Real Effects of Intangibles Capitalization

—Empirical Evidence from Voluntary IFRS Adoption in Japan—

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Abstract

This study examines how firms' behaviors are affected by the voluntary adoption of the International Financial Reporting Standards (IFRS) in Japan, which has expanded the scope for capitalization of intangibles compared with Japanese Generally Accepted Accounting Principles (JGAAP). Prior research suggests that capitalization of intangibles is preferred by firms with larger intangibles and enables them to further expand investment in intangibles. Using empirical data of Japanese IFRS adopters, this study analyzes the interrelationship between firms' intangible asset amount and their voluntary IFRS adoption. It finds that (1) the more intangibles the firms possess, the more likely they are to adopt IFRS, and (2) once a firm decides to adopt IFRS, it further increases its intangible investments, as expected based on past literature.

Keywords: Real effects, Intangibles, Capitalization, IFRS

1. Introduction

Undoubtedly the global economy has been and will be shifting its importance from tangible to intangible investments. Market capitalization ranking is now dominated by "GAFA" (Google, Apple, Facebook, and Amazon) instead of General Electric, Exxon Mobil, or Walmart from a few decades ago. More than 80% of the market value of S&P 500 comprises intangible assets today, compared with about 30% 30 years ago [1].

This drastic change in the economy has brought a question under debate: how should a firm measure and disclose its intangible assets? The traditional historical cost approach requires most intangible investments to be fully expensed in the year of expenditure instead of being recorded as assets on balance sheets because these investments are less certain to be realized and more challenging to measure than tangible investments. However, some regard this approach to be out of date and insist that intangibles should be capitalized so that balance sheets more accurately reflect firms' economic value.

While this discussion still continues, the International Accounting Standards Board (IASB) has expanded the scope for capitalization of intangibles. For example, a part of R&D investment is capitalized under International Financial Reporting Standards (IFRS) and goodwill is not regularly amortized to better reflect the underlying economic

[1] Annual Study of Intangible Asset Market Value from Ocean Tomo, LLC., March 5, 2015.

value under IFRS along with the United States Generally Accepted Accounting Principles (US GAAP). Prior literature has examined the consequences of these changes in intangible accounting, but there is no clear conclusion thus far as to their effectiveness.

Apart from extant literature, which focus on the effects of changes in accounting rules on the stock market (transparency, comparability, capital cost, etc.), this study analyzes the "real effects" of intangible capitalization: how firms alter their behaviors when intangibles are capitalized. If intangibles are recorded as assets instead of expenses, it increases earnings at least in the short term. Thus, managers may prefer such a change if a firm already has a large amount of intangibles; additionally, the firm may be more inclined towards intangible investments thereafter. In accordance with this intuitive prospect, some theoretical studies imply that capitalization of intangibles has favorable consequences if a firm has more intangibles and if it helps them increase further intangible investments.

To test this hypothesis, this study uses a unique situation in Japan, where voluntary adoption of IFRS was permitted in 2010. Compared with Japanese GAAP (JGAAP), IFRS allow firms to capitalize more of their intangible investments. This study observes the behaviors of IFRS adopters before and after adoption along with those of non-adopters as a control sample, and finds that (1) the more intangibles the firms possess, the more likely they are to adopt IFRS, and (2) once a firm decides to adopt IFRS, it further increases its intangible

investment, as expected based on prior literature.

The paper is organized as follows. Section 2 provides a theoretical overview of prior literature and develops the hypotheses to be tested in this study. The research design is explained in Section 3 and results are shown in Section 4. Finally, Section 5 concludes.

2. Theory and hypotheses

2.1. Intangibles capitalization versus historical cost approach

Some suggest that as the economy has shifted its importance from tangible to intangible investments, traditional financial statements have become less relevant (Lev 2001, 2008). Without capitalization of intangible investments, it is believed that balance sheets are undervalued and that it causes various adverse effects such as higher cost of capital, systematic undervaluation of intangible assets, and higher abnormal returns from insider trading. The proponents of this view insist that intangibles capitalization increases the usefulness of financial statements for investors.

On the other hand, some opponents of capitalization argue that investors can evaluate firms based on the information in the income statement instead of the balance sheet and, therefore, there is no need to capitalize intangibles (Penman 2007; Skinner 2008a, 2008b). They maintain that the measurement of intangibles as a component of the balance sheet is problematic and that regulators should leave it to private incentives to voluntarily disclose information related to

intangible investments.

Although this furious debate has not been settled, the scope for intangibles capitalization under IFRS has expanded. Various empirical researches examine the effects of IFRS adoption from different viewpoints including transparency, comparability, and cost of capital (ICAEW 2015). However, the results appear to be mixed and thus, no single conclusion has been drawn so far as to whether capitalization is sufficiently effective.

This study examines this issue from a different perspective compared to prior research, namely from the viewpoint of the "real effects" of intangible capitalization. How specific accounting items are measured and reported can significantly affect firms' real decisions because managers anticipate the stock market reaction (Kanodia 2006; Kanodia and Sapra 2016). Among this stream of literature, Kanodia et al. (2004) specifically analyze the real effects of intangible capitalization. They compare the capital stock levels when intangibles are expensed versus when they are capitalized. Their analysis shows that, when the relative weight of intangibles is sufficiently large, intangibles capitalization enables capital stock levels to reach closer to the first best than in the case of intangibles expensing. This implies that a firm with a larger weight of intangible assets prefers capitalization to expensing. Similarly, Lu and Sivaramakrishnan (2017) compare capitalization and expensing regimes and show that the investment level under expensing is lower

than that under capitalization. This matches the intuitive expectation that after the capitalization regime is introduced, the negative effects of intangible investments on short-term profit reduce and thus, managers would accelerate their intangible investments.

While these analytical studies appear to propose insightful hypotheses, no empirical tests have been conducted thus far. Some studies analyze the real effects of IFRS adoption (Schleicher et al. 2010; Chen et al. 2013; Biddle et al. 2016); however, these focus on macro-level consequences of such adoption and do not shed light on the effects of the changes in a specific accounting item's procedure on management decision-making at the micro-level, as assumed by the aforementioned "real effects" literature. Therefore, there is a research gap in terms of empirical tests for the hypotheses introduced in analytical literature.

2.2. IFRS versus Japanese GAAP

This study uses the unique situation in Japan to address this issue. In Japan, voluntary adoption of IFRS was permitted in 2010. It is noteworthy that IFRS and JGAAP have several differences in terms of intangibles accounting.

