Impact of XBRL adoption on financial reporting quality: A global evidence

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Abstract

Purpose: In this paper, we examine the effect of XBRL adoption on financial reporting quality at the country-level (developing and developed countries).

Design/methodology: We use data from 98 developed and developing countries between 2005-2018. We collected data from various sources such as the World Economic Forum, World Development Indicators, World Governance Indicators and XBRL website.

Finding: Our results show that XBRL is associated with an increased financial reporting quality. However, the relationship is stronger in developing countries than in developed countries. We also find that the results remain the same after accounting for years of XBRL experience and the effect of accounting globalisation. The results are consistent with the assumption that XBRL formatted financial statements improve information efficiency through increased searching efficiency, quality of display, and comparability. Our results are robust to alternative econometric modifications such as controlling for country, year effects and endogeneity.

Implications: Our results can potentially assist the XBRL promoters and regulators in expeditiously assessing the benefits of XBRL and advocating its adoption by many countries. Our findings offer more motivations for regulators around the world to mandate this new filing standard format.

Originality: This study contributes to the literature by providing empirical evidence on the consequences of XBRL at the country-level. The present study provides evidence on an important question of whether the XBRL, new information technology in the accounting field, can play a useful role in improving financial reporting.

Keywords: **XBRL; Financial reporting quality; developed countries; developing countries**

1. Introduction

The eXtensible Business Reporting Language (XBRL) is a new revolution in accounting that is significantly changing the financial reporting process (Hao et al., 2014). XBRL enables companies

to file one set of information instead of filing it repeatedly in different forms to different professional organisations and government agencies for different purposes (Kim et al., 2012). Many regulators and professional organisations have recognised the XBRL as a standardised format for electronic financial reporting with more benefits in the creation, preparation, exchange, analysis, and communication of business information than other reporting formats (e.g. Word, Excel, PDF, XTML). Therefore, in this study, we examine the consequence of XBRL adoption on financial reporting quality.

Prior research on XBRL generally focus on traits of this new reporting standard, its feasibility, the advantages and the cost of using it. For example, Debreceny et al. (2010) evaluate the program's implications and feasibility proposed by the Securities and Exchange Commission (SEC) regarding voluntary financial reporting. They concluded that XBRL performs a vital function in democratising markets. In addition, Premuros and Bhattacharya (2008) show that early voluntary filers are related to the firm's corporate governance and performance. Pinsker and Li (2008) prove that XBRL improves reporting transparency to the capital Market by reducing investment risk.

Other studies have highlighted some unintended consequences. Boritz and No (2008) show that many entities participating in the Voluntary Filer Program did not include any notes in their XBRL filings. They also found that some XBRL filings did not match with the relevant paper filings, and many XBRL filings included inconsistencies and errors. Simiarly, Bartley et al. (2011) find many errors and inconsistencies when comparing XBRL filings to the corresponding Forms 10-K. The errors include omitted amounts, wrong signs, inadequate values, unsuitable labelling and improper classification of financial statement elements. However, the errors decrease over time, suggesting that the unintended consequence is short term.

Prior studies suggest that the consequences of XBRL are unclear and mixed because of little research and a lack of knowledge on the topic. (Steenkamp & Neal, 2012; Sassi et al., 2021), The few studies that have provided mixed findings are limited to the firm level (Chen et al., 2021; Liu et al., 2017; Hao et al., 2014; Shan & Troshani, 2016; Zhang et al., 2019). Hence, this study aims to extend the literature by examining the impact of XBRL adoption on financial reporting quality at the country-level. We employ robust econometric modelling on a sample of 98 developed and developing countries between 2005-2018. Our results show that XBRL-formatted financial statements are associated with high financial reporting quality. This relationship is stronger in

developing countries than in developed countries. We also find that the results remain the same after accounting for years of XBRL experience and the effect of accounting globalisation. The results are consistent with the assumption that XBRL formatted financial statements improve information efficiency through increased searching efficiency, quality of display, and comparability. Our results are robust to alternative econometric modifications such as controlling for country and year effects.

Our results can potentially assist the XBRL promoters and regulators in expeditiously assessing the benefits of XBRL and advocating its adoption by many countries. Our findings offer more motivations for regulators around the world to mandate XBRL filing. The study responds to the lack of research on the relationship between XBRL adoption and country-level financial reporting quality.

