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# DID U.S. BANKS MANAGE THEIR EARNINGS IN THE AFTERMATH OF THE 2007-2009 FINANCIAL CRISIS? EVIDENCE FROM THE POST-CRISIS HOUSING MARKET

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## ABSTRACT

*Building on and extending our prior work, this paper studies earnings management practices of banks in the aftermath of the Financial Crisis of 2007-2009. We focus our attention on two distinct groups of institutions; banks headquartered in states that were most impacted by the housing market crisis and those in least impacted states. Our dataset is generated using the Reports of Condition and Income and covers the periods before and after the 2007-2009 Financial Crisis. We divide our balanced panel dataset into two equal subsets and analyze pre- and post-crisis periods separately. Each subset covers a four-year period and consists of 7,560 observations gathered from the same 1,890 banking institutions that had been continuously active from 2003 to 2010. Our empirical evidence lends support to the earnings management hypothesis, suggesting that banks (both low- and high-profit ones) headquartered in states where the housing market crash was most pronounced used loan loss provisions to manage reported earnings in the post-crisis period.*

## INTRODUCTION

The Financial Crisis of 2007-2009 and the ensuing Great Recession were unprecedented in their scope and severity in the post-World War II U.S. economic history. Two major and interrelated sections of the U.S. economy, namely housing and financial services, were at the epicenter of seismic economic shifts taking place in the pre- and post-crisis periods. Fueled by cheap credit and lax lending standards, the real estate boom of the early 2000s gradually grew into an asset bubble of dangerous proportions. When the bubble eventually burst in 2007, the long-lasting effects of the turmoil were felt most strongly in real estate and financial services industries, which played an important role in exacerbating both the boom and bust phases of the business cycle. This paper investigates the practice of earnings management in the banking industry in the form of provision for loan losses in the aftermath of the Financial Crisis of 2007-2009. We hypothesize that banks in U.S. states where house prices fell more sharply had stronger incentives and, hence, were more likely to manage their earnings than institutions in states where the housing market was more resilient in the period following the crisis. In order to do so, we compare the loan loss provisioning behavior of banking institutions operating in top five states which experienced the greatest decline in the House Price Index (HPI) published by the Federal Housing Finance Agency (FHFA), with those in bottom five states for the same index in the post-crisis period. As a result, we are able to exploit a "natural experiment" setting, where the high variability in the HPI between these two distinct groups of states enables us to study banks' earnings management behavior.

Relying on a large balanced panel dataset, our empirical findings do not provide evidence to suggest earnings management by banks for the period before the Financial Crisis of 2007-2009. On the other hand, for the period after the crisis, we find evidence that banks headquartered in states that were most impacted by the housing market meltdown practiced earnings management, while those in least impacted states did not, holding other factors constant. The remainder of this paper is organized as follows. In Section 2, an overview of the earnings management literature is presented and our hypothesis is developed. Section 3 describes the dataset and research methodology; and presents our empirical findings. Finally, Section 4 summarizes and concludes the paper.

## LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

One of the most widely accepted definitions of earnings management is given by Healy and Wahlen (1999, p. 368) who state that "Earnings management occurs when managers use judgment in financial reporting and in structuring transactions to alter financial reports to either mislead some stakeholders about the underlying economic performance of the company or to influence contractual outcomes that depend on reported accounting numbers." Earnings management may take a number of different forms and managers may be motivated by a variety of factors for engaging in earnings management activity. Dechow and Skinner (2000) observe that firms with large accruals (thus, large differences between accounting earnings and cash flows) and with weak governance structures are more likely to conduct earnings management activities. They also note that two of the strongest managerial incentives for earnings management are meeting analysts' earnings forecasts and boosting stock price before making seasoned equity offerings.

The Statement of Financial Accounting Standards (SFAS) 5 (Accounting for Contingencies) is the principal source of guidance for recording of accruals for loan impairments. SFAS 5 requires that an estimated loss be accrued by a charge to income if it is probable that a loan had been impaired and the amount of the impairment can be reasonably estimated. Accordingly, banks and other creditors periodically estimate and record a provision for loan losses, and thereby, maintain a sufficient amount of reserves in their allowance for loan losses account (a contra-asset account deducted from gross loans to determine the amount of net loans). In addition, SFAS 114 (Accounting by Creditors for Impairment of a Loan), which amended SFAS 5, provides more specific guidance for creditors on the measurement and disclosure of impaired loans. Financial reporting standards provide bank managers with considerable flexibility in recording loan loss provisions, based on the notion that the use of judgement by managers increases the information quality of financial reports. As insiders, bank managers are in a better position than others to assess the credit quality of their banks' loan portfolios, and build up and maintain adequate loan loss reserves. Thus, when this discretion is exercised in an objective and rational manner, banks may have a greater ability to absorb credit losses without experiencing drastic earnings declines or capital deteriorations. On the other hand, being able to exercise considerable judgement over loan loss provisioning also gives bank managers the ability to manage earnings in line with their personal agendas. Such abuses of managerial discretion over loan loss accruals ultimately pose significant uncertainties for external users of financial information by distorting the true economic picture. In a 1998 speech titled "The Numbers Game", Arthur Levitt, then the chairman of the Securities and Exchange Commission (SEC), while describing earnings management as a widespread practice across industries, discussed five popular earnings management tools, including "using unrealistic assumptions to estimate liabilities for such items as sales returns, loan losses … in doing so, stashing accruals in cookie jars during the good times and reach into them when needed in the bad times". In regard to the banking industry, Chairman Levitt's remarks point out the hypothesized practice of earnings management, in which banks tend to build up surplus loan loss reserves by overstating expected loan losses in good years (i.e., when earnings are high) and draw down on these excess reserves by understating loan loss provisions in bad years (i.e., when earnings are low). One likely motivation behind smoothing out excessive variability in reported earning over time is reducing the risk perception of the bank (albeit by creating a false sense of stability), and in so doing lowering its cost of capital (both debt and equity) and enhancing the overall firm value.

While there exists a broad literature on the practice of earnings management across various industries, the breadth of studies analyzing the subject in the banking industry is rather modest. In an early study, Scheiner (1981) argues that banks do not use loan loss provisions to smooth income. Beatty et al. (1995) and Ahmed et al. (1999) also do not find evidence of income smoothing via loan loss provisions. On the other hand, Greenawalt and Sinkey Jr. (1988) show that large banks managed their earnings by using loan loss provisions during the period between 1976 and 1984. Similarly, according to Ma (1988), managers at the largest U.S. banks raised (lowered) loan loss provisions in periods of high (low) operating income for the period from 1980 to 1984, suggesting that loan loss provisioning of these institutions was not strongly related to the credit risk of their loan portfolios. Robb (1998) and Beatty et al. (2002) find that bank managers tended to manage earnings upward using loan loss provisions in order to meet the market's earnings expectations during the periods of 1986-1991 and 1988-1999, respectively. Based on a sample of publicly traded banks from the period 1987 to 2000, Kanagaretnam et al. (2003) find evidence that managers build up reserves in good years by reducing reported earnings through increased loan loss provisions and boost earnings in lean years by borrowing from those reserves through reduced loan loss provisions. Kanagaretnam et al. (2004) show that bank managers are more likely to smooth income using discretionary loan loss provisions, when earnings variability of their institutions is greater than that of the industry median. In addition, their findings suggest an interaction between smoothing income and signaling private information to the market, if a firm is underpriced.

The Financial Crisis of 2007-2009 had a profound effect on the U.S. banking industry as a whole, creating major disruptions in the banking system and bringing about a significant number of bank failures. Amid this financial turmoil, it was vital for banks, particularly for those in a weakened financial position, to have continued access to money and capital markets for funding needs. In the credit crunch that followed the financial crisis, banks with relatively strong and stable reported earnings would be in a better position to borrow at lower costs and, more importantly, have easier access to external financing sources. Moreover, in this turbulent environment, banks were under increased regulatory scrutiny and pressure to meet certain capital, solvency, and liquidity standards, and failing to comply with these requirements was likely to prompt already wary bank regulators to intervene and force a close-down.

As a result, in the post-crisis era, banks presumably had strong incentives to manage their earnings upward through loan loss provisions, in an attempt to hide their deficiencies and present themselves as lower-risk and resilient institutions to markets and regulators. The fortunes of most banks, particularly smaller ones, are highly dependent on the economic and financial viability of communities they operate in. Community banks along with many regional banks collect deposits from, supply credit to, and, in general, do business within a limited geographical area. Therefore, a downturn in a state's or a region's economy, which may be caused by a slump in real estate or a decline of a major local industry, tends to cause bank failures in that geographical area. For instance, the failure of a large number of banks during the early 1990s in the Northeast region of the United States was directly linked to the region's real estate problems (Federal Deposit Insurance Corporation, 1997).

As the real estate boom began to recede in 2006, banks started seeing an increased volume of non-performing loans and loan write-offs. Faced with unexpected and substantial loan defaults, banks had to rapidly increase their loan loss provisions, which resulted in large losses and deterioration of capital in the entire industry. The weakening condition of banks, along with decreasing demand for credit caused by declining overall economic activity, had a magnifying impact on an already severe downturn. The effects of the downturn were presumably experienced more extensively in places where real estate markets were hit especially hard. A real estate market downturn has a negative impact on the value of collateral underlying secured loans (e.g., mortgage loans), which constitute a significant portion of the banking industry's loan portfolio, and is likely to lead banks to further tighten lending. Moreover, a decline in the value of the underlying real estate increases both the likelihood and cost of foreclosures, therefore placing additional strain on banks as well as local economies. As a result, we hypothesize that banks operating in hard-hit

markets had more incentives to manage their earnings and lessen the perception of risk than those operating in relatively less impacted areas in the aftermath of the crisis.

In order to test our earnings management hypothesis, we focus our attention on two distinct groups of banking institutions. One group consists of banks headquartered in U.S. states which had the largest decline in the HPI published by the FHFA, while the other group includes institutions headquartered in states where the change in the index was the smallest in the period after the crisis. To a certain extent, the high variability in the HPI between these two distinct groups of states provides a "natural experiment" setting for studying earnings management behavior of banks in the post-crisis period. As explained earlier, one can argue that institutions in the former group were more likely to manage their reported earnings than institutions in the latter group. Table 1 shows top five and bottom five states with respect to the change in the purchase-only HPI between the first quarter of 2007 and the second quarter of 2011, the period when the index for the entire U.S. housing market peaked and bottomed out.

## DATASET AND METHODOLOGY

Our dataset is generated using the Reports of Condition and Income (Call Reports) and covers the periods before and after the 2007-2009 Financial Crisis. Call Reports provide detailed demographic and financial data on all U.S. banking institutions (i.e., commercial banks and thrifts) insured by the Federal Deposit Insurance Corporation (FDIC). We divide our balanced panel dataset into two equal subsets and analyze pre- and post-crisis periods separately. Each subset covers a four-year period (i.e., pre-crisis years of 2003 through 2006 and post-crisis years of 2007 through 2010) and consists of 7,560 observations gathered from the same 1,890 banking institutions that had been continuously active from 2003 to 2010.

Table 1: Percentage Change in the Seasonally Adjusted HPI Between Quarter 1, 2007 and Quarter 2, 2011 For Top Five and Bottom Five States*

|  | **2007, Quarter 1** | **2011, Quarter 2** | **% Change** |
|---|---|---|---|
| United States | 224.54 | 177.76 | -20.83 |
| *Top Five* |  |  |  |
| Nevada | 264.47 | 114.80 | -56.59 |
| Arizona | 319.58 | 162.99 | -49.00 |
| Florida | 308.07 | 166.21 | -46.05 |
| California | 273.32 | 153.37 | -43.89 |
| Idaho | 259.89 | 178.03 | -31.50 |
| *Bottom Five* |  |  |  |
| Kentucky | 191.18 | 182.21 | -4.69 |
| Louisiana | 232.76 | 221.91 | -4.66 |
| Iowa | 197.94 | 190.79 | -3.61 |
| Texas | 186.35 | 185.38 | -0.52 |
| Oklahoma | 191.05 | 190.91 | -0.07 |

*We excluded N. Dakota, S. Dakota, Alaska, and Wyoming with percentage changes of 11.13%, 0.25%, -0.2%, and -4.58%, respectively from the bottom-five list since these states have relatively small housing markets with fewer than 15,000 transactions over the latest ten years. Source: Federal Housing Finance Agency (n.d.).*

Table 2 describes the variables used in our regression analysis and Table 3 reports descriptive statistics. The data are annual as of December 31 and all continuous variables are scaled by total loans and leases. The dependent variable LLP is defined as the provision for loan and lease losses, which is a likely means of managing earnings. The primary focus in the current paper is to study possible earnings management behavior of banks in the period after the financial crisis. Our dataset design enables a direct comparison of banks potentially facing strong incentives to practice earnings management with those less motivated or compelled to do so. In this regard, we interact EARN (defined as the net income before taxes and provision for loan and lease losses) with TOP5, a dummy variable for institutions headquartered in one of the five states (i.e., Nevada, Arizona, Florida, California, and Idaho) that experienced the largest decline in the HPI over the period when the index for the entire U.S. housing market peaked and bottomed out. The base group

consists of institutions headquartered in one of the five states (i.e., Kentucky, Louisiana, Iowa, Texas, and Oklahoma) that experienced the smallest decline in the HPI over the same period. Holding other factors constant, a positive relationship between EARN x TOP5 and the dependent variable would provide evidence that banks headquartered in states where the housing market crash was most prominent resorted to the practice of earning management, relative to their counterparts in the benchmark group.

Table 2:  Description of Variables

| Variable | Description |
|---|---|
| Llp | Provision for loan and lease losses to total loans and leases (%) |
| Earn | Net income before taxes and provision for loan and lease losses to total loans and leases (%) |
| Top5 | Dummy variable for institutions headquartered in one of the five states that experienced the largest decline in the HPI |
| Lowroa | Dummy variable for institutions with a below-median pre-tax return on assets |
| Chroff | Net loan charge-offs to total loans and leases (%) |
| All | Lagged allowance for loan and lease losses to total loans and leases (%) |
| Nonc | Lagged other real estate owned plus noncurrent loans and leases to total loans and leases (%) |
| Δnonc | Change in NONCUR between the current and previous periods (% points) |
| Inter | Dummy variable for institutions operating branches in more than one state |
| Metro | Dummy variable for institutions headquartered in a metropolitan area |
| Cbank | Dummy variable for community banks |

*This table shows the description of variables used in two different specifications of a fixed effects model to study possible earnings management practices by banks before and after the 2007-2009 Financial Crisis.*

Table 3: Descriptive Statistics

| | Pre-Crisis | | Post-Crisis | |
|---|---|---|---|---|
| | Mean | Std. Dev. | Mean | Std. Dev. |
| Llp | 0.3116 | 0.7933 | 0.8081 | 1.9873 |
| Earn | 20.696 | 1559.0 | 2.6080 | 17.268 |
| Top5 | 0.2083 | 0.4061 | 0.2090 | 0.4066 |
| EARN x TOP5 | 18.436 | 1559.0 | 0.4953 | 14.293 |
| Lowroa | 0.5000 | 0.5000 | 0.5000 | 0.5000 |
| EARN x LOWROA | 0.8813 | 2.8207 | 0.4639 | 7.8670 |
| EARN x LOWROA x TOP5 | 0.0866 | 1.0937 | -0.0122 | 7.7686 |
| Chroff | 0.2406 | 0.6963 | 0.6551 | 1.5328 |
| All | 1.4316 | 1.0183 | 1.4325 | 0.9230 |
| Nonc | 1.1654 | 1.6401 | 1.9653 | 2.8998 |
| Δnonc | -0.0911 | 1.1879 | 0.7844 | 2.4182 |
| Inter | 0.0335 | 0.1799 | 0.0519 | 0.2217 |
| Metro | 0.5399 | 0.4984 | 0.5481 | 0.4977 |
| Cbank | 0.9401 | 0.2374 | 0.9217 | 0.2687 |
| N | 7,560 | | 7,560 | |

*This table shows the descriptive statistics of our balanced panel dataset divided into two equal subsets where each subset covers a four-year period (i.e., pre-crisis years of 2003 through 2006 and post-crisis years of 2007 through 2010) and consists of 7,560 observations gathered from the same 1,890 banking institutions that had been continuously active from 2003 to 2010.*

We further test our earnings management hypothesis by focusing on low-profit banks in states that were most impacted by the housing meltdown, with the assumption that those banks are significantly more likely to manage their earnings upward, *ceteris paribus*. In order to do so, we use a three-way interaction term between EARN x TOP5 and LOWROA, a dummy variable for institutions with below-median pre-tax return on assets. A positive relationship between this three-way interaction term and the dependent variable would support our hypothesis. Variables CHROFF, ALL, NONC, and ΔNONC are used to control for nondiscretionary factors impacting banks' provisioning decisions, in other words factors that are not highly dependent on managerial discretion. A number of previous papers looking at earnings management in the banking industry, including Dolar (2019); Dolar and Drickey (2017); Kanagaretnam et al. (2004); Kanagaretnam et al. (2003); Ahmed et al. (1999); Beatty and Harris (1999); Kim and Kross (1998); Beaver and Engel (1996); and Wahlen (1994) utilize these variables as controls. CHROFF is the net loan charge-offs. The expected sign of the coefficient of CHROFF is positive, on the assumption that a bank would need to record more loan loss provisions as its net loan charge-offs increase, *ceteris paribus*. ALL is the lagged

allowance for loan and lease losses. The coefficient on ALL should be negative, assuming that a bank would require a smaller loan loss provision for the year, if it starts the year with a large reserve of provisions, *ceteris paribus*. NONC is the lagged other real estate owned plus noncurrent loans and leases and ΔNONC denotes the change in NONC between the current and previous periods. The coefficient on both variables would be expected to be positive, since banks holding large sums of noncurrent loans and foreclosed property are likely to reserve more for loan losses, *ceteris paribus*.

The dummy variable INTER takes the value of 1 for institutions operating branches in more than one state and 0 otherwise. We included INTER in our analysis to differentiate between banks operating in only one of the ten states this study focuses on and those having further banking activities outside our focus-states. METRO is a dummy variable which takes the value of 1 when the headquarters of the observed institution is in a metropolitan area. The base group is defined as institutions whose headquarters are located in a non-metropolitan area. CBANK denotes community banks as defined by the FDIC for research purposes. It takes the value of 1 when the observed institution meets the FDIC-criteria and 0 otherwise. The FDIC developed a new research definition of the community bank in 2012, which uses extensive financial data beyond size as well as non-financial, demographic information. This definition first excludes any institution, regardless of the amount of their total assets, if they have: no loans or no core deposits; foreign assets greater than 10% of total assets; and more than 50% of assets in certain specialty banking areas (e.g. credit card or industrial loans). Of the remaining banking institutions, the ones with total assets less than $1 billion (in 2010 dollars) are designated as community banks. The FDIC also designates institutions with total assets more than $1 billion if they meet the following criteria: have loan to assets ratio and core deposits to assets ratio above 33% and 50%, respectively; operate more than one office but no more than 75 offices (as of 2010); operate offices in no more than three states and two large metropolitan statistical areas; and do not operate any single office with deposits more than $5 billion (in 2010 dollars). METRO and CBANK are included to capture potentially significant differences between metropolitan versus rural institutions, and small versus large banks. Finally, we include year dummy variables to control for time-specific fixed effects. We use two specifications of a fixed effects model to study possible earnings management practices by banks before and after the 2007-2009 Financial Crisis. The first specification has the following general form:

$$Y = b_0 + b_1 EARN + b_2 TOP5 + b_3 EARN \ x \ TOP5 + b_4 CHROFF + b_5 ALL + b_6 NONC + b_7 \Delta NONC + b_8 INTER + b_9 METRO + b_{10} CBANK + \alpha + \varepsilon \tag{1}$$

The next specification looks at the possible differences in earnings management practices between low-profit and high-profit banks by interacting EARN with LOWROA. The specification has the following general form:

$$Y = b_0 + b_1 EARN + b_2 TOP5 + b_3 LOWROA + b_4 EARN \ x \ TOP5 + b_5 EARN \ x \ LOWROA + b_6 EARN \ x \ LOWROA \ x \ TOP5 + b_7 CHROFF + b_8 ALL + b_9 NONC + b_{10} \Delta NONC + b_{11} INTER + b_{12} METRO + b_{13} CBANK + \alpha + \varepsilon \tag{2}$$

In the above regressions, $Y$ is LLP (defined as the provision for loan and lease losses), $\alpha$ is the institution-specific fixed effect which contains all factors that do not vary over time, and $\varepsilon$ is the idiosyncratic error term. Estimated regressions for the pre-crisis and post-crisis periods include year dummy variables (not reported) to control for time-specific effects, with years 2003 and 2007 as the base, respectively.

**RESULTS**

The estimated fixed effects specifications generate regression results reported in Tables 4-7. All regressions are statistically significant at the 1% level and explain between 73.4% and 86.7% of the variation in loan

loss provisioning of banks. Table 4 provides regression results from the first regression we ran using data from the pre-crisis period. There are 35 missing data points in the pre-crisis dataset because 35 of the 1,890 banks in the dataset were established in 2003 and had no datapoints for the lagged variables of ALL and NONC for that year. Neither of the coefficients on EARN and EARN x TOP5 is statistically significant, suggesting no evidence of earnings management by banks headquartered in states that were most and least impacted by the looming housing market crash, respectively, during the pre-crisis period of 2003-2006.

Table 4: Regression of Loan Loss Provisions on Reported Earnings for the Period Before the Crisis

|  | Coefficient | Std. Error | t-stats | p-value |
|---|---|---|---|---|
| earn | 0.0046 | 0.0035 | 1.32 | 0.186 |
| top5 | 0.0778 | 0.4170 | 0.19 | 0.852 |
| earn x top5 | -0.0046 | 0.0035 | -1.32 | 0.186 |
| chroff | 1.0202 | 0.0087 | 117 | 0.000*** |
| all | -0.3029 | 0.0105 | -28.9 | 0.000*** |
| nonc | -0.0160 | 0.0070 | -2.27 | 0.023** |
| $\delta$nonc | 0.0410 | 0.0053 | 7.76 | 0.000*** |
| inter | -0.0358 | 0.0809 | -0.44 | 0.658 |
| metro | 0.1110 | 0.0969 | 1.15 | 0.252 |
| cbank | 0.0317 | 0.0593 | 0.53 | 0.593 |
| intercept | 0.4275 | 0.1171 | 3.65 | 0.000*** |
| f-stats | 1,202*** |  |  |  |
| $r^2$ (with-in) | 0.7355 |  |  |  |
| adjusted $r^2$ | 0.6460 |  |  |  |
| n | 7,525 |  |  |  |
| # of groups | 1,890 |  |  |  |

*This table shows the regression results generated by the first specification above for the period before the financial crisis. We interact EARN (defined as the net income before taxes and provision for loan and lease losses) with TOP5, a dummy variable for institutions headquartered in one of the five states (i.e., Nevada, Arizona, Florida, California, and Idaho) that experienced the largest decline in the HPI between Quarter 1, 2007 and Quarter 2, 2011. \*\*\*, \*\*, and \* denote 1%, 5%, and 10% significance, respectively.*

Table 5 shows our findings from the post-crisis period. The coefficient on EARN is statistically insignificant suggesting no earnings management behavior in the post-crisis period by banks headquartered in one of the five states that experienced the smallest decline in the HPI during the housing market crash. On the other hand, the coefficient on EARN x TOP5 has the predicted positive sign and is statistically significant at the 1% level. Variable TOP5 (the dummy variable for institutions headquartered in Nevada, Arizona, Florida, California, and Idaho) is omitted by STATA from regressions estimated using data from the post-crisis period, since TOP5 is constant within the grouping variable defined as the FDIC-designated bank certificate number. Since the fixed effects estimator (i.e., $\alpha$) explains all of the variance at the group level, nothing remains for TOP5 to explain. This finding is consistent with the earnings management hypothesis that banks headquartered in states where the housing market crash was most pronounced used their loan loss provisions to manage reported income upward in the post-crisis period.

Table 5: Regression of Loan Loss Provisions on Reported Earnings for the Period After the Crisis

|  | Coefficient. | Std. Error | T-Stats | P-Value |
|---|---|---|---|---|
| Earn | -0.0002 | 0.0013 | -0.19 | 0.851 |
| Top5 |  |  |  |  |
| EARN x TOP5 | 0.1052 | 0.0018 | 58.0 | 0.000*** |
| Chroff | 0.9663 | 0.0106 | 91.2 | 0.000*** |
| All | -0.8392 | 0.0269 | -31.2 | 0.000*** |
| Nonc | 0.1015 | 0.0069 | 14.8 | 0.000*** |
| Δnonc | 0.0761 | 0.0057 | 13.4 | 0.000*** |
| Inter | 0.0311 | 0.1698 | 0.18 | 0.855 |
| Metro | 0.1485 | 0.2738 | 0.54 | 0.587 |
| Cbank | -0.1338 | 0.1412 | -0.95 | 0.343 |
| Intercept | 1.0424 | 0.2021 | 5.16 | 0.000*** |
| F-stats | 1,443*** |  |  |  |
| $R^2$ (with-in) | 0.7538 |  |  |  |
| Adjusted $R^2$ | 0.6710 |  |  |  |
| N | 7,560 |  |  |  |
| # Of groups | 1,890 |  |  |  |

*This table shows the regression results generated by the first specification above for the period after the financial crisis. We interact EARN (defined as the net income before taxes and provision for loan and lease losses) with TOP5, a dummy variable for institutions headquartered in one of the five states (i.e., Nevada, Arizona, Florida, California, and Idaho) that experienced the largest decline in the HPI between Quarter 1, 2007 and Quarter 2, 2011. ***, **, and * denote 1%, 5%, and 10% significance, respectively.*

Table 6 reports the findings from the second regression we ran using data for the period before the 2007-2009 crisis. The coefficient on EARN x LOWROA is negative and statistically significant at the 1% level, indicating that banks in the base group (i.e., low-profit banks from one of the five states least impacted by the impending housing market woes) did not engage in earning management. The coefficient of the three-way interaction variable EARN x LOWROA x TOP5 also has a negative sign, but it is not statistically significant. These findings suggest that, in the pre-crisis period, there were no differences in loan loss provisioning practices (that did not involve earnings management) between banks headquartered in states that were most affected by the housing crash and those least affected by it.

