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The Determinants of eXtensible Business Reporting Language (XBRL) Adoption: A Cross-Country Study

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Abstract:

This paper investigates the determinants of eXtensible Business Reporting Language (XBRL) adoption using the Technology-Organizational-Environment (TOE) framework. This framework explains how the process of adopting and implementing XBRL is influenced by the technological context (country's firm-level technology absorption and technological capacity), organizational context (education) and environmental context (level of economic development; degree of external economic openness; investor protection; accounting system and the burden of government regulation). Using a sample of 78 countries during the period 2009–2017, we find that countries with high levels of technology absorption, higher levels of economic development and strong investor protection are more likely to adopt XBRL.

Keywords: XBRL; TOE framework; countries; technology absorption; economic development; investor protection.

1. Introduction

The eXtensible Business Reporting Language (XBRL) is an electronic language for commercial and financial data that revolutionizes the worldwide communication of information (Cormier et al., 2019; Markelevich et al., 2015; Chotaliya, 2014; Steenkamp and Nel, 2012). It was developed by XBRL International, which is a consortium of over 600 members. This consortium consists of regulatory bodies, public audit firms, financial institutions, and software vendors as well as international and national standard setters and public entities (Wang et al., 2014). XBRL provides more benefits in the creation, preparation, exchange, analysis and communication of business information than other reporting formats (e.g. Word, Excel, PDF, XHTML) (Borgi and Tawiah, 2022).

Currently, numerous countries have implemented XBRL to meet the information needs of securities regulators and different government agencies. Also, many pilot projects are underway in several countries (e.g., Finland and Brazil) to assess the potential benefits that XBRL can offer.

Some countries (e.g., Japan and the United States of America) require the use of XBRL while others (e.g., Canada and Peru) permit its use. However, many countries (e.g., New Zealand and Tunisia) still do not mandate or permit the use of XBRL. Also, countries adopt XBRL to meet the information needs of different users. Some countries (e.g., South Africa and Chile) adopt XBRL to meet the information needs of securities regulators. Other countries (e.g., Italy and France) adopt XBRL to meet the information needs of other government agencies. Several countries (e.g., India and Australia) use XBRL to meet the information needs of both securities regulators and other government agencies.

To the best of the author's knowledge, the only study that investigates the country-level factors influencing XBRL adoption is the study of Borgi and Tawiah (2022). Borgi and Tawiah (2022) examine the institutional factors that influence the adoption of XBRL at the country level. They use a sample of 175 countries over 14 years. Their finding indicates that coercive, mimetic and normative pressures, respectively, in terms of ROSC reports, the extent of accounting globalization, technological access and education are key factors influencing XBRL adoption. Borgi and Tawiah (2022) uses institutional theory to develop the research hypotheses on the determinants of XBRL. Our paper complements Borgi and Tawiah (2022) and offers an incremental contribution to the literature by the Technology-Organization-Environment (TOE) framework that is suitable for explaining technology adoption in organisations and well countries.

The TOE framework is provided by Tornatzky et al. (1990) for understanding technology adoption. It is composed of three contexts: technological, organizational and environmental and has been used in most of the research work related to XBRL at the firm level (e.g. Cordery et al., 2011; Mandilas et al., 2009; Henderson et al., 2012; Slehat, 2018; Alkhatib et al., 2019; Singh and Singh, 2021; Lakovic et al., 2018; Hentati et al., 2021). Moreover, most TOE studies used primary survey data. Mandilas et al. (2009) and Henderson et al. (2012) examine the TOE factors affecting the decision of XBRL adoption using different countries but at the firm level and through survey data.

Our research complements these studies and contributes to the literature by identifying the determinants of the adoption of XBRL at the country level using the TOE framework. According to Srivastava and Teo (2006), the TOE framework is a useful theoretical lens for understanding technology adoption in a cross-country scenario and using secondary data. Srivastava and Teo (2006) and Larosiliere et al. (2015) applied the TOE framework at the country level to investigate the adoption of Information Technology (IT) innovations.

Our study is motivated by success stories from regulators in countries such as the USA, Australia and the Netherlands demonstrating the benefits of the XBRL adoption (Cordery et al., 2011). It is also motivated by the discrepancy between countries in terms of XBRL adoption and/or the purpose of XBRL adoption. The adoption of XBRL around the world has been driven by its potential benefits in facilitating financial reporting comparability, and investor protection through increased accounting transparency and disclosure (Borgi and Tawiah, 2022). Therefore, this study will enhance our understanding of the factors that could influence the adoption of XBRL at a country level and not just at a microeconomic level. In addition, our study investigates the different purposes of adoption of XBRL rather than considering a simple adoption or not of XBRL reporting at a country level. XBRL is used to meet the information needs of (i) securities regulators, (ii) other government agencies and/or (iii) both securities regulators and other government agencies. According to Mandilas et al. (2009), to decide whether XBRL is a successful technological innovation, it is necessary to examine the degree of its adoption.

Therefore, our objective consists, firstly, to identify the factors that could explain the adoption or non-adoption of XBRL by countries (without considering the objective of adoption: to meet the information needs of securities regulators or other government agencies) using the TOE framework. Then, we specified our model and identified the factors that could explain the country's decision to adopt or not to adopt the XBRL to meet the information

needs of securities regulators, of other government agencies and both securities regulators and other government agencies.

We consider the following factors: the country's firm-level technology absorption and technological capacity as technological factors and education as an organizational factor. For the environmental factors, we include the level of economic development; the degree of external economic openness; investor protection; the accounting system and the burden of government regulation. Using a sample of 78 countries over the period 2009-2017, we find that countries more likely to adopt XBRL have high levels of technology absorption, higher levels of economic development and strong investor protection.

More specifically, for the adoption of XBRL to meet the information needs of securities regulators, we find that the countries, which are most likely to adopt XBRL, have high levels of technology absorption, more highly educated populations, higher levels of economic development and strong investor protection. In contrast, we find that countries with high technology capacity and more degree of external economic openness are less likely to adopt XBRL to meet the information needs of securities regulators. As for the adoption of XBRL to meet the information needs of at least one of the other government agencies, we find that higher levels of economic development and a high burden of government regulation encourage countries to adopt XBRL. Finally, we find that the country's firm-level technology absorption, the technology capacity, education, the degree of external economic openness and the mandatory adoption of IFRS significantly impact the adoption of XBRL to meet the information needs of both securities regulators and at least one other government agency.

This study is useful to regulators, managers, countries and policymakers that have not yet adopted XBRL and are interested in incorporating XBRL technology into their systems to better develop a strategy that encourages and helps firms and users to adopt and use XBRL reporting. Our findings suggest a conceptual framework that helps them to comprehend the factors influencing the adoption of XBRL and, then, formulate an effective public policy that facilitates the use of XBRL. XBRL International can use our findings to promote the adoption of XBRL and improve the transparency of business performance globally, by providing an open data exchange standard for business reporting (www.xbrl.org). In addition, our study helps scholars to widen their expertise and enhance their empirical comprehension of XBRL.