Our investigation of the effect of XBRL adoption on financial reporting quality is important for several reasons. First, research on XBRL is essential in general, as this technology has been broadly expected to lead to an improvement in governance decision making (Alles & Piechocki. 2012), increased disclosure (Blankespoor et al. 2014; Liu et al. 2017), increased market efficiency (Cong, et al, 2014), constrain managerial opportunism (Kim et al. 2019), and improve firm performance post-XBRL adoption (Wang et al. 2014). Second, XBRL technology advances (Hsieh and Bedard, 2018). In 2010, the United Kingdom (UK) developed the inline XBRL (iXBRL) to absorb large amounts of information (HMRC, 2011). The iXBRL filing could become human and machine-readable. Research on the first movement of XBRL adoption is important as it can help regulators, investors, and policymakers to assess and better understand the adoption of the next-generation form of XBRL (Hsieh and Bedard, 2018). The present study provides evidence on important questions of whether the XBRL, new information technology in the accounting field, can play a useful role in improving financial reporting.

The remainder of the paper is structured as follows. Section 2 presents the literature review and hypotheses development with theory. Section 3 presents our data and methodology. The results and discussions are presented in Section 4. The paper concludes in Section 5.

2. Literature review and hypotheses development

2.1.XBRL

XBRL is an application of Extensible Markup Language (XML) (Borgi, 2022; Gray & Miller, 2009; Cordery et al., 2011). It is a digital format of financial reporting that may replace traditional reports written in PDF or HTML format (Ahmi & Nasir, 2019; De Martinis et al., 2020). The purpose of XBRL is to automate the collection, transmission, and use of financial information to support decision-making (Hsieh et al., 2019). It enables entities to file one set of information rather than filing it repeatedly in different forms to professional organisations and government agencies for various purposes (Sinnett and Willis, 2009). It also requires the creation and the use of taxonomies that provide standardised information formats by tagging data (Hao et al., 2014; Dhole et al., 2015). Hence, redundant data and unuseful descriptions are driven out (Eierle et al., 2014). The number of Standard Business Reporting (SBR) implementation projects based on XBRL is rising quickly. For example, such initiatives have been launched in the Netherlands (Cohen et al., 2014), Australia, India, China, Finland, Brazil, Belgium, New Zealand, and Singapore (Ojala et al., 2018).

Further, XBRL technology is continuously progressing (Hsieh and Bedard, 2018). In 2010, inline XBRL (iXBRL) was developed in the UK to absorb large amounts of information (HMRC, 2011). The iXBRL filing requires embedding XBRL tags in entities' traditional reporting. This allows the entity's information to be presented in a normal document format but with XBRL tags embedded in the soft copy document (Eierle et al., 2014). It means that the iXBRL-based filings could become human and machine-readable. Research on XBRL adoption can inform several stakeholders about its consequences and usefulness, such as regulators, investors and policymakers, due to their need to assess the adoption of the next-generation form of XBRL (Borgi, 2022; Hsieh and Bedard, 2018).

2.2.Hypotheses development

Prior studies suggest that several institutional factors, including the legal system, capital market development, and technological advancement, affect financial reporting quality (e.g., Ball et al., 2003; Kaya, 2014; Leuz et al., 2003; Sellami & Borgi 2020: Soderstrom & Sun, 2007).

Accordingly, the institutional theory can explain how these institutional variables affect financial reporting quality (Isidro & Raonica 2012). Firms are economic units that operate in contexts constituted by institutions that influence their behaviour and impose their expectations on them (Campbell, 2007; Roe, 1991). Companies that operate in countries with a similar institutional structure will adopt homogeneous behaviours (La Porta et al., 1998; Campbell, 2007). DiMaggio and Powell (1983) call this process 'isomorphism' and suggest that it improves corporate firm stability and survival, facilitating political power and institutional legitimacy. These isomorphic practices emanate from the firm's decision to imitate others (mimetic isomorphism), to do the professionally correct thing (normative isomorphism) or comply with the rules and requirements initiated by external forces (coercive isomorphism) (See Scott et al. 1976).

The adoption of XBRL by a country represents new institutional settings in which firms need to operate. XBRL, as a global technological innovation in accounting, requires firms to adopt new formats of reporting. The XBRL format increases disclosures and transparency, leading to an increase in overall financial reporting quality (Blankespoor et al., 2014; Pinsker and Li, 2008). Consequently, we argue that consistent with institutional theory, the financial reporting quality of XBRL adopting countries will increase because firms are forced to use a high-quality reporting format, XBRL (coercive isomorphism). Further, as firms compete for limited capital investment, the weak firms will copy the practice of strong firms who are using XBRL (mimetic isomorphism) to improve their financial reporting quality. Some firms also see XBRL as the new professional norm (normative isomorphism) for increasing financial reporting quality.

