0.213)	(0.274)
Ln(Market value)			0.104	0.343***
			(0.114)	(0.123)
Ln(Share turnover)			0.243*	0.636***
			(0.129)	(0.135)
Ln(Stock return volatility)			0.235	0.503**
			(0.149)	(0.211)
Diff. in coefficients (p-value)	0.013		0.255	
Observations	640	2,050	640	2,050
Adjusted R-square	0.414	0.351	0.424	0.379
Firm and Year FE	Y	Y	Y	Y

Table 9: Litigation risk and firm valuation

Panel A reports the DID results for Tobin's Q. Tobin's Q is defined as (market value of equity + book value of liabilities)/total assets. We take the natural logarithm of Tobin's Q to mitigate the effects of outliers and to measure the percentage change in Tobin's Q around the SCA introduction in 2003. *Treat* equals 1 if a firm has at least 2 trillion KRW assets at the end of 2003 and 0 for otherwise. *Post* equals 1 if an observation is in the post-event period (2003-2005) and 0 for otherwise. Panel B presents the moderating effect of the presence of D&O insurance coverage in 2002 on the valuation response to the increase in litigation risk. Regressions include a constant whose coefficient estimates are not tabulated. Standard errors clustered at the firm level are reported in parentheses. $*$ $p<0.10$, $**$ $p<0.05$, $***$ $p<0.01$ (two-tailed).

Panel A: Change in Tobin's Q

Y = *Log(Tobin's Q)*	(1)	(2)
*Treat * Post*	0.097***	
	(0.032)	
*Treat * Y2001*		0.011
		(0.032)
*Treat * Y2002*		0.062
		(0.041)
*Treat * Y2003*		0.111***
		(0.043)
*Treat * Y2004*		0.167***
		(0.051)
*Treat * Y2005*		0.088
		(0.057)
Log(Sales)	0.032*	0.032
	(0.020)	(0.019)
Financial leverage	0.363	0.341
	(0.375)	(0.375)
Capex/TA	0.201***	0.203***
	(0.065)	(0.065)
Dividend payment (1/0)	0.014	0.015
	(0.018)	(0.017)
Observations	2,953	2,953
Adjusted R-square	0.788	0.788
Firm and Year FE	Y	Y

Panel B: The moderating effect of D&O insurance on the change in Tobin's Q

Y = *Log(Tobin's Q)*	With D&O insurance or not	
	(1)	(2)
	Yes	No
*Treat * Post*	0.013	0.186***
	(0.040)	(0.057)
Ln(Sales)	0.030	0.032
	(0.022)	(0.026)
Financial leverage	0.771	0.296
	(0.501)	(0.448)
Capex/TA	0.144*	0.207**
	(0.087)	(0.081)
Dividend payment (1/0)	0.039	0.007
	(0.024)	(0.022)
Diff. in coefficients (*p*-value)	0.006	
Observations	702	2,234
Adjusted R-square	0.808	0.782
Firm and Year FE	Y	Y

Figure 1: Time-series patterns of cash holdings for treatment and control firms

The graph plots the time-series patterns in annual average of *Log(Cash/Assets)* for the treatment and the control firms, respectively, in the period from 2000 to 2008.