Table 6: Regression of Loan Loss Provisions on Reported Earnings for the Period Before the Crisis

|  | Coefficient | Std. Error | t-stats | p-value |
|---|---|---|---|---|
| earn | 0.0085 | 0.0036 | 2.35 | 0.019** |
| top5 | 0.0980 | 0.4167 | 0.24 | 0.814 |
| lowroa | 0.0819 | 0.0215 | 3.80 | 0.000*** |
| earn x top5 | -0.0085 | 0.0036 | -2.35 | 0.019** |
| earn x lowroa | -0.0256 | 0.0068 | -3.78 | 0.000*** |
| earn x lowroa x top5 | -0.0085 | 0.0111 | -0.77 | 0.443 |
| chroff | 1.0203 | 0.0087 | 117 | 0.000*** |
| all | -0.3058 | 0.0105 | -29.2 | 0.000*** |
| nonc | -0.0171 | 0.0070 | -2.43 | 0.015** |
| δnonc | 0.0402 | 0.0053 | 7.61 | 0.000*** |
| inter | -0.0411 | 0.0808 | -0.51 | 0.611 |
| metro | 0.0963 | 0.0968 | 0.99 | 0.320 |
| cbank | 0.0370 | 0.0592 | 0.62 | 0.533 |
| intercept | 0.4060 | 0.1175 | 3.46 | 0.001*** |
| f-stats | 981*** |  |  |  |
| $r^2$ (with-in) | 0.7364 |  |  |  |
| adjusted $r^2$ | 0.6471 |  |  |  |
| n | 7,525 |  |  |  |
| # of groups | 1,890 |  |  |  |

*This table shows the regression results generated by the second specification above for the period before the financial crisis, where we look at the possible differences in earnings management practices between low-profit and high-profit banks by interacting EARN with LOWROA. ***, **, and * denote 1%, 5%, and 10% significance, respectively.*

The findings reported in Table 7 do not provide any evidence of earnings management practice by institutions with below-median pre-tax return on assets in the base group in the post-crisis period, since the coefficient on EARN x LOWROA is negative and statistically insignificant. On the other hand, the positive

and statistically significant coefficient (at the 1% level) on EARN x LOWROA x TOP5 indicates that low-profit banks headquartered in Nevada, Arizona, Florida, California, and Idaho managed their earnings upward during the same period. This result is consistent with our hypothesis that banks facing declining profitably in states where the impact of the housing market crash was most felt were particularly prone to managing their earnings.

Table 7: Regression of Loan Loss Provisions on Reported Earnings for the Period After the Crisis

|  | Coefficient | Std. Error | t-stats | p-value |
|---|---|---|---|---|
| Earn | -0.0003 | 0.0009 | -0.30 | 0.766 |
| Top5 |  |  |  |  |
| Lowroa | 0.0509 | 0.0304 | 1.67 | 0.094* |
| EARN x TOP5 | -0.0014 | 0.0020 | -0.67 | 0.502 |
| EARN x LOWROA | -0.0104 | 0.0099 | -1.05 | 0.294 |
| EARN x LOWROA x TOP5 | 0.1577 | 0.0101 | 15.7 | 0.000*** |
| Chroff | 0.9679 | 0.0078 | 124 | 0.000*** |
| All | -0.8188 | 0.0199 | -41.2 | 0.000*** |
| Nonc | 0.0971 | 0.0051 | 18.9 | 0.000*** |
| Δnonc | 0.0790 | 0.0042 | 18.8 | 0.000*** |
| Inter | 0.0502 | 0.1248 | 0.40 | 0.687 |
| Metro | 0.1288 | 0.2015 | 0.64 | 0.523 |
| Cbank | -0.1408 | 0.1038 | -1.36 | 0.175 |
| Intercept | 1.0780 | 0.1488 | 7.25 | 0.000*** |
| F-stats | 2,458*** |  |  |  |
| $R^2$ (with-in) | 0.8670 |  |  |  |
| Adjusted $R^2$ | 0.8222 |  |  |  |
| N | 7,560 |  |  |  |
| # Of groups | 1,890 |  |  |  |

*This table shows the regression results generated by the second specification above for the period after the financial crisis, where we look at the possible differences in earnings management practices between low-profit and high-profit banks by interacting EARN with LOWROA. \*\*\*, \*\*, and \* denote 1%, 5%, and 10% significance, respectively.*

Three of the variables (i.e., CHROFF, ALL, and ΔNONC) controlling for the nondiscretionary component of loan loss provisioning have the expected signs on their coefficients and are statistically significant at the 1% level in all estimated regressions. The coefficients on NONC, on the other hand, have the expected signs and are significant at the 1% level in two of the four estimated regressions. Overall, these findings are consistent with the prediction that nondiscretionary factors, to a large extent, determine banks' loan loss provisioning. On the other hand, none of coefficients on other control variables (i.e., INTER, METRO, and CBANK) are statistically significant in either model. Lastly, the main findings of our paper are generally consistent with prior research that banks tend to use loan loss provisions to manage earnings by employing the high degree of discretion provided by accounting rules in determining the proper balance for the allowance for loan losses account through loan loss provisions.

## CONCLUDING COMMENTS

The median home price in the United States reached an all-time high in the first half of 2007 before it began a prolonged descent. Over the next four years, the HPI published by the FHFA fell more than 20% nationwide, making this momentous house market correction one of the main contributors to the Financial Crisis of 2007-2009. Making central use of this natural experiment setting, our study aims to test the earnings management hypothesis that banks are strongly incentivized to understate loan loss provisions in order to manage reported earnings upward during times of declining earnings. Our dataset is generated using Call Reports and covers the periods before and after the 2007-2009 Financial Crisis. We divide our balanced panel dataset into two equal subsets and analyze pre- and post-crisis periods separately. Each subset covers a four-year period and consists of 7,560 observations gathered from the same 1,890 banking institutions that had been continuously active from 2003 to 2010. For the pre-crisis period of 2003-2006, our findings do not provide any evidence of earnings management by banks (including those with below-median profitability) headquartered in states that were most and least impacted by the housing market crash.

In contrast, our empirical findings support the earnings management hypothesis that banks (both low- and high-profit ones) headquartered in states where the housing market crash was most pronounced used loan loss provisions to manage reported earnings in the post-crisis period. However, for the same period, we did not find any evidence of banks headquartered in states that experienced the smallest decline in the HPI practicing earnings management. Finally, we show that nondiscretionary factors also played a big role in determining banks' loan loss provisioning.

This paper adds to the literature on the loan loss provisioning practices of U.S. banks, with emphasis on institutions particularly likely to conduct earnings management due to experiencing financial distress. Our study has significant economic and regulatory implications. The findings suggest that banking institutions faced by declining financial conditions are likely to resort to the practice of earnings management, which in return distorts the financial picture of this vital industry that is at the heart of the economic and financial systems. If bank financial statements are found to be inaccurate or misleading, a loss of confidence in the banking system among investors and customers would be the likely outcome. Furthermore, distorted financial statements may cause a breakdown of trust in the financial system, thus negatively impact the overall economy, consequences of which would be magnified when the economy is already under strain. In this regard, banking and financial regulators, who play a crucial role in maintaining public confidence in the banking system, have the oversight responsibility to prevent the obscuring of true financial performance through dubious loan loss provisioning practices. This study has certain limitations that should be considered when our findings are expounded; yet the same limitations also offer opportunities for further research. First, our analysis may be extended by analyzing the financial and demographic characteristics of banks that are more likely to manage earnings when faced with difficult economic conditions. Also, our paper does not differentiate between earnings management practices of institutions of different sizes in the context of strengthening incentives to manage reported earnings amid rising financial strain. Future research may incorporate institutional size as a variable of interest, given that it significantly impacts organizational and operational characteristics of banks.

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**BIOGRAPHY**

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# THE IMPACT OF BOARD COMPOSITION AND OWNERSHIP STRUCTURE ON INNOVATION PERFORMANCE: AN EMPIRICAL STUDY IN TAIWAN'S ELECTRONICS INDUSTRY

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## ABSTRACT

*This research measures innovation performance from the perspective of R&D investment and patent rights and explores the impact of different board compositions and shareholding structures on corporate innovation performance. This study goes on to discuss whether the composition of the board of directors can be balanced with the shareholding structure, which will have a different impact on the company's innovation performance. The sample used in this study is a sample of Taiwan's listed OTC electronics industry for a total of five years from 2014 to 2018. The innovation value chain is used to measure the company's innovation performance, from "input (R&D expenditure) → intermediate output (patent rights) → final output (Sales) "conducted an empirical analysis. The results show that the composition of the board of directors and the shareholding structure have inconsistent effects on the company's innovation value chain, which may be beneficial to investment in research and development but not conducive to the final output (sales). External and independent directors can increase the independence of the board of directors, and can adjust the ratio of shareholding and deviation of control rights and cash flow rights of directors and supervisors, which will have a positive impact on innovation performance.*

## INTRODUCTION

In the knowledge economy era, companies must continue learning and innovating. The purpose is to promote the company's growth, demonstrate competitiveness, and ensure a leading position. Due to the development of globalization and the popularization of the Internet, the overall environment is changing rapidly, and competition is quite fierce, especially for high-tech industries with short life cycles and rapid growth. The world economy has also evolved from a regional economy to a shared global economy that affects the whole situation. Companies must maintain their competitiveness through R&D innovation and enhance their core capabilities and value. Peter Drucker, a Master of Management, said, "Innovation or Die" companies must find opportunities to seek innovation in response to changes at any time. The importance of innovation activities is that they can enable companies to stimulate outstanding performance and are likely to be an essential element for companies to gain an advantage (Knight, 1997). In addition, the ability to innovate is also considered an asset for a company's ability to maintain a competitive advantage and carry out its overall strategy (Lawson & Samsom, 2001).

Companies' decisive assets have been replaced by intellectual capital and intangible assets (Drucker, 1993). Among intangible assets, one of the most important items for companies to create value is innovation

(Kalafut & Low, 2001). Companies are also gradually attaching the importance of accumulating intangible assets and actively investing in R&D work. Cho (1998) stated that when a company's performance is better, it should behave more funds for R&D innovation activities; therefore, performance quality can be evaluated at the level of R&D expenditure. Furthermore, according to Mairesse & Mohnen (2004) and Kim & Marschke (2004), when a company conducts R&D activities, it can assist in generating innovative results, and the results representing R&D activities are usually patent rights. R&D success is not easy, and the required R&D expenditure frequently accounts for a part of the operating income. For example, in 2018, TSMC's R&D expenditure accounted for up to 8% of net operating income. Ernst (2001) discovered that after the patent right is approved, it is deferred for 2-3 years, demonstrating that companies need to spend a lot of money and time in the innovation process, which is not easy. Requires R&D expenditure to show results to the end; it takes a lot of time and money to turn a profit for companies.

For companies, corporate governance is a crucial topic. La Porta, Lopez-de-Silanes, & Shleifer (1999) found that most companies in East Asian countries are family-controlled or government-controlled companies; they also have a pyramid structure and cross-shareholding to enhance control; however, 70% of listed OTC companies in Taiwan are family-controlled. Under the circumstance that control and management rights are not separated, controlling shareholders would have enormous incentives to deprive minority shareholders of the core agency problem. The innovation activities are highly uncertain and risky; therefore, how the composition of the board of directors and ownership structure will affect companies' innovation performance; is the research motivation of this study. Nearly half of the top 10 companies in Taiwan by market value in 2019 belong to the electronics industry, which shows that the electronics industry is of considerable importance to Taiwan's economy and industry. With the changes in the overall global economy, large factories cannot maintain the competitiveness of domestic companies solely through OEM. Only by determining the future trends will they not be eliminated in the highly competitive high-tech industry. Cainelli, Evangelista, & Savona (2004) found that innovative companies outperformed non-innovative companies in terms of productivity and economic growth; thus, innovation is an inevitable process for companies to progress. In highly uncertain and risky innovation activities, if funds are invested blindly without planning and managing their use, it will result in resource waste and failure to achieve innovation goals. The external mechanism will assist companies in carrying out their innovation activities successfully. This study uses the local listed OTC electronics industry from 2014 to 2018 as a sample. Referring to the model adopted by Yang, Cai and Wu (2008), Wang and Shen (2014). Lev (2001) stated that the innovation value chain measures innovation performance. In order to explore the impact of board composition and ownership structure on innovation performance, this study expands the research question as follows:

The impact of the board of directors' composition on innovation performance.
The impact of ownership structure on innovation performance.
The impact of board composition and ownership structure on innovation performance.

Furthermore, we contribute to this literature by exploring whether the board composition and ownership structure impacted companies' innovation performance. We also explore whether independent directors and outside directors can moderate the phenomenon of ownership concentration and positively impact companies. Our findings are inconsistent with considering the impact of the measurement variables of board composition and ownership structure on R&D investment and sales. It may be because management decisions and outside director opinions benefit the company's R&D innovation. The remainder of this paper is structured as follows: Section II discusses the relevant literature review and the development of our hypothesis. Section III describes the data sources, samples, and research methods used. Section IV shows the empirical results and analysis. The last section provides conclusions and recommendations.

## LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

OECD (1996) proposed that a knowledge economy refers to an economic formation that focuses on the possession, creation, acquisition, dissemination, and application of knowledge. Lev (2001) mentioned that intangible assets primarily drive the knowledge economy, wealth, and development. Tangible and financial assets are rapidly becoming commodities and the defining assets of businesses, and intellectual capital and intangible assets replaced tangible assets (Druker, 1993). Kalafut & Low (2001) pointed out that among intangible assets, innovation activities are among the most important items for companies to create value. Under the type of the knowledge economy, the importance of intangible assets to companies has dramatically increased. In facing fierce global competition, companies can only continue to innovate and conduct R&D to enhance their core values and competitiveness.

The company's innovation activities at different stages are not the same, and it will dominate by the product development stage. In the early stages, it will focus on developing new methods and materials to enhance competitiveness and profitability so that products will be changed more frequently. After entering the growth period stage, it will cause significant changes in the manufacturing process in response to consumer demand. After the maturity period, companies will choose product areas or innovative activities suitable to develop (Utterback, 1994). However, when companies commit to innovation activities, they must invest much money as R&D expenditures. Besides that, innovation also has a high degree of uncertainty, which causes not all companies to be willing to invest a lot of R&D expenditures on innovation activities. Cho (1998) pointed out that when the company's performance is better, it should have more funds for R&D innovation activities, so the level of R&D expenditure can assess the quality of performance.

Prior research has found that R&D expenditures positively correlate with patent rights (Artz, Norman, Hatfield & Cardinal, 2010). Strong research capabilities are also the key to enabling companies to obtain creative outputs, and companies can benefit from new products. In the prior study on the impact of indicators such as patent rights and R&D expenditure on company performance, productivity, and value, most studies argue that they have a positive effect (Griliches, 1981; Pakes, 1985; Cockburn & Griliches, 1987; Griliches, Hall & Pakes, 1998; Deng, Lev, & Narin, 1999). According to the research by Johnson and Johnston (2004), innovation performance represents products that reflect the effectiveness of new products in the market, cost, and financial performance indicators. There is inconsistency among scholars on the measurement of innovation performance. The output of new products requires integrating many resources and assets, investing funds in research and development of new technologies, obtaining patent rights, and finally integrating them to produce new products, bringing profits to the company. This is similar to the concept of innovation value chain proposed by Lev (2001), which measures innovation performance from the perspective of input (R&D expenditure) → intermediate output (patent rights) → final output (sales).

Cai, Li, and Ji (2009) proposed objective innovation performance measures, such as reports, patents, the number of papers published, and the ratio of approved projects. Subjective emphasis is placed on comparing new products with other products in terms of quality and competitors, or innovation in the industry can continue to launch new products or make it possible to obtain reports and awards. In addition, these new products can even hold a high market share to cause imitation of the industry (Olson, Walker & Ruekert, 1995). Many factors affect innovation performance, roughly divided into external environmental and internal factors, including customers, competitors, laws, management systems, etc. (Cai et al., 2009). Due to the high uncertainty of innovation and insufficient public information, it is easy to cause information asymmetry between the company's internal and external information, which means the importance of highlighting the internal governance mechanism. Different internal governance mechanisms have other impacts on the company's innovation performance. The following sections describe the impacts of internal governance mechanisms on innovation performance. Jensen & Meckling (1976) proposed that the traditional agency problem theory refers to a situation where control and ownership are separated; it creates a conflict of interest between the controller and the company's owner due to separating the manager and

financial provider. La Porta et al. (1999) found that companies in most East Asian countries, including Taiwan, are mostly family-controlled. Under the condition that control and management rights are not separated, it is easy to generate core agency problems. There are great incentives for controlling shareholders to deprive minority shareholders of their rights and interests.

However, many prior studies have found that agency problems bring uncertainty to the value of R&D investment (Hall & Lerner, 2010; O'Connor, Rafferty & Sheikh, 2013; Tsao, Lin & Chen, 2015). Chu, Yang, and Yang (2016) mentioned that the agency problem reduces R&D efficiency and the value of R&D investment. When there is information asymmetry between managers and financial providers, managers will tend to engage in R&D activities that serve their interests but are inefficient. Not all company's innovation performance and innovation value effects are the same and may be affected by agency problems. Unlike agency theory, Donaldson & Davis (1991) proposed the stewardship theory, in which the interests of managers and financial providers are consistent, and they work hard because of their dignity, beliefs, and the pursuit of inner satisfaction. In facing R&D investment with high uncertainty, managers will avoid the risk of unemployment, but they will even be willing to sacrifice personal interests to achieve company goals (Boyd, 1995; Donaldson & Davis, 1994). Therefore, if the stewardship theory measures the impact on innovation performance, it may positively impact innovation performance under the condition that the interests of the principal-agent are consistent.

To reduce the impact of agency problems, companies have gradually developed corporate governance mechanisms. The World Bank (1999) discusses the corporate governance structure, divided into internal and external mechanisms, from the two perspectives of corporate and public policy. The core of the internal governance mechanism lies in the board of directors, which is responsible for supervising the management and decision-making of the company. External mechanisms include the establishment of legal norms and organizations to strengthen the functions of internal mechanisms. A mature external mechanism can effectively reduce agency problems between shareholders and management. The ownership structure is closely related to corporate governance. When the company's equity is highly concentrated, the controlling shareholders may directly control the management level. Currently, the focus of corporate governance is to avoid the occurrence of core agency problems. If the company's shareholding is dispersed, the management level is held by managers who are only responsible for management. Currently, the focus of corporate governance is to establish an independent board of directors to supervise the management performance. Therefore, based on different theories and viewpoints, the different board compositions and ownership structures have a different impact on the company's decision-making and performance. It is necessary to check and balance the internal and external corporate governance mechanisms to maximize the company's value and protect the stakeholders' rights and interests, such as financial providers.

The Impact of Board Composition and Ownership Structure on Innovation Performance

Xie (2009) mentioned that the function of the board of directors could provide management consultation under the resource dependence theory, assist the company in planning strategies and engaging with the outside world, reduce the uncertainty caused by the external environment, and obtain operating resources that are helpful to the company. Prior conclusions about the impact of large-size boards on companies have been inconsistent, with over-large and over-small boards. There are advantages and disadvantages for companies. Prior studies have pointed out that the over-large board of directors can easily affect communication and efficiency problems (Dechow, Sloan & Sweeney, 1996; Abbott, Parker, & Peters, 2004). Moreover, it will reduce the board of directors to a formalization (Jensen, 1993) and then lose the board's due supervisory function. Otherwise, smaller boards are less susceptible to the influence of management, and the function of supervision is easily achieved (Beasley, 1996). Yermack (1996) pointed out that small-size boards have higher real-time strategy efficiency, and the decision-making cost of the board of directors will increase as the number of people increases. Therefore, it may not be easy to implement innovative strategies with larger boards because of their inefficiency.

However, according to the resource dependence theory, the directors of a large-size board of directors will have more diverse backgrounds, skills, and opinions on business strategies, which will help to improve company performance (Bacon & Brown, 1975); it is also more effective control and monitoring of managers' decisions and behaviors (Chen, 2008). According to the stakeholder theory, Adams, Hermalin, and Weisbach (2010) argue that a large-size board can involve other stakeholders to participate in innovation. Pearce & Zahra (1992) argue that although the more large-size the board of directors is, the more difficult it is to be dominated by managers, the more the board can refute managers' proposals. However, the large-size board members have more diverse backgrounds and industry expertise, leading to higher company performance. Most companies in Taiwan are family businesses with relatively concentrated shareholdings. Inefficiency boards of directors and communication problems are unlikely to have an impact on innovation performance. Therefore, the hypothesis of this study is as follows:

*H1a:* There is a positive correlation between board size and innovation performance.

The chairman has an important influence on the board of directors. Prior studies on the chairman and general manager have different views based on agency theory and stewardship theory. First, according to agency theory, when the same people serves as chairman and general manager when faced with decision-making, it is easy to make independent and speculative decisions, thus deepening the principal-agent problem (Boyd, 1994; Daily & Dalton, 1993; Mallette & Fowler, 1992; Morck, Shleifer & Vishny, 1989). On the other hand, according to the stewardship theory, managers are willing to sacrifice personal interests to achieve the company's goals, thus increasing the incentive to invest in R&D activities. R&D activities are highly uncertain, rely on the discretion of management, and have a high degree of information asymmetry, making it difficult to reliably estimate the appropriate amount of resources and expenditures for R&D activities. For companies, the most crucial thing is to ensure that their R&D expenditures are carried out under effective monitoring and management to increase the company's advantages (Chow, Harrison, Lindquist & Wu, 1997, Cheng, Schultz, Luckett & Booth, 2003). Gul & Leung (2004) argue that serving as the chairman and general manager at the same time will have a significant impact on the board of directors, which may reduce the board's ability to supervise and manage decision-making, thus will possibly occurring a negative impact on innovation performance. Based on this view, this study proposes a hypothesis is as follows:

*H1b:* There is a negative correlation between the chairman and the general manager of innovation performance.

The board of directors' members is composed of internal and external directors. They are not only the company's decision-makers, but it is also a key internal mechanism for supervising the company and play a vital role in corporate governance. From the standpoint of supervisory role, Hossain, Cahan, and Adams (2000) argue that the value of outside directors is related to their ability to objectively judge company performance, while inside directors lack this trait. Therefore, their effectiveness in supervising the company is limited. When the board of directors makes decisions, inside directors are less able to express their positions objectively, which makes the board's supervisory function and the objectivity of performance evaluation questionable (Daily & Dalton, 1994). Bhagat & Black (1999) divided outside directors into outside non-independent directors and independent directors. Non-independent directors are employees who have served in the company, relatives of employees, or directors who have business dealings with the company or provide consulting services. Mallette & Hogler (1995) defines independent directors as directors who have no apparent relationship with the company. Independent directors should be independent of the company and have nothing to do with the company's operations, nor hold important positions or contacts, and must have a certain degree of professional background.

Many prior studies have pointed out that establishing independent directors can improve the board of directors' independence, and board independence positively impacts company performance. According to the resource dependence theory, independent directors can help companies obtain the required resources

and improve innovation performance. They are regarded as important external human resources because of their higher monitoring ability and advanced professional knowledge (Stevenson & Radin, 2009). In addition to facing complex problems, companies also need to invest many resources when carrying out innovation activities, so it is necessary to conduct a careful evaluation. The company can not only use the supervision and professional knowledge of independent directors to help carry out innovation activities but also in the implementation stage of R&D projects; Companies can use independent directors to monitor the effectiveness of resource allocation (Desai, Kroll & Wright, 2005). Efficient use of resources can enable companies to improve the efficiency and productivity of new product development. Therefore, the hypothesis establishes as follows:

*H1c:* Companies with a higher ratio of outside directors have better innovation performance.

*H1d***:** Companies with a higher ratio of independent directors have better innovation performance.

There were two different views in the literature on the shareholding ratio of directors and supervisors in the prior. According to the "Interest Convergence Hypothesis" proposed by Jensen & Meckling (1976), which argues that the interests of management and shareholders are consistent. Therefore, it argues that the proportion of shareholders within a company is positively related to company performance. On the other hand, the "Interest Conflict Hypothesis" proposed by Jensen & Ruback (1983) argues that when the management level's shareholding ratio is higher than a certain level, it has enough voting rights or influence to protect the position from being shaken, and there may be some serious problems. "Anti-takeover behavior" to consolidate one's position, which has a negative impact on company performance.

In terms of empirical study, Wang (2001) pointed out that the insider shareholding ratio has a significant positive correlation with R&D expenditure. Because the company's insiders have the information advantage, which aligns with the hypothesis of interest convergence, when the insider shareholding ratio is higher, the company tends to choose an innovation strategy. Zeng, Zeng, and Zheng (2013) found that the higher the shareholding ratio of directors and supervisors, it is beneficial for companies to accumulate innovation capabilities through R&D and create growth opportunities. Hill & Snell (1989) and Baysinger, Kosnik & Turk (1991) found a positive relationship between ownership concentration and R&D expenditure, indicating that large shareholders can effectively control managers' innovation decisions. Following the above literature, this study proposes a hypothesis is as follows:

*H2a:* The higher the shareholding ratio of directors and supervisors, the better the innovation performance.

To examine the relationship between institutional investors and operating performance, Pound (1988) pointed out three hypotheses: the efficiency supervision hypothesis, the conflict of interest hypothesis, and the strategic cooperation hypothesis. Because institutional investors have enough resources and rich information channels, the effect of investment selection and supervision is better than that of general retail investors. According to the efficiency supervision hypothesis, strong incentives and a better ability to supervise the company's various operating strategies (Almazan, Hartzell, & Starks 2005; Chen, Harford, & Li 2007; Fama & Jensen 1983). The prior literature mentioned that when there is information asymmetry between the controller and the owner, the controller will tend to engage in R&D activities with self-interest and low efficiency because institutional investors have rich information channels and the ability to collect data. Therefore, companies with institutional investors have less information asymmetry. According to Sias (2004), institutional investors do have the ability to collect information. The study shows that institutional investors' shareholding can reduce the information asymmetry between internal and external companies, and information asymmetry is common in innovation activities. Based on the efficiency supervision hypothesis, the proposed hypothesis is as follows:

*H2b:* When the company's institutional shareholding ratio is higher, the company's innovation performance

is better.