The remainder of this paper is organised as follows. Section 2 reviews the relevant literature and develops our hypotheses. The sample selection, data description and empirical model are discussed in Section 3. The empirical findings are presented and discussed in Section 4. Section 5 concludes.

2. Literature review and hypotheses development

2.1. Literature review

Identifying and analyzing the factors that influence the adoption of XBRL is of great importance because the process of accepting XBRL as an innovation does not take place everywhere and always in the same way. The diversity between countries explains the degree of acceptance of a technology (Lakovic et al., 2018). Several theories and models have been used to study the factors that influence the adoption of technology. These theories and models were further modified, changed, integrated and extended based on the needs and requirements of the information system (Rawashdeh and Selamat, 2013).

Previous studies on XBRL have used for example technological–organisation–environmental (TOE) framework, Technology Acceptance Model (TAM), Institutional (INT) theory and Decomposed Theory of Planned Behavior (DTPB), Unified Theory of Acceptance and Use of Technology (UTAUT) model to explain the determinants of XBRL adoption (Rawashdeh and Rawashdeh, 2021).

For example, Chouhan and Goswami (2015) use the TAM (Technology Acceptance Model) model proposed by Davis (1989) to analyze the perception of financial experts in respect of the acceptance of XBRL as reporting method. They examine the effect of perceived usefulness and ease of use on the attitude of Indian financial professionals towards XBRL reporting. Elissavet et al. (2013) develop a model that is based on the Technology Acceptance Model 2 (TAM2) to examine the factors that led to the acceptance and usage of XBRL using a sample of EU companies. The proposed model consists of five key constructs: perceived usefulness, perceived ease of use, output quality, training costs, and behavioural intention. Pinsker (2008) uses the technology acceptance model (TAM) and absorptive capacity as appropriate theories for studying the intention to adopt XBRL. Perceived usefulness, attitudes toward technology adoption and absorptive capacity are the key variables used.

Other studies use the Technology-Organizational-Environment (TOE) framework to explain the adoption of XBRL. The TOE framework is used by many studies attempting to study information technology, which demonstrates its usefulness for understanding the diffusion of innovations (Alkhatib et al., 2019). According to Henderson et al. (2012) and Troshani and Doolin (2005), the TOE framework is a suitable theoretical basis for understanding the XBRL adoption.

Three aspects identified by the TOE framework influence the adoption and implementation of technological innovation like XBRL, namely technological, organizational and environmental aspects. The technological context describes both the existing technologies

in use and new technologies relevant to the firm. Some studies include the XBRL characteristics, the relative advantage, the compatibility, the complexity and the trialability of XBRL and find that these characteristics impact significantly the decision to adopt XBRL in several contexts (Cordery et al., 2011; Alkhatib et al., 2019; Di and Xia, 2017). Other research includes the technical infrastructure, the availability of expert programmers and trainers and the ease of understanding and uses, as a technological factor (Hentati et al., 2021; Lakovic et al., 2018; Slehat, 2018; Rawashdeh and Selamat, 2013). The organizational context refers to the characteristics of the organization. It includes employees' education and knowledge regarding this reporting system (Singh and Singh, 2021; Di and Xia, 2017; Alkhatib et al., 2019; Slehat, 2018). The environmental context is the arena in which a firm conducts its business including market competition, trading partners, national macroeconomic conditions and public institutions (Oliveira and Martins, 2010; Cordery et al., 2011; Slehat, 2018; Srivastava and Teo, 2006). These three aspects are interrelated and influence the behaviour and speed of adopting and propagating XBRL technology (Di and Xia, 2017).

2.2. Hypotheses development

Our study aims to examine the TOE factors affecting the decision of XBRL adoption. Three adoption determinants are identified to examine whether, and to what extent, they affect the XBRL adoption decision.

2.2.1. Technological factors

Technology absorption

Various studies focus on the technological context to examine the adoption of IT innovation, such as XBRL. According to Chouhan and Goswami (2015), the use of XBRL improves the effectiveness and quality of the job of the users but technological complexities and lengthy process for matching financial data with a given set of taxonomies make the system less interesting to accept. In addition, companies need to conduct change management initiatives and regular training that help employees easily adopt new technologies like XBRL (Chouhan and Goswami, 2015). Pinsker (2007) affirms that the more the technology is easy to be learned if there is a need for it, the more the company will adopt it. According to Adam and Alhassan (2020), when individuals are well-educated and trained on how to use IT applications in a firm, efficiency and profitability are enhanced and as such, firms will continuously absorb technology to better their operations and enjoy some economies of scale.

The ability of the firm to absorb technology and knowledge depends on its organization and the skills of its workforce (Goldberg et al., 2010). Pinsker (2008) indicates that the absorptive capacity measures are indicative of the ease of learning XBRL. The easier a firm believes it is to learn XBRL, the more it would be willing to accept/adopt it. Adam and Alhassan (2020) analyse the relationship between IT usage and firm-level technology absorption using country-level data across 134 countries for the year 2016 from both developing and developed countries. They find that IT usage is associated with firm level technology absorption.

Therefore, companies that have high levels of absorptive capacity, have an excellent ability to acquire and exploit new knowledge, and subsequently are more likely to adopt XBRL compared to companies with lower levels of absorptive capacity. A study conducted by Pinsker (2008) in the American context shows a significant and positive association between absorption capacity and the adoption of XBRL. Hence, our first hypothesis is:

H1: Countries with higher levels of technology absorption are more likely to adopt XBRL.

Technological capacity

The level of Internet penetration in a country influences the XBRL adoption decision. In countries with high internet penetration rates, it is expected that countries will adopt XBRL as a means of widespread financial disclosure. According to Larosiliere et al. (2015), a country's technological environment consists of users of internet and communication technologies. Larosiliere et al. (2015) consider internet users as the main technology-related factor that influences social network adoption. They find that country's technological factor (Internet Adopters) is positively associated with its adoption of social network systems.

According to Borgi and Tawiah (2022), XBRL is a computer-based reporting system that requires technological infrastructure such as the internet to operate efficiently and widely. Borgi and Tawiah (2022) find that the level of technological capacity measured by the proportion of the population using the internet is positive and significantly associated with a country's XBRL adoption decision using a sample of 175 countries. Mandilas et al. (2009) find that XBRL adoption is affected by the level of internet penetration in the country where the company is located using a sample of firms located in seven European countries. Therefore, the second hypothesis generated is :

H2: Countries with higher levels of technological capacity are more likely to adopt XBRL.

2.2.2. Organization factor

Education

Previous studies (Srivastava and Teo, 2006; Larosiliere et al., 2015) using the TOE framework at a country level consider education as one of the most important organizational predictors of IT adoption. The education factor plays an essential role in the use and adoption of innovations (Rawashdeh et al., 2011). Education includes knowledge, basic skills, and the required confidence to operate innovation-related applications successfully (Hambrick and Mason, 1984; Troshani and Doolin, 2005). High-quality scientific research institutions can generate the basic knowledge needed to build new technologies (WEF, GCR-2009-2017). According to Pinsker (2005), business graduates need to know how to use XBRL to be successful in their jobs. A lot of researchers including Steenkamp and Nel (2012) indicate there is a lack of knowledge of XBRL in several countries and by several users. Therefore, tertiary education institutions, such as universities, are well-placed to disseminate knowledge about XBRL, its benefits, and how to use it (Troshani and Doolin, 2007).