Enachi (2013) argues that XBRL may help achieve the qualitative characteristics of information defined by the IASB (i.e. understandability, relevance, reliability, and comparability). This can be achieved by reducing significant errors in financial reports, clarifying the content of financial reports for different stakeholders, reducing the time needed to prepare financial reports and improving comparability between accounting numbers between companies and over the years. Wang and Gao (2012) also find that the XBRL-based financial reports improve the quality of the information provided to stakeholders as financial reports become accessible, accurate, timely, and consistent. Premuros and Bhattacharya (2008) highlight that adopting XBRL as a disclosure tool may decrease potential divergences between firms regarding disclosure level and content. They add that the implementation of the XBRL infrastructure by firms would strengthen and make it

easier to implement and comply with the various disclosure requirements (especially the relatively vague "disclosure" provisions of Section 401, Disclosures in Periodic Reports) of the Sarbanes-Oxley Act of 2002. Kim et al. (2012) show that adopting XBRL technology in the financial reporting process leads to better disclosure and lower information asymmetry. Generally, regulators tend to use XBRL to enhance the transparency of capital markets for actual and potential investors (Borgi and Tawiah, 2022).

However, some studies have raised some issues about the credibility and reliability of the information included in the XBRL format. Boritz and No (2008) show that some entities fail to follow requirements contained in the relevant specifications and there are several inconsistencies and errors in some XBRL filings. More particularly, they find inconsistencies between an XBRL instance document and suggested, but not mandatory, practices. For example, sub-totals that are in the taxonomy but not in the instance document would be flagged by some software products as calculation errors. An example of this is having "Accounts Receivable, Net" and "Allowance for Doubtful Accounts" in the instance document but omitting "Accounts Receivable, Gross." The validation routine reports an error since it is inconsistent with the taxonomy, which contains all three elements and relates them through a calculation link. Also, Bartley et al. (2011) find many errors and inconsistencies when comparing XBRL filings to the corresponding Forms 10-K. The errors include omitted values, inaccurate signs, amounts, labelling and improper classification of financial statement elements. However, they show that the errors reduce over time, suggesting that the Voluntary Filer Program for XBRL improves financial reporting quality in the long run.

More recently, Gao and Huang (2020) suggest that modern information technology such as the XBRL leads to wider information dissemination, which enhances information production and, more generally, financial reporting quality. Following previous studies and consistent with institutional theory, we expect XBRL adoption to exert a significant positive effect on financial reporting quality.

H_1: XBRL adoption exerts a significant positive effect on financial reporting quality.

According to Tawiah (2022), most developing countries have less-developed capital markets or no stock exchanges. Hence, firms tend to rely on bank loans and other forms of advances from financial institutions for their financing needs. Moreover, developing countries have weaker institutions and regulations in contrast to developed countries (Bova & Pereira, 2012; Houqe &

Monem, 2016, Tawiah and Gyapong, 2021). Developing countries could encounter some problems when adopting XBRL. In fact, due to the nature of XBRL (e.g., a technologically based system), developing countries may not have the institutional ability to effectively implement it and reach its potential benefits (Ben Othman and Kossentini, 2015). However, XBRL could represent an opportunity for developing countries as it provides a new layer of institutional quality. Adopting XBRL improves transparency and, more generally, a better financial reporting quality that will facilitate the decision-making for potential investors. Arguably, the implications of XBRL adoption in developed countries may be different from those of developing countries due to the lower levels of institutional quality.

Therefore, we expect that the effect of XBRL adoption on financial reporting quality differs between developed and developing countries, as companies in developing economies have different ownership, financing, and governance structure compared to those in developed ones (Ben Othman and Kossentini, 2015). Hence, we formulate the following hypothesis:

H_2: The effect of XBRL adoption on financial reporting quality differs between developed and developing countries.

3. Data and methodology

3.1.Sample data

We use the strength of auditing and reporting standards index by the World Economic Forum as the measure of financial reporting quality. Therefore, our sample selection is based on economies covered World Economic Forum in the Global Competitive Index. We begin our sample selection from the 140 economies in 2018 Global Competitive Index. After removing countries with missing data, the final selection yields 98 developed and developing economies. The sample period begins from 2005 because XBRL is a recent technology; hence the earliest adoption of the sample country is 2005. Due to data availability of all variables of interest, we end in 2018. We collected data from various sources such as the World Economic Forum, World Development Indicators, World Governance Indicators and XBRL website. Appendix A contains the list of sample countries and their XBRL adoption status. The sample selection procedure is presented in Appendix C.

3.2.Variable description and sources

Financial reporting quality: Consistent with prior studies; Boolaky (2012), Boolaky and Cooper (2015), Boolaky et al. (2019), Houqe et al. (2012), we use the strength of auditing and reporting standards index by the World Economic Forum as the measure of financial reporting quality. The index is based on a survey of expert opinions from top investors and executives on the strength and enforcement of auditing and reporting standards in the country. The respondents cover experts in all key sectors of the economy and include both large and medium-sized firms and listed and unlisted companies (Boolaky, 2012). The SARS index ranges between 1 and 7, with higher values indicating a high-quality financial reporting system. Houqe et al. (2012) argue that the World Economic Forum index is more current than other country-level financial quality measures. The World Economic Forum database is a well-established and reliable source for policy decisions and empirical research (Boolaky et al., 2019). The financial reporting quality index is measured on a scale of 1-7, where high values indicate higher financial reporting quality.