Prior research has shown that companies in most countries, including Taiwan, are characterized by shareholding and concentration in the hands of controlling shareholders and separation of control and ownership (Claessens, Djankov, & Lang, 2002; La Porta et al., 1999). Controlling shareholders increase their control over the company through cross-shareholding, pyramid structure, and participation in company management. So that the control rights and cash flow rights are separated, which in turn produces positive incentive effects and entrenchment effects. The higher the control power, the more power the controlling shareholder must decide the company's business decisions. Therefore, in terms of incentive effect, when the control power is greater, the interests of the controlling shareholder are consistent with the company's, and there are more incentives to supervise the management level. On the other hand, when the control power is greater, it is easy to generate agency problems, resulting in large shareholders encroaching on small shareholders for profit. Since innovation activities have five characteristics: long-term investment, high risk, unpredictability, labor-intensive, and specificity (Holmström, 1989), controlling shareholders tend to be less inclined to engage in innovation activities due to self-interest incentives. Jin and Chen (2006) found that "the degree of deviation of control rights and cash flow rights" is negatively correlated with the company's patent rights. Therefore, the hypothesis of this study is as follows:

*H2c:* When the degree of deviation between the company's control rights and cash flow rights is greater, the innovation performance is lower.

Since outside directors are not actually involved in the company business, their status is relatively independent. They have professional backgrounds, which can alleviate agency problems and provide the board of directors' professional advice when making decisions. Prior studies showed that outside directors are more capable of playing the role of supervisory managers (Weisbach, 1998; Rosenstein & Wyatt, 1997). In addition, the knowledge and experience of outside independent directors can positively affect company sales growth (Kor & Sundaramurthy, 2009). Therefore, outside directors may influence the company's innovation performance by supervising the management level or having a positive influence on R&D innovation, thereby improving the company's innovation performance. Therefore, based on the above, this study establishes the following hypothesis:

*H3a:* When the ratio of outside directors of the company is higher, it has a positive impact on the shareholding ratio of directors and supervisors, thereby improving innovation performance.

*H3b:* When the ratio of outside directors of the company is higher, it has a positive impact on control rights and cash flow rights, thereby improving innovation performance.

*H3c:* When the ratio of independent directors of the company is higher, it positively impacts the shareholding ratio of directors and supervisors, thereby improving innovation performance.

*H3d:* When the ratio of independent directors of the company is higher, it has a positive impact on control rights and cash flow rights, thereby improving innovation performance.

## DATA AND METHODOLOGY

### Data Sources

The information required for this study includes the innovation performance of listed electronics companies, the board size, chairman and general manager, the ratio of outside directors, the ratio of independent directors, the shareholding ratio of directors and supervisors, the institutional investor shareholding ratio, the degree of deviation between control rights and cash flow rights, and related financial variables. The

sample data takes from the Taiwan Economic Journal (TEJ) and the Taiwan Patent Search System.

The Sample Period

This study aims to observe the impact of board composition and ownership structure on innovation performance in Taiwan's listed OTC electronics industry in the past five years. The research period was five years, from 2014 to 2018.

Sample Selection Standard

High-tech industries with a short life cycle and intense competition will actively innovate to enhance the company's competitiveness. The selected companies in this study are listed electronics companies in Taiwan. Errors caused by different economic environment systems and patent production processes can avoid. The research sample must have complete net operating income, patent rights, R&D expenditure, the board size, whether the chairman is concurrently the general manager, the ratio of outside directors, the ratio of independent directors, the shareholding ratio of directors and supervisors, institutional investors shareholding ratio, the degree of deviation between control rights and cash flow rights, and other public information. If there are omissions and extreme data, the sample will delete.   Table 1 shows the total number of research samples selected from 2014 to 2018 in the listed OTC electronics industry. The initial number of samples from 2014 to 2018 was 4,171. First, the total number of samples for R&D productivity is 3,730 after excluding 441 missing values. Second, the total number of samples for R&D efficiency is 3,761 after excluding 410 missing values. Third, the number of samples for paten productivity is 2,547 after excluding 1,624 missing values.

Table 1: Sample Selection Instructions

|  | R&D Productivity | R&D Efficiency | Patent Productivity |
|---|---|---|---|
| 2014-2018 listed Otc electronics industry | 4,171 | 4,171 | 4,171 |
| Minus: missing values | 441 | 410 | 1,624 |
| Total number of research samples | 3,730 | 3,761 | 2,547 |

*This table shows sample selection instructions. Columns 2, 3, and 4 indicate the number of final samples used in this paper, respectively.*

The Definition of Variables

In the past, most of the literature used questionnaires or the number of patent rights increases to measure innovation performance. This study refers to the empirical model used by Yang et al. (2008) and Wang and Shen (2014). Also, it adopts the innovation value chain proposed by Lev (2001), from "input (R&D expenditure) → intermediate output (patent rights) → final from the perspective of output (sales)," these three indicators are used to measure innovation performance. According to Ernst (2001), the impact of patent rights on sales revenue is about two to three years behind. Therefore, the effect of time lag must consider when setting variables. Table 2 presents the definition of the variables used in this study. The variables consist of dependent variables, independent variables, and control variables.

Table 2: Definition of Variables

| Variables | Definition |
|---|---|
| Dependent variable: innovation performance | |
| R&D productivity (RD PRODUCTIVITY) | Net operating income for the current period / The sum of R&D expenditures for the current period and the past two periods |
| R&D efficiency (RD EFFICIENCY) | The sum of patent rights in the current period and the past two years / The sum of R&D expenditures in the current period and the past two periods (the natural log) |
| Patent productivity (PATENT PRODUCTIVITY) | Net operating income for the current period (the natural log) / The sum number of patent rights in the current period and the past two years |
| Independent variable | |
| Board of director's size (BOARDSIZE) | The total number of director seats on the board |
| Chairman and General Manager (DUALITY) | This variable is a dummy variable. When the chairman and the general manager are the same people, it is 1; otherwise, 0 |
| Ratio of outside directors (OUTBOD) | It is the ratio of the number of outside directors to the total number of directors, referring to the definition of Yang and Wu (2009). Outside directors = the number of seats on the board of directors - the number of director seats held by the controlling shareholder through a family or a friendly group - the number of independent directors, as an outside non-independent director |
| Ratio of independent directors (INDBOD) | It is the ratio of independent directors to all directors on the board |
| **Variables** | **Definition** |
| Shareholding ratio of directors and supervisors (BSHOLD) | Dividing the number of shares held by directors and supervisors by the number of outstanding shares at the end of the year |
| Institutional investor shareholding ratio (ISHOLD) | Refer to the definitions of Yang and Wu (2009), which include four categories, i.e., dealers, domestic and foreign fund-raising (investment (internal)), the country's trust funds (investment (external)), and foreign institutional investors (foreign investors) |
| Degree of deviation between control rights and cash-flow (DEV) | According to the definition of La Porta, Lopez-de-Silanes, Shleifer, & Vishny (2002), the difference between control rights and cash flow rights had calculated. Control rights refer to the shareholding ratio ultimately controlled by the controlling shareholders, while cash flow rights refer to the controlling shareholder's final earnings distribution rights |
| Control variable | |
| Company size (SIZE) | This variable is the natural log of the company's total assets |
| Company age (AGE) | This variable is the number of years the company had an establishment |
| Debt ratio (DEBT) | Total liabilities / Total assets × 100% |
| Profitability (PROFIT) | Net profit before tax for the current period / Net revenue in the current period |
| R&d intensity (R&D) | R&D expenditures in the current period / Net sales in the current period |
| Industry year (YEAR) | The innovation performance of each year may be affected by overall economic factors. The research period is five years, from 2014 to 2018. Therefore, considering the business cycle factors, four annual dummy variables are set up as control variables |

*This table shows the definitions of the variables used in this study, including dependent variables, independent variables, and control variables.*

Table 3 presents the expected direction of the variables. According to H1a, H1c, H1d, H2a, and H2b, this study expects that innovation performance is positively correlated. Meanwhile, based on H1b and H2c, this study expects that innovation performance is negatively correlated.

Table 3: The Variable's Expected Direction

| Variable | Expected Direction |
|---|:---:|
| Dependent variable: innovation performance | |
| R&D productivity (RD PRODUCTIVITY) | |
| R&D efficiency (RD EFFICIENCY) | |
| Patent productivity (PATENT PRODUCTIVITY) | |
| Independent variable | |
| Board of director's size (BOARDSIZE) | + |
| Chairman and General Manager (DUALITY) | - |
| Ratio of outside directors (OUTBOD) | + |
| Ratio of independent directors (INDBOD) | + |
| Shareholding ratio of directors and supervisors (BSHOLD) | + |
| Institutional investor shareholding ratio (ISHOLD) | + |
| Degree of deviation between control rights and cash-flow (DEV) | - |
| **Variable** | **Expected Direction** |
| Control variable | |
| Company size (SIZE) | + |
| Company age (AGE) | + |
| Debt ratio (DEBT) | + |
| Profitability (PROFIT) | + |
| R&d intensity (R&D) | + |

*This table shows the variable's expected direction. RD PRODUCTIVITY : Net operating income for the current period/sum of R&D expenditures for the current period and the past two periods; RD EFFICIENCY: The sum of patent rights in the current period and the past two years/the sum of R&D expenditures in the current period and the past two periods (the natural log); PATENT PRODUCTIVITY: Net operating income for the current period (the natural log)/sum of patent rights for the current period and the past two years; BOARDSIZE: the total number of director seats on the board of directors; DUALITY: This variable is a dummy variable, 1 when the chairman and general manager are the same people, otherwise 0; OUTBOD: the number of outside directors/total number of board directors; INDBOD: the seats of independent directors/total number of board directors; BSHOLD: the number of shares held by directors and supervisors/the number of outstanding shares at the end of the year; ISHOLD: including four categories, i.e., dealers, domestic and foreign fund-raising, the country's trust funds, and foreign institutional investors (foreign investors); DEV: the difference between control rights and cash flow rights; SIZE: the natural log of the company's total assets; AGE: the number of years the company had an establishment; DEBT: total liabilities/total assets; PROFIT: net profit before tax/net revenue in the current period; R&D: R&D expenditure in the current period/net sales in the current period.*

Empirical Models

This study uses a regression model to explore the impact of corporate board composition and ownership structure on corporate innovation performance. Innovation performance is measured by patent rights, R&D expenses, and net operating income, while the regression model (1) measures the impact of board characteristics on innovation performance and verifies H1a, H1b, H1c, and H1d. In addition, the regression model (2) measures the impact of ownership structure on innovation performance and verifies H2a, H2b, and H2c.

$$RDpro_{it}(\alpha) = \alpha_0 + a_1 BODSIZE_{it} + \alpha_2 DUALITY_{it} + \alpha_3 INDBOD_{it} + \alpha_4 OUTBOD_{it} + \alpha_5 SIZE_{it}$$
$$+ \alpha_6 AGE_{it} + \alpha_7 DEBT_{it} + \alpha_8 PROFIT_{it} + \alpha_9 R\&D_{it} + \alpha_{10} YEAR + \varepsilon_{it} \qquad (1)$$

$$RDpro_{it}(\alpha) = \alpha_0 + a_1 BSHOLD_{it} + \alpha_2 ISHOLD_{it} + \alpha_3 DEV_{it} + \alpha_4 SIZE_{it} + \alpha_5 AGE_{it} + \alpha_6 DEBT_{it}$$
$$+ \alpha_7 PROFIT_{it} + \alpha_8 R\&D_{it} + \alpha_9 YEAR + \varepsilon_{it} \qquad (2)$$

This study further uses the regression model (3)(4) to measure whether board independence can moderate ownership structure and thus impact innovation performance. This study uses model (3)(4) to verify H3a, H3b, H3c, and H3d.

$$RDpro_{it}(\alpha) = \alpha_0 + a_1 BODSIZE_{it} + \alpha_2 DUALITY_{it} + \alpha_3 OUTBOD_{it} + \alpha_4 BSHOLD_{it} + \alpha_5 ISHOLD_{it}$$
$$+ \alpha_6 DEV_{it} + \alpha_7 OUTBOD_{it} \times BSHOLD_{it} + \alpha_8 OUTBOD_{it} \times DEV_{it} + \alpha_9 SIZE_{it}$$
$$+ \alpha_{10} AGE_{it} + \alpha_{11} DEBT_{it} + \alpha_{12} PROFIT_{it} + \alpha_{13} R\&D_{it} + \alpha_{14} YEAR + \varepsilon_{it} \qquad (3)$$

$$RDpro_{it}(\alpha) = \alpha_0 + a_1 BODSIZE_{it} + \alpha_2 DUALITY_{it} + \alpha_3 INDBOD_{it} + \alpha_4 BSHOLD_{it} + \alpha_5 ISHOLD_{it}$$
$$+ \alpha_6 DEV_{it} + \alpha_7 INDBOD_{it} \times BSHOLD_{it} + \alpha_8 INDBOD_{it} \times DEV_{it} + \alpha_9 SIZE_{it}$$
$$+ \alpha_{10} AGE_{it} + \alpha_{11} DEBT_{it} + \alpha_{12} PROFIT_{it} + \alpha_{13} R\&D_{it} + \alpha_{14} YEAR + \varepsilon_{it} \qquad (4)$$

<u>Empirical Results and Analysis</u>

In this study, the descriptive statistics of each variable are summarized and arranged in Table 4 and Table 5. According to the following three tables, it can know that the mean size of the board of directors (BOARDSIZE) is about 7, which shows that the mean number of board directors of listed OTC electronics companies in Taiwan is seven people. The chairman and general manager mean value (DUALITY) is about 0.400, which shows that nearly 40% of the chairman and general manager of Taiwan-listed electronics companies are the same people. The mean deviation of control rights and cash flow rights (DEV) is about 7%, showing that Taiwan's listed companies in the OTC electronics industry generally have deviations in control and cash flow rights. The mean R&D intensity (R&D) is about 0.07. It shows that for every 1 yuan of net sales generated by the company, it is willing to invest 0.07 yuan as an R&D expenditure.

Table 4: Descriptive Statistics - R&D Productivity

| Variable | Number of Samples | Mean | Median | Standard Deviation | Maximum | Minimum |
|---|---|---|---|---|---|---|
| **Dependent Variable** | | | | | | |
| RD PRODUCTIVITY | 3,730 | 1.308 | 1.276 | 0.173 | 4.112 | 0.879 |
| **INDEPENDENT VARIABLE** | | | | | | |
| BOARDSIZE | 3,730 | 7.120 | 7.000 | 1.614 | 15.000 | 2.000 |
| DUALITY | 3,730 | 0.400 | 0.000 | 0.491 | 1.000 | 0.000 |
| OUTBOD | 3,730 | 49.612 | 50.000 | 19.168 | 100.000 | 0.000 |
| INDBOD | 3,730 | 32.378 | 33.333 | 12.970 | 80.000 | 0.000 |
| BSHOLD | 3,730 | 21.100 | 17.080 | 14.665 | 96.460 | 0.050 |
| ISHOLD | 3,730 | 36.198 | 33.900 | 22.083 | 96.950 | 0.000 |
| DEV | 3,730 | 6.983 | 1.655 | 12.496 | 93.550 | 0.000 |
| **Control Variable** | | | | | | |
| SIZE | 3,730 | 15.206 | 15.015 | 1.439 | 21.949 | 10.665 |
| AGE | 3,730 | 24.950 | 24.000 | 10.059 | 65.000 | 1.000 |
| DEBT | 3,730 | 38.650 | 37.708 | 17.241 | 99.760 | 0.904 |
| PROFIT | 3,730 | 0.032 | 0.062 | 0.568 | 12.233 | -16.268 |
| R&D | 3,730 | 0.070 | 0.038 | 0.132 | 3.294 | 0.000 |

*RD PRODUCTIVITY : Net operating income for the current period/sum of R&D expenditures for the current period and the past two periods; BOARDSIZE: the total number of director seats on the board of directors; DUALITY: This variable is a dummy variable, 1 when the chairman and general manager are the same people, otherwise 0; OUTBOD: the number of outside directors/total number of board directors; INDBOD: the seats of independent directors/total number of board directors; BSHOLD: the number of shares held by directors and supervisors/the number of outstanding shares at the end of the year; ISHOLD: including four categories, i.e., dealers, domestic and foreign fund-raising, the country's trust funds, and foreign institutional investors (foreign investors); DEV: the difference between control rights and cash flow rights; SIZE: the natural log of the company's total assets; AGE: the number of years the company had an establishment; DEBT: total liabilities/total assets; PROFIT: net profit before tax/net revenue in the current period; R&D: R&D expenditure in the current period/net sales in the current period.*

Table 5: Descriptive Statistics - R&D Efficiency

| Variable | Number of Samples | Mean | Median | Standard Deviation | Maximum | Minimum |
|---|---|---|---|---|---|---|
| **Dependent Variable** | | | | | | |
| RD EFFICIENCY | 3,761 | 2.051 | 0.250 | 7.750 | 133.597 | 0.000 |
| **Independent Variable** | | | | | | |
| BOARDSIZE | 3,761 | 7.110 | 7.000 | 1.607 | 15.000 | 2.000 |
| DUALITY | 3,761 | 0.40 | 0.000 | 0.491 | 1.000 | 0.000 |
| OUTBOD | 3,761 | 49.700 | 50.000 | 19.150 | 100.000 | 0.000 |
| INDBOD | 3,761 | 32.416 | 33.333 | 12.921 | 80.000 | 0.000 |
| BSHOLD | 3,761 | 21.130 | 17.090 | 14.710 | 96.46 | 0.010 |
| ISHOLD | 3,761 | 36.149 | 33.790 | 22.019 | 96.950 | 0.000 |
| DEV | 3,761 | 6.978 | 1.650 | 12.458 | 93.550 | 0.000 |
| **Control Variable** | | | | | | |
| SIZE | 3,761 | 15.191 | 15.006 | 1.443 | 21.949 | 9.830 |
| AGE | 3,761 | 25.03 | 24.00 | 10.010 | 65.000 | 2.000 |
| DEBT | 3,761 | 38.634 | 37.711 | 17.292 | 99.760 | 0.904 |
| PROFIT | 3,761 | 0.024 | 0.062 | 0.691 | 12.233 | -21.902 |
| R&D | 3,761 | 0.069 | 0.038 | 0.132 | 3.294 | 0.000 |

*RD EFFICIENCY: The sum of patent rights in the current period and the past two years/the sum of R&D expenditures in the current period and the past two periods (the natural log); BOARDSIZE: the total number of director seats on the board of directors; DUALITY: This variable is a dummy variable, 1 when the chairman and general manager are the same people, otherwise 0; OUTBOD: the number of outside directors/total number of board directors; INDBOD: the seats of independent directors/total number of board directors; BSHOLD: the number of shares held by directors and supervisors/the number of outstanding shares at the end of the year; ISHOLD: including four categories, i.e., dealers, domestic and foreign fund-raising, the country's trust funds, and foreign institutional investors (foreign investors); DEV: the difference between control rights and cash flow rights; SIZE: the natural log of the company's total assets; AGE: the number of years the company had an establishment; DEBT: total liabilities/total assets; PROFIT: net profit before tax/net revenue in the current period; R&D: R&D expenditure in the current period/net sales in the current period.*

Pearson Correlation Coefficient Analysis

In general, regression models should be based on correlation analysis because the reliability of any interpretation and prediction depends on the strength between the independent and dependent variables. In order to avoid the problem of collinearity among the independent variables during the regression analysis in this study, which will affect the interpretive ability of the variables. This study first used the Pearson correlation coefficient to analyze whether there is a correlation between the variables. The Pearson correlation coefficient is suitable for describing the linear relationship between two continuous variables. It mainly measures the high or low degree of correlation between the variables and does not examine the impact of (independent variable) on (dependent variable). If the correlation coefficient is greater than 0.8, it is highly correlated, indicating collinearity between the variables; a correlation between 0.4 to 0.8 indicates a moderate correlation, and a correlation coefficient below 0.4 indicates a low correlation. In this study, the Pearson correlation coefficients of the variables are arranged in Table 6 to Table 8, except for the multiplication term and related variables. Most of the other independent variables are between plus and minus 0.4, which is a low correlation. Overall, there is no collinearity between the independent variables.

Table 6: Pearson Correlation Coefficient Analysis - R&D Productivity

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (1) RD PRO | 1 | | | | | | | | | | | |
| (2) BOARSIZE | 0.096*** | 1 | | | | | | | | | | |
| (3) DUALITY | 0.045*** | 0.119*** | 1 | | | | | | | | | |
| (4) OUTBOD | 0.025 | 0.127*** | 0.055*** | 1 | | | | | | | | |
| (5) INDBOD | 0.093*** | 0.033** | -0.019 | 0.546*** | 1 | | | | | | | |
| (6) BSHOLD | 0.093*** | -0.024 | 0.052*** | 0.141*** | 0.014 | 1 | | | | | | |
| (7) ISHOLD | 0.072*** | 0.198*** | 0.158*** | 0.197*** | 0.092*** | 0.347*** | 1 | | | | | |
| (8) DEV | 0.050*** | 0.115*** | 0.131*** | 0.216*** | 0.051*** | 0.531*** | 0.356*** | 1 | | | | |
| (9) OUTBOD ×BSHOLD | 0.088*** | 0.040** | 0.070*** | 0.528*** | - | 0.864*** | 0.390*** | 0.554*** | 1 | | | |
| (10) OUTBOD ×DEV | 0.038** | 0.104*** | 0.126*** | 0.326*** | - | 0.522*** | 0.346*** | 0.959*** | 0.623*** | 1 | | |
| (11) INDBOD ×BSHOLD | 0.029* | 0.028* | 0.062*** | - | 0.457*** | 0.833*** | 0.323*** | 0.463*** | - | - | 1 | |
| (12) INDBOD ×DEV | 0.067*** | 0.102*** | 0.120*** | - | 0.224*** | 0.486*** | 0.331*** | 0.920*** | - | - | 0.568*** | 1 |

*, **, and *** Indicate statistical significance levels of 10%, 5%, and 1%, respectively BOARDSIZE: the total number of director seats on the board of directors; DUALITY: this variable is a dummy variable, 1 when the chairman and general manager are the same people, otherwise 0; OUTBOD: the number of outside directors/total number of board directors; INDBOD: the seats of independent directors/total number of board directors; BSHOLD: the number of shares held by directors and supervisors/the number of outstanding shares at the end of the year; ISHOLD: including four categories, i.e., dealers, domestic and foreign fund-raising, the country's trust funds, and foreign institutional investors (foreign investors); DEV: the difference between control rights and cash flow rights.

Table 7: Pearson Correlation Coefficient Analysis - R&D Efficiency

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (1) RD EFF | 1 | | | | | | | | | | | |
| (2) BOARSIZE | 0.190*** | 1 | | | | | | | | | | |
| (3) DUALITY | 0.052*** | 0.121*** | 1 | | | | | | | | | |
| (4) OUTBOD | 0.048*** | 0.128*** | 0.053*** | 1 | | | | | | | | |
| (5) INDBOD | 0.088*** | 0.036** | 0.020 | 0.544*** | 1 | | | | | | | |
| (6) BSHOLD | 0.133*** | 0.027 | 0.049*** | 0.143*** | 0.014 | 1 | | | | | | |
| (7) ISHOLD | 0.194*** | 0.196*** | 0.156*** | 0.196*** | 0.092*** | 0.349*** | 1 | | | | | |
| (8) DEV | 0.017 | 0.115*** | 0.131*** | 0.214*** | 0.051*** | 0.526*** | 0.352*** | 1 | | | | |
| (9) OUTBOD ×BSHOLD | 0.111*** | 0.037** | 0.065*** | 0.528*** | - | 0.865*** | 0.391*** | 0.545*** | 1 | | | |
| (10) OUTBOD ×DEV | 0.027 | 0.105*** | 0.125*** | 0.324*** | - | 0.517*** | 0.342*** | 0.959*** | 0.613*** | 1 | | |
| (11) INDBOD ×BSHOLD | 0.089*** | 0.031*** | 0.061*** | - | 0.457*** | 0.829*** | 0.322*** | 0.461*** | - | - | 1 | |
| (12) INDBOD ×DEV | 0.002 | 0.102*** | 0.120*** | - | 0.224*** | 0.482*** | 0.327*** | 0.920*** | - | - | 0.565*** | 1 |

*, **, and *** Indicate statistical significance levels of 10%, 5%, and 1%, respectively BOARDSIZE: the total number of director seats on the board of directors; DUALITY: this variable is a dummy variable, 1 when the chairman and general manager are the same people, otherwise 0; OUTBOD: the number of outside directors/total number of board directors; INDBOD: the seats of independent directors/total number of board directors; BSHOLD: the number of shares held by directors and supervisors/the number of outstanding shares at the end of the year; ISHOLD: including four categories, i.e., dealers, domestic and foreign fund-raising, the country's trust funds, and foreign institutional investors (foreign investors); DEV: the difference between control rights and cash flow rights

Table 8: Pearson Correlation Coefficient Analysis – Patent Productivity

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (1) PATENT PRO | 1 | | | | | | | | | | | |
| (2) BOARSIZE | 0.130*** | 1 | | | | | | | | | | |
| (3) DUALITY | 0.045** | 0.133*** | 1 | | | | | | | | | |
| (4) OUTBOD | 0.014 | 0.179*** | 0.092*** | 1 | | | | | | | | |
| (5) INDBOD | 0.043** | 0.076*** | 0.018 | 0.536*** | 1 | | | | | | | |
| (6) BSHOLD | 0.074*** | 0.018 | 0.050** | 0.148*** | 0.011 | 1 | | | | | | |
| (7) ISHOLD | 0.154*** | 0.265*** | 0.185*** | 0.229*** | 0.090*** | 0.290*** | 1 | | | | | |
| (8) DEV | 0.068*** | 0.099*** | 0.127*** | 0.238*** | 0.050*** | 0.613*** | 0.357*** | 1 | | | | |
| (9) OUTBOD ×BSHOLD | 0.061*** | 0.058*** | 0.084*** | 0.526*** | - | 0.869*** | 0.361*** | 0.629*** | 1 | | | |
| (10) OUTBOD ×DEV | 0.051*** | 0.086*** | 0.128*** | 0.349*** | - | 0.603*** | 0.351*** | 0.959*** | 0.701*** | 1 | | |
| (11) INDBOD ×BSHOLD | 0.037* | 0.038* | 0.051** | - | 0.427*** | 0.847*** | 0.255*** | 0.548*** | - | - | 1 | |
| (12) INDBOD ×DEV | 0.080*** | 0.080*** | 0.117*** | - | 0.221*** | 0.567*** | 0.326*** | 0.926*** | - | - | 0.648*** | 1 |

*, **, And *** Indicate Statistical Significance Levels Of 10%, 5%, And 1%, Respectively BOARDSIZE: The Total Number Of Director Seats On The Board Of Directors; DUALITY: This Variable Is A Dummy Variable, 1 When The Chairman And General Manager Are The Same People, Otherwise 0; OUTBOD: The Number Of Outside Directors/Total Number Of Board Directors; INDBOD: The Seats Of Independent Directors/Total Number Of Board Directors; BSHOLD: The Number Of Shares Held By Directors And Supervisors/The Number Of Outstanding Shares At The End Of The Year; ISHOLD: Moderating; DEV: The Difference Between Control Rights And Cash Flow Rights

Regression Analysis Results

Firstly, this study explores the impact of corporate board composition on innovation performance. Table 9 presents the empirical results for H1a, H1b, H1c, and H1d. The results show that the board of directors' size (BOARDSIZE) and the ratio of independent directors (INDBOD) have a significant positive correlation with the model (2), indicating that the larger the board of directors' size and the higher the ratio of independent directors, the better the investment in the company's R&D innovation, which supports the hypothesis H1a and H1d.  However, they have a significant negative correlation with the model (1), indicating that when the board of directors' size is larger, and the ratio of independent directors is higher, it may be due to the difficulty in integrating team opinions or because it is more difficult for independent directors to obtain internal company information, thus having a negative impact on the company's final output (sales), which is incompatible with H1a. In addition, the chairman and general manager (DUALITY) have a significant positive correlation with model (1), which does not support hypothesis H1b. The results show the contrary to agency theory, i.e., when the chairman is also the general manager, the unification of the command and order system is beneficial to the company's positive impact on the final output.