According to Troshani and Doolin (2005), employees should have a basic understanding of XBRL's functionality, benefits, and applications. Pinsker (2003) indicates that knowledgeable graduates are more likely to contribute to the enlargement of the scope of the adoption and implementation of XBRL by their future employers. Warren (2004) finds a positive relationship between education and the propensity to adopt the technology. According to Rahwani (2013) and Borgi and Tawiah (2022), XBRL education is one of the essential factors for a country to successfully implement XBRL. Borgi and Tawiah (2022) find that education is positive and highly significantly related to the adoption of XBRL using a sample of 175 developed and developing countries over 14 years. Hence, countries with high literacy are more likely to adopt XBRL than countries with low literacy. Based on these discussions, our third hypothesis is:

H3: Countries with higher levels of educated population are more likely to adopt XBRL.

2.2.3. Environnement factors

The environmental factors refer to the conditions and settings of the environment (i.e. business) in which the organization or enterprise resides (Larosiliere et al., 2015).

The level of economic development

Economic conditions are major determinants in the development of a country's accounting and financial system (Zeghal and Mhedhbi, 2006). Adhikari and Tondkar (1992) consider that a country's stage of development influences its accounting development and practice. As economies develop, the social function of accounting to measure and communicate economic data becomes much more important (Adhikari and Tondkar, 1992). According to Ben Othman and Zeghal (2008), in countries where the level of economic growth is relatively high, the social function of accountancy as an instrument of measurement and communication is of considerable importance. Business and economic activities reach a size and complexity that require sophisticated, high-quality corporate disclosure practices.

Thus, we estimate that the adoption of XBRL increases with the level of economic development. Wunnava and Leiter (2009) indicate that richer countries have well-developed market economies and well-established legal systems. Consequently, they are able and willing to invest more in research and development, and innovation. Thus, our fourth hypothesis is:

H4: Countries with a higher level of economic development are more likely to adopt XBRL.

The degree of external economic openness

Foreign investors, international accounting firms, international credit rating agencies, multinational corporations, and world financial institutions represent external pressures (Zeghal and Mhedhbi, 2006; Ben Othman and Zeghal, 2008). They have the potential to influence companies' decisions to adopt XBRL. According to Zehri and Chouaibi (2013), while a country's openness to the outside world enhances economic growth, it also engenders greater risks in terms of the security and scale of international pressure. These pressures are reflected in the volume of economic affairs. Such pressures can lead some countries to adopt XBRL. For example, according to Hamid and Salleh (2005), foreign investors are usually more cautious in protecting their economic interests in foreign companies. Through XBRL, foreign investors can effectively monitor their interests.

According to Cooke and Wallace (1990), the more a country's economy is open to the outside world, the more the country is exposed to external pressures. Thus, our fifth hypothesis is:

H5: Countries with a higher degree of external economic openness are more likely to adopt XBRL.

Investor protection

According to La Porta et al. (2000), the key mechanism for protecting outside investors, whether they are shareholders or creditors, is the legal system. This mechanism means both laws and their enforcement. When investor rights, such as the shareholders' voting rights and the creditors' reorganization and liquidation rights, are extensive and well enforced by regulators and the courts, investors are willing to finance companies. In contrast, when the legal system does not protect outside investors, corporate governance and external finance do not work well.

Therefore, given the benefits of XBRL, countries that protect investors are encouraged to adopt XBRL. On the other hand, countries with weak investor protection laws are also motivated to adopt XBRL to improve their investor protection and gain a better reputation and, then, attract investors.

According to Baldwin et al. (2006), a country tends to adopt XBRL to ensure the production of relevant information for decision-making, since it contributes to improving the quality of financial reporting. The country sees XBRL as a method to improve the transparency of financial information that protects investors. This protection stems from the availability of useful, complete, and timely disclosed information since investors must be able to analyze financial information. Consequently, XBRL makes this information easier to understand and easier to process then facilitates investors' decision-making. According to Ra and Lee (2018), although no guarantee exists that firms disclose more information under the XBRL system, XBRL improves accessibility through comparable and standardized reporting language. With better accessibility, the information asymmetry between firms and users will be reduced. Thus, our sixth hypothesis is:

H6: Investor protection affects the likelihood of XBRL adoption.

The accounting system: IFRS

According to Zehri and Chouaibi (2013), more than 100 countries have adopted or expressed their intention to adopt or converge towards the IFRS. Several researchers (e.g., Sudalaimuthu and Haraiharan, 2011; Zeghal and Mhedhbi, 2012; Ben Othman and Kossentini, 2015; Turki et al., 2016; Persakis and Iatridis, 2017; Ozkaya, 2018; Wook-bin and Yuk, 2018) confirm the benefits of the adoption of IFRS. For example, Ben Othman and Kossentini (2015) investigate the country-level association between the extent of IFRS adoption and the development of emerging stock markets using a sample of 50 emerging

economies over a period spanning from 2001 to 2007. They find that a higher level of IFRS adoption has both a positive and significant effect on stock market development.

Therefore, we expect that countries that adopt IFRS to enhance their financial statements will be more willing to adopt XBRL. XBRL and IFRS are a win-win situation (Shanmuganathan, 2016). According to Sudalaimuthu and Haraiharan (2011), IFRS and XBRL are two different projects; however, a combined project implementation approach can enable greater efficiency and control over reporting. Both IFRS and XBRL are intended to standardize financial reporting to promote transparency and improve the quality and comparability of business information. Therefore, the two form a perfect partnership. Accordingly, our seventh hypothesis is:

H7: Countries that have adopted IFRS are more likely to adopt XBRL.

The burden of government regulation

The burden of government regulation refers to how burdensome is it for a country's businesses to comply with governmental administrative requirements (e.g., permits, regulations, and reporting) (WEF, GCR 2009-2017). Government agencies require companies to publish financial information regularly for many different purposes. They require such information to verify that the companies are in the process of meeting the established laws and regulations (Sinnott and Willis, 2009; Bharosa et al., 2012). However, these requirements represent an administrative burden on all companies around the world (OECD, 2009; Chen, 2012) and may have a significant impact on the country's economy (Chen, 2012).

To avoid these problems, several countries have adopted Standard Business Reporting (SBR)/XBRL. SBR is a program that is used to reduce the burden of disclosure. The SBR program is based on XBRL which is a national financial taxonomy that companies use to report financial information to the government (OECD, 2009). This taxonomy seeks to avoid unnecessarily or duplicated data descriptions (OECD, 2009) and the standardization of the business and financial terms in the reporting (Chen, 2012; Richards et al., 2007; Chang and Jarvenpaa, 2005). In addition, once created, companies can use the XBRL data several times with no problem which greatly reduces the overall cost of the creation of the data and observation of compliance obligations (Bharosa et al., 2012; OECD 2009; Chang and Jarvenpaa, 2005).

