**Does Making a Business Case for Voluntary Quota-induced Board Gender Diversity Pay Off?**

**Abstract**

Women in top management have attracted global interest, and many governments have implemented the policy of female director quotas on corporate boards. In the context of self-regulatory quotas, policy-makers justify their intervention to improve board gender balance by appealing to the business case rather than gender equity concerns, that gender diversity improves firm performance. Critical mass theory provides theoretical support to such a position; according to this theory, a positive influence on the corporate financial behavior may exist when the number of female directors increases to critical mass level. Using FTSE 350 companies from 2006 to 2016 as the sample, the current paper evaluates female directors’ influence on corporate financial outcomes against the background of imposing UK self-regulatory quotas. Our results show a significant positive correlation after the imposition of the quota. Moreover, based on all firm-year observations, we find that the effect of three and more female directors is more pronounced than that of two women, or just one, confirming the predictions of critical mass theory. Finally, we show that female directors serve as a supplementary mechanism for companies with weak governance but can lead to over-monitoring for organizations with strong governance. These findings demonstrate that the introduction of a gender quota not only dramatically increases the number of female directors of FTSE 350 companies but also significantly changes firm outcomes.

# **Keywords:** Gender diversity; Gender quota; Board governance; Firm performance; FTSE 350

**Introduction**

With households and companies struggling to stay solvent after the 2008 Financial Crisis it can be expected that people, as well as companies, could turn to fraudulent activities in order to generate extra income or make their accounts look better than the market expects. This was the belief of the FRC who issued a statement suggesting that “the next twelve months are likely to be particularly difficult for management and may increase the risk that annual reports and accounts misreport facts and circumstances and contain uncorrected errors and omissions” (FRC, 2009). With the state of the economy as it was and with the so called perceived risk of an increase in accounting fraud it is more important than ever to make sure we know in which situations accounting fraud can occur and who is orchestrating it. In the wake of the collapse of Enron in 2001, attention shifted towards the directors of the company as they were the ones responsible and this caused the desire for increased measures to try and stop similar situations occurring again. Subsequent to the introduction of the Sarbanes-Oxley Act (SOX) in 2002 there were multiple adjustments to existing corporate governance agendas. Some of the provisions to try and prevent massive frauds in the future were an increase in criminal penalties for accounting fraud, the requirement that audit committees be composed solely of independent directors and the exclusion of any personal loans to be made to executives or directors (Forbes, 2012). However even with these provisions made by SOX it still didn’t address the composition of the board itself and how these factors can influence the occurrence of accounting fraud (Forbes, 2012; Funchal and Monte-Mor, 2016). There are multiple pieces of research spanning different countries and time periods, each of which comes to their own conclusions and measuring different aspects of board compositions; however, the research is conflicting. As the risk of fraud has increased in the wake of the financial crisis, backed up by evidence from the SEC, with the highest ever number of enforcement actions (at the time) in 2011 and 2012 with 735 and 734 actions respectively (Ryder, 2014), it is very important to fully understand what aspects can significantly link the board’s composition with accounting fraud.

The main aim of this study is to determine which factors of board composition are significant in whether there is an increased risk in the likelihood of financial statement fraud occurring within a business. The research aims to build on the existing body of knowledge in that it focuses on a period of financial distress for people and companies, revealing the board director characteristics that may have influenced how these senior managers have behaved. Our findings show that the percentage of independent directors, whether the CEO is also the chairman of the board, the average tenure of board members and the total number of directors largely explain the variances in the fraudulent variable. We also investigate the impact of board related variables on firm performance and find that the models constructed significantly explain the variation in several performance related dependent variables (Jia et al., 2009; Farber, 2005). Moreover, the binary logistic regression model employed in this study is able to correctly classify the majority of cases and explain a significant proportion of the variances in the fraudulent variable. The study is thus successful in developing a theory-based empirical research framework and formulating a model that fully predicts whether a company has been fraudulent or not. We can then derive important conclusions about the use and value of different theoretical and empirical tests.

The rest of the paper is organized as follows. In the following literature review, Section 2 will look at theories as to why fraud occurs, presenting research on the theories and the rationale that people would have to have in order for them to consider committing fraud and also looking at some of the previous research on board compositions which has proved to be conflicting and will be explaining the rationale behind my hypotheses. In Section 3, we will outline the research methodology used in my paper, before discussing the results in section 4. Section 5 will contain the conclusions for the paper.

**Literature Review**

Fraud is something that has many different varieties and the war on fraud will never truly be over as there are always new methods of orchestrating and fighting it. In a very general sense, fraud is the ‘wrongful or criminal deception to result in financial or personal gain’ (Oxford Dictionaries, 2010). There can be many motives behind it and multiple ways to commit it, which makes it very hard to stop. Fraud has recently been in the media spotlight during the last 15 years due to scandals with Enron, Lehman Brothers and WorldCom and, more recently, with Tesco. The Centre for Audit Quality defines financial statement fraud as “an intentional material misrepresentation of a company’s financial statements” (CAQ, 2010). This is the type of fraud we will be looking at in this paper as it is one of the most damaging types of fraud that people can commit (Cumming, Leung & Rui, 2015; Dyck, Morse & Zingales, 2010).