First, goodwill is regularly amortized within 20 years under JGAAP while IFRS only require annual impairment tests. Prior researches show that impairment recognition is delayed without regular amortization (Ramanna and Watts 2012; Li and Sloan 2017). This may

be partly because managers have greater discretion and partly because internally generated goodwill can replace acquired goodwill under the impairment-only approach. Therefore, more goodwill would remain capitalized under IFRS than JGAAP, at least in the short term.

Second, R&D expenditure is fully expensed under JGAAP. Software development and production costs, when related to research and development, should also be expensed when incurred (Ernst & Young ShinNihon 2011). On the other hand, the IFRS allow a firm to capitalize a part of its development cost "after technical and commercial feasibility of the asset for sale or use have been established" (IAS 38.57).

How do those differences impact the amount of intangible assets of IFRS adopters? In Japan, IFRS adopters are required to disclose two-year financial statements based on IFRS in the first year of adoption. As Figure 1 shows, a firm that first discloses IFRS financial statements at the end of year t+1 needs to share these both in year t and t+1 under IFRS. Thus, the financial statements for year t can be compared under JGAAP and IFRS. Table 1 shows the *IA* (Intangible assets deflated by total assets, see Panel A) and *ROA* (net profit deflated by beginning-year total assets, see Panel B) of IFRS adopters in year t under the two standards. The first row in each panel shows the *ALL* sample results, which includes 40 firms that voluntarily adopted IFRS in Japan by 2015. These are divided into the two categories of *Large IA* (row 2) and *Small IA* (row 3), based on whether

they are in the top or the bottom half of *IA* in year *t* under JGAAP. Considering the *ALL* sample results in the first row of each panel, *IA* increases by 1.0% point under IFRS while *ROA* is 3.3% points larger in IFRS than in JGAAP, roughly a third of which can be explained by intangibles capitalization. This analysis suggests that capitalization of intangibles by IFRS adoption can increase short-term profit and therefore, managers' real decision making can be affected by this change.

Next, the second and third rows of each panel, which show the results for the *Large IA* and *Small IA* subsamples, respectively, are analyzed. Panel A shows that under IFRS, the *IA* of the *Large IA* subsample increases by 1.6% points while that of the *Small IA* subsample increases by only 0.5% point. Thus, the more the intangibles that firms have under JGAAP, the more intangibles are capitalized when adopting IFRS. Similarly, Panel B shows that *ROA* of *Large IA* increases by 4.0% points under IFRS while that of *Small IA* increases by 2.5% points. Thus, those with more intangibles benefit more from capitalization in terms of profitability. This analysis suggests that firms with larger intangibles have greater incentives to adopt IFRS.

2.3. Hypotheses

The arguments proposed in the previous sections lead to two hypotheses to be tested. First, IFRS adoption by Japanese firms

expands the scope for capitalization of intangibles and enlarges their short-term profits. Therefore, as Kanodia et al. (2004) imply, this change is more preferable for a firm with a larger amount of intangibles. As IFRS adoption is voluntary in Japan, such firms should have more incentives to adopt IFRS. This argument is supported by the evidence presented in section 2.2 whereby firms with more intangibles capitalize more intangibles and thus, increase profitability when adopting IFRS. Therefore, the following hypothesis is to be tested.

H1: The more intangibles a firm has, the more likely it is to adopt IFRS.

Next, after adopting IFRS, a firm can accelerate its investments in intangibles because the downward pressure of expensing on short-term profit reduces significantly. That is, as Lu and Sivaramakrishnan (2017) suggest, a firm can increase its intangible investments when intangibles are capitalized. This prediction is consistent with a stream of literature about R&D expenditure (Cooper and Selto 1991; Seybert 2010) which suggests that a firm invests more on R&D when it is capitalized than when it is expensed as managers aim to meet current performance benchmarks.

Additionally, there is anecdotal evidence in Japan to support this argument. Specifically, Softbank Group, one of the largest telecom firms in Japan adopted IFRS in fiscal year 2013. As this firm has

grown through many large acquisitions, it recorded 0.7 trillion Yen of goodwill in fiscal year 2012. After IFRS adoption, however, this amount further increased rapidly reaching 4.2 trillion Yen in fiscal year 2016 owing to several new acquisitions. In the FY 2013 annual report, Ms. Kazuko Kimiwada, an Executive Officer, mentioned, "As we do not have to amortize goodwill under IFRS, we do not hesitate about M&A anymore." This supports the argument above that capitalization of intangibles after IFRS adoption can significantly accelerate managers' real actions concerning intangible investments. Therefore, the following hypothesis is constructed.

H2: Once a firm decides to adopt IFRS, it further increases its intangible investment.

3. Research design

3.1. Logit model for IFRS adoption

To test H1, this study builds a logit model to predict the likelihood of IFRS adoption.

$$ADOPTION_{i,t} = Logit(\beta_0 + \beta_1 IA_{i,t-5} + \beta_2 RD_{i,t-5} + \beta_3 FS_{i,t-5} + \beta_4 SIZE_{i,t-5} + \beta_5 AGE_{i,t-5} + Industry\_dummy + Year\_dummy)$$

ADOPTION = A dummy variable which takes a value of 1 for IFRS adopters, and 0 otherwise

IA = Intangible assets/Total assets

RD = R&D expenses/Sales

FS = Foreign sales ratio

SIZE = Log (Total assets)

AGE = Log (Firm age)

The dependent variable is measured in year *t* (IFRS transition year) and the independent variables are considered to be relevant incentives to adopt IFRS in year *t*-5. Transition to IFRS takes approximately four years on average (Financial Services Agency 2015); thus, the adoption decision may have been taken around year *t*-4. Therefore, the independent variables are based on year *t*-5 to reflect the state before the adoption related decision-making.

Among these, the variables of interest are *IA* and *RD*. *IA* includes goodwill, software, and other minor intangibles (e.g., trademarks, patents, and leases). Since R&D investments are fully expensed under JGAAP in year *t*-5, capitalized R&D is not included in *IA*. Thus, the model also incorporates *RD*. In accordance with H1, the larger are the *IA* and *RD*, the more likely is the firm to adopt IFRS. Thus, the coefficients of *IA* and *RD* are expected to be positive.

