

Voluntary XBRL Adopters and Firm Characteristics: An Empirical Analysis

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Abstract. Some of the governance weaknesses stem from the information asymmetry between insiders and the investing public. One way to mitigate the information asymmetry problem is to enhance accounting disclosures through XBRL format. In this paper, we analyze financial characteristics of voluntary adopters of XBRL. We build a multivariate logistic regression model to examine the relationship between firm characteristics and voluntary XBRL adopters. The new results of this study indicate that plant intensity (political costs), PE ratio (growth), and inventory ratio (complexity) are useful in discriminating voluntary “XBRL adopters” from non-adopters. We also confirm prior results with respect to firm size and debt ratio. We also build a multiple regression model and use the Governance Score developed by Brown and Caylor (2006) to further investigate the relationship between corporate governance rating and operating performance for voluntary XBRL adopters. Our results indicate that current ratio (liquidity), size, and auditor type are associated with corporate governance rating for voluntary adopters of XBRL.

Keywords: XBRL; interactive reporting; voluntary adoption; logistic regression; information asymmetry

1 INTRODUCTION

The United States Securities and Exchange Commission (SEC) introduced a voluntary XBRL (eXtensible Business Reporting Language) filing program during 2005. In response, several firms voluntarily chose to report their financial statements to the SEC using the XBRL format during the next three years. We investigate some of the financial characteristics of these voluntary adopters of

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XBRL in this paper. The financial scandals at Enron, WorldCom, Tyco, Madoff Investment Securities, and others have exposed corporate governance weaknesses and have increased the interest of investors and scholars alike in various governance and accounting transparency issues. Some of the governance weaknesses stem from the information asymmetry between insiders and the investing public. One way to mitigate the information asymmetry problem is to enhance accounting disclosures through the adoption of XBRL format.

Diamond and Verrecchia (1991) argue that if firms increase the level of disclosures, the level of information asymmetry is decreased. When a firm provides financial reports in a high-quality, standardized (XBRL) format, that firm is likely to be viewed as less risky by investors. Such a favorable perception could potentially decrease the cost of capital for that firm and stock price of that firm could go up. Yoon *et al.* (2011) examine whether or not XBRL adoption reduces information asymmetry in the Korean stock market. Using t-tests and multiple regression analysis in their study, they report a significant reduction of the information asymmetry for large firms in the Korean stock market. Pinsker and Li (2008) argue that early adopters can signal transparency through XBRL filings which can get them better access to capital markets which in turn, can result in lower cost of capital.

The “contracting approach” of accounting theory assumes information and contracting costs to be non-zero and predicts that accounting method choices are determined by the use of accounting numbers in contracts between capital suppliers, managers, suppliers, and customers. Contracting costs include transaction costs, agency costs (such as bonding costs, monitoring costs, and the residual loss from dysfunctional decisions), renegotiation costs, and bankruptcy costs (Watts and Zimmerman, 1990). Because a market price is absent within the firm, there are systems for assigning decisions among managers, and measuring, rewarding and punishing managerial performance. Meckling and Jensen (1986) argue that accounting plays an important role in these systems and is an integral part of the firm's efficient contracting technology. We emphasize the contracting perspective of accounting and posit that the XBRL adoption decision is influenced by information and contracting costs. This study will identify a set of predictor variables of firms that have voluntarily filed financial statements using the XBRL format. Debreceeny *et al.* (2005) suggest that researchers should examine the

adoption of information systems innovations. Voluntary adoption of XBRL is one such innovation that is examined in this study. Alles *et al.* (2008) have called for exploiting the comparative advantage of academic accounting researchers to provide value added research in the XBRL area. Several researchers including Baldwin *et al.* (2006, 2011), Bonson *et al.* (2009), Srivastava (2009), Bovee *et al.* (2001), Plumlee and Plumlee (2008), Debreceeny *et al.* (2005), Boritz and No (2008) and others have called for additional investigation of multiple XBRL related issues. What characteristics of a firm are associated with the XBRL adoption decision? Does company size influence XBRL filing? Does leverage influence the XBRL decision? Does firm complexity play a role? What is the impact of auditor type on the adoption decision? Does plant (asset) intensity play a role in the adoption decision? We extend the prior research in the area of voluntary XBRL adoption in three ways. First, we use explanatory variables derived from multiple theories: agency theory, innovation diffusion theory, institutional change theory and information and contracting costs theory. Second, our sample size of XBRL adopters ($n=102$) is bigger than some of the earlier studies (for e.g. Premuroso, R. and S. Bhattacharya (2008) had a sample size of 20, Callaghan and Nehmer (2009) had 39 firms in their sample and Efendi *et al.* (2009) examined 53 XBRL adopters). Third, we use OLS regression to examine the relationship between corporate governance rating and operating performance for voluntary XBRL adopters. We use several interesting explanatory variables including Tobin's Q.