In terms of control variables, company size (SIZE) is positively correlated with model (2) but negatively correlated with the model (1) and (3), indicating that the larger the company is, the more beneficial it is to R&D investment but not conducive to final output. The company age (AGE) has a significant positive correlation with the models (1) and (3), indicating that the longer a company has been in the establishment, the more beneficial it is to the final output (sales) of R&D innovation. Debt ratio (DEBT) has a significant positive correlation with model (1), indicating that creditors have a supervisory effect on the results of innovation activities. Profitability (PROFIT) and R&D intensity (R&D) are significantly negatively correlated, which means that higher values will not have a good impact on innovation performance.

Table 9: The Impact of Board Composition on Innovation Performance

| | (1)-R&D Productivity | | (2)-R&D Efficiency | | (3)-Patent Productivity | |
|---|---|---|---|---|---|---|
| | Coefficient | t | Coefficient | t | Coefficient | t |
| Constant | 1.658*** | 52.422 | -42.183*** | -29.298 | 17.055*** | 16.018 |
| BOARDSIZE | -0.045*** | -2.950 | 0.036** | 2.341 | -0.026 | -1.278 |
| DUALITY | 0.028** | 1.961 | 0.015 | 1.034 | 0.001 | 0.046 |
| OUTBOD | 0.013 | 0.771 | -0.008 | -0.465 | 0.018 | 0.775 |
| INDBOD | -0.036** | -1.996 | 0.101*** | 5.463 | -0.006 | -0.229 |
| SIZE | -0.187*** | -11.813 | 0.503*** | 31.242 | -0.308*** | -14.162 |
| AGE | 0.099*** | 6.627 | -0.011 | -0.741 | 0.155*** | 7.473 |
| DEBT | 0.103*** | 6.682 | -0.024 | -1.546 | -0.030 | -1.432 |
| PROFIT | -0.216*** | -13.057 | -0.009 | -0.548 | -0.060*** | -2.694 |
| R&D | -0.535*** | -31.248 | -0.085*** | 5.255 | -0.177*** | -7.705 |
| YEAR | YES | | YES | | YES | |
| F value | 113.946 | | 99.843 | | 27.278 | |
| $R^2$ | | | | | | |
| Adjusted $R^2$ | 0.283 | | 0.255 | | 0.118 | |

*This table shows the regression analysis results of the impact of corporate board composition on innovation performance. All coefficient values are standardized, only the constant term presents unstandardized values. \*, \*\*, and \*\*\* Indicate statistical significance levels of 10%, 5%, and 1%, respectively.*

Subsequently, to explore the impact of ownership structure on innovation performance, Table 10 shows the empirical results of H2a, H2b, and H2c. The results show that the correlation between the shareholding ratio of directors and supervisors (BSHOLD) with models (1) and (3) is significantly positive, indicating that when the shareholding ratio of a company's directors and supervisors is higher, it has a good impact on the final output (sales) of R&D innovation, supporting hypothesis H2a. In terms of institutional shareholder ratio (ISHOLD), the results of this study are positive but not significant with the model (3). In terms of control rights and cash flow rights (DEV), the results of this study show that there is a significant negative correlation with models (1) (2) (3), indicating that when the company's DEV is higher, it is not conducive to R&D investment, patent output, and final output (sales), and it is less inclined to innovate activities. This result supports hypothesis H2c. The control variables are not much different from the previous empirical results. However, the research and development intensity (R&D) has a significant positive correlation with the model (2), indicating that when more considerable R&D will have a good impact on the R&D efficiency.

Table 10: The Impact of Ownership Structure on Innovation Performance

| | (1)-R&D Productivity | | (2)-R&D Efficiency | | (3)-Patent Productivity | |
|---|---|---|---|---|---|---|
| | Coefficient | t | Coefficient | t | Coefficient | t |
| Constant | 1.579*** | 49.111 | -39.184*** | -26.849 | 16.724*** | 14.760 |
| BSHOLD | 0.093*** | 4.967 | 0.008 | 0.424 | 0.053** | 1.994 |
| ISHOLD | -0.004 | -0.218 | -0.004 | -0.215 | 0.032 | 1.251 |
| DEV | -0.068*** | -4.031 | -0.039** | -2.256 | -0.071** | -2.859 |
| SIZE | -0.180*** | -9.748 | 0.520*** | 27.669 | -0.319*** | -11.899 |
| AGE | 0.110*** | 7.477 | -0.048*** | -3.203 | 0.154*** | 7.459 |
| DEBT | 0.106*** | 6.838 | -0.029* | -1.872 | -0.026 | -1.213 |
| PROFIT | -0.211*** | -12.793 | -0.006 | -0.387 | -0.061*** | -2.752 |
| R&D | -0.527*** | -30.785 | 0.088*** | 5.399 | -0.173*** | -7.525 |
| YEAR | YES | | YES | | YES | |
| F value | 124.551 | | 103.302 | | 30.316 | |
| $R^2$ | | | | | | |
| Adjusted $R^2$ | 0.284 | | 0.246 | | 0.121 | |

*This table shows the regression analysis results of the impact of ownership structure on innovation performance. All coefficient values are standardized, only the constant term presents unstandardized values. \*, \*\*, and \*\*\* Indicate statistical significance levels of 10%, 5%, and 1%, respectively.*

Table 11 and Table 12 present the empirical results of regression analysis on the impact of board independence on the moderating effect of ownership concentration on innovation performance. The first is the moderating effect of the outside director ratio. The empirical results show that the impact on the outside director's seat (OUTBOD) and the shareholding ratio of directors and supervisors (BSHOLD) have a significant negative correlation with the model (2), indicating that the outside director ratio and the shareholding ratio of directors and supervisors are higher, it is the more unfavorable for the company to conduct R&D innovation. However, after independent directors moderate the shareholdings of directors and supervisors, there is a significant positive correlation with the company's R&D efficiency, consistent with hypothesis H3a. This study concludes that after moderates, it may reduce the information asymmetry, alleviate the disadvantage that outside directors may not be able to obtain information easily, and conduct supervision to develop R&D innovation activities. The moderating effect between the outside director ratio and control rights and cash flow rights (DEV) still negatively correlates with R&D efficiency. Hypothesis H3b is not supported, indicating that outside directors do not mitigate the deviation of the company's control rights and cash flow rights and supervise their R&D innovation activities.

Table 11: The Impact of Board Independence on the Moderating Effect of Ownership Concentration on Innovation Performance

|  | (1)-R&D Productivity | | (2)-R&D Efficiency | | (3)-Patent Productivity | |
| --- | --- | --- | --- | --- | --- | --- |
|  | Coefficient | t | Coefficient | t | Coefficient | t |
| Constant | 1.574*** | 45.773 | -37.788*** | -24.116 | 17.263*** | 14.404 |
| BOARDSIZE | -0.044*** | -2.872 | 0.034** | 2.181 | -0.024 | -1.177 |
| DUALITY | 0.027 | 1.944 | 0.007 | 0.516 | 0.000 | -0.021 |
| OUTBOD | 0.006 | 0.226 | -0.093*** | -3.765 | -0.040 | -1.205 |
| BSHOLD | 0.023 | 0.507 | -0.094** | -2.055 | -0.070 | -1.097 |
| ISHOLD | -0.011 | -0.604 | 0.002 | 0.082 | 0.022 | 0.838 |
| DEV | -0.008 | -0.128 | 0.084 | 1.407 | -0.075 | -0.915 |
| OUTBOD×BSHOLD | 0.093* | 1.705 | 0.133** | 2.444 | 0.163** | 2.098 |
| OUTBOD×DEV | -0.070 | -1.137 | -0.129** | -2.085 | -0.009 | -0.100 |
| SIZE | -0.158*** | -8.206 | 0.505*** | 25.660 | -0.307*** | -11.004 |
| AGE | 0.106*** | 7.178 | -0.038** | -2.521 | 0.151*** | 7.256 |
| DEBT | 0.100*** | 6.464 | -0.025 | -1.571 | -0.027 | -1.289 |
| PROFIT | -0.212*** | -12.819 | -0.007 | -0.434 | -0.056** | -2.524 |
| R&D | -0.528*** | -30.824 | 0.089*** | 5.480 | -0.171*** | -7.386 |
| YEAR | YES | | YES | | YES | |
| F value | 89.412 | | 74.766 | | 21.926 | |
| R 2 | | | | | | |
| Adjusted R 2 | 0.287 | | 0.250 | | 0.123 | |

*This table shows the regression analysis results of the impact of board independence on the moderating effect of ownership concentration on innovation performance. All coefficient values are standardized, only the constant term presents unstandardized values. *, **, and *** Indicate statistical significance levels of 10%, 5%, and 1%, respectively.*

This study regarded the impact of board independence moderating the ownership concentration on innovation performance. Subsequently, this study analyzes the moderating effect of the independent director ratio (INDBOD). The empirical results show that the independent director's seat and the shareholding ratio of directors and supervisors have a significant positive correlation with model (2). They indicated that when the independent director ratio and the shareholding ratio of directors and supervisors are higher, it is beneficial for the company to conduct R&D innovation. However, after independent directors moderate the directors' shareholdings and supervisors, they present a significant negative correlation, which is not beneficial to the company's R&D innovation activities. It does not support hypothesis H3c. In addition, after the ratio of independent directors moderates the degree of deviation of control rights and cash flow rights, it presents a significant positive correlation with R&D efficiency. Supporting hypothesis H3d shows

that the independent directors have professional background and independence, fulfilling their supervisory and management responsibilities and providing opinions for R&D innovation decision-making so that companies' innovation performance can be improved.

Table 12: The Impact of Independent Director Ratio on Innovation Performance

|  | R&D Productivity | | R&D Efficiency | | Patent Productivity | |
| --- | --- | --- | --- | --- | --- | --- |
|  | Coefficient | t | Coefficient | t | Coefficient | t |
| Constant | 1.592*** | 44.939 | -44.841*** | -28.093 | 16.924*** | 13.604 |
| BOARDSIZE | -0.042*** | -2.767 | 0.039*** | 2.576 | -0.024 | -1.157 |
| DUALITY | 0.026* | 1.824 | 0.007 | 0.488 | -0.001 | -0.059 |
| INDBOD | -0.010 | -0.428 | 0.196*** | 7.967 | 0.001 | 0.037 |
| BSHOLD | 0.154*** | 3.327 | 0.227*** | 5.014 | 0.061 | 0.914 |
| ISHOLD | 0.002 | 0.094 | -0.013 | -0.692 | 0.033 | 1.250 |
| DEV | -0.077 | -1.631 | -0.179*** | -3.811 | -0.004 | -0.063 |
| INDBOD×BSHOLD | -0.077 | -1.517 | -0.258*** | -5.165 | -0.010 | -0.138 |
| INDBOD×DEV | 0.016 | 0.342 | 0.152*** | 3.167 | -0.071 | -0.998 |
| SIZE | -0.164*** | -8.562 | 0.513*** | 26.423 | -0.311*** | -11.185 |
| AGE | 0.097*** | 6.377 | -0.016 | -1.065 | 0.147*** | 6.862 |
| DEBT | 0.102*** | 6.561 | -0.025 | -1.636 | -0.027 | -1.253 |
| PROFIT | -0.213*** | -12.899 | -0.008 | -0.521 | -0.061*** | -2.731 |
| R&D | -0.528*** | -30.858 | 0.084*** | 5.167 | -0.173*** | -7.520 |
| YEAR | YES | | YES | | YES | |
| F value | 89.572 | | 78.961 | | 21.608 | |
| $R^2$ | | | | | | |
| Adjusted $R^2$ | 0.288 | | 0.261 | | 0.121 | |

*This table shows the regression analysis results of the impact of the independent director ratio on innovation performance. All coefficient values are standardized, only the constant term presents unstandardized values. \*, \*\*, and \*\*\* Indicate statistical significance levels of 10%, 5%, and 1%, respectively.*

## CONCLUDING COMMENTS

Nowadays, technology is changing rapidly, and fierce competition has shortened the life cycle of many industries, such as high-tech industries. If a company wants to survive in this globalization trend, it must create advantages through continuous R&D innovation. Therefore, in responding to changes in the environment, managers' strategies and directions are also the keys to success or failure. There may be traditional or core agency problems when companies have information asymmetry.    Since most companies in Taiwan are family businesses, their equity is relatively concentrated, which may lead to core agency problems. Currently, the board of directors plays a crucial role in determining how to avoid agency problems that internal and external mechanisms of corporate governance need to mitigate. This study uses a sample based on Taiwan's listed OTC electronics companies from 2014 to 2018 to explore the impact of board composition and ownership structure on companies' innovation performance.

The results of this study found that the influence of the measurement variables of board composition and ownership structure on R&D investment and sales is not consistent. It may be because management decisions and outside director opinions are beneficial to the company's R&D innovation. However, it is detrimental to the final output (sales). Outside directors can successfully adjust the shareholding of directors and supervisors, effectively improving the company's innovation performance. In contrast, independent directors can positively moderate the degree of deviation in control rights and cash flow rights, which improves the company's R&D efficiency.   This study aims to explore the impact of board composition and ownership structure on companies' innovation performance, and it also explores whether independent directors and outside directors can moderate the phenomenon of ownership concentration and positively impact companies. In Taiwan, most companies are family businesses with ownership concentration and

control rights, and then the cash flow rights deviation is a normal phenomenon. In response to changes in the environment, companies may carry out R&D innovation activities that are high-risk and require a large amount of expenditure. Therefore, corporate governance is needed to check and balance the self-interested behavior of controlling shareholders, which may infringe on the behavior of other small shareholders.

This study suggests that when companies conduct R&D innovation, they disclose information appropriately and reduce information asymmetry so that minority shareholders and external directors, including independent directors, can effectively supervise. Timely opinions and R&D innovation by the company have a positive impact, allowing the company to develop and operate sustainably in a competitive environment.

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# TRADE-OFF BETWEEN WORKING CAPITAL AND FIXED INVESTMENT UNDER SHARIAH COMPLIANCE AND ISLAMIC ADHERENCE

Han-Fang Tsai, Feng Chia University

## ABTRACT

*This study investigates whether Shariah (Islamic Law) compliance and Islam adherence influence the relationship between working capital and fixed investment, as well as, whether this relationship further affects firm performance. Using a sample of firms listed on the Indonesia Stock Exchange over the period 2011-2018, we find that the relationship between working capital and fixed investment is linear for Shariah-compliant firms, however, this relationship is non-linear for non-Shariah-compliant firms. In addition, the result also shows that non-Shariah-compliant firms with higher working capital/fixed investment ratio have a better firm performance, however, this effect does not exist for Shariah-compliant firms. Finally, Muslim proportion of city exerts influence on the relationship between working capital/fixed investment ratio and firm performance, but Muslim proportion of province does not have this influence.*

## INTRODUCTION

Investment in working capital is closely associated with fixed capital investment. Firms need investment in net working capital when undertaking fixed asset investments because the increased revenues need higher accounts receivable and inventory to support and, at the same time, accounts payable increase as well (Ross et al., 2019). This is a complement relationship between working capital and fixed investment. On the other hand, when firms face financial constraints, they may have to lower working capital to support the expansion of fixed capital investment. Therefore, there also exists substitute relationship between working capital and fixed capital investment. A large body of research examines working capital management issues. Banos-Caballero et al. (2010) investigates the determinants of cash conversion cycle (CCC, hereafter) for small- and medium-sized Spanish companies. They document a target CCC length and firms with higher leverage, investment in fixed capital and returns on assets maintain a more aggressive working capital policy. Hill et al. (2010) investigate net working capital behavior based on a sample of US nonfinancial and nonutility firms. They find some factors such as sales growth and internal financing capacity affect working capital policy. They suggest that operating and financing conditions must be taken into consideration in evaluating working capital behavior. In addition, numerous papers study the relationship between working capital management and firm performance. For example, Banos-Caballero et al. (2014) investigates a sample of non-financial UK companies and identify an inverted U-shaped relationship between working capital investment and firm performance, implying an optimal level of working capital and this optimal level is lower for financially constrained firms. Almeida and Eid (2014) use a sample of Brazilian listed companies to analyze the effect of financial leverage on the relationship between working capital and firm value. They document that increasing investment in working capital reduces firm value. Aktas et al. (2015) examines the influence of working capital management based on US firms. They find an optimal level of working capital and firms that approach to optimal level enhance their

stock and operating performance through the channel of corporate investment. Moreover, some other studies focus on the relationship between investment in working capital and fixed capital. For example, Fazzari and Petersen (1993) investigate the effect of financial constraints on fixed investment based on a sample of US manufacturing firms. They find a negative coefficient on working capital investment when it is included in a fixed investment regression, suggesting a substitute relationship between working capital and fixed investment when financial constraints exist. Finally, Ding, Guariglia, and Knight (2013) investigate the links between investment in fixed and working capital and financial constraints using a panel of Chinese firms from 2000 to 2007. They find that firms with low fixed capital and high working capital have the highest fixed investment rates, regardless of highly external financial constraints, suggesting that firms with good working capital management could mitigate the influence of financial constraints on fixed investment. Overall, working capital management issue is widely explored in previous research, especially on the determinants of working capital and the relationship between working capital and firm performance. Regarding the linkage between working capital and fixed investment, although it was once examined by Fazzari and Petersen (1993) and Ding, Guariglia, and Knight (2013), they focus on the situation when firms face financial constraints. Moreover, neither of them studies this issue based on the capital markets in Islamic countries. This research therefore fills this gap by examining the relationship between fixed and working capital investment using a sample of firms listed on the Indonesia Stock Exchange (IDX, hereafter). In addition, both the firms with and without financial constraints are included in the analysis. This research explores the Indonesia Stock Market due to the following reasons.

First, Indonesia is a large emerging market with high economic growth rate. According to the Asian Development Bank, Indonesia's economy is predicted to grow at 5 percent in 2022 and will rise to 5.2 percent in 2023. Second, in Indonesia Stock Market, there are two types of listed firms – Shariah-compliant firms (SCFs, hereafter) and non-Shariah-compliant firms (NSCFs, hereafter) – SCFs are imposed on some limitations according to the Shariah screening criteria while NSCFs are not. This provides a unique institutional setting for investigating the effect of the Shariah (Islamic law) on capital budgeting and net working capital decisions. Furthermore, financial constraints are a problem for most firms in emerging markets, especially in Indonesia, the ratio of total debt based on interest compared to total assets should not exceed 45% for SCFs. In addition, conceptually and in a broad view, Shariah prefers firms to invest more in productive assets and less in liquid ones. All these limitations may make SCFs more financially constrained and further impact the linkage between fixed and working capital investment. Finally, as abovementioned, Indonesia is a large emerging market. According to Zeidan and Shapir (2017), in emerging markets, the poor working capital management may be prevalent and severely harm the firm value more than previously thought. Therefore, how firms listed in IDX manage the relationship between working capital and fixed investment is an intriguing and important issue.

This study examines whether Shariah (Islamic Law) compliance and Islam adherence influence the relationship between working capital and fixed investment, as well as, whether this relationship further affects firm performance. Using a sample of firms listed on the Indonesia Stock Exchange over the period 2011-2018 and dividing it into SCFs and NSCFs two sub-groups, we find that the relationship between working capital and fixed investment is linear for SCFs, however, this relationship is non-linear for NSCFs. This result suggests that fixed investment increases with working capital for SCFs. For NSCFs, however, fixed investment increases with working capital to some point, beyond that point, fixed investment declines as working capital further increases. It implies that Shariah does exert influence on the relationship between working capital and fixed investment. We further investigate whether the relationship between working capital and fixed investment, represented by working capital/fixed investment ratio, affects firm performance as well as whether Shariah plays a role in this effect. The result shows that for NSCFs higher working capital/fixed investment ratio leads to a better firm performance, however, this effect does not exist for SCFs. Finally, the relationship between working capital/fixed investment and firm performance is linear for firms located in low Muslim proportion province, however, this relationship does not exist in high Muslim proportion province. In contrast, Islam adherence exerts influence on the relationship between

working capital/fixed investment ratio and firm performance.

This study contributes to the literature in the following ways. First, this research extends the work of Fazzari and Petersen (1993) and Ding, Guariglia and Knight (2013) to include both financially and non-financially constrained firms in the analysis. Hopefully, we can shed more light on the linkage between capital and net working capital investment. Second, to the best of our knowledge, no other previous research examines the relationship between fixed and working capital investment taking both the Shariah and Islam adherence into consideration. This study fills this gap. Third, this research extends Banos-Caballero et al. (2014) which finds an optimal level of investment in working capital that maximizes firm value. This research moves a step further and identifies an optimal trade-off between working capital and fixed investment on the left-hand side of the optimal point, the level of working capital increases as fixed investment goes up, which may happen when firms have no financial constraints. Beyond this highest point, working capital investment declines as fixed investment further increases, indicating the situation when firms suffer from financial constraints. Compared with previous research, we consider both financial constraint and non-constraint situations The remainder of this study is organized as follows: Section 2 reviews the literature and develops the hypotheses. Section 3 describes the sample, research models and variables. Section 4 presents the empirical results, and Section 5 concludes.

**LITERATURE REVIEW**

<u>Working Capital and Fixed Investment</u>

Fazzari and Petersen (1993) propose that changes in working capital should be positively correlated with fixed investment if cash flow represents investment demand. Firms build up working capital as they invest in fixed capital in response to the increased demand. The increased sales resulting from fixed assets expansion leads to higher cash holding, accounts receivable, inventory, and accounts payable. It is called revenue effect, which is driven by increased sales, and this effect is value creating (Zeidan and Shapir, 2017). However, if the investment in working capital is not caused by increased sales, it is called CCC (cash conversion cycle) effect and is value destroying (Zeidan and Shapir, 2017). On the other hand, when firms faced financial constraints, working capital investment competes with fixed investment for funds, as argued by Fazzari and Petersen (1993). In this case, investment in working capital should be negatively related to fixed investment. Investment projects are normally separated and take a long time to finish. It is therefore costly for firms to decrease or stop spending on a project in progress because of a sudden deficit in cash flow or difficult to raise funds from capital markets, due to the relatively higher costs of adjusting fixed investment level than those of changes in working capital investment. In contrast, working capital is reversible. That is, firms can substitute working capital investment for fixed investment to lower adjustment costs and losses when a large short-term negative cash flow shock happens. When necessary, working capital investment even can become negative, providing funds to fixed investment. By doing so, firms can equalize marginal returns on working capital investment and that on fixed investment, after considering adjustment costs. The extent to which for a firm to smooth fixed investment should depend on its initial level of working capital which are related to the marginal opportunity cost of working capital adjustment. The lower marginal returns due to the higher level of working capital increase the willingness for firms to deal with the sudden cash flow reduction by releasing working capital. However, low level of working capital makes it difficult for firms to smooth fixed capital investment. Therefore, a sudden cash flow decline will lead to a major impact on fixed investment. From the above discussion, the relationship between investment in working capital and fixed capital can be inverted-U shape. For non-financially constrained firms, working capital investment rises as fixed capital increases to the top (complement stage), then, beyond the highest point, working capital investment begins to decline as fixed capital further expands (substitute stage). Some intriguing questions thus arise from the relationship between investment in working capital and fixed capital. Is there a best match between working capital and fixed investment which maximizes firm performance? What is the difference of firm performance between the stages of

complement and substitute? What is the change in firm performance along the lines at complement and substitute stages, respectively?