XBRL also reduces the costs of preparing and producing reports by eliminating the time and effort required to re-key and verify information (Richards et al., 2007; Vasal and Srivastava, 2002; Willis et al., 2002). The software programs can perform automatic validation and detect fraud much faster than a manual approach and, thus, reduce labor costs (Chen, 2012). According to Rahwani et al. (2019), the use of XBRL can help the government to prevent accounting fraud by companies submitting multiple versions of the financial statement to different regulators. According to Kaa et al. (2018), high-quality business-to-government reporting helps to make economies strong and successful. Therefore, governments in different countries may encourage innovation like XBRL. Thus, our eighth hypothesis is:

H 8: Countries with a higher burden of government regulation are more likely to adopt XBRL.

3. Research design

3.1. Sample selection and data collection

We selected a large number of countries based on the list provided by Standard & Poor's¹ (2017). We excluded countries with missing data. Table 1 and Appendix 1 shows that our sample consists of 78 countries. It covers the period from 2009 to 2017. **The final dataset comprises 678 country-year observations.** Only a few countries had adopted XBRL before 2009 (e.g., in 2004, only two countries had adopted XBRL). We collected the data from different sources including, World Development Indicators (WDI) on the World Bank website (<http://data.worldbank.org>), the Global Competitiveness Report (from 2009 to 2017) of the World Economic Forum (WEF) and Deloitte's website (www.iasplus.com).

Insert Table 1 here

3.2. Econometric modeling

Given that our dependent variable is dichotomous, we use logistic regression to analyze the determinants of XBRL adoption. Our empirical model is as follows:

¹ <https://www.spglobal.com/spdji/en/documents/index-news-and-announcements/20170615-spdji-annual-country-classification-consultation-update.pdf>

$$\begin{aligned} \text{ADOPXBRL}_{it} = & \alpha_0 + \alpha_1 \text{TAB}_{it} + \alpha_2 \text{TECH}_{it} + \alpha_3 \text{EDUC}_{it} + \alpha_4 \text{LED}_{it} + \alpha_5 \text{DEEO}_{it} \\ & + \alpha_6 \text{INVPRO}_{it} + \alpha_7 \text{ACCSYS}_{it} + \alpha_8 \text{BGR}_{it} + \alpha_{10} \text{ESL}_{it} + \alpha_{11} \text{DEV}_{it} \\ & + \text{YEAR EFFECTS} + \varepsilon \end{aligned}$$

Where:

ADOPXBRL: The adoption of XBRL (source: specific country-based information).

We used the following four ways to measure our dependent variable, namely, the adoption of XBRL:

1. One if country (i) adopts XBRL without considering the purpose of adoption and zero otherwise.
2. One if country (i) adopts XBRL to meet the information needs of securities regulators and zero otherwise.
3. One if country (i) adopts XBRL to meet the information needs of at least one other government agency (chamber of commerce, companies house, statistical offices, tax administration, central balance sheet, banking regulators) and zero otherwise.
4. One if country (i) adopts XBRL to meet the information needs of both securities regulators and at least one other government agency and zero otherwise.

The following are the definitions of our independent and control variables:

Independent variables:

TAB: Country's firm-level technology absorption is measured by a score of 1 to 7 [1 = not at all; 7 = adopt extensively] (source: The Global Competitiveness Report of the World Economic Forum, WEF).

TECH: Technology capacity is the proportion of the population using the internet. Internet users are individuals who have used the internet (from any location) in the past 3 months (source: World Development Indicators, WDI, World Bank).

EDUC: Education is measured by the gross tertiary education enrollment rate (source: The Global Competitiveness Report of the World Economic Forum, WEF).

LED: The level of economic development is measured by the annual growth rate of the gross domestic product (GDP) per capita (source: World Development Indicators, WDI, World Bank).

DEEO: The degree of external economic openness is measured by the net inflows of foreign direct investment, divided by the GDP (source: World Development Indicators, WDI, World Bank).

INVPRO: The strength of investor protection is a combination of the extent of the disclosure index (transparency of transactions), the extent of the director liability index (liability for self-dealing), and the ease of the shareholder suit index (shareholders' ability to sue officers and directors for misconduct). It is measured on a 0–10 (best) scale (source: The Global Competitiveness Report of the World Economic Forum, WEF).

ACCSYS: The accounting system is represented by the adoption of IFRS. The adoption of IFRS is measured by a dummy variable that takes the value of one if country (i) requires the adoption of IFRS and zero otherwise (source: Deloitte's website, www.iasplus.com).

BGR: The burden of government regulation is measured by a score of one [extremely burdensome] to seven [not burdensome at all] (source: The Global Competitiveness Report of the World Economic Forum, WEF). We have reversed this order of the burden of government regulation score in our regressions to make it easier to interpret. Thus, one is now the lowest burden of government regulations and seven is the highest burden of government regulations.

Control variables:

ESL: English-speaking language is a dummy variable that takes the value one if English is the official language of the country and zero otherwise (source: specific country-based information).

DEV : The development of a country is a dummy variable that takes the value one if the country is developed, and zero otherwise (standard and poor's classification).

Year effects represent year dummy variables.

ε is the margin of error.

Index i indicates the individuals (the countries), and t is for time (the period covers the years from 2009 to 2017).

4. Empirical findings

4.1. Descriptive statistics

Table 2 presents the descriptive analysis of the independent and control variables. The sampled countries show a very large variability in our key variables. The country's firm-level technology absorption ranges from 3.4 to 6.5 with a mean of 5.028 and a standard deviation of 0.620. Technology capacity ranges from 2 to 98.136 with a mean of 57.526 and a standard deviation of 25.829. The mean of technology (57.526) indicates that more than half of the population has access to the internet. The variable education varies widely among the 78 countries with a minimum of 2.2 and a maximum of 116.6.

There is a large variation between the countries in terms of the level of economic development, degree of external economic openness, investor protection and burden of government regulation.

Regarding the variable accounting system, the majority of countries mandate the adoption of IFRS. For the variables English-speaking language and country's development, the most of countries in our sample do not use the English as an official language and are emerging.

Insert Table 2 here

Table 3 shows the descriptive analysis for the dependent variable (the adoption of XBRL). It shows that 68.14% of the country-year observations did not adopt XBRL while 31.86% of the country-year observations adopt XBRL. XBRL is adopted to meet the information needs of several government agencies such as securities regulators. This ensures the quality of the information provided to inform users, investors, and analysts. The adoption of XBRL also means that the information needs of chambers of commerce, companies' houses, statistical offices, tax administration, central balance sheet, and banking regulators can be met. For 17.85% of the country-year observations, the XBRL is adopted to meet the information needs of securities regulators. Of the country-year observations, 22.12% show that XBRL is adopted to meet the information needs of other government agencies. Further, 8.11% of the country-year observations show that XBRL is adopted to meet both the securities regulators and other government agencies needs. In general, the number of countries that adopt XBRL vary from 17 in 2009 to 29 in 2017. However, while the adoption is

increasing, just a few countries have adopted XBRL so far. This may be due to the lack of knowledge about XBRL and its benefits.