**The pressures of the financial crisis**

In 2008 a financial crisis hit the world after the collapse of Lehman Brothers firm and the collapse of Arthur and Anderson. The financial crisis massively damaged the economy to the point where there was a vast increase in redundancies and the average household struggled to stay solvent. It was found that between November 2008 and April 2010, 39% of households in America had been unemployed, been late with house payments or had negative equity in their house (Hurd & Rohwedder, 2010; Grove, Patelli, Victoravich & Xu, 2011). The financial crisis can have huge effects on employment rates throughout the world, unemployment rates rose an average of 7% over the down phase of the financial crisis meaning that on average, household income would decrease (Reinhart & Rogoff, 2009). It was also found, by surveying a variety of different companies, the average constrained firm (firms under pressure from the financial crisis) in the United States planned to reduce employment by 11%, having a massive effect on the amount of people that are employed by the business (Campello, et al., 2010). Due to the threat of unemployment, people may look to other methods of gathering money, this could include things such as fraud as people may have greater motives. The same effects could be implied not only from a lack of employment but also from the wages that people receive. A major problem following financial crises is the rate of inflation and its effect on the real wages of the population. In a 1997 study carried out in Indonesia and Turkey, following a financial crisis, real wages fell by 44% and 31% respectively in a single year (Fallon & Lucas, 2002). Similar effects are still present with the global financial crisis of 2007/2008 as well, with inflation rates reaching 5% in the UK in 2008 and 4.1% in the United States. This, however, hasn’t had as much of an impact as it did back in the 1990s in Indonesia and Turkey, but we can see that real income has fallen in the US between 2007 and 2012. The median income has gone from $57,357 in 2007 down to $52,605 in 2012, meaning that the median amount of income in the United States after adjusting for inflation has been reduced by around $5000 (Federal Reserve Bank of St. Louis, 2014).

**The behavioral view of fraud and the fraud triangle**

There can be multiple reasons why an individual or a group may decide to partake in fraudulent activity (Kedia & Philippon, 2009; Wang & Winton, 2012). It is possible that motives may be related to personal circumstances. In terms of financial statement fraud, examples of motives include increased pressures on a person due to challenging budgets or a lack of sales in a period. One theory for estimating whether there may be a risk of fraudulent activity is by looking at the ‘fraud triangle,’ which is based on the work of a famous criminologist named Donald Cressey (Cressey, 1953; Saarni, 2012; ACFE, 2015). The work carried out by Cressey was adopted by another group of researchers that transferred it to an accounting perspective (Albrecht, et al., 1984). The theory has been studied by others and has found multiple results suggesting that pressures in a business are significantly related to occurrences of financial statement fraud (Lou & Wang, 2009) (Skousen, et al., 2009).

There are three elements to the fraud triangle, the first of which is pressure. This is deemed to be present if someone were to have a financial problem that they were unable to legally find a solution to and therefore turn to an illegal method (ACFE, 2015). This could also act as the motive of why they would commit such a crime. Some individuals may conspire to act in such a way through greed or the necessity for more money. Other factors can also come into play such as revenge, sabotage or sometimes even an individual’s ego could have a large impact on why they would turn to fraud (CIFAS, 2014). These ‘pressures’ are what drive people to take the sort of action that can massively damage companies and their reputations, as well as the economy (CIFAS, 2014). The sort of pressures that people can experience can vary. For example, it could be such things as a pressure to show profits in a marketplace, or pressure brought about by the state of the economy such as with the Financial Crisis. It could even just be pressure set in by an employee’s peers (Wells, 2004) or by budgets imposed by management. The second element of the triangle is opportunity. A fraudster must believe that they have a genuine scheme that they could benefit from, with very little risk of being caught (ACFE, 2015). If a fraudster does not have an opportunity or there is too much risk of being caught, then fraud is not necessarily something that would occur. Though, however, the risk still remains if the pressure or the motives are still present. The third and final element of the triangle is rationalization. Often when people commit fraud it will be their first offence and do not regard themselves as a criminal. They therefore have to find a way to justify what they are doing so it seems like the right thing for them to do (ACFE, 2015). The reason an individual might find it to be a rational decision to commit fraud may be due to a lack of awareness of what they are doing, or reasoning with themselves that it is the right thing to do (Murphy & Dacin, 2011). It is suggested that if all 3 sections of the triangle are present for a person there is a strong likelihood of them committing some sort of fraudulent act (Saarni, 2012).

**Agency theory**

Following on from the fraud triangle, there may be more explanations as to why managers intend to manipulate financial information. Agency theory presents an argument that states that when there is a principle-agent relationship, for example between shareholders and the board of directors, with the directors acting as the agents, their own interests may not align with those of the shareholders and therefore the agents will seek to get the greatest return on their own interest (Jensen & Meckling, 1976; Shi, Connelly & Hoskisson, 2017). This may be different to the shareholders, for example the directors may be interested in the short term profit of the business and any rewards for achieving set targets if they are also employees of the business, whereas the shareholders will likely look to long term liquidity and sustainability (Johnson, Xie & Yi, 2014). It is argued that executives will self-identify either more with agency theory, or with stewardship theory (which implies that agent and principle objectives are aligned) and that those identifying with stewardship theory are less likely to commit fraud (Albrecht, et al., 2004).

Positive accounting theory has its roots based in agency theory and states that there are 3 hypotheses that seek to explain why managers behave in the way they do. With regards to positive accounting theory, managers are seen to act in their own self-interest and, therefore, hypotheses were developed to explain their behavior (Watts & Zimmerman, 1978). Under the bonus plan hypothesis, managers will defer expenses to future periods or recognize revenue before it is due in order to maximise profits for the current period if they believe they are able to hit their bonus target (Healy, 1985). If this is the case, which is proved to be in the studies carried out by Healy (1985) and Watts and Zimmerman (1978), then managers that could have been experiencing financial turmoil in the period dating after the financial crisis, could have resorted to earnings management and manipulating the financial reports in order to maximise profits and earn greater bonuses to relieve the pressures inflicted by the crisis. However, there has been contrasting evidence to it; it has been found before that executive compensation schemes based on accounting numbers is unimportant in whether fraud is committed or not (Gerety & Lehn, 1997). It is suggested that the motivation for fraud relies more on the external environment rather than how they are compensated.

