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"Does Mandatory IFRS Adoption Affect Crash Risk?"

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Does Mandatory IFRS Adoption Affect Crash Risk?

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ABSTRACT
We examine the impact of mandatory IFRS adoption on firm-level 'crash risk,' defined as the frequency of extreme negative stock returns. An important feature of our study is that we separately analyze non-financial firms and financial firms because IFRS adoption is likely to affect crash risk for these firms through different mechanisms. We find that, on average, mandatory IFRS adoption leads to decreased crash risk among non-financial firms and increased crash risk among financial firms. We also find evidence consistent with IFRS decreasing crash risk among non-financial firms by improving transparency through additional disclosure; and with IFRS increasing crash risk among financial firms through its fair value provisions, which increase reporting volatility that in turn increases investor uncertainty and contracting costs. Overall, our study contributes to the literature by documenting the impact of changes in financial reporting standards on crash risk and adds to the debate on the economic consequences of fair value accounting.

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Does Mandatory IFRS Adoption Affect Crash Risk?

1. Introduction

Crash risk, defined as the frequency of extreme negative stock returns, is an important concern for investors that prior research suggests is related to the financial reporting environment (Jin and Myers, 2006; Bleck and Liu, 2007; Hutton et al., 2009). In 2005, the European Union (EU) mandated the adoption of International Financial Reporting Standards (IFRS) for thousands of public companies across a wide range of institutional environments. This event provides a natural experiment for testing how changes in financial reporting standards affect firm-level crash risk across a variety of industries and institutional settings. The purpose of this study is to examine how mandatory IFRS adoption in the EU affects crash risk.

Compared to most local EU accounting standards prior to 2005, IFRS results in greater disclosure and places a greater emphasis on fair values (Hung and Subramanyam, 2007; Li, 2010). Thus, we expect mandatory IFRS adoption to affect crash risk through two (non-mutually exclusive) mechanisms – increased transparency and fair value accounting. Following prior studies, we expect the increased transparency associated with additional disclosure to reduce crash risk. Specifically, prior research suggests that opacity contributes to crash risk because increased opacity results in managers withholding firm-specific bad news from public disclosure. Since managers are only able or willing to withhold the bad news up to a point, once a threshold is met, the accumulated negative information is released all at once and results in a stock price crash (Jin and Myers, 2006; Hutton et al., 2009). In contrast to increased disclosure, however, the effect of fair value accounting on

crash risk is unclear. Proponents of fair value accounting argue that it can increase reporting transparency (IASB, 2003; Bleck and Liu, 2007). In contrast, opponents argue that it increases reporting volatility that results in negative stock returns due to increased uncertainty and higher re-contracting costs (European Central Bank, 2004; Plantin et al., 2008). Since these factors affect crash risk in opposite directions, the net effect of fair value accounting on crash risk is an empirical question.

An important feature of our study is that we separately analyze non-financial firms and financial firms, because IFRS adoption is likely to affect crash risk of these firms through different mechanisms. For non-financial firms, we predict that the dominant effect of IFRS adoption is increased transparency, which reduces crash risk.[1] Unlike non-financial firm, we do not have a prediction for financial firms. On the one hand, prior research argues that financial firms tend to be more opaque, suggesting that IFRS is likely to increase transparency and thereby decrease crash risk (Morgan, 2002). On the other hand, financial firms are also inherently more subject to fair value accounting, which can result in increased transparency that in turn decreases crash risk, or lead to greater reporting volatility that in turn increases crash risk.

We test the effect of mandatory IFRS adoption on crash risk using a large sample of 7,532 firm-year observations of EU firms from 2003 to 2006. Following prior research (e.g., Armstrong et al., 2010; DeFond et al., 2011), our sample focuses exclusively on mandatory IFRS adoption in the EU. We employ a difference-in-differences research design that compares the change in crash risk among mandatory IFRS adopters with the change in

[1] The effect of fair value accounting associated with IFRS adoption likely has a negligible effect on non-financial firm because IAS 39 is applicable only to financial instruments. While IFRS allows firms to voluntarily use fair value for non-financial assets such as property, plant, and equipment (PPE), EU IFRS adopters overwhelmingly choose to value these assets at historical cost (Christensen and Nikolaev, 2009).

crash risk among a benchmark sample of voluntary IFRS adopters. Our benchmark sample controls for changes in the economic environment around 2005 that are likely to impact crash risk, but are unrelated to IFRS adoption (Li, 2010; Byard et al., 2011).

Our first analysis finds weak evidence that, on average, EU non-financial firms experience a decrease in crash risk relative to voluntary adopters after 2005, and that EU financial firms experience an increase in crash risk after 2005. This finding provides some evidence that increased transparency under IFRS decreases crash risk for *non-financial* firms, and that the increased reporting volatility associated with IFRS' fair value provisions increase crash risk for *financial* firms. In addition, finding an increase in crash risk among financial firms is consistent with increased reporting volatility rather than increased transparency being the dominant effect of IFRS adoption on these firms.

Importantly, we perform various cross-sectional tests to provide corroborating evidence that the decrease in crash risk after 2005 among non-financial firms is associated with increased transparency, while the increase in crash risk among financial firms is attributable to increased volatility associated with fair value accounting. We begin our cross-sectional analysis by partitioning our sample based on the quality of the firm's information environment prior to IFRS adoption. We expect the consequences of improved financial reporting transparency for non-financial firms, and increased volatility for financial firms, to be stronger when the information environment is poor. For non-financial firms, this is because IFRS adoption in poor information environments is likely to result in larger increases in transparency when compared to non-financial firms in rich information environments, which are highly transparent even prior to IFRS adoption. For financial firms, this is because increased reporting volatility in poor information environments is

likely to result in greater uncertainty when compared to financial firms in rich information environments. This analysis finds strong evidence that crash risk decreases for non-financial firms and increases for financial firms in poor information environments after 2005. Thus, while mandatory IFRS adoption, on average, has only a small effect on crash risk, it has a large and significant impact on firms in poor information environments. In addition, consistent with our expectation, we find that the decrease in crash risk for non-financial firms and the increase in crash risk for financial firms are more pronounced among firms in poor information environments than firms in rich information environments.

We also perform tests on our non-financial firms after partitioning our sample based on countries with "large GAAP changes," where (1) IFRS results in more changes to local GAAP, and (2) strong institutions ensure IFRS is credibly implemented. We expect the effects of IFRS adoption to be stronger among non-financial firms in countries with large GAAP changes that are credibly implemented. We do not expect large GAAP changes to be applicable to financial firms because most accounting changes under IFRS, such as changes in inventory accounting and accounting for R&D, primarily impact non-financial firms and have little or no impact on financial firms. Further, while there is a large cross-country variation in the number of changes to local GAAP under IFRS for non-financial firms, financial firms in all EU countries experience a switch from historical-based measurement to fair value-based measurement under IFRS.[2] Consistent with our expectations, we find that non-financial firms in countries with large GAAP changes experience a greater decrease in crash risk when compared to non-financial firms in other

[2] In untabulated analysis we find, as expected, that there is no difference in the change of crash risk for financial firms with or without large GAAP changes.

counties.

In addition, we examine the effects of IFRS adoption on crash risk across banks, conditioned on the extent of their exposure to fair value accounting. If fair value accounting is associated with more reporting volatility, which in turn increases the likelihood of stock price crashes, we expect that the impact of IFRS adoption on crash risk is more pronounced for financial firms with greater exposure to fair value accounting (measured as the proportion of assets that are trading and investment securities). Consistent with our prediction, we find that banks with more fair value exposure experience a greater increase in crash risk than banks with less fair value exposure.

Furthermore, we examine the effects of IFRS adoption on crash risk among commercial banks after partitioning on the restrictiveness of each sample country's banking regulations (Laeven and Levine, 2009). We expect that banks in countries with less restrictive regulations are more likely to engage in risk-taking activities and have more exposure to fair value accounting, which may lead to greater increases in volatility and crash risk. As expected, we find that banks in countries with less restrictive banking regulations experience a greater increase in crash risk after 2005 than banks in countries with more restrictive banking regulations.

Finally, we examine measures of opacity and volatility in the pre- and post-adoption periods for non-financial firms and financial firms separately. We find that the proportion of non-financial firms meeting or beating consensus analyst forecasts decreases after 2005, while the proportion for financial firms remains unchanged. In addition, we find that earnings volatility of non-financial firms decreases significantly after 2005, while earnings volatility of financial firms increases. We also find that analyst forecast dispersion stays

unchanged for non-financial firms after 2005, while analyst forecast dispersion increases for financial firms. Overall, these findings corroborate our conclusion that mandatory IFRS adoption decreases crash risk among non-financial firms by improving transparency through additional disclosure, while it increases crash risk among financial firms by increasing reporting volatility through fair value provisions.

Our study contributes to the literature in several ways. First, while prior studies examine various aspects of the impact of IFRS adoption on stock returns, our study examines a novel and unique implication of IFRS adoption. Crash risk captures negative return skewness (the third moment of stock returns), which is distinct from measures studied in prior research, such as the average return (the first moment), and the variance of stock returns (the second moment).[3] Crash risk is an important feature of stock returns to investors because, unlike the risks stemming from symmetric volatilities, it cannot be reduced through diversification (Sunder, 2010). Crash risk is also the focus of a large body of finance literature and it is well documented that large price movements are more likely to be downward than upward (e.g., French et al., 1987; Campbell and Hentschel, 1992). Thus, by examining crash risk, our study makes an original and important contribution to the research that examines the impact of accounting standards on asset pricing, as well as to the studies on portfolio and risk management that focus on tail events (Hutton et al., 2009).

Our study also adds to the literature by documenting that while IFRS adoption *decreases* crash risk for non-financial firms in poor information environments and in countries with large GAAP changes, it *increases* crash risk for financial firms in poor information environments, and for banks with more exposure to fair value accounting and

[3] Examples of IFRS studies examining the first and second moments of stock returns include Armstrong et al. (2010), which documents market reactions to IFRS-related events, and Beuselinck et al. (2009), which investigates the effect of IFRS on stock return synchronicity.

in countries with less restrictive banking regulation. These findings complement prior international studies that examine the importance of institutional arrangements on the economic consequences of financial reporting regulations (Li, 2010; Byard et al., 2011; DeFond et al., 2011; Landsman et al., 2011). In particular, while prior IFRS studies provide evidence on many of the benefits of IFRS adoption, they provide little evidence on the negative consequences of IFRS adoption. In contrast, our study finds that while mandatory IFRS adoption benefits non-financial firms by reducing crash risk, it also results in negative consequences for financial firms by increasing crash risk.

Finally, our study adds to the debate on whether fair value accounting impacts risk in the financial industry (Khan, 2010; Laux and Leuz, 2010; Bhat et al., 2011). Specifically, while Laux and Leuz (2010) suggest that fair value accounting does not increase risk, Khan (2010) and Bhat et al. (2011) find evidence supporting that fair value accounting increases systemic risk (i.e., the risk of breakdown of an entire system) and feedback trading (i.e., increased tendency to liquidate asset holdings) in the banking industry. Our study complements this line of research by examining how a shift from historical-based accounting standards to fair-value-oriented accounting standards such as IFRS affects firm-specific crash risk (i.e., the risk of breakdown of an individual company). Our findings are consistent with mandatory IFRS adoption increasing crash risk among financial firms by inducing greater volatility.