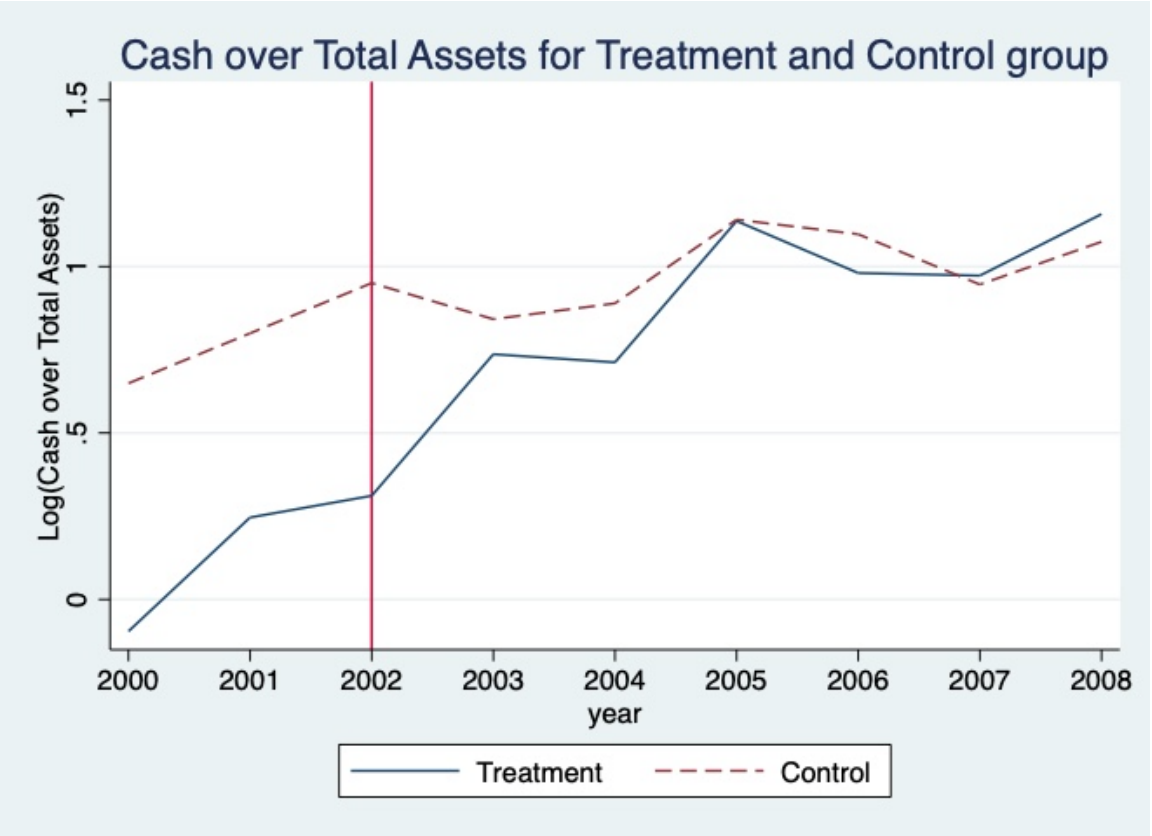

Figure 2: Dynamics in the differences in cash holdings

This graph plots the dynamics in the difference in the cash-to-assets ratio between treatment firms and control firms over the period from 2000 to 2008. Each point is based on the corresponding coefficient estimate of the interaction term for the model specification in column (3) of Table 3 using data up to year 2008. The vertical line represents the 95% confidence interval of each coefficient estimate.

