

The Adoption of Internationally Recognized Accounting Standards: Implications for the Credit Markets

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Abstract

We examine whether the adoption of internationally recognized accounting standards is associated with a greater sensitivity of credit ratings to accounting information. We find that credit ratings are significantly more sensitive to the accounting default factor post voluntary International Financial Reporting Standards (IFRS)/U.S. Generally Accepted Accounting Principle (GAAP) adoption. Similar evidence is also found post mandatory IFRS adoption in countries with strong rules of law. Collectively, the above evidence suggests that firms' incentives to comply are important in determining the consequences of accounting standard changes.

Keywords

internationally recognized accounting standards, IFRS, credit markets, credit relevance

Introduction

Internationally recognized accounting standards are gaining widespread acceptance around the world.¹ Many individual companies have adopted International Financial Reporting Standards (IFRS) or U.S. Generally Accepted Accounting Principle (GAAP) on a voluntary basis. Furthermore, a large number of jurisdictions now mandate IFRS financial reporting, including those from the European Union (EU) since 2005. Existing research on the adoption of internationally recognized accounting standards focuses mainly on the equity markets (Hail & Leuz, 2007). Evidence on whether and how creditors are affected is limited. Our analysis broadens the scope of this literature.

The impact of the adoption on creditors deserves researchers' attention for several reasons. First, debt represents a significant source of financing for public firms, and for many companies it is a more important financing channel than external equity. For example,

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based on a sample of public companies in 49 countries, La Porta, Lopez-de-Silanes, Shleifer, and Vishny (1998) report that the sum of private sector bank debt and public bonds as a share of gross national product (GNP) is, on average, 59%, compared to equity markets' 40% share of GNP. Therefore, debtholders represent a highly significant class of stakeholders and the analysis of internationally recognized accounting standards cannot be complete without a careful study of the implications for debtholders.

Second, debtholders are likely particularly sensitive to accounting changes as they rely heavily on accounting information and often have debt covenants that are constructed exclusively based on financial statement variables.² Therefore, the debt market provides a powerful setting for understanding changes in accounting standards. In addition, since debtholders' information needs help to shape the properties of accounting numbers (Watts, 2003) and are argued by some as the primary influence on financial reporting (Ball, Robin, & Sadka, 2008), it is important to understand debtholders' perceptions of and responses to accounting standard changes.

Finally, shareholders and debtholders likely have different information needs. For example, Shi (2003) studies the effect of R&D activities and documents that they have different implications for equity valuations and bond valuations. Holthausen and Watts (2001), in their critique of the value relevance literature, point out that what is relevant for one group of investors may not be relevant for another and warn against the "virtually exclusive reliance on stock market data." Although their comments pertain to the value relevance research, they can have broader implications.

We investigate whether the adoption of IFRS or U.S. GAAP affects the way accounting information is used by a firm's creditors. Specifically, we compare the relevance of accounting information for firms' credit ratings before and after the adoption. Because voluntary adopters likely face different incentives than mandatory adopters, an important aspect of our study is the distinction and contrast between these two groups of firms.³ Prior research suggests that *voluntary* adoption of internationally recognized accounting standards is associated with less earnings management and increased informativeness of accounting information (e.g., Barth, Landsman, & Lang, 2008, for IFRS adopters; and Lang, Raedy, & Yetman, 2003, for U.S. GAAP adopters). Furthermore, the extant literature finds that voluntary adopters experience reduced information asymmetry and lower costs of equity capital (e.g., Leuz & Verrecchia, 2000). We expect the improved accounting quality following voluntary adoption to make financial statements more relevant in creditors' decision process and predict an increase in the credit relevance of accounting information post adoption for *voluntary* adopters. The credit relevance of accounting information is measured by the sensitivity of Moody's credit ratings to various accounting ratios of default risk such as return on assets (ROA), leverage, and interest coverage.

Voluntary adopters often face strong underlying incentives to improve reporting quality to cross-list on foreign exchanges, to enter foreign product markets, and to achieve other corporate objectives. Without the firm-level incentives, it is questionable that mandating a new set of accounting standards by a state or international body such as the EU can in itself lead to meaningful changes in firms' reporting behavior (e.g., Ball, Robin, & Wu, 2003). This suggests that unlike the voluntary adoption setting, *mandatory* IFRS adopters may not experience increases in the credit relevance of accounting information. On the other hand, along with the mandatory adoption, many countries have undertaken measures to strengthen enforcement (Hail & Leuz, 2007). This can conceivably provide firms with incentives to improve reporting quality. We investigate the sensitivity of credit rating changes to accounting information before and after the mandatory IFRS adoption without

offering signed predictions for the overall sample. However, we do expect that if mandatory IFRS adoption affects the credit relevance of accounting information, the effect is stronger in countries with stronger rules of law.

Our sample comprises firms that adopt internationally recognized accounting standards, either voluntarily or under a regulatory mandate, from 1990 to 2007. Credit ratings are from Moody's. Consistent with our expectations for the voluntary adopters, we find that credit ratings are significantly more sensitive to accounting information following the *voluntary* adoption of IFRS/U.S. GAAP. On the other hand, we find that *mandatory* adoption is associated with significant increases in the credit relevance of accounting information only in countries with stronger rules of law. In addition, voluntary adopters do not appear to experience positive externalities with respect to the credit relevance of accounting information after mandatory IFRS adoption in their home countries. As a robustness check, we also investigate the sensitivity of bonds' yield-to-maturity to accounting information and use it as an alternative measure of credit relevance. In addition, all of our inferences are robust when non-adopting firms are included as controls.

Our article is related to Kim, Tsui, and Yi (2011), who analyze the implications of *voluntary* IFRS adoption for loan contracts. It is different from our study along several dimensions. First, the research questions are different. Kim et al. analyze the difference in the *level* of loan spreads between adopting and non-adopting firms, whereas we focus on the change in the *sensitivity* of credit ratings to accounting information from pre- to post-adoption. Second, Kim et al. focus exclusively on voluntary adoption, while we compare and contrast the voluntary and mandatory adopters. Subsequent to prior versions of this article, Kosi, Pope, and Florou (2010) and Bhat, Callen, and Segal (in press) also investigate the implications of *mandatory* IFRS adoption for the credit market. Similar to us, Kosi et al. conclude that credit relevance increases after adoption. However, their inferences are confounded by their reliance on regression goodness-of-fit measures, which are affected by non-accounting variables such as firm size that are included on the right-hand side along with accounting information. Kosi et al.'s reliance on model goodness-of-fit also precludes the consideration of a more comprehensive set of controls variables such as country and year fixed effects. In contrast, our emphasis on the regression coefficients instead of overall goodness-of-fit produces cleaner inferences on the role of the accounting variables. Finally, a recent study by Bhat et al. reaches the conclusion that mandatory IFRS adoption has no effect on the sensitivity of credit default swaps to accounting earnings. The evidence to date is therefore mixed regarding the implications of mandatory IFRS adoption for credit market investors.

Our article makes several contributions to the literature. First, we add to the understanding of the adoption of internationally recognized accounting standards and its implications for the debt markets. Recognizing the significance of debt financing and the need for more research, Hail and Leuz (2007) call for more studies on the implications of IFRS adoption for the debt markets. Our article takes a step in that direction.

Second, we contribute to the fast-growing literature on mandatory IFRS adoption. Existing evidence on the effects of mandatory IFRS adoption is somewhat mixed. For example, Christensen, Lee, and Walker (in press) conclude that mandatory adoption is not associated with increases in financial reporting quality, while others report reduced cost of equity capital (Daske, Hail, Leuz, & Verdi, 2008), more precise and less dispersed analyst earnings forecasts (Byard, Li, & Yu, 2010), and greater information content of earnings announcements to the equity markets (Landsman, Maydew, & Thornock, 2012) after mandatory IFRS adoption. We contribute to this debate from the perspective of creditors and

document that relative to voluntary adoption, the effects of mandatory IFRS adoption are more nuanced and conditional on the strong enforcement and implementation of IFRS. Our findings, together with the evidence from prior research on the equity markets (for example, Byard et al., 2010; Daske et al., 2008; Landsman et al., 2012), highlight the importance of managerial incentives in determining the consequences of accounting standard changes.

Finally, we add new evidence to the literature on the consequences of voluntary IFRS adoption. The recent wave of mandatory IFRS adoption that includes the EU member states has sparked great interest in issues related to mandatory adoption and added urgency to research questions in this particular setting. At the same time, it is also true that a significant number of jurisdictions do not yet require IFRS reporting and these include both large and developed economies such as the United States and Japan and major emerging markets such as China and India, for which analyses of voluntary IFRS adoption still hold relevance and significance. In addition, the contrast between voluntary and mandatory adoption is important for understanding the fundamental question on the relative importance of standards and incentives in financial reporting.

Hypothesis Development

Following prior literature (e.g., Ashbaugh-Skaife, Collins, & LaFond, 2006; Hann, Hefflin, & Subramanayam, 2007), we use credit ratings to assess the credit relevance of information. Credit rating agencies are sophisticated users of financial information. They often have access to both public (e.g., financial reports) and private information of an issuer. As a result, the quality of public information may not be as essential to the rating agencies as it is to individual investors. However, the importance of high quality and comparable financial reporting for credit assessment has been recognized by both regulators (e.g. Securities and Exchange Commission [SEC], 2003) and the rating agencies. In its comment letter to the SEC on the “*Concept Release on Allowing U.S. Issuers to Prepare Financial Statements in accordance with International Financial Reporting Standards*,” Moody’s argues that adopting a single set of high-quality accounting standards globally will enhance the efficiency of capital deployment. Standard and Poor’s also writes in their comment letter:

We view the prospects of a single comprehensive global reporting system, to be consistently applied and enforced, as an important facet in maintaining and expanding efficient global financial market . . . Global accounting and disclosure standards will be of great value to our analysts, by improving data consistency and enabling enhanced global peer comparisons.

While Standard and Poor’s expects accounting harmonization to facilitate the globalization of capital markets, they also suggest that in order for accounting harmonization to have a real effect, the common standards have to be consistently applied and enforced. In the following discussion, we make the distinction between voluntary and mandatory adoption of internationally recognized accounting standards because firms’ incentives to comply with the standards are likely different in the two settings.

Voluntary Adoption

Prior research documents that the voluntary adoption of internationally recognized accounting standards comes with significant changes in accounting earnings properties. For

example, Barth et al. (2008) find that voluntary IFRS adopters experience greater informativeness, less earnings management, and more timely loss recognition in their IFRS accounting earnings. Hung and Subramanyam (2007) document similar evidence for a sample of German IFRS voluntary adopters. Lang et al. (2003) study voluntary U.S. GAAP adopters due to U.S. cross-listing and similarly find that the U.S. GAAP earnings are less managed and timelier at reflecting large losses. Significant economic consequences have been documented as a result of the voluntary adoption, including lower analyst earnings forecast errors (Ashbaugh & Pincus, 2001), reduced information asymmetry (Leuz & Verrecchia, 2000), and increased foreign capital investment through mutual fund holdings (Covrig, DeFond, & Hung, 2007).

We expect the credit assessment process by the rating agencies to be affected by the voluntary adoption as well. Less earnings smoothing and greater timeliness in reflecting economic losses can enable IFRS/U.S. GAAP earnings to better capture firms' default risk. Ball et al. (2008) argue that accounting conservatism through more timely loss recognition likely mitigates the information asymmetry and agency problems between borrowers and lenders. Therefore, IFRS/U.S. GAAP financials can be a more useful tool in assessing firms' credit worthiness by the rating agencies than local GAAP numbers. Moreover, the IFRS/U.S. GAAP numbers can play a greater role in credit ratings if they are more comparable to international reporting practices and are more familiar to the credit analysts than local GAAP financials. As a result, we expect accounting information provided by the voluntary adopters under IFRS or U.S. GAAP to become more useful for credit assessment post adoption. Following prior literature (e.g., Ashbaugh-Skaife et al., 2006; Hann et al., 2007; Shi, 2003), we adopt the commonly used accounting-based credit risk measures, such as ROA, leverage, and interest coverage ratio, and have the following hypothesis (stated in null form):

Hypothesis 1 (H1): *Ceteris paribus*, the relevance of accounting-based default risk measures for creditors does not change after firms voluntarily adopt IFRS or U.S. GAAP.