Insert Table 3 here

We examine the difference between the countries that adopted XBRL and those that did not by using the non-parametric Mann-Whitney test for the independent variables. This choice is based on the normality test (the Kolmogorov-Smirnov test). The normality assumption is not validated for all the variables.

Table 4 presents the results of the Mann-Whitney test. These show significant differences in the firm-level technology absorption, technology capacity, education, investor protection, the burden of government regulation and the country's development at the 1% level between the countries that adopted XBRL and those that did not. For the level of economic development, degree of external economic openness, accounting system and English-speaking language, there is no significant difference between the two groups.

Insert Table 4 here

4.2. Correlation analysis

Table 5 shows the correlation analysis. It shows that the adoption of XBRL is positively associated with the country's firm-level technology absorption, technology capacity, education level, the strength of investor protection and the country's development (at the 1% significance level). The burden of government regulation is negative and significant at the 1% level. Therefore, a higher burden of government regulation decreases the probability of adopting XBRL. The table also shows that multicollinearity is not a problem in our model. In addition, we conducted the Variance Inflation Factor (hereafter referred to as VIF) test. **The results² of the VIF indicate that the multicollinearity is not a concern in our analysis.**

Insert Table 5 here

4.3. Main Results

Table 6 shows our findings. It shows that the coefficient on the country's firm-level technology absorption is positively associated with the adoption of XBRL. The association between the two variables is statistically significant at the 1% level. This suggests that countries with high levels of technology absorption are more likely to adopt XBRL.

² All the VIF values of our independent variables are less than the critical value of 5.

According to Hentati et al. (2021), a firm that has a well-qualified staff with skills and knowledge increases the chance that XBRL will be adopted. Consequently, the firm will be able to better manage XBRL because the staff is already familiar with this type of innovation. Therefore, H1 is accepted. However, the table shows that the technology capacity has no statistically significant influence on the decision to adopt XBRL. We, therefore, reject H2.

We find also that the education level, which is included as an organizational factor, has no statistically significant impact on the adoption of XBRL as well. Hence, we reject H3. This is not consistent with our predictions and with previous research including Borgi and Tawiah (2022) and Troshani and Doolin (2005). Therefore, countries should implement other strategies that are complementary to the technology capacity and education level to promote the adoption of XBRL.

For the environmental factors, the coefficients on the level of economic development and investor protection are positive and statistically significant at the 1% level. This indicates that the probability of a country adopting XBRL increases with the level of economic development and with the level of investor protection. Therefore, we accept H4 and H6. Literature shows that the level of economic development constitutes a major determinant in adopting IFRS (Zehri and Chouaibi, 2013; Zeghal and Mhedhbi, 2006). IFRS and XBRL tend to enhance the quality of information (e.g. Shanmuganathan, 2016; Shan and Troshani, 2016; Markelevich et al., 2015). Hence, we can conclude that countries that have well-developed economies are more likely to adopt XBRL. In addition, Chung (2006) states that a good investor protection environment minimizes the costs of information asymmetry and reduces the probability of trading against informed traders. In contrast, a weaker investor protection environment leads to greater expropriation by managers and higher asymmetric information costs. XBRL helps to improve transparency; to reduce the asymmetry of information and earnings management; and improve the firm's governance (Sassi et al., 2021; Aksoy et al., 2021; Blankespoor, 2019; Birt et al., 2017; Shan and Troshani, 2016; Shkurti and Allko, 2016; Felo et al., 2018; Liu et al., 2017; Liu et al., 2014; Bai et al., 2014; Wang and Gao, 2012; Peng et al., 2011; Tan and Shon, 2009; Yoon et al., 2011; Premuroso and Bhattacharya, 2008; Hao et al., 2014; Lai et al., 2015). For that, countries with strong investor protection are more willing to adopt XBRL.

The table also shows that the coefficients on DEEO, ACCSYS and BGR are statistically insignificant. This indicates that the degree of external economic openness, the accounting system and the burden of government regulation did not drive countries to adopt XBRL. Therefore, we reject H5, H7 and H8.

For the control variables, the coefficient on the English-speaking language variable is negative and significant at the level of 1%. Countries, where English is the official language, are less likely to adopt XBRL. Countries, where English is not the official language, tend to overcome the language barriers and thus attract more investors. This is because XBRL improves and speeds up access to information in all languages and improves transparency. Further, foreign investors can rely on information in XBRL-tagged financial reports to make investment decisions without having to translate the financial statements into their language (Markelevich et al., 2015). For the country's development variable, the coefficient is positive and significant at the 1% level. Compared with developing countries, developed countries have adequate resources. Therefore, they are more inclined to adopt XBRL.

Insert Table 6 here

4.4. Adoption for different purposes

Countries adopt XBRL to meet the information needs of (i) securities regulators, (ii) other government agencies such as companies' houses, statistical offices, tax administration, and banking regulators, and/or (iii) both securities regulators and other government agencies. We test the determinants of XBRL adoption for each of these purposes. Table 7 presents the pooled logistic regression results. We, therefore, introduce three different measures for our dependent variable based on the purpose of XBRL adoption as follows:

Measure (1): we assign a value of 1 if country (i) adopts XBRL to meet the information needs of securities regulators and 0 otherwise.

Measure (2): we assign a value of 1 if country (i) adopts XBRL to meet the information needs of at least one of the other government agencies and 0 otherwise.

Measure (3): we assign a value of 1 if country (i) adopts XBRL to meet the information needs of both securities regulators and at least one of the other government agencies and 0 otherwise.

Using Measure (1), the adoption of XBRL to meet the information needs of securities regulators, Table 7 shows that the coefficients on the country's firm-level technology absorption, education level, level of economic development and investor protection are positive and significant at the 1% levels. This indicates that countries that have these characteristics are more willing to adopt XBRL to meet the information needs of securities regulators. The table also shows that the coefficient on the technology capacity is negative and significant coefficient at the 1% level. This indicates that countries with less internet penetration are more likely to adopt XBRL to encourage users and firms to use and benefit

more from the internet and IT as XBRL is an internet-based technology. It also shows that the coefficient on the degree of external economic openness is negative and significant at the 1% level. This is not surprising as Zehri and Chouaibi (2013) find that a country's openness level to the outside world negatively affects IFRS adoption by developing countries. Indeed, Ben Othman and Zeghal (2008) find that the degree of external economic openness has a negative impact on corporate governance disclosure. The table shows that the coefficients on the accounting system and the burden of government regulation are insignificant. For the control variables, the analysis suggests that country's development positively affects XBRL adoption, while the English-speaking language variable has no impact on XBRL adoption.