In this paper, we review prior research exploring the relationship between firm characteristics and the XBRL adoption decision. We present empirical results on characteristics of firms that have adopted XBRL and a group of control firms that did not adopt XBRL. Explanatory variables used in this study include: debt ratio (leverage), cash flow to sales ratio, firm size, price earnings ratio, auditor type, inventory to total assets ratio, audit type, Tobin's Q and others. Some of the accounting variables used above are historical and have an inward looking focus. They measure the past successes of various decisions taken by the board of directors. On the other hand, market based measures mentioned above (PE ratio, and Tobin's Q) are forward looking in the sense that they emphasize future expected earnings of the firm. These measures reflect current plans and strategies of the management team. Section 2 provides a brief literature review. Section 3 deals with hypothesis development. The data and methodology are discussed in

sections 4. Section 5 describes the empirical results for both logistic regression and multiple regression models. A conclusion for the paper is provided in the sixth section.

2 LITERATURE REVIEW

Koh *et al.* (2010) examined 206 voluntary XBRL filers in South Korea from three perspectives: external financing, governance structure, and auditing. In 2007, South Korea developed “K-GAAP Common Taxonomy” for the voluntary filers. The authors conclude that XBRL adoption in Korea is associated with low accounting performance and higher amounts of external debt. They also report that clients of Big 4 accounting firms are more likely to adopt XBRL voluntarily. Koh *et al.* (2010) also conclude that earnings quality of voluntary XBRL filers is higher than their control firms.

Bartley *et al.* (2011) select their sample from the SEC’s Voluntary Filing Program and examine the accuracy of these XBRL filings. Their findings indicate that there were reductions in filing errors over time. They conclude that the voluntary filing program is useful in identifying and solving unanticipated technical issues before a mandatory technological innovation in financial reporting is imposed on a large number of filers. Efendi *et al.* (2009) examine the financial characteristics of 53 voluntary adopters of XBRL in the US. They conclude that voluntary adopters are larger and more innovative firms in their respective industries. They also find that report lags have decreased over time and efficiency in XBRL reporting is increasing. Zheng and Roohani (2010) use a third party rating system (XBRL Cloud EDGAR Dashboard) to examine XBRL filings. They examine deficiencies in mandatory XBRL filings and firm characteristics associated with them. They conclude that deficiencies are less severe in 10Q filings compared to XBRL extensions and are filed by bigger and more complex firms. They also report that more complex firms used the XBRL format voluntarily in earlier years. An interesting (and intuitive) finding in the Zheng and Roohani (2010) study is XBRL filers are less likely to have major errors, if they have already filed in the XBRL format several times. According to Zheng and Roohani (2010) these firms might still have more minor errors. Abdullah *et al.* (2009) and Cordery *et al.* (2011) suggest that a governmental mandate is needed in different countries before XBRL becomes more widely used. Several other studies (Valentinetti and Rea, (2011), Troshani and Rao (2007), Ghani *et al.*

(2009), Azam and Taylor (2011)) have examined many aspects of the XBRL phenomenon including adoption strategies, technological innovations, variations in adoption, user perceptions, gaps and misfits, and complexities associated with XBRL implementation.

Yoon *et al.* (2011) examine whether or not XBRL adoption reduces information asymmetry in the Korean stock market. They measure information asymmetry using a relative bid-ask spread measure. Based on their examination of a sample of 550 firms, they report highly significant and negative association between XBRL adoption and information asymmetry. They use four control variables including volatility, firm size, turnover rate, and stock price. Bonson *et al.* (2009) conducted a Delphi investigation regarding XBRL adoption. They surveyed a panel of 29 XBRL experts asking them about potential reasons for voluntary adoption of XBRL format. The top three reasons identified by the experts are: 1) gaining a deeper knowledge of XBRL; 2) acquisition of image as a pioneer of technology and 3) to obtain technical advantages of XBRL.

Premuroso and Bhattacharya (2008) examined a sample of 20 early adopters of XBRL. They investigated the relationship between governance and operating characteristics and the adoption decision. The authors conclude that liquidity (current ratio) and firm size are associated with the decision to voluntarily adopt the XBRL format. Callaghan and Nehmer (2009) examine a sample of 39 firms and conclude that the voluntary XBRL adopters are larger in size, less financially leveraged (book value of debt to market value of equity) and have lower corporate governance ratings than the control firms. Even though the SEC has recently mandated that all public companies must submit their filings in the XBRL format (SEC 2009), it is still interesting to examine voluntary XBRL adoption in the context of confirming the predictions of agency theory, signaling theory, and positive accounting theory in the accounting literature.

XBRL facilitates the exchange of financial information and accounting data between software programs. It is based on XML (eXtensible Markup Language). XBRL allows businesses to report their accounting/financial (and non-financial) data in a standardized format.

Former SEC chairman, Christopher Cox (XBRL Conference speech on January 18, 2006) states: "Few understand the SEC's interest in interactive data. The real basis of our interest in interactive data is tied to our fundamental mission

– to protect investors. Markets function best when all the information that market participants need is available to them when they want it, and in a form they can use.”

Taylor and Dzarainin (2010) suggest that XBRL has three key benefits for financial reporting: accessibility, usability, and comparability. Once a company creates an instance document and files it with the SEC, the instance document containing financial statements and XBRL tags becomes accessible to anyone interested. Investors and other can even use Excel to download these instance documents into preferred formats. Since these instance documents and tagged data are computer-readable, there is no need to transcribe data from a PDF or HTML document. Usability is considerably enhanced since XBRL eliminates the need to build a database from scratch (through additional data entry). XBRL taxonomies (classification schemes or dictionaries) allow for tagging (akin to bar coding) of data in a standardized fashion. Tagging in a uniform way makes data comparable across companies.