The remainder of our study is organized as follows: Section 2 discusses the institutional background and empirical predictions. Section 3 presents our sample, data, and hypothesis tests. Section 4 describes additional analysis and Section 5 reports sensitivity tests. Section 6 concludes.

2. Hypothesis development

2.1. IFRS adoption, financial reporting transparency, and crash risk

In 2005, thousands of European companies ceased using domestic accounting standards and switched to IFRS.[4] Mandatory IFRS adoption in the EU resulted in an abrupt and major shift in financial reporting behavior and established IFRS as the single most widely used accounting standard in the world. Proponents assert that IFRS will increase reporting transparency and enable investors to more easily compare financial performance across different jurisdictions (Tweedie, 2006). For example, compared to Greek GAAP, IFRS requires disclosure of related party transactions, discontinued operations, segment reporting, and cash flows statements (GAAP, 2001). Consistent with IFRS providing greater disclosure and better reflecting economic position and performance, research finds that IFRS adoption, when credibly implemented, results in many positive capital market consequences, including reducing the cost of capital, improving firms' information environments, and increasing financial reporting comparability (e.g., Li, 2010; Byard et al., 2011; DeFond et al., 2011; Tan et al., 2011). Thus, one effect of mandatory IFRS adoption in the EU is increased financial reporting transparency.

We expect the increased transparency associated with IFRS adoption to reduce crash risk based on prior theoretical and empirical research. Specifically, the theoretical model in Jin and Myers (2006) suggests that increased opacity results in managers withholding firm-specific bad news from public disclosure. However, managers are only able or willing to withhold the bad news up to a point. Once a threshold is met, the accumulated negative

[4] We use the term IFRS to refer to both IFRS, issued by the International Accounting Standards Board (IASB) and the International Accounting Standards (IAS) issued by the IASB's predecessor, the International Accounting Standards Committee (IASC).

information is disclosed all at once, thereby resulting in a stock price crash. It is important to note that this theory simply requires that managers have both the ability and the incentives to control public access to at least some negative information about firm value. When managers lose either the ability or incentives to withhold this information, it leads to the sudden release of accumulated negative information and results in a stock price crash (Hutton et al., 2009). This phenomenon is consistent with the opaqueness in Parmalat's financial reporting that enabled insiders to hide their tunneling activities for over a decade (Coffee, 2005).[5] Supporting this information-based theory, Jin and Myers (2006) find that country-level differences in opacity are associated with cross-country differences in stock return crashes, and Hutton et al. (2009) find that firm-level opacity is associated with stock return crashes among US firms. Thus, an important channel through which IFRS adoption may reduce crash risk is increased transparency.

2.2. IFRS adoption, fair value, and crash risk

Compared to local GAAP in the EU, a distinct feature of mandatory IFRS adoption is its emphasis on fair value accounting. However, the economic consequences of its fair value provisions are greatly debated. The controversy stems primarily from the potential effects of IAS 39, which requires fair value accounting for trading securities, with the resulting gains and losses recognized in the income statement.[6] IAS 39 differs substantially from local accounting standards in EU countries, all of which value financial instruments (notably derivatives) at historical cost. This standard is aimed primarily at financial institutions, which use derivatives extensively in risk management and trading.

[5] Parmalat's accounting scandal involved a fictitious €3.9 billion account with Bank of America and misappropriation of assets by corporate insiders through related party transactions with companies affiliated with or controlled by its founder (*Wall Street Journal*, 'How Parmalat Spent and Spent,' July 23, 2004).

[6] IAS 39 also requires fair value accounting for available-for-sale securities, with the resulting gains and losses recognized in other comprehensive income.

While some argue that the fair value provisions under IFRS increase reporting transparency, others argue that these provisions lead to increased reporting volatility that is associated with greater uncertainty and higher re-contracting costs. Since these factors affect crash risk in opposite directions, the impact of fair value accounting on crash risk is unclear.

Proponents of IFRS' fair value provisions argue that they provide greater transparency that in turn better reflects the underlying risk profiles and performance of the firm.[7] For example, IASB states in its press release regarding standards on financial instruments:

'The Standards require companies to disclose their exposure to financial instruments and to account for their effects – in most cases as they happen, rather than allowing problems to be hidden away. In particular, IAS 39 requires derivatives to be reported at their 'fair' or market value, rather than at cost. This overcomes the problem that the cost of a derivative is often nil or immaterial and hence if, derivatives are measured at cost, they are often not included in the balance sheet at all and their success (or otherwise) in reducing risk is not visible. In contrast, measuring derivatives at fair value ensures that their leveraged nature and their success (or otherwise) in reducing risk are reported. ' (IASB, 2003, p.1).

Consistent with the view that fair value accounting results in more informative financial statements, theoretical work by Bleck and Liu (2007) suggest that marked-to-market accounting provides investors with an early warning system while historical cost offers management greater opportunities to mask firms' true economic performance. If so, the greater opacity associated with a historical cost accounting regime would be associated with higher levels of crash risk, and shifting to IFRS would reduce crash risk.

There are, however, reasons why fair value accounting may instead increase crash risk. Critics contend that fair value accounting results in more volatile reported earnings and

[7] See 'Intl Accounting Board confirms tough derivative standard' (Down Jones Newswires, December 17, 2003).

introduces greater uncertainty among investors.[8] While volatility *per se* may not be the concern for investors if it reflects more timely incorporation of information (Ball, 2006), opponents of fair value accounting argue that it puts investors at a disadvantage because it induces greater estimation errors or artificial volatility. 'Artificial' volatility refers to the excess volatility driven by factors such as short-term fluctuations in financial markets, rather than volatility driven by the riskiness of long-term cash flows, and is distinct from volatility that is simply due to a better reflection of underlying operating fundamentals. In 2003, such criticism ultimately led to intervention by then French president Jacques Chirac, who expressed concerns to the president of the European Commission that IAS 39 would increase volatility among financial firms.[9] This concern was also expressed in the 2004 staff report by the European Central Bank:

'It can be argued that volatility provides relevant information and should be duly recognized in the financial statements. However, an excessive reliance on fair values, including for assets that are not actively traded on liquid secondary markets, runs the risk that the information disclosed will embody "artificial" volatility, driven by short-term fluctuations in financial market valuations, or caused by market imperfections or by inadequate development of valuation techniques.' (European Central Bank, 2004, p.2).

If fair value accounting increases artificial reporting volatility, as its critics argue, we expect it to increase crash risk. This is because the increase in artificial reporting volatility likely results in increased investor uncertainty about the true volatility of firms' underlying cash flows. Increased uncertainty leads to an increase in the required risk premium. As the

[8] See 'Europe's banks, beancounters cross swords in accounting fight' (Down Jones Newswires, October 14, 2002)

[9] The EU initially endorsed IAS 39 with two "carve-out" provisions on fair value options and portfolio hedging of demand deposits (Armstrong et al., 2010). The carve-out on fair value option was eventually eliminated after the IASB revised IAS 39 with a new fair value option in 2005. The effect of IAS 39 on earnings volatility was also tempered during the financial crisis in 2008, when the IASB issued amendments allowing companies to reclassify financial assets in order to avoid recognition in the income statement.

risk premium increases, stock prices fall, which reinforces the effects of bad news but offsets the effect of good news, thus generating negative skewness (i.e., crash risk).[10]

A second reason is that increased reporting volatility (regardless of whether it reflects underlying economic fundamentals or estimation errors) can also increase crash risk because it is likely to negatively impact firm's contracting costs. Financial contracts are often based on accounting numbers and more volatile reported numbers will lead to greater re-contracting costs. For example, more volatile reported numbers will increase the probability of firms violating their accounting-based debt covenants (such as net worth covenants) and thereby trigger costly renegotiation with the lender, which in turn increases borrowing costs. Since contract renegotiation tends to happen when bad news arrives, this will exacerbate the effect of bad news and therefore increase crash risk.[11]

2.3. The impact of IFRS adoption on crash risk for non-financial firms

Based on the above discussion, we expect that the affects of mandatory IFRS adoption on crash risk are likely to differ across non-financial and financial firms. For non-financial firms, we expect that the dominant effect of IFRS adoption is increased transparency, thereby reducing crash risk. By comparison, the effect of fair value accounting on non-financial firms is likely to be negligible, because IAS 39 is only applicable to financial instruments. While IFRS does allow firms to voluntarily fair value non-financial assets, such as property, plant, and equipment (PPE) and intangible assets, research finds that EU IFRS adopters overwhelmingly opt to value these assets at historical cost and rarely record

[10] This is also consistent with the empirical observation that volatility is related to negative returns (French et al., 1987).

[11] In addition, fair value accounting may also lead to increased crash risk through its effect on investor behavior during financial crises, such as feedback trading (Bhat et al., 2011; Allen and Carletti, 2008; Plantin et al., 2008). However, given that our data does not encompass the financial crisis, such behavior is unlikely to explain our results.

them at fair value (Christensen and Nikolaev, 2009). In addition, consistent with IFRS adoption not increasing volatility for non-financial firms, Byard et al. (2011) find that analyst forecast dispersion significantly decreases subsequent to mandatory IFRS adoption. Thus, our first hypothesis is (in alternative form):

Hypothesis 1: Non-financial firms experience a decrease in crash risk subsequent to the mandatory IFRS adoption.

2.4. The impact of IFRS adoption on crash risk for financial firms

Unlike non-financial firms, the impact of IFRS adoption on crash risk for financial firms is unclear. On the one hand, prior research argues that financial firms, by their nature, tend to be more opaque (Morgan, 2002), which suggests that the additional disclosure associated with IFRS adoption will be more likely to reduce crash risk. For example, the additional disclosure of financial assets or related party transactions associated with IFRS adoption likely leads to better insights into the risk profile of financial institutions. On the other hand, financial firms have inherently more exposure to the effects of fair value recognition (particularly under IAS 39), which suggests that the increased reporting volatility associated with fair value provisions under IFRS will increase crash risk. In addition, most non-fair value related accounting changes under IFRS, such as changes in inventory accounting and accounting for R&D, have a greater impact on non-financial firms than on financial firms. Thus, we are unable to provide a directional prediction in our second hypothesis, which is:

Hypothesis 2: Financial firms may experience either a decrease or an increase in crash risk subsequent to the mandatory IFRS adoption.

3. Sample, data, and hypothesis tests

3.1. Sample

EU companies are required to switch to IFRS for fiscal years beginning on or after January 1, 2005. We focus on the last two years before the IFRS mandate (i.e., the pre-adoption period), and the first two years after the IFRS mandate (i.e., the post-adoption period). For a December year-end company, for example, the pre-adoption period consists of 2003 and 2004, while the post-adoption period consists of 2005 and 2006. We stop at 2006 to avoid the potential confounding effects of the global financial crisis starting in early 2007 (Ryan, 2008). To identify mandatory adopters, we select companies that report under local accounting standards ("DS" code in Compustat) in the two-year pre-adoption period and IFRS ("DI" code) in the two-year post-adoption period. Following prior studies (Li, 2010; Byard et al., 2011), we include a benchmark sample of voluntary adopters that report under IFRS throughout our sample period to control for the impact of confounding concurrent events.

We collect financial statement information from Compustat and Worldscope, stock return and volume data from Datastream, and information on analyst following from I/B/E/S. To mitigate the influence of outliers, we winsorize all continuous variables in our multivariate regression analysis at the top and bottom 1% of their distributions. Our final sample consists of 7,532 firm-year observations representing 1,883 (7,532/4) unique firms

in the EU, including 1,660 non-financial firms and 283 financial firms (i.e., firms with one-digit SIC code of 6).