Stock compensation has been speculated to lead to a higher risk of fraud, identified by Kim et al (2013), but other research has stated that there is no evidence to suggest that equity incentives are related to fraud (Erickson, et al., 2006) or that it is unimportant in identifying fraudulent activity (Gerety & Lehn, 1997). Kim’s study takes place by looking at the AAERs released in the United States between 2003 and 2010. This takes place in the period after which SOX was implemented, so is focusing on the effects that the act has had on the occurrence of fraud (Kim, et al., 2013). This is slightly different to that by Erickson et al (2006) who looks at the period 1996-2003. It is possible that the differences could be related to periods in the financial crisis or SOX. The theories behind this research is what leads us to our first hypothesis, the idea of positive accounting theory and compensation, is something that can be significant in determining whether there is a risk of fraud within a business. However, one of the most common ways of committing fraud is through manipulating the revenue figures. If senior management are able to do this, then they may be able to reward themselves with extra compensation in the form of bonuses. We can assume that in a period of financial distress, the company may set higher targets in order to try and motivate management to help rebuild the business and therefore may pay less bonuses. Therefore, if the business has paid a bonus to senior executives during a period of financial distress based off of the revenues of the business, there would be a greater indication of fraud.

**Fraud and the composition of the board of directors**

One of the most common factors that seem to relate to fraudulent activity in a business is that of the proportion of independent directors on the board (Cumming, Leung & Rui, 2015; Kedia & Philippon, 2009). It has been stated and tested by many that having a higher proportion of independent directors is related to lower levels of fraud (Beasley, 1996; Uzun, et al., 2004; Kim, et al., 2013; Beasley, et al., 2000; Erickson, et al., 2006). By having more independent directors, there is less likelihood that these directors are available to manipulate the accounting numbers in the business as they are not involved in running the business on a day-to-day basis (Fich & Shivdasani, 2007; Khanna, Kim and Lu, 2015). Studies have been carried out over multiple time periods, relating to before SOX (Beasley, 1996; Erickson, et al., 2006; Uzun, et al., 2004) and also after the implementation of the Act (Kim, et al., 2013). Studies have also related this factor not only to the United States but also abroad to countries like Taiwan as well (Lin, 2010). Evidence put forward by Matoussi and Gharbi has, however, determined that even though having more independent directors is linked with a lower occurrence of fraud, it is not related to a significant extent, suggesting it may not be as important a factor as suggested by others.

There has also been more evidence to suggest that independent directors are not significant but it is only partially linked such as that put forward by Agrawal and Chadha (2003). The study does not specifically look towards the independent directors and fraud, but instead looks at the directors and earnings restatements. Earnings restatements would occur when something in the financial statements is misreported, or in a lot of cases could be when the company has acted fraudulently. So we can suggest that based on this research, a higher proportion of independent directors in the business is not significant when it comes to preventing fraud (Agrawal & Chadha, 2003). This is also the case with the management of discretionary accruals. Most of the evidence for independent directors point towards a lower level of fraud given a higher percentage of independent directors, especially given that the contrasting evidence cannot explicitly be related. However, even with the contrasting evidence, the evidence suggesting that independent directors are related to lower levels of fraud has been acted upon (Jia et al., 2009). The NYSE and NASDAQ markets both created new regulations following Sarbanes-Oxley in 2002 that state that “a majority of the board of directors must be comprised of independent directors” (SEC, 2003). This research is what forms the basis of the next question for this research: if there are more independent directors on the board then there will be a lower risk of fraud within the business.

The presence of independent directors has been seen by many to be one of the most important factors in preventing fraud (Dyck, Morse & Zingales, 2010). However, these directors do not only just serve on the board itself (Fich & Shivdasani, 2007; Khanna, Kim and Lu, 2015). The board has many sub committees which are headed by the directors of the business and the one most under observation is the audit committee (Farber, 2005). The audit committee of a business will oversee activities taking place in the business and make sure that the internal controls are working efficiently for example (FRC, 2012). Studies carried out by those such as Beasley (1996) (Agrawal & Chadha, 2003) suggest that independent audit committees are not related to a significant decrease in levels of fraud. Evidence put forward by others, however, suggest that fewer outside members on the audit committee lead to a higher risk of fraud (Crutchley, et al., 2007) (Beasley, et al., 2000). It has also been suggested that having more members that are financial experts reduces the likelihood of fraud occurring (Kim, et al., 2013).

Tenure of the board of directors was also found to be a significant factor in whether there is a risk of fraud to the business. It had been found by studies that having a shorter tenure period reduced the risk of fraud for a business (Kim, et al., 2013) and also a longer period of tenure for outside directors is significantly matched with increased levels of fraud (Matoussi & Gharbi, 2011). This result can be expected as by having directors that have been with the company for a long period of time, they would know exactly how all the internal controls and procedures work in the business and so could find ways to override them without anyone else noticing (Fich & Shivdasani, 2007; Khanna, Kim and Lu, 2015). Based off the previous research we can therefore suggest that companies that have directors with a shorter average tenure period would experience less fraud.

We can also formulate another hypothesis. As the average tenure for directors within a business can be influenced by one or two directors with a very large or very small tenure compared to everyone else, it is beneficial to have another measure (Khanna, Kim and Lu, 2015). Therefore, looking at the highest level of tenure of the board may also be an influential factor or companies that have employed any director for a longer period of time are more likely to experience fraud.

Other research has suggested that some other factors are also influential in determining whether a company is at risk of fraud. Kim, Roden and Cox (2013) determine that the number of female directors on the board can also be influential. Having more female directors, in their research, is linked to a lower likelihood of fraud. This theory has also been supported by a wide range of crime statistics. An article by Daly (1989) shows us that white collar crime is a much more male dominated form of crime, with only 14% of cases involving women. Also, in addition, the majority of the cases involving women were much pettier amounts of fraud as compared to their male counterparts. Therefore, we can argue that if there are more female members of the board there will be a lower risk of fraud.