Mandatory Adoption

Compared to voluntary adoption, the mandatory IFRS adopters likely face very different incentives. Voluntary adoption is often driven by firms' desire to better communicate with foreign stakeholders due to cross-listing and/or entry into foreign product markets (e.g., Ashbaugh, 2001; Harris & Muller, 1999; Leuz & Verrecchia, 2000), and to improve internal reporting and corporate governance (Wu & Zhang, 2009). By definition, mandatory adoption is not due to the adopting firm's own initiative. Therefore, their incentives to improve financial reporting transparency are likely much weaker than the voluntary adopters. Furthermore, since IFRS does not come with its own enforcement body (for example, there is no counterpart of the U.S. SEC for enforcing IFRS), enforcement can be weak and inconsistent across countries (Ernst & Young, 2006). This raises doubt that mandatory IFRS adoption can improve financial reporting transparency and benefit investors, including creditors.

However, there are reasons to believe that mandatory IFRS adoption can indeed improve financial reporting transparency. For example, along with the mandatory adoption, the EU has taken various measures to strengthen enforcement (Hail & Leuz, 2007). Furthermore, even if the IFRS financials are not more informative than those under local GAAPs,

investors may still benefit if the IFRS statements improve the comparability of financial information across firms and across countries.

The literature on mandatory IFRS adoption is largely motivated by the sweeping EU adoption in 2005. The evidence on the effects of the mandatory adoption is somewhat mixed. Christensen et al. (in press) report for a sample of German firms, that *voluntary* IFRS adoption comes with less earnings management and more timely loss recognition; while *mandatory* adoption is not associated with discernible changes in reporting quality, casting doubt on the efficacy of mandatory adoption in improving accounting transparency. Chen, Tang, Jiang, and Lin (2010) document less earnings management toward a target and lower magnitude of discretionary accruals but increased earnings smoothing post-mandatory adoption. On the other hand, Byard et al. (2010) find reduced analyst forecast error and forecast dispersion after mandatory IFRS adoption. Daske et al. (2008) study a comprehensive sample of mandatory IFRS adoption and find evidence of improved liquidity and reduced cost of equity capital after the adoption. Furthermore, Landsman et al. (2012) find greater information content of earnings announcements after mandatory IFRS adoption. Interestingly, the findings of positive mandatory IFRS adoption effects in Daske et al., Byard et al., and Landsman et al. exist mainly in countries with stronger enforcement of accounting standards, suggesting the importance of preparers' incentives. Armstrong, Barth, Jagolinzer, and Riedl (2010) find positive average stock market reactions to events that increase the likelihood of mandatory IFRS adoption in the EU. They also report that the stock returns are more positive for firms with a lower quality pre-adoption information environment, higher pre-adoption information asymmetry, and domiciled in common-law countries (a proxy for stronger enforcement).

We investigate the relevance of accounting information for credit evaluation after mandatory IFRS adoption. Given the previously discussed competing arguments regarding the possible effects of mandatory adoption and the mixed empirical evidence to date, we do not make signed predictions for the overall sample but expect an increase in the credit relevance of accounting information in countries with strong rules of law. Our hypotheses stated in the null form are,

Hypothesis 2 (H2): *Ceteris paribus*, the relevance of accounting-based default risk measures for creditors does not change after mandatory IFRS adoption.

Hypothesis 3 (H3): *Ceteris paribus*, changes in the relevance of accounting-based default risk measures for creditors after mandatory IFRS adoption do not vary with the strength of legal enforcement.

Sample

We start with Moody's default risk database as of March 2008. The database contains Moody's ratings history for 11,000 entities and more than 330,000 debt issues around the world since 1970. Firms' financial data are from Worldscope. We merge Moody's default risk database with Worldscope by company name. As financial data on Worldscope are limited in the early years, we restrict the sample to the post-1990 period. In addition, we exclude U.S. firms.⁴ Our analyses are conducted at both the firm and the debt-issue levels. At the firm level, Moody's provides an estimated senior unsecured debt rating for corporate bank loan issuers and bond issuers.⁵ At the debt-issue level, we examine the initial Moody's rating of senior unsecured bonds.

To construct the voluntary and mandatory adoption samples, we first classify firms' accounting standards into two categories, internationally recognized accounting standards (i.e., IFRS/U.S. GAAP) and local standards, following Daske, Hail, Leuz, and Verdi (2013).⁶ In countries that have not mandated IFRS financial reporting, we consider an IFRS/U.S. GAAP reporting firm as a voluntary adopter. All firm years with rating and financial data pre- and post the voluntary adoption are included in the voluntary adoption sample and comparisons are made between the pre- and post-adoption periods for hypothesis testing. In countries that require IFRS financial reporting, a firm is classified as a voluntary adopter if IFRS/U.S. GAAP is adopted prior to its home country's mandatory adoption year. The post-adoption periods for these voluntary adopters end in the year before the mandatory adoption to mitigate potential confounding effects from the mandatory adoption.⁷ To construct the mandatory adoption sample, we consider all firms that are domiciled in countries requiring IFRS who did not adopt until the mandatory adoption year to be mandatory adopters. All firm-years with rating and financial data pre- and post the mandatory adoption year are included in the mandatory adoption sample.

To mitigate the concern that the pre- vs. post-adoption analysis captures general changes in rating practices unrelated to IFRS/U.S. GAAP adoption, we contrast the voluntary and mandatory adoption samples with two different sets of non-adopting benchmark samples. The first benchmark sample is the population of non-adopters. This benchmark sample comes from countries that have not mandated IFRS reporting and includes firms that report under the local GAAP throughout our sample period. The pre-adoption years of the mandatory adopters are also included as part of the benchmark sample in the voluntary adoption analysis. Some countries such as Japan are heavily represented in the population of non-adopters. To avoid the possibility that specific events in the heavily represented countries affect the results, we construct a second set of control samples by randomly selecting 100 firm-year observations from each country that has more than 100 firm-year observations and keeping all observations from countries with fewer than 100 observations. A more detailed description of the control samples is discussed in the "Results" section and Appendix A.

The first three panels of Table 1 report the distribution, based on the firm-level credit ratings, of the voluntary and mandatory adoption samples by country, year, and Moody's senior unsecured debt rating. Panel A presents the distribution of firm-year observations by country. There are 883 firm-year observations from 16 countries in the voluntary adoption sample. The mandatory adoption sample has 1,917 firm-year observations from 18 countries. Japan, Canada, and Germany have the largest representation in the voluntary adoption sample, while United Kingdom, France, and Australia each account for over 10% of the mandatory adoption sample.⁸ Panel B reports the distribution by year. Panel C presents the credit ratings distribution of the two samples. Ratings above the Ba level are considered investment grade and those at or below are speculative. About 81% (87%) of the voluntary (mandatory) adoption samples are rated as investment grade, with A being the most common rating.

Panel D of Table 1 reports the descriptive statistics of the voluntary and mandatory adoption samples. Variables are defined in Appendix B. *Rating* is set to 1 for Moody's ratings of B1 or below; 2 for Ba1, Ba2, or Ba3; 3 for Baa1, Baa2, or Baa3; 4 for A1, A2, or A3; 5 for Aa1, Aa2, or Aa3; and 6 for a Moody's rating of Aaa. Following Ashbaugh-Skaife et al. (2006), we use three accounting-based ratios to measure default risk, *ROA*, *Leverage*, and *Coverage*. *ROA* is equal to EBITDA over total assets. *Leverage* is defined as long-term debt over total assets. *Coverage* represents the interest coverage ratio, computed

Table 1. Firm Level Analysis—Descriptive Statistics.

This table reports the distribution of the voluntary and mandatory adoption samples by home country, year, and Moody's estimated senior unsecured debt rating at the firm level and the descriptive statistics of key variables for the two samples. A firm adopting International Financial Reporting Standards (IFRS)/U.S. Generally Accepted Accounting Principle (GAAP) is classified as a voluntary adopter if it is domiciled in a country not mandating IFRS or if it is domiciled in a country mandating IFRS but adopts IFRS/U.S. GAAP prior to the mandatory adoption year. All firm-years before and after the voluntary adoption (except for those after the mandatory adoption year, when applicable) are included in the voluntary adoption sample. All firms that are domiciled in countries requiring IFRS that did not adopt it until the mandatory adoption year are classified as mandatory adopters. All firm years before and after the mandatory adoption are included in the mandatory adoption sample. Countries that have fewer than five firm-year observations with financial and rating data available are excluded.

Panel A: Distribution of Firm-Year Observations by Country.

Voluntary adoption sample			Mandatory adoption sample		
Country	Number of observations	%	Country	Number of observations	%
Austria	24	2.72	Australia	258	13.46
Canada	124	14.04	Denmark	48	2.50
Finland	26	2.94	Finland	22	1.15
France	67	7.59	France	270	14.08
Germany	115	13.02	Germany	45	2.35
Italy	66	7.47	Greece	8	0.42
Japan	308	34.88	Hong Kong	60	3.13
Luxembourg	12	1.36	Ireland	37	1.93
Netherlands	20	2.27	Italy	80	4.17
New Zealand	11	1.25	Netherlands	83	4.33
Norway	18	2.04	Norway	33	1.72
Russia	12	1.36	Philippines	45	2.35
Sweden	16	1.81	Portugal	24	1.25
Switzerland	35	3.96	Singapore	25	1.30
United Kingdom	17	1.93	Spain	69	3.60
Venezuela	12	1.36	Sweden	148	7.72
			Switzerland	8	0.42
			United Kingdom	654	34.12
Total	883	100	Total	1,917	100

(continued)

as EBITDA over interest expense on debt. *ROA* and *Coverage* are expected to be positively correlated with *Rating*, and *Leverage* is expected to be negatively correlated with *Rating*. We also include *PPE*, defined as net property, plant, and equipment over total assets, and *Size*, measured as the logarithm of total assets in U.S. dollars. Firms with higher *PPE* (greater capital intensity) and larger size are expected to present lower risk to creditors and have higher credit ratings. All continuous variables are winsorized at the top and bottom 1%.

Table 1 Panel D suggests that the average credit rating does not change significantly after voluntary adoption, but it declines post mandatory adoption. *ROA*, *Leverage*, *Coverage*, and *PPE* are lower post voluntary adoption; while *ROA*, *Leverage*, and *Coverage* increase post mandatory adoption. We do not have predictions on how *ROA*,

Table I. (continued)

Panel B: Distribution of Observations by Year.

Year	Voluntary adoption sample		Mandatory adoption sample	
	Number of observations	%	Number of observations	%
1990	23	2.60	28	1.46
1991	29	3.28	35	1.83
1992	35	3.96	39	2.03
1993	32	3.62	47	2.45
1994	40	4.53	53	2.76
1995	47	5.32	58	3.03
1996	51	5.78	65	3.39
1997	58	6.57	70	3.65
1998	59	6.68	89	4.64
1999	65	7.36	109	5.69
2000	72	8.15	123	6.42
2001	81	9.17	151	7.88
2002	76	8.61	158	8.24
2003	82	9.29	174	9.08
2004	93	10.53	178	9.29
2005	27	3.06	178	9.29
2006	7	0.79	203	10.59
2007	6	0.68	159	8.29
Total	883	100.00	1,917	100.00

Panel C: Distribution of Observations by Rating.