Table 1 reports the sample distribution separately for non-financial firms and financial firms by country. The table indicates that the number of total firm-year observations and the number of unique firms vary widely across the EU. Moreover, the country distribution is similar for both non-financial and financial firms. For example, the U.K. has the largest number of firm-year observations for non-financial (1,520) and financial firms (244), while Luxembourg has the smallest number of firm-year observations for non-financial firms (four) and, along with Slovenia for financial firms (zero). In addition, Table 1 shows a considerable variation in sample distribution across mandatory and voluntary adopters. For example, for non-financial firms, mandatory (voluntary) adopters are from 19 (17) different countries, with the largest number of companies from the U.K. (Germany). The pattern is similar for financial firms as well.

3.2. Variables

3.2.1. Measuring crash risk

To calculate the measures of firm-specific crash risk, we first estimate firm-specific weekly returns for each firm-year. Specifically, the firm-specific weekly return, denoted by *W*, is defined as the natural logarithm of one plus the residual return from the following expanded market model regression (Jin and Myers, 2006):

$$r_{it} = \alpha_i + \beta_{1,i} r_{m,j,t} + \beta_{2,i}[r_{US,t} + EX_{jt}] + \beta_{3,i} r_{m,j,t-1} + \beta_{4,i}[r_{US,t-1} + EX_{j,t-1}] + \beta_{5,i} r_{m,j,t-2} + \beta_{6,i}[r_{US,t-2} + EX_{j,t-2}] + \beta_{7,i} r_{m,j,t+1} + \beta_{8,i}[r_{US,t+1} + EX_{j,t+1}] + \beta_{9,i} r_{m,j,t+2} + \beta_{10\,j}[r_{US,t+2} + EX_{j,t+2}] + \varepsilon_{it}, \quad (1)$$

where r_{it} is the return on stock *i* in week t in country j, $r_{m,j,t}$ is the return on the MSCI country-specific market index or the country index compiled by Datastream in week t, $r_{us,t}$ is the US market index return (a proxy for the global market), and $EX_{j,t}$ is the change in country j's exchange rate versus the US dollar. As in Jin and Myers (2006), we include two lead and lagged terms for the local and US market index returns to allow for nonsynchronous trading (Dimson, 1979). The firm-specific weekly return for firm *i* in week t, $W_{i,t}$, is measured by the natural logarithm of one plus the residual return in Eq. (1), that is, $W_{i,t} = \text{Ln}\,(1+\varepsilon_{i,t})$.

Following Chen et al. (2001) and Kim et al. (2011a, b), our first measure of crash risk for each firm-year, denoted by *NCSKEW*, is the negative conditional return skewness. Specifically, we calculate *NCSKEW* for a given firm-year by taking the negative of the third moment of firm-specific weekly returns, $W_{i,t}$, for each sample year and dividing it by the standard deviation of firm-specific weekly returns raised to the third power. Specifically, for each firm *j* in year *t*, we compute *NCSKEW* as

$$NCSKEW_{it} = -\left[n(n-1)^{3/2}\sum W^{3}{}_{it}\right] \Big/ \left[(n-1)(n-2)\left(\sum W^{2}{}_{it}\right)^{3/2}\right]. \qquad (2)$$

Our second measure of crash risk is the down-to-up volatility (*DUVOL*) measure of crash likelihood from Chen et al. (2001) and Kim et al. (2011b), which is computed as follows. For each firm *i* over a fiscal year period *t*, we separate all the weeks with firm-specific weekly returns, $W_{i,\tau}$, below the annual mean ("down" weeks) from those with firm-specific returns above the annual mean ("up" weeks) and calculate the standard deviation for each of these subsamples separately. We then measure *DUVOL* as the natural logarithm

of the ratio of the standard deviation in the down weeks to the standard deviation in the up weeks.[12] Higher values of *NCSKEW* and *DUVOL* indicate greater crash risk.

3.2.2. Other variables

Following prior studies such as Chen et al. (2001), Hutton et al. (2009), and Kim et al. (2011a, b), our analysis includes the following control variables measured in year t-1: (1) the change in average monthly stock turnover from year t-1 to year t, $DTURN_{t-1}$, to proxy for the change in differences of opinion among investors; (2) the one year lagged negative skewness of firm-specific weekly returns, $NCSKEW_{t-1}$, because firms with a high return skewness are likely to have a high crash risk in the following year;[13] (3) the standard deviation of firm-specific weekly returns over the fiscal year period t-1, $SIGMA_{t-1}$, because more volatile stocks are more likely to experience stock price crashes in the future; (4) the average of firm-specific weekly returns, RET_{t-1}, as stocks with high past returns are more likely to crash; (5) the natural logarithm of the market value of equity, $SIZE_{t-1}$, as larger firms are more likely to crash; (6) the market-to-book ratio, MB_{t-1} because prior studies document that growth stocks are more likely to experience future price crashes; (7) the total long-term debt divided by total assets, LEV_{t-1}, as prior studies show that financial leverage is negatively related to crash risk;[14] (8) income before extraordinary items divided by lagged total assets, ROA_{t-1}, because operating performance is shown to be significantly

[12] An alternative measure for the likelihood of crashes is an indicator variable for firms experiencing one or more crash events during a year (Hutton et al., 2009; Kim et al., 2011a, b). Based on this definition, 10.8% of our sample experience crashes, i.e., having weekly firm-specific residual returns of 3.2 standard deviations below the mean for the firm's fiscal year. We do not use this measure in our analysis because the *dichotomous* measure has less power in detecting the hypothesized association between IFRS adoption and crash risk compared to the other two *continuous* measures of crash risk. In addition, the indicator crash risk measure computes the left tail risk independently of the right tail risk and thus does not capture the *asymmetry* in the return distribution.

[13] We conduct a sensitivity test by replacing $NCSKEW_{t-1}$ with $DUVOL_{t-1}$ when the dependent variable is $DUVOL_t$ and find consistent results (untabulated).

[14] While the negative association between leverage and crash risk may seem counter intuitive, one explanation is that more stable, less crash-prone firms are likely to have a greater ability to borrow (Hutton et al., 2009).

related to crash risk;[15] (9) the absolute value of discretionary accruals, $ABACC_{t-1}$, as firms with more earnings management are more prone to stock price crashes; (10) country indicators to control for country-fixed effects; and (11) for analysis based on non-financial firms, industry indicators to control for industry-fixed effects.

3.2.3. Descriptive statistics

Panel A of Table 2 presents descriptive statistics of the crash risk variables as well as control variables used in our regression analysis, separately for non-financial and financial firms. Appendix A provides detailed variable definitions. For the crash risk measures, the average non-financial (financial) firm in our sample has a negative weekly return skewness (*NCSKEW*) of -0.294 (-0.306) and a ratio of the standard deviation of down-week to up-week firm-specific weekly returns (*DUVOL*) of -0.162 (-0.162). On average, the sample non-financial (financial) firm has a change in monthly share turnover from the previous year ($DTURN_{t-1}$) of 0.005 (0.001), a one-year lagged negative weekly return skewness ($NCSKEW_{t-1}$) of -0.241 (-0.286), a standard deviation of firm-specific weekly returns over last year ($SIGMA_{t-1}$) of 0.044 (0.029), and an average of firm-specific weekly returns over last year (RET_{t-1}) of -0.130 (-0.055). In addition, the average sample non-financial (financial) firm has a log of market value of equity ($SIZE_{t-1}$) of 5.386 (6.676), a market-to-book ratio (MB_{t-1}) of 2.210 (1.607), a leverage ratio (LEV_{t-1}) of 0.141 (0.191), return on assets (ROA_{t-1}) of 0.018 (0.029). Finally, the absolute average value of abnormal accruals ($ABACC_{t-1}$) for non-financial firms is 0.054.[16] Overall, Panel A shows a reasonably high degree of variation in many of the variables for both non-financial and financial firms.

[15] Hutton et al. (2009) use the contemporaneous *ROA* instead of lagged *ROA* as a control for crash risk. In an untabulated sensitivity test, we find consistent results when replacing ROA_{t-1} with ROA_t.

[16] Following the earnings management literature, we compute abnormal accruals for non-financial firms only.

Panel B of Table 2 presents Pearson correlation coefficients across the test variables for non-financial and financial firms separately. We find that the two crash risk measures (*NCSKEW* and *DUVOL*) are highly correlated with each other for both groups of firms, with a correlation coefficient of 0.96. For non-financial firms, these two crash risk measures are positively correlated with lagged negative return skewness ($NCSKEW_{t-1}$), average weekly return over last year (RET_{t-1}), lagged firm size ($SIZE_{t-1}$), lagged market-to-book ratio (MB_{t-1}), lagged return on assets (ROA_{t-1}), and negatively correlated with standard deviation of weekly returns over the previous year ($SIGMA_{t-1}$). For financial firms, the two crash risk measures are positively related to lagged negative return skewness ($NCSKEW_{t-1}$) and lagged firm size ($SIZE_{t-1}$).

3.3. Hypothesis tests of the average effect of mandatory IFRS adoption on crash risk

To test our hypotheses of the average effect of mandatory IFRS adoption on firm-specific crash risk, we regress firm-specific crash risk measures on: (1) a dummy variable indicating whether the firm is a mandatory adopter (*Mandatory adopters*), (2) a dummy variable indicating whether the period is post-adoption (*Post),* (3) the interaction term between these two indicator variables, and a set of control variables as listed in Appendix A. Our regression model follows:

$$Crash\ risk = \beta_0 + \beta_1(Mandatory\ adopters) + \beta_2(Post) + \beta_3(Mandatory\ adopters*Post) + \beta_j(Controls_j) + \varepsilon \quad (3)$$

Our variable of interest is the coefficient on the interaction term, β_3, which captures the incremental change in crash risk for mandatory adopters after 2005 relative to the change for voluntary adopters. A negative coefficient on β_3 is consistent with a decrease in crash risk and a positive coefficient on β_3 is consistent with an increase in crash risk. In this and all of our regression analysis we adjust the standard errors by firm and year clusters (Gow et al., 2010) and present one-tailed *p*-values where we have predictions and two-tailed otherwise.

Table 3 reports the results for non-financial and financial firms separately. We present the coefficients and *p*-values for non-financial firms in columns (1)-(4) and those for financial firms in columns (5)-(8). In addition, the odd columns report the results without firm-level control variables while the even columns report the results after including firm-level control variables.

For non-financial firms, the coefficient β_3 on the interaction term, *Mandatory adopters*Post*, is negative and significant at the 10% level across all four columns, except in column (4) when all control variables are included and when crash risk is measured by *DUVOL*. These results are generally consistent with our first hypothesis that mandatory IFRS adoption decreases crash risk in non-financial firms. For financial firms, on the other hand, the coefficient β_3 is significant and positive at the 10% level across all columns, except in column (6) when all controls are included and when crash risk is measured by *NCSKEW*. These results suggest that mandatory IFRS adoption increases crash risk in financial firms.

Table 3 also reports that lagged negative return skewness ($NCSKEW_{t-1}$) and firm size ($SIZE_{t-1}$) are positively related to crash risk across all columns. In addition, accrual

manipulation ($ABACC_{t-1}$) is positively associated with crash risk in all columns for non-financial firms. Although it is difficult to make direct comparisons with prior work due to differences in the sample and time period, these findings are generally consistent with Chen et al. (2001), Hutton et al. (2009), and Kim et al. (2011a, b).