Banos-Calallero et al. (2014) argue that increasing accounts receivable and inventories may improve firm performance. Large inventories can lower supply costs and price fluctuation, allowing better service for their customers and avoid interruption in production process. Providing trade credit, on the other hand, can increase sales due to an effective price reduction; it also mitigates the information asymmetric between sellers and buyers by enabling the latter to verify product and services quality before making payment. Investment in trade credit thus is more profitable than in marketable securities (Banos-Calallero et al., 2014). In addition, firms may be able to get cash discounts by paying accounts payable early. However, investment in working capital can have a negative effect on firm performance. For instance, maintaining a high level of inventory leads to costs of insurance, storehouse as well as financing and opportunity costs. Moreover, high investment in working capital may limit the opportunity of firms to undertake positive NPV projects, thereby hindering firm performance. Banos-Calallero et al. (2014) propose and document an optimal working capital level that trades off the costs and benefits and maximizes firm performance. They argue that in an imperfect world, cost of external capital is higher than that of internal financing due to the capital market friction. Therefore, a firm's investment may rely on the accessibility of internal fund, approach to external capital markets or financing cost (Fazzari et al., 1988). Banos-Calallero et al. (2014) posit that the optimal level of working capital would be lower for firms with more financial constraints because a positive working capital requires financing. Firms maintain a higher level of working capital when they have better internal financing capability and more easily access to capital market (Hill et al., 2010). Ding, Guariglia, and Knight (2013) investigate the relations between investment in fixed and working capital and financial constraints. They find that firms with low fixed capital and high working capital display highest fixed investment rates, suggesting that good management in working capital may mitigate the limitation of financing constraints on fixed investment.

Several previous research documents an optimal working capital level which maximizes firm performance (Banos-Calallero et al., 2014), some other studies further find that efficient working capital management enhances firm performance through the channel of fixed capital investment (Aktas et al., 2015; Almeida and Eid, 2014). This study thus argues that the match between working capital and fixed capital investment is very important. When financial constraints do not exist, both working capital and fixed capital investments rise to pursue growth, thereby enhancing firm performance. However, beyond the optimal point, firms may become financially constrained due to the exhausted funds available. If firms keep pursuing growth, they have to finance the fixed investment by releasing working capital. At this stage, firm performance may become declining due to the overinvestment of fixed capital and the rising costs of working capital. This study thus proposes the following hypotheses:

H1: Investment in working capital has an inverted U-shaped relationship with fixed capital investment.

H2: Firms at the complement stage perform better than those at the substitute stage

<u>Islam Adherence, Shariah-Compliance and the Relationship Between Working Capital and Fixed Capital Investment</u>

Some limitations are imposed on SCFs in the Indonesia Stock Market, they include: (1) The ratio of total debt based on interest compared to total assets should not exceed 45%, and (2) The ratio of total interest income and other non-halal income compared to total operating income and other income is not more than 10% for SCFs. These limitations are frictions that may affect the relationship between working capital and fixed investments. The debt limitation may restrict the access to source of financing for SCFs, thus obstructing the build-up in working capital which can be used to fund fixed investment when necessary. The constraint on income may lower the investment opportunities of SCFs, thereby hindering the

investment in fixed capital. In addition, the Shariah prefers firms to invest more in productive assets and less in liquidity. Shariah screening criteria set by the Dow Jones Islamic index requires SCFs to hold less than 33% of liquid assets which include cash and accounts receivable. This constraint may lower the level of working capital and affect the relationship between working capital and fixed investment since it restricts the extent to which firms can release working capital to fund fixed investment, as documented by Din, Guariglia, and Knight (2013). The results in their study on Chinese firms show that firms with high working capital to cash flow and low fixed capital to cash flow have the highest fixed investment rates, even though when they face highly external financial constraints. According to the above discussion, this study posits that the debt and source of income limitations based on the Shariah screening criteria in Indonesia may cause constraints on financing and operating activities for SCFs. We thus hypothesize:

H3: The highest point on the relationship between working capital and fixed investment for SCFs is lower than that for NSCFs.

Moreover, corporate decisions are also affected by religion. An intriguing issue naturally arises, that is, in Indonesia such a highly religious country, Islam adherence or Shariah compliance, which one is more important in shaping corporate financial decisions generally, and in making working capital and fixed investment decisions in particular in this paper. As abovementioned, SCFs are imposed some limitations according to the Shariah screening criteria and those restrictions may affect financial decisions. However, religiosity could also influence corporate decisions. In their study of US firms, Hilary and Hui (2009) propose that people's characteristics may influence group behavior. People's personal identity is stemmed from social group membership such as the religion and they incorporate and follow the norms, values and attributes of the group they belong to. This influence from the dominant values and behavior of the group has implications for company behavior. A company attracts and recruits people and this brings in a certain kind of people and it is these people who form company behavior (Schneider, 1987; Hilary and Hui, 2009). Holland (1976) documents that the work environment people select is inclined to be similar to the people who choose them. We thus expect that the behavior of a company is in general consistent with the local environment of the firm. Indonesia is a highly Islamic country with more than 87% of the population being Muslims, and the proportion of Muslim varies across province. Companies located in the province with higher proportion of Muslim should employ a higher proportion of Muslims as their employees, especially managers. Consequently, corporate decisions, including working capital and fixed investment decisions, should be highly influenced by the religion of Islam. Hilary and Hui (2009) propose that religious people are risk averse, and firms located in more religious areas are more risk averse than firms located in less religious areas. It is people who make decisions rather than companies and the ways people make decisions are affected by the norms, values and attributes of their group. Firms with more risk aversion should require a higher return on investment due to the higher risk premium. In other words, firms in more religious areas should use a higher hurdle rate in capital budgeting and net working capital decisions. This study thus hypothesizes:

H4: The highest point on the relationship between working capital and fixed investments for firms located in more religious (Islamic) areas is lower than that for firms located in less religious (Islamic) areas.

**DATA AND METHODOLOGY**

Sample

This research focuses only on Indonesia, which has advantage of obtaining a more homogeneous sample as to financial and economic development, legal structure, public infrastructure, etc. (Hilary and Hui, 2009). The data in this research are from Eikon with Datastream for Office (formerly Datastream), an online database developed by Thomson Financial which provides databases for more than 60 markets and 175 countries worldwide (Imamah, 2019). In addition, the information about financial statements, board

characteristics, ownership structure and industry is collected manually from the annual reports of firms listed on the Indonesia Stock Exchange (IDX). The study period spans 2011-2018 because the Indonesia Shariah Stock Index (ISSI) was launched on May 12, 2011. ISSI is a composite index of Shariah stocks listed on the IDX and its constituents are Islamic stocks that listed on the IDX and included on an Islamic Securities List (DES) issued by the OJK (Ortoritas Jasa Keuangan, an Indonesian government agency and supervises the financial services sector). The insurance, banking, and securities industries are excluded from the sample since the financial structure and investment behavior of the finance related industries are different from other industries. In total, the sample includes 398 listed firms with 3,184 firm-year observations, consisting of 2,223 Shariah-compliant and 961 non-Shariah-compliant observations. To deal with outliers, this study winsorize the data by 1% of the top-and-bottom of all continuous variables.

Research Models

To test Hypothesis 1, this research estimates the following model:

$$\left(\frac{Inv}{TA}\right)_{i,t} = \alpha_0 + \alpha_1\left(\frac{OCF}{TA}\right)_{i,t} + \alpha_2(SHARIAH)_{i,t} + \alpha_3\left(\frac{\Delta WC}{TA}\right)_{i,t} + \alpha_4\left(\frac{\Delta WC}{TA}\right)^2_{i,t} + \alpha_5(TQ)_{i,t-1} + \tag{1}$$
$$\alpha_6(LEV)_{i,t-1} + \alpha_7(ROA)_{i,t-1} + \alpha_8(CG)_{i,t-1} + Firm\ Fixed\ Effects +$$
$$YearFixed\ Effects + \mu_{i,t}$$

The dependent variable, $\left(\frac{Inv}{TA}\right)_{i,t}$, is firm i's fixed investment divided by total assets at time t. The independent variables include Shariah, which is set to one if the firm has Shariah stock and zero otherwise; $\left(\frac{\Delta wc}{TA}\right)_{i,t}$, investment in working capital divided by total assets. In addition, the square of $\left(\frac{\Delta wc}{TA}\right)_{i,t}$ is included and if its coefficient $(\alpha_4)$ is positive and significant, H1 will be supported. Following previous research (Fazzari and Petersen, 1993; Nur Imamah, et al., 2019), this study includes the control variables of cash flow (OCF, operating cash flow / total assets), TQ (Tobin's Q, the sum of market value of equity and book value of total debt divided by book value of total assets), LEV (financial leverage, total debt /total assets), ROA (return on assets, net income / total assets), CG (corporate governance, including board characteristics, ownership structure), firm fixed effects and year fixed effects. $\mu_{i,t}$ is error term, which is uncorrelated with any information known at time t. Control variables are all divided by total assets to avoid the size effect and lagged by one year to mitigate the endogeneity problem.

This research tries to identify the inflection point (the highest point) for the relationship between working capital and fixed investment in equation (1). The sample then is divided into complement stage (left hand side) and substitute stage (right hand side) and the performance difference between these two groups is further investigated to test if hypothesis 2 is supported. Moreover, the sample will be separated into SCFs and NSCFs two groups and the analysis of equation (1) is conducted again to test Hypothesis 3. Then, SCFs and NSCFs each is divided into complement stage (left hand side) and substitute stage (right hand side) and the performance difference between these two groups is analyzed to test hypothesis 2 again to see whether hypothesis 2 is supported or not. Finally, the sample is also separated into high- and low-religious (Islamic) areas to test if hypotheses 2 and 3 are supported.

Furthermore, this research applies model (2) to test hypotheses 5 and 6:

$$(PERFORMANCE)_{i,t} = \beta_0 + \beta_1(SHARIAH)_{i,t} + \beta_2(MUSLIM)_{i,t} +$$
$$\beta_3\left(\frac{Inv}{\Delta WC}\right)_{i,t} + \beta_4(SHARIAH)_{i,t}\left(\frac{Inv}{\Delta WC}\right)_{i,t} + \beta_5(SIZE)_{i,t-1} + \beta_6(LEV)_{i,t-1} + \beta_7(GROWTH)_{i,t-1} +$$
$$\beta_8(CG)_{i,t-1} + Firm\ fixed\ effects + Year\ fixed\ effects + \varepsilon_{i,t} \tag{2}$$

The dependent variable, PERFORMANCE $_{i,t}$, is firm i's performance at time t. This research uses ROA (return on assets, net income / total assets) and ROE (return on equity, net income / total equity) to proxy for firm performance. The independent variables include SHARIAH $_{i,t}$, ( Shariah, which is set to one if the firm has Shariah stock and zero otherwise), MUSLIM (the ratio of Muslims to the population of the province where a firm is located), $\left(\frac{Inv}{\Delta Wc}\right)_{i,t}$ (the relationship between fixed capital investment and working capital investment, fixed investment divided by working capital investment) and several control variables. Based on previous research (Fazzari and Petersen, 1993; Nur Imamah, et al., 2019) this study includes OCF (operating cash flow / total assets), SIZE (firm size, Ln (total assets)), LEV (financial leverage, total debt /total assets), GROWTH (sales growth, $\left(\frac{Sales_1}{Sales_0} - 1\right)$), CG (corporate governance, including board characteristics and ownership structure), firm fixed effects and year fixed effects. $\varepsilon_{i,t}$, is error term, which is uncorrelated with any information known at time t.

**RESULTS AND DISCUSSION**

<u>Descriptive Statistics</u>

Table 1 reports the descriptive statistics for the variables. The mean values (median values) are 0.042 (0.003) and 0.046 (0.009) for fixed and working capital investments, respectively. The mean value (median value) of debt ratio is 0.62 (0.485), and they are 0.05 (0.034) and 0.201 (0.068) for ROA and ROE, respectively. The descriptive statistics show a wide range for some variables, we therefore winsorize the financial variables at the 1% level to mitigate the effect of outliers when performing regression analysis. Table 2 presents a correlation analysis of the variables used in this study. As can be seen from the table, Fixed investment is significant and positively associated with working capital investment, supporting the traditional view that firms need investment in working capital when undertaking fixed assets investment. In addition, some variables such as OCF and LEV, as well as ROA have high correlation with each other.

We will deal with this possible multicollinearity issue in the regression analysis. Table 3 presents the difference of main variables used in this study between SCFs and NSCFs. As can be seen from the table, the financial leverage (LEV) of SCFs is on average significantly lower than NSCFs, consistent with the debt limitation imposed on SCFs. In addition, compared with NSCFs, SCFs bring in higher operating cash flow (OCF) and are more profitable (higher ROA and ROE). Finally, SCFs have bigger board size and higher ownership by institutional investors, government and insiders. These results imply that for firms following Islamic Law (Shariah) do show different characteristics in some important financial and corporate governance variables.

Table 1: Descriptive Statistics (ISSI)

| Variables | Obs. | Minimum | Maximum | Mean | Median | Standard Deviation |
|---|---|---|---|---|---|---|
| INV | 3451 | -11.856 | 29.772 | 0.042 | 0.003 | 0.868 |
| WC | 3433 | -11.907 | 31.402 | 0.046 | 0.009 | 0.847 |
| OCF | 3451 | -29.08 | 68.577 | 0.078 | 0.047 | 1.42 |
| TQ | 3453 | 0.025 | 1984.616 | 2.375 | 1.087 | 33.891 |
| LEV | 3452 | -0.049 | 89.841 | 0.622 | 0.485 | 1.845 |
| ROA | 3452 | -10.589 | 55.007 | 0.05 | 0.034 | 0.293 |
| ROE | 3461 | -160.712 | 161.755 | 0.201 | 0.068 | 4.957 |
| SIZE | 3453 | 7.69 | 19.646 | 14.55 | 14.552 | 1.686 |
| GRO | 3378 | -16.945 | 6051.089 | 2.306 | 0.092 | 107.74 |
| BS | 3419 | 0.693 | 3.367 | 2.13 | 2.079 | 0.354 |
| BI | 3418 | 0 | 2 | 0.24 | 0.238 | 0.118 |
| INST | 3583 | 0 | 4.824 | 0.602 | 0.661 | 0.312 |
| GOV | 3583 | 0 | 0.900 | 0.027 | 0 | 0.131 |
| INSI | 3583 | 0 | 1 | 0.028 | 0 | 0.105 |
| EXT | 3583 | 0 | 1 | 0.023 | 0 | 0.082 |

*This table reports the summary statistics for the variables. INV is firms' fixed investment divided by total assets. WC is investment in working capital divided by total assets. OCF is operating cash flow divided by total assets. TQ is the sum of market value of equity and book value of total debt divided by book value of total assets. LEV is total debt divided by total assets. ROA is net income divided by total assets. ROE is total equity divided by total equity. SIZE is Ln (total assets). GRO is (Sales1/Sales0)-1. BS is the number of directors on the boards. BI is the percentage of independent directors on the board. INST is the percentage of the shares owned by institutional investors. GOV is the percentage of the shares owned by the government. INSI is the percentage of the shares owned Insiders. EXT is the percentage of the shares owned by external shareholders.*

Table 2: Pearson Correlation Matrix for the Variables

| | INV | SHA | WC | OCF | TQ | LEV | ROA | SIZE | BS | BI | INST | GOV | INSI | EXT | GRO |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| INV | 1 | | | | | | | | | | | | | | |
| SHA | 0.025 | 1 | | | | | | | | | | | | | |
| WC | 0.773 *** | 0.022 | 1 | | | | | | | | | | | | |
| OCF | 0.316 *** | 0.029 * | 0.097 *** | 1 | | | | | | | | | | | |
| TQ | 0.078 *** | 0.004 | -0.002 | 0.87 *** | 1 | | | | | | | | | | |
| LEV | 0.084 *** | -0.112 *** | 0.014 | 0.705 *** | 0.852 *** | 1 | | | | | | | | | |
| ROA | 0.071 *** | 0.035 | -0.001 | 0.879 *** | 0.981 *** | 0.783 *** | 1 | | | | | | | | |
| SIZE | -0.074 *** | -0.023 | -0.057 *** | -0.023 | -0.044 ** | -0.107 *** | -0.013 | 1 | | | | | | | |
| BS | -0.003 | 0.074 *** | -0.007 | 0.053 *** | 0.027 | -0.018 | 0.057 *** | 0.631 *** | 1 | | | | | | |
| BI | -0.012 | -0.01 | 0.002 | -0.055 *** | -0.03 * | -0.028 | -0.192 *** | -0.007 | | 1 | | | | | |
| INST | 0.012 | -0.006 | 0.004 | 0.024 | 0.015 | 0.027 | 0.015 | -0.145 *** | -0.039 ** | 0.028 | 1 | | | | |
| GOV | -0.005 | 0.049 *** | -0.007 | -0.001 | -0.002 | -0.012 | 0.003 | 0.222 *** | 0.175 *** | -0.12 *** | -0.425 *** | 1 | | | |
| INSI | -0.005 | 0.024 | -0.008 | -0.005 | -0.009 | -0.033 * | -0.007 | -0.084 *** | -0.076 *** | 0.035 ** | -0.313 *** | -0.054 *** | 1 | | |
| EXT | -0.004 | -0.017 | 0.019 | -0.020 | -0.006 | -0.013 | -0.008 | -0.157 *** | -0.064 *** | 0.011 | -0.24 *** | -0.057 *** | 0.063 *** | 1 | |
| GRO | -0.005 | 0.009 | -0.003 | -0.003 | -0.001 | -0.005 | -0.001 | 0.009 | -0.010 | 0.006 | -0.037 ** | -0.004 | 0.006 | 0.058 *** | 1 |

*This table reports the Person correlation matrix for the variables. INV is firms' fixed investment divided by total assets. WC is investment in working capital divided by total assets. OCF is operating cash flow divided by total assets. TQ is the sum of market value of equity and book value of total debt divided by book value of total assets. LEV is total debt divided by total assets. ROA is net income divided by total assets. ROE is total equity divided by total equity. SIZE is Ln (total assets). GRO is (Sales1/Sales0)-1. BS is the number of directors on the boards. BI is the percentage of independent directors on the board. INST is the percentage of the shares owned by institutional investors. GOV is the percentage of the shares owned by the government. INSI is the percentage of the shares owned Insiders. EXT is the percentage of the shares owned by external shareholders.*
*\* Significance at the 10% level. \*\* Significance at the 5% level. \*\*\* Significance at the 1% level.*

Table 3: The Value Difference of Variables between Shariah and Non-Shariah Firms

| Variable | Mean | | | Median | | | Differences | |
|---|---|---|---|---|---|---|---|---|
| | All | SCFs | NSCFs | All | SCFs | NSCFs | T-Test | Mann-Whitney Z |
| INV | 0.042 | 0.044 | 0.038 | 0.003 | 0.003 | 0.001 | -0.172 | 1.841* |
| WC | 0.045 | 0.043 | 0.051 | 0.009 | 0.009 | 0.009 | 0.256 | 0.372 |
| OCF | 0.077 | 0.108 | 0.001 | 0.047 | 0.054 | 0.029 | -1.987** | 6.683*** |
| TQ | 2.374 | 2.484 | 2.09 | 1.055 | 1.087 | 1.101 | -0.306 | 0.263 |
| LEV | 0.621 | 0.492 | 0.953 | 0.485 | 0.433 | 0.662 | 6.632*** | 23.045*** |
| ROA | 0.05 | 0.07 | -0.002 | 0.034 | 0.042 | 0.0172 | -1.955* | 11.284*** |
| ROE | 0.2 | 0.23 | 0.124 | 0.067 | 0.092 | 0.026 | -0.576 | 13.697*** |
| SIZE | 14.550 | 14.554 | 14.54 | 14.554 | 14.555 | 14.55 | -0.22 | 0.233 |
| GRO | 2.306 | 2.941 | 0.589 | 0.092 | 0.094 | 0.085 | -0.58 | 1.994** |
| BS | 2.130 | 2.15 | 2.076 | 2.079 | 2.079 | 2.079 | -5.36*** | 4.763*** |
| BI | 0.24 | 0.24 | 0.24 | 0.235 | 0.231 | 0.25 | 0.25 | 1.322 |
| INST | 0.602 | 0.626 | 0.545 | 0.661 | 0.673 | 0.595 | -7.144*** | 6.588*** |
| GOV | 0.027 | 0.032 | 0.015 | 0 | 0 | 0 | -3.696*** | 3.59*** |
| INSI | 0.028 | 0.03 | 0.023 | 0 | 0 | 0 | -2.07** | 2.231** |
| EXT | 0.023 | 0.023 | 0.023 | 0 | 0 | 0 | -0.06 | 0.318 |

*This table reports the value difference of the variables between Shariah and nob-Shariah firms. INV is firms' fixed investment divided by total assets. WC is investment in working capital divided by total assets. OCF is operating cash flow divided by total assets. TQ is the sum of market value of equity and book value of total debt divided by book value of total assets. LEV is total debt divided by total assets. ROA is net income divided by total assets. ROE is total equity divided by total equity. SIZE is Ln (total assets). GRO is (Sales1/Sales0)-1. BS is the number of directors on the boards. BI is the percentage of independent directors on the board. INST is the percentage of the shares owned by institutional investors. GOV is the percentage of the shares owned by the government. INSI is the percentage of the shares owned Insiders. EXT is the percentage of the shares owned by external shareholders. \* Significance at the 10% level. \*\* Significance at the 5% level. \*\*\* Significance at the 1% level.*

## The Relationship between Working Capital and Fixed Investments

Table 4 reports the results of multivariate regressions on the relationship between working capital and fixed asset investment. Column 1 includes working capital investment (WC) as the main independent variable; Column 2 adds the squared working capital investment (WC2) into the regression, Column 3 includes Shariah and, finally, Column 4 adds the interaction items between Shariah and working capital investment as well as Shariah and the squared working capital investment. As can be seen from Column I, the coefficient on WC is significant at the 1% level and in Column 2, the coefficient on WC is significant, however, that on WC2 is not significant at traditional levels. These results suggest that working capital investment is positively associated with fixed investment and the relationship is linear when Shariah is not included. Columns 3 and 4 take Shariah into consideration. As can be seen in Column 3, the coefficient on Shariah is significant at the 5% level, indicating that SCFs invest more in fixed assets than NSCFs. In addition, the coefficient on WC (working capital investment) is significant and positive, but that on WC2 (squared working capital investment) is not significant. Finally, Column 4 shows that the coefficients on WC and WC2 are both significant at the 1% level, the sign of the former is positive, but it is negative for the latter. Regarding the interaction items, the coefficient on Shariah*WC is not significant but that on Shariah*WC2 is positive and significant at the 1% level. The results suggest that the relationship between working capital and fixed investment is non-linear for NSCFs, but it is linear for SCFs. It implies that for Shariah-compliant firms, fixed investment increases with working capital investment, however, for non-Shariah-compliant firms, in the beginning fixed investment increases with working capital investment to some point, beyond that point, fixed investment decreases as working capital investment increases. Hypothesis 1 is supported for NSCFs, but it is not for SCFs. Furthermore, Hypothesis 3 that the highest point on the relationship between working capital and fixed investment

Table 4: Multivariate Regression of the Effect of Working Capital on Fixed Investment

| **Dummy Variable: Shariah (ISSI)** | | | | |
|---|---|---|---|---|
| **Dependent Variable: INV** | | | | |
| | **1** | **2** | **3** | **4** |
| C | -0.178*** (0.061) | -0.18*** (0.056) | -0.199*** (0.056) | -0.104 (0.09) |
| SHARIAH_ISSI | | | 0.041* (0.024) | 0.006 (0.01) |
| OCF | 0.398* (0.207) | 0.402** (0.205) | 0.402* (0.205) | 0.42** (0.199) |
| WC | 0.859*** (0.08) | 0.821*** (0.18) | 0.822*** (0.18) | 0.529*** (0.113) |
| WC2 | | 0.001 (0.006) | 0.001 (0.006) | -0.085*** (0.014) |
| SHARIAH_ISSI*WC | | | | 0.209(0.174) |
| SHARIAH_ISSI*WC2 | | | | 0.091***(0.007) |
| Control variables | YES | YES | YES | YES |
| Firm | YES | YES | YES | YES |
| Year | YES | YES | YES | YES |
| $R^2$ | 0.847 | 0.847 | 0.848 | 0.918 |
| Adj $R^2$ | 0.777 | 0.777 | 0.777 | 0.853 |
| F-statistics | 28.773*** | 28.732*** | 28.703*** | 46.928*** |
| N | 3,322 | 3,322 | 3,322 | 3,322 |

*This table reports regression results of the effect of working capital on fixed investment. SHARIAH_ISSI is a dummy variable that sets one if the firm is included in the Indonesia Shariah Stock Index, or zero otherwise. WC is investment in working capital divided by total assets. WC2 is the squared term of the investment in working capital divided by total assets. OCF is operating cash flow divided by total assets. Control variables include: INV is firms' fixed investment divided by total assets. TQ is the sum of market value of equity and book value of total debt divided by book value of total assets. LEV is total debt divided by total assets. ROA is net income divided by total assets. ROE is total equity divided by total equity. SIZE is Ln (total assets). GRO is (Sales1/Sales0)-1. BS is the number of directors on the boards. BI is the percentage of independent directors on the board. INST is the percentage of the shares owned by institutional investors. GOV is the percentage of the shares owned by the government. INSI is the percentage of the shares owned Insiders. EXT is the percentage of the shares owned by external shareholders. * Significance at the 10% level. ** Significance at the 5% level. *** Significance at the 1% level.*

## The Relationship between Working Capital/Fixed Investment Ratio and Performance

Table 5 reports the results for the regression of the impact of working capital/fixed investment ratio on firm performance represented by ROA (return on assets). Working capital/fixed investment ratio is included in regression 1 in addition to control variables, as shown in Column 1. The squared term of working capital/fixed investment ratio is also added regression 2 to determine whether the relationship between working capital/fixed investment ratio and firm performance is non-linear. Finally, in Column 3, the interaction between Shariah and working capital/fixed investment as well as the interaction between Shariah and the squared term of working capital/fixed investment are also included to determine whether the relationship of Shariah-compliant firms is different from that of non-Shariah-compliant firms or not. As can be seen from Table 5, the coefficient on working capital/fixed investment (WCINV) is significant only in regression 1, suggesting that higher working capital/fixed investment ratio leads to better performance and Shariah does not exert influence on the effect of working capital/fixed investment on firm performance. This is not consistent with our hypothesis 6 that the relationship between fixed and working capital investment is the channel through which Shariah compliance affects firm performance. Finally, Hypothesis 2 that firms at the complement stage perform better than those at the substitute stage is not supported as well.