The rest of the independent variables are included for the following reasons. *FS* is included because firms with a high ratio of foreign sales would prefer IFRS due to their need to unify standards with their subsidiaries (Dumonitier and Raffournier 1998). *SIZE* is included due

to a scale merit that holds in terms of IFRS adoption given its fixed costs of adoption (Dumonitier and Raffournier 1998). *AGE* is based on the assumption that younger firms have greater financing needs and thus, are more likely to adopt IFRS to reach a wide range of investors (Andre et al. 2012).

3.2. Propensity score matching (PSM)

To test H2, the intangible assets of IFRS adopters are to be compared before and after adoption. As IFRS adoption in Japan is voluntary, there is a problem of self-selection (De George et al. 2016). To alleviate this bias, this study uses propensity score matching whereby each IFRS adopter is to be matched with a non-adopter (JGAAP adopter) based on the propensity of IFRS adoption. In doing so, the treatment group (i.e., IFRS adopters) is compared with the control group (i.e., non-adopters) in terms of the effect of treatment (i.e., IFRS adoption).

Propensity scores are calculated based on the IFRS adoption logit model. Based on this score, each IFRS adopter is matched with one non-adopter, with no single sample unit being matched more than once [2].

[2] This method (one-to-one matching without replacement) is common in accounting literature (Shipman et al. 2017).

3.3. Difference in differences (DID)

Finally, intangible investments are compared between pairs of IFRS adopters and non-adopters before and after IFRS adoption based on the model below.

$$IA = \beta_0 + \beta_1 POST + \beta_2 ADOPTION + \beta_3 (POST * ADOPTION) + \beta_4 BTM + \beta_5 LEV + \beta_6 SIZE + Year\ dummy + Industry\ dummy$$

IA = Intangible assets/Total assets

POST = A dummy variable that is equal to 1 after IFRS adoption, and 0 otherwise

ADOPTION = A dummy variable which takes a value of 1 for IFRS adopters, and 0 otherwise

*POST * ADOPTION* = Interaction term

BTM = Book-to-market ratio

LEV = Total debt/Total assets

SIZE = Log (Total assets)

The pre-adoption (*POST* = 0) sample is as of year *t*-5 and post-adoption *(POST* = 1) is as of year *t*+1, as decision-making regarding adoption would usually occur around year *t*-4 with subsequent transition in year *t*. The variable of interest is the interaction term, *POST * ADOPTION*. The sign of the coefficient β_3 is expected to be positive, which would suggest that the intangible assets of IFRS

adopters increases after adoption, compared with that of non-adopters.

3.4. Sample

Japanese firms could adopt IFRS voluntarily in 2010. The sample for the IFRS adoption logit model includes all firms listed in Japan, covering from 2010 to 2015. Firms with unavailable data, firms in the financial services industry, and firms that adopt US GAAP are excluded. Based on these criteria, 14,809 firm-year samples are collected from the Nikkei NEEDS Financial Quest database. These include 40 IFRS adopters [3], which are matched with 40 non-adopters based on the logit model. These 40 pairs are compared in terms of the changes in the amount of intangible assets based on the DID model.

4. Results

4.1. Logit model for IFRS adoption

Table 2 reports the descriptive statistics of the sample for the logit model. For both variables of interest, *IA* and *RD*, the mean is much larger than the corresponding median, specifically close to the 75th percentile, indicating that only a small group of firms are characterized by high intangibles or R&D expenses. Next, Table 3 presents the Pearson correlations between the independent variables. The results show that there is no strong correlation that would

[3] IFRS adopters' firm-years where they have already adopted/ are going to adopt IFRS are excluded, so IFRS adopters are included only once exactly when they adopt IFRS.

otherwise have implied multicollinearity. Then, Table 4 reports the results of the logit model. The coefficients of *IA* and *RD* are positive and significant as expected, thereby supporting H1.

4.2. Propensity score matching (PSM)

The propensity scores are calculated based on the logit model and enable each IFRS adopter to be matched with the non-adopter that has the closest propensity of IFRS adoption. As 40 IFRS adopters are included in the 14,809 firm-year samples for the logit model, 40 pairs of IFRS adopters and non-adopters are formed. Table 5 shows the results of the balanced property test of the matched samples. In every variable of the logit model, there is no significant difference between adopters and non-adopters, confirming that these matched pairs are well balanced and appropriate for DID comparisons.

4.3. Difference in differences (DID)

Figure 2 shows the differences in *IA* of matched IFRS adopters and non-adopters. Adopters see a continuous increase in *IA* from year t-5 to t+4, while the *IA* of non-adopters remains constant. This change in *IA* of adopters can be attributed to three effects:

(1) One-time accounting effect: At the initial year of IFRS disclosure (year t), retroactive adjustments should be made for

some of the past investments [4]. That is, a portion of the past investments expensed under JGAAP are capitalized ex post facto in year *t*, which increases *IA* as a one-time effect. If this is a dominant cause, however, *IA* should increase only in year *t*, while Figure 2 reflects a rather continuous increase.

(2) Continuous accounting effect: After year *t*, goodwill is no longer amortized while a part of development costs is capitalized. Therefore, *IA* should increase faster than in the pre-adoption period even if firms continue their operations in exactly the same manner. However, Figure 2 does not show significant difference in the speed of increase in *IA* before and after year *t*, implying that this effect is not a major factor explaining the increase.

(3) Continuous real effect: The remainder of the change can be attributed to a real effect, which is as assumed in H2. As explained, the decision-making regarding adoption would be made around year *t*-4. The real effect can occur after *t*-4 even though IFRS disclosure actually begins in year *t*. For example, assume that an IFRS adopter acquires another firm in year *t*-3 and records goodwill. Under JGAAP, goodwill is amortized within 20 years; hence, this firm should record amortization expense until year *t*-1, but no amortization is required beyond year *t*. That is, the negative impacts of amortization on earnings

[4] There are some exemptions for retroactive adjustments; hence, not all past investments are adjusted.

are limited only to a couple of years. Therefore, IFRS adopters may increase intangible investments as soon as they decide to adopt IFRS. However, this is mainly true of goodwill and not of development costs, which are expensed in the year in which they are incurred and thus, do not benefit from IFRS adoption unless they are retroactively adjusted in year *t*. Figure 3 shows the breakdown of adopters' *IA*. Goodwill increases even before year *t* while other intangibles increase mainly after year *t*, consistent with the arguments above.