In sum, the results in Table 3 find that EU non-financial firms switching to IFRS in 2005 experience a decrease in crash risk relative to voluntary adopters. EU financial firms, in contrast, experience an increase in crash risk. These findings provide some supporting evidence to our prediction that increased transparency under IFRS decreases crash risk for *non-financial* firms. In addition, these results suggest that the increased volatility associated with IFRS' fair value provisions increase crash risk for *financial* firms. In the next section, we conduct additional analysis to provide corroborating evidence on the channels through which mandatory IFRS adoption affects crash risk for non-financial and financial firms.

4. Additional analysis

4.1. Additional analysis conditional on firm-level information environment

We argue that the effect of increased transparency is likely the dominant channel through which IFRS adoption affects crash risk for non-financial firms. If so, we expect the effect of increased transparency to be more pronounced among non-financial firms in poor information environments before the adoption. This is because non-financial firms in poor information environments prior to the adoption are likely to experience greater improvements in financial transparency, which in turn results in a larger decrease in crash risk.

For financial firms, our main result suggests that the increased volatility associated with fair value accounting is likely the dominant channel through which IFRS adoption affects crash risk. We expect that the effect of increased volatility is also likely to be more pronounced among financial firms in poor information environments. This is because the effect of 'artificial' volatility is likely to be more severe in the environments with less firm-specific information.

To test these predictions, we classify firms into rich or poor information environments following prior studies such as Armstrong et al. (2010). Specifically, we use the first principal component, labeled as "*InfoEnviron*," derived from six variables that capture the firm's information environment prior to mandatory IFRS adoption. [17] The six variables are: (1) *ADR*, an indicator variable that equals one if a firm cross-lists its shares in the U.S. using American Depository Receipts (ADR) in the year before the adoption, and zero otherwise; (2) *Index*, an indicator variable that equals one if the firm is included in any stock market index in the year before the adoption, and zero otherwise; (3) *Exchanges*, the number of exchanges on which the firm is listed in the year before the adoption; (4) *Foreign sales*, the average foreign sales in the two years before the adoption; (5) *Analyst*, the number of analyst following in the year before the adoption; and (6) *Size*, the average natural logarithm of market value of equity in the two years before the adoption. We expect firms with higher values of each measure to have richer information environments.

We partition the non-financial firms and financial firms separately based on the sample median value of "*InfoEnviron*" and label the firms above or equal to the median as those in rich information environments. We then estimate the regression model in Eq. (3) for each

[17] The first and second principal component eigenvalues are 2.55 and 1.06 for non-financial firms, and 2.64 and 1.06 for financial firms.

information environment and test whether the coefficient on the interaction term, *Mandatory adoption*Post*, differs across partitions. Because there are very few voluntary adopters in our sample of firms in the financial industry (21 unique firms), the control group for financial firms includes voluntary adopters in both rich and poor information environments. If the reduction in crash risk for non-financial firms is attributable to increased disclosure associated with IFRS adoption, we expect β_3 to be significantly more negative among those in poor information environments. And if the increase in crash risk for financial firms stems from increased volatility after implementing fair value accounting following mandatory IFRS adoption, we expect β_3 to be significantly more positive among those in poor information environments.

Panel A of Table 4 presents the results of this analysis for non-financial firms, where columns (1) and (2) report the results when crash risk is measured by *NCSKEW*, and columns (3) and (4) report the results when crash risk is measured by *DUVOL*. We find that β_3 is significantly negative among the firms with poor information environments for both measures of crash risk, and insignificantly different from zero among the firms with rich information environments. In addition, consistent with our prediction, we find that β_3 is significantly more negative in the poor information environment partition than in the rich information environment partition (significant at the 5% level).

We also find that the decrease in crash risk among non-financial firms in poor information environments is economically significant. Specifically, mandatory IFRS adoption in poor information environments is associated with a decrease in crash risk of

45% and 31%, compared to the overall average crash risk for non-financial firms, where crash risk is captured using *NCSKEW* and *DUVOL*, respectively.[18]

Panel B of Table 4 reports the results of the analysis after partitioning the sample based on the information environment for financial firms. In contrast to Panel A, we find that the coefficients β_3 on the interaction term, *Mandatory adopters*Post*, are significantly positive in the partitions in poor information environments for both measures of crash risk, and insignificantly different from zero in the partitions in rich information environments. In addition, consistent with our prediction, we find that β_3 is significantly more positive in the poor information environment partition than in the rich information environment partition (significant at the 1% level).

We also find that the increase in crash risk among financial firms in poor information environments is economically significant. Specifically, mandatory IFRS adoption in poor information environments is associated with an increase in crash risk of 74% and 73%, compared to the overall average crash risk for financial firms, where crash risk is captured using *NCSKEW* and *DUVOL*, respectively.[19]

In summary, the analysis in Table 4 finds that non-financial firms in poor information environments experience a statistically and economically significant reduction in crash risk following the IFRS mandate, and that financial firms in poor information environments experience a statistically and economically significant increase in crash risk following the

[18] 45% = -0.133/-0.294= β_3 in Column (2) in Panel A of Table 4 divided by mean crash risk in Panel A of Table 2, where crash risk is measured as *NCSKEW*. 31% = -0.050/-0.162= β_3 in Column (4) in Panel A of Table 4 divided by mean crash risk in Panel A of Table 2, where crash risk is measured as *DUVOL*. The numbers are qualitatively similar if we use mean crash risk in the pre-adoption period to assess economic significance.

[19] 74% = 0.225/|-0.306|=β_3 in Column (2) in Panel B of Table 4 divided by mean crash risk in Panel A of Table 2, where crash risk is measured as *NCSKEW*. 73% = 0.118/|-0.162|= β_3 in Column (4) in Panel A of Table 4 divided by absolute value of the mean crash risk in Panel A of Table 2, where crash risk is measured as *DUVOL*. The numbers are qualitatively similar if we use mean crash risk in the pre-adoption period to assess the economic significance.

IFRS mandate. These findings corroborate our conclusion that the decrease in crash risk after 2005 among non-financial firms is associated with increased disclosure and transparency, while the increase in crash risk among financial firms is attributable to increased volatility associated with fair value accounting.

4.2. Additional analysis conditional on country-level large GAAP changes

This section provides further evidence on our inferences that the reduced crash risk for non-financial firms is likely due to increased disclosure associated with IFRS adoption. Specifically, we rerun the regression in Eq. (3) after partitioning non-financial firms by whether they experience large changes in accounting standards that are credibly implemented. If the switch to IFRS leads to more disclosure and therefore decreased crash risk, we expect that the effect on crash risk to be more pronounced for mandatory adopters in countries with both stronger enforcement regimes and larger changes in accounting standards after the IFRS adoption. We do not expect large GAAP changes to differentially affect financial firms because most of the accounting standard changes are not applicable to financial firms (e.g., accounting for inventory or R&D), and financial firms in all EU countries experience a shift from historical cost accounting to fair value accounting (which has a significant impact on financial firms).

We begin this analysis by partitioning our sample based on countries with where IFRS adoption results in large changes to local GAAP among strong enforcement regimes. We label this partition as firms with *Large GAAP changes*. Our proxy for strong enforcement is the mean of the three enforcement measures from La Porta et al. (1998): (1) the efficiency of the judicial system, (2) the rule of law, and (3) corruption. Higher values of this enforcement index indicate relatively stronger legal enforcement. We measure the size of

the change in local GAAP after the IFRS adoption using the *Gaapdiff1* variable in Bae et al. (2008).[20] Higher values of *Gaapdiff1* indicate larger changes in accounting standards after the IFRS mandate. We create an indicator variable, *Large GAAP change,* which equals one for firms with values of both enforcement and *Gaapdiff1* equal to or above the sample country-level median, and zero otherwise. Three countries in our sample are classified as those with large GAAP changes – Austria, Belgium, and Finland.

We partition mandatory adopters of non-financial firms based on *Large GAAP change* and estimate the regression model in Eq. (3) for sub-samples in countries experiencing large GAAP changes after the IFRS mandate and others. We include all voluntary adopters as the control group in each partition because voluntary adopters already use IFRS and thus experience no GAAP change after 2005 (that is, the partitioning variable is not applicable to voluntary adopters). We test whether the coefficients on the interaction term, *Mandatory adoption*Post*, differ across the partitions. If mandating IFRS for non-financial firms increases disclosure and improves firms' information environments, which in turn lowers crash risk, we expect β_3 to be more negative among the firms in the *Large GAAP change* partition.

Panel A of Table 5 reports descriptive statistics on the components of country-level large GAAP changes. For example, Luxembourg has the largest change in accounting standards following the IFRS mandate (with a value of 18), while Ireland and the U.K. have the smallest (with a value of one). Denmark, Finland, the Netherlands, and Sweden

[20] The *gaapdiff1* variable in Bae et al. (2008) is based on comparing local GAAP with 21 IAS items (such as those related to segment disclosure, accounting for employee benefit obligations, impairment testing of intangibles, and capitalization of research and development costs). It does not include IAS 39. To assess the impact of IAS 39 on our sample countries, we also examine the difference in local GAAP and IAS 39 based on the source used in Bae et al. (2008), that is, the GAAP 2001 survey, and find that all of our EU sample countries experience changes from historical cost accounting to fair value accounting for financial instruments after the IFRS mandate.

have the strongest legal enforcement environment (with a value of 10), while Greece has the weakest legal enforcement environment (with a value of 6.82).

Panel B of Table 5 reports the results of the analysis after partitioning the sample on *Large GAAP change*. Columns (1) and (2) report the results when crash risk is measured by *NCSKEW* and columns (3) and (4) report the results when crash risk is measured by *DUVOL*. We find that β_3 is significantly negative among the firms in the *Large GAAP change* partition for both measures of crash risk, and is insignificantly different from zero among the firms in the other partition. In addition, β_3 is significantly more negative in the *Large GAAP change* partition than in the other partition (significant at the 5% level). These findings are consistent with our prediction that non-financial firms with large changes in GAAP experience a greater reduction in crash risk after mandatory IFRS adoption.

We also find that the decrease in crash risk among non-financial firms in the *Large GAAP change* partition is economically significant. Specifically, mandatory IFRS adoption in the *Large GAAP change* partition is associated with a decrease in crash risk by 49% and 47%, compared to the overall average crash risk for non-financial firms, where crash risk is captured using *NCSKEW* and *DUVOL*, respectively.[21]

In summary, the findings in Table 5 indicate that the effect of mandatory IFRS adoption in reducing non-financial firms' crash risk depends critically on whether the adoption results in large credible changes in accounting standards. Specifically, the effect of IFRS adoption on crash risk for non-financial firms is more pronounced for mandatory adopters in countries with both stronger enforcement regimes and larger changes in local accounting

[21] 49% = -0.145/-0.294= β_3 in Column (2) in Panel B of Table 5 divided by mean crash risk in Panel A of Table 2, where crash risk is measured as *NCSKEW*. 47% = -0.076/-0.162= β_3 in Column (4) in Panel A of Table 5 divided by mean crash risk in Panel A of Table 2, where crash risk is measured as *DUVOL*. The numbers are qualitatively similar if we use mean crash risk in the pre-adoption period to assess the economic significance.

standards from IFRS adoption. This is consistent with the notion that the IFRS mandate imposes larger accounting changes on firms in these countries, while strong enforcement ensures that companies comply with these changes.