XBRL adoption (XBRL). Following the coding of other recent developments in accounting, such as International Financial Reporting Standards, we measure XBRL adoption as a binary variable. XBRL takes the value of 1 for adopting countries and 0 for non-adoption countries. Data on XBRL adoption is sourced from XBRL adoption around the world at the XBRL website.

Control variables: Consistent with the literature on financial reporting quality Boolaky and Cooper (2015), Boolaky et al. (2019), Houqe et al. (2012), we include a battery of variables to control for other factors that are found to influence financial reporting quality.

Institutional quality: Prior studies assert that the institutional structures of the country have a significant influence on the financial reporting quality (Boolaky et al., 2019; Houqe et al., 2012). Boolaky et al. (2019) report that high-quality institutions are associated with high financial reporting quality. Therefore, we use a composite index from the six World Governance Indicators to control the effect of institutional quality. These indicators are developed by Kaufmann and Kraay (2018) and are widely used proxy for institutional quality (Houqe et al., 2012; Houqe and Momen, 2016; Tawiah & Gyapong, 2021; Tawiah, 2022). Consistent with these prior studies, we use the Principal Component Analysis to develop a composite index from the six indicators.

Economic development: Arguably, economic development and growth are likely to be significant antecedents to financial reporting quality. Extant literature such as Boolaky et al. (2019) suggests that high economic development is associated with high financial reporting quality. Therefore, we control economic development and growth with the gross national product per capita.

Education: Countries with high literacy are more likely to have high financial reporting quality. Boolaky and Cooper (2015) argue that education is relevant to the development of accounting and auditing practices. We use secondary school enrolment collected from the World Development Indicator as the measure of *Education*.

Foreign ownership (FDI) and Trade openness: Boolaky and Cooper (2015) claim that trading and investment partners are likely to mimic each other for comparability. This process allows foreign investors and traders to influence the financial reporting quality of the host country. Consequently, we use foreign direct investment (FDI) and trade openness to control the influence of foreign operations on financial reporting quality.

3.3. Modelling and equation

We test the impact of XBRL adoption on financial reporting quality using the following equation. In the analysis, we account for the year and country effect. We conduct different pre-regression tests to determine the appropriate modelling technique for the estimation. First, we test the correlation among the variables using the Pearson pairwise correlation matrix. The results, which are presented in Table 2, show that none of the correlation coefficients of the independent and control variables is above the threshold for posing multicollinearity problems (Field, 2000; Tabachnick and Fidell, 2007). Next, we perform the Hausman (1989) test, and the un-tabulated results indicate that the random effect model is more appropriate for estimating the effect of XBRL on financial reporting quality.

$$
\begin{aligned}
Financial\ reporting\ quality_{it} &= a + \beta_1 XBRL\ adoption_{it} + \beta_2 Institutional\ quality_{it} \\
&+ \beta_3 Economic\ development_{it} + \beta_4 Education_{it} \\
&+ \beta_5 Foreign\ direct\ investment_{it} + \beta_6 Trade\ openness_{it} \\
&+ \varepsilon_{it} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots . EQ1
\end{aligned}
$$

Where i represents country, and ε_{it} is the associated error. All variables are defined in Table 1.

[Insert Table 1 – Variable description and modelling]

4. Results and discussion

4.1.Descriptive statistics

The descriptive statistics, including the mean, 25th percentile, median, 75th percentile and the standard deviation of all variables used in the study, are presented in Table 2. The mean of *Financial reporting quality* is 4.832, suggesting that most sample countries have above-average performance, given that the score ranges between 1 to 7, with high values indicating high quality. However, the high standard deviation of 0.796 shows the extent of variations among the sample countries. We also find that mean of *XBRL* is 0.143, indicating that less than half of the sample countries have adopted XBRL. In absolute numbers as of 2018, 32 out of 98 sample countries have adopted XBRL. We also observed that the years of XBRL experience (XBRLEXP) is about 2 years, suggesting that most countries have had a few years of exposure to XBRL.

[Insert Table 2 – Descriptive statistics]

We employ the Pearson Pairwise correlation matrix to check the appropriateness of the independent and control variables regarding potential multicollinearity. As presented in Table 3, all the correlations coefficients are lower than the standard threshold (Field, 2000; Tabachnick & Fidell, 2013); hence there is no multicollinearity problem.