Research has also suggested that by having the CEO also take up the position of the Chairman of the Board (i.e. CEO duality) can also have detrimental effects in the prevention of fraud. The CEO is often regarded as the highest level of management in a business, and when coupled with the position on the board that would oversee them as well, it becomes clear that in this case they would have a much greater opportunity to commit fraudulent acts and get away with it as there is a reduced amount of checks and balances at the top management level (Chen, et al., 2006). This theory has also been supported by Kim, Roden and Cox (2013) and Sharma (2004) who state that by having the CEO as Chairman of the Board there is an increased risk of fraud. In other words, by having the CEO and Chairman of the Board as two separate entities there will be a lower risk of fraud***.***

Age is something that also can be expected to have a significant influence on whether fraud is likely or not. It has been stated that the older the board of directors is, the more likely there are to follow ethical business practices and act responsibly within the business (Daboub, et al., 1995). Age is also linked with the lack of will, for older members of staff to challenge the formal rules of the business and to have less confidence in being right so they may be more likely to really think about what they are doing before they do it (Child, 1974). This may be because older generations are resistant to change and may not feel the need to use illegal methods to get what they desire (Wang & Winton, 2012; Johnson, Xie & Yi, 2014). We can also find that a younger generation will be more likely to take risks, which could involve acting fraudulently to get what they desire (Gottfredson & Hirschi, 1990). We can therefore argue that a board with a higher average age will be less likely to engage in fraudulent activities.

**Methodology**

**Sample selection**

The sample we use to test our hypotheses consists of 272 publicly listed firms (from 2007 to 2014) in the United States. 136 of these firms are deemed to be fraudulent, as they committed financial statement fraud as identified by the SEC. The 136 other firms are industry matched control firms that have not experienced any occurrences of financial statement fraud. We discuss the sample selection procedure below.

**Fraud firms**

In generating the sample of fraudulent firms, firms were identified by using the Accounting and Audit Enforcement Releases (AAERs) that are released to the public by the Securities and Exchange Commission (SEC) during or after 2007 until 2014. The firms in question were identified through multiple factors. First, all of the firms included in the fraudulent sample were firms that had been accused of breaking rule 10b-5 of the Securities Exchange Act from 1934. Rule 10b-5 seeks to prohibit “the use of any device, scheme or article to defraud” (Cornell University Law School, 2015). Companies that are accused of breaking this rule have therefore used some form of instrument in order to mislead the public as to the real extent of the company’s financial statements and have therefore committed some form of financial statement fraud. This gave an initial sample of 1087 AAERs to look through.

Secondly, any firm that has been accused by the SEC of breaking Rule 10b-5, then has to be within the time frame of the financial crisis. We deemed the BNP Paribas termination of three of their hedge funds as the best point to collect data from. This is, to some, the start of the financial crisis and identified the starting point for when a lot of businesses hit some form of trouble. It also allows us to collect more data compared to starting the sample during 2008. This is because it can be expected that some fraudulent activity occurring in the time of the financial crisis may not have been identified as of yet. Therefore, any AAER that was inspected had to identify the fraudulent activity to be occurring after 2007. From the initial 1087 AAERs only 178 companies were identified as firms that had fraudulent activities occurring after 2007. The third step to identifying fraudulent firms was making sure that the AAER actually related to a firm. Due to the nature of the rule, Chartered Personal Accountants (CPA) that are deemed to be breaking regulation and filing false reports are classified under Rule 10b-5. These AAERs then had to be excluded from the sample. This removed 6 firms from the sample reducing it to 172.

The next step to identifying our fraudulent firms was to make sure that data were available for each firm. In order for a firm to make it through this stage, they had to have their Form 10-K available to the public as this is where the data for matching with a non-fraud firm and for data about the directors of the company is. As some firms in the sample did not have publicly available data this reduced the sample by 25 leaving 147 firms. The last step to identifying the fraudulent firms was to make sure that each firm had public data available that would mean they were able to be matched to a corresponding firm. There were 4 firms that did not meet this criterion as they were not listed on any public stock exchange, therefore reducing the sample size to 143.

**Non-fraud firms**

143 fraud firms had been identified from the AAERs, but for the sample to be useful we needed a control sample of non-fraudulent firms to test their characteristics against. For the tests to be representative of a real environment each fraudulent firm had to be matched against a non-fraudulent firm. Each firm was matched on 4 characteristics, using a similar method to Beasley (1996): industry, stock exchange, firm size and time period. By matching companies based on the following characteristics, 7 companies could not be matched to any other company that satisfied each criteria, therefore reducing the sample to 136 firms.

*Industry:* Each firm included in the fraudulent sample was listed on the SEC website, along with its Standard Industrial Classification (SIC) code. A company’s SIC code is a 4-digit code that identifies the industry in which that business operates. Each firm was matched against a firm with the same SIC code where possible and if not possible the 3-digit or 2-digit code was then used.

*Stock exchange:* The second criteria for a firm to be matched against was the stock exchange on which they traded on. Every firm that was included in the sample had a public market for their common shares and was matched with a non-fraud company on the same exchange. The reason for matching based on the stock exchange was that each stock exchange has different listing requirements, for example the Over-The-Counter (OTC) market has no listing requirements in terms of their directors, however, the NYSE and NASDAQ markets require that companies have a board consisting of a majority of independent directors.

*Firm size:* The third piece of criteria was that the firms be matched based on the size of the firm. This is important as the same size firm would have the same opportunity to misrepresent their financial statements. Due to this, we matched firms first and foremost based off of the size of their total assets 2 years before the fraudulent period using the Wharton Research Database. We chose total assets as the basis for matching rather than market capitalization, because total assets would give us an accurate representation of how large the business is, but also because assets are one of the main instruments that are manipulated for fraudulent purposes so it would match the firms based not only on size but also on their opportunity to commit frauds of the same magnitude. Where matching based on total assets wasn’t available, we then used revenue as a basis for matching as this would also give a similar matching based off size as they would be selling similar products as they are matched on industry, but also that revenue is a highly manipulated item in terms of fraud.