4.3. Additional analysis conditional on exposure to fair value

We argue in Section 2 that an important mechanism through which IFRS adoption affects crash risk for financial firms is their exposure to fair value accounting. If fair value accounting (i.e., IAS 39) is associated with more reporting volatility, which in turn increases the likelihood of stock price crashes, we expect that the impact of IFRS adoption on crash risk to be more pronounced among financial firms with more exposure to fair value accounting.

To test this prediction, we focus on commercial and investment banks (two-digit SIC codes of 60-62) in our sample, and measure the extent of their exposure to fair value accounting by the total of trading securities, dealing accounting securities, and investment securities in the year before the adoption, scaled by total assets. In untabulated analysis, we find that the mean and median values of this measure of fair value exposure for banks that adopt IFRS in 2005 (i.e., mandatory adopters) are 0.156 and 0.132, respectively. We partition these banks based on the sample median value of the fair value exposure and label the firms above or equal to (less than) the median as those with more (less) exposure to fair value accounting. We then estimate the regression model in Eq. (3) for each partition and test whether the coefficient on the interaction term, *Mandatory adoption*Post*, differs across the partitions. Because there are very few voluntary adopters in our sample of financial firms (21 unique firms), the control group for this analysis includes all 21 voluntary adopters in each partition. If mandating IFRS adoption increases crash risk for

financial firms through the emphasis on fair value accounting, we expect β_3 to be significantly more positive among banks with more exposure to fair value accounting.

Table 6 presents the results of this analysis, where columns (1) and (2) report the results when crash risk is measured by *NCSKEW*, and columns (3) and (4) report the results when crash risk is measured by *DUVOL*. We find that β_3 is significantly positive among banks with more fair value exposure for both measures of crash risk, and insignificantly different from zero among those with less exposure. In addition, consistent with our prediction, we find that β_3 is significantly more positive in the more exposure partition than in the less exposure partition (significant at the 10% level).

We also find that the increase in crash risk among banks with more fair value exposure is economically significant. Specifically, mandatory IFRS adoption for banks with more fair value exposure is associated with an increase in crash risk of 73% and 67%, compared to the overall average crash risk for financial firms, where crash risk is captured using *NCSKEW* and *DUVOL*, respectively.[22] Thus, the findings in Table 6 provide further evidence that fair value accounting is the channel through which IFRS adoption increases crash risk for financial firms.

4.4. Additional analysis conditional on banks with less restrictive regulations

This section provides additional evidence on how IFRS adoption increases crash risk for financial firms by examining the effect of banking regulations on the change in crash risk. Prior studies suggest that banking regulations play an important role in shaping banks' risk-taking behavior (e.g., Laeven and Levine, 2009). Based on this research, we expect

[22] 73% = 0.223/|-0.306| = β_3 in Column (1) in Table 6 divided by absolute value of mean crash risk in Panel A of Table 2, where crash risk is measured as *NCSKEW*. 67% = 0.109/|-0.162|= β_3 in Column (3) in Table 6 divided by absolute value of mean crash risk in Panel A of Table 2, where crash risk is measured as *DUVOL*. The numbers are qualitatively similar if we use mean crash risk in the pre-adoption period to assess the economic significance.

that banks in countries with less restrictive regulations are more likely to engage in risk-taking activities and hold financial assets and liabilities that are subject to greater volatility. Thus, we expect banks with less restrictive regulations to experience greater increases in crash risk subsequent to mandatory IFRS adoption.

To capture the extent of the country-level banking regulations, we use *Restrict*, an index of regulatory restrictions on the activities of banks from Barth et al. (2006). *Restrict* measures regulatory impediments to banks engaging in securities market activities (e.g., underwriting, brokering, dealing, and all aspects of the mutual fund industry), insurance activities (e.g., insurance underwriting and selling), real estate activities (e.g., real estate investment, development, and management), and the ownership of nonfinancial firms.

Our sample of mandatory IFRS adopters includes 344 commercial bank firm-year observations, representing 86 unique commercial banks (with two-digit SIC codes of 60 and 61).[23] We partition our commercial bank subsample into those with more or less restrictive regulations, based on the sample median value of *Restrict*. We estimate Eq. (3) separately for each partition. Because of the small sample size of voluntary adopters in the financial industry (21 unique firms), we include all of them as the control group in each partition.

Table 7 reports the results of this analysis. Panel A presents descriptive statistics on the country-level index of regulatory restrictions and shows that Italy, Malta, and Poland have the most restrictive banking regulations in our sample (ten), while Austria, Germany, and the U.K. have the least restrictive regulations (five).

[23] We include only commercial banks in this analysis, rather than commercial and investment banks used in the analysis of fair value exposure, because the bank regulation survey in Barth et al. (2006) focuses on commercial banks.

Panel B of Table 7 reports the results of our regression analysis. We find that β_3 is significantly positive among the firms with less restrictive banking regulations for both measures of crash risk, and insignificantly different from zero among the firms with more restrictive banking regulations. In addition, β_3 is significantly larger in the countries with less restrictive banking regulations (significant at the 5% level). These findings indicate that only banks in countries with less restrictive banking regulations experience an increase in crash risk after mandatory IFRS adoption.

We also find that the increase in crash risk among the firms in countries with less restrictive banking regulations is economically significant. Specifically, mandatory IFRS adoption in countries with less restrictive regulations is associated with an increase in crash risk by 84% and 69%, compared to the overall average crash risk for financial firms, where crash risk is captured using *NCSKEW* and *DUVOL*, respectively.[24]

Overall, the results in Table 7 are consistent with the notion that, to the extent that more fair value exposure under IFRS induces greater volatility, more restrictive regulations help constrain managers' risk-taking behavior and as a result, attenuate the impact of IFRS adoption on crash risk.

4.5. Additional analysis of the change in opacity and uncertainty after 2005

In this section we provide further evidence on the two channels through which IFRS adoption impacts firms' crash risk. We conjecture that if the decrease in crash risk for non-financial firms results from improved information transparency and reduced opacity, non-financial firms are less likely to engage in earnings management activities to meet/beat

[24] 84% = 0.256/|-0.306|=β_3 in Column (2) in Panel B of Table 7 divided by absolute value of mean crash risk in Panel A of Table 2, where crash risk is measured as *NCSKEW*. 69% = 0.112/|-0.162|= β_3 in Column (4) in Panel B of Table 7 divided by absolute value of mean crash risk in Panel A of Table 2, where crash risk is measured as *DUVOL*. The numbers are qualitatively similar if we use mean crash risk in the pre-adoption period to assess the economic significance.

analyst forecasts in more transparent environments following the IFRS adoption. By comparison, if the increase in crash risk for financial firms results from increased volatility associated with fair value accounting, non-financial firms are more likely to experience increased earnings volatility and analyst forecast dispersion subsequent to mandatory IFRS adoption.

We test these conjectures in Table 8. We find that the proportion of non-financial firms meeting or beating consensus analyst forecasts decreases after 2005 (significant at the 1% level), while the proportion for financial firms remains unchanged. In addition, earnings volatility (i.e., cross-sectional standard deviation of ROA) among non-financial firms decreases significantly following IFRS adoption. By comparison, financial firms experience increased earnings volatility (significant at the 1% level) after 2005. We also find that analyst forecast dispersion stays unchanged for non-financial firms after 2005, but increases for financial firms (significant at the 10% level). Thus, the findings in Table 8 corroborate our conclusion that the decrease in crash risk after 2005 among non-financial firms is associated with increased disclosure and transparency, while the increase in crash risk among financial firms is attributable to increased volatility imposed by fair value accounting.

5. Sensitivity tests

5.1. Excluding the U.K.

The country-level sample distribution in Table 1 indicates that the U.K. has the largest number of firms in our sample for both non-financial and financial firms. To explore whether firms from the U.K. drive our results, we remove firm-year observations from the

U.K. and find consistent results in Tables 3 to 7, with one exception in Table 6 where the difference across partitions with more or less exposure to fair value accounting is not significant. Thus, our primary conclusion is generally robust to excluding the country with the largest number of observations.

5.2. Excluding 2005

Our post-adoption period includes the first two years of IFRS adoption. To explore whether the first year under the IFRS reporting, i.e., the transition year, has any undue influence on our findings, we remove 2005 and find generally consistent results as those reported in Tables 3 to 7, with the exceptions in Tables 3 and 7 where the coefficient on the interaction term, *Mandatory adopters*Post*, is not significant. Thus, our primary conclusion is generally robust to excluding the effect of the transition year.

5.3. Alternative specifications regarding accounting-based control variables

Hung and Subramanyam (2007) find that the value and variability of accounting numbers are different between IFRS and German GAAP. To ensure that differences between IFRS and local GAAP accounting numbers do not drive our results, we remove the control variables constructed based on accounting measures (i.e., LEV_{t-1}, ROA_{t-1}, and $ABACC_{t-1}$) and find consistent results in Tables 3 to 7. We also include the contemporaneous values of these three accounting variables as additional controls and find consistent results in Tables 3 to 7. Thus, our primary conclusion is not sensitive to alternative specifications regarding accounting-based control variables.

5.4. Alternative measures of enforcement

We measure the strength of a country's legal enforcement using the enforcement measure in La Porta et al. (1998). To check the robustness of the results, we use the

following alternative measures of enforcement in Kaufmann et al. (2007): (1) the rule of law score in 2005; (2) the governance effectiveness score in 2005, or (3) the average of the six governance scores in 2005. We re-conduct our analysis in Table 5 with these alternative measures and find consistent results. Thus, our primary conclusion is not sensitive to alternative enforcement measures.

5.5. Controlling for potential self-selection bias

Prior studies show that voluntary IFRS adopters are not a randomly selected group and they face different incentives compared to mandatory adopters (e.g., Leuz and Verrecchia, 2000). To account for the potential self-selection bias arising from the heterogeneity between these two groups of adopters, we follow prior literature and estimate a Heckman (1979) two-stage regression (e.g., Leuz and Verrecchia, 2000; Li, 2010). In the first stage we estimate the likelihood of voluntary adoption with a probit model in which the independent variables include firm size, U.S. cross-listing, industry adjusted ROA (a proxy for proprietary costs), country-level regulations regarding IFRS adoption in 2003, as well as industry and year fixed effects. We then include the Inverse Mills Ratio from the first stage and rerun the analysis in Tables 3 to 7. We find that all of our results continue to hold except in Table 3 where the coefficient on the interaction term, *Mandatory adopters*Post*, is not significant for financial firms.

6. Conclusion

This study examines whether mandatory IFRS adoption in the EU affects firm-specific stock price crash risk. It is important to understand crash risk in the context of accounting standards because prior research suggests that financial reporting environment is a critical

factor in explaining crash risk. The mandatory adoption of IFRS by thousands of companies in the EU in 2005 is an ideal setting for testing how changes in financial reporting standards affect crash risk.

We find only weak evidence that, on average, EU non-financial firms experience a decrease in crash risk relative to voluntary adopters after 2005, and that EU financial firms experience an increase in crash risk after 2005. This finding is consistent with our prediction that increased transparency under IFRS decreases crash risk for *non-financial* firms, and with increased volatility associated with IFRS' fair value provisions increasing crash risk for *financial* firms.