Using Measure (2), the adoption of XBRL to meet the information needs of at least one of the other government agencies, we find that the coefficients on the level of economic development and the burden of government regulation are positive and statistically significant at 1% and 5% respectively. We noted that the coefficient on the mandatory adoption of IFRS is negative and statistically significant. The adoption of XBRL to meet the information needs of government agencies aims to reduce the firm's administrative burden and to enhance the work of government agencies (e.g. Kaya and Pronobis, 2016; Bharosa et al., 2012; Chen, 2012). IFRS is designed to enhance the information provided to investors (Houque et al., 2014). Hence, there is no relation between the adoption of IFRS and the adoption of XBRL to meet the information needs of at least one of the other government agencies. For example, according to Samuel et al. (2013), financial accounting and Taxation accounting have different purposes and requirements. The objective of accounting is the preparation of information for control and decision making and the main purpose of taxation is to raise revenue. We also find that the English-speaking language variable is negative and significant at the level of 1%. In addition, the coefficient on the country's development variable is positive and significant at the 1% level.

Using Measure (3), to meet the information needs of both securities regulators and at least one other government agency, we find that the coefficients on the country's firm-level technology absorption and education are positive and significantly significant at the levels of 5% and 1%. The coefficients on the technology capacity, the degree of external economic openness and the mandatory adoption of IFRS are negative and significant at the level of 1% and 5%). Therefore, countries should adopt other policies that are complementary to the technology capacity, the external economic openness and the mandatory adoption of IFRS to facilitate the adoption of XBRL. For the control variables, the coefficient on the country's development is positive and significant at the 1% level.

Insert Table 7 here

4.5. Additional analysis

Comparison of the determinants of adoption of XBRL between developed and developing countries

We also compare the factors that could explain the decision to adopt XBRL by developed countries and developing countries separately. We use the pooled logistic regression. Our dependent variable is one if the country (i) adopts XBRL (whatever the purpose of adoption: to meet the information needs of securities regulators or other government agencies) and zero otherwise. We split our sample into two sub-samples: a sub-sample of developed countries and a sub-sample of developing countries (see table 8).

Developing countries:

We find that the country's firm-level technology absorption as a technological factor has a positive and significant impact (at the level of 1%) on XBRL adoption. For the organizational factor, the education level is positive and significant at only 10% level. The level of economic development and investor protection as environmental factors have a positive and significant effect (at the 1% level) on the decision to adopt the XBRL. However, the coefficients on technology capacity, the burden of government regulation and the English-speaking language are negative and significant.

Developed countries:

We find that the variable technology capacity has a significant (at the level of 1%) and positive impact on the adoption of XBRL for developed countries. According to Borgi and Tawiah (2022), developed countries have adequate resources to implement XBRL and developing countries, need some external support and pressures for the successful implementation of new accounting technology such as XBRL. For the country's firm-level technology absorption, the coefficient is negative but significant at the 10% level. For the environmental factors, the level of economic development, investor protection and the burden of government regulation has a positive and significant effect on the decision to adopt the XBRL. The coefficient on the mandatory adoption of IFRS is negative and significant at the level of 10%.

Insert Table 8 here

5. Conclusion

We identified the key factors associated with the countries' decisions to adopt XBRL. We used the pooled logistic regressions on 78 countries over the period from 2009 to 2017. The results of the empirical analysis indicated that the countries that are most likely to adopt XBRL are those that have high levels of technology absorption, higher levels of economic development and strong investor protection. We found this result by measuring the dependent variable, adoption of XBRL, by one if country (i) adopts XBRL without considering the objective of that adoption and zero otherwise.

We also introduced three other measures for the adoption of XBRL. This first measure is one if country (i) adopts XBRL to meet the information needs of securities regulators and zero otherwise. The second measure is one if country (i) adopts XBRL to meet the information needs of at least one other government agency (which are the chamber of commerce, companies house, statistical offices, tax administration, central balance sheet, and banking regulators) and zero otherwise. The third measure is one if country (i) adopts XBRL to meet the information needs of both securities regulators and at least one other government agencies. Using each measure, we find several factors affecting the country's decision to adopt XBRL.

In addition, we investigate the separate factors that affect developing and developed countries' decisions to adopt XBRL without considering the purpose of adoption. Our findings show that country's firm-level technology absorption, education level, level of economic development and investor protection promote the adoption of XBRL in developing countries. For developed countries, we found that technology capacity, the level of economic development, investor protection and the burden of government regulation positively affect XBRL adoption.

This paper provides policy implications. To attract foreign investment, it is important to improve information quality through the adoption of XBRL. Hence, regulators and managers must facilitate the adoption of XBRL. Our study is especially useful for researchers, professionals, and countries that have not yet adopted XBRL to better understand the specific factors that may promote the adoption of XBRL. It also helps the XBRL international consortium and regulators to formulate effective strategies that facilitate all countries to adopt XBRL.

This study has some limitations. Small number of countries have adopted XBRL and the data on XBRL adoption at a country level is quite limited. Future research could provide large-scale evidence by extending the sample period and including more countries in the analysis. In addition, our findings in Table 7 differ across three purpose of XBRL adoption and from the overall findings reported in Table 6. It is not clear why there is such a difference under the TOE framework. We treat this as a purely empirical question that requires qualitative research paradigms to answer. Finally, it would be interesting to consider other determinants that may affect the countries' adoption of XBRL and investigate the consequences of the adoption of XBRL at the country level.

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Table 1: Presentation of 78 countries of the sample by region over nine-year period from 2009 to 2017

Africa (10 countries)	Middle East and North Africa (11 countries)	America (12 countries)	Asia and Oceania (18 countries)	Europe (28 countries)
Egypt (0)	Israel (1)	Canada (1)	Japan (1)	Belgium (1)
South Africa (1)	Morocco (0)	United States (1)	South Korea (1)	Spain (1)
Botswana (0)	Bahrain (0)	Brazil (0)	Singapore (1)	France (1)
Cote d'Ivoire (0)	Jordan (0)	Chile (1)	Philippines (0)	United Kingdom (1)
Ghana (0)	Kuwait (0)	Mexico (0)	China (1)	Ireland (1)
Kenya (0)	Lebanon (0)	Peru (0)(1)	India (1)	Italy (1)
Mauritius (0)	Oman (0)	Ecuador (0)	Indonesia (0)(1)	Luxembourg (1)
Namibia (0)	Qatar (0)	Jamaica (0)	Malaysia (0)(1)	Netherlands (1)
Nigeria (0)	Tunisia (0)	Panama (0)	Bangladesh (0)	Portugal (0)
Zambia (0)	United Arab Emirate (UAE) (0)(1)	Trinidad & Tobago (0)	Kazakhstan (0)	Hungary (0)
	Turkey (0) (1)	Argentina (0)	Pakistan (0)	Czech Republic (0)
		Colombia	Slovakia	Poland

(0)	(0)	(1)
	Sri Lanka	Russia
	(0)	(0)
	Vietnam	Bulgaria
	(0)	(0)
	New Zealand	Croatia
	(0)	(0)
	Australia	Estonia
	(1)	(1)
	Hong Kong	Latvia
	(0)	(0)
	Thailand	Slovenia
	(0)	(0)
		Ukraine
		(0)
		Romania
		(0)
		Austria
		(0)
		Sweden
		(1)
		Switzerland
		(0)
		Cyprus
		(0)
		Denmark
		(0) (1)
		Lithuania
		(0)
		Greece
		(0)

The values of 0 and 1 are defined as follows:

1 if XBRL is adopted in the country (whatever the purpose of adoption: to meet the information needs of securities regulators or other government agencies);

0 if not

As Appendix 1 shows, there are different years of adoption of XBRL for the same country (depending on the purpose of adoption: for securities regulators and other government agencies), we attribute code 1 from the first adoption of XBRL. For example, in the case of the South Korea, we attribute the code 1 from 2009.