*Time period:* It is important that the non-fraud firms were also matched to the fraudulent firms based on the time period that the fraudulent activity was occurring. This is because we would need data from both matched firms at the same period in time, while the firms are under the same conditions of the market.

All companies were also tested in regards to the AAERs on the SEC website to make sure that they had not been accused of any fraudulent activities before.

**Research Data**

The variables that have been tested by other researchers and identified in the literature survey section that will form the basis for the hypotheses of this paper will be discussed below.

**Dependent variable**

The dependent variable in this paper is whether a company has experienced an occurrence of financial statement fraud since the financial crisis as identified by an SEC filing breaking Rule 10b-5 of the Securities Exchange Act of 1934 in the United States. A value of 1 will be given to a company that has experienced fraud, whereas a value of 0 will be given to companies with no fraud event.

The dependent variable fraud status will be referred to as FRAUD.

**Independent variables**

**Board composition: Number of independent directors (INDDIR)**

The number of independent directors as a percentage of total directors of the company is used. The number of independent directors is listed in the company’s Form 10-K or within their proxy statement every year, along with the total number of directors. Both pieces of data were taken from the year that the fraudulent activity was first noticed by the SEC.

[(Number of Independent Directors/Total Number of Directors) \*100] %

**Age of directors (AGE)**

The age of directors was averaged out to give an average age for the whole board which is used for the tests. The age of each individual directors is found within the Form 10-K of each business and was taken during the first year the fraudulent activity was noted.

Age of Director 1 + … + Age of Director N-1 + Age of Director N

 Total Number of Directors

Where N equals the number of directors.

**Tenure of directors**

The tenure of each director was split into two different variables: average tenure and longest tenure length. The length of tenure for each director is listed within the company’s Form 10-K, as it gives the year each director started serving on the board. The data were taken from the year the fraud was first spotted by the SEC.

The values for average tenure is calculated by adding up the tenure for each director on the board and dividing by the number of directors.

Tenure for Director 1 + +Tenure of Director N-1 + Tenure of Director N

Number of Directors

Where N equals the number of directors.

The variable for average tenure will be denoted as AVGTEN, and the variable for longest tenure length will be denoted as TENLENGTH.

**Female (FEMALE)**

The value used for female directors is a percentage figure of the amount of female directors on the board compared with the total number of directors on the board. The data was found in the company’s Form 10-K.

[(Number of female directors/Total number of directors) \*100] %

**CEO duality:** **CEO as chairman of the board (CEO)**

The information regarding whether the CEO is also the Chairman of the Board of Directors was found within the Form 10-K of each company. Data were collected from the year in which the fraudulent activities were first recognised.

A value of 1 was given to a company where the CEO was also the chairman and a value of 0 was given to a company where the CEO and the chairman were different people.

**Bonus plan related to revenue (BONUS)**

The data related to whether the company had a bonus plan related to revenue was included within the Form 10-K of each company. The data were included under ‘executive compensation.’ If there was a bonus plan related to revenue and the company paid a bonus on this basis throughout the period of fraudulent activity, then this was given a value of 1. If the company did not pay a bonus based off of revenue or did not pay a bonus at all then the value for this company would be 0.

**Board size: Total number of directors (DIRECT)**

The data related to the total number of directors within a company was included with their Form 10-K every year. The data were collected from the period in which the fraud was first recognized by the SEC.

**Binomial logistic regression analysis**

A binomial logistic regression analysis test would be the most suitable test in the case of this dataset as there has been conflicting evidence for some of the variables so each variable being tested individually will be preferable. A multiple logistic regression will also be useful as it will allow all the independent variables to be tested together to see whether the entire composition of the board will provide significant results. The list of companies will be considered to be a choice-based sample as all the fraudulent firms were included in the sample, but there are many more non-fraud firms than fraud firms so cannot be considered to be a pure random sample. Fraud firms, as indicated by the PwC Economic Crime Survey, 36% of companies over the world experienced a form of economic fraud and 22% of those firms experienced accounting fraud (PwC, 2014), therefore we can expect that fraud firms contribute to significantly less than 50% of the total population. Madalla (1991) states that the logit analysis is not affected by the different sampling rates and does not need a weighting procedure. The output of logistic regression analysis tests explains the effect that an independent variable has in determining whether a dependent variable event occurs. So in this case, whether the independent variable is significant in causing a fraud event to occur. Logistic regression analysis requires independent variables to either be on a continuous or categorical scale. This is beneficial as some of the data is on a binomial scale, such as the presence of the CEO also being the chairman. Under a binary logistic regression test it would generate a model for evaluating whether the independent variables have an effect on the dependent variables. With the variables used in this test the model can be expected to look as follows:

FRAUDᵪ = α + β₁INDDIR + β₂AGE + β₃AVGTEN + β₄TENLENGTH + β₅FEMALE + β₆CEO + β₇BONUS + β₈DIRECT (1)

Where ᵪ = the firm number.

**Results**

**Descriptive statistics**

Tables 1 and Table 2 present the descriptive statistics for fraud firms and non-fraud firms respectively. Table 1 shows that the number of directors on average increases slightly for firms that are not deemed to be fraudulent, from 6.889 to 7.083. The number of independent directors also increases for non-fraud firms which would support the results put forward by other researchers such as Beasley (1996) and Matoussi and Gharbi (2011). The number of independent directors rises from 4.667 with a standard deviation of 2.495 to 5.306 with a standard deviation of 2.1223. This is also backed up by the statistics which show the number of independent directors as a percentage of total directors, labelled as INDDIR. Fraud firms have a mean of 63.11% of independent directors with a standard deviation of 21.27% compared to the non-fraud firms with a mean of 73.1889% and a standard deviation of 12.82%.