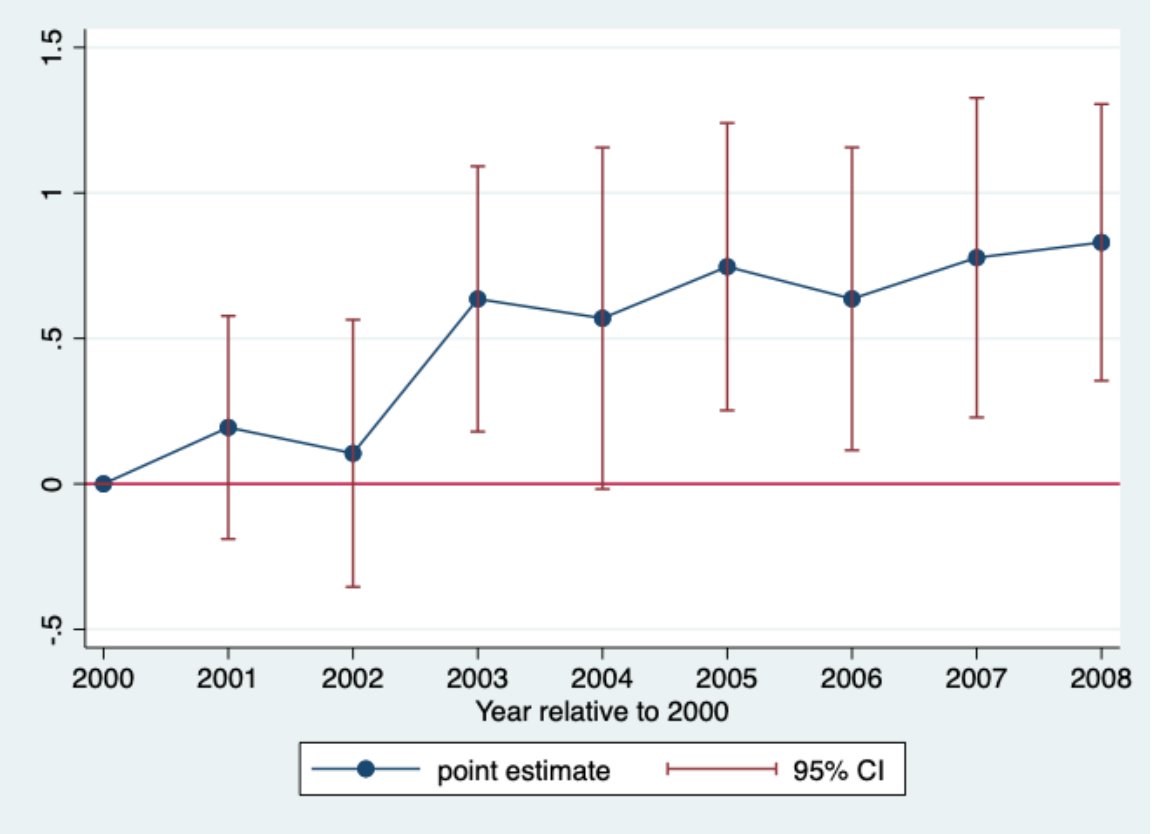

Figure 3: Density of the running variable (Total Assets)

This figure plots the density of Total Assets in 2003 where the zero is centered at the value of KRW 2 trillion (the X-axis). The solid lines represent the fitted density function of the underlying variable for firms in the control group (Red, on the left) and in the treatment group (Blue, on the right). The bandwidth used to construct the density estimators on the two sides of the cutoff is the optimal one used for the baseline estimate in Table 4. We run the testing procedure and the graphical procedures as in Cattaneo et al. (2020). The null hypothesis of this test is that there is no discontinuity of the density at the cutoff, and so we cannot reject the null hypothesis under both the tests developed by Cattaneo et al. (2020) and McCrary (2008).