Former SEC chairman, Christopher Cox observed in a speech to the AICPA (on December 8, 2008): “In the same way that IFRS might someday soon make financial statements understandable to investors anywhere on earth, the 30 different spoken languages that will someday soon be embedded in XBRL data tags attached to public company financial statements could let any investor read an IFRS or U.S. GAAP financial statement from any country in his or her own native language. Interactive data is being introduced in nearly every major market around the world. As the use of interactive data in SEC filings becomes the norm, we can look forward to a streamlined financial reporting process that provides more timely access to information for investors, financial analysts, and regulators. XBRL tagging promises easier identification and comparison of financial data, and will vastly simplify cross-border analysis. (...) At the SEC, we are on the threshold of replacing the EDGAR model with a new 21st-century reporting system that runs on interactive data.”

3 HYPOTHESIS DEVELOPMENT

While several studies (Efendi *et al.* 2009, Zheng and Roohani 2010, Efendi *et al.* 2011) have documented significant effects for the size variables, others (Wallace *et al.* 1995, Camfferman and Cooke, 2002, for their Netherlands sample, and Alsaeed, 2005) have reported no relationship between size and

disclosure levels. Callaghan and Nehmer (2009) have found that larger firms are more likely to adopt XBRL filings voluntarily. Ettredge *et al.* (2002) found that voluntary information disclosure on corporate web sites is associated with firm size. Larger firms are subject to more attention from investors and financial analysts and hence may increase disclosures. Moreover larger firms have adopted technologies such as Just in Time (Efendi *et al.* 2009) and Business to Business systems earlier than smaller firms. Various measures of firm size appear in the literature. Dowell *et al.*, (2000) use the logarithm of total assets with mixed results in examining whether corporate global standards create or destroy market value. Since we use total assets in debt ratio and in inventory ratio, we follow Yoon *et al.* (2011) and use the logarithm of market value of equity as the size measure.

H1: Ceteris paribus, there is a positive relationship between firm size (natural logarithm of market value of equity) and the decision to adopt XBRL voluntarily.

Complex firms may want to signal to the investors that they are in the forefront of technology adoption. Firms with high inventory levels in multiple locations may already be technologically adept and may have already invested in information systems innovations. Zheng and Roohani (2010) report that more complex firms used the XBRL format voluntarily in earlier years. Chan *et al.* (1993) find that inventory to total assets ratios proxy for complexity and risk and are a determinant of audit fees. Positive accounting theory also supports the existence of political costs as an explanation for more disclosure. Studies explaining agency theory support the use of the proportion of fixed assets in place to explain variation in voluntary disclosures (see Chow and Wong-Boren, 1987). If a firm already has large amounts of fixed assets in place, it has less incentive for voluntary disclosures. To proxy for political costs, we use inventory to total assets ratio and plant intensity (property, plant and equipment (PPE) to total assets) as explanatory variables in the logit model.

H2: Ceteris paribus, there is a positive relationship between inventory intensity (inventory to total assets ratio) and the decision to adopt XBRL voluntarily.

H3: Ceteris paribus, there is a negative relationship between plant intensity (PPE to total assets ratio) and the decision to adopt XBRL voluntarily.

Big 4 auditors are associated with high quality audits and have experienced audit teams in different industries. All of the Big 4 accounting firms are members

of the XBRL organization. In addition, PricewaterhouseCoopers is one of earliest supporters of XBRL and hence it may not be surprising if they push their audit clients to adopt the XBRL format for financial reporting. Xiao *et al.* (2004) argue that innovation diffusion theory suggests that Big 4 auditors are more likely to support the diffusion of innovative practices such as XBRL reporting. Xiao *et al.* (2004) suggest that normative isomorphism results from actions of professional firms who want to create homogenous company practices and standards to be followed. Basically the Big 4 can create best practices of XBRL reporting to be followed by others. Hence, the Big 4 auditors facilitating the voluntary adoption of XBRL reporting is supported by the institutional change theory. In a study examining UK firms, Camfferman and Cooke (2002) reported a positive relationship between annual report disclosures and auditor type. However, Wallace and Naser (1995) while examining a sample of Hong Kong firms concluded that there is a negative relationship between disclosure levels and auditor type. While the results are unclear as to the direction of the relationship, both studies found a statistically significant relationship between auditor type and disclosure levels.

H4: Ceteris paribus, there is a relationship between a firm's auditor type (Big 4 or not) and the decision to adopt XBRL voluntarily.