Moody's rating	Voluntary adoption sample		Mandatory adoption sample	
	Number of observations	%	Number of observations	%
Aaa	20	2.27	67	3.50
Aa1, Aa2, Aa3	162	18.35	403	21.02
A1, A2, A3	319	36.13	767	40.01
Baa1, Baa2, Baa3	217	24.58	426	22.22
Ba1, Ba2, Ba3	60	6.80	146	7.62
B1 or below	105	11.89	108	5.63
Total	883		1,917	

Panel D: Descriptive Statistics.

This panel reports descriptive statistics of the voluntary and mandatory adoption samples. Variables are defined in Appendix B. *t* tests are used to test the differences in means and Wilcoxon tests are used to test the differences in medians between the pre- and post-adoption periods.

Variables	Voluntary				Mandatory			
	Pre-adopt		Post-adopt		Pre-adopt		Post-adopt	
	M	Median	M	Median	M	Median	M	Median
Rating	3.5422	4.0000	3.4726	4.0000	3.7906	4.0000	3.5764***	4.0000***
ROA (%)	10.1074	10.0347	8.4168**	8.7680***	9.1699	9.0348	10.5967***	9.8317***
Leverage (%)	25.6884	22.4061	22.8854**	19.5529***	22.0645	19.0712	23.3514	20.4459
Coverage (%)	11.9433	5.2093	9.5069	5.0924	6.2020	4.8400	9.0784***	6.3167***
PPE (%)	44.6546	45.1634	25.6944***	24.2745***	31.7982	25.1142	22.3329***	13.9484***
Size	16.2993	16.1933	16.8308***	16.9448***	16.5684	16.3788	17.0237***	16.9319***

*, **, *** significantly different from pre-adoption at 10%, 5%, 1% level respectively, two-tailed test.

Leverage, *Coverage*, or *PPE* should change around the adoption. The differences between the voluntary and mandatory samples can be due to a time effect as the mandatory adoption tends to occur later in the sample. We control for the time effect in our regressions by including year fixed effects and clustering the standard errors by year.

Results

This section reports, based on firm-level credit ratings, (1) our baseline findings; (2) the results with a single default factor extracted from *ROA*, *Leverage*, and *Coverage*; (3) difference-in-differences analysis with the benchmark non-adopting samples; and (4) the analysis incorporating the effects of the legal environment.

Baseline Results

We use the following ordered logit model to examine the relevance of accounting information for credit ratings:

$$\begin{aligned}
 Rating_{i,t} = & a_0 + a_1ROA_{i,t} + a_2Leverage_{i,t} + a_3Coverage_{i,t} + a_4PPE_{i,t} \\
 & + a_5Size_{i,t} + a_6Post_{i,t} + a_7Post_{i,t} \times ROA_{i,t} + a_8Post_{i,t} \\
 & \times Leverage_{i,t} + a_9Post_{i,t} \times Coverage_{i,t} + a_{10}Post_{i,t} \times PPE_{i,t} + a_{11}Post_{i,t} \\
 & \times Size_{i,t} + a_{12}US_Cross + Country, year, industry fixed effects + e_{i,t}.
 \end{aligned}
 \tag{1}$$

Post equals 1 if fiscal year *t* is a reporting period after the voluntary adoption of IFRS/ U.S. GAAP or mandatory adoption of IFRS, and 0 otherwise. The coefficients on *ROA* and *Coverage* are expected to be positive and that on *Leverage* negative. If these accounting-based default risk measures become more relevant for credit ratings post adoption, we expect the coefficients on the interactions of *Post* with *ROA* and *Coverage*, a_7 and a_9 , to be positive, and that on the interaction of *Post* with *Leverage*, a_8 , to be negative.

The coefficients on the control variables, *PPE* and *Size*, are expected to be positive due to prior literature (e.g., Ashbaugh-Skaife et al., 2006). As they are accounting-based variables, we also include their interactions with *Post*. However, we do not treat *PPE* and *Size* as primary measures of default risk following prior literature (e.g., Ashbaugh-Skaife et al., 2006; Hann et al., 2007; Shi, 2003) and do not have predictions for the interactive terms. Some of our sample firms are cross-listed in the U.S. and provide U.S. GAAP reconciliations for their key financial data. Prior research argues that foreign firms voluntarily bond themselves to tougher disclosure rules by seeking cross-listing in the United States and following U.S. securities laws. Because credit ratings and their association with the local accounting-based default risk measures could differ for these cross-listed firms than for other non-U.S. firms, we include an additional control variable, *US_Cross*. It is set to 1 if a firm is cross-listed in the United States in the sample period and 0 otherwise. In all regressions, we include country, year, and industry fixed effects. Standard errors are clustered by country and year.

The estimation results of model (1) are reported in Table 2. We first estimate a variation of model (1) for the voluntary adoption sample without differentiating between the pre- and post-adoption periods and report the results in column (1). *ROA*, *Leverage*, *Coverage*, *PPE*, and *Size* are all significantly correlated with *Rating* with the correct signs. *US_Cross*

Table 2. Firm Level Analysis—Relevance of Accounting Information for Credit Rating. This table reports the estimation results of the following regression model:

$$\begin{aligned}
 \text{Rating}_{i,t} = & a_1 \text{ROA}_{i,t} + a_2 \text{Leverage}_{i,t} + a_3 \text{Coverage}_{i,t} + a_4 \text{PPE}_{i,t} + a_5 \text{Size}_{i,t} + a_6 \text{Post}_{i,t} + a_7 \text{Post}_{i,t} \times \text{ROA}_{i,t} + a_8 \text{Post}_{i,t} \\
 & \times \text{Leverage}_{i,t} + a_9 \text{Post}_{i,t} \times \text{Coverage}_{i,t} + a_{10} \text{Post}_{i,t} \times \text{PPE}_{i,t} + a_{11} \text{Post}_{i,t} \times \text{Size}_{i,t} + a_{12} \text{US_Cross} \\
 & + \text{Country, year, industry fixed effects} + e_{i,t}.
 \end{aligned}
 \tag{1}$$

Variables are defined in Appendix B. Columns (1) and (2) report the estimation results of model (1) and a variation of the model for the voluntary adoption sample. Columns (3) and (4) report the estimation results for the mandatory adoption sample. Coefficients on country, industry, and year fixed effects are suppressed. Standard errors are clustered by country and year.

	Voluntary				Mandatory				
	(1)	(2)	(3)	(4)	(3)	(4)	(3)	(4)	
	Prediction	Estimate	SE	Estimate	SE	Estimate	SE	Estimate	SE
ROA	+	0.0657***	0.0153	0.0362*	0.0216	0.0824***	0.0077	0.1015***	0.0092
Leverage	-	-0.0635***	0.0098	-0.0620***	0.0106	-0.0289***	0.0036	-0.0303***	0.0045
Coverage	+	0.0177***	0.0052	0.0022	0.0081	0.0343***	0.0088	0.0220*	0.0132
PPE	+	0.0373***	0.0051	0.0366***	0.0053	0.0236***	0.0037	0.0298***	0.0040
Size	+	1.5023***	0.1066	1.5370***	0.1163	1.0168***	0.0585	1.0613***	0.0644
Post				-1.0894	1.8613			3.4179**	1.4788
Post × ROA	+ ^a			0.0530**	0.0304			-0.0466***	0.0176
Post × Leverage	- ^a			-0.0014	0.0147			0.0011	0.0078
Post × Coverage	+ ^a			0.0200**	0.0104			0.0256	0.0187
Post × PPE				-0.0013	0.0085			-0.0238***	0.0059
Post × Size				-0.0031	0.0990			-0.1308*	0.0764
US_Cross		1.3572***	0.2762	1.4441***	0.2711	-0.2034	0.1254	-0.1932	0.1265
Country fixed effects			Yes		Yes		Yes		Yes
Year fixed effects			Yes		Yes		Yes		Yes
Industry fixed effects			Yes		Yes		Yes		Yes
Number of observations			883		883		1917		1917
Pseudo R ²			.4713		.4729		.3189		.3285

^aVoluntary adoption sample only. *, **, *** significantly different from zero at 10%, 5%, 1% level respectively, two-tailed test.

is significantly positively correlated with *Rating*. We then add interactions of *Post* with *ROA*, *Leverage*, *Coverage*, *PPE*, and *Size* to the regression to test the difference between the pre- and post-adoption periods (column (2)). Consistent with accounting information being more useful for credit rating post voluntary adoption of internationally recognized standards, the coefficients on *Post* × *ROA* and *Post* × *Coverage* are significantly positive. The coefficient on *Post* × *Leverage* is negative as predicted but insignificant. The coefficients on *Post* × *PPE* and *Post* × *Size* are insignificant.

Next, we estimate model (1) for the mandatory adoption sample. When the regression is estimated without differentiating between the pre- and post-adoption periods, *ROA*, *Leverage*, *Coverage*, *PPE*, and *Size* are all significantly correlated with *Rating* with the correct signs (column (3)). In column (4), we add the *Post*-related interactions and find insignificant coefficients on *Post* × *Leverage* and *Post* × *Coverage* and a significant but *negative* coefficient on *Post* × *ROA*. In addition, we find *negative* and significant coefficients on *Post* × *PPE* and *Post* × *Size*. These results do not suggest that accounting information post mandatory IFRS adoption is more relevant for credit ratings, on average.

The combined results in Table 2 point to an increase in the credit relevance of accounting information for the voluntary adopters post adoption, but not after mandatory adoption. Relative to the local standards, IFRS tend to include less verifiable items on the balance sheet and income statement, which require more managerial discretion and judgment.⁹ The voluntary adopters likely possess a strong desire to improve financial reporting quality and can use the discretion afforded by IFRS/U.S. GAAP to convey more relevant information to investors. On the other hand, the same flexibility under IFRS may not bring more informative financial reporting if managers have much weaker incentives to improve financial transparency—a possible scenario for mandatory adopters, especially with weak enforcement. In the section titled “The Impact of Legal Environment,” we consider the role of legal enforcement for mandatory adopters.

A Single Default Factor

ROA, *Leverage*, and *Coverage* are all accounting-based default risk measures and they are significantly correlated with one another with *p* values at less than the 1% level. For example, the correlation between *ROA* and *Coverage* is over 0.36 for both samples. To increase the power of our tests, we extract a common default factor from these three credit risk measures. For both the voluntary and the mandatory adoption samples, *Factor* is highly positively correlated with *ROA* and *Coverage*, and negatively correlated with *Leverage*. Therefore, the higher the *Factor* the lower the default risk is. We replace the three separate default risk measures with the single default factor in model (2) below:

$$\begin{aligned}
 Rating_{i,t} = & a_0 + a_1 Factor_{i,t} + a_2 PPE_{i,t} + a_3 Size_{i,t} \\
 & + a_4 Post_{i,t} + a_5 Post_{i,t} \times Factor_{i,t} + a_6 Post_{i,t} \times PPE_{i,t} + a_7 Post_{i,t} \\
 & \times Size_{i,t} + a_8 US_Cross + Country, year, industry fixed effects + e_{i,t}.
 \end{aligned} \quad (2)$$

The estimation results of variations of model (2) for the voluntary adoption sample are reported in Table 3, columns (1) and (2). From column (1), *Factor*, *PPE*, and *Size* are all significantly positively correlated to *Rating* as predicted. In column (2), we allow the coefficient on *Factor* to vary across the pre- and post-adoption periods. *Post* × *Factor* loads significantly with the predicted positive sign, suggesting that credit rating is more sensitive

Table 3. Firm Level Analysis—Accounting-Based Default Factor. This table reports the estimation results of the following regression model,

$$\begin{aligned}
 \text{Rating}_{i,t} = & a_1 \text{Factor}_{i,t} + a_2 \text{PPE}_{i,t} + a_3 \text{Size}_{i,t} + a_4 \text{Post}_{i,t} + a_5 \text{Post}_{i,t} \times \text{Factor}_{i,t} \\
 & + a_6 \text{Post}_{i,t} \times \text{PPE}_{i,t} + a_7 \text{Post}_{i,t} \times \text{Size}_{i,t} + a_8 \text{US_Cross} + \text{Country, year, industry fixed effects} + e_{i,t}.
 \end{aligned}
 \tag{2}$$

Variables are defined in Appendix B. Columns (1) and (2) report the estimation results of model (2) and a variation of the model for the voluntary adoption sample. Columns (3) and (4) report the estimation results for the mandatory adoption sample. Coefficients on country, industry, and year fixed effects are suppressed. Standard errors are clustered by country and year.