Some countries – for example – UAE and Turkey - have two values (0 and 1). The value of 0 is assigned for the period when the country did not start using XBRL and 1 is assigned for the period of adopting XBRL. In other words, the adoption of XBRL for these countries has occurred between 2009 and 2017.

When we used the other measures for the adoption of XBRL:

For the adoption of XBRL to meet the information needs of securities regulators, the value 1 is attributed to the first year of use of XBRL in the country to meet the information needs of securities regulators.

For the adoption of XBRL to meet the information needs of other government agencies: if the country has different periods of adoption, we take into consideration the first adoption and we attribute the value 1 from the first year of using XBRL.

Some countries use XBRL as a project to assess the potential benefit that XBRL may offer. We did not consider the use of project XBRL as an adoption.

**Table 2: Descriptive statistics of the independent and control variables for the full sample
(Number of observations = 678)**

Variables	Mean	Std. Dev.	Min	Max
TAB	5.028	0.620	3.4	6.5
TECH	57.526	25.829	2	98.136
EDUC	46.932	25.730	2.2	116.6
LED	1.522	3.593	-15.151	23.985
DEEO	6.339	18.972	-15.745	280.131
INVPRO	5.926	1.376	2.7	9.7
ACCSYS	0.827	0.378	0	1
BGR	3.624	0.754	0.7	5.3
ESL	0.277	0.447	0	1
DEV	0.292	0.455	0	1

TAB: country's firm-level technology absorption; TECH: Technology capacity; EDUC: education; LED: level of economic development; DEEO: the degree of external economic openness; INVPRO: strength of investor protection; ACCSYS: the accounting system (IFRS); BGR: burden of government regulation; ESL: English speaking language; DEV: country's development

Table 3: Descriptive statistics of the dependent variable

Panel A: Summary statistics of XBRL for years 2009 -2017								
Variables	ADOPXBRL		ADOPXBRL-SR		ADOPXBRL-OGA		ADOPXBRL-SROGA	
	0	1	0	1	0	1	0	1
Frequency	462	216	557	121	528	150	647	55
Percent	68.14	31.86	82.15	17.85	77.88	22.12	91.89	8.11
Mean	0.318		0.178		0.221		0.081	

Panel B: Yearly number of countries adopting XBRL from 2009 to 2017								
	0	1	0	1	0	1	0	1
2009	61	17	68	10	68	10	75	3
2010	58	20	67	11	64	14	73	5
2011	56	22	66	12	62	16	72	6
2012	52	26	65	13	59	19	72	6
2013	51	27	64	14	58	20	71	7
2014	50	28	63	15	58	20	71	7
2015	50	28	63	15	58	20	71	7
2016	49	29	62	16	58	20	71	7
2017	49	29	62	16	58	20	71	7

ADOPXBRL: the adoption of XBRL to meet the information needs of securities regulators or one of the other government agencies; ADOPXBRL-SR: the adoption of XBRL to meet the information needs of securities regulators; ADOPXBRL-OGA: the adoption of XBRL to meet the information needs of other government agencies (which are: chamber of commerce, companies' house, statistical offices, tax administration, central balance sheet and banking regulators); ADOPXBRL-SROGA: the adoption of XBRL to meet the information needs of both securities regulators and at least one of other government agencies and zero otherwise.

Table 4: Comparison of variables between the two groups of countries' adoption

Mann-Whitney test				
Variables	Rank Sum		Z	Sig.
	Adoption=1	Not adoption=0		
TAB	99717.5	130463.5	-11.116	0.000***
TECH	98016.5	132164.5	-10.388	0.000***
EDUC	94441	135740	-8.883	0.000***
LED	75913	154268	-1.086	0.277

DEEO	73654	156527	-0.136	0.892
INVPRO	93295	136886	-8.418	0.000***
ACCSYS	73764	156417	-0.278	0.781
BGR	64608.5	165572.5	3.675	0.000***
ESL	75402	154779	-1.123	0.261
DEV	100086	130095	-14.296	0.000***

TAB: country's firm-level technology absorption; TECH: Technology capacity; EDUC: education; LED: level of economic development; DEEO: the degree of external economic openness; INVPRO: strength of investor protection; ACCSYS: the accounting system (IFRS); BGR: burden of government regulation; ESL: English speaking language; DEV: country's development

***Significant at the 1% level

Table 5 : correlation matrix

	ADOPX BRL	TAB	TECH	EDUC	LED	DEEO	INVPRO	ACCSY S	BGR	ESL	DEV
ADOPXBRL	1.000										
TAB	0.427***	1.000									
TECH	0.399***	0.569***	1.000								
EDUC	0.341***	0.282***	0.638***	1.000							
LED	0.041	-0.123***	-0.217***	-0.140***	1.000						
DEEO	0.005	0.093**	0.032	-0.025	0.146***	1.000					
INVPRO	0.323***	0.180***	0.161***	0.257***	0.097**	0.016	1.000				
ACCSYS	0.010	-0.008	0.202***	0.190***	-0.099***	0.107***	-0.019	1.000			
BGR	-0.141***	-0.438***	-0.189***	0.164***	-0.125***	-0.242***	-0.119***	0.074*	1.000		
ESL	0.043	0.090**	-0.135***	-0.194***	-0.012	0.034	0.297***	0.030	-0.176***	1.000	
DEV	0.549***	0.644***	0.632***	0.514***	-0.192***	0.023	0.297***	0.027	-0.152***	0.189***	1.000

ADOPXBRL: The adoption of XBRL to meet the information needs of securities regulators or one of the other government agencies; TAB: country's firm-level technology absorption; TECH: Technology capacity; EDUC: education; LED: level of economic development; DEEO: the degree of external economic openness; INVPRO: strength of investor protection; ACCSYS: the accounting system (IFRS); BGR: burden of government regulation; ESL: English speaking language; DEV: country's development.

***Significant at the 1% level, **significant variable to 5%, *significant at the 10% level

Table 6: The pooled logistic regression analysis for the adoption of XBRL to meet the information needs of securities regulators or other government agencies (whatever the purpose of adoption)

Variables	Expected results	Coefficients (p-Value)
TAB	+	0.971 (0.002)***
TECH	+	-0.001 (0.836)
EDUC	+	-0.002 (0.736)
LED	+	0.189 (0.000)***
DEEO	+	-0.013 (0.196)
INVPRO	+/-	0.376 (0.000)***
ACCSYS	+	0.211 (0.481)
BGR	+	0.204 (0.281)
ESL		-0.933 (0.002)***
DEV		2.438 (0.000)***
Year Effect		Yes
Constant		-9.782
R-squared		0.3277
LR chi2		278.08
Prob > chi2		0.000
Number of observations		678
TAB: country's firm-level technology absorption; TECH: Technology capacity; EDUC: education; LED: level		

of economic development; DEEO: the degree of external economic openness; INVPRO: strength of investor protection; ACCSYS: the accounting system (IFRS); BGR: burden of government regulation; ESL: English speaking language; DEV: country's development, Year Effect represents dummy variables that reflect the years between 2009 and 2017.