Jensen and Meckling (1976) posit that firms that have high levels of debt can reduce the associated monitoring costs by providing comprehensive levels of disclosures. Healy and Palepu (2001) argue that firms that are planning to issue debt or equity securities have incentives to provide voluntary disclosures. According to them, managers attempt to reduce information asymmetry by providing voluntary disclosures and thereby attempt to reduce firm's cost of external financing. Companies that are tapping the capital markets for financing face scrutiny by rating agencies. If managers want to maintain credibility with rating agencies, they may want to send positive signals. If firms have higher levels of debt, they may want to reduce information asymmetry by providing informative disclosures and thereby hope to reduce their cost of borrowing. Ahmed and Courtis (1999) performed a meta-analytic study and concluded that disclosure increases with leverage. Xiao *et al.* (2004) argue that increased disclosures can reduce bondholders' propensity to price-protect themselves against wealth transfers stockholders.

H5: Ceteris paribus, there is a positive relationship between the magnitude of debt ratio and the decision to adopt XBRL voluntarily.

Another explanatory variable used in this study is the price to earnings ratio. The price earnings (PE) ratio is measured as the market price of a firm's common stock divided by the firm's income-per-share of common stock. Following Efendi *et al.* (2009), we include PE ratio in the model to pick up the effect of firm-level growth. Firms with higher growth opportunities are expected to provide more disclosures (see Peng *et al.* 2011).

H6: Ceteris paribus, there is a positive relationship between a firm's PE ratio and the decision to adopt XBRL voluntarily.

H7: Ceteris paribus, there is a positive relationship between a firm's intangible assets to total ratio and the decision to adopt XBRL voluntarily.

Kinney (2000) argues that voluntary disclosures serve as a positive signal about management's successful stewardship. Singhvi and Desai (1971) report that firms with higher profitability provide additional information to satisfy investors. Hence, managers of highly profitable firms are more likely to voluntarily adopt XBRL, which increases firms' accounting transparency. Firms that voluntarily adopt XBRL are expected to be profitable firms. Cash Flow to Sales ratio is used here to proxy "profitability" and is expected to be higher for the XBRL firms than for control firms. Therefore in regression model II we add an explanatory variable to proxy for profitability and test an additional hypothesis: *Ceteris paribus, there is a positive relationship between the profitability of a firm and the decision to adopt XBRL voluntarily.*

4 DATA AND METHODOLOGY

Voluntary adopters of XBRL format for filing financial statements were identified by visiting the SEC website on March 29, 2009 - <http://viewerprototype1.com/viewer>. Data for 102 voluntary adopters of XBRL (who filed in 2008 using the XBRL format) were collected from COMPUSTAT for the year 2007. We then generated a matched sample for these voluntary adopters of XBRL, by selecting firms that were deemed direct competitors by Yahoo finance and of approximately the same size as defined by market value of equity. Data for these 102 control firms for the year 2007 were also obtained from the COMPUSTAT.

Table 1 provides industry break-down for XBRL firms. The XBRL group contains 102 firms from 34 SIC two-digit industries. Chemical companies accounting for 11.8 percent of the sample constituted the biggest group of XBRL adopters. Firms in the business services industry are the second largest XBRL adopters at 9.8 percent of the sample. This industry includes companies that develop XBRL software and as such it is not surprising that they are also early adopters of XBRL. Financial institutions (Depository institutions and security brokers) account for 8.8 percent of the sample. FDIC already requires several XBRL reports from these companies. Firms in the electrical and electronic industry (7.8 percent of the sample) and machinery and equipment industry (6.8 percent of the sample) also are voluntary adopters of XBRL. These industries were closely followed by electric & gas, oil and gas, and communications. The non-XBRL group has very similar industry distribution.

<u>SIC CODE</u>	<u>INDUSTRY</u>	<u>Number</u>	<u>%</u>
10	Metal Mining	1	0.9
12	Coal Mining	2	1.9
13	Oil and Gas	4	3.9
16	Heavy Construction	1	0.9
20	Food and Kindred Products	4	3.9
21	Tobacco Products	2	1.9
27	Printing and Publishing	2	1.9
28	Chemicals	12	11.8
29	Petroleum Refining	2	1.9
33	Primary Metal Industries	2	1.9
35	Machinery & Equipment	7	6.8
36	Electricals & Electronics	8	7.8
37	Transportation Equipment	4	3.9
38	Instruments & Related Products	2	1.9
40	Railroads	1	0.9
44	Water Transport	1	0.9
45	Air Transport	1	0.9
47	Transportation Services	1	0.9
48	Communications	4	3.9
49	Electric, Gas & Other serv.	6	5.9
50	Wholesale - durables	1	0.9
52	Building Materials	1	0.9
54	Food Stores	1	0.9
56	Apparel and Accessory Stores	1	0.9
60	Depository Institutions	3	2.9
62	Security and Commodity Brokers	6	5.9
63	Insurance Carriers	4	3.9
64	Insurance Agents and Brokers	1	0.9
67	Holding and Other Investment	2	1.9
72	Personal Services	1	0.9
73	Business Services	10	9.8
80	Health services	1	0.9
87	Engineering Consulting	1	0.9
99	Others	2	1.9
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Total		102	100.0
		===	=====

Table 1: Frequency distribution of XBRL firms by industry

The database used in this study consists of ten attributes (obtained from COMPUSTAT) for each firm. These attributes are: debt ratio, auditor type, market value of equity, plant intensity, cash flow to sales ratio, Price earnings ratio, Tobin's Q, inventory to total assets ratio, intangible assets to total assets ratio, and return on assets. Support for using these specific variables is found in earlier research described in the literature review section.