Next, to conduct a DID analysis, data are extracted from year *t*-5 to represent the pre-adoption period, and from year *t*+1 as the post-adoption period, for the 40 pairs of IFRS adopters and non-adopters, yielding 160 firm-year observations in total (Table 6). Table 7 reports the descriptive statistics. The mean values of *IA* and *SIZE* are much higher than those of the all samples for the logit model (Table 2), suggesting the matched IFRS adopters and non-adopters are much larger firms with more intangibles than average firms. Table 8 presents the Pearson correlations of the variables used in the DID model. There is no strong correlation to suggest multicollinearity. Finally, Table 9 reports the results of the DID model. The sign of the interaction term, *POST * ADOPTION*, is positive and significant as expected. In other words, *IA* of IFRS adopters increases after adoption compared with that of non-adopters, thereby supporting H2.

4.4. Robustness test

(1) Changes in real actions following adoption

As argued in section 4.3, the increased intangibles of IFRS adopters can be considered to have been caused not by mere accounting effects, but by changes in real actions. To prove this point, the changes in real actions following adoption are analyzed. Since a majority of the intangibles of IFRS adopters comprise goodwill, the real action most related to the increase in intangibles would be mergers and acquisitions (M&A). If the increase in intangibles is related to changes in real actions, the volume and value of M&A made by IFRS adopters should increase after adoption.

M&A transaction data were collected from Thomson One database for the sample of 160 firm-years for the DID model. Figure 4 shows the average number of M&A transactions made by an IFRS adopter and non-adopter per year in both the pre-adoption (year t-5) and post-adoption (year t+1) periods. As observed, the transaction volume for IFRS adopters increased by 0.15 while that for non-adopters decreased by 0.3. The difference of these two differences yields a slightly insignificant DID of 0.45. The drop in the non-adopters' transaction volume can be attributed to a macroeconomic condition. M&A activities in Japan decreased for a few years following the financial crisis in 2008. As IFRS adoption was permitted in 2010, M&A transactions in the post-adoption period can be affected by this

downward trend. However, the figure shows that the transaction volume for IFRS adopters increased despite facing the same conditions as the non-adopters.

This tendency is much clearer in Figure 5, which presents the average M&A transaction values scaled by beginning-year total assets of an acquiring firm for the sample of 47 firm-years of IFRS adopters and non-adopters that made transactions with deal values available in each period. Relative transaction value increased by 4.7% point for IFRS adopters post adoption while that for non-adopters decreased by 2.7% point, yielding a significant 7.3% point DID.

These analyses suggest that the real actions of IFRS adopters changed following adoption as they were more actively engaged in M&A activities, especially in terms of relative transaction values. This indicates that IFRS adopters conducted relatively larger deals after adoption, leading to more intangibles, especially goodwill, being recorded in the post-adoption period. Therefore, the changes in intangibles of IFRS adopters can be considered a result of changes in their real actions, and not only the result of accounting rules.

(2) More recent sample

The DID analysis in Section 3.2 is based on a rather small sample size. One reason is that the sample collection period was only up to 2015. Including more recent periods would increase the sample size while shortening the observable period after IFRS adoption. That is,

there is a trade-off between sample size and observation periods. In this section, DID analyses are conducted based on more recent samples. The resulting observation periods include data until 2016, 2017, and 2018, yielding 54, 80, and 105 matched pairs, respectively. Figures 6, 7, and 8 show the changes in *IA* for each of these sets of matched pairs. It can be observed that all figures basically reflect the same results as the 40 matched pairs used in the main analysis shown in Figure 2. Table 10 presents the results for the DID model based on these samples. Columns (1), (2), and (3) show the results for the 54, 80, and 105 matched pairs, yielding 216, 320, and 420 firm-years, respectively [5]. All the three models have similar results to that of the main analysis in Table 9, that is, the coefficients for *(Post * Adoption)* are positive and significant, indicating that the IFRS adopters' intangibles increased after adoption compared with the matched non-adopters. These analyses show that the results in the main analysis are robust when using more recent and larger samples.

(3) Observation period relative to adoption

Next, the sample observation periods using both the logit model and DID model were changed to ensure that the results are not affected by any year specific effects. For the IFRS adoption logit model, the period is changed from *t*-5 to *t*-6 and *t*-7, both of which yield basically

[5] As the sample includes firm-years before and after IFRS adoption for matched pairs (adopters and non-adopters), the total N is four times the number of matched pairs.

the same results as the original model (Table 11). Similarly, for the DID model, the pre-adoption period is changed from t-5 to t-6 and t-7, and for post-adoption from t+1 to t+2 and t+3; each of these generally report the same results (Table 12) as the original model.

(4) One-to-many matching

Finally, the robustness of the PSM method is tested. The main analysis uses one-to-one matching, which is reexamined here based on one-to-many matching, that is, one IFRS adopter is matched with several non-adopters. One-to-many matching has a trade-off in that it increases power with a larger sample size than one-to-one matching, while reducing matching quality (Shipman et al. 2017). This study conducts one-to-two and one-to-three matching instead of one-to-one. The resulting re-matched samples are used for the same DID analysis and yield basically the same results (Table 13), thereby confirming the robustness of the approach.

5. Conclusion

This study examines how firms' behaviors are affected by voluntary adoption of IFRS in Japan, which has expanded the scope for capitalization of intangibles compared with JGAAP. Some analytical works in the literature suggest that capitalization of intangibles is preferred by firms with larger intangibles and additionally, it helps them further expand intangible investment.

Using empirical data of Japanese IFRS adopters, this study analyzes the interrelationship between firms' amount of intangible assets and their voluntary IFRS adoption. The IFRS adoption logit model shows that the more intangibles the firm possesses, the more likely it is to adopt IFRS. Next, based on PSM and DID analyses, this study shows that once firms decide to adopt IFRS, they further increase their intangible investment, as expected based on prior literature. These results are time invariant and robust to the method of matching.

This study contributes to the literature by providing empirical evidence related to past analytical works in order to fill the existing research gap. It also contributes to accounting standards setting practice by suggesting that accounting procedures of intangible assets can affect firms' real decision-making.

Nonetheless, there are several limitations of this study. First, the sample size is small because voluntary IFRS adoption in Japan is not yet dominant. The number of IFRS adopters is increasing every year; hence, the analyses should be revisited in the future with a larger sample size. In addition, this study implies an increase in intangible investments after IFRS adoption, but does not analyze whether the increased investments are effective. This point may be explored in future studies.