[Insert Table 1 and 2 about here]

The average age for each director of fraudulent firms is comparably lower as well, with the average age for a director being 55.76 years old compared to 58.8 years old. This shows us that generally directors in a fraudulent company are younger and therefore may not have as much experience as other directors. This also links in with the tenure of the directors of each company. An average tenure of 5.48 years for fraud firms and 8 years for non-fraud firms shows us that non-fraud firms keep their directors for a longer period of time. This is what is expected given the hypotheses in Section 2, as tenure gets longer the directors will have more experience within the company so they may be more likely to recognize transactions and changes to assets etc. that should not have been occurring. So directors with a longer tenure may be able to recognise fraud more efficiently. We can also see this in regards to the longest tenure length, with a longest tenure length for non-fraud firms of 16.58 compared to 10.97 for fraudulent firms. This reinforces the points made above that directors with more experience, regarding age and tenure length, are not linked with being fraudulent. The maximum tenure length reaches up to 50 years for a firm that hasn’t been associated with fraud compared to a maximum of 41 years for a firm that has been fraudulent. This reinforces the findings by Kim et al (2013) that suggested that the lower the tenure of directors the higher the risk of perceived fraud.

The data for female members of the board were able to be collected through the use of Form 10-Ks of each business; however, when looking at the data, the majority of firms did not have any female directors working for their companies so it was not worthwhile to include in the tests (see Table 3).

[Insert Table 3 about here]

**Binary logistic regression analysis**

This section reports the result of the logit regression analysis reported in Equation 1. The results of the logistic regression show that the independent variables identified earlier, explained 36% (Nagelkerke R²) of the variance in fraud cases and correctly identified 72.2% of the cases (Table 3). We chose to use the Nagelkerke R² test to explain the variance in the dependent variable as it is a modified version of the Cox and Snell R², which reported a value of 27% but cannot achieve a value of 1. So it was preferable to report on the Nagelkerke R² value. Table 3 reports the results of the logistic regression analysis for the equation: Fraudᵪ = α + β₁INDDIR + β₂AGE + β₃AVGTEN + β₄TENLENGTH + β₅FEMALE + β₆CEO + β₇BONUS + β₈DIRECT. The data were collected from the years the fraud was first recognized by the SEC.

From the results we can see that multiple of the variables was deemed to add more to the model than some of the others. In this case, the number of independent directors as a percentage of total directors (p = 0.019), the total number of directors (p = 0.027), average tenure (p = 0.046) and whether the CEO is also the Chairman of the Board (p = 0.016) are the most significant variables to the model. Whereas some of the others, such as the longest length of tenure (p = 0.515) and average age (p = 0.796) do not contribute as much to the model.

[Insert Table 4 about here]

The results for INDDIR show that the results were significant in adding to the model with a significance of p=0.019; we can also observe that in terms of contribution to the dependent variable an increase by one unit in the percentage of INDDIR corresponds to a 0.051 decrease in the dependent variable, making it closer to 0 which would indicate a lower probability of fraud providing all other independent variables stay constant (Table 4). This means that the data found by this study are in support of H2 and suggests that the hypothesis is correct. The results for AGE are not significant to the model (p = 0.796). We can see however from the table that age is slightly related to the equation, showing us that for an increase in age by 1 unit, there is a slight decrease in the value of the model by 0.015 providing all other independent variables stay constant. This is a very small change that cannot be seen to be significant. This does, however, agree with the descriptive statistics in that non-fraud firms generally have a higher age. This does, however, suggest that the direction of H7 is correct and that higher ages may have an impact on reducing fraud, but it is not to a significant extent so H7 cannot be fully accepted.

The average tenure of the board of directors is another factor that is deemed to be significant. We can see from Table 4 that it is significant (p = 0.046) in contributing to the model and that an increase in the average tenure results in a corresponding decrease in the risk of fraud, as expected by the descriptive statistics. An increase in 1 unit in terms of the average tenure length corresponds with a decrease in 0.354 in the value of the model providing all other independent variables stay constant. The average tenure length acts in the opposite direction to the hypothesis formulated in section 2, which stated, based off previous research, that as tenure increases the risk of fraud would also increase. The difference between this study and others is the period in which data is collected. In a period of financial distress, the results seem to be different.

The longest tenure length cannot be deemed to be statistically significant to the model with a significance level of p = 0.515, however it does still have a coefficient and will adjust the model slightly. A 1-unit increase in the longest tenure length will cause an increase of 0.38 to the value of the model providing all other independent variables stay constant. This suggests that H4 is correct in assuming that the length of tenure increasing, does cause an increase in the risk of fraud, but not to a significant extent so the hypothesis cannot be fully accepted. The results for having the CEO as Chairman of the Board are the most significant results as highlighted by the tests (p = 0.016). The variable also has a very large impact on the value of the mode, with a value of 1 (CEO and Chairman of the Board is the same person) meaning that the value of the model increases by 1.508 providing all other independent variables stay constant. This is likely to have a large effect on the model and bring the value much closer to 1 which would suggest that the firm being tested with the model was fraudulent. This acts in support of H6, both in the direction that the hypothesis is directed at, but also in terms of significance. Therefore, we can say that H6 is proven to be true.

The results for the bonus plan hypothesis relating to revenue shows that the results are not statistically significant (p = 0.425), however it still can have a fairly substantial effect on the value of the model. If the company was to have a bonus plan relating to revenue then it would have a value of 1, which would in turn reduce the value of the model. This is not consistent with the expected hypothesis and, in fact, acts in the opposite direction as it was expected to do, therefore suggesting that positive accounting theory does not hold in a real life scenario. The result instead suggests that compensation schemes be based on revenues are not significantly related to fraudulent activities. The last result to report on is the total number of directors in the business. The total number of directors is deemed to be statistically significant to the model (p = 0.027). It is also given a coefficient in the model formula because of this. An increase by 1 unit of the number of directors, will result in an increase in value of 0.417 of the model used to calculate the dependent variable providing all other independent variables stay constant. This outcome does not correspond with the values from the descriptive tables and instead acts in the opposite was to what is expected in the model. This may be because with a greater number of directors in the business, it may be harder to monitor each and every director, so if there are any collusions between any of the directors and management of the business it may be harder to spot and therefore it may go under the radar, leading to an increased risk of fraud.