Table 5: Multivariate Regression of the Effect of Working Capital/Fixed Investment on ROA

| Dummy Variable: Shariah (ISSI) | | | |
|---|---|---|---|
| Dependent Variable: Performance (ROA) | | | |
| | 1 | 2 | 3 |
| C | -4.782*** (0.967) | -4.781*** (0.966) | -4.782*** (0.969) |
| WCINV | 0.000** (0.000) | 0.000 (0.000) | 0.000 (0.000) |
| WCINV2 | | 0 (0) | 0 (0) |
| WCINV*SHARIAH | | | 0.000 (0.000) |
| WCINV2*SHARIAH | | | 0 (0) |
| Control variables | YES | YES | YES |
| Firm | YES | YES | YES |
| Year | YES | YES | YES |
| $R^2$ | 0.844 | 0.844 | 0.844 |
| Adj $R^2$ | 0.778 | 0.778 | 0.778 |
| F-statistics | 27.993*** | 27.916*** | 27.765*** |
| N | 3,179 | 3,179 | 3,179 |

*This table reports the regression results of the effect of working capital/fixed investment on ROA. WCINV is investment in working capital divided by fixed investment. WCINV2 is the squared term of the investment in working capital divided by fixed investment. SHARIAH is a dummy variable that sets one if the firm is included in the Indonesia Shariah Stock Index, or zero otherwise. Control variables include: INV is firms' fixed investment divided by total assets. TQ is the sum of market value of equity and book value of total debt divided by book value of total assets. LEV is total debt divided by total assets. ROA is net income divided by total assets. ROE is total equity divided by total equity. SIZE is Ln (total assets). GRO is (Sales1/Sales0)-1. BS is the number of directors on the boards. BI is the percentage of independent directors on the board. INST is the percentage of the shares owned by institutional investors. GOV is the percentage of the shares owned by the government. INSI is the percentage of the shares owned Insiders. EXT is the percentage of the shares owned by external shareholders. * Significance at the 10% level. ** Significance at the 5% level. *** Significance at the 1% level.*

The Effect of Islam Adheres on Firm Performance

Table 6 presents the results of the influence of Islam adherence on firm performance. In Column 1, we include the interaction between Muslim proportion of province and working capital/fixed investment as well as the interaction between Muslim proportion of province and the squared working capital/fixed investment in the regression, in addition to working capital/fixed investment and its squared term and control variables. In Column 2, the Muslim proportion of province is replaced by the Muslim proportion of city, and we run regression in the same way again. As can be seen in Column 1, the coefficient on working capital/fixed investment is positive and significant at the 10% level, however, the interaction between Muslim proportion of province and working capital/fixed investment is negative and significant at the 10% level. Both the coefficients on squared working capital/fixed investment as well as the interaction between Muslim proportion of province and the squared working capital/fixed investment are not significant, suggesting that firm performance improves as the working capital/fixed investment increases for firms located in low Muslim proportion province and the relationship between working capital/fixed investment is linear rather than non-linear for non-Shariah-compliant firms. In addition, for Shariah-compliant firms, both working capital/fixed investment and its squared term do not exert influence on firm performance, implying that working capital/fixed investment does not influence firm performance in high Muslim proportion province. Furthermore, in Column 2, with the Islam adherence being represented by the Muslim proportion of city, the results show that in high Muslim proportion city, the relationship between working capital/fixed investment and firm performance is quadratic, that is, in the beginning, firm performance improves as working capital/fixed investment increases to some pint, beyond that point, firm performance turns lower with working capital/fixed investment. In contrast, in low Muslim proportion city, the relationship does not exist either linear or quadratic. Hypotheses 5 and 6 are thus supported partially.

Table 6: Multivariate Regression of the Effect of Islam Adherence on the Relationship Between Working Capital/Fixed Investment and ROA

|  | 1 | 2 |
|---|---|---|
| C | -4.85*** (0.961) | -0.038 (0.136) |
| WCINV | 0.004* (0.002) | 0.000 (0.000) |
| WCINV2 | -0.000 (0.000) | 0.000 (0.000) |
| WCINV*MUSLIM_PROP_PROV_DUM | -0.004* (0.002) | |
| WCINV2*MUSLIM_PROP_PROV_DUM | 0.000 (0.000) | |
| WCINV*MUSLIM_PROP_CITY_DUM | | 0.000*** (0.000) |
| WCINV2*MUSLIM_PROP_CITY_DUM | | -0.000*** (0.000) |
| Control variables | YES | YES |
| Firm | YES | YES |
| Year | YES | YES |
| $R^2$ | 0.843 | 0.488 |
| Adj $R^2$ | 0.778 | 0.418 |
| F-statistics | 27.877*** | 5.774*** |
| N | 3,161 | 2,667 |

*This table reports the regression results of the effect of Islam adherence on the relationship between working capital/fixed investment and ROA. WCINV is investment in working capital divided by fixed investment. WCINV2 is the squared term of the investment in working capital divided by fixed investment. MUSLIM_PROP_PROV_DUM is a dummy variable that sets one if the firm is in the high Muslim proportion province, or zero otherwise. MUSLIM_PROP_CITY_DUM is a dummy variable that sets one if the firm is in the high Muslim proportion city, or zero otherwise. Control variables include: INV is firms' fixed investment divided by total assets. TQ is the sum of market value of equity and book value of total debt divided by book value of total assets. LEV is total debt divided by total assets. ROA is net income divided by total assets. ROE is total equity divided by total equity. SIZE is Ln (total assets). GRO is (Sales1/Sales0)-1. BS is the number of directors on the boards. BI is the percentage of independent directors on the board. INST is the percentage of the shares owned by institutional investors. GOV is the percentage of the shares owned by the government. INSI is the percentage of the shares owned Insiders. EXT is the percentage of the shares owned by external shareholders. The definitions of the variables are as presented in Table1. * Significance at the 10% level. ** Significance at the 5% level. *** Significance at the 1% level.*

## CONCLUDING COMMENTS

This study examines whether Shariah (Islamic Law) compliance and Islam adherence influence the relationship between working capital and fixed investment, as well as, whether this relationship further affects firm performance. Using a sample of firms listed on the Indonesia Stock Exchange over the period 2011-2018 and dividing it into Shariah-compliant firms (SCFs) and non-Shariah-compliant firms (NSCFs) two sub-groups, we find that the relationship between working capital and fixed investment is linear for SCFs, however, this relationship is non-linear for NSCFs. This result suggests that fixed investment increases with working capital for SCFs. For NSCFs, however, fixed investment increases with working capital to some point, beyond that point, fixed investment declines as working capital further increases. It implies that Shariah does exert influence on the relationship between working capital and fixed investment. We go a step further to investigate whether the relationship between working capital and fixed investment, represented by working capital/fixed investment ratio, affects firm performance as well as whether Shariah plays a role in this effect. The result shows that for NSCFs higher working capital/fixed investment leads to a better firm performance, however, this effect does not exist for SCFs.

Finally, the sample is divided into two sub-groups, based on the Muslim proportion of the population in a province and in a city, respectively. In which, the proportion higher than proportion median set as High group, otherwise Low group. The results indicate that the relationship between working capital/fixed investment and firm performance is linear for firms located in low Muslim proportion province, however, this relationship does not exist in high Muslim proportion province. In contrast, Islam adherence exerts influence on the relationship between working capital/fixed investment and firm performance, as evidenced by quadratic relationship that in the beginning firm's performance increases to some point, after that, firm performance declines as working capital/fixed investment goes up. Overall, the results of this study

suggest that Shariah exerts influence on the relationship between working capital and fixed investment, and in turn, affect the relationship between working capital/fixed investment. Finally, Islam adherence, represented by Muslim proportion of population also may affect the relationship between working capital/fixed investment and firm performance.

For non-Shariah-compliant firms, managers should keep their eyes on firms' liquidity to prevent default risks; while for Shariah-compliant firms, managers should make the best use of working capital to transfer into fixed investment to reach the firm value maximization. For policymakers, they should facilitate a sound short-term financing environment to increase firms' liquidity. Future research can extend our findings to figure out whether the relationship between working capital and fixed investment can also be moderated by corporate governance and whether there is a substitute effect between corporate governance and Shariah laws on the relationship between working capital and fixed investment.

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# DO SMES LISTED ON THE ALTERNATIVE INVESTMENT MARKET OUTPERFORM SMES LISTED ON EURONEXT?

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## ABSTRACT

*This paper examines the performance of small and medium enterprises (SMEs) listed on the Alternative Investment Market (AIM) with that of Euronext. The analysis compares SMEs in both markets using index prices for a period of 10 years Jan. 2010 to Dec. 2019 from Euronext (Paris and Brussels) and AIM, as well as SMEs own financial reports. CAPM and Fama and French three factor were applied using OLS regression analysis to capture the risks and returns of the two stock markets. The interpretation of Alphas and betas revealed that the Alphas, betas, and adjusted R square ranges in the CAPM model are less significant than those in Fama and French 3 factor model; the two models are more consistent with the Euronext than AIM. However, it is important to highlight that AIM SMEs overall performance in terms of risk and return is higher than those of Euronext.*

## INTRODUCTION

Access to finance remains one of the top challenges for small and medium enterprises (SMEs) in Europe (Beck & Demirguc-Kunt 2006; Bongini et al 2019). Thus, the goal behind the creation of unregulated stock markets is to overcome the existing financial gap by enabling SMEs access to financial resources (Carpentier and Suret 2010). However, in recent years the European SMEs initial public offering (IPO) is in constant decline. Additionally, it must be noted that pan-European unregulated stock markets such as Euronext Growth (formerly known as Alternext) or Euronext Access (formerly known as the Free Market) do not meet the same craze as their British counterparts (AIM: Alternative Investment Market) (Zachariadis, 2019). Prior studies compared the AIM London performances to its American, Japanese, and other counterparts in terms of listing conditions (Kashefi-Pour and Lasfer, 2011; Gerakos et al., 2013); economic performance (Vismara et al., 2012) functions (Granier et al. 2019) and financial disclosure (Pozniak et al. 2016) etc. Few studies have focused on comparing AIM London with other European unregulated markets dedicated to SMEs. Lagneau-Ymonet et al., (2014) in their comparison of AIM London and Alternext concluded that Alternext's performances are not as bad as critics have led to believe, and the organizational characteristics of AIM do not allow it to be a model for benchmark to unregulated stock markets dedicated to SMEs.

Risk and return are essential indicators in the evaluation of stock markets performance; higher risk is generally associated with a higher return, and lower risk is in parallel associated with a lower return. Thus, because of the uncertainty surrounding future market behaviors, enterprises willing to go public and investors looking for investment opportunities pay cautious attention to these trade-off factors between return and risk before taking any significant decision towards IPOs or shares acquisition. In this paper, we compare SMEs performance on AIM London which is the LSE's market for small and medium size growth

companies to its Euronext peer. Indeed, the AIM London is recognized in the literature for being the biggest in Europe, a benchmark and reference for the creation of other unregulated stock markets both at the local and global levels; markets such as First North in 2005; AIM Italia and AIM Japan in 2009 (Lagneau-Ymonet et al., 2014) The main contribution of our research is to assess AIM London's SMEs performance compared to its European counterparts in terms of risk and return. Subsequently, comparing the performance of AIM London SMEs to that of similar pan-European markets could provide a better understanding of the attractivity and predominance of AIM London in European unregulated stock markets. We hypothesize that if it is true that AIM is the main European unregulated stock market, SMEs listed on AIM should overperform their European counterparts in terms of risk and return. The remainder of the paper is organized as follows. The first section reviews the literature. We present the characteristics of unregulated markets (their companies' profiles, the number of IPOs, the admission criteria, and operating rules) and the controversy about performance. Then we introduce the data and the methodology. The fourth section presents the analysis and results. And finally, the last section summarizes the most important findings.

## LITERATURE REVIEW

SMEs makeup to 99% of the total number of businesses in the EU non-financial business sector, contributing to approximately 66.6% of employment and a value-added of 56.4 %. Yet, unlike large companies, SMEs face increasing challenges in accessing finance, hence limiting their ability to raise capital for their development and positively enable economic growth (Annual Report on European SMEs 2018/2019). Banks are traditionally known as businesses and much particularly SMEs' primary source of finance; with bank credits accounting for 53% while stock markets represent only 12 % (AFME, 2017). Making SMEs inextricably highly reliant on bank credits, to the extent that the 2008 financial crisis shrunk down the world economy, causing financial distress in the banking sector has also consequently dragged many SMEs into the same fate. Since then, SMEs access to finance has dramatically deteriorated with the new cautious regulations in the banking sector through Basel III and austerity policies (Wehinger, 2013; Udell, 2015; Colombo et al., 2016). Therefore, SMEs should significantly look for alternative sources of financing. Besides leasing, trade credit, loans from other companies, crowdfunding venture capital or business angels, and informal lending; stock markets aim to provide businesses with a platform to raise funds (Kraemer-Eis et al, 2019). For instance, to raise capital by issuing equity or debt securities which involves stringent listing requirements, high average transaction costs, and very complex regulatory frameworks, there are several regulated stock markets in Europe (London Stock Exchange: LSE, Euronext N.V, SIX Swiss Exchange, Frankfurt Stock Exchange, etc.). In their effort to develop and expand their activities, ambitious SMEs that are looking for financial means through stock markets must deal with operators who tend to focus on maintaining their market share by listing larger companies. Nevertheless, with fewer restrictions and easier listing rules, unregulated stock markets are more attractive to SMEs than regulated markets (Gupta & Saini, 2016; Eberhart, and Eesley, 2018). Therefore, the LSE created in 1995 AIM London with much less restricted admission criteria and listing rules. The success of the AIM in terms of organization and its resilience to the dot-com bubble have inspired the creation of junior markets such as First North in 2005; AIM Italia and AIM Japan in 2009 (Lagneau-Ymonet et al., 2014). Table 1 summarize the listing criteria of London Stock Exchange and AIM.

Table 1: The LSE and the AIM Listing Criteria

| Conditions for admission | AIM | LSE Main List |
| --- | --- | --- |
| Floating capital | No minimum | Minimum of 25% shares owned by the public |
| Financial information | No history required | 3years history |
| % of entity activities supported by income | No | 75% |
| Control over the majority of assets of the entity (3 years) | No | Yes |
| Sufficient working capital | Yes | Yes |
| Market capitalization | No minimum | £700 000 (€793 013) |
| Profitability | No | No |
| Role of the advisors | Nomad required during the IPO and after | A sponsor |
| Admission documents | Under the responsibility of the Nomad | Reviewed by the UKLA |

*Table 1 compares the listing criteria on the main market: London Stock Exchange and on the unregulated market: AIM. To go public on the LSE companies are required to have a minimum capitalization of €793013, disclosure of 3 years financial information, 75% of activities supported by income and a minimum of 25% shares owned by the public. However, for an IPO on AIM there is no mandatory requirements except from appointing a nominated advisor and prepare admission document in compliance with the AIM rules.*

Inspired by the AIM success story, European stock exchanges also created junior markets dedicated to SMEs. Indeed, given the contribution of SMEs to European economic growth and the existing financial gap, in their effort to enable SMEs to raise capital in the stock market (previously difficult to access), the European Commission has promoted the creation of Pan-European unregulated stock markets such as, Euronext Access and Euronext Growth. Table 2 summarizes the listing requirements on those three markets.

Notwithstanding, several controversies have arisen over AIM London's capacity in supporting SMEs (Revest and Sapio, 2012; Campbell & Tabner, 2014). Gerakos et al. (2013) in their investigation of the experience of firms listing and capital raising on AIM London compared to similar firms' IPO on the Nasdaq and OTC Bulletin Board (OTCBB) concluded that the failure rate of companies listed on AIM London appears to be higher than that of its US counterparts. Espenlaub et al. (2012) studied SMEs IPO on AIM from 1995 to 2004 and found that 10.7% of companies are delisted from the AIM within five years of the IPO. An analysis by Kashefi-Pour and Lasfer (2011) on the characteristics of delisted firms from AIM London between 1995 and 2009 revealed that delisted firms have significantly higher leverage and are unable to issue securities or raise additional capital, which represents the major factor in their exit decision. In the same perspective, others evaluated AIM London's economic performance; AIM London economic performance turns out to be negative and lower compared to Nasdaq, and OTCBB in the five years following the IPO, while it is positive for the main regulated market (LSE) (Gerakos et al., 2013; Vismara et al., 2012). Moreover, Cassia et al., (2009) demonstrated that AIM London is not a springboard for young innovative companies; and does not provide specific support to technology firms.

In the past decades, despite all the enthusiasm and promises surrounding the creation of those junior stock markets in Europe, SMEs IPO have been in constant decline. Before the 2008 financial crisis, from 2005 to 2007 the European Commission reported an average of €11 billion raised per year, up to an average of €2.8 billion raised annually from 2008 to 2015 with a considerable decline in the number of SMEs going public (300 from 2005 to 2007 versus 172 in 2016) (AEFM, 2017). This negative trend in European SMEs IPO is further unbalanced by the predominance of AIM London's market share to that of the other Pan-European unregulated stock markets in terms of the number of IPO (AIM London represents 70% of total SMEs IPO in Europe) (Zachariadis, 2019). The drivers behind this downturn phenomenon are from SMEs side (the cost of going public continues to be high) and the investors' side (junior markets are qualified as risky, volatile, and less liquid) (Lopez de Silanes, F et al; 2015).

Table 2: Euronext Listing Requirements

| | Euronext European Regulated Markets | Euronext Growth (Prior Alternext) | Euronext Access (Prior Free Market) |
|---|---|---|---|
| **Free float** | Minimum of 25% of share capital or 5% if this represents at least EUR 5 million | EUR 2.5 million (public offer) | Not Applicable (N/A) |
| **Track record** | Three years financial statements | EUR2.5 million (private placement within one year with a minimum of three investors)<br><br>EUR 2.5 million (on another market)<br><br>At least two years financial statements | Two years of financial statements recommended |
| **Accounting standards** | IFRS or equivalent accounting standards (including US, Canada, China and Japan) | EEA Company: IFRS or national GAAP | Optional IFRS or national accounting standards |
| **Prospectus / Information Document** | Prospectus approved by Competent Authority | Non-EEA Company: IFRS or equivalent accounting standards (in case of public offer) and IFRS, equivalent accounting standards (including US, Canada, China and Japan) or national accounting standards with reconciliation table (in case of private placement or direct listing) | Prospectus approved by the Regulator in case of a public offer |
| **Financial Reporting** | Audited annual and semiannual financial statements Price sensitive information | Limited number of threshold declarations: 25, 30, 50, 75 and 95% of voting rights | No reporting of periodic obligations Price sensitive information |
| **Declaration** | Multiple threshold declarations: Multiples of 5% of voting rights | | No reporting of major holdings |
| **Insider List** | Yes | Yes | Yes |
| **Declaration of Manager Transactions** | Yes | Yes | Yes |

*Table 2 compares the listing requirements on Euronext markets: the regulated market called Euronext and the two unregulated markets : Euronext Access and Euronext Growth. Access to the regulated Market requires a minimum floating of 25% of share capital, disclosure of 3 years financial information, and compliance with the IFRS accounting standards. The requirements for Euronext growth are a EUR 2.5 million minimum floating, disclosure of 2 years financial information, and a compliance with IFRS accounting standards. However, for Euronext Access there is no floating minimum requirement nor a financial*

To meet the specific needs and requirements of investors or SMEs, unregulated stock markets rules and regulations differ among EU markets, which consequently influence not only their development but also their performances. The European markets become diversified with stock markets competing with and with large banks and investment firms. With the success and all the controversies surrounding AIM London, this paper instead seeks the answer of whether AIM overperforms other pan-European unregulated stock markets in terms of risks and returns. In modern times, performance evaluation of stocks through the estimation of portfolio risk and return was introduced by Harry Markowitz in 1952. The objective of the model that he developed is to reduce the risk as much as possible for a given level of return. Hence in the 1960s, the Capital Asset Pricing Model was independently studied by Treynor Sharp, Linter and Mossin in 1960. Their motivation was based on a criticism to the Markowitz model since the model provides global prediction while disregarding the information present on the market at equilibrium. Therefore, the CAPM is a slightly less ambitious theory which allows prediction at a local level, consistent with the market equilibrium of stocks supply and demand. Empirical tests of CAPM often found factors that influenced a portfolio performance that were not explained by the model. As a solution to that anomaly, the Fama and French model was initially introduced in 1996 adding size risk and value risk factors to the CAPM market risk factors. This model considers the fact that SMEs stocks regularly outperform the market. Yet, there is

a lot of debate about whether the Fama and French 3-factor model outperformance tendency is due to market efficiency or market inefficiency.

In recent years, scholars have included other factors to the original 3-factor model of Fama and French. For instance, giving a small improvement in the explanatory power compared to the three-factor model. As the name suggests, the Cahart four-factor model proposed by Mark Carhart adds a fourth factor WML, which stands for Winners Minus Losers, factor to the Fama and French 3-factor model. This fourth factor is the momentum is defined as the tendency for assets to fluctuate: rising or falling (Cahart, 1997). In 2015, Fama and French adapted their model to include five factors by adding two new factors to their classic 3-factor model and found out that it performs better than their previous model. Those two additional factors are profitability (stocks with a high operating profitability perform better) and an investment factor (stocks of companies with the high total asset growth have below average returns). However, their five-factor model's main problem is its failure to capture the low average returns on small stocks whose returns behave like those of firms that invest a lot despite low profitability (Fama & French, 2015). For this study, we will focus on CAPM and Fama and French 3-factor model to conduct our analysis.

## DATA AND METHODOLOGY

To carry out our empirical study, we collected monthly historical index prices of SMEs constituents for a period of 10 years Jan. 2010 to Dec. 2019 from Euronext (Paris and Brussels) and LSE available on the Bureau van Dijk database, 120 observations. We obtained the Fama French factors from the monthly data available on Fama & French website (Fama/French European, 3; 4; momentum) which includes the risk-free rate and the market premium. Companies' own financial reports (monthly stock prices, book-value, market capitalization and shares outstanding) and index prices have been gathered from Oribis Bureau van Dijk's flagship company database.  The selection of SMEs constituents of each stock market is based on the EU definition of SME (total employees of fewer than 250, a turnover of fewer than € 50 million and a total balance sheet of fewer than € 43 million). Based on our selection criteria, we found 215 SMEs listed on Euronext (Paris: 200, Brussels: 15) and 334 on LSE (AIM London).  Unfortunately, the index prices and financial reports of all the selected companies are not available on the database. Therefore, our dataset consists of 30 companies from each stock market.

The companies are sorted into groups. Size factor with two groups (Small and Big). BE/ME factor with three groups (Low, Medium, and High). Portfolios average returns are used to create the SMB (small minus big), HML (high minus low) factors. OLS time regression analysis is used to estimate the alpha and beta values for Rm-Rf, SMB, HML for the 4 models. We used Excel to calculate the return, and standard deviation of each individual index. Afterwards, we construct a monthly market cap-weighted portfolio for both constituents, calculate the portfolio's return (used to create SMB and HML factor), excess return, and apply CAPM and F&F 3 factors (1993 using OLS regression. Then, report the alphas of each model and interpret all the betas.  We constructed SMB and HML by dividing our data into two (0 to 50% and 50 to 100%) and BE/ME ratio (Low: 0-30%, Medium: 40-70% and High: 70-100%). The SMB and HML sort produced 6 value weighed portfolios. The WML is the companies' monthly average returns (Loser: 0-30%, Medium: 40-70% and Winner: 70-100%).

$$SMB = 1/3\,(Small\,Value\,+\,Small\,Neutral\,+\,Small\,Growth)-1/3\,(Big\,Value\,+\,Big\,Neutral\,+\,Big\,Growth). \tag{1}$$

it is the difference between the expected return of a portfolio of small capitalization and that of a portfolio with big/large capitalization.

$$HML = \frac{1}{2}(Small\,Value\,+\,Big\,Value)-\frac{1}{2}(Small\,Growth\,+\,Big\,Growth) \tag{2}$$

It is the difference between the expected return of a portfolio with a high book value / market value ratio and a portfolio with a low book value / market value ratio.

Capital Asset Pricing Model (CAPM)

Even with the "don't put all your eggs in the same basket" concept, investors always bear some level of risks no matter how they diversify their investment. William Sharpe, John Lintner, Jan Mossin and Jack Treynor introduced in the early 60s the CAPM which helps to calculate investment risk and what return on investment an investor should expect.

The CAPM function:

$$E\ (Ri)\ =\ Rf\ +\ \beta i\ [E\ (R\ m) - Rf]. \tag{3}$$

where:
E $(Ri)$: expected return of investment
$Rf$ : risk-free rate
$Rm$: Return of the market portfolio.
$\beta i$ : beta of the investment
[E($Rm$) −$Rf$ ]: market risk premium

The regression function:

$$Ri\ -\ Rf\ =\ \alpha\ +\ \beta 1\ (Rm\ -\ Rf) + \varepsilon i \tag{4}$$

where:
$Ri$:  return on asset i
$Rf$: risk-free rate
$Rm$: Return of the market portfolio
$\alpha$:  intercept of the regression line
$\beta 1$: Beta value of the independent variable $(Rm - Rf)$
$\varepsilon i$: residuals of the regression model

Due to its simplicity and utility, the CAPM still remains popular despite its failing numerous empirical tests and its problematic assumptions (Graham and Campbell, 2001; Fama & French, 2004). For example, the model cannot explain all the returns for a portfolio consisting of various stocks. Since 1992 Fama and French developed models which are more modern approaches that improved the explanatory power for portfolio returns in comparison to the CAPM. They found two anomalies "*If asset prices are priced rationally, our results suggest that stock risks are multidimensional. One dimension of risk is proxied by size (ME). Another dimension of risk is proxied by BE/ME*". (Fama & French 1992: 2).