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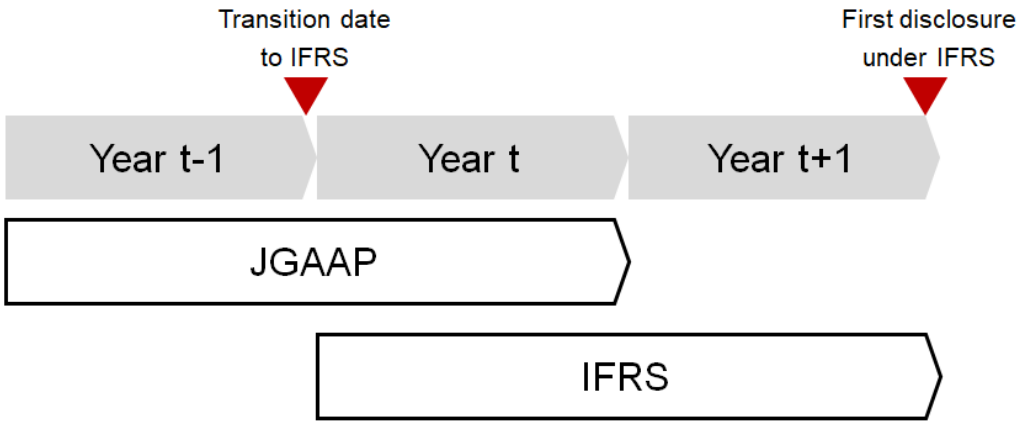
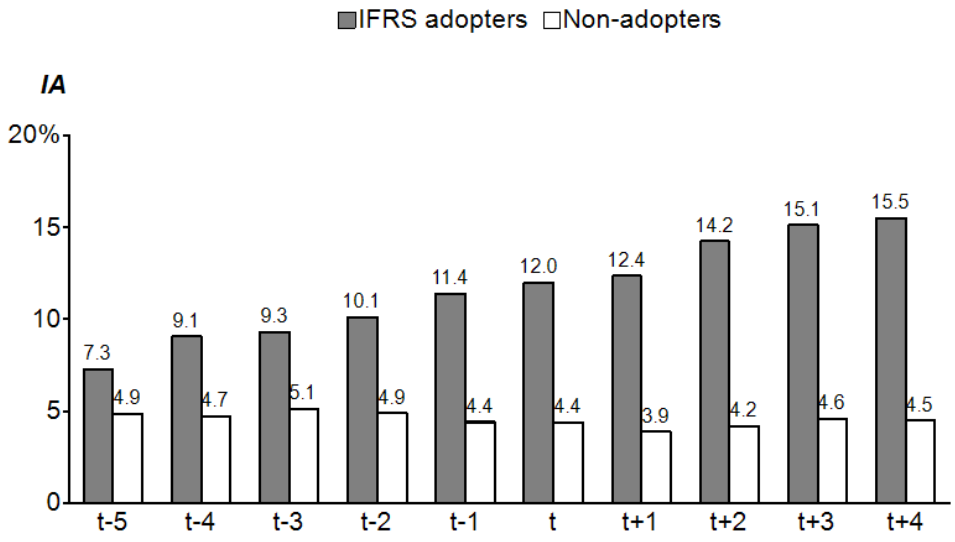
Figures and tables

Figure 1: Disclosure period when adopting IFRS



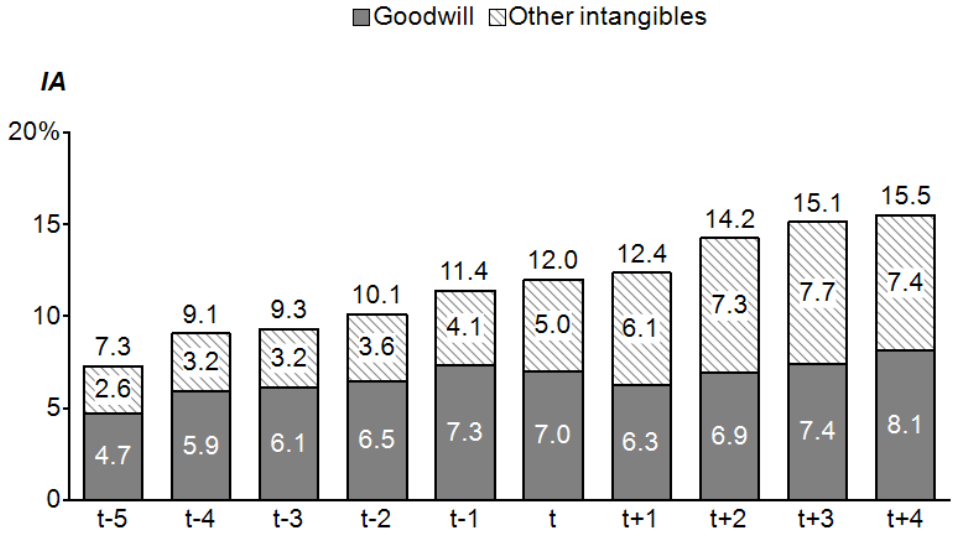
At the end of year t-1 and year t, financial statements are disclosed under JGAAP only. At the end of year t+1, balance sheet of the beginning of year t (transition date) is made under IFRS and financial statements under IFRS for two periods are disclosed at the same time.

Figure 2: Changes in intangible assets



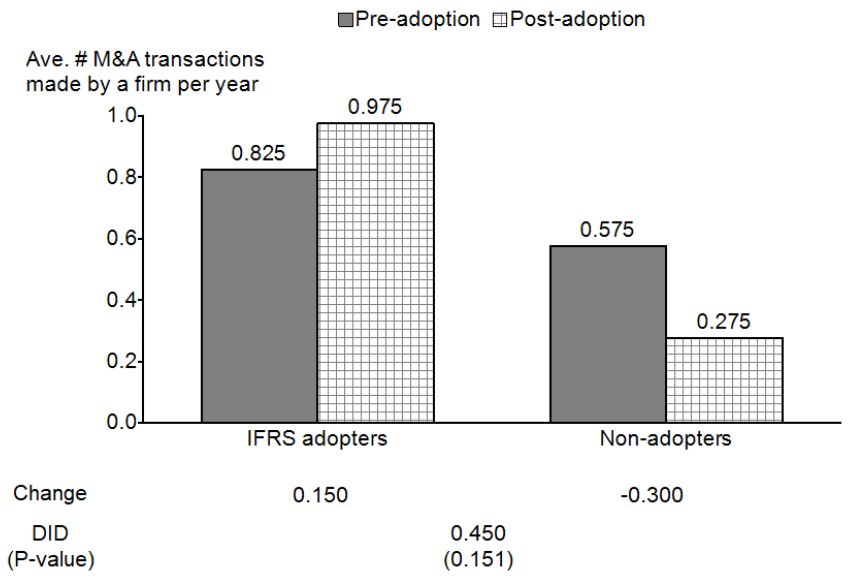
This table presents mean value of *IA* (intangible assets deflated by total assets) for the sample of 40 matched pairs of IFRS adopters and non-adopters.
The numbers for IFRS adopters are those of JGAAP until year t-1 while IFRS after t