We also perform additional analysis that provides corroborating evidence that the decrease in crash risk after IFRS adoption among non-financial firms is associated with increased disclosure and transparency, while the increase in crash risk among financial firms is attributable to increased volatility associated with fair value accounting. Specifically, we find that crash risk decreases for non-financial firms and increases for financial firms in poor information environments after IFRS adoption. As expected, we also find that non-financial firms experience a greater decrease in crash risk when they are in countries with large GAAP changes, and that banks with more exposure to fair value accounting and in countries with less restrictive banking regulations experience a greater increase in crash risk after 2005. Finally, we compare changes in proxies capturing opacity and uncertainty for non-financial and financial firms and find results consistent with our inferences regarding the channels through which IFRS adoption affects crash risk for these firms.

Our study contributes to the literature by examining the effect on IFRS adoption on crash risk, a previously unexplored implication of IFRS adoption. Crash risk is particularly important for investors because it cannot be reduced through diversification, unlike the risks stemming from symmetric volatilities. Our findings complement prior international studies that examine the importance of institutional arrangements on the economic consequences of financial reporting regulations by providing evidence on both the benefits of IFRS adoption, as well as one negative consequence. Our study also adds to the research on fair value accounting by examining how a shift from historical-based accounting standards to fair-value-oriented accounting standards such as IFRS affects firm-specific crash risk. We caution, however, that there are many factors to consider in deciding fair value provisions under IFRS. While our finding suggests that crash risk increases for financial firms due to the increased volatility associated with fair value accounting, our study is not intended to be prescriptive and does not imply that IASB should abandon fair value accounting.

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Appendix A
Variable definition

Crash risk variables

NCSKEW: The negative skewness of firm-specific weekly returns over the fiscal year period.

DUVOL: The log of the ratio of the standard deviations of down-week to up-week firm-specific weekly returns.

For the crash risk variables, the firm-specific weekly return *(W)* is equal to ln(1 + residual), where the residual is from the following expanded market model regression based on Jin and Myers (2006):

$$r_{it} = \alpha_i + \beta_{1,i} r_{m,j,t} + \beta_{2,i}[r_{US,t} + EX_{jt}] + \beta_{3,i} r_{m,j,t-1} + \beta_{4,i}[r_{US,t-1} + EX_{j,t-1}] + \beta_{5,i} r_{m,j,t-2} +$$
$$\beta_{6,i}[r_{US,t-2} + EX_{j,t-2}] + \beta_{7,i} r_{m,j,t+1} + \beta_{8,i}[r_{US,t+1} + EX_{j,t+1}] + \beta_{9,i} r_{m,j,t+2} + \beta_{10\,j}[r_{US,t+2} + EX_{j,t+2}] + \varepsilon_{it}$$

where r_{it} is the return on stock *i* in week t in country j, $r_{m,j,t}$ is the return on the MSCI country-specific market index or the country index compiled by Datastream in week t, $r_{us,t}$ is the US market index return (a proxy for the global market), and $EX_{j,t}$ is the change in country j's exchange rate versus the US dollar.

Variables of interest

Mandatory adopters: An indicator variable equal to one if companies prepared their financial statements based on local accounting standards before 2005, and switched to IFRS in 2005.

Post: An indicator variable equal to one if a firm-year falls in or after 2005.

Firm-level controls

DTURN: The average monthly share turnover over the current fiscal year period minus the average monthly share turnover over the previous fiscal year period, where monthly share turnover is calculated as the monthly trading volume divided by the total number of shares outstanding during the month.

SIGMA: The standard deviation of firm-specific weekly returns over the fiscal year period.

RET: The mean of firm-specific weekly returns over the fiscal year period, times 100.

SIZE: The log of the market value of equity.

MB: The market value of equity divided by the book value of equity.

LEV: Total long-term debts divided by total assets.

ROA: Income before extraordinary items divided by lagged total assets.

ABACC: The absolute value of discretionary accruals, where discretionary accruals are estimated from the modified Jones model.

Appendix A, continued

Conditional variables

InfoEnviron: The first principal component derived from six variables capturing firm-level information environment before the IFRS adoption. The six variables are: (1) *ADR*, an indicator variable that equals one if a firm cross-lists its shares in the US using American Depository Receipts (ADR) in the year before the adoption, and zero otherwise; (2) *Index*, an indicator variable that equals one if the firm is included in any stock market index in the year before the adoption, and zero otherwise; (3) *Exchanges*, the number of exchanges on which the firm is listed in the year before the adoption; (4) *Foreign sales*, the average foreign sales in the two years before the adoption; (5) *Analyst*, the number of analyst following in the year before the adoption; and (6) *Size*, the average of natural logarithm of market value of equity in the two years before the adoption.

Change in GAAP: The differences between national accounting standards and IFRS based on Bae et al. (2008, Table 1); higher values indicate greater changes in GAAP after IFRS adoption.

Enforcement: The mean of the three enforcement measures from La Porta et al. (1998): (1) the efficiency of the judicial system, (2) the rule of law, and (3) the corruption index; higher values indicate stronger enforcement.

Large GAAP change: An indicator variable equal to one for countries with values of *Change in GAAP* and *Enforcement* both above or equal to the sample country-level median for mandatory adopters, and zero otherwise.

Fair value exposure: A firm-level variable capturing the use of fair value accounting for commercial and investment banks (two-digit SIC codes of 60-62), measured as the total of trading or dealing accounting securities and investment securities in the year before the adoption, scaled by total assets.

Restrict: A country-level index of regulatory restrictions on the activities of banks from Barth et al. (2006). This index measures regulatory impediments to banks engaging in securities market activities (e.g., underwriting, brokering, dealing, and all aspects of the mutual fund industry), insurance activities (e.g., insurance underwriting and selling), real estate activities (e.g., real estate investment, development, and management), and the ownership of nonfinancial firms. Higher values indicate more restrictive regulations.

Others

Meet or beat analyst forecast: A firm-level indicator variable equal to one if the actual annual EPS in I/B/E/S is equal to or greater than the consensus analyst forecast before earnings announcements in I/B/E/S, and zero otherwise.

Earnings volatility: Cross-sectional standard deviation of income before extraordinary items scaled by assets for the sample firms.

Appendix A, continued

Analyst forecast dispersion: Firm-level standard deviation of analyst forecasts before earnings announcements scaled by actual annual EPS in I/B/E/S.

Country indicators: Indicator variables for countries.

Industry indicators: Variables indicating industry membership based on Campbell (1996).

Table 1
Sample distribution

Table 1 presents the sample distribution. The sample includes 7,532 firm-year observations representing 1,883 unique firms including 1,600 non-financial firms and 283 financial firms in the EU during 2003–2006, where 2003–2004 is defined as the pre-adoption period and 2005–2006 as the post-adoption period.

	No. of firm-years		No. of firms		No. of mandatory users		No. of voluntary users	
Country	**Non-financial**	**Financial**	**Non-financial**	**Financial**	**Non-financial**	**Financial**	**Non-financial**	**Financial**
Austria	108	20	27	5	6	1	21	4
Belgium	176	56	44	14	35	12	9	2
Czech Rep	16	4	4	1	2	0	2	1
Denmark	252	76	63	19	51	19	12	0
Estonia	12	4	3	1	0	0	3	1
Finland	324	44	81	11	74	11	7	0
France	1,124	144	281	36	261	36	20	0
Germany	836	96	209	24	83	15	126	9
Greece	212	28	53	7	50	7	3	0
Hungary	32	4	8	1	1	0	7	1
Ireland	76	20	19	5	19	5	0	0
Italy	408	136	102	34	102	34	0	0
Luxembourg	4	0	1	0	1	0	0	0
Malta	8	4	2	1	0	0	2	1
Netherlands	312	60	78	15	76	15	2	0
Poland	32	20	8	5	5	4	3	1
Portugal	104	16	26	4	25	3	1	1
Slovenia	16	0	4	0	3	0	1	0
Spain	200	60	50	15	50	15	0	0
Sweden	628	96	157	24	152	24	5	0
UK	1,520	244	380	61	378	61	2	0
Total	6,400	1,132	1,600	283	1,374	262	226	21

Table 2
Descriptive statistics

Table 2 presents descriptive statistics for measures of stock price crash risk and control variables. Panel A presents descriptive statistics and Panel B reports the Pearson correlation among the variables. See Appendix A for variable definitions.

Panel A: Descriptive statistics

Variable	Type of firms	N (firm-years)	Mean	p25	p50	p75	Std dev
Crash risk variables							
$NCSKEW_t$	Non-financial	6,400	-0.294	-0.682	-0.261	0.098	0.708
	Financial	1,132	-0.306	-0.672	-0.248	0.106	0.679
$DUVOL_t$	Non-financial	6,400	-0.162	-0.387	-0.157	0.054	0.336
	Financial	1,132	-0.162	-0.389	-0.155	0.064	0.332
Control variables							
$DTURN_{t-1}$	Non-financial	6,400	0.005	-0.006	0.001	0.014	0.044
	Financial	1,132	0.001	-0.006	0.001	0.012	0.040
$NCSKEW_{t-1}$	Non-financial	6,400	-0.241	-0.644	-0.224	0.151	0.730
	Financial	1,132	-0.286	-0.660	-0.212	0.156	0.723
$SIGMA_{t-1}$	Non-financial	6,400	0.044	0.026	0.036	0.053	0.026
	Financial	1,132	0.029	0.018	0.024	0.034	0.017
RET_{t-1}	Non-financial	6,400	-0.130	-0.137	-0.064	-0.034	0.187
	Financial	1,132	-0.055	-0.056	-0.028	-0.016	0.083
$SIZE_{t-1}$	Non-financial	6,400	5.386	3.874	5.221	6.761	2.052
	Financial	1,132	6.676	5.221	6.659	8.099	2.049
MB_{t-1}	Non-financial	6,400	2.210	0.992	1.649	2.718	2.404
	Financial	1,132	1.607	0.949	1.331	1.961	1.044
LEV_{t-1}	Non-financial	6,400	0.141	0.020	0.112	0.224	0.133
	Financial	1,132	0.191	0.028	0.142	0.308	0.186
ROA_{t-1}	Non-financial	6,400	0.018	0.000	0.037	0.075	0.127
	Financial	1,132	0.029	0.006	0.014	0.042	0.052
$ABACC_{t-1}$	Non-financial	6,400	0.054	0.002	0.026	0.070	0.081
	Financial	1,132	n.a.				