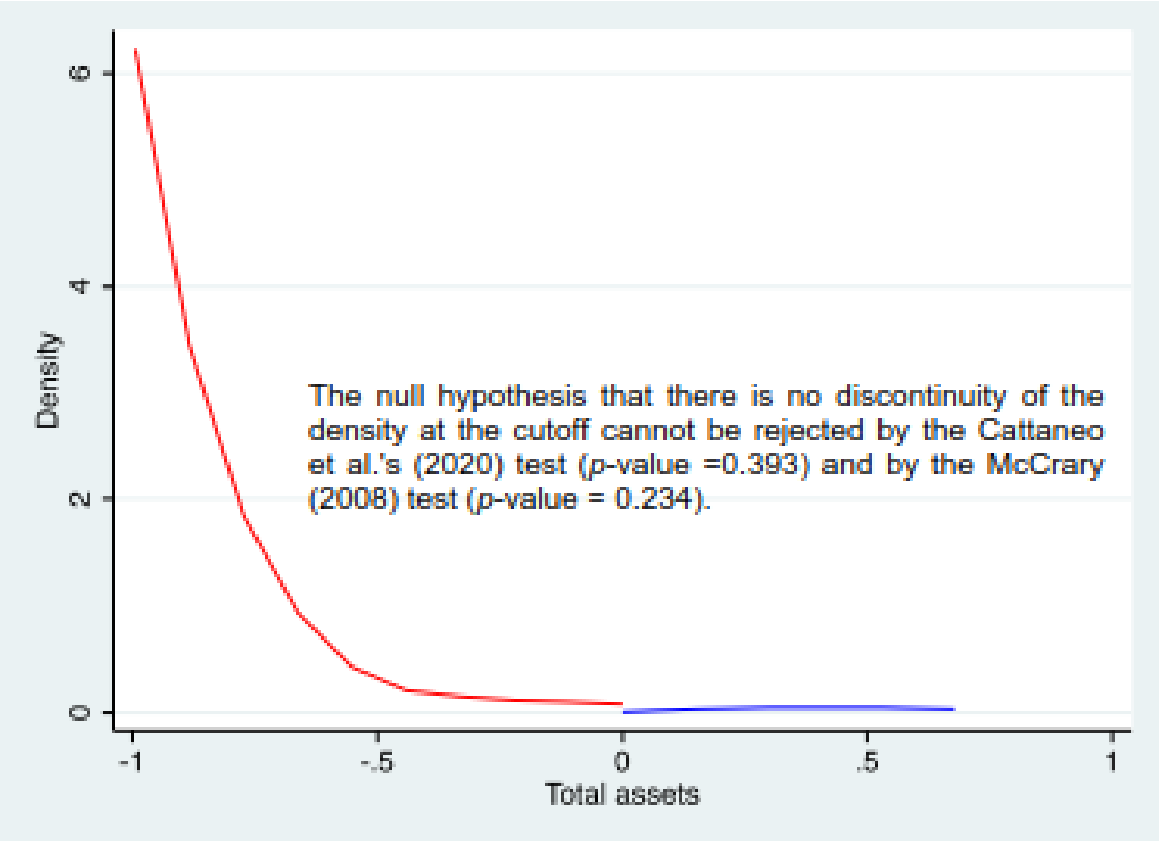

Figure 4: Litigation risk and cash holding: RDD results

The graph plots results from regression discontinuity design (RDD) analysis for two different dependent variables: the plot on the left refers to the average annual change of cash holdings in the period 2000-2005 while the plot on the right refers to the average annual change of the cash-to-assets ratio in the period 2000-2005. On the X-axis, we report the normalized total assets such that it takes the value of zero at the value KRW 2 trillion.

Appendix 1

Variable Definitions

Variables	Definitions
Cash/TA (%)	The ratio of cash and cash equivalents to total assets*100
Log(Cash/TA)	The natural logarithm of (Cash/TA*100)
Total assets	The book value of total assets reported at the end of a fiscal year
Log(Sales)	The natural logarithm of a firm's annual sales revenue in a year
Growth of cash/TA $_{2000\text{-}2002}$	(Total assets in 2002 – total assets in 2000)/total assets in 2000
Financial leverage	The ratio of book value of total debt to equity
Market-to-book of equity	The ratio of a firm's market value of equity to the book value of equity at the end of a fiscal year
Capex/TA	Capital expenditure/total assets, measured as (property, plant, equipment in year *t* – property, plant, equipment in year *t-1* + depreciation in year *t*) divided by year-end total assets
Dividend payment (0/1)	Dummy variable that equals 1 if a firm pays cash dividend in a year, and 0 for otherwise.
Cash flow/TA	Net operating cash flow in a year scaled by total assets
Cash flow volatility	Standard deviation of *Cash flow/TA* over the previous 4 years (i.e., over the period *t*-4 to *t*-1, with year *t* being the focal year)
NWC/TA	(Net working capital - cash and cash equivalents)/total assets
Tobin's Q	(Market value equity + book value liabilities)/total assets
Ammihud illiquidity	The median of daily absolute stock return divided by trading volume (KRW) *1,000,000,000 in a year
Share turnover	(Total trading volume in a year (KRW)/year-end market capitalization)*1,000,000
Stock return volatility	Standard deviation of daily stock returns in a given year