***Significant at the 1% level

Table 7: The pooled logistic regression analysis

Variables	Expected results	The adoption of XBRL to meet the information needs of securities regulators	The adoption of XBRL to meet the information needs of at least one of the other government agencies	The adoption of XBRL to meet the information needs of both securities regulators and at least one of the other government agencies
		Coefficients (p-Value)	Coefficients (p-Value)	Coefficients (p-Value)
TAB	+	1.475 (0.000)***	0.189 (0.565)	1.049 (0.055)*
TECH	+	-0.0345 (0.000)***	0.003 (0.671)	-0.091 (0.000)***
EDUC	+	0.026 (0.001)***	0.001 (0.818)	0.073 (0.000)***
LED	+	0.146*** (0.006)	0.166*** (0.001)	0.164* (0.065)
DEEO	+	-0.077 (0.000)***	0.004 (0.538)	-0.092 (0.041)**
INVPRO	+/-	0.390 (0.000)***	0.059 (0.526)	-0.016 (0.912)
ACCSYS	+	0.368 (0.273)	-0.870 (0.005)***	-1.531 (0.002)***
BGR	+	-0.190 (0.405)	0.528 (0.012)**	0.598 (0.145)
ESL		-0.135 (0.657)	-0.802 (0.010)***	0.039 (0.929)

DEV	1.188 (0.005)***	2.887 (0.000)***	3.603 (0.000)***
Year Effect	Included	Included	Included
Constant	-11.135	-5.917	-10.783
R-squared	0.2744	0.2898	0.4022
LR Chi2	174.53	207.70	153.54
Prob > chi2	0.000	0.000	0.000
Number of observations	678	678	678

TAB: country's firm-level technology absorption; TECH: Technology capacity; EDUC: education; LED: level of economic development; DEEO: the degree of external economic openness; INVPRO: strength of investor protection; ACCSYS: the accounting system (IFRS); BGR: burden of government regulation; ESL: English speaking language; DEV: country's development; Year Effect represents dummy variables that reflect the years between 2009 and 2017.

***Significant at the 1% level, **significant variable to 5%, *significant variable to 10% level.

Table 8: Comparison between developed countries and developing countries –Pooled logistic regressions for the adoption of XBRL to meet the information needs of securities regulators or other government agencies (whatever the purpose of adoption)

Variables	Expected results	Sub-sample of developed countries	Sub-sample of developing countries
		Coefficients (p-Value)	Coefficients (p-Value)
TAB	+	-1.379 (0.054)*	1.813 (0.000)***
TECH	+	0.091 (0.000)***	-0.027 (0.009)***
EDUC	+	-0.002 (0.854)	0.018 (0.073)*
LED	+	0.341	0.205

		(0.009)***	(0.001)***
DEEO	+	0.014 (0.402)	-0.037 (0.305)
INVPRO	+/-	0.302 (0.058)*	0.711 (0.000)***
ACCSYS	+	-1.067 (0.068)*	0.702 (0.131)
BGR	+	1.285 (0.001)***	-0.648 (0.024)**
ESL	+	-0.294 (0.553)	-0.915 (0.066)*
Year Effect		Included	Included
Constant		-2.891	-13.165
R-squared		0.1743	0.2826
LR Chi2		41.11	116.61
Prob > chi2		0.000	0.000
Number of observation		198	480

TAB: country's firm-level technology absorption; TECH: Technology capacity; EDUC: education; LED: level of economic development; DEEO: the degree of external economic openness; INVPRO: strength of investor protection; ACCSYS: the accounting system (IFRS); BGR: burden of government regulation; ESL: English speaking language; DEV: country's development; Year Effect represents dummy variables that reflect the years between 2009 and 2017.

***Significant at the 1% level, **significant variable to 5%, *significant variable to 10% level.

Appendix 1: XBRL adoption on the world

Countries	BR	CBS	SMR	BRG	CH	TA	SO
Argentina	*						
	P						
Australia	*	*	*	*		*	*
	(2010)	(2010)	(2010)	(2010)		(2010)	(2010)
	V	V	V	V		V	V
Belgium	*	*				*	*
	(2007)	(2007)				(2011)	(2009)
	M	M					
Brazil	*					*	
	P					P	
Canada			*				
			(2007)				
			V				
Chile			*				
			(2009)				

		V
		(2010)
		M
China		*
		(2004)
		M
Colombia	*	
	P	
Denmark		*
		(From
		2012)
		M
Estonia		*
		(2010
		V)
		(2012
		M)
Finland	*	
	V	
France	*	*

	(2007)	(2009)	
	M	M	
Greece	*		
	M		
India	*	*	
	(2008)	(2011)	
	M	M	
Indonesia	*		
	(2012)		
	M		
Ireland	*	*	*
	V	(2011)	(2012
		P	V)
			(2013
			M)
Israel		*	
		(2008)	
		M	
Italy		*	
		(2009)	
		M	

Japan	*		*		*
	(2006)		(2008)		(2004)
	M		M		M
Luxembourg	*		*		*
	(2008)		V		V
	M				
Malaysia	*				
	(2012)				
	M				
Mexico	*				
	P				
Netherlands	*	*	*	*	*
	(2011)	(2011)	(2011)	(2011)	(2011)
	V	V	V	V	V
New Zealand				*	
				P	
Peru	*		*		
	(2013)		(2013)		
	V		V		
Poland	*		*	*	
	M		(2011)	(2010)	

			P	M
Russia	*			
	P			
South Africa			*	
			(2009)	
			V	
South Korea	*		*	
	(2010)		(2007)	
	V		M	
Spain	*	*	*	*
	(2008)	(2007)	(2005)	(2009)
	M	V	M	M
Sweden				*
				(2006)
				V
Switzerland	*			
	P			
Taiwan			*	
			(2010)	
			M	
Turkey			*	

		(2016)	
		M	
United Arab Emirates		*	
		(2011)	
		P	
		(2014)	
		M	
United- States	*	*	
	(2005)	(2005	
	M	V)	
		3	
		phases	
		(2009)	
		M	
		(2010)	
		M	
		(2011)	
		M	
United Kingdom (UK)		*	*
		V	(2011)

(2013 M
M)

XBRL is adopted by companies in a country to meet the information needs of :

BR: Banking Regulator; **CBS:** Central Balance Sheet; **SMR:** Stock Market Regulator; **BRG:** Business Register; **CH:** Companies House ; **TA:** Tax Administration ; **SO:** Statistical Offices

V: voluntary adoption of XBRL; **M:** mandatory adoption of XBRL ; **P:** the adoption of XBRL as a pilot project

The year of adoption of XBRL is indicated in brackets

We did not include in our sample the countries in which we do not have enough information regarding the adoption of XBRL.