We provide a summary of descriptive statistics in Table 2. The debt ratio averaged 0.417 for XBRL adopters and 0.248 percent for their non-adopting peers. 93 percent of XBRL firms were audited by a Big 4 firm while 97 percent of the control firms were audited by a Big 4 firm. The mean for natural logarithm of the market value of equity (size measure) is 9.36 for XBRL adopters and 8.67 for their control firms. The return on assets measure had a mean of 9.316 percent for XBRL firms and a mean of 5.51 percent for control firms. The inventory to total assets ratio has a mean of 6.6 percent for XBRL firms and a mean of 17.6 percent for their peers. The cash flow to sales ratio has a mean of 0.194 for XBRL firms and a mean of 0.084 for control firms. The PE ratio averaged 22.28 for XBRL adopters and 44.59 for their non-adopting peers. The Tobin's Q measure has a mean of 2.64 for XBRL firms and a mean of 2.02 for control firms. The t-test results indicate that firm size, plant intensity and Tobin's Q were statistically significantly different between the two groups. Non-parametric Wilcoxon Z test also found that firm size, plant intensity and Tobin's Q were statistically different between the two groups.

Univariate tests may not produce robust results, when independent variables are correlated. Using the independent variables in a multivariate context, however, allows one to examine their relative explanatory power and can lead to better predictions since the information contained in the cross-correlations among variables is utilized. A primary objective of many multivariate statistical techniques is to classify entries correctly into mutually exclusive groups. Multiple discriminant analysis, PROBIT, and LOGIT represent such multivariate models.

In this study, the following logistic regression (LOGIT) model is proposed:

$$\Pr (Y=1|X) = F (\beta_0 + \beta_1 x_1 + \beta_2 x_2 + \dots + \beta_K x_K)$$

Variables	FC	N	Mean	Std. Deviation	T-Stat.	Wilcoxon Z- Stat.
DebtRatio	1	102	0.417	1.788	0.950	-0.231
	0	102	0.248	0.212		
Auditor Type	1	102	0.93	0.254	-1.296	-1.294
	0	102	0.97	0.170		
ROA	1	102	9.365	24.987	1.466	-1.558
	0	102	5.508	9.033		
LnMktVal	1	100	9.357	1.924	2.581**	-3.227***
	0	99	8.665	1.854		
PlantInt	1	98	0.330	0.305	-2.113**	-1.735*
	0	98	0.434	0.383		
PEratio	1	101	22.285	23.17	-1.235	-0.441
	0	99	44.590	178.25		
CFsale	1	98	0.194	0.385	1.382	-0.647
	0	98	0.084	0.689		
IntanTA	1	100	0.185	0.183	-0.248	-0.469
	0	99	0.192	0.211		
InventTA	1	100	0.066	0.086	-0.963	-1.321
	0	79	0.176	1.128		
Tobin's Q	1	99	2.641	3.153	1.825*	-1.992**
	0	98	2.021	1.214		
FC= Firm code: 1= XBRL firm; 0 = control firm *Statistically significant at 10% level; **Statistically significant at 5% level ***Statistically significant at 1% level						

Table 2: Descriptive statistics

The dependent variable Y is a dichotomous (0, 1) variable representing the two groups, voluntary XBRL adopters (Y=1) and control (Y=0) firms. The independent variables X1 , X2 , XK include firms size, auditor type (Big 4 or not), debt ratio, price earnings ratio, and inventory to total assets ratio, plant intensity (complexity) and intangible assets to total assets ratio. Following Premuroso and Bhattacharya (2008), we use a binary variable to denote auditor type and we code a firm as 1, if it has a Big 4 auditor and 0, otherwise.

Specifically these explanatory variables are:

- LnMktVal = natural logarithm of market value of equity
- InventTA = Inventory / total assets
- Auditor = auditor type: 1= Big 4 firm, 0=others
- PlantInt = property, plant & equipment / total assets

- Debt Ratio = total debt / total assets
- P/E ratio = Price Earnings ratio;
- IntanTa = Intangibles / total assets

It is assumed that no exact linear dependencies exist among X's across k, and that the relationship between Y's and X's are non-linear or logistic, i.e.:

$$P(Y = 1|X) = \exp(\sum \beta_k X_k) / [1 + \exp(\sum \beta_k X_k)]$$

The null hypotheses would be:

$$H_0 : \beta_k = 0, \text{ where } k = 1, \dots, 7.$$

The correlation coefficients are reported in Table 3.