Figure 3: IFRS adopters' intangibles breakdown



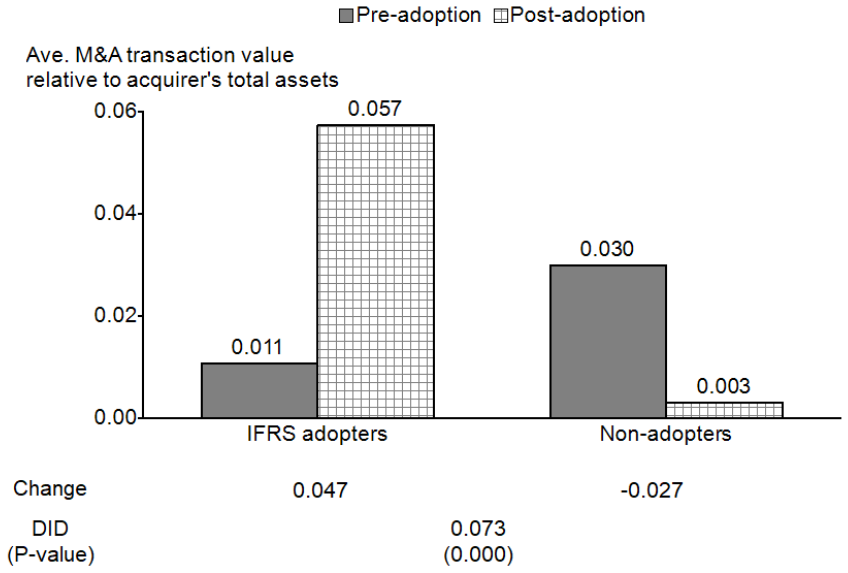
This table presents mean value of *IA* (intangible assets deflated by total assets) for the sample of 40 IFRS adopters.
The numbers for IFRS adopters are those of JGAAP until year t-1 while IFRS after t

Figure 4: Robustness test (1) – Changes in M&A transaction volume



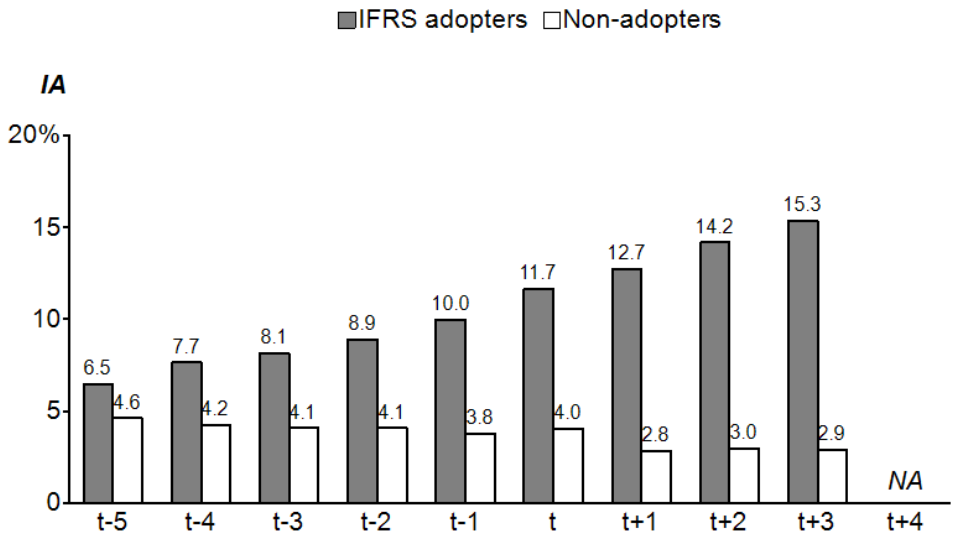
This figure presents average number of M&A transactions made by an IFRS adopter and non-adopter per year for the sample of 160 firm-year for the DID model. Pre-adoption period is year t-5 and Post-adoption is t+1.

Figure 5: Robustness test (1) – Changes in M&A transaction value



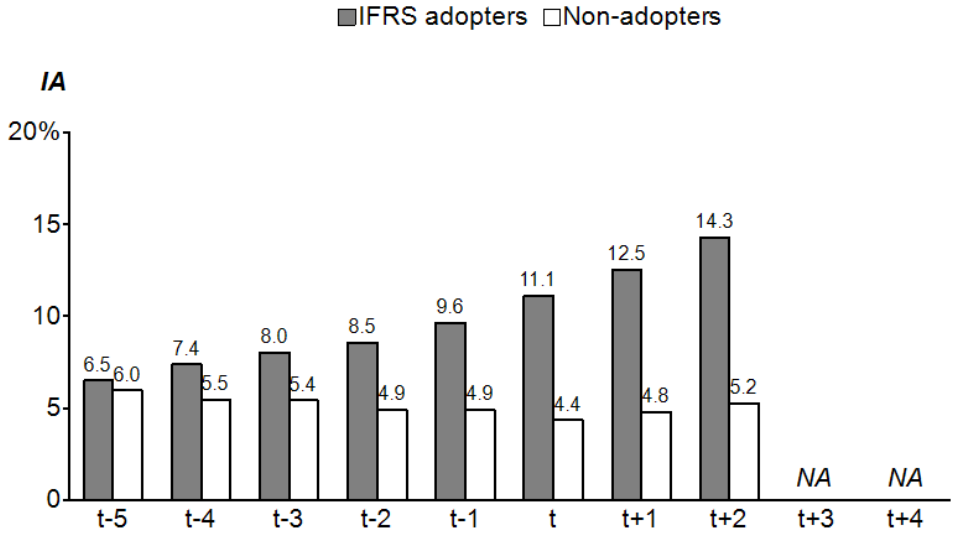
This figure presents average M&A transaction value scaled by beginning-year total assets of an acquiring firm for the sample of 47 firm-year of IFRS adopters and non-adopters that made transactions with deal value available in each period. Pre-adoption period is year t-5 and Post-adoption is t+1.