	Voluntary				Mandatory				
	(1)		(2)		(3)		(4)		
	Prediction	Estimate	SE	Estimate	SE	Estimate	SE	Estimate	SE
Factor	+	1.4802***	0.1717	0.7712***	0.2784	1.1200***	0.1047	1.1118***	0.2073
PPE	+	0.0354***	0.0052	0.0342***	0.00671	0.0238***	0.0036	0.0303***	0.00399
Size	+	1.6257***	0.0999	1.6882***	0.1112	1.0518***	0.0561	1.0784***	0.0626
Post				0.2034	1.5386			2.7315**	1.2278
Post × Factor	+ ^a			0.9900***	0.3151			-0.2152	0.1669
Post × PPE				0.0003	0.0090			-0.0275***	0.0054
Post × Size				-0.0441	0.0862			-0.0958	0.0689
US_Cross		1.1837***	0.2782	1.2745***	0.2962	-0.2315*	0.1211	-0.2021*	0.1214
Country fixed effects			Yes		Yes		Yes		Yes
Year fixed effects			Yes		Yes		Yes		Yes
Industry fixed effects			Yes		Yes		Yes		Yes
Number of observations			883		883		1,917		1,917
Pseudo R ²			.4574		.4632		.3042		.3195

^aVoluntary adoption sample only.

*, **, *** significantly different from zero at 10%, 5%, 1% level respectively, two-tailed test.

to accounting-based measures of credit risk after the voluntary adoption of IFRS or U.S. GAAP.

We apply the same analyses to the mandatory adoption sample and report the results in columns (3) and (4) of Table 3. While *Factor* is significantly correlated with *Rating*, the mandatory adoption sample does not see a general increase in the sensitivity of *Rating* to *Factor* post IFRS adoption. The coefficient on *Post* \times *Factor* is negative but insignificant. Therefore, the conclusions from Table 3 confirm those in Table 2 that credit ratings are more sensitive to the accounting-based default risk measure post voluntary adoption but not for mandatory adopters in general.

Difference-in-Differences Analysis

If there are general changes in the sensitivity of credit ratings to accounting information during our sample period that are unrelated to the adoption of IFRS or U.S. GAAP, our inferences can potentially be affected. To mitigate this concern, we include the non-adopting control sample and conduct a difference-in-differences analysis with the following regression model:

$$\begin{aligned}
 Rating_{i,t} = & a_0 + a_1 Factor_{i,t} + a_2 PPE_{i,t} + a_3 Size_{i,t} + a_4 Post_{i,t} + a_5 Post_{i,t} \\
 & \times Factor_{i,t} + a_6 Post_{i,t} \times PPE_{i,t} + a_7 Post_{i,t} \times Size_{i,t} \\
 & + a_8 Adopt_{i,t} + a_9 Adopt_{i,t} \times Factor_{i,t} + a_{10} Adopt_{i,t} \times PPE_{i,t} + a_{11} Adopt_{i,t} \\
 & \times Size_{i,t} + a_{12} Adopt_{i,t} \times Post_{i,t} + a_{13} Adopt_{i,t} \times Post_{i,t} \times Factor_{i,t} \\
 & + a_{14} Adopt_{i,t} \times Post_{i,t} \times PPE_{i,t} + a_{15} Adopt_{i,t} \times Post_{i,t} \times Size_{i,t} + a_{16} US_Cross \\
 & + Country, year, industry fixed effects + e_{i,t}.
 \end{aligned}
 \tag{3}$$

We first run model (3) for the voluntary adoption analysis. Recall from “Sample” section that we construct two sets of control samples. The first set of control firms for voluntary adoption (control sample V1) come from countries that have not mandated IFRS reporting and these firms report under the local GAAP throughout our sample period. The pre-adoption years of the mandatory adopters are also included as part of the benchmark sample. This control sample includes 4,490 firm-year observations from 27 countries, and Japanese firms have the largest representation in the sample (35.70% of the firm-year observations). We set an indicator variable, *Adopt*, to 1 for firm-years in the voluntary adoption sample, and 0 for those in the control sample. For each control firm, we randomly select a year as the pseudo “adoption” year and *Post* is set to 1 for the pseudo “adoption” year and all subsequent years. The second benchmark sample (V2) is formed by randomly selecting, from control sample V1, 100 observations from countries with more than 100 observations and keeping all observations from countries with fewer than 100 observations. Appendix A summarizes our various control samples. If voluntary adopters of internationally recognized standards experience an incremental rise in the credit relevance of accounting information from pre- to post-adoption, we expect the coefficient on *Adopt*_{*i,t*} \times *Post*_{*i,t*} \times *Factor*_{*i,t*} to be positive.

We report the analysis of voluntary adoption relative to control sample V1 in Table 4, columns (1) and (2), and that relative to control sample V2 in column (3). Column (1)

Table 4. Firm Level Analysis—Difference-in-Differences Approach.

This table reports the estimation results of the following regression model and its variations,

$$\begin{aligned}
 \text{Rating}_{i,t} = & a_0 + a_1 \text{Factor}_{i,t} + a_2 \text{PPE}_{i,t} + a_3 \text{Size}_{i,t} + a_4 \text{Post}_{i,t} + a_5 \text{Post}_{i,t} \times \text{Factor}_{i,t} + a_6 \text{Post}_{i,t} \times \text{PPE}_{i,t} + a_7 \text{Post}_{i,t} \times \text{Size}_{i,t} \\
 & + a_8 \text{Adopt}_{i,t} + a_9 \text{Adopt}_{i,t} \times \text{Factor}_{i,t} + a_{10} \text{Adopt}_{i,t} \times \text{PPE}_{i,t} + a_{11} \text{Adopt}_{i,t} \times \text{Size}_{i,t} + a_{12} \text{Adopt}_{i,t} \times \text{Post}_{i,t} + a_{13} \text{Adopt}_{i,t} \\
 & \times \text{Post}_{i,t} \times \text{Factor}_{i,t} + a_{14} \text{Adopt}_{i,t} \times \text{Post}_{i,t} \times \text{PPE}_{i,t} + a_{15} \text{Adopt}_{i,t} \times \text{Post}_{i,t} \times \text{Size}_{i,t} + a_{16} \text{US_Cross} \\
 & + \text{Country}_{i,t} \times \text{industry fixed effects} + e_{i,t}.
 \end{aligned}
 \tag{3}$$

Variables are defined in Appendix B. Coefficients on country, industry, and year fixed effects are suppressed. Standard errors are clustered by country and year. Columns (1)-(3) report the results for the voluntary adoption sample and control sample. For columns (1) and (2), the control sample (V1) includes (a) all firms in countries not mandating IFRS and reporting under local Generally Accepted Accounting Principle (GAAP) throughout our sample period, and (b) the pre-adoption years of mandatory adopters. For each control firm, we randomly select a year as the pseudo “adoption” year and Post is set to 1 for the pseudo “adoption” year and all subsequent years. In column (3), the control sample (V2) is constructed from the control sample (V1) in columns (1) and (2) by randomly selecting 100 firm-year observations from each country that has more than 100 firm-year observations and retaining all observations from countries with fewer than 100 observations. The regressions in columns (2) and (3) include additional controls for potential self-selection in the voluntary adoption decision: analyst following, growth, and capital activities in the subsequent 3 years, including equity issuance, acquisitions, and spinoffs.

Columns (4) and (5) report the results for the mandatory adoption sample and control sample. The control sample (M1) in column (4) includes all firms in countries not mandating IFRS and reporting under local GAAP throughout our sample period. Post is set to 1 for 2005, 2006, and 2007 for these firms. The control sample (M2) in column (5) is constructed from the control sample (M1) in column (4) by randomly selecting 100 firm-year observations from each country that has more than 100 firm-year observations and retaining all observations from countries with fewer than 100 observations. A summary of the controls samples is in Appendix A.

Factor	Control sample Prediction	Voluntary						Mandatory					
		(1)		(2)		(3)		(4)		(5)			
		VI	VI	VI	V2	M1	M2	Estimate	SE	Estimate	SE		
+	2.1198***	0.1543	2.1307***	0.1612	1.8567***	0.2815	1.7929***	0.1005	1.5460***	0.1650			
PPE	0.0082***	0.0029	0.0059***	0.0028	0.0096**	0.0041	0.0133***	0.0032	0.0164***	0.0044			
+	0.8791***	0.0496	0.7995***	0.0579	0.7750***	0.0949	0.7486***	0.0601	0.5687***	0.0983			
Size	0.4917	0.7813	0.3800	0.8586	-0.0425	1.3877	0.6367	2.0832	0.5685	2.4737			
Post	-0.5291***	0.1594	-0.5221***	0.1716	-0.1937	0.3556	-0.6736***	0.1644	-0.3602	0.2816			
Post × Factor	-0.0061**	0.0030	-0.0040	0.0031	-0.0077*	0.0045	-0.0218***	0.0066	-0.0089	0.0074			
Post × PPE	-0.0173	0.0496	-0.0163	0.0536	0.0216	0.0835	0.0959	0.1396	0.0874	0.1578			
Post × Size	-6.9007***	1.1185	-9.4335***	1.4311	-11.2426***	1.8200							

(continued)

Table 4. (continued)

Column Control sample Prediction	Voluntary						Mandatory					
	(1)		(2)		(3)		(4)		(5)		M2	
	Estimate	SE	Estimate	SE	Estimate	SE	Estimate	SE	Estimate	SE	Estimate	SE
Adopt × Factor	-1.2362***	0.3044	-1.5199***	0.2940	-0.9837***	0.3475	-0.4469**	0.1498	-0.2607	0.1957		
Adopt × PPE	0.0100	0.0067	-0.0019	0.0065	0.0024	0.0071	-0.0012	0.0044	0.0095*	0.0051		
Adopt × Size	0.4380***	0.0704	0.6112***	0.0877	0.6898***	0.1079	0.3174***	0.0676	0.5450***	0.1033		
Adopt × Post	0.3341	1.4292	2.1365	1.8516	2.4103	2.1445	3.1090	2.4432	2.7023	2.7756		
Adopt × Post × Factor	1.2999***	0.3365	1.5157***	0.3341	1.0111**	0.4534	0.2994	0.2329	0.0822	0.3253		
Adopt × Post × PPE	0.0007	0.0080	0.0097	0.0083	0.0138	0.0092	-0.0018	0.0082	-0.0181**	0.0090		
Adopt × Post × Size	-0.0506	0.0825	-0.1629	0.1072	-0.1887	0.1234	-0.2738*	0.1533	-0.2239	0.1716		
US_Cross	-0.1375	0.0940	-0.1085	0.0980	0.1236	0.1588	-0.4001***	0.1077	-0.1863*	0.1006		
Country fixed effects		Yes		Yes		Yes		Yes		Yes		
Year fixed effects		Yes		Yes		Yes		Yes		Yes		
Industry fixed effects		Yes		Yes		Yes		Yes		Yes		
Additional controls		Yes		Yes		Yes		Yes		Yes		
Number of observations		5,373		5,059		2,275		4,839		2,718		
Pseudo R ²		.2973		.3001		.3641		.3005		.3433		

^aVoluntary adoption sample only.