Variables	LnMkt Val	Invent TA	Auditor	PlantInt	Debt Ratio	PERatio	IntanTA	CFsale
LnMktVal	1							
InventTA	0.123	1						
	(.107)							
Auditor	0.250	0.060	1					
	(.000)	(.421)						
PlantInt	0.032	0.271	0.105	1				
	(.657)	(.000)	(.142)					
DebtRatio	-.118	0.015	0.026	0.307	1			
	(.097)	(.837)	(.714)	(.000)				
PERatio	0.072	-.088	-.050	.040	-.196	1		
	(.310)	(.244)	(.485)	(.586)	(.005)			
IntanTA	0.014	0.078	0.006	-.344	0.026	0.047	1	
	(.847)	(.303)	(.933)	(.000)	(.712)	(.517)		
CFsale	0.333	-.177	.002	0.180	-.115	.281	-.114	1
	(.000)	(.021)	(.975)	(.012)	(.107)	(.000)	(.118)	(.565)

Table 3: Spearman correlation coefficients among key variables

The correlation analysis results indicate that auditor type is strongly related to firm size. Firm size and cash flow to sales ratio are positively correlated. The higher the profitability (CFsale), the higher is PE ratio. Debt ratio and PE ratio are negatively related. Profitability and inventory to total assets ratio are also negatively related. Plant intensity and inventory ratio are positively related.

Multicollinearity among independent variables may be present in the data and can potentially lead to unstable regression coefficients. A rule of thumb is suggested by Judge et al (1985) to assess the impact of multicollinearity. They argue that a serious multicollinearity problem arises only when correlations among the explanatory variables are higher than 0.8 or 0.9. In our sample, the highest correlation is between cash flow to sales ratio and firm size at 0.333. Hence, the degree of collinearity present among independent variables does not appear to degrade estimation results in any serious way. We also perform some further collinearity diagnostic tests and their results are discussed in the results section.

5 RESULTS AND DISCUSSION

Logistic regression results are reported in Table 4 (column I). When the logistic regression analysis was performed the sample size shrank from 204 to 161, mainly due to missing data for inventory. Hypothesis 1 suggests that there is a positive relationship between firm size and the decision to adopt XBRL voluntarily. The coefficient estimate for firm size is 0.357 and is statistically significant at the 1 percent level. This suggests that size is different between the two groups and confirms previous findings by Efendi *et al.* (2009), and Premuroso and Bhattacharya (2008).

Hypothesis 2 suggests that there is a positive relationship between inventory intensity (inventory to total assets ratio) and the decision to adopt XBRL voluntarily. The coefficient estimate for inventory to total assets ratio is 4.759 and is statistically significant at the 10 percent level. This suggests that the inventory intensity is (weakly) significantly different between the two groups. This is an interesting finding of this study. This confirms earlier findings by several accounting researchers in other accounting studies. For example, Chan *et al.* (1993) find that inventory to total assets ratios proxy for complexity and risk and are a determinant of audit fees. Chen *et al.* (2005) found that companies that carry abnormally high amounts of inventory had abnormally poor stock returns. Hypothesis 3 suggests that there is a relationship between the plant intensity ratio and the decision to adopt XBRL voluntarily. The coefficient estimate for property, plant & equipment to total assets ratio is -1.591 and is statistically significant at the 5 percent level.

	I	II
CONSTANT	-1.410 (1.588)	-0.669 (0.275)
LNMktVal	0.357 (10.277) ***	0.278 (5.321) **
InventTA	4.759 (2.963)*	5.367 (3.474)*
Auditor	-1.310 (2.176)	-1.467 (2.304)
PlantInt	-1.591 (6.287)**	-1.949 (7.624) ***
DebtRatio	2.261 (4.657)**	2.738 (5.193)**
PERatio	-0.009 (3.229)*	-0.011 (3.489)*
IntanTa	1.019 (1.179)	-1.427 (1.759)
CFsale	-----	1.614 (1.539)
N	161	159
-2 Log likelihood	193.31	189.03
Negelkerke R-square	0.204	0.217
Percent correctly classified	67.1	64.8
^a The dependent variable: 1=XBRL filer; 0=control; Wald Chi-square statistic is in parentheses *Statistically significant at 10% level; **Statistically significant at 5% level ***Statistically significant at 1% level LNmktVal = natural logarithm of market value of equity InventTA = Inventory / total assets Auditor = auditor type: 1= Big 4 firm, 0=others PlantInt = plant intensity = property, plant & eqp. /total assets Debt Ratio = total debt / total assets P/E ratio = Price Earnings ratio; IntanTA = Intangibles / total assets CFsale = cash flow to sales ratio;		

Table 4: Logistic regression results ^a

Hypothesis 4 suggests that there is a relationship between a firm's auditor type (Big 4 or not) and the decision to adopt XBRL voluntarily. The coefficient estimate for auditor type variable is -1.310 and is not statistically significant. While this result is somewhat surprising, it is not entirely unexpected. Ninety three percent of XBRL firms and ninety seven percent of control firms in our sample have Big 4 auditors! Results for this variable in prior studies are mixed. Premuroso and Bhattacharya (2008) report that the Big 4 audit firm variable in their study was negative and insignificant. On the other hand, Camfferman and Cooke (2002) report a positive and significant estimate for the Big 6 auditor

variable in their study. However, it should be noted that their sample came from UK firms.