Internet Appendix for

Liquidity Effects of Litigation Risk: Evidence from a Legal Shock

Table IA1. Securities class action law: Comparison between Korea and USA

Elements	Korea	USA
Relevant law	*Securities-Related Class Action Act*	*SEC Rule 10b-5* *The Private Securities Litigation Reform Act of 1995*
Main cause of action	Material misstatements: Affirmative misstatements and failures to disclose important information that result in material damages (Source 1)	Material misstatements: Affirmative misstatements and failures to disclose important information that result in material damages (Source 4)
Other causes of action	Insider trading, market price manipulation, auditor's liabilities and all other device, scheme, or artifice that is deemed socially unfair and leads to material losses (Source 1).	Material losses caused by investee companies' misbehaviors including insider trading and manipulative or deceptive practices that lead investor to buy or sell securities on the open market (Source 4).
Standing	Those who disposed of or purchased securities based on misstatements (Source 1).	Those who disposed of or purchased securities based on misstatements (Source 4).
Potential defendants	Not only those who instructed, prepared or issued the misleading statements, but also related abettors such as a certified public accountant, a certified appraiser or a credit rating specialist, who certified the statements or accompanying documents, a person who consented to include his/her statement of appraisal, analysis, or verification in the statements, an underwriter or intermediary of the securities, or the seller (securities issuer) at the time the registration statement for sale was filed (Source 1)	Only the primary violator can be sued in a class action, however the SEC can hold liable aiders and abettors (Source 4).
The Scienter requirement	Scienter, i.e. knowledge of violation, as well as lack of due care which led to false description or representation or omission (Source 1). Defendants bear the burden of disproving scienter (Source 6).	Scienter, i.e. knowledge of violation (Source 4). A plaintiff should plead a strong inference of scienter (Source 5).
Requirement to prove reliance	No. Plaintiffs' reliance on the relevant misstatement is presumed without a need of proof in most cases (Source 6).	No. Plaintiffs' reliance on the relevant misstatement is presumed without a need of proof in most cases as long as market efficiency is proved at the time of class certification (Sources 4 and 6).
Discovery system (extensive right of access to evidence held by other parties)	Does not exist, but plaintiffs are not required to prove market efficiency at the time of class certification. The Court may request the related regulatory	Exists and allows the plaintiff to gather evidence and prove complex factual matters (Source 6).

	bodies such as Financial Supervisory Services or Financial Services Commission to investigate the matter when the court finds it necessary, subject to certain restrictions (Source 6).	
Loss causation	Once class suit is approved, plaintiffs must show a link between the damages they suffered and the corresponding misrepresentation (Source 3).	Plaintiffs must show a link between the damages they suffered and the corresponding misrepresentation (Source 4).
Markets targeted (Primary vs. Secondary)	*Securities-Related Class Action Act* governs losses in both primary and secondary markets are governed.	*SEC Rule 10b-5* applies only to secondary market transactions. Causes of action in primary market offering are stipulated and governed separately by Articles 11 and 12 of the *Securities Exchange Act*.
Class certification	1) The number of the class members shall be at least 50; 2) The sum of the securities held by the class members at the time of conducting the activities which are the grounds for the claim shall be at least 1/10,000 of the total number of the outstanding securities of the defendant company; 3) The legally or actually material counts shall be common to all members of the class (Source 2).	1) Numerosity: the class is so numerous that joinder of all members is impracticable; 2) Commonality: there are questions of law or fact common to the class; 3) Typicality: the claims or defences of the representative parties are typical of claims or defences of the class; 4) Adequacy of representation: uncover conflicts of interest between named parties and the class they seek to represent (Sources 4 & 6).
Legal fee	The lead plaintiff or plaintiff lawyer needs to pay the filing fee (e.g., costs for notice, announcement, and appraisal) upfront, which is calculated as a proportion of not only the amount-at-stake for the lead plaintiff but also the amount-at-stake for the other class members (Source 6). The loser pays the fee for both parties (Source 6)	The filing fee in federal courts is flat (Source 6). Each party pays for its own legal fees without regarding to the outcome of the case (Source 6).
The number of SCA suits that the plaintiff lawyer can represent	Generally up to three cases over the past three years and so the plaintiff lawyer only has limited ability to diversify the risk (Source 6).	No restriction on the number of SCA suits that the plaintiff lawyer can represent (Source 6).
Lawyer compensation	Either a fixed fee with or without a contingency fee or simply a contingency fee (Source 6).	Typically a contingency fee (Source 6).