[Insert Table 3 – Correlation matrix]

4.2.Regression results

This study aims to establish the effect of XBRL adoption on financial reporting quality at the country level. Consistent with institutional theory and prior studies, we expect XBRL to increase financial reporting quality. To demonstrate the robustness as well as account for the year and country effect of the results, we execute the econometric modelling in four steps. First, we regress XBRL adoption on financial reporting quality without the control variables. Next, we include the control variables. Third, we include the year effect, and in the last step, we include both the year

and country effect. The results are presented in Table 4. The coefficient of *XBRL adoption* is positive and highly significant in all four columns. The results imply that the use of XBRL as a medium of financial reporting increases financial reporting.

Our finding is consistent with the argument that XBRL provides easy access to financial statements. Also, it makes it easier for users to compare companies' performance and make informed decisions (Yang et al., 2018). In addition, to increase comparability and accessibility, the XBRL platform also encourages transparent reporting because it has pre-determined fields requiring more detailed information than regular paper reporting (Blankespoor et al., 2014). Compared with traditional paper reporting, where firms choose which information or terminology to use, the XBRL platform provides similar terminology and format for all firms, thereby reducing the possibility of creative accounting and earnings manipulations. Moreover, XBRL-formatted financial statements improve efficiency in searching and quality of display compared with non-XBRL formatted financial statements (Wang, 2015). The results support our hypothesis that XBRL adoption exerts a significant positive effect on financial reporting quality.

Most of the control variables are consistent with standard assumptions and prior studies. Institutional quality and economic development have a positive and significant association with financial reporting quality.

4.3.Developed and developing countries

By the inclusion of economic development, we may have controlled for the variations in financial reporting quality between developed and developing countries. However, prior studies argue that there could still be a significant difference between developed and developing countries regarding the outcome of adopting a new accounting system (Bova & Pereira, 2012; Houqe & Monem, 2016; Tawiah, 2022). Therefore, in this section, we test our second hypothesis, which states that the effect of XBRL adoption on financial reporting quality differs between developed and developing countries. We use the sub-sampling technique to classify countries into developed and developing countries based on the World Economic Outlook report by the World Bank. The results of developed countries are presented in column 5. The coefficient of XBRL is positive and significant at 5 percent, suggesting that XBRL increases financial reporting quality in developed countries. In column 6, we present the results of developing countries. Like that of the developed countries, the

coefficient of XBRL is positive and significant, indicating that the adoption of XBRL increases financial reporting quality in developing countries. However, the coefficient of developing countries is larger and at higher significance than the developed countries (0.250 at 1% > 0.0.06) at 5%). The results validate our second hypothesis that the effect of XBRL adoption on financial reporting quality differs between developed and developing countries. These results imply that developing countries are likely to benefit more from the adoption of XBRL than developed countries. This is consistent with the prior studies that new accounting developments, such as XBRL, legitimate and improve the institutional structures in developing countries (Bova & Pereira, 2012; Houqe & Monem, 2016).

[Insert Table 4 – Main results]

4.4.The effect of IFRS and ISA

The adoption of XBRL has been in parallel with other significant global development in accounting; hence the benefit of increasing financial reporting quality may not necessarily be due to the adoption of XBRL. Therefore, in this section, we test whether the effect of XBRL on financial reporting quality remains the same after accounting for the adoption of IFRS and ISA. *Accounting globalisation* is measured as the number of international accounting standards a country has adopted. It takes the value of 0 if the country has not adopted any of the international standards; 1 – if the country has adopted one of the international standards; 2 – if the country has adopted both international standards. We begin by establishing the relationship between accounting globalisation and financial reporting quality in column 1 of Table 5. As expected, *Accounting globalisation* has a positive and significant association with financial reporting quality. Next, we introduce *Accounting globalisation* as a control variable in our main equation, and the results are presented in column 2 of Table 5. The coefficient of XBRL remains positive and highly significant, suggesting that the adoption of XBRL still increases financial reporting quality with or without the adoption of international accounting standards. Finally, we use the Difference in Difference identification strategy to isolate the effect of XBRL adoption on financial reporting quality. In the DiD analyses, we limit the sample to only IFRS adopters; hence IFRS adopters who have adopted XBRL are classified as the treatment group, and IFRS, non-XBRL adopters are classified as the control group. The sample period is limited to 2015-2018. The results are presented in column 3. The coefficient of DiD is positive and significant, confirming that XBRL

is associated with an increase in financial reporting quality even in IFRS adopting countries. That is, the adoption of IFRS and ISA does not override the benefit of XBRL increasing financial reporting quality.