*, **, *** significantly different from zero at 10%, 5%, 1% level respectively, two-tailed test.

shows a positive and significant coefficient on *Factor*, indicating that credit ratings are sensitive to the default factor in the “base category” of *control firms pre adoption*. The coefficient on $Post \times Factor$ is negative and significant, suggesting that the credit relevance of the default factor decreases *post adoption for the control sample*. $Adopt \times Factor$ has a significant and negative coefficient, indicating that *prior to adoption* the adopting firms’ credit ratings are less sensitive to the default factor than control firms. To assess the difference between adopting and control firms in their pre- and post-adoption differences, we turn to the coefficient on the triple interactive term, $Adopt \times Post \times Factor$. It is positive and significant at the 1% level, suggesting that voluntary adopters experience a greater increase in the sensitivity of credit ratings to the default factor post adoption than firms in the control sample. In column (2), we estimate a variation of model (3) by including additional controls for firms’ decisions to adopt IFRS/U.S. GAAP. Six control variables are added, the number of analysts following and growth measured by the book-to-market ratio in year $t - 1$, and dummy variables for equity issuance, acquirers, targets, and spinoffs in the 3 years subsequent to the adoption. Prior research suggests that these variables are likely associated with greater disclosure incentives and a higher likelihood of voluntary IFRS/U.S. GAAP adoption (e.g., Ashbaugh, 2001; Harris & Muller, 1999; Leuz & Verrecchia, 2000; Wu & Zhang, 2009). After including these additional control variables, the coefficient on $Adopt \times Post \times Factor$ capturing the incremental change in the association between *Rating* and *Factor* in the adoption sample relative to the control sample remains positive and highly significant. In column (3), the regression with additional control variables is estimated with control sample V2. The results are similar to those in column (2). The coefficient on $Adopt \times Post \times Factor$ is significantly positive with a p value of 2.57%, two-sided.

We next run model (3) for mandatory IFRS adoption relative to the control sample. The first control sample for the mandatory adoption (M1) includes firms from countries that have not mandated IFRS reporting and these firms report under the local GAAP throughout our sample period. This control sample consists of firms from 11 countries, of which 55% are from Japan. We set an indicator variable, *Adopt*, to 1 for firm-years in the mandatory adoption sample, and 0 for those in the control sample. Since mandatory adoption of IFRS clusters in 2005, *Post* is set to 1 for 2005, 2006, and 2007, and 0 otherwise. The second control sample (M2) is formed by randomly selecting, from control sample M1, 100 observations from each country with more than 100 observations and keeping all data points from countries with fewer than 100 observations.

The estimation results of model (3) for the mandatory adoption sample and control sample M1 are reported in column (4) of Table 4. We focus on the coefficient on the triple interactive term, $Adopt \times Post \times Factor$, which reflects the incremental change from pre- to post-adoption in the credit relevance of the default factor in the adopting firms relative to the changes experienced by the local standards firms. The coefficient is positive, although insignificant at conventional levels with a p value of 19.86%. The estimation results of model (3) for the mandatory adoption sample and control sample M2 are reported in column (5). The coefficient on $Adopt \times Post \times Factor$ is also positive but insignificant with a p value of 80.05%. Overall, the evidence from the difference-in-differences analyses again suggests that the accounting-based default factor becomes more credit relevant after voluntary adoption but not after mandatory adoption in general.

The Impact of Legal Environment

Daske et al. (2008) find that the equity market effects of mandatory adoption vary with the legal environment in each country. Specifically, the benefits of mandatory IFRS adoption occur only when a country's legal enforcement is strong. It is possible that a strong legal environment also increases the usefulness of accounting information for credit ratings through better enforcement of the new accounting standards. Therefore, we examine whether and how a country's legal environment interacts with IFRS adoption to affect the usefulness of the accounting default factor for credit ratings. A variation of model (3) is estimated for this purpose, where we allow the coefficient on *Factor* and all its interaction variables to vary with the strength of the rule of law.¹⁰

$$\begin{aligned}
 Rating_{i,t} = & a_0 + a_1 Factor_{i,t} + a_1' Factor_{i,t} \times Law + a_2 PPE_{i,t} + a_3 Size_{i,t} \\
 & + a_4 Post_{i,t} + a_5 Post_{i,t} \times Factor_{i,t} + a_5' Post_{i,t} \times Factor_{i,t} \times Law \\
 & + a_6 Post_{i,t} \times PPE_{i,t} + a_7 Post_{i,t} \times Size_{i,t} + a_8 Adopt_{i,t} + a_9 Adopt_{i,t} \\
 & \times Factor_{i,t} + a_9' Adopt_{i,t} \times Factor_{i,t} \times Law + a_{10} Adopt_{i,t} \times PPE_{i,t} \\
 & + a_{11} Adopt_{i,t} \times Size_{i,t} + a_{12} Adopt_{i,t} \times Post_{i,t} + a_{13} Adopt_{i,t} \times Post_{i,t} \\
 & \times Factor_{i,t} + a_{13}' Adopt_{i,t} \times Post_{i,t} \times Factor_{i,t} \times Law + a_{14} Adopt_{i,t} \\
 & \times Post_{i,t} \times PPE_{i,t} + a_{15} Adopt_{i,t} \times Post_{i,t} \times Size_{i,t} + a_{16} US_Cross \\
 & + Country, year, industry fixed effects + e_{i,t}.
 \end{aligned}
 \tag{4}$$

Law is set equal to 1 if the rule of law index is in the upper quartile of the sample, and 0 otherwise. The results are reported in Table 5, in columns (1) and (2) for the voluntary adoption analysis and columns (3) and (4) for the mandatory adoption analysis. Columns (1) and (2) also control for self-selection in the voluntary adoption decision by including analyst following, growth, and variables capturing subsequent financing, acquisition, and divestiture activities. We focus on $Adopt_{i,t} \times Post_{i,t} \times Factor_{i,t}$, which captures the incremental post-adoption increase in the credit relevance of accounting information of adopters relative to control firms, and $Adopt_{i,t} \times Post_{i,t} \times Factor_{i,t} \times Law$, which captures the additional incremental increase of adopters from countries with stronger rules of law.¹¹

Column (1) Table 5 reports the estimation results for voluntary adoption with control sample V1 and column (2) with control sample V2. Both columns show a positive and significant coefficient on $Adopt \times Post \times Factor$ while the coefficient on $Adopt \times Post \times Factor \times Law$ is insignificant. This suggests that both countries with strong rules of law and those with weak rules of law see increased credit relevance of the default factor associated with the *voluntary* adoption. Hence, the strength of the rule of law apparently does not make a difference in the setting of voluntary adoption, possibly because the voluntary adopters already possess strong incentives to comply with the standards they themselves choose to adopt. Columns (3) and (4) report the findings on mandatory adoption, with M1 being the control sample in column (3) and M2 the control sample in column (4). In both columns, the coefficient on $Adopt \times Post \times Factor$ is insignificant and that on $Adopt \times Post \times Factor \times Law$ is positive and significant. The sum of $Adopt \times Post \times Factor$ and $Adopt \times Post \times Factor \times Law$ captures the incremental post-adoption change in the association between *Rating* and *Factor* for mandatory adopters in countries with strong rules of law. Untabulated results show that the sum is positive and significant in both

Table 5. Firm Level Analysis—Impact of Legal Environment.
This table reports the estimation results of the following regression model,

$$\begin{aligned}
 \text{Rating}_{i,t} = & a_0 + a_1 \text{Factor}_{i,t} + a_1' \text{Factor}_{i,t} \times \text{Law} + a_2 \text{PPE}_{i,t} + a_3 \text{Size}_{i,t} + a_4 \text{Post}_{i,t} + a_5 \text{Post}_{i,t} \times \text{Factor}_{i,t} + a_5' \text{Post}_{i,t} \\
 & \times \text{Factor}_{i,t} \times \text{Law} + a_6 \text{Post}_{i,t} \times \text{PPE}_{i,t} + a_7 \text{Post}_{i,t} \times \text{Size}_{i,t} + a_8 \text{Adopt}_{i,t} + a_9 \text{Adopt}_{i,t} \times \text{Factor}_{i,t} + a_9' \text{Adopt}_{i,t} \\
 & \times \text{Factor}_{i,t} \times \text{Law} + a_{10} \text{Adopt}_{i,t} \times \text{PPE}_{i,t} + a_{11} \text{Adopt}_{i,t} \times \text{Size}_{i,t} + a_{12} \text{Adopt}_{i,t} \times \text{Post}_{i,t} + a_{13} \text{Adopt}_{i,t} \times \text{Post}_{i,t} \\
 & \times \text{Factor}_{i,t} + a_{13}' \text{Adopt}_{i,t} \times \text{Post}_{i,t} \times \text{Factor}_{i,t} \times \text{Law} + a_{14} \text{Adopt}_{i,t} \times \text{Post}_{i,t} \times \text{PPE}_{i,t} + a_{15} \text{Adopt}_{i,t} \times \text{Post}_{i,t} \\
 & \times \text{Size}_{i,t} + a_{16} \text{US_Cross} + \text{Country, year, industry fixed effects} + e_{i,t}.
 \end{aligned}
 \tag{4}$$

Variables are defined in Appendix B. The regression is estimated for the voluntary adoption sample and control sample V1 in column (1) and control sample V2 in column (2). The regression is estimated for the mandatory adoption sample and control sample M1 in column (3) and control sample M2 in column (4). Control samples V1, V2, M1, and M2 are described in Table 4 and Appendix A. Coefficients on country, industry, and year fixed effects are suppressed. Standard errors are clustered by country and year.

Factor	Control sample Prediction	Voluntary				Mandatory			
		(1)		(2)		(3)		(4)	
		Estimate	SE	Estimate	SE	Estimate	SE	Estimate	SE
Factor × Law	+	2.0437***	0.1844	1.6358***	0.3012	1.6548***	0.0877	1.3031***	0.1716
Factor × Law		0.3575	0.3507	0.8923	0.5526	0.9446***	0.2756	1.8971***	0.4399
PPE	+	0.0053*	0.0030	0.0097**	0.0043	0.0119***	0.0033	0.0173***	0.0046
Size	+	0.8003***	0.0584	0.7545***	0.0956	0.7302***	0.0574	0.5326***	0.0949
Post		0.4100	0.9617	-0.5229	1.4147	-0.0657	2.2146	-0.3510	2.5980
Post × Law		-0.3370*	0.1947	0.0921	0.2955	-1.3141***	0.2833	-1.7713***	0.5892
Post × Factor		-0.4472**	0.1982	-0.0267	0.3892	-0.5362***	0.1919	-0.1829	0.3093
Post × Factor × Law		-0.3166	0.4188	-0.7144	0.7709	-1.2870***	0.3823	-2.2555***	0.7525
Post × PPE		-0.0033	0.0032	-0.0071	0.0046	-0.0164***	0.0059	-0.0088	0.0075
Post × Size		-0.0157	0.0587	0.0470	0.0847	0.1455	0.1523	0.1558	0.1695
Adopt		-11.3329***	1.7984	-13.5591***	2.1939				
Adopt × Law		0.7026**	0.3575	0.9435**	0.4203				

(continued)

Table 5. (continued)

Column Control sample Prediction	Voluntary			Mandatory		
	(1)	(2)	(3)	(4)		
	VI	V2	M1	M2	Estimate	SE
Adopt × Factor	-1.3058***	-0.6013	-0.1643	0.1374	0.1344	0.1981
Adopt × Factor × Law	-0.5314	-1.2834*	-1.5342***	-2.4761***	0.4040	0.5241
Adopt × PPE	-0.0052	-0.0014	0.0001	0.0088*	0.0045	0.0052
Adopt × Size	0.7117***	0.8157***	0.3438***	0.5972***	0.0660	0.1013
Adopt × Post	4.3943**	4.9066**	3.4204	3.3256	2.5630	2.8946
Adopt × Post × Law	-1.3303***	-1.5189***	1.9074***	2.4303***	0.3436	0.6184
Adopt × Post × Factor	1.4682***	0.8500*	0.1184	-0.1350	0.2572	0.3495
Adopt × Post × Factor × Law	-0.4674	0.2627	1.4636***	2.3578***	0.5285	0.8385
Adopt × Post × PPE	0.0177*	0.0212**	-0.0076	-0.0187**	0.0077	0.0090
Adopt × Post × Size	-0.2850**	-0.3214**	-0.3138*	-0.2855	0.1654	0.1834
US_Gross	-0.1184	0.1469	-0.4191***	-0.2016**	0.1054	0.1002
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Additional controls	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	5,039	2,255	4,839	2,718	4,839	2,718
Pseudo R ²	.3004	.3648	.3050	.3477	.3050	.3477

^aVoluntary adoption sample only.