Hypothesis 5 suggests that there is a positive relationship between the magnitude of debt ratio and the decision to adopt XBRL voluntarily. The coefficient estimate for debt ratio is 2.261 and is statistically significant at conventional levels. This suggests that leverage is different between the two groups. XBRL adopters had larger debt ratios than the control group. The positive relationship for the debt ratio is consistent with the results reported by Premuroso and Bhattacharya (2008). Hypothesis 6 suggests that there is a relationship between a firm's PE ratio and the decision to adopt XBRL voluntarily. The coefficient estimate for PE ratio is -0.009 and is statistically significant only at the 0.10 level. This suggests that the PE ratio is different between the two groups only marginally. However, the coefficient estimate had a negative sign. Voluntary adopters of XBRL had lower PE ratios, on average, than the control group. Hypothesis 7 is not supported and the intangible assets to total assets ratio is not different between the two groups.

We performed a robustness test by adding an additional explanatory variable in logistic regression model II: cash flow to sales ratio which is a proxy for profitability. The robustness test results are reported in Table 4 – column II. The model I results are confirmed by model II and the same variables as in model I are statistically significant for the most part. The added hypothesis suggests that there is a positive relationship between the profitability of a firm and the decision to adopt XBRL voluntarily. The coefficient estimate for the cash flow to sales ratio is 1.641 and is statistically not significant at the 0.05 level. This suggests cash flow to sales ratios are not different between XBRL filers and non-filers. Even though voluntary adopters of XBRL had higher profitability ratios, on average, than the control group, the difference is not statistically significant.

We also build a multiple regression model and use the Governance Score developed by Brown and Caylor (2006) to further investigate the relationship between corporate governance rating and operating performance for voluntary XBRL adopters. An ordinary least-squares regression model was developed to investigate the relationship between Governance score and firm size, PE ratio (growth), current ratio (liquidity), auditor type, Tobin's Q, and return on assets (profitability). Regression methodology permits the testing of null hypotheses

simultaneously. Following Hirschey and Connolly (2003), the following formula is used to estimate Tobin's q: $\text{Tobin's } q = [\text{Total assets} + \text{market value of equity} - \text{book value of equity}] / \text{Total assets}$. Tobin's q was also computed from the data obtained from the COMPUSTAT data base. Governance score was the dependent variable and the six explanatory variables mentioned earlier were used as independent variables. According to Brown and Caylor (2006): "Governance Score is a composite measure of 51 factors encompassing eight corporate governance categories: audit, board of directors, charter/bylaws, director education, executive and director compensation, ownership, progressive practices, and state of incorporation." Accounting based indices serve as an indicator of how firm earnings respond to managerial policies (Orlitzky *et al.* 2003). Manufacturing organizations are asset-intensive; as a result, return on assets (ROA), defined as net income divided by total assets, is an effective indicator of firm profitability. To an investor ROA is an effective way to estimate the profit an organization may generate for each \$1 of assets. Cochran and Wood (1984) indicate that ROA capture a firm's internal efficiency. Preston and O'Bannon (1997), using a survey methodology, found a positive relationship between corporate social disclosures and ROA. Return on assets (ROA), is used as a measure of firm-level profitability.

The multiple regression model used in this study is:

Governance score = f {firm size, PE ratio, auditor type, Tobin's Q, current ratio and profitability}

The null hypotheses used to test the multiple regression model are defined as follows:

H1: Firm size has no significant effect on Governance score

H2: PE ratio has no significant effect on Governance score

H3: Auditor type has no significant effect on Governance score

H4: Tobin's Q has no significant effect on Governance score

H5: Liquidity as measured by current ratio has no significant effect on Governance score

H6: Profitability as measured by return on assets has no significant effect on Governance score

The regression coefficients, t-statistics, and significance levels for the two regression models for early adopters of XBRL are reported in Table 5 - columns I, and II. The multiple regression models have a respectable adjusted R-square of 39.7 to 40.4 percent. Because *multicollinearity* may be present in the data, diagnostic measures of collinearity are obtained. Collinearity diagnostics are based on procedures recommended by Belsley *et al.* (1980) who suggest that condition indexes in excess of 30 indicate moderate to strong dependencies. There is one large condition index observed in the regression which is 32.17 and another moderate index at 16.82 (which is less than 30). The other 5 condition indices are less than 6.9.

	I	II
CONSTANT	35.284 (5.868)***	37.031 (5.697)***
LnMktVal	1.086 (2.446)**	1.054 (2.540)**
PE ratio	0.038 (1.407)	0.041 (1.489)
Auditor	-6.727 (-1.764)*	-7.020 (-1.821)*
Tobin's Q	-0.691 (-1.160)	-0.804 (-1.299)
Cratio	-2.274 (-3.385)***	-3.004 (-3.369)***
ROA	0.086 (0.941)	0.097 (1.039)
PlantInt	--	-1.509 (-0.734)
N	47	47
Model F	6.198***	5.328***
Adjusted R-square	0.404	0.397
^a The dependent variable is Governance Score; t-statistic in parentheses *Statistically significant at 10% level; **Statistically significant at 5% level ***Statistically significant at 1% level LNMktVal = natural logarithm of market value of equity P/E ratio = Price Earnings ratio; Auditor = auditor type: 1= Big 4 firm, 0=others Tobin's Q = [TA + market value of equity – book value of equity] / TA Cratio = current assets / current liabilities ROA = Return on Assets PlantInt = plant intensity = property, plant & eqp. /total assets		

Table 5: Multiple regression results ^a

We discuss the statistically significant independent variables (rejected null hypotheses) first and the rest of the variables next. The regression results (in column I of table 5) indicate that the firm size is statistically significant ($t=2.446$) at the 5 percent level and is positively related to governance score. Thus, the null hypothesis H1 (firm size has no significant effect on Governance score) can be rejected. This is along the expected lines since larger companies tend to have effective boards and good auditor oversight. This confirms the results of Premuroso and Bhattacharya (2008) study that found firm size to be positively and significantly associated with governance score.