4.5.XBRL experience and alternative measurement

Till this point, our measure of XBRL adoption has accounted for whether a country is using XBRL or not. The binary coding of countries into simple adoption and non-adopting largely ignores the difference in XBRL exposure among countries. The measurement is predicated on the assumption that once a country adopts XBRL, its financial reporting increases instantaneously. However, it is more probable that the benefit of adopting a new development in accounting materialised more and more as the country continues to use the system. That is to say, the longevity of using XBRL may yield a different result in financial reporting. Bartley et al. (20111) found that errors in XBRL filing decrease over time. To account for the effect of the XBRL experience, we replace *XBRL* with *XBRLEXP*. Following Houqe and Monem (2016), we measure XBRLEXP as the number of years a country has been using XBRL. For example, if a country adopted in 2010, it will have 1 in 2010, 2 in 2011, 3 in 2012, etc. We limit the sample to only adopting countries. The result presented in column 4 of Table 5 shows that the continuous use of XBRL increases financial reporting quality, implying that the benefit of XBRL is not static or limited to the year of adoption.

As with any other global development in accounting, countries use different approaches to adopting the new standard or system. In the case of XBRL, we found that some countries adopt for all companies while others adopt only for listed companies. Therefore, in this section, we focus on countries that have adopted for only listed companies. The result presented in column 5 of Table 5 shows that the benefit of XBRL increasing financial reporting quality still holds even for countries that have mandated it only for listed firms.

4.6.Additional control variables.

In this section, we provide further robustness of our findings by including two additional control variables which influence the financial reporting quality. Prior studies assert that common law countries have better accounting structures; hence their financial reporting quality is higher than other legal systems (Ball et al. 2000; Barniv et al. 2005). This argument is based on the assumption that current global financial reporting regulations are developed based on common law systems,

so they fit well in common law countries. We measure *Legal system* as a dummy variable, equal to either 1 for common law countries or 0 otherwise.

Additional, the type of financing within a country can influence the quality of financial reporting. In market-oriented economies where the primary funding source is from the capital market, financial reporting is expected to be higher because of the dominance of many external shareholders. On the contrary, in a bank-oriented economy, the principal financier, the bank, has access to internal information; hence, external reporting is not essential for attracting capital. *Economic orientation* is proxy by stock market turnover as the ratio of GDP. As reported in column 6 of Table 5, the coefficient of XBRL remains positive and significant, confirming that our findings of a positive association between XBRL adoption and financial reporting quality still hold regardless of the legal system and economic orientation.

[Insert Table 5 – Further analyses]

4.7.Endogeneity check

We employ the Difference in Difference identification strategy to check the robustness of our results to possible endogeneity problems. We classify XBRL adopters as *Treatment* control coded as 1 and non-adopters as control group coded as 0. We use XBRL adoption as the event. Many sample countries adopted XBRL around 2015, so we limit the sample period from 2015 to 2018. Therefore we classify 2015 and 2016 as pre-adoption periods and 2018 to 2019 as *Post*-adoption periods coded as 1. *DiD* is the interaction term between *Treatment* and *Post.* As presented in Table 6, the coefficient of the variable of interest *DiD* is positive and significant, suggesting an increase in financial reporting quality after the adoption of XBRL. These findings confirm that our main results are not sensitive to potential endogeneity issues.

[Insert Table 6 Endogeneity check]

5. Conclusion

XBRL, a recent development in the format of reporting financial information, aims to improve the financial reporting quality through increased accessibility and comparability of financial statements. Consequently, prior studies have begun to analyse the realisation of this objective by

examining the impact of XBRL adoption on a different aspect of financial reporting (Bartley et al., 2011; Buys, 2008; Debreceny et al., 2011; Dhole et al., 2015; Dong et al., 2016). However, most of them are limited to firm-level comparability and based mainly in US settings. Therefore, we extend and update the XBRL literature by analysing whether the XBRL reporting system has improved the country-level financial reporting quality. Contrarily to prior studies, our study is focused on cross-country analysis using a large sample of 98 developed and developing countries over 14 years.

Our empirical estimation indicates that the adoption of XBRL is associated with a significant increase in financial reporting quality. We attribute this positive effect to the improvement in the information efficiency and searching ability of XBRL. Our results are, therefore, consistent with Dong et al. (2016) and Kim et al. (2012) study that XBRL mitigates information risk and improves the information environment. We further find that the relationship is more pronounced in developing countries than developed countries. Further analysis demonstrates that the positive effect of XBRL on financial reporting quality still holds after controlling for the adoption of IFRS and ISA. Our results are robust to alternative econometric specifications.

This study makes incremental contributions to both policy and academic literature. It provides empirical evidence on the benefit of adopting XBRL at the country level. Our study could serve as a basis for XBRL promoters to lobby countries to mandate this new filing standard format. Our findings can encourage policymakers and regulators in non-adopting countries to consider the use of XBRL because it can improve financial reporting quality. In the realm of academic literature, to the best of our knowledge, we contend that this is the first study to examine the effect of XBRL on financial reporting quality at the country-level. Few studies in this space are mainly limited to firm-level or single-country studies. Therefore, our study complements these firm-level analyses and provides new insights into the benefit of XBRL at the country level.