^bMandatory adoption sample only.

*, **, *** significantly different from zero at 10%, 5%, 1% level respectively, two-tailed test.

specifications at better than the 1% level, two sided. These results show a significant post-adoption increase in the credit relevance of accounting information for firms in countries with stronger rules of law, while no such evidence for firms in weaker legal environment, consistent with our prediction. The evidence suggests a positive role of the rule of law in enhancing the credit relevance of the accounting information post mandatory IFRS adoption.

Additional Tests

Debt Issue-Level Analysis

Our analysis thus far has focused on credit ratings at the *firm level*, which are the *estimated* senior unsecured debt ratings for corporate bank loan issuers and bond issuers. Moody's sets the firm-level estimated senior debt rating to be the actual senior unsecured debt rating when such a debt issue exists. When there is no such debt issue, the firm-level rating is estimated based on the other outstanding debts of the firm. In this section, we examine Moody's *issue-level* credit ratings for *new* issues of senior unsecured debt and how they respond to accounting information around accounting standards changes. If a firm issues multiple senior unsecured debts in a year, we randomly select one issue to include in the issue-level analysis because multiple issues of the same issuer year generally receive the same rating.

A firm carrying a Moody's *firm-level* credit rating may not always have a senior unsecured debt, and even when it does, it may not have a new issue every year. As a result, the number of firm-year observations in the issue-level analysis is smaller than that in the firm-level analysis. Another, and potentially more important, aspect of the issue-level analysis is that the ratings on new debt issues can be more reflective of the most recent accounting information than the existing firm-level credit ratings, which can be sticky if rating revisions are not timely (e.g., Beaver, Shakespeare, & Soliman, 2006).¹²

The voluntary adoption and mandatory adoption samples and their respective controls are constructed in the same way as before. Similar to the statistics reported at the firm level, Japan has the largest representation in the voluntary adoption sample (33%), and France and the United Kingdom are heavily represented in the mandatory adoption sample, each accounting for over 20% of the sample. For both the voluntary and the mandatory adoption samples, about 40% of the issues are rated at the A level. About 92% (95%) of the voluntary (mandatory) adoption sample are rated as investment grade.

We estimate the following ordered logit model to examine the relevance of accounting information for issue-level credit ratings:

$$\begin{aligned}
 \text{Rating} - \text{IssueLevel}_{i,t} = & a_0 + a_1 \text{Factor}_{i,t} + a_2 \text{PPE}_{i,t} + a_3 \text{Size}_{i,t} \\
 & + a_4 \text{Post}_{i,t} + a_5 \text{Post}_{i,t} \times \text{Factor}_{i,t} + a_6 \text{Post}_{i,t} \times \text{PPE}_{i,t} \\
 & + a_7 \text{Post}_{i,t} \times \text{Size}_{i,t} + a_8 \text{Adopt}_{i,t} + a_9 \text{Adopt}_{i,t} \times \text{Factor}_{i,t} \\
 & + a_{10} \text{Adopt}_{i,t} \times \text{PPE}_{i,t} + a_{11} \text{Adopt}_{i,t} \times \text{Size}_{i,t} + a_{12} \text{Adopt}_{i,t} \\
 & \times \text{Post}_{i,t} + a_{13} \text{Adopt}_{i,t} \times \text{Post}_{i,t} \times \text{Factor}_{i,t} \\
 & + a_{14} \text{Adopt}_{i,t} \times \text{Post}_{i,t} \times \text{PPE}_{i,t} + a_{15} \text{Adopt}_{i,t} \times \text{Post}_{i,t} \\
 & \times \text{Size}_{i,t} + a_{16} \text{US_Cross} + a_{17} \text{Issue_Size} + a_{18} \text{Maturity} \\
 & + \text{Country, year, industry fixed effects} + e_{i,t}.
 \end{aligned}$$

(3')

Similar to the firm-level analysis, we extract a common default factor from *ROA*, *Leverage*, and *Coverage*. To reduce duplication, we do not tabulate the results with *ROA*, *Leverage*, and *Coverage* as separate default risk measures, which produce very similar inferences. The dependent variable in model (3') is the issue-level credit ratings by Moody's. The right-hand-side variables are the same as those in model (3), except that in addition to measures of the firm-level default risk, we also include issue-specific control variables: *Issue_size* and *Maturity*. *Issue_size* is computed as the logarithm of the issue amount in U.S. dollars. *Maturity* is issue maturity in years.

The estimation results of model (3') for voluntary adoption and control sample V1' (debt issues by firms in control sample V1) are reported in columns (1) and (2) of Table 6. Similar to our earlier discussion of firm-level credit ratings, our focus is on the triple interactive term, *Adopt* × *Post* × *Factor*. Its coefficient is positive and significant at the 1% level, suggesting that the voluntary adopters experience a greater increase in the sensitivity of credit ratings to the default factor post adoption than firms in the control sample. In column (2), we estimate a variation of model (3') by including additional controls for firms' decisions to adopt IFRS/U.S. GAAP—the number of analysts following and growth measured by the book-to-market ratio in year $t - 1$, and dummy variables for equity issuance, acquirers, targets, and spinoffs in the 3 years subsequent to adoption. After including these additional control variables, the coefficient on *Adopt* × *Post* × *Factor* remains positive and highly significant. The regression is estimated for voluntary adoption and control sample V2' (debt issues by firms in control sample V2) in column (3). Again, the coefficient on the triple interactive term, *Adopt* × *Post* × *Factor*, is positive and significant at the 1% level.

The results for mandatory adoption are reported in columns (4) and (5) of Table 6. The benchmark sample is M1' (debt issues by firms in control sample M1) in column (4) and M2' (debt issues by firms in control sample M2) in column (5). Consistent with the firm-level results, there is no strong evidence that mandatory adopters experience an increase in the relevance of the accounting default factor for credit ratings, with the coefficient on *Adopt* × *Post* × *Factor* being positive but insignificant at conventional levels.

Similar to our firm-level analysis, we also explore whether the strength of a country's legal environment affects the impact of IFRS/U.S. GAAP adoption. We estimate a variation of model (3') by allowing the association between *Rating* and *Factor* to vary with *Law*.

$$\begin{aligned}
 \text{Rating} - \text{IssueLevel}_{i,t} = & a_0 + a_1 \text{Factor}_{i,t} + a_1' \text{Factor}_{i,t} \\
 & \times \text{Law} + a_2 \text{PPE}_{i,t} + a_3 \text{Size}_{i,t} + a_4 \text{Post}_{i,t} + a_5 \text{Post}_{i,t} \\
 & \times \text{Factor}_{i,t} + a_5' \text{Post}_{i,t} \times \text{Factor}_{i,t} \times \text{Law} + a_6 \text{Post}_{i,t} \\
 & \times \text{PPE}_{i,t} + a_7 \text{Post}_{i,t} \times \text{Size}_{i,t} + a_8 \text{Adopt}_{i,t} \\
 & + a_9 \text{Adopt}_{i,t} \times \text{Factor}_{i,t} + a_9' \text{Adopt}_{i,t} \times \text{Factor}_{i,t} \times \text{Law} \\
 & + a_{10} \text{Adopt}_{i,t} \times \text{PPE}_{i,t} + a_{11} \text{Adopt}_{i,t} \times \text{Size}_{i,t} + a_{12} \text{Adopt}_{i,t} \\
 & \times \text{Post}_{i,t} + a_{13} \text{Adopt}_{i,t} \times \text{Post}_{i,t} \times \text{Factor}_{i,t} + a_{13}' \text{Adopt}_{i,t} \\
 & \times \text{Post}_{i,t} \times \text{Factor}_{i,t} \times \text{Law} + a_{14} \text{Adopt}_{i,t} \\
 & \times \text{Post}_{i,t} \times \text{PPE}_{i,t} + a_{15} \text{Adopt}_{i,t} \times \text{Post}_{i,t} \\
 & \times \text{Size}_{i,t} + a_{16} \text{US_Cross} + a_{17} \text{Issue_Size} + a_{18} \text{Maturity} \\
 & + \text{Country, year, industry fixed effects} + e_{i,t}.
 \end{aligned}
 \tag{4'}$$

Table 6. Debt Issue Level Analysis—Relevance of Accounting Information for Credit Rating. This table reports the estimation results of the following regression model and its variations,

$$\begin{aligned}
 \text{Rating} - \text{IssueLevel}_{i,t} = & a_0 + a_1 \text{Factor}_{i,t} + a_2 \text{PPE}_{i,t} + a_3 \text{Size}_{i,t} + a_4 \text{Post}_{i,t} + a_5 \text{Post}_{i,t} \times \text{Factor}_{i,t} + a_6 \text{Post}_{i,t} \times \text{PPE}_{i,t} \\
 & + a_7 \text{Post}_{i,t} \times \text{Size}_{i,t} + a_8 \text{Adopt}_{i,t} + a_9 \text{Adopt}_{i,t} \times \text{Factor}_{i,t} + a_{10} \text{Adopt}_{i,t} \times \text{PPE}_{i,t} + a_{11} \text{Adopt}_{i,t} \\
 & \times \text{Size}_{i,t} + a_{12} \text{Adopt}_{i,t} \times \text{Post}_{i,t} + a_{13} \text{Adopt}_{i,t} \times \text{Post}_{i,t} \times \text{Factor}_{i,t} + a_{14} \text{Adopt}_{i,t} \times \text{Post}_{i,t} \times \text{PPE}_{i,t} \\
 & + a_{15} \text{Adopt}_{i,t} \times \text{Post}_{i,t} \times \text{Size}_{i,t} + a_{16} \text{US_Cross} + a_{17} \text{Issue_Size} + a_{18} \text{Maturity} + \text{Country}_{i,t} + \text{Year}_{i,t} \\
 & + \text{industry fixed effects} + e_{i,t}.
 \end{aligned} \tag{3'}$$

Variables are defined in Appendix B. Coefficients on country, industry, and year fixed effects are suppressed. Standard errors are clustered by country and year. Columns (1)-(3) report the results for the voluntary adoption sample and control sample. The control sample is V1' in columns (1) and (2) and is V2' in column (3). The regressions in columns (2) and (3) include additional controls for potential self-selection in the voluntary adoption decision: analyst following, growth, and capital activities in the subsequent 3 years, including equity issuance, acquisitions, and spinoffs. Columns (4) and (5) report the results for the mandatory adoption sample and control sample. The control sample is M1' in column (4) and is M2' in column (5). The various control samples are described in Appendix B.