Source 1: *Securities-Related Class Action Act Article 3*
Source 2: *Securities-Related Class Action Act Article 12*
Source 3: *Securities-Related Class Action Act Article 30*
Source 4: *SEC Rule 10b-5*
Source 5: *The Private Securities Litigation Reform Act of 1995* (PSLRA)
Source 6: Lee, B.J., 2017. Saving the Korean securities class action, University of Pennsylvania Journal of International Law 39, 247-292.

Table IA2: Litigation risk and cash holdings: Results from staggered DID

This table reports the results from staggered differences-in-differences estimations. *Post_Staggered* is an indicator for the post-event periods: it equals 1 from 2003 for treatment firms (i.e., those that with at least 2 trillion KRW assets at the end of 2003) and from 2007 for control firms (i.e., those that with assets below KRW 2 trillion at the end of 2003), and 0 otherwise. Dummy variable *SCA(0)* stands for the event year, and equals 1 for 2003 (the SCA Act passage year) for firms with at least 2 trillion KRW assets or equals 1 for 2007 when the remaining firms become treated. Dummy variable *SCA(-1)* stands for one year prior to the event year, the dummy variable *SCA(1)* stands for one year after the event year. Other *SCA* dummies are defined analogously. Dummy variable *SCA(3+)* indicates all years that are at least three years after the event. Regressions include a constant whose coefficient estimates are not tabulated. Standard errors clustered at the firm level are reported in parentheses. $*$ $p<0.10$, $**$ $p<0.05$, $***$ $p<0.01$ (two-tailed).

Y = *Log(Cash/TA)*	(1)	(2)
Post_Staggered	0.239*	
	(0.125)	
SCA(-2)		0.160
		(0.184)
SCA(-1)		0.264
		(0.228)
SCA(0)		0.436*
		(0.230)
SCA(1)		0.410
		(0.280)
SCA(2)		0.844**
		(0.370)
SCA(3+)		1.046**
		(0.438)
Observations	5,392	5,392
Adjusted R-square	0.479	0.480
Firm and Year FE	Y	Y

Table IA3: Litigation risk and stock liquidity: Results from staggered DID

This table reports the results from staggered differences-in-differences estimations of changes in (-1)*Amihud's (2002) illiquidity using actual implementation year of the SCA Act. *Post_Staggered* is an indicator for the post-event periods: it equals 1 from 2005 for treatment firms (i.e., those that with at least 2 trillion KRW assets at the end of 2003) and from 2007 for control firms (i.e., those that with assets below 2 trillion KRW at the end of 2003), and 0 otherwise. Dummy variable *SCA(0)* stands for the event year, and equals 1 for 2005 for firms with over KRW 2 trillion assets or equals 1 for 2007 when the remaining firms become compliant with the SCA Act. Dummy variable *SCA(-1)* stands for one year prior to the event year, and dummy variable *SCA(1)* stands for one year after the event year. Other *SCA* dummies are defined analogously. Regressions include a constant whose coefficient estimates are not tabulated. Standard errors clustered at the firm level are reported in parentheses. $*$ $p<0.10$, $**$ $p<0.05$, $***$ $p<0.01$ (two-tailed). The positive and statistically significant coefficient estimates on *SCA(-2)* and *SCA(-1)* suggest that (large) treatment firms experienced an increase in stock liquidity starting from 2003, which is consistent with the results shown in Table 8.