Figure 6: Robustness test (2) – More recent sample (54 matched pairs)



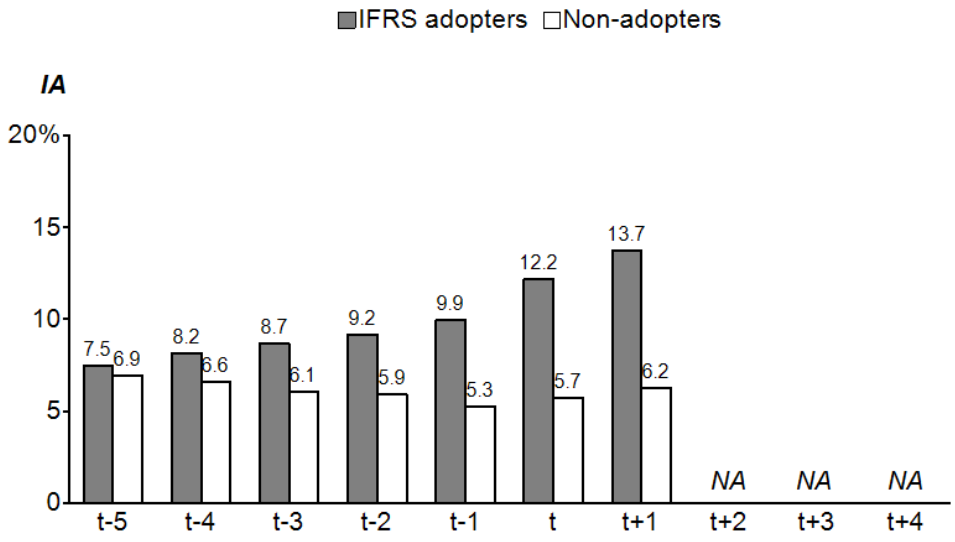
This table presents mean value of *IA* (intangible assets deflated by total assets) for the sample of 54 matched pairs of IFRS adopters and non-adopters.
The numbers for IFRS adopters are those of JGAAP until year t-1 while IFRS after t

Figure 7: Robustness test (2) – More recent sample (80 matched pairs)



This table presents mean value of *IA* (intangible assets deflated by total assets) for the sample of 80 matched pairs of IFRS adopters and non-adopters.
The numbers for IFRS adopters are those of JGAAP until year t-1 while IFRS after t

Figure 8: Robustness test (2) – More recent sample (105 matched pairs)



This table presents mean value of *IA* (intangible assets deflated by total assets) for the sample of 105 matched pairs of IFRS adopters and non-adopters.
The numbers for IFRS adopters are those of JGAAP until year t-1 while IFRS after t

Table 1: Intangibles and ROA in year t under JGAAP and IFRS

Panel A: *IA* (Intangible assets deflated by total assets)

Sample	N	JGAAP (1)	IFRS (2)	Difference (2) – (1)
All	40	0.109	0.120	0.010
Large IA	20	0.203	0.218	0.016
Small IA	20	0.016	0.021	0.005

Panel B: *ROA* (net profit deflated by beginning-year total assets)

Sample	N	JGAAP (1)	IFRS (2)	Difference (2) – (1)
All	40	0.052	0.084	0.033
Large IA	20	0.061	0.101	0.040
Small IA	20	0.042	0.068	0.025

This table presents mean value of IFRS adopters' *IA* and *ROA* in year t (transition to IFRS) both under JGAAP and IFRS. The first row in each panel shows the *ALL* sample results, which includes 40 firms that voluntarily adopted IFRS in Japan by 2015. These are divided into the two categories of *Large IA* (row 2) and *Small IA* (row 3), based on whether they are in the top or the bottom half of *IA* in year t under JGAAP .

Table 2: Descriptive statistics for the logit model

	Mean	St. Dev.	Min	25%	50%	75%	Max
IA	0.019	0.041	0.000	0.003	0.007	0.018	0.677
RD	0.017	0.080	0.000	0.000	0.003	0.019	5.484
FS	0.111	0.192	0.000	0.000	0.000	0.162	1.000
SIZE	10.363	1.531	4.682	9.321	10.244	11.265	16.447
AGE	3.735	0.637	0.693	3.466	3.951	4.127	4.844

This table presents descriptive statistics for the sample of 14,809 firm-years for the logit model *IA* = Intangible assets / Total assets; *RD* = R&D expenses / Sales; *FS* = Foreign sales ratio; *SIZE* = Log (Total assets); *AGE* = Log (Firm age)

Table 3: Pearson correlations for the logit model

	IA	*RD*	*FS*	*SIZE*
RD	0.089			
FS	-0.012	0.122		
SIZE	-0.106	-0.031	0.268	
AGE	-0.318	-0.078	0.175	0.457

This table presents Pearson correlations for the sample of 14,809 firm-years for the logit model *IA* = Intangible assets / Total assets; *RD* = R&D expenses / Sales; *FS* = Foreign sales ratio; *SIZE* = Log (Total assets); *AGE* = Log (Firm age)

Table 4: Logit model for IFRS adoption

IA	6.858*** (2.175)
RD	0.315** (0.128)
FS	2.162*** (0.631)
SIZE	0.964*** (0.254)
AGE	-0.501*** (0.114)
Intercept	-33.248*** (3.419)
Year FE	Yes
Industry FE	Yes
N	14,809
Nagelkerke R-square	0.405

Dependent variable: *ADOPTION* = A dummy variable which takes a value of 1 for IFRS adopters, and 0 otherwise; Year-clustered standard errors are in parenthesis
***, **, and *, indicate statistical significance at the 1%, 5%, and 10% levels, respectively

Table 5: Balanced property test

	Adopters	Non-Adopters	Difference	P-value
IA	0.073	0.049	0.024	0.332
RD	0.190	0.040	0.151	0.276
FS	0.352	0.405	-0.052	0.433
SIZE	12.735	12.978	-0.242	0.490
AGE	3.804	3.988	-0.183	0.184
PS	0.148	0.125	0.022	0.632
N	40	40	-	-

This table presents mean value of the variables in the logit model for the 40 matched pairs and difference of those values between IFRS adopters and non-adopters.
PS = propensity score calculated by the logit model.