We acknowledge that the coding of countries can be challenging as there is no uniform adoption approach. Some countries may require some specific industry, such as banking, while others require all listed firms to report in XBRL format. However, consistent with prior studies, we use a holistic approach by coding all countries that have mandated XBRL for any specific industry or class of firms as adopted.

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Tables

Appendix A - List of countries and XBRL adoption

Country	Status	Country	Status	Country	Status
Albania	Not adopted	Hungary	Not adopted	Pakistan	Not adopted
Armenia	Not adopted	Iceland	Not adopted	Panama	Not adopted
Australia	Adopted	India	Adopted	Paraguay	Not adopted
Austria	Not adopted	Indonesia	Adopted	Peru	Adopted
Bangladesh	Not adopted	Ireland	Adopted	Philippines	Not adopted
Barbados	Not adopted	Israel	Adopted	Poland	Adopted
Belgium	Adopted	Italy	Adopted	Portugal	Adopted
Benin	Not adopted	Jamaica	Not adopted	Romania	Not adopted
Botswana	Not adopted	Jordan	Not adopted	Russia	Adopted
Brazil	Adopted	Kazakhstan	Not adopted	Rwanda	Not adopted
Brunei	Not adopted	Kenya	Not adopted	Saudi Arabia	Adopted
Bulgaria	Not adopted	Kuwait	Adopted	Senegal	Not adopted
Burkina Faso	Not adopted	Kyrgyz Rep.	Not adopted	Serbia	Not adopted
Cambodia	Not adopted	Latvia	Adopted	Singapore	Not adopted
Cameroon	Not adopted	Lebanon	Not adopted	Slovakia	Not adopted
Canada	Not adopted	Lesotho	Not adopted	Slovenia	Not adopted
Chile	Adopted	Lithuania	Not adopted	South Africa	Not adopted
Colombia	Adopted	Luxembourg	Adopted	Spain	Adopted
Costa Rica	Not adopted	Madagascar	Not adopted	Sri Lanka	Not adopted

Cote d'Ivoire	Not adopted	Malawi	Not adopted	Sweden	Adopted
Croatia	Not adopted	Malaysia	Adopted	Switzerland	Not adopted
Czech Republic	Not adopted	Malta	Adopted	Tanzania	Not adopted
Denmark	Adopted	Mauritius	Adopted	Thailand	Not adopted
Dominican Republic	Not adopted	Mexico	Adopted	Trinidad and Tobago	Not adopted
Estonia	Adopted	Mongolia	Not adopted	Tunisia	Not adopted
Finland	Adopted	Montenegro	Not adopted	Turkey	Adopted
France	Adopted	Morocco	Not adopted	Uganda	Not adopted
Georgia	Not adopted	Mozambique	Not adopted	Ukraine	Not adopted
Germany	Adopted	Netherlands	Adopted	United Kingdom	Adopted
Ghana	Not adopted	New Zealand	Not adopted	Uruguay	Adopted
Greece	Not adopted	Nicaragua	Not adopted	Zambia	Not adopted
Guatemala	Not adopted	Nigeria	Not adopted	Zimbabwe	Not adopted
Honduras	Not adopted	Norway	Adopted		

Appendix B – Abbreviations

Abbreviation	**Full format**
XBRL	eXtensible Business Reporting Language
iXBRL	Inline - eXtensible Business Reporting Language
XBRLEXP	XBRL experience

Appendix C – Sample Selection

	Countries	**Observations**
Intial sample in Global competitive report 2018	140	1960
Less countries without scores on FRQ for more than 5 years	-24	-336
Less countries with missing data from other sources for than 5 years	-18	-252
Outliners, missing and inconsistent observations		-204
Final sample and observations	98	1168

Table 1. Variable description and sources

Variable	**Description**	**Source**
Financial reporting quality	The measure of financial reporting quality based the strength of auditing and reporting standards	Global Competitive Index by the World Economic Forum

XBRL	Binary variable equals to 1 for XBRL adopting countries and 0 for non-adopters	XBRL Website
XBRLEXP	The number of years, since a country started using XBRL.	XBRL Website
Accounting Globalization	The adoption status of IFRS and ISA where 0 equal to no adoption of IFRS and ISA, 1 = adoption of either IFRS or ISA 2 = adoption of both IFRS and ISA.	IFAC Website, IFRS foundation, PWC and Deloitte
Institutional quality	Principal component analysis of the six World Governance indicators.	World Governance Indicators
Economic development	Log of gross national product per capita	World Development Indicators
Literacy	Secondary school enrolment rate	Global Financial Development Database
Foreign direct investment (FDI)	Foreign direct investment as percentage of gross domestic product	World Development Indicators
Trade Openness	Sum of exports and imports as a percentage of gross domestic product	World Development Indicators