Column Prediction	Voluntary						Mandatory					
	(1)		(2)		(3)		(4)		(5)			
	Estimate	SE	Estimate	SE	Estimate	SE	Estimate	SE	Estimate	SE		
Factor	1.2816***	0.1494	1.4205***	0.1634	1.1522***	0.2482	1.1605***	0.1213	0.9468***	0.1691		
PPE	0.0052	0.0045	0.0058	0.0047	0.0076	0.0065	0.00779*	0.0047	0.0102	0.0066		
Size	0.9666***	0.0774	0.9263***	0.0873	0.8289***	0.1076	0.8771***	0.0895	0.7365***	0.1190		
Post	0.0349	1.4695	1.8026	1.6459	-1.6706	2.0758	2.7286	3.1002	4.7891*	2.7755		
Post × Factor	-0.0117	0.1725	-0.0917	0.1857	-0.0009	0.2742	-0.9334***	0.1762	-0.8034***	0.2834		
Post × PPE	-0.00479	0.0041	-0.0081	0.0052	-0.0009	0.0072	-0.0153**	0.0068	-0.0215**	0.0092		
Post × Size	0.0164	0.0844	-0.0863	0.095	0.1237	0.1181	-0.0273	0.1868	-0.1367	0.1719		
Adopt	-10.7363***	3.0793	-10.8987***	3.3431	-13.2356***	3.6833						
Adopt × Factor	-0.8673***	0.3189	-1.1260***	0.3551	-0.5151	0.4023	-0.2918*	0.1548	-0.0876	0.1979		
Adopt × PPE	0.0026	0.0095	0.0010	0.0114	0.0025	0.0116	0.0125**	0.0059	0.0192**	0.0075		

(continued)

Table 6. (continued)

Column Control sample Prediction	Voluntary						Mandatory			
	(1)		(2)		(3)		(4)		(5)	
	VI'	SE	VI'	SE	V2'	SE	MI'	SE	M2'	
Adopt × Size	0.6485***	0.1882	0.6739***	0.2049	0.8026***	0.2199	0.2433**	0.1046	0.4386***	0.1341
Adopt × Post	8.6041**	3.7986	5.2371	3.8905	9.0521**	4.1171	6.0467	3.7749	3.6193	3.5487
Adopt × Post × Factor	1.6064***	0.4436	1.8246***	0.4906	1.5186***	0.5513	0.4379	0.2719	0.2630	0.3593
Adopt × Post × PPE	-0.00641	0.0161	0.0035	0.0166	-0.0068	0.0165	-0.0203*	0.0106	-0.0112	0.0126
Adopt × Post × Size	-0.5311**	0.2187	-0.3434	0.2265	-0.5675**	0.2359	-0.4268*	0.2197	-0.3092	0.2089
US_Gross	-0.0829	0.1878	0.0081	0.1887	0.2004	0.2230	-0.0543	0.2099	0.2648	0.2088
Issue_Size	-0.0978*	0.0507	-0.0487	0.0530	-0.0211	0.0573	-0.0819*	0.0458	-0.0709	0.0464
Maturity	0.0260**	0.0109	0.0280***	0.0111	0.0258**	0.0111	0.0187*	0.0105	0.0109	0.0114
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Additional controls										
Number of observations		1,903		1,747		1,113			1,700	1,169
Pseudo R ²		.3299		.3422		.3665			.3440	.3632

^aVoluntary adoption sample only.

*, **, *** significantly different from zero at 10%, 5%, 1% level respectively, two-tailed test.

We first estimate model (4') for voluntary adopters using the two different control samples, V1' and V2'. In untabulated results, we find a positive and significant coefficient on $Adopt \times Post \times Factor$ while the coefficient on $Adopt \times Post \times Factor \times Law$ is insignificant.¹³ Thus, we find evidence of an increased association between the issue-level credit ratings and $Factor$ in both countries with strong rules of law and countries with weak rules of law.

We also estimate model (4') for mandatory adoption with the two benchmark samples, M1' and M2'. Here, we find an insignificant coefficient on $Adopt \times Post \times Factor$, while that on $Adopt \times Post \times Factor \times Law$ is positive and significant. This suggests that compared to mandatory adopters in weaker rule of law countries, those from countries with stronger rules of law experience an *incremental* increase in the credit relevance of accounting default factor post adoption. Untabulated test shows that the sum of the coefficients on $Adopt \times Post \times Factor$ and $Adopt \times Post \times Factor \times Law$ is significantly positive at a less than 5% level (two-sided test). Therefore, consistent with the firm-level analysis, these issue-level results also suggest a positive role of the rule of law in enhancing the credit relevance of the accounting default factor post-mandatory IFRS adoption, supporting our prediction.

Beaver et al. (2006) argue that bond yields likely capture all publicly available information about default risk. We therefore redo our issue-level analysis using the yield-to-maturity on a newly issued bond as an alternative to Moody's issue-level credit ratings.¹⁴ A *negative* association between yield-to-maturity and $Factor$ is expected because higher $Factor$ suggests lower default risk and thus lower yield. Untabulated results suggest that bond yield-to-maturity has a significantly stronger negative association with $Factor$ after voluntary adoption of IFRS/U.S. GAAP. However, this result is obtained without the inclusion of control firms. When compared to the control firms, the voluntary adopters do not experience significant changes in the sensitivity of yield-to-maturity to $Factor$ after adoption. On the other hand, mandatory adopters do not experience a significant change in the sensitivity of yield-to-maturity to $Factor$ after adoption, whether compared to the control firms or not.

Potential Externalities From Mandatory Adoption

Prior research suggests that mandatory IFRS adoption may generate positive externalities. For example, Daske et al. (2008) document that the voluntary adopters experience significant capital market benefits (greater liquidity and lower cost of equity capital) around the time of mandatory IFRS adoption in their home countries. If mandatory IFRS adoption makes accounting standards more comparable and potentially more useful to creditors, we may also observe an increase in the credit relevance of accounting information for the voluntary adopters when their home countries start to mandate IFRS reporting. To test this, we run the following ordered logit regression:

$$\begin{aligned}
 Rating_{i,t} = & a_0 + a_1Factor_{i,t} + a_2PPE_{i,t} + a_3Size_{i,t} + a_4Post_{i,t} \\
 & + a_5Post_{i,t} \times Mandate05_{i,t} + a_6Post_{i,t} \times Factor_{i,t} + a_7Post_{i,t} \\
 & \times Mandate05_{i,t} \times Factor_{i,t} + a_8Post_{i,t} \times NonMandate05_{i,t} \times Factor_{i,t} \\
 & + a_9Post_{i,t} \times PPE_{i,t} + a_{10}Post_{i,t} \times Size_{i,t} + a_{11}US_Cross + Country, \\
 & year, industry fixed effects + e_{i,t}.
 \end{aligned}$$

(5)

The sample includes all firm-years both pre- and post adoption for the voluntary adopters. Ratings are based on firm-level credit ratings. *Post* is equal to 1 for the post-voluntary adoption years and 0 for the pre-adoption years. *Mandate05* is a dummy variable that is set to 1 for the years of 2005, 2006, and 2007 for voluntary adopters domiciled in countries mandating IFRS, and 0 otherwise. *NonMandate05* is set to 1 for 2005, 2006, and 2007 for voluntary adopters in countries not yet requiring IFRS, and 0 otherwise. If mandatory IFRS adoption generates positive externalities, the coefficient on $Post \times Mandate05 \times Factor$ capturing the incremental sensitivity of ratings to the accounting-based default factor for voluntary adopters post-mandatory adoption is expected to be positive. Because this coefficient can also reflect a general change in rating practices post-2005, we compare it to changes in the sensitivity of ratings to the default factor for the voluntary adopters in countries not mandating IFRS—reflected by the coefficient on $Post \times Factor \times NonMandate05$. Specifically, if the coefficient on $Post \times Factor \times Mandate05$ is higher than that on $Post \times Factor \times NonMandate05$, it would be evidence consistent with mandatory IFRS adoption creating positive externalities.¹⁵

The estimation results of model (5) are reported in Table 7. We first estimate a variation of model (5) including only voluntary adopters in countries mandating IFRS. The results are reported in column (1). The coefficient on $Post \times Factor$ is positive (1.1026) and significant with a *p* value of 6.97%, indicating heightened sensitivity of credit ratings to *Factor* after the voluntary adoption. The coefficient on the triple interactive term $Post \times Factor \times Mandate05$, measuring potential externalities for voluntary adopters at the time of the mandatory adoption, is insignificantly different from zero at conventional levels. Model (5) is then estimated for all voluntary adopters with the results presented in column (2). The coefficient on $Post \times Factor$ is positive (0.9011) and significant with a *p* value of 0.33%, again suggesting that the sensitivity of *Rating* to *Factor* increases post-voluntary adoption. Both the coefficient on $Post \times Factor \times Mandate05$ and that on $Post \times Factor \times NonMandate05$ are negative and insignificant. The coefficient on $Post \times Factor \times NonMandate05$ is higher than that on $Post \times Factor \times Mandate05$, although the difference is insignificant, showing no support for the hypothesis that mandatory IFRS adoption creates positive externalities for the voluntary adopters. Finally, the regression is estimated with additional controls for the adoption decision—the number of analysts following and growth measured by the book-to-market ratio in year $t - 1$, and dummy variables for equity issuance, acquirers, targets, and spinoffs in the 3 years subsequent to adoption. The results are reported in column (3) of Table 7. The inferences are very similar to those from column (2). In sum, we do not find evidence that voluntary adopters experience positive externalities with respect to the credit relevance of accounting information after mandatory IFRS adoption.

Additional Robustness Tests

We have so far included both IFRS and U.S. GAAP as internationally recognized accounting standards in our voluntary adoption analysis. To determine whether the adoption of IFRS versus U.S. GAAP has differential effects, we estimate a variation of model (2) for the voluntary adoption sample, allowing the coefficients on the explanatory variables to vary across the IFRS and U.S. GAAP adopting firms. In untabulated results, we find that both samples experience significant increases in the sensitivity of credit ratings to the accounting factor. An *F* test cannot reject the null that the increases are the same across the two samples.

Table 7. Externalities From Mandatory Adoption.

This table reports the estimation results of the following regression:

$$\begin{aligned}
 Rating_{i,t} = & a_0 + a_1Factor_{i,t} + a_2PPE_{i,t} + a_3Size_{i,t} \\
 & + a_4Post_{i,t} + a_5Post_{i,t} \times Mandate05_{i,t} + a_6Post_{i,t} \times Factor_{i,t} + a_7Post_{i,t} \\
 & \times Mandate05_{i,t} \times Factor_{i,t} + a_8Post_{i,t} \times NonMandate05_{i,t} \times Factor_{i,t} \quad (5) \\
 & + a_9Post_{i,t} \times PPE_{i,t} + a_{10}Post_{i,t} \times Size_{i,t} + a_{11}US_Cross + Country, \\
 & year, industry fixed effects + e_{i,t}.
 \end{aligned}$$

Variables are defined in Appendix B. Coefficients on country, industry, and year fixed effects are suppressed. Standard errors are clustered by country and year.

The regression is first estimated for voluntary adopters in countries mandating IFRS in column (1). Voluntary adopters from all countries are included in column (2). The regression in column (3) is estimated for all voluntary adopters and includes additional controls for potential self-selection in the voluntary adoption decision: analyst following, growth, and capital activities in the subsequent 3 years, including equity issuance, acquisitions, and spinoffs.