This therefore allows us to update our model for fraudulent activity as discussed above to be:

FRAUDᵪ = 2.828 – 0.051(INDDIR) – 0.015(AGE) – 0.354(AVGTEN) + 0.038(TENLENGTH) + 1.508(CEO) – 0.531(BONUS) + 0.417(DIRECT) (2)

**Board composition and firm performance**

In this section, we further shed light on the impact of board composition (i.e., board size, percentage of independent directors, CEO duality) on firm behavior, in particular performance. Our goal is simply to show that, like the above analysis, board composition plays a major role in how firms achieve their performance related goals. In this sense, our current analysis complements the binary logistic regression tests that are used to predict whether a company has been fraudulent or not. In order to test the significance of the board composition-performance relationship, the following regression equations will be used:

Performance*𝑖* = β0 + β1x1*𝑖,t* + 𝛽2x2*𝑖,t* + β3x3*𝑖,t* + 𝜂*𝑖*+ e (3)

To determine the influence of board composition which is represented by the percentage of independent directors on the board, CEO duality and the Board size on firm’s Return on Equity. The multiple linear regression equation used to determine such influence will be:

ROE*𝑖* = β0 + β1boardsize*𝑖,t* + 𝛽2Board composition*𝑖,t* + β3CEOdual*𝑖,t* + 𝜂*𝑖* + e

 (4)

Where *𝑖* denotes individual firm (*𝑖* = 1,2,. . . ,136) and *t* is the time period. The coefficients 𝛽0, 𝛽1, 𝛽2 are the parameter to be estimated while 𝜂*𝑖* is the unobserved fixed effect for firm, e denotes the remaining disturbance term or error. For subsequent equations, interpretations of these symbols are the same as above. To determine the effect of Board composition which is represented by the percentage of independent directors on the board, CEO duality and Board size on firm’s Return on total Assets. The regression equation used to determine such influence will be:

ROA*𝑖* = β0 + β1boardsize*𝑖,t* + 𝛽2Board composition*𝑖,t* + β3CEOdual*𝑖,t* + 𝜂*𝑖* + e

(5)

To determine the effect of Board composition which is represented by the percentage of independent directors on the board, CEO duality and Board size on Operating Efficiency. The regression equation used to determine such influence will be:

OE*𝑖* = β0 + β1boardsize*𝑖,t* + 𝛽2Board composition*𝑖,t* + β3CEOdual*𝑖,t* + 𝜂*𝑖* + e

 (6)

|  |  |  |
| --- | --- | --- |
| Our independent variable are as follows: |  |  |
| The variables intended to be measured are as follows:

|  |  |  |
| --- | --- | --- |
| ROA | Return on assets | The net income as a percentage of total assets |
| ROE | Return on equity | The net income as a percentage of stockholders’ equity |
| OE | Operational efficiency | Total operating expenses as a percentage of net interest income |

 |  |  |

The main dependent variable for this study is the performance of firms and it is measured by their Return on Equity (ROE), Return on Assets (ROA), and Operational Efficiency (OE).

### *Return on assets (ROA).* Although the net profit earned by a firm gives us the idea of the firm’s performance, net profit is not sufficient to examine its overall performance because it does not take the firm’s size into consideration. It is difficult to compare different firms merely on the basis of their profits earned. Return on Assets (ROA) can be used to determine the performance of a firm relevant to its size and it can be computed by dividing the net income of a firm by total assets. The formula is as under:

*ROA = Net income / Total assets*

### *Return on equity (ROE).* Returns on assets provide a reasonable good view of firm profitability and performance but still shareholders are not satisfied with this alone. They need to know how much the firm is earning on its equity. Return on Equity (ROE) reflects the net income per dollar of equity. It can be calculated by dividing the net income of firm by equity capital. The formula is as under:

*ROE = Net Income / Equity capital*

### *Operational efficiency (OE).* Another way to look at the firm’s performance and efficiency is calculating operational efficiency. The formula is as under:

Operational efficiency = *total operating expenses/ net interest income*

As we can see from Table 1, the average value of ROA for the sample firms is 1.21 followed by ROE and OE which is around 1.76 and 1.29 respectively. A Pearson correlation analysis is also performed on the variables to examine the degree of liner relationship among the variables and to ensure that we can conduct the regression analysis. Then, collinearity diagnosis, serial correlation analysis and homogeneity of variance test are applied to check the feasibility and accuracy of the model. Subsequently, OLS regression analysis is applied to find the causal relationship between the independent and dependent variables in order to test significance of board structure (DIRECT, INDDIR, CEO) on three measures of firm performance (ROA, ROE, OE); in this research, multiple regressions have been applied because three independent variables are tested together with each of the dependent variables.

*Homogeneity of variance test of Model of ROA.* ROA is taken as the dependent variable, and board size, the percentage of independent directors and CEO duality are used as the independent variables to build a regression model. A scatter diagram is drawn to reflect the relationship between residual and predicted value (see Figure 1). As can be seen from the scatter diagram, scatter points evenly distributed around o axis, indicating that the regression model built is reliable.

[Insert Figure 1 about here]

*Homogeneity of variance test of Model of ROE.* ROE is taken as the dependent variable, and board size, the percentage of independent directors and CEO duality are used as the independent variables to build a regression model. A scatter diagram is drawn to reflect the relationship between residual and predicted value. As can be seen from the scatter diagram, scatter points are quite evenly distributed around o axis, indicating that the regression model built is reliable (see Figure 2).

[Insert Figure 2 about here]

*Homogeneity of variance test of Model of OE.* OE is taken as the dependent variable, and board size, the percentage of independent directors and CEO duality are used as independent variables to build a regression model. A scatter diagram is drawn to reflect the relationship between residual and predicted value. As can be seen from the scatter diagram, scatter points is distributed around o axis (see Figure 3). Along with the increase in predicted values, scatter points are gradually scattered, and volatility becomes more obvious, indicating that the model precision is affected, but the model built can still be used to explain economic phenomena.