Current ratio is a commonly used measure of liquidity. The regression results (reported in column I of table 4) indicate that current ratio is negatively related to the governance score (t -statistic = -3.385) and is significant at the 0.01 level. Thus, the null hypothesis H5 (liquidity has no significant impact on governance score) can be rejected. The negative coefficient is similar to the results reported by Camfferman and Cooke (2002) for current ratio in a study examining UK and Dutch annual report disclosures (not XBRL disclosures). The auditor type variable has a coefficient of -6.727 and a t -statistic of -1.764 and is statistically significant at the 10 percent level. The negative coefficient is unexpected and is inconsistent with a directional finding of Camfferman and Cooke (2002). Camfferman and Cooke (2002) report a significant and positive relationship between auditor type (Big 6 auditor in UK) and firm-level annual report disclosures. The other three explanatory variables - PE ratio, Tobin's Q and return on assets were not statistically significant and hence null hypotheses 2, 4 and 6 are not rejected.

An additional hypothesis is tested in regression model II in Table 5. The seventh hypothesis in the null form is: Plant intensity as measured by property, plant & equipment to total assets has no significant effect on Governance score. The results as reported in column II of table 4 indicate that plant intensity is not statistically significant. However, firm size, current ratio and auditor type are still statistically significant as in regression model I.

6 CONCLUSION

In this paper, we explored the relationship between early adopters of XBRL and some key financial and accounting variables. Some of the governance weaknesses stem from the information asymmetry between insiders and the

investing public. One way to mitigate the information asymmetry problem is to enhance accounting disclosures through the adoption of XBRL format. We addressed some of the limitations of prior studies, by using more holistic measures of governance (governance score) and allowing for non-linear relationships between XBRL adoption and financial performance. We built a non-linear, multivariate logistic regression model to examine the relationship between firm characteristics and voluntary XBRL adoption. Our independent variables are also multi-dimensional. Our results provide support to some prior studies that found firm size and debt ratio (leverage) to be significant. However, new results of this study indicate that plant (asset) intensity, PE ratio (growth), and inventory ratio (complexity) are useful in discriminating voluntary “XBRL adopters” from non-adopters. Agency theory suggests that assets that are already in place make it more difficult for managers to transfer wealth than assets yet to be acquired. The implication here is that the level of voluntary disclosures would be inversely related to assets already in place and hence asset intensity would be negatively related to voluntary XBRL adoption. Firms with higher inventory ratios are more complex and maybe already technologically adept. Hence these firms are more likely to invest in new technologies and would be more likely to adopt XBRL voluntarily. Firms with higher growth potential as measured by PE ratio are expected to embrace voluntary disclosures. However, the results for the PE ratio variable are weakly significant and the sign of the coefficient is in the wrong direction.

We also build a multiple regression model and use the Governance Score developed by Brown and Caylor (2006) to further investigate the relationship between corporate governance rating and operating performance for voluntary XBRL adopters. Our new results indicate that current ratio (liquidity), and auditor type are associated with corporate governance rating for voluntary adopters of XBRL. Firm size is also related to corporate governance rating and is consistent with results reported by Premuroso and Bhattacharya (2008). Our study also confirms various positive theory hypotheses developed by Watts and Zimmerman (1990), such as the size hypothesis and the debt hypothesis. Since the sample size used in this study is somewhat small (even though larger than earlier studies), great care should be exercised while generalizing the results of this study. We used the Governance Score developed by Brown and Caylor (2006) in our regression study and it may not have sufficiently captured the depth

of governance ratings. Corporate governance and firm performance are jointly determined by partially unobservable variables. Also corporate governance adjusts to firm performance in prior years. Just like several other corporate governance studies (Brown and Caylor, 2006), this paper also suffers from the endogeneity problem.

Here are some ideas for future XBRL research projects. Future research could investigate the industry effect on voluntary XBRL adoption. The association between voluntary XBRL adoption and additional bond/stock issues could be investigated. Researchers could also investigate the problems associated with the mandated use of XBRL disclosures. For example, there are reports that mandatory XBRL filings contain large amount of errors (Debreceeny *et al.* 2010 and Du *et al.* 2011). The nature and causes of these errors could be investigated. New research could be performed to examine the research question about information asymmetry using data from US companies – do XBRL reports reduce information asymmetry in the US? It would be nice to examine the characteristics of companies that voluntarily report sustainability information using the XBRL format. Since certain financial variables are significant in discriminating voluntary adopters of XBRL from the control group, useful evidence is being provided to investors, regulators, analysts, and auditors in addition to confirming the predictions of agency theory and positive accounting theory in the accounting literature.

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