Fama-French Three-factor Model

The Fama and French 3-factor model expanded the original CAPM model by adding size risk and value risk factors to the CAPM market risk factors. Which means, the three factors used are SMB, HML and the portfolio's return minus the risk-free rate of return.

Regression function:

$$Ri\ -\ Rf\ =\ \alpha\ +\ \beta 1i\ (Rm\ -\ Rf) + \beta 2i\ (SMB) + \beta 3i\ (HML) + \varepsilon i \tag{5}$$

where:
$Ri$: return on asset i
$Rf$: risk-free rate
$Rm$: Return of the market portfolio.
$\alpha$: intercept of the regression line
$\beta$1-2-3: Beta value of $(Rm - Rf)$, (SMB) and (HML)
(SMB): Return of the size factor (small minus big)
(HML): Return of the BE/ME factor (high minus low).
$\varepsilon i$: residuals of the regression model

Yet, there is a lot of debate about whether the Fama and French 3-factor model outperformance tendency is due to market efficiency or market inefficiency.

**RESULTS**

Capital Asset Pricing Model (CAPM)

In this section yearly and the whole period's (2010-2019) returns, excess returns, of portfolios A and B will be presented (see Table 3). The Beta and Alpha coefficients will be interpreted.

Table 3: Yearly Return and Excess Return of Portfolio A and Portfolio B

| | Return | | Excess Return | |
|---|---|---|---|---|
| | **Portfolio A EURONEXT (Unregulated)** | **Portfolio B LSE / AIM London** | **Portfolio A EURONEXT** | **Portfolio B LSE / AIM London** |
| 31/12/2010 | 2.680% | 1.983% | 2.671% | 3.374% |
| 31/12/2011 | 0.501% | -6.996% | 0.497% | -2.543% |
| 31/12/2012 | 2.268% | 9.370% | 2.268% | 5.016% |
| 31/12/2013 | 2.268% | 9.809% | 2.268% | 10.869% |
| 31/12/2014 | 1.084% | -3.453% | 1.084% | -3.459% |
| 31/12/2015 | 1.710% | 6.027% | 1.709% | 1.341% |
| 31/12/2016 | 2.101% | 12.243% | 2.084% | 12.611% |
| 31/12/2017 | 2.577% | 6.380% | 2.511% | 7.615% |
| 31/12/2018 | -1.992% | 18.966% | -2.141% | 15.828% |
| 31/12/2019 | 1.803% | -12.251% | 1.626% | -11.117% |
| 2010-2019 | 1.50% | 4.20% | 1.45% | 3.90% |

*Table 3 shows yearly returns and excess returns of portfolio A and B from 2010 to 2019. We constructed monthly market cap-weighted portfolio with SMEs listed on both Euronext (portfolio A) and AIM London/LSE and (portfolio B) and calculated the return and excess return of both portfolios on a yearly basis. Although the returns and excess of portfolio A are poor compared to portfolio B, portfolio A stocks a less risky than that of portfolio B.*

As we can see in figure 1 and figure 2 below, almost all annual returns and excess returns of portfolio A are inferior to portfolio B's annual returns and excess returns. Likewise, Portfolio B's returns, and excess returns are higher than those of portfolio B. However, portfolio A' values are closer to their mean than

those of portfolio B with monthly returns standard deviation of portfolio A = 4.42% and portfolio B = 44.24.

Figure 1: Yearly Return of Portfolio A and Portfolio B
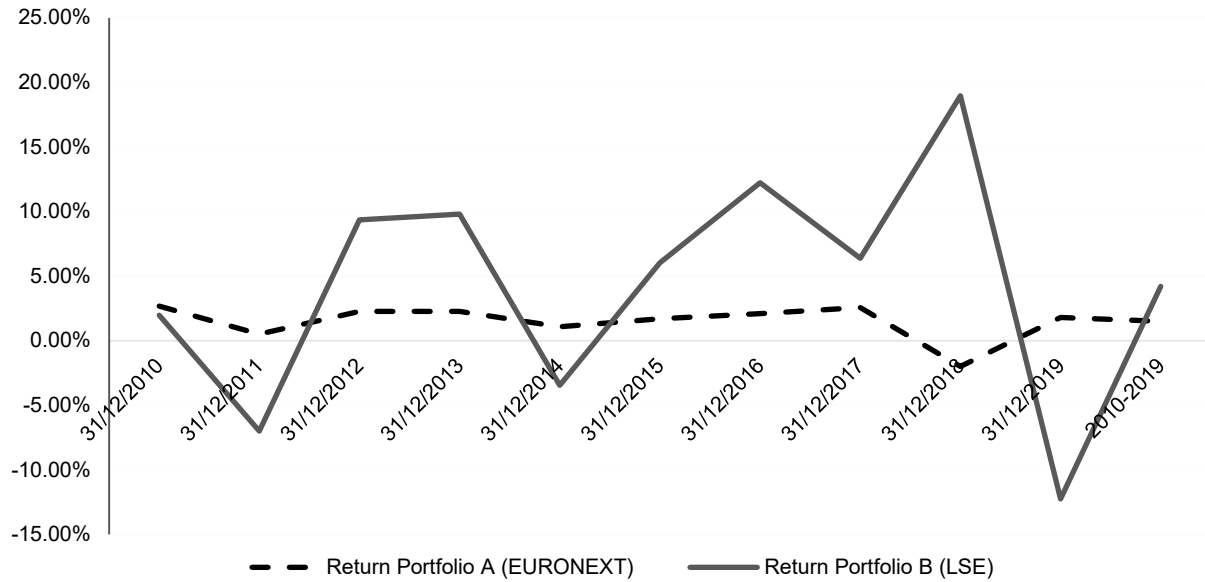


*Figure 1 shows yearly returns of portfolio A and B from 2010 to 2019. Almost all annual returns of portfolio A are inferior to portfolio B's annual returns. However, in terms of risk, Portfolio A's is less risky than portfolio B. Hence, Risk averse investor would prefer investing in Portfolio A stocks than in portfolio B.*

Figure 2: Excess Return of Portfolio A and Portfolio B
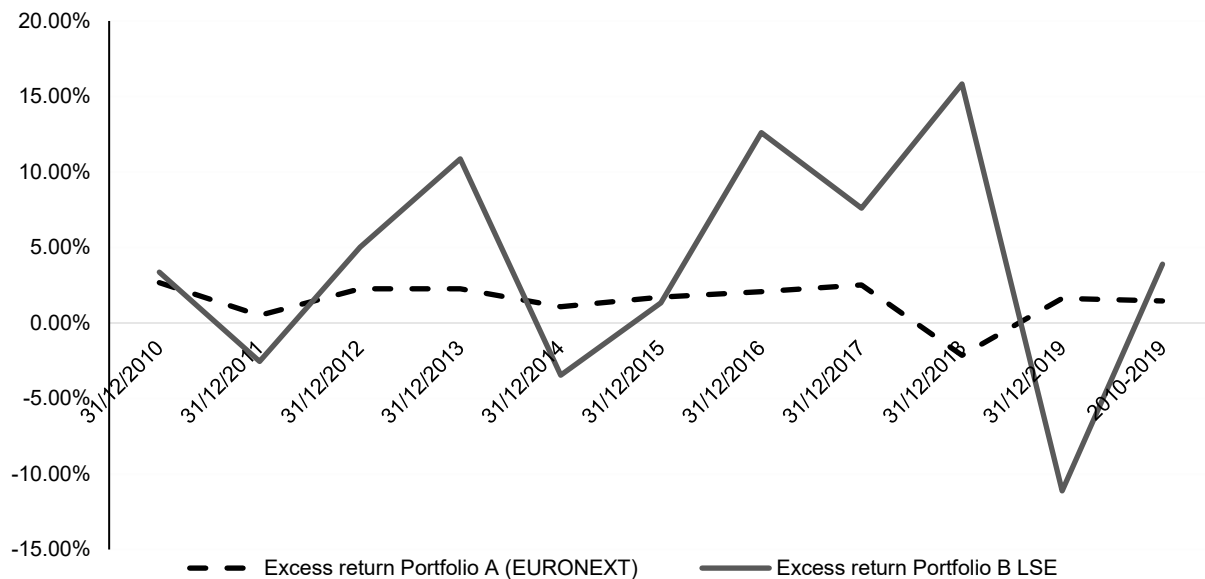


*Figure 2 shows excess returns of portfolio A and B from 2010 to 2019. Almost all excess returns of portfolio A are inferior to portfolio B's excess returns. However, in terms of risk, Portfolio A's is less risky than portfolio B. Hence, Risk tolerant investor would prefer investing in Portfolio B stocks than in portfolio B.*

The OLS regressions (see Table 4) output show that the portfolio A' $\beta$ is positive and < 1 with an intercept $\alpha$ = 0.011; this implies that portfolio A is less volatile and performed poorly compared to the market. Portfolio B' $\beta$ which is also positive but > 1 has an $\alpha$ = 0.029, which means that portfolio B is more volatile and outperforms the market, therefore, more exposed to economic fluctuations. Contrary to portfolio B, The P-values of portfolio A are < 5% which means significant. The CAPM therefore failed to explain the returns of portfolio B which has significant P-values > 5%. Moreover, considering the range of adjusted R squares for both portfolios, the CAPM model does not efficiently capture the excess returns variations and the associated risks.

Table 4: CAPM Regression Result

| | $\beta$ | $\alpha$ | P-value (X Variable) | P-value (Intercept) | R Square | Adjusted R Square | Observations |
|---|---|---|---|---|---|---|---|
| Portfolio A | 0.5227 | 0.0110 | 0,0000712*** | 0.0016 | 0,30554862 | 0.2996 | 120 |
| Portfolio B | 16.167 | 0.0295 | 0.0608 | 0.4652 | 0,034319365 | 0.0214 | |

*Table 4 shows the regression results of monthly excess returns with the market premium from 2010 to 2019 for portfolio A and B. The results of our linear regression display a positive $\beta$ and $\alpha$ for both portfolio with Portfolio A' $\beta$ <1 and portfolio B' $\beta$>1, however, Portfolio A' $\alpha$ is inferior to Portfolio B' $\alpha$. The P value of portfolio A is far less that 5% compared to that of portfolio B.*

The Fama and French 3-factor regression (see Table 5) show a decreasing $\beta$ range between 0.45 and 0.10 and an average R Square of 0.434 which is more significant compared to the CAPM adjusted R Squares. The $\beta$ range implies that SMB companies with a small market cap generate higher returns than the HMB. This result is consistent with the Fama and French 3-factor (1993).

Table 5: Euronext Constituents Fama and French 3-Factor Regression

| | $\beta$ | $\alpha$ | P-value | Adjusted R Square | R Square |
|---|---|---|---|---|---|
| SL | 0.5527 | 0.0018 | 0.0018 | 0.4342 | 0.4431 |
| SM | 0.6473 | -0.0568 | 0,0007 | 0.2936 | 0.3260 |
| SH | 0.4083 | -0.0384 | 0.0162 | 0.5537 | 0.5473 |
| BL | 0.1231 | -0.0573 | 0.3849 | 0.4987 | 0.5227 |
| BM | 0.2520 | 0.0384 | 0.3473 | 0.4421 | 0.4212 |
| BH | 0.2053 | -0.0034 | 0.0464 | 0.4213 | 0.3473 |

*Table 5 displays the regression results from 2010-2019 for the six portfolios constructed from Euronext constituents of the dataset. After constructing a monthly market cap-weighted portfolio Euronext constituents, we calculated the portfolio's return (used to create SMB and HML factor), excess return, and applied CAPM and found that Portfolio A $\beta$ range between 0,45 and 0,10 with an average R Square of 0,434*

The Fama and French 3-factor regression (see Table 6) show an increasing $\beta$ range between 0.71 and 1.97 and an average R Square of 0.513. Contrary to the Euronext constituents $\beta$ range, LSE displays abnormal excess returns which are not consistent with the Fama and French 3-factor. This implies that although Euronext constituents' portfolios earn less returns compared to LSE, it allows small cap companies to outperform value portfolios with high book to market ratios.

Table 6: LSE Constituents Fama and French 3-factor Regression

|  | β | α | P-value | Adjusted R Square | R Square |
|---|---|---|---|---|---|
| SL | 1,9799 | -0,0115 | 0,0019 | 0,5689 | 0.5768 |
| SM | 0,7004 | 0,0053 | 0,01317 | 0,4571 | 0.5571 |
| SH | 1,7295 | -0,0384 | 0,0017 | 0,6112 | 0.5879 |
| BL | 0,8212 | 0,0104 | 0,0666 | 0,5227 | 0.6243 |
| BM | 0,82 | -0,0384 | 0,0501 | 0,4074 | 0.5633 |
| BH | 0,7112 | 0,0011 | 0,0464 | 0,5111 | 0.5121 |

*Table 6 displays the regression results from 2010-2019 for the six portfolios constructed from LSE constituents of the dataset. After constructing a monthly market cap-weighted portfolio AIM London constituents, we calculated the portfolio's return (used to create SMB and HML factor), excess return, and applied CAPM and found that Portfolio A β range between 0,71 and 1,97 with an average R Square of 0,513.*

**CONCLUSION**

Since AIM London has been a reference for the creation of many other junior markets in Europe and elsewhere, unregulated stock markets are gaining more attention as a possible alternative for SMEs to access financial resources for their development and reduce their banks' dependence. We assessed the performance of SMEs enterprises listed on the AIM London and Euronext. The goal was to investigate which of both markets is more profitable to SMEs in terms of risks and return for a period of 10 years, from 2010 to 2019. Different portfolios were constructed from each market's SMEs constituent, and we applied CAPM and Fama & French 3 factor model using OLS regression analysis. We discovered that AIM SMEs overall performance in terms of risk and return is higher than those of Euronext.

The empirical results also revealed that the Alphas, betas, and adjusted R square ranges in the CAPM model are less significant than those in Fama and French 3 factor model. Additionally, the two models are more consistent with the Euronext than the AIM.It is also important to highlight that despite scholars and academics recommendation to make use of the Fama and French Model to estimate portfolio risk and return, portioners are in favour of the CAPM. As a limitation, it is important to highlight that this study does not include all the SMEs listed in both markets, likewise the sector of activity of the companies has not been taken into consideration. Besides the comparison of SMEs performance in both stock markets, further investigations need to be conducted to understand the reason behind SMEs choice of going public on AIM London Instead of Euronext. From the above results, although there is clear evidence that SMEs Listed on the AIM outperform those on Euronext in terms of risk and return, this may not be the main factor that explains attractivity and predominance of AIM London in European unregulated stock markets. The listing conditions of unregulated stock markets (AIM London, Euronext Growth and Euronext Access) are less stringent compared to the primary stock markets (LSE and Euronext). Furthermore, it must be noted that in comparison to Euronext Growth and Euronext Access, AIM London IPO requirements are more attractive. For instance, where a EUR 2.5 million floating capital and two years of financial statements are request from SMEs to go public on Euronext unregulated market, such requirements are not imposed on SMEs IPO on AIM London. Thus, Policy makers and market regulators in Europe should take decisions to set adequate regulatory actions aiming to facilitate IPOs and alleviate burden on listed SMEs. This will motivate SME managers to choose Euronext in their decisions to go public instead of AIM London. Furthermore, to easy SMEs capital raising, regulators should commit to reducing SMEs dependency on bank loans by diversifying their source of financing.

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# RELATIONSHIPS AMONG MARKETING MIX, CUSTOMER SATISFACTION AND CUSTOMER LOYALTY: EVIDENCE FROM TAIWAN

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## ABSTRACT

*As the widespread use of retail applications increases during and after the pandemic, so does the need to explore factors contributing to customer loyalty in the context of retail applications. This study aims to investigate the relationships among marketing mix, customer satisfaction, and customer loyalty. The current study collected data from a survey of 197 retail application users in Taiwan to test the proposed model. SPSS 20 and AMOS were used to analyze the data. Results indicated that marketing mix is found to have an effect on satisfaction, which in turn exerts an influence on loyalty. However, marketing mix does not directly affect loyalty. Instead, satisfaction fully mediates the relationship between marketing mix and loyalty. The findings may be helpful to researchers as well as mobile retailers interested in customer loyalty. In the end, the findings' theoretical and practical implications are discussed and the direction for future research is provided.*

**JEL**: M30, M31

**KEYWORDS**: Marketing Mix, Customer Satisfaction, Customer Loyalty, Retail Applications, Mobile Retailing

## INTRODUCTION

The COVID-19 pandemic has drastically changed how people live, especially the way people shop. During lockdowns, as in-person shopping activities were restricted, people primarily shifted to online shopping, making purchases by using the applications (apps) on their mobile devices. Understandably, people tried to avoid close contact with others by shopping through mobile apps during the pandemic, which accidentally promoted the widespread adoption of mobile shopping and caused the number of retail apps to soar around the globe. However, it was reported that about 25% of mobile apps are used only once after being downloaded (Statista, 2020). Another survey revealed that mobile users often delete an application (app) they seldom use (The Manifest, 2018). Therefore, it is evident that mobile retailers face intense competition due to customers' discontinuance of using retail apps, which will definitely affect retailers' long-term survival. Toward this end, the question of keeping customers loyal and continuing shopping by using retail apps remains a pressing issue. Fortunately, according to prior literature (Fakhimi Azar, Akbari Vanehabad, & Rasouli, 2011), one of the ways of addressing this issue is to analyze the concept of marketing mix, which is a set of tools companies can use to achieve their goals (Azhar, Prayogi, & Sari, 2018).The current study adopted the marketing mix proposed by Lauterborn (1990) because it is customer-centered and is considered preferable in the digital environment (Lei, 2022). The adopted marketing mix includes four elements, which are customer value, cost, convenience, and communication (4Cs).

Researchers suggested that successful marketing strategies based on marketing mix are conducive to meeting customer demand (Othman, Harun, De Almeida, & Sadq, 2021), which in turn leads to loyalty

(Elgarhy & Mohamed, 2022). Other scholars also emphasized the positive association between marketing mix and loyalty (Ohrabi, Hanbolooki, & Hazavi, 2017). Based on the aforementioned studies, it is believed that marketing mix is one of the crucial factors that mobile retailers can employ to create customer loyalty. Furthermore, as mobile retailers use marketing mix tools to address customer demand, they can gain customer satisfaction, which will contribute to loyalty (Daniawati, Muhardi, & Harahap, 2023). Although a number of researchers have adopted different theories or concepts to examine mobile shopping apps, such as the Technology Acceptance Model (TAM) (Kim, Yoon, & Han, 2016), or the Unified Theory of Acceptance and Use of Technology (UTAUT) (Tak & Panwar, 2017), very few have incorporated the concept of the 4Cs marketing mix in their studies. Hoping to address this gap, this study is motivated to adopt the 4Cs marketing mix to examine the relationships among marketing mix, satisfaction, and loyalty in the context of retail apps. The contribution of the current study will not only extend our knowledge of the 4Cs marketing mix but also help mobile retailers design viable marketing strategies to retain customers. The organization of this paper is as follows. First, a literature review that includes marketing mix, satisfaction and loyalty is discussed and a research model is proposed. Second, data collection and methodology are explained. Third, data analysis and results are reported. Finally, this study discusses key findings, implications, and areas for future research.

## LITERATURE REVIEW AND RESEARCH MODEL

The research model is shown in Figure 1. The reasons for using the constructs and the relationships among them are explicated in the following parts of this section.

Figure 1: Research Model
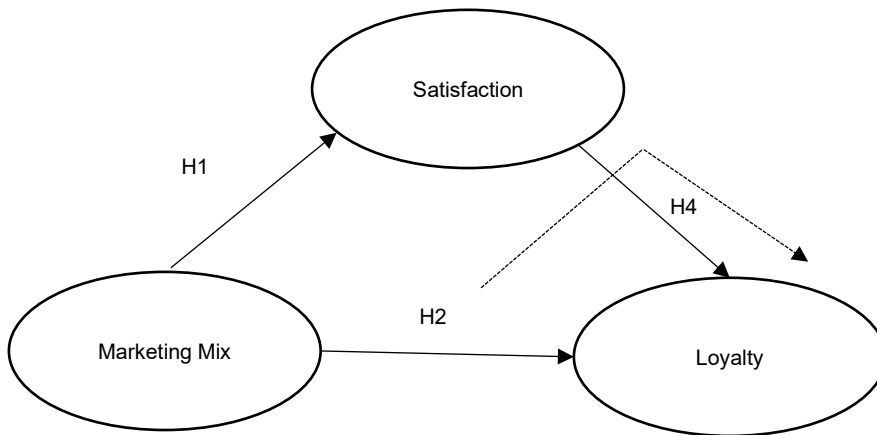


*Figure 1 explains the relationships among the factors used in this study, including marketing mix, satisfaction, and loyalty. Continuous lines represent direct relationships, and dashed lines represent indirect relationships.*

Marketing Mix

Marketing mix is a set of marketing tools companies employ to satisfy their targeted groups (Cannon, Perreault, & McCarthy, 2008) and achieve their goals (Azhar, Prayogi, & Sari, 2018). The four traditional elements of marketing mix are product, price, place, and promotion (4Ps), which have long been criticized for being enterprise-centered, and only focusing on the perspective of suppliers rather than customers (Manafzadeh & Ramezani, 2016). However, the 4Cs marketing mix proposed by Lauterborn (1990) is considered customer-centered, and its elements include customer value, cost, convenience, and communication. Customer value means that companies must create value for customers in addition to providing products and services (Wang, 2020), and cost refers to the purchase cost of a customer, such as money, time, energy, and physical strength (Guo, 2020). Convenience means customers will experience the slightest difficulty when shopping (Jiang, 2019). For example, customers can choose their preferred

delivery or payment methods (Lei, 2022). Finally, communication refers to all the information provided to customers (Guo, 2019). The current research adopted the 4Cs marketing mix as it is customer-centered (Lauterborn, 1990), and more appropriate in the digital age (Lei, 2022).

Satisfaction

The effect of satisfaction is highly significant in the retail industry. In the online context, satisfaction refers to customers' evaluation of their online shopping experiences compared to their experiences with traditional brick-and-mortar stores (Evanschitzky, Iyer, Hesse, & Ahlert, 2004; Szymanski & Hise, 2000). Further, in the mobile commerce environment, Lin and Wang (2006) defined satisfaction with mobile commerce as a customer's level of feeling in response to the shopping experiences. This study defines satisfaction as a customer's total response to the shopping experiences when using retail apps. The marketing mix will deliver value to customers and satisfy them if the results exceed their expectations. Previous literature in this stream has shown evidence for the relationship between marketing mix and satisfaction. For instance, Ohrabi et al. (2017) contended that banking service marketing mix affects customer satisfaction. Thus, the following hypothesis is proposed:

*H1: Marketing mix is positively associated with satisfaction.*

Loyalty

Loyalty has long been considered a key mechanism in e-commerce (Reichheld & Schefter, 2000) as loyal customers make purchases more often, recommend the company to friends, even tolerate higher prices and are willing to buy different products from the same company (Chang & Fong, 2010). Consequently, loyal customers will bring substantial income to the company. In the online context, many scholars have also emphasized that increasing customer loyalty is critical for mobile service providers (Deng, Lu, Wei, & Zhang, 2010). Following the same logic, we believe customer loyalty also plays a pivotal role in retail apps. In the current study, loyalty is defined as a customer's intention to reuse an app or to buy from it. It is argued that if customers like the marketing mix elements on retail apps, they will stick to them and encourage their friends to use them. Several empirical studies have demonstrated the positive relationship between marketing mix and loyalty. For example, Azhar et al. (2018) noted that marketing mix positively and significantly affects tourist loyalty. In addition, Daniawati et al. (2023) validated the relationship between health services marketing mix and patient loyalty. Therefore, the following hypothesis is proposed:

*H2: Marketing mix is positively associated with loyalty.*

A related stream of research has indicated that loyalty can be generated via increased satisfaction (Daniawati et al., 2023). In our context, if customers are satisfied with retail apps, they will be more likely to continue using them. In investigating the relationship between customer satisfaction and loyalty, several studies have found that customer satisfaction exerts an effect on customer loyalty (Elgarhy & Mohamed, 2022; Sudari, Tarofder, Khatibi, & Tham, 2019). For example, Wongsawat and Deebhijarn (2019) found that satisfaction is a direct antecedent of loyalty when exploring customer loyalty in tourism. Extrapolating from this argument, the following hypothesis is proposed:

*H3: Satisfaction is positively associated with loyalty.*

Nevertheless, the study results of Chadha and Kapoor (2009) showed that customer satisfaction is an influential mediator of consumer behavior. Elgarhy and Mohamed (2022) explicated that tourist satisfaction mediates the relationship between marketing mix and loyalty. Likewise, some scholars argued that customers must be satisfied before becoming loyal (Wahab, Hassan, Shahid, & Maon, 2016), which means customers will only become loyal with satisfaction (Nguyen, Nguyen, Nguyen, & Phan, 2018). Summarizing the preceding discussion, it is believed that if customers like the marketing mix elements on

retail apps, they will experience satisfaction.Once satisfied, they will continue using the apps. Accordingly, the following hypothesis is proposed:

*H4: Satisfaction mediates the relationship between marketing mix and loyalty.*

## DATA AND METHODOLOGY

The current study adapted operational definitions and measurement items from past research whenever possible. Marketing mix was measured by four dimensions, fifteen-item measures adapted from Wang (2020). The six items measuring satisfaction were taken from Smith (2020). Loyalty was assessed using items from Castañeda (2011). All the items were measured using a five-point Likert scale with anchors ranging from strongly disagree (1) to strongly agree (5). Demographic variables tied to loyalty were also collected, including gender, marital status, age, education, occupation, monthly income, and times of using the app for the past three months. The current study surveyed customers of two 7-ELEVEN convenience stores in Kaohsiung City, Taiwan, from January to March 2022. The target participants consisted of 7-ELEVEN mobile app users. Two experienced interviewers were assigned to two 7-ELEVEN convenience stores to collect data. To ensure eligible responses, at the beginning of each interview, participants were asked if they had installed the 7-ELEVEN app and had used the app for shopping for the past three months. After completing the questionnaire, a gift certificate was offered to appreciate their participation. Totally, 197 complete and valid questionnaires were collected for data analysis. Of the 197 respondents, 111 (56.3%) were females and 152 (77.2%) were single. 107 (54.3%) were between the ages of 21 and 30. 94 (47.7%) reported having completed a college degree. 77 (39.1%) were employees, and 114 (57.9%) reported having a monthly income between NT$ 15,001 to NT$ 25,000. Finally, approximately 98 (49.7%) reported using the app 11 to 20 times in the past three months.