Table 2, continued

Panel B: Pearson correlations -- non-financial firms (lower diagonal) and financial firms (upper diagonal)

		1	2	3	4	5	6	7	8	9	10
1	$NCSKEW_t$		0.957***	0.046	0.131***	-0.018	0.007	0.208***	0.006	0.006	0.006
2	$DUVOL_t$	0.959***		0.040	0.144***	-0.032	0.018	0.211***	0.005	0.021	0.012
3	$DTURN_{t-1}$	-0.014	-0.016		-0.002	0.099***	-0.093**	0.025	0.032	-0.018	0.011
4	$NCSKEW_{t-1}$	0.067***	0.075***	-0.014		0.018	-0.058	0.175***	-0.023	-0.014	-0.083**
5	$SIGMA_{t-1}$	-0.094***	-0.089***	0.103***	-0.050***		-0.931***	-0.399***	0.023	-0.005	-0.188***
6	RET_{t-1}	0.092***	0.084***	-0.097***	0.079***	-0.953***		0.323***	0.017	-0.030	0.184***
7	$SIZE_{t-1}$	0.185***	0.187***	0.032**	0.105***	-0.529***	0.449***		0.215***	-0.105***	0.038
8	MB_{t-1}	0.053***	0.051***	0.019	-0.044***	-0.035**	0.012	0.242***		-0.116***	0.043
9	LEV_{t-1}	0.015	0.023	0.008	0.022	-0.081***	0.052***	0.215***	-0.032*		0.039
10	ROA_{t-1}	0.099***	0.092***	-0.001	-0.004	-0.481***	0.466***	0.353***	0.136***	-0.029*	
11	$ABACC_{t-1}$	-0.003	-0.006	0.010	-0.022*	0.237***	-0.214***	-0.153***	0.037***	-0.104***	-0.138***

Table 3

The average effect of mandatory IFRS adoption on firm-level crash risk

Table 3 presents the regression results of the impact of mandatory IFRS adoption in the EU on firm-level stock price crash risk. *p*-values in parentheses are based on standard errors clustered by firm and year (one-tailed for coefficients with predicted signs and two-tailed otherwise). *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. See Appendix A for variable definitions.

			Non-financial firms					Financial firms			
		Pred. sign	(1)	(2)	(3)	(4)	Pred. sign	(5)	(6)	(7)	(8)
Dependent variable =			**NCSKEW**	**NCSKEW**	**DUVOL**	**DUVOL**		**NCSKEW**	**NCSKEW**	**DUVOL**	**DUVOL**
Mandatory adopters	β_1		-0.061*	0.029	-0.034*	0.011		0.017	0.123**	0.026	0.074
			(0.092)	(0.474)	(0.055)	(0.572)		(0.805)	(0.036)	(0.638)	(0.127)
Post	β_2		0.054	0.010	0.018	-0.001		-0.071	-0.084	-0.057	-0.065
			(0.103)	(0.636)	(0.256)	(0.915)		(0.431)	(0.397)	(0.198)	(0.203)
Mandatory adopters×Post	β_3	-	**-0.049****	**-0.036***	**-0.016***	**-0.010**	n.a.	**0.139***	**0.131**	**0.080****	**0.076***
			(0.029)	**(0.072)**	**(0.078)**	**(0.177)**		**(0.061)**	**(0.101)**	**(0.028)**	**(0.066)**
$DTURN_{t-1}$				-0.368**		-0.187***			0.689		0.311*
				(0.042)		(0.000)			(0.237)		(0.064)
$NCSKEW_{t-1}$				0.034**		0.020***			0.047***		0.030***
				(0.012)		(0.000)			(0.004)		(0.002)
$SIGMA_{t-1}$				3.093*		1.290			1.933		0.396
				(0.059)		(0.129)			(0.327)		(0.726)
RET_{t-1}				0.404**		0.149			-0.350		-0.208*
				(0.049)		(0.169)			(0.258)		(0.066)
$SIZE_{t-1}$				0.071***		0.035***			0.087***		0.041***
				(0.000)		(0.000)			(0.000)		(0.000)
MB_{t-1}				0.000		-0.000			-0.015		-0.005
				(0.909)		(0.846)			(0.334)		(0.537)
LEV_{t-1}				-0.080		-0.022			0.083		0.058
				(0.178)		(0.483)			(0.636)		(0.517)
ROA_{t-1}				0.211		0.092			0.091		0.061
				(0.124)		(0.226)			(0.847)		(0.785)
$ABACC_{t-1}$				0.187**		0.078**			n.a.		n.a.
				(0.026)		(0.012)					
Country fixed effects			yes	yes	yes	yes		yes	yes	yes	yes
Industry fixed effects			yes	yes	yes	yes		no	no	no	no
Observations			6,400	6,400	6,400	6,400		1,132	1,132	1,132	1,132
Adj. R-squared			0.009	0.046	0.009	0.046		0.033	0.083	0.036	0.085

Table 4
The effect of mandatory IFRS adoption on firm crash risk, conditional on firm-level information environments

Table 4 presents the regression results of the impact of mandatory IFRS adoption in the EU on firm-level stock price crash risk, conditional on firm-level information environment. Panel A reports the results for non-financial firms and Panel B for financial firms. The sample firms are partitioned into sub-samples based on the sample median values of the conditional variables. *p*-values in parentheses are based on standard errors clustered by firm and year (one-tailed for coefficients with predicted signs and two-tailed otherwise). *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. See Appendix A for variable definitions.

Panel A: Non-financial firms only

		(1)	(2)	(3)	(4)
Dependent variable =		**NCSKEW**	**NCSKEW**	**DUVOL**	**DUVOL**
Partition =		***Rich InfoEnviron***	***Poor InfoEnviron***	***Rich InfoEnviron***	***Poor InfoEnviron***
Mandatory adopters	β_1	-0.029	0.061	-0.013	0.027
		(0.265)	(0.256)	(0.274)	(0.307)
Post	β_2	-0.084*	0.108***	-0.041*	0.042**
		(0.071)	(0.001)	(0.096)	(0.030)
Mandatory adopters × Post	***β_3***	**0.058**	**-0.133*****	**0.027**	**-0.050*****
		(0.289)	**(0.000)**	**(0.337)**	**(0.001)**
Prediction of difference in β_3			*-*		*-*
Test of difference in β_3, Poor-rich InfoEnviron			***-0.191**** ***(0.023)***		***-0.077**** ***(0.046)***
$DTURN_{t-1}$		-0.510***	-0.155	-0.220***	-0.125**
		(0.002)	(0.162)	(0.005)	(0.011)
$NCSKEW_{t-1}$		0.005	0.054***	0.004	0.031***
		(0.863)	(0.000)	(0.698)	(0.000)
$SIGMA_{t-1}$		5.701***	2.283	2.954***	0.944
		(0.002)	(0.486)	(0.002)	(0.594)
RET_{t-1}		0.907***	0.257	0.482***	0.079
		(0.001)	(0.521)	(0.001)	(0.715)
$SIZE_{t-1}$		0.058***	0.088***	0.033***	0.040***
		(0.000)	(0.000)	(0.000)	(0.000)
MB_{t-1}		0.006	-0.009***	0.003	-0.005***
		(0.198)	(0.004)	(0.132)	(0.002)
LEV_{t-1}		0.073	-0.262**	0.034	-0.091**
		(0.337)	(0.014)	(0.402)	(0.022)
ROA_{t-1}		0.458**	0.102	0.188	0.051
		(0.012)	(0.389)	(0.110)	(0.382)
$ABACC_{t-1}$		0.190	0.119	0.055	0.058
		(0.322)	(0.355)	(0.538)	(0.396)
Country fixed effects		yes	yes	yes	yes
Industry fixed effects		yes	yes	yes	yes
Observations		3,200	3,200	3,200	3,200
Adj. R-squared		0.035	0.030	0.039	0.029

Table 4, continued

Panel B: Financial firms only

Dependent variable =		(1) **NCSKEW**	(2) **NCSKEW**	(3) **DUVOL**	(4) **DUVOL**
Partition =		***Rich InfoEnviron***	***Poor InfoEnviron***	***Rich InfoEnviron***	***Poor InfoEnviron***
Mandatory adopters	β_1	0.002	0.266**	-0.020	0.155*
		(0.971)	(0.043)	(0.555)	(0.059)
Post	β_2	-0.077	-0.115	-0.064	-0.077
		(0.459)	(0.296)	(0.213)	(0.178)
Mandatory adopters × Post	β_3	**0.046**	**0.225*** **	**0.039**	**0.118*** **
		(0.594)	**(0.007)**	**(0.359)**	**(0.008)**
Prediction of difference in β_3			+		+
Test of difference in β_3, Poor-rich InfoEnviron			***0.179****		***0.079****
			(0.015)		***(0.021)***
$DTURN_{t-1}$		0.827	0.133	0.451	-0.048
		(0.280)	(0.909)	(0.109)	(0.920)
$NCSKEW_{t-1}$		0.002	0.029	0.012	0.020**
		(0.963)	(0.171)	(0.488)	(0.046)
$SIGMA_{t-1}$		-0.663	0.606	-1.423	-0.121
		(0.915)	(0.908)	(0.654)	(0.961)
RET_{t-1}		-0.788	-0.631	-0.634	-0.304
		(0.387)	(0.485)	(0.157)	(0.475)
$SIZE_{t-1}$		0.064**	0.123***	0.033**	0.059***
		(0.025)	(0.000)	(0.012)	(0.000)
MB_{t-1}		-0.043**	0.010	-0.018	0.002
		(0.033)	(0.606)	(0.135)	(0.781)
LEV_{t-1}		0.266	-0.062	0.150	-0.024
		(0.237)	(0.681)	(0.180)	(0.743)
ROA_{t-1}		0.625	-0.511	0.555**	-0.318
		(0.297)	(0.398)	(0.042)	(0.274)
Country fixed effects		yes	yes	yes	yes
Industry fixed effects		no	no	no	no
Observations		608	608	608	608
Adj. R-squared		0.036	0.097	0.047	0.104

Table 5
The effect of mandatory IFRS adoption on firm crash risk, conditional on country-level large GAAP change

Table 5 presents the regression results of the impact of mandatory IFRS adoption in the EU on firm-level stock price crash risk, conditional on country-level large GAAP changes. Panel A presents the descriptive statistics of the components of country-level large GAAP changes. Panel B reports the regression results. *p*-values in parentheses are based on standard errors clustered by firm and year (one-tailed for coefficients with predicted signs and two-tailed otherwise). *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. See Appendix A for variable definitions.

Panel A: Descriptive statistics of the components of country-level large GAAP change

Country	Change in GAAP	Enforcement
Austria	12	9.36
Belgium	13	9.44
Czech Rep	14	.
Denmark	11	10.00
Estonia	7	.
Finland	15	10.00
France	12	8.68
Germany	11	9.05
Greece	17	6.82
Hungary	13	.
Ireland	1	8.36
Italy	12	7.07
Luxembourg	18	.
Malta	.	.
Netherlands	4	10.00
Poland	12	.
Portugal	13	7.19
Slovenia	9	.
Spain	16	7.14
Sweden	10	10.00
UK	1	9.22
Median	12	9.14

Table 5, continued

Panel B: Non-financial firms only -- The effect of large GAAP change on mandatory IFRS adoption and crash risk