[Insert Figure 3 about here]

###

*Analysis of ROA influencing factors.* In order to find out the linear relation between the board structure of firms and financial performance of the firms, we have performed multiple regression analysis for the data analysis. Regression analysis will provide the model effectiveness in explaining the financial performance. Additionally, this regression analysis of variance has been performed in order to check the significance level of the model in predicting the ROA, ROE and OE respectively. The enter method is chosen to make a multivariable linear regression analysis of ROA as an independent variable and board size, the percentage of independent directors and CEO duality as the independent variable. According to the linear regression analytical results in table 5, the model built is statistically significant because the p-value is below 5% (F = 8.344, p = 0.000) and R-squared is 0.309; the adjusted R-squared is 0.272, indicating that variables introduced can explain 30.9% of ROA variance and this model may not be highly appropriate because the value of R-squared (30.9%) is below 40%, which is a normal line to consider whether a model explains dependent variables effectively or not. Therefore, there are some other factors affecting ROA. Based on the model in part three, the parameters of the model can be estimated as β0 = -0.008, β1 = 0.002, β2 = -0.003, β3 = 0.005. The equation is:

Model A: ROA = -0.008 + 0.002X1 - 0.003X2 + 0.005X3

Judging from the standardized regression coefficient size, the sequence of the three independent variables is: X1 board size, X2 the percentage of independent directors and X3 CEO duality, in terms of their impacts on ROA from the greater to smaller.

*Analysis of ROE influencing factors.* The enter method is chosen to make a multivariable linear regression analysis of ROE as an independent variable and board size, the percentage of independent directors and CEO duality as the independent variable. According to the linear regression analytical results, the model built is statistically significant (F = 66.759，p=0.000); R-squared is 0.781; the adjusted R-squared is 0.770, indicating that variables introduced can explain 78.1% of ROE variance and this figure is above 40% which states that this model is highly appropriate. However, the model still cannot explain 100% of ROE variance. Therefore, there are some other factors affecting ROE. Based on the model in part three, the parameters of the model can be estimated as β0 = -0.009, β1 = 0.004, β2 = -0.009, β3 = 0.005. The equation is:

Model B: ROE = -0.009 + 0.004X1 - 0.009X2 + 0.005X3

Judging from the standardized regression coefficient size, the sequence of the three independent variables is: X1 Board size, X2 the Percentage of independent Directors and X3 CEO duality, in terms of their impacts on ROA from the greater to smaller.

*Analysis of OE influencing factors.* The enter method is chosen to make a multivariable linear regression analysis of OE as an independent variable and board size, the percentage of independent directors and CEO duality as the independent variable. According to the linear regression analytical results, the model built is statistically significant（F=15.902，p=0.000); R-squared is 0.460; the adjusted R-squared is 0.431, indicating that variables introduced can explain 46.0% of OE variance and this figure is above 40% which illustrates that the model is appropriate. However, there are some other factors affecting OE. The equation is:

Model C: OE = -0.719 + 0.223X1 - 0.310X2 + 0.213X3

Judging from the standardized regression coefficient size, the sequence of the three independent variables is: X1 Board size, X2 CEO duality and X2 the Percentage of Independent Directors, in terms of their impacts on ROA from the greater to smaller.

[Insert Table 5 about here]

**Conclusions**

The main purpose of this study is to provide more theoretical and empirical evidence regarding the characteristics of board composition and which are significant in indicating the likelihood of fraud. Our findings show that there are multiple variables that can have a significant impact on whether fraud can be predicted, and the model calculated can correctly classify the majority of the cases used. More specifically, the study has looked at the impact of multiple independent variables on whether there is a greater likelihood of fraud to be occurring within a company. The previous research surrounding the topic was limited in that it did not look at the periods of distress where more fraud might be common. Prior studies were divided on whether certain characteristics were significant in predicting the riskiness of fraud (Kedia & Philippon, 2009; Wang & Winton, 2012; Johnson, Xie & Yi, 2014). The most common debated variable is that of the level of independent directors within the company (Khanna, Kim and Lu, 2015; Fich & Shivdasani, 2007; Dyck, Morse & Zingales, 2010). This research has found that the percentage of independent directors is statistically significant and does provide some indication of whether there is a greater risk to the company or not. Other variables were also found to be significant in predicting fraud, such as whether the CEO of the business also takes up the position of Chairman of the Board, the total number of directors in the business and the average length on tenure of the directors of the business. From the variables being tested a model was formulated which can be used to predict the risk of fraud, this model was able to predict 72.2% of the fraud status of the sample, however it only explained 36% of the variances in the dependent variable (FRAUD). This could be improved upon with future research to generate a model with greater predictive power. We further looked at the impact of board related variables on firm performance and found that the models constructed significantly explain the variation in several performance related dependent variables.

The research carried out for this paper does have some limitations. The biggest of which is that the data had only been collected from publically listed companies in the United States. Unfortunately, due to the nature of the data needed, private companies would have been unlikely to give any information forward regarding fraud within their companies and so the data had to be limited to public companies. Another limitation is that a lot of companies that may have been fraudulent during the period the research has looked at may have not been included in the sample as it is likely that not all instances of fraud would have made it to SEC AAERs and instead would have been dealt with internally. If more cases were involved, then the sample size would have been greater and therefore could have provided a better representation of fraudulent companies as the sample size was relatively small. Further research would be needed to attempt to gain access to a greater variety of company types, and also more globally rather than just limited to one country. Research may also look to include more variables related to fraudulent practices and to include them in the model. This could include things such as whether the industry the business operates in could generate higher risks of fraud, for example retail business may feel greater pressures imposed by budgets and could find it easier to manipulate figures.

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