Table 6: Sample distribution for DID model

	Pre-adoption (Year t-5)	Post-adoption (Year t+1)	Total
Adopter	40	40	80
Non-adopter	40	40	80
Total	80	80	160

Table 7: Descriptive statistics for the DID model

	Mean	St. Dev.	Min	25%	50%	75%	Max
IA	0.071	0.112	0.000	0.008	0.022	0.074	0.677
BTM	0.944	0.713	0.056	0.458	0.753	1.226	4.128
LEV	0.480	0.215	0.016	0.302	0.496	0.649	0.977
SIZE	13.024	1.544	9.437	12.023	13.094	13.964	16.651

This table presents descriptive statistics for the sample of 160 firm-year for the DID model
IA = Intangible assets / Total assets; *BTM* = Book-to-market ratio
LEV = Total debt / Total assets; *SIZE* = Log (Total assets)

Table 8: Pearson correlations for the DID model

	IA	*BTM*	*LEV*
BTM	-0.221		
LEV	0.021	0.075	
SIZE	0.002	-0.213	0.304

This table presents descriptive statistics for the sample of 160 firm-year for the DID model
IA = Intangible assets / Total assets; *BTM* = Book-to-market ratio
LEV = Total debt / Total assets; *SIZE* = Log (Total assets)

Table 9: DID model for changes in intangibles

*(POST*ADOPTION)*	0.062** (0.020)
POST	0.007 (0.021)
ADOPTION	-0.003 (0.012)
BTM	-0.010 (0.007)
LEV	0.146*** (0.035)
SIZE	-0.010 (0.008)
Intercept	0.082 (0.047)
Year FE	Yes
Industry FE	Yes
N	160
Adjusted R-square	0.270

Year-clustered standard errors are in parenthesis

***, **, and *, indicate statistical significance at the 1%, 5%, and 10% levels, respectively

POST = A dummy variable that is equal to 1 after IFRS adoption, and 0 otherwise

ADOPTION = A dummy variable which takes a value of 1 for IFRS adopters, and 0 otherwise

*POST * ADOPTION* = Interaction term

Table 10: Robustness test (2) – More recent sample

	(1)	(2)	(3)
*(POST*ADOPTION)*	0.074***	0.072***	0.066***
	(0.018)	(0.022)	(0.017)
POST	-0.095***	-0.075*	-0.025
	(0.017)	(0.042)	(0.019)
ADOPTION	0.017	0.000	0.015
	(0.011)	(0.018)	(0.013)
BTM	-0.005	-0.010	-0.028***
	(0.009)	(0.006)	(0.005)
LEV	0.071*	0.108***	0.064*
	(0.033)	(0.022)	(0.034)
SIZE	-0.002	-0.003	0.000
	(0.004)	(0.004)	(0.007)
Intercept	-0.053	0.025	-0.014
	(0.057)	(0.070)	(0.079)
Year FE	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes
N	216	320	420
Adjusted R-square	0.321	0.256	0.239

Year-clustered standard errors are in parenthesis

***, **, and *, indicate statistical significance at the 1%, 5%, and 10% levels, respectively

POST = A dummy variable that is equal to 1 after IFRS adoption, and 0 otherwise

ADOPTION = A dummy variable which takes a value of 1 for IFRS adopters, and 0 otherwise

*POST * ADOPTION* = Interaction term

Table 11: Robustness test (3) – Observation period (logit model)

	Period of independent variables	
	t-6	t-7
IA	7.051*** (2.160)	5.284*** (1.934)
RD	0.394** (0.181)	0.327** (0.159)
FS	2.131*** (0.555)	2.096*** (0.532)
SIZE	0.954*** (0.258)	0.935*** (0.276)
AGE	-0.451*** (0.105)	-0.555*** (0.154)
Intercept	-33.413*** (1.861)	-32.790*** (3.322)
Year FE	Yes	Yes
Industry FE	Yes	Yes
N	14,378	13,836
Nagelkerke R-square	0.397	0.383

Dependent variable: *ADOPTION* = A dummy variable which takes a value of 1 for IFRS adopters, and 0 otherwise; Year-clustered standard errors are in parenthesis
***, **, and *, indicate statistical significance at the 1%, 5%, and 10% levels, respectively

Table 12: Robustness test (3) – Observation period (DID model)

Pre-adoption	t-6	t-7	t-5	t-5
Post-adoption	t+1	t+1	t+2	t+3
*(POST*ADOPTION)*	0.062**	0.067***	0.072***	0.078***
	(0.022)	(0.020)	(0.021)	(0.018)
POST	-0.044	0.027	0.022	0.029
	(0.030)	(0.016)	(0.026)	(0.027)
ADOPTION	0.000	-0.003	-0.002	-0.004
	(0.010)	(0.008)	(0.013)	(0.011)
BTM	-0.034**	-0.045***	-0.013	-0.012
	(0.014)	(0.013)	(0.007)	(0.008)
LEV	0.132***	0.097**	0.205**	0.197***
	(0.023)	(0.040)	(0.083)	(0.063)
SIZE	-0.012*	-0.010**	-0.015	-0.015
	(0.005)	(0.005)	(0.011)	(0.011)
Intercept	0.197***	0.149**	0.096*	0.099
	(0.057)	(0.066)	(0.053)	(0.058)
Year FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
N	160	160	160	160
Adjusted R-square	0.241	0.218	0.324	0.317

Year-clustered standard errors are in parenthesis

***, **, and *, indicate statistical significance at the 1%, 5%, and 10% levels, respectively

POST = A dummy variable that is equal to 1 after IFRS adoption, and 0 otherwise

ADOPTION = A dummy variable which takes a value of 1 for IFRS adopters, and 0 otherwise

*POST * ADOPTION* = Interaction term

Table 13: Robustness test (4) – One to many matching

Matching	1 to 2	1 to 3
*(POST*ADOPTION)*	0.060* (0.031)	0.054* (0.030)
POST	0.006 (0.024)	0.010 (0.012)
ADOPTION	0.018 (0.022)	0.025 (0.020)
BTM	-0.019** (0.008)	-0.016** (0.006)
LEV	0.094*** (0.021)	0.082*** (0.017)
SIZE	-0.005 (0.004)	-0.002 (0.003)
Intercept	0.077* (0.042)	0.046 (0.034)
Year FE	Yes	Yes
Industry FE	Yes	Yes
N	240	320
Adjusted R-square	0.232	0.273

Year-clustered standard errors are in parenthesis

***, **, and *, indicate statistical significance at the 1%, 5%, and 10% levels, respectively

POST = A dummy variable that is equal to 1 after IFRS adoption, and 0 otherwise

ADOPTION = A dummy variable which takes a value of 1 for IFRS adopters, and 0 otherwise

*POST * ADOPTION* = Interaction term