Y = *(-1)*Amihud's (2002) illiquidity*	(1)	(2)
Post_Staggered	0.354*	
	(0.189)	
SCA(-2)		1.281***
		(0.243)
SCA(-1)		1.745***
		(0.289)
SCA(0)		0.965***
		(0.341)
SCA(1)		1.930***
		(0.387)
SCA(2)		0.238
		(0.409)
SCA(3)		2.098***
		(0.460)
Observations	4,858	4,858
Adjusted R-square	0.358	0.360
Firm and Year FE	Y	Y
Controls	Y	Y

Table IA4: Litigation risk and corporate investments

This table reports the DID regression results for firm investments. The dependent variable in columns (1) and (2) is total investment which is the sum of capital expenditure and the value of cash spending on M&A deals of a firm scaled by total assets. In columns (3) and (4), the dependent variable is capital expenditure scaled by total assets. In columns (5) and (6), the dependent variable is the value of cash spending on M&A deals scaled by total assets. *Treat* equals 1 if a firm has at least 2 trillion KRW assets at the end of 2003 and 0 for otherwise. *Post* equals 1 if an observation is in the post-event period (2003-2005) and 0 for otherwise. Regressions include a constant whose coefficient estimates are not tabulated. Standard errors clustered at the firm level are reported in parentheses. $*$ $p<0.10$, $**$ $p<0.05$, $***$ $p<0.01$ (two-tailed).

	Total investments/TA		Capex/TA		M&A/TA	
	(1)	(2)	(3)	(4)	(5)	(6)
*Treat * Post*	0.012		0.012		-0.001	
	(0.009)		(0.008)		(0.002)	
*Treat * 2001*		0.002		0.002		0.001
		(0.023)		(0.022)		(0.003)
*Treat * 2002*		0.016		0.009		0.001
		(0.022)		(0.019)		(0.003)
*Treat * 2003*		0.012		0.010		0.001
		(0.018)		(0.017)		(0.003)
*Treat * 2004*		0.020		0.021		-0.002
		(0.017)		(0.016)		(0.002)
*Treat * 2005*		0.021		0.015		0.001
		(0.019)		(0.016)		(0.003)
Ln(Sales)	-0.016***	-0.016***	-0.016***	-0.016***	-0.000	-0.000
	(0.006)	(0.006)	(0.005)	(0.005)	(0.001)	(0.001)
Cash flow/TA	0.070***	0.070***	0.078***	0.078***	-0.003	-0.003
	(0.027)	(0.027)	(0.025)	(0.025)	(0.003)	(0.003)
Cash flow volatility	0.110**	0.110**	0.110**	0.110**	0.001	0.001
	(0.055)	(0.055)	(0.051)	(0.051)	(0.005)	(0.005)
NWC/TA	0.084***	0.084***	0.089***	0.089***	0.001	0.001
	(0.019)	(0.019)	(0.016)	(0.016)	(0.002)	(0.002)
Market-to-book of equity	0.015***	0.015***	0.015***	0.015***	0.000	0.000
	(0.004)	(0.004)	(0.004)	(0.004)	(0.000)	(0.000)
Financial leverage	0.043	0.038	0.067	0.064	-0.010	-0.010
	(0.090)	(0.090)	(0.086)	(0.086)	(0.007)	(0.007)
Observations	3,423	3,423	3,423	3,423	3,427	3,427
Adjusted R-square	0.256	0.255	0.283	0.283	0.010	0.010
Firm and Year FE	Y	Y	Y	Y	Y	Y