Table 2 – Descriptive statistics

Variables	(1) Mean	(2) 25th	(3) Median	(4) 75th	(5) Stdiv
Financial reporting quality	4.832	4.233	4.797	5.400	0.796
XBRL	0.143	0	0	0	0.350
XBRLEXP	1.751	0	0	3	2.800
Accounting globalisation	1.171	1	1	2	0.789
Institutional Quality	0.114	-1.564	-0.406	1.846	2.269
Economic development	9.475	8.740	9.624	10.35	1.120

Education	74.66	63.17	84.61	92.30	23.17
Foreign direct investment	5.756	1.614	3.168	5.930	16.66
Trade Openness	91.95	57.37	78.91	106.7	56.82

Table 3. Correlation matrix

Variables	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
XBRL	1							
XBRLEXP	0.54	1						
Accounting globalisa.	0.16	0.3	1					
Institutional Quality	0.25	0.06	0.12	1				
Economic development	0.29	0.05	0.07	0.58	1			
Education	0.24	0.17	0.05	0.63	0.66	1		
Foreign direct invest.	-0.02	-0.08	0.02	0.12	0.05	0.04	1	
Trade Openness	0	-0.09	0.01	0.38	0.36	0.28	0.33	1

Table 4. Main results – dependent variable is financial reporting quality

					Developed	Developing
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
XBRL adoption	0.597***	0.157***	0.202***	0.539***	0.0617**	0.250***
	(0.0640)	(0.0449)	(0.0475)	(0.0383)	(0.0302)	(0.0757)
Institutional Quality		0.234***	0.229***	0.230***	0.266***	0.217***
		(0.0108)	(0.0109)	(0.0369)	(0.0145)	(0.0169)
Economic development		0.148***	0.159***	0.272***	0.364***	0.112**
		(0.0331)	(0.0332)	(0.102)	(0.0639)	(0.0445)
Education		-0.00454***	-0.00469***	0.00528***	0.00111	-0.00189
		(0.00127)	(0.00127)	(0.00191)	(0.00395)	(0.00160)
Foreign direct investment		0.000102	-0.000158	-0.000565	0.00126	-0.0147***
		(0.000953)	(0.000961)	(0.000600)	(0.000839)	(0.00407)

Trade Openness		-9.39e-05	-4.29e-05	-0.00210***	-5.21e-07	-0.000648
		(0.000304)	(0.000305)	(0.000794)	(0.000296)	(0.000721)
Constant	4.746***	3.722***	3.664***	1.598*	0.829	3.971***
	(0.0243)	(0.247)	(0.251)	(0.935)	(0.778)	(0.337)
Year effect			Yes	Yes	Year	Year
Country effect			-	Yes	Yes	Yes
Observations	1,168	1,168	1,168	1,168	407	761
R-squared	0.069	0.589	0.594	0.889	0.609	0.373
Adjusted R-squared	0.068	0.587	0.588	0.876	0.603	0.368
VIF	1.00	2.69	2.21	3.72	1.22	2.34

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 5. Further analyses

VARIABLES	IFRS and ISA effect			XBRL Experience	Alternative measurement	Additional controls
	(1)	(2)	(3)	(4)	(5)	(6)
XBRL		0.050**	0.155**			0.0439**
		(0.0211)	(0.0731)			(0.0187)
Accounting globalisation	0.0770***	0.076***				

	(0.0218)	(0.0218)				
DiD			0.147**			
			(0.070)			
Post XBRL			0.236*			
			(0.121)			
XBRLEXP				0.0389***		
				(0.0115)		
XBRL for listed firms					0.113***	
					(0.0304)	
Economic orientation						0.0033***
						(0.0006)
Common law						1.296***
						(0.231)
Constant	1.789*	1.774*	3.789***	3.307**	1.759*	4.040***
	(0.931)	(0.931)	(0.034)	(1.648)	(0.937)	(1.280)
Observations	1,168	1,168	311	400	1,168	859

R-squared	0.890	0.890	0.940	0.865	0.889	0.914
Adjusted R-squared	0.877	0.877	0.917	0.845	0.876	0.901
VIF	5.77	4.76	5.89	3.72	5.73	5.50

All regression includes original control variables, year and country effect.

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 6. Endogeneity check

VARIABLES	(1)	(2)	(3)
DiD	0.301***	0.152**	0.0727**
	(0.113)	(0.072)	(0.0313)
XBRL	0.142**	0.158**	0.0370**
	(0.0674)	(0.0790)	(0.0165)
Post	-0.0436	-0.0752	-0.130**
	(0.0609)	(0.0787)	(0.0603)
Constant	3.360***	3.393***	-1.325
	(0.435)	(0.437)	(3.592)
Observations	392	392	392
R-squared	0.604	0.605	0.943
Adjusted R-squared	0.595	0.594	0.921
VIF	2.73	2.60	6.88

All regression includes original control variables, year and country effect.

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1