	Prediction	(1)		(2)		(3)	
		Estimate	SE	Estimate	SE	Estimate	SE
<i>Factor</i>	+	1.5257***	0.5224	0.7931***	0.2753	1.1254***	0.3045
<i>PPE</i>	+	0.0696***	0.0099	0.0336***	0.0072	0.0345***	0.0089
<i>Size</i>	+	1.8783***	0.1587	1.6880***	0.1007	1.7597***	0.1251
<i>Post</i>		-1.5278	2.4994	-0.3533	1.5147	0.2833	2.1761
<i>Post</i> × <i>Mandate05</i>				0.1473	0.6986	0.2158	0.7777
<i>Post</i> × <i>Factor</i>	+	1.1026*	0.6079	0.9011***	0.3085	0.6357*	0.3270
<i>Post</i> × <i>Factor</i> × <i>Mandate05</i>		-0.8123	0.5014	-0.2576	0.3628	-0.1768	0.3795
<i>Post</i> × <i>Factor</i> × <i>NonMandate05</i>				-0.1117	0.4270	-0.1514	0.4293
<i>Post</i> × <i>PPE</i>		-0.0173	0.0111	0.0049	0.0085	-0.00075	0.0102
<i>Post</i> × <i>Size</i>		0.0989	0.1414	-0.0184	0.0843	-0.0364	0.1200
<i>US_Cross</i>		-1.5913**	0.6320	1.0547***	0.3044	1.4513	0.2932
<i>Country fixed effects</i>			Yes		Yes		Yes
<i>Year fixed effects</i>			Yes		Yes		Yes
<i>Industry fixed effects</i>			Yes		Yes		Yes
<i>Additional controls</i>							Yes
<i>Number of observations</i>			645		1,089		1,029
<i>Pseudo R²</i>			.5413		.4584		.4800

*, **, *** significantly different from zero at 10%, 5%, 1% level respectively, two-tailed test.

We have included an indicator variable *US_Cross* in the regression models to control for the potential effects of U.S. cross-listings. In untabulated analysis, we exclude U.S. cross-listing firms from our analysis and find that our inferences are unchanged whether we estimate the regression for the voluntary adoption sample itself or the voluntary adoption and the control samples (V1 for the population of control firms and V2 for the randomly selected control sample). Similarly, our inferences regarding the mandatory adoption sample are unaffected by excluding firms cross-listed in the U.S.

Finally, a recent study by Christensen, Hail, and Leuz (2012) finds that the EU-wide mandatory IFRS adoption around 2005 is concurrent with significant increases in enforcement and governance rules in five countries: Finland, Germany, the Netherlands, Norway, and the United Kingdom. Among these five countries, Finland, the Netherlands and Norway are classified in our study as countries having stronger rules of law. To assess whether our rule of law variable captures the enforcement effects in Christensen et al., we exclude Finland, the Netherlands and Norway from our analysis and our inferences remain unchanged.

Conclusion

Academic research on the adoption of internationally recognized accounting standards has focused largely on the equity market effects. Debtholders represent an important class of capital providers for most listed firms and they rely heavily on financial statement information. The understanding of the adoption of internationally recognized accounting standards cannot be complete without a careful study of the debt market effects.

We examine whether the adoption of internationally recognized accounting standards is associated with a greater sensitivity of credit ratings to accounting information. Our results suggest that voluntary adoption of IFRS/U.S. GAAP comes with significant increases in the sensitivity of credit ratings to the accounting default factor. On the other hand, mandatory adoption is associated with significant increases in the sensitivity of credit ratings to the accounting default factor only in countries with strong rules of law. We contribute to the literature by adding to the understanding of the adoption of internationally recognized accounting standards and its implications for the credit markets. We also contribute to the fast-growing literature on mandatory IFRS adoption by highlighting the importance of strong enforcement of accounting standards in this setting.

Appendix A

Summary of the Various Control Samples.

	Firm-level credit ratings analysis	Debt issue-level credit rating analysis
Voluntary adoption analysis		
V1	Firm-years from countries that have not mandated International Financial Reporting reporting and these firms report under the local GAAP throughout our sample period. The pre-adoption years of the mandatory adopters are also included as part of the benchmark sample.	V1' New debt issues of senior unsecured debt from firm-year observations in <u>V1</u> . If a firm issues multiple senior unsecured debt in a year, we randomly select one issue.
V2	Formed by randomly selecting, from control sample <u>V1</u> , 100 observations from countries with more than 100 observations and keep all observations from countries with fewer than 100 observations.	V2' New debt issues of senior unsecured debt from firm-year observations in <u>V2</u> . If a firm issues multiple senior unsecured debt in a year, we randomly select one issue.
Mandatory adoption analysis		
M1	Firm-years from countries that have not mandated International Financial Reporting reporting and these firms report under the local GAAP throughout our sample period.	M1' New debt issues of senior unsecured debt from firm-year observations in <u>M1</u> . If a firm issues multiple senior unsecured debt in a year, we randomly select one issue.
M2	Formed by randomly selecting, from control sample <u>M1</u> , 100 observations from countries with more than 100 observations and keep all observations from countries with fewer than 100 observations.	M2' New debt issues of senior unsecured debt from firm-year observations in <u>M2</u> . If a firm issues multiple senior unsecured debt in a year, we randomly select one issue.

Note. GAAP = Generally Accepted Accounting Principle.

Appendix B

Variable Definitions.

Variables	Definitions
<i>Rating</i>	<i>Rating</i> is set to 1 for Moody's ratings of B1 or below, 2 for Ba1, Ba2, or Ba3, 3 for Baal, Baa2, or Baa3, 4 for A1, A2, or A3, 5 for Aa1, Aa2, or Aa3, and 6 for a Moody's rating of Aaa.
<i>ROA</i>	Return on assets, EBITDA divided by total assets
<i>Leverage</i>	Long-term debt divided by total assets
<i>Coverage</i>	Interest coverage ratio, EBITDA divided by interest expense on debt
<i>PPE</i>	Net property, plant, and equipment over total assets
<i>Size</i>	Logarithm of total assets in U.S. dollars
<i>US_Cross</i>	Dummy variable equals 1 if a firm is cross-listed in the U.S. in the sample period and 0 otherwise.
<i>Post</i>	For International Financial Reporting Standards (IFRS)/U.S. GAAP adopters, <i>Post</i> is equal to 1 for the adoption year and subsequent years, and 0 for the pre-adoption years. For control firms in the voluntary adoption sample, <i>Post</i> is set to 1 for a randomly selected pseudo adoption year and subsequent years, and 0 for pre-adoption years. For control firms of the mandatory adoption sample, <i>Post</i> is equal to 1 for 2005-2007, and 0 before 2005.
<i>Factor</i>	A common factor extracted from <i>ROA</i> , <i>Leverage</i> , and <i>Coverage</i>
<i>Adopt</i>	Dummy variable equal to 1 for voluntary IFRS/U.S. GAAP adopters or mandatory IFRS adopters; 0 otherwise
<i>Issue_Size</i>	Logarithm of debt issue amount in U.S. dollars
<i>Maturity</i>	Maturity of debt in years
<i>Law</i>	Dummy variable equal to 1 if a firm is domiciled in a country with the rule of law index falling into the upper quartile of the sample, 0 otherwise
<i>Mandate05</i>	Dummy variable equal to 1 for 2005-2007 if a voluntary adopter is domiciled in a country mandating IFRS, and 0 otherwise
<i>NonMandate05</i>	Dummy variable equal to 1 for 2005-2007 if a voluntary adopter is domiciled in a country not mandating IFRS, and 0 otherwise

Note. GAAP = Generally Accepted Accounting Principle.

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Notes

1. Internationally recognized accounting standards refer to both International Financial Reporting Standards (IFRS) and U.S. Generally Accepted Accounting Principle (GAAP). The International Accounting Standards (IAS) were renamed to IFRS in 2001, we use IFRS and IAS interchangeably.
2. A recent study by Christensen, Lee, and Walker (2009) finds evidence consistent with IFRS adoption affecting the tightness of debt covenants in the United Kingdom.
3. Voluntary adopters refer to firms that voluntarily adopt either IFRS or U.S. GAAP. Mandatory adopters are firms that adopt IFRS due to regulatory mandate.
4. We exclude U.S. firms as they have been reporting under U.S. GAAP and thus do not allow us to examine the impact of a change in accounting standards. Also, as Daske, Hail, Leuz, and Verdi (2008) point out, including U.S. firms in the non-adopting benchmark sample can be problematic due to significant U.S. specific events, such as the passage of the Sarbanes-Oxley Act.
5. Moody's sets the firm-level estimated senior debt rating to be the actual senior unsecured debt rating when such a debt issue exists. When there is no such debt issue, the firm-level rating is estimated based on the other outstanding debts of the firm.
6. For the firm-level analysis of voluntary adoption, 345 observations are from firms voluntarily adopting IFRS and 538 observations from firms voluntarily adopting U.S. GAAP. As discussed later in section "Additional Robustness Tests," running the tests separately for the IFRS and the U.S. GAAP samples produces very similar inferences.
7. For example, Daske et al. (2008) and Horton, Serafeim, and Serafeim (2013) suggest that early adopters that voluntarily report under IFRS experience positive externalities around the time of mandatory adoption. We examine potential positive externalities associated with mandatory adoption in section "Additional Tests."
8. United Kingdom is unique among mandatory adopting countries in that U.K. firms were not allowed to voluntarily switch to IFRS prior to 2005. The paper's inferences regarding mandatory adoption are not affected if U.K. firms are excluded from the sample.
9. For example, Hung and Subramanyam (2007) report large increases in the book value of shareholders' equity under IFRS relative to German local standards due to the capitalization of intangibles including R&D costs as well as revaluations of property, plant, and equipment (*PPE*). Horton and Serafeim (2009) similarly find that non-amortization of goodwill increases IFRS book value relative to U.K. GAAP.
10. The rule of law variable (for year 2000) is obtained from Kaufmann, Kraay, and Mastruzzi (2004). It measures the extent to which agents have confidence in and abide by the rules of society. These include perceptions of the incidence of both violent and non-violent crimes, the effectiveness and predictability of the judiciary, and the enforceability of contracts. The main effect

of the rule of law variable is not included in model (4) because it is subsumed by the country dummies.

11. Coefficients in model (4) that capture the sensitivity of *Rating* to *Factor* and post-adoption changes in the sensitivity for adopters and control firms are summarized below:

	Rule of law	Pre-adoption	Post-adoption change	Incremental change relative to control
Control	Weak	Factor	Post \times Factor	
	Strong	Factor + Factor \times Law	Post \times Factor + Post \times Factor \times Law	
Adopters	Weak	Factor + Adopt \times Factor	Post \times Factor + Adopt \times Post \times Factor	Adopt \times Post \times Factor
		Factor + Factor \times Law + Adopt \times Factor + Adopt \times Factor \times Law	Post \times Factor + Post \times Factor \times Law + Adopt \times Post \times Factor + Adopt \times Post \times Factor \times Law	Adopt \times Post \times Factor + Adopt \times Post \times Factor \times Law
	Strong			

12. Moody's usually issues a credit rating soon (within 1 year) after a new debt issuance. We also find that for about 10% of the firm-year observations in our voluntary and mandatory adoption samples, the Moody's firm-level credit rating and issue-level credit rating are different.
13. To save space, the estimation results of model (4') are not reported. They are available upon request from the authors.
14. We estimate the bond yield-to-maturity based on the coupon rate, issue price, frequency of interest payment, and maturity from Moody's default risk database. Since Moody's default risk database is not intended for analyzing yield, the information on the parameters to estimate the yield-to-maturity is missing in many cases. Requiring these data reduces the sample of voluntary adopters by 35%. There are data errors in these items as well. For example, the issue price of many zero-coupon bonds was coded 100% of the coupon value, which is obviously incorrect. Although we exclude these observations for the yield analysis, we are not confident about the reliability of the issue price data in general. As a result, we do not focus on yield-to-maturity in our primary analysis.
15. Model (5) does not include a $Post_{i,t} \times NonMandate05_{i,t}$ term because it is a linear combination of $Post_{i,t} \times Mandate05_{i,t}$ and the year dummy variables.

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