Dependent variable =		(1) **NCSKEW**	(2) **NCSKEW**	(3) **DUVOL**	(4) **DUVOL**
Partition =		***Large GAAP change***	***Others***	***Large GAAP change***	***Others***
Mandatory adopters	β_1	0.184**	-0.002	0.095***	-0.003
		(0.021)	(0.963)	(0.002)	(0.858)
Post	β_2	0.001	0.012	-0.005	-0.001
		(0.951)	(0.598)	(0.650)	(0.952)
Mandatory adopters × Post	β_3	**-0.145****	**-0.023**	**-0.076****	**-0.002**
		(0.024)	**(0.269)**	**(0.013)**	**(0.785)**
Prediction of difference in β_3			***-***		***-***
Test of difference in β_3, Large GAAP change-others			***-0.122****		***-0.074*****
			(0.022)		***(0.000)***
$DTURN_{t-1}$		-0.088	-0.392***	-0.074	-0.188***
		(0.878)	(0.004)	(0.806)	(0.002)
$NCSKEW_{t-1}$		0.005	0.032**	0.008	0.020***
		(0.719)	(0.036)	(0.317)	(0.002)
$SIGMA_{t-1}$		5.241	3.462**	2.246	1.388*
		(0.130)	(0.025)	(0.120)	(0.079)
RET_{t-1}		0.859**	0.447**	0.338**	0.161
		(0.028)	(0.036)	(0.042)	(0.144)
$SIZE_{t-1}$		0.057***	0.072***	0.031***	0.035***
		(0.000)	(0.000)	(0.000)	(0.000)
MB_{t-1}		0.008	-0.000	0.003	-0.000
		(0.432)	(0.979)	(0.596)	(0.739)
LEV_{t-1}		-0.260	-0.062	-0.066	-0.020
		(0.304)	(0.302)	(0.598)	(0.497)
ROA_{t-1}		0.135	0.214*	0.046	0.093
		(0.446)	(0.086)	(0.441)	(0.210)
$ABACC_{t-1}$		-0.015	0.216***	-0.046	0.089***
		(0.942)	(0.003)	(0.588)	(0.001)
Country fixed effects		yes	yes	yes	yes
Industry fixed effects		yes	yes	yes	yes
Observations		1,364	5,892	1,364	5,892
Adj. R-squared		0.044	0.045	0.047	0.046

Table 6
The effect of mandatory IFRS adoption on firm crash risk, conditioned on the exposure to fair value for commercial and investment banks

Table 6 presents an additional analysis on the impact of mandatory IFRS adoption in the EU on firm-level stock price crash risk for commercial and investment banks (two-digit SIC codes of 60-62). It reports the regression results for sub-samples partitioned based on the extent of their exposure to fair value accounting, measured as the total of trading or dealing accounting securities and investment securities, scaled by total assets. *p*-values in parentheses are based on standard errors clustered by firm and year (one-tailed for coefficients with predicted signs and two-tailed otherwise). *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. See Appendix A for variable definitions.

Dependent variable =		(1) **NCSKEW**	(2) **NCSKEW**	(3) **DUVOL**	(4) **DUVOL**
Partition =		***More exposure to fair value***	***Less exposure to fair value***	***More exposure to fair value***	***Less exposure to fair value***
Mandatory adopters	β_1	0.033	0.020	0.037	0.077
		(0.782)	(0.925)	(0.554)	(0.127)
Post	β_2	-0.196	-0.087	-0.114*	-0.071
		(0.110)	(0.461)	(0.065)	(0.265)
Mandatory adopters×Post	β_3	**0.223*** **	**0.024**	**0.109*** **	**0.001**
		(0.000)	**(0.852)**	**(0.000)**	**(0.983)**
Prediction of difference in β_3			+		+
Test of difference in β_3, More-less fair value exposure			***0.199**** ***(0.062)***		***0.108**** ***(0.042)***
$DTURN_{t-1}$		-0.307	0.724	-0.137	0.214
		(0.660)	(0.601)	(0.705)	(0.707)
$NCSKEW_{t-1}$		-0.056	-0.011	-0.011	-0.005
		(0.292)	(0.860)	(0.263)	(0.853)
$SIGMA_{t-1}$		10.303	-3.269	3.139	-2.120
		(0.278)	(0.460)	(0.651)	(0.371)
RET_{t-1}		2.999	-0.853	1.064	-0.524
		(0.246)	(0.441)	(0.551)	(0.292)
$SIZE_{t-1}$		0.099***	0.095***	0.049***	0.054***
		(0.001)	(0.000)	(0.002)	(0.000)
MB_{t-1}		0.037	-0.088***	0.008	-0.045***
		(0.381)	(0.000)	(0.730)	(0.002)
LEV_{t-1}		0.451	0.302	0.154	0.160
		(0.427)	(0.266)	(0.621)	(0.176)
ROA_{t-1}		1.440	0.191	0.913	0.289
		(0.614)	(0.875)	(0.497)	(0.506)
Country fixed effects		yes	yes	yes	yes
Industry fixed effects		no	no	no	no
Observations		300	304	300	304
Adj. R-squared		0.116	0.024	0.113	0.069

Table 7
The effect of mandatory IFRS adoption on firm crash risk, conditioned on country-level banking regulation

Table 7 presents an additional analysis on the impact of mandatory IFRS adoption in the EU on firm-level stock price crash risk for commercial banks. Panel A presents the descriptive statistics of the country-level restriction index. Panel B reports the regression results for commercial banks (two-digit SIC codes of 60 and 61), which are partitioned into sub-samples based on whether they are in countries with restrictive regulations. *p*-values in parentheses are based on standard errors clustered by firm and year (one-tailed for coefficients with predicted signs and two-tailed otherwise). *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. See Appendix A for variable definitions.

Panel A: Descriptive statistics of country-level restriction index

Country	**Restrict**
Austria	5
Belgium	9
Czech Rep	8
Denmark	8
Estonia	8
Finland	7
France	6
Germany	5
Greece	9
Hungary	9
Ireland	8
Italy	10
Luxembourg	6
Malta	10
Netherlands	6
Poland	10
Portugal	9
Slovenia	9
Spain	7
Sweden	9
UK	5
Median	8

Table 7, continued

Panel B: Commercial banks only – The effect of restrictive regulations on mandatory IFRS adoption and crash risk

Dependent variable =		(1) **NCSKEW**	(2) **NCSKEW**	(3) **DUVOL**	(4) **DUVOL**
Partition =		***Banks with more restrictive regulations***	***Banks with less restrictive regulations***	***Banks with more restrictive regulations***	***Banks with less restrictive regulations***
Mandatory adopters	β_1	0.169	-0.084	0.116	0.002
		(0.240)	(0.626)	(0.110)	(0.979)
Post	β_2	-0.071	-0.163	-0.062	-0.097
		(0.674)	(0.201)	(0.466)	(0.178)
Mandatory adopters×Post	β_3	**-0.015**	**0.256*** **	**-0.004**	**0.112***
		(0.816)	**(0.009)**	**(0.911)**	**(0.066)**
Prediction of difference in β_3			+		+
Test of difference in β_3, Less-more regulations			***0.271**** ***(0.030)***		***0.116**** ***(0.049)***
$DTURN_{t-1}$		-0.958	2.372***	-0.311	0.953***
		(0.115)	(0.010)	(0.236)	(0.000)
$NCSKEW_{t-1}$		0.004	-0.092	0.014	-0.021
		(0.938)	(0.179)	(0.593)	(0.551)
$SIGMA_{t-1}$		12.257**	-4.968	4.643	-3.126
		(0.033)	(0.733)	(0.295)	(0.706)
RET_{t-1}		2.032	0.046	0.796	-0.085
		(0.177)	(0.991)	(0.502)	(0.972)
$SIZE_{t-1}$		0.119***	0.048**	0.059***	0.023*
		(0.000)	(0.019)	(0.000)	(0.058)
MB_{t-1}		-0.061	-0.068	-0.030	-0.044*
		(0.495)	(0.159)	(0.461)	(0.089)
LEV_{t-1}		0.591	-0.026	0.260	-0.079
		(0.341)	(0.957)	(0.475)	(0.745)
ROA_{t-1}		-0.209	2.392	0.133	1.612
		(0.933)	(0.446)	(0.901)	(0.287)
Country fixed effects		yes	yes	yes	yes
Industry fixed effects		no	no	no	no
Observations		280	232	280	232
Adj. R-squared		0.117	0.025	0.122	0.028

Table 8
Additional analysis on opacity and volatility

Table 8 presents descriptive statistics on opacity and uncertainty before and after the mandatory IFRS adoption for non-financial and financial firms, respectively. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. See Appendix A for variable definitions.

	N	Mean	Pre-adoption	Post-adoption	Diff, post-pre
Meet or beat analyst forecast					
Non-financial firms	2,844	0.644	0.684	0.603	-0.081***
Financial firms	540	0.715	0.722	0.707	-0.015
Earnings volatility					
Non-financial firms	5,496	0.339	0.455	0.148	-0.307***
Financial firms	1,048	0.084	0.055	0.102	0.047***
Analyst forecast dispersion					
Non-financial firms	1,820	0.092	0.087	0.097	0.010
Financial firms	356	0.094	0.059	0.130	0.071*

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EDUCATION

Ph.D., Business Administration, 1987, University of Washington

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EMPLOYMENT HISTORY

2010-Present	A. N. Mosich Chair of Accounting University of Southern California
2001-2010	Joseph A. DeBell Professor of Business University of Southern California
1999-2001	Professor University of Southern California
1994-1999	Associate Professor University of Southern California
1987-1993	Assistant Professor University of Southern California
1978-1983	Auditor, CPA 1981 (currently inactive) Deloitte (formerly Touche Ross & Company) San Francisco and Oakland California

HONORS and AWARDS

Research Awards and Honors

Top Twenty-five Most Highly Cited Authors in Accounting: Chan, K. and K. Liano "Threshold citation analysis of influential articles, journals, institutions and researchers in accounting" Accounting and Finance, 2008

Best Paper Prize, Journal of Accounting & Economics, 2007

Notable Contribution to Auditing Literature Award, 2006, awarded by the Auditing Section of the American Accounting Association.

Research Awards and Honors, continued

Best Paper Award, Seventh Asian-Pacific Conference, Seoul, Korea, 1995

Distinguished Speaker, Pac-10 Doctoral Consortium, 2007

Distinguished Visiting Faculty, American Accounting Association Doctoral Consortium, 2006

Distinguished Resident Faculty, American Accounting Association Doctoral Consortium, 2004/5

Teaching Awards and Honors

MBA Golden Apple Teaching Award, 1995, 1998, 2000, 2005

Mellon Award for Excellence in Mentoring Faculty, 2005

Marshall School's Dean's Educator of the Year Award, 2005

Ranked among the ten most outstanding USC MBA faculty in Business Week Guide to the Best Business Schools, 1995, 1997 and 2001

Other Awards and Honors

Dean's Visiting Professor, National University of Singapore, 2009-present

Visiting Professor, Chinese University of Hong Kong, 2006

Associate Professor, Hong Kong University of Science and Technology, 1995-1997
(on sabbatical and leave from University of Southern California)

Deloitte, Haskins and Sells Doctoral Fellowship Award, 1986

American Accounting Association Doctoral Consortium Representative, 1985

Certified Public Accountant, California, 1981 (currently inactive)

RESEARCH

Articles in Academic Journals

"The Effect of SOX on Small Auditor Exits and Audit Quality" with Clive Lennox. Journal of Accounting and Economics, 2011, Vol. 52, 21-40.

"The Impact of IFRS Adoption on Mutual Fund Ownership: The Role of Comparability" with Xuesong Hu, Mingyi Hung and Siqi Li. Journal of Accounting and Economics 2011, Vol. 51, 240-258.

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Awarded the Best Paper Prize, for most innovative paper published in the Journal of Accounting & Economics in 2007 that is likely to have the most impact on the profession.

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Awarded the Notable Contribution to Auditing Literature Award, 2006, by the Auditing Section of the American Accounting Association.

"Auditor Changes and Discretionary Accruals" with K. R. Subramanyam. Journal of Accounting and Economics 1998, Vol. 25, pp. 35-68.

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"Smoothing Income in Anticipation of Future Earnings" with Chul W. Park. Journal of Accounting and Economics 1997, Vol. 23, pp. 115-139.

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Working Papers

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