## RESULTS

Measurement Model

The current study used SPSS 20 for descriptive statistics and used AMOS to examine the proposed model. By using confirmatory factor analysis (CFA), the measurement model was examined.The convergent validity was checked by factor loadings, composite reliability (CR), and average variance extracted (AVE). According to Hair, Hult, Ringle, and Sarstedt (2017), the factor loading value should be greater than 0.5. Also, based on Fornell and Larcker (1981), the acceptable value of CR and AVE is 0.7 and 0.5, respectively. As shown in Table 1, all loadings exceeded the 0.5 threshold.The composite reliabilities of the constructs were between 0.780 and 0.912, and the AVE were between 0.532 and 0.675. Therefore, a reasonable convergent validity is proved.

To assess the discriminant validity of the scales, the two criteria suggested by Gaski and Nevin (1985) were used: (1) the correlation coefficient of two dimensions should be smaller than 1, (2) the individual Cronbach's alpha reliability coefficient is larger than the correlation coefficient of two dimensions. Table 2 illustrates that all the diagonal values were larger than the inter-construct correlations, which corresponds with the criteria required to demonstrate discriminant validity.

Table 1: Measurement Model Assessment

| Constructs | Dimensions | Items | Loadings | Cronbach's alpha | CR | AVE |
|---|---|---|---|---|---|---|
| Marketing Mix | Customer Value | mm1_1 | 0.794 | 0.826 | 0.828 | 0.616 |
| | | mm1_2 | 0.788 | | | |
| | | mm1_3 | 0.772 | | | |
| | Cost | mm2_1 | 0.810 | 0.785 | 0.780 | 0.543 |
| | | mm2_2 | 0.729 | | | |
| | | mm2_3 | 0.665 | | | |
| | Convenience | mm3_1 | 0.896 | 0.911 | 0.912 | 0.675 |
| | | mm3_2 | 0.827 | | | |
| | | mm3_3 | 0.794 | | | |
| | | mm3_4 | 0.775 | | | |
| | | mm3_5 | 0.811 | | | |
| | Communication | mm4_1 | 0.841 | 0.848 | 0.852 | 0.591 |
| | | mm4_2 | 0.736 | | | |
| | | mm4_3 | 0.784 | | | |
| | | mm4_4 | 0.708 | | | |
| Satisfaction | | sf1 | 0.709 | 0.871 | 0.872 | 0.532 |
| | | sf 2 | 0.666 | | | |
| | | sf 3 | 0.708 | | | |
| | | sf 4 | 0.740 | | | |
| | | sf 5 | 0.757 | | | |
| | | sf 6 | 0.791 | | | |
| Loyalty | | loy1 | 0.701 | 0.902 | 0.903 | 0.571 |
| | | loy2 | 0.819 | | | |
| | | loy3 | 0.818 | | | |
| | | loy4 | 0.738 | | | |
| | | loy5 | 0.725 | | | |
| | | loy6 | 0.790 | | | |
| | | loy7 | 0.686 | | | |

*Table 1 indicates the range of values of Cronbach's alpha is between 0.785 and 0.911, all of which pass the 0.7 threshold. It also indicates that composite reliability (CR) has values between 0.780 and 0.912, all of which also pass the 0.7 threshold.*

Table 2: Descriptive Statistics and Correlations

| Dimensions | M | S.D. | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|---|---|
| 1. Customer Value | 3.49 | 0.93 | 0.826 | | | | | |
| 2. Cost | 3.54 | 0.89 | 0.685** | 0.785 | | | | |
| 3. Convenience | 3.57 | 0.97 | 0.449** | 0.490** | 0.911 | | | |
| 4. Communication | 3.70 | 0.91 | 0.632** | 0.588** | 0.382** | 0.848 | | |
| 5. Satisfaction | 3.52 | 0.81 | 0.728** | 0.674** | 0.448** | 0.730** | 0.871 | |
| 6. Loyalty | 3.47 | 0.84 | 0.740** | 0.669** | 0.477** | 0.630** | 0.825** | 0.902 |

*Table 2 shows the descriptive statistics and correlations of all the dimensions. Diagonal elements (in shade) are Cronbach's alpha values, whereas off-diagonal ones are the correlations among dimensions. Diagonal elements should be larger than off-diagonal ones to establish discriminant validity. \*P<0.05, \*\*P<0.01, \*\*\*P<0.001*

As data were collected through a cross-sectional approach, the issue of common method variance (CMV) might occur in the measurement model. As a result, CMV was checked by using Harman's single-factor test (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). The current study divided all constructs items in the proposed model into various factors. It was found that the first element of the factors illustrated 46% of the variance, which showed that CMV is not a problem according to prior literature standards. The variance inflation factor (VIF) and tolerance values of all the constructs were both computed, too. Based on Mason and Perreault Jr (1991), multicollinearity will not be an issue in the dataset if the VIF values are smaller than 10 and the tolerance values are larger than 0.1. The findings showed that the VIF values were 2.73 and the tolerance values were 0.37. As a result, there are no serious multicollinearity issues.

<u>Structural Model</u>

The current study used the AMOS structural model to examine the hypotheses. Figure 2 and Table 3 summarize that all the hypotheses were supported except H2. In addition, Figure 2 demonstrates the explanatory power of the research model. As expected, marketing mix significantly and positively affects satisfaction, with a path coefficient of 0.940 (t = 4.663), supporting hypothesis 1. Moreover, satisfaction significantly and positively affects loyalty, with a path coefficient of 0.752 (t = 2.750), supporting hypothesis 3. However, marketing mix is not positively associated with loyalty, with a path coefficient of 0.201 (t = 0.918). Thus, hypothesis 2 is not supported. Finally, the research model explained 89% of variance in loyalty. R2 is 88% when marketing mix was used to predict satisfaction.

Figure 2: Results of the Structural Model
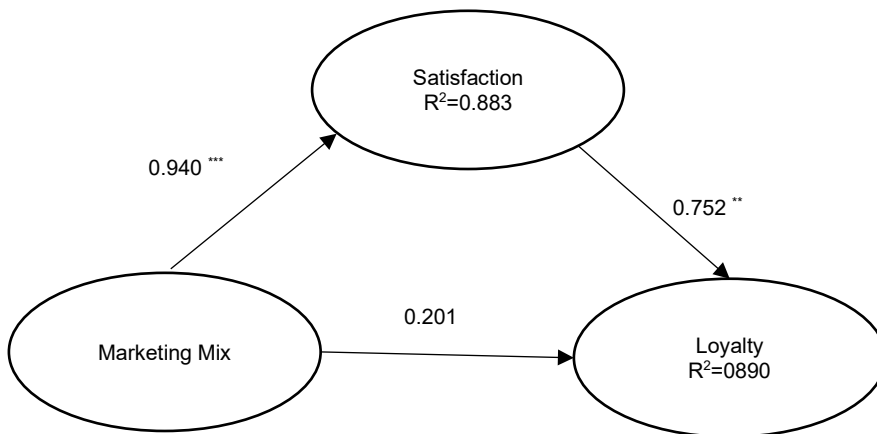


*The simple linear regressions are presented in this figure. The percentage of variance for satisfaction and loyalty is 88% and 89%, respectively.*

Table 3: Summary of Hypotheses Testing Results

| Hypotheses | Path Coefficient | t-value | P-value | Supported |
|---|---|---|---|---|
| H1: MM→SF | 0.940*** | 4.663 | P<0.001 | Yes |
| H2: MM→LOY | 0.201 | 0.918 | ns | No |
| H3: SF→LOY | 0.752** | 2.750 | P<0.01 | Yes |

*Table 3 lists the path coefficient, t-values, and p-values for each hypothesis. H1 and H3 are supported with p-values less than 0.05. H2 is not supported. \*P<0.05, \*\*P<0.01, \*\*\*P<0.001, ns= not significant*

To test the proposed mediation effect (i.e., hypothesis 4), the current study implemented bootstrapping procedure with replacement using 2000 subsamples on AMOS. According to Shankar and Jebarajakirthy (2019), the medication effects can be either partial or full mediation effects. Based on Cheung and Lau (2008), partial mediation exists when both indirect and direct effects are significant. However, full medication exists when the indirect effect is significant, whereas the direct effect is not. Table 4 shows that the indirect effect of marketing mix on loyalty via satisfaction is positively significant (standardized estimate = 0.706) with a 95% bootstrap confidence interval (CI.95 = 0.261, 1.721). However, the direct effect of marking mix on loyalty is not significant (standardized estimate = 0.201) with a 95% bootstrap confidence interval (CI.95 = -0.883, 0.664). Thus, satisfaction was found to serve as a full mediator of the link between marketing mix and loyalty, supporting H4.

Table 4: Result of Indirect Effect Analysis

| | Estimate | p value | BC 95% Confidence Interval | |
|---|---|---|---|---|
| | | | Lower | Upper |
| Indirect effect | | | | |
| MM→SF→LOY | 0.706 | 0.016[*] | 0.261 | 1.721 |
| Direct effect | | | | |
| MM→LOY | 0.201 | 0.519 | -0.883 | 0.664 |
| Total effect | | | | |
| MM→LOY | 0.908 | 0.002[**] | 0.848 | 0.953 |

*Table 4 shows that satisfaction fully mediates the relationship between marketing mix and loyalty, with the indirect effect being significant but the direct effect not significant. BC: Bias-corrected percentile method *P<0.05, **P<0.01, ***P<0.001.*

## CONCLUDING COMMENTS

The current study proposed and tested a model to assess customer loyalty in the context of retail apps. This study aims to investigate the relationships among marketing mix, customer satisfaction, and customer loyalty. A questionnaire survey was administered to collect data, which included 197 retail application users of two 7-ELEVEN convenience stores in Taiwan. Data analysis was then performed using SPSS 20 and AMOS to test the measurement and structural models. The results showed that marketing mix affects satisfaction directly. After that, satisfaction has a positive effect on loyalty, which is in congruence with prior studies (Nguyen et al., 2018). Also, this study, consistent with prior literature (Ohrabi et al., 2017; Wahab et al., 2016), found that satisfaction mediates the relationship between marketing mix and loyalty. However, marketing mix is not positively associated with loyalty, which is outside our expectations. A plausible explanation is that more than marketing mix tools are needed to gain loyalty. Though pleased with the marketing mix tools, customers must be satisfied with the goods or services received before reusing the apps. Otherwise, customers are always free to stop using the apps or even delete them when pursuing their best interests. The research contributes to the current literature in mobile retailing by employing the 4Cs marketing mix to study customer loyalty. It examined and clarified the direct and indirect relationships among marketing mix, satisfaction, and loyalty. As a result, this study extends the scope of previous research on the 4Cs marketing mix, shedding some light on the broader application of this marketing concept. In addition to the aforementioned theoretical contributions, this study provides specific recommendations to help mobile retailers better design marketing strategies and activities. For example, it is clear that marketing mix is of major importance in determining customer satisfaction. Toward this end, retailers are suggested to continue to update, maintain and enhance their apps to magnify the effects of marketing mix. Specifically, they should keep offering higher quality products at reasonable prices, making shopping easier, and providing fast and efficient customer service. Moreover, retailers should be aware that online shoppers are as demanding as those in brick-and-mortar stores even though they cannot touch the goods. Without satisfaction, they might discontinue using the apps anytime.

Finally, a few limitations are identified in the current study. First, marketing mix was treated only as a general construct encompassing four dimensions. Future research is suggested to investigate those four dimensions as separate constructs to acquire valuable insights into how each dimension affects satisfaction and loyalty individually. Second, another area for improvement is that this study only examined one retail app in Taiwan. Replicating this study across users of different retail apps, such as clothing apps, may provide further insights into customer loyalty.

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# SIZE, PERFORMANCE AND ALLIANCE: AN EXAMINATION OF MARKET SEGMENTATION AND MARKET STRUCTURE

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## ABSTRACT

*In this study, we compare the performance of audit firms under different market segments in different market structures. In terms of market segmentation, we classify audit firms into four groups: international, national, regional, and local audit firms. Further, we define the audit market structure as the Big 6, Big 5 and Big 4 periods. In addition, we take the alliance between audit firms and consulting companies into account. We find size matters. Specifically, firm performance of international firms is better than that of national, regional, and local firms in the Big 6, Big 5, and Big 4 periods. Firm performance of international firms in the Big 5 and Big 4 periods is inferior to that of the Big 6 period, but no significant difference in firm performance between Big 5 and Big 4 periods. Further, international firms outperform national, regional and local firms in the alliance performance during Big 5 and Big 4 periods, but they have no significant differences in alliance performance between Big 5 and Big 4 periods.*

**JEL**: M41, M42, E24

**KEYWORDS**: Market Segmentation, Market Structure, Strategic Alliance, Operating Performance, Audit Firms

## INTRODUCTION

Long-term cooperation between auditing industries of the US and Taiwan has created a similar audit market structure in both countries. Taiwanese international audit firms became affiliates or members of the US international firms five decades ago. In the past two decades, the largest US international firms are often referred to as the Big N firms, including Big 8, Big 6, Big 5 or Big 4. In addition, many non-international firms are associated with other US firms, such as BDO, Grant Thornton, and Baker Tilly International. Currently, Taiwan exhibits a dual audit market structure, a few large audit firms (e.g. the Big N) and many small audit firms (the non-Big N) (Brocheler, Maijoor and van Witteloostuijn, 2004). Prior studies document the effects of dual market structure on competition (Bills and Stephens, 2016) and on audit quality (Lawrence, Minutti-Meza and Zhang, 2011; Eshleman and Guo, 2014; Jiang, Wang and Wang, 2019).

Big firms provide higher audit quality because they are expected to be more independent due to larger client base for them to have less pressure to succumb to individual audit clients (DeFond & Zhang, 2014). As a result, the Big 8 auditors charge clients an average of 34 percent brand name premium (Craswell, Francis and Taylor, 1995). The Big 4 city-specific industry leaders charge higher audit fees than do non-Big 4 auditors (Basioudis and Francis, 2007). Audit fees of higher risk clients are 42% higher compared to those without such situations for the first year of an audit engagement (Elliott, Ghosh and Peltier, 2013). Although the Big N audit firms charge higher audit fees, whether higher audit fees have been translated into performance enhancement is left unanswered.

Regarding the international firm affiliations, Taiwan had six largest international firms before 1999. The number of international firms was further reduced to five when Price Waterhouse and Coopers & Lybrand merged in 1999 to form the PricewaterhouseCoopers, resulting in the Big 5. The loss of Arthur Andersen in the Enron event leaves 4 international firms in Taiwan after 2003. Two international firm consolidations in Taiwan result in 6 international firms between 1992 and 1998, 5 firms between 1999 and 2002, and 4 firms between 2003 and 2020. In terms of the three time periods, this study defines the audit market structure as the Big 6, Big 5 and Big 4 periods. For all extensive research on the international audit firms, the effect of audit market structure on their performance has rarely been addressed, which motivates us to examine it.

Market segmentation allows audit firms to differentiate themselves from their competitors and thus to gain competitive advantages (McAlexander et al., 1991; Defond et al., 2000; Ghosh & Lustgaten, 2006; Chen et al., 2008; Carson, Redmayne and Liao, 2014; Chen et al., 2022). In terms of market segmentation, we classify audit firms into four groups: international, national, regional, and local audit firms. To the best of knowledge, a few prior studies investigate the auditing industry under different segments, the effects of market segmentation on performance of audit firms warrant further investigation. This constitutes our second motivation.

A variety of businesses are provided by audit firms, including audit services and non-audit services which are also referred to as management advisory services (MAS). The market for audit services has become increasingly competitive, but MAS provides unlimited opportunity for audit firms (Banker et al., 2003). The market for audit services can be regarded as a red ocean market and that of MAS as a blue ocean market (Chen et al., 2022). However, joint provision of audit services and MAS to the same audit client is supposed to impair independence of auditors (Ashbaugh et al., 2003). To overcome the dilemma, audit firms can strategically ally with consulting companies (Brown et al., 1996; Dopuch and King, 1991; Chen et al., 2022). From the perspective of resource-based view, the alliance benefits audit firms and consulting companies as well. Few prior research explores the effects of strategic alliance on performance of audit firms under different market segmentation in market structure. To investigate the effects of strategic alliance on performance of audit firms to bridge the research gap forms our third motivation.

We extend prior studies by four ways: investigation of aggregate financial performance of audit firms, division of audit firms into four segments, establishment of three market structures, and consideration of strategic alliance between audit firms and consulting companies. By establishing two performance measures, audit firm performance and alliance performance, this study finds size matters. Specifically, firm performance of international firms is better than that of national, regional and local firms in the Big 6, Big 5, and Big 4 periods. Consolidations between international firms result in higher market concentration but more unequal market share among international firms. Firm performance of international firms in the Big 5 and Big 4 periods is inferior to that of in the Big 6 period, but no significant difference in firm performance between Big 5 and Big 4 periods.

However, firm performance of national and local firms in the Big 5 period is significantly better than that of in the Big 4 period. Further, international firms outperform national, regional and local firms in the alliance performance during Big 5 and Big 4 periods but they have no significant differences in alliance performance between Big 5 and Big 4 periods. The rest of this paper proceeds as follows. In the next section, this study presents the literature review and hypothesis development. Section 3 details the research methodology. Section 4 reports the empirical results. This study discusses and concludes in Section 5.

**LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT**

Status Quo of International Audit Firms in Taiwan

Regarding the international firm affiliations, Taiwan had six largest international firms before 1999, including Arthur Andersen, KPMG, Price Waterhouse, Ernst & Young, Deloitte & Touche, and Coopers & Lybrand. The number of international firms was further reduced to five when Price Waterhouse and Coopers & Lybrand merged in 1999 to form the PricewaterhouseCoopers (PWC), resulting in the Big 5. The loss of Arthur Andersen in the Enron event leaves 4 international firms in Taiwan after 2003, including Deloitte Touche Tohmatsu Limited (DTTL), KPMG, PWC, and Ernst & Young. Table 1 presents two market shares of international audit firms, auditing industry market share (Market Share 1) and public company market share (Market Share 2). The Market Share 1 of international firms was 40.87% in Big 6 period and rose to 50.75% in Big 5 periods. It continuously climbs to 63.05% in the Big 4 period. Market Share 1 indicates that international firms provide most of the audit services in the auditing industry and maintain a steady growth in market share.

In terms of Market Share 2, international firms occupied 71.75% public company auditing market in the Big 6 period and it leapt up to 82.41% in the Big 5 period. In the Big 4 period, Market Share 2 reaches as high as 91.28%. As shown, international firms dominate the public company auditing market with less than ten percent services left to the non-international firms. Similar to the US and most other western countries, Taiwan has audit market existing a dual market structure with a few large international audit firms and many small ones (Bröcheler, Maijoor & Witteloostuijn, 2004).

Merger of Arthur Andersen and Deloitte & Touche in 2002 results in DTTL and leads to changes in market structure between Big 5 and Big 4 periods. For the international firms, growth rate of Market Share 1 is 24.24% ((63.05-50.75)/50.75). The Market Share 1 of Arthur Andersen was 13.14% and that of Deloitte & Touche was 7.85% in Big 5 period. If Arthur Andersen and Deloitte & Touche remain the same tendency in the growth rate, DTTL should have the corresponding growth rate of 26.08% ((13.14%+7.85%)*(1+24.24%)) but it has actual rate of 25.53%. Likewise, international firms have the growth rate of 10.76% ((91.28-82.41)/82.41) in Market Share 2. The Market Share 2 of Arthur Andersen was 35.23% and that of Deloitte & Touche was 10.55% in Big 5 period. DTTL should have the corresponding growth rate of 50.71% but it has actual rate of 36.38%. We then apply the analyses to the other three international firms given the same tendency in growth rate. The theoretical and actual growth rates of Market Shares 1 in KPMG are 14.85% and15.41% and that of in PWC are 13.24% and13.94%, agreeing with the growth rate of Market Shares 1 in the international firms. However, the theoretical Market Share 2 of KPMG and PWC are 17.27% and 13.86%, respectively. The actual Market Share 2 of KPMG is 26.81%, 55% higher than the expected rate. The actual Market Share 2 of PWC is 17.87%, 29% higher than the expected rate.

After the merger of Arthur Andersen and Deloitte & Touche, some audit partners leave the DTTL with their audit clients and join either KPMG or PWC. Table 1 shows that the public company auditing market, as indicated in Market Share 2, becomes more unequal and increasingly competitive in the Big 4 period. Both DTTL and KPMG capture the market share of public company auditing market as high as 63.19% (36.38% + 26.81%).

Table 1: Market Share of International Audit Firms

| Audit Firms | Market Share 1 | Market Share 2 |
|---|---|---|
| **Big 6 period: 1992~1997** | | |
| Arthur Andersen | 10.45% | 25.57% |
| KPMG Peat Marwick | 8.30% | 14.73% |
| Price Waterhouse | 6.69% | 10.36% |
| Ernst & Young | 5.68% | 8.01% |
| Deloitte & Touche | 5.24% | 7.00% |
| Coopers & Lybrand | 3.75% | 6.08% |
| Total | 40.12% | 71.75% |
| **Big 5 period: 1998~2002** | | |
| Arthur Andersen | 13.14% | 35.23% |
| KPMG | 11.95% | 15.59% |
| PWC | 10.66% | 12.51% |
| Deloitte & Touche | 7.85% | 10.55% |
| Ernst & Young | 7.15% | 8.54% |
| Total | 50.75% | 82.41% |
| **Big 4 period: 2003~2020** | | |
| DTTL | 25.53% | 36.38% |
| KPMG | 15.41% | 26.81% |
| PWC | 13.94% | 17.87% |
| Ernst & Young | 8.17% | 10.22 |
| Total | 63.05% | 91.28% |

*This table presents two market shares of international audit firms, Market Share 1 and Market Share 2. Table 1 shows that the public company auditing market, as indicated in Market Share 2, becomes more unequal and increasingly competitive in the Big 4 period. Market Shares 1 is based on the auditing industry and Market Shares 2 on the public company auditing market.*

Firm Performance Comparisons Between Different Categories of Audit Firms

In theory, scale economies exist in an industry when its constituent firms can reduce their average cost or increase their average revenues by expanding firm size (Christenson & Greene, 1976; Darrough & Heineke, 1978). Scale economies prevail in the auditing industry as well (Banker et al., 2003). Large audit firms earn more fee premiums over small ones due to product differentiation, brand name reputation and audit quality (Francis, 1984; Carson et al., 2012; Palmrose, 1986; Beatty, 1989). For example, the brand name premium of Big 8 auditors over that of non-Big 8 auditors averages around 34 percent (Craswell et al., 1995). Consolidation of Big N audit firms leads to increase in the audit fee premiums paid by Big N clients during Big 6, Big 5, and Big 4 periods (Carson et al., 2012). The Big 4 city-specific industry leaders charge higher audit fees than do Big 4 non-city leaders and other non-Big 4 auditors (Basioudis and Francis, 2007). The US-based Big N principal auditors are associated with higher audit fees because they improve the financial reporting environment by providing higher-quality audited earnings for their US-listed foreign clients (Asthana, Raman and Xu, 2015). In addition, a spate of merger and acquisition shrinks the "Big 8" to the "Big 4" international audit firms. Audit market concentration is significantly associated with higher audit quality and audit fees (Eshleman and Lawson, 2017).

The affiliation between Taiwan and US international firms provides abundant resources for Taiwanese member firms, including professional auditing techniques and expertise, human capital development, and continuing professional education. Further, headquarters of international firms determine the services offered by worldwide member firms which often exchange valuable information. With this professional development, international firms represent a symbol of high quality auditors (DeFond & Zhang, 2014). After the Enron event, the US Congress passes the Sarbanes-Oxley Act of 2002, which creates the Public Company Accounting Oversight Board (PCAOB) to supervise audit firms. The PCAOB establishes

auditing and quality control standards for audits of public companies and performs inspections of quality controls on audit firms rendering services to public companies. The inspections also apply to foreign audit firms offering services to companies issuing the American Depositary Receipt (ADR). Hence, Taiwanese international firms received the PCAOB inspection over the past few years (PCAOB, 2022).

Product differentiations exist in the audit market (Craswell et al., 1995). Taiwanese international firms have more auditors with high academic education level, much work experience, and CPA designation (Chen et al., 2014). International firms also devote more resources on the continuing professional education of auditors. Consequently, Taiwanese international firms render higher audit quality services and charge higher audit fees compared to other audit firms. Prior studies report an audit fee premium of international firm due to greater expertise, audit quality, enhanced auditor independence and more resources international firms have than do non-international firms (Simunic, 1980; DeAngelo, 1981; Chaney, Jeter & Shivakumar, 2004). DeAngelo (1981) regards auditor size as a proxy of audit quality and clams that size alone alters auditor's incentives to supply high quality services, which in turn help incumbent auditors earn client-specific quasi-rents. The quasi-rents then serve as a collateral against opportunistic behavior to maintain high quality audit and to boost firm revenues considerably. To the extent, the fee premiums are also a function of the degree of market power exercised by these large international firms in the audit market (Minyard & Tabor, 1991; Wootton, Tonge & Wolk, 1994; Choi & Ze´ghal, 1999). Because audit firm size is positively associated with audit pricing (Niemi, 2004), we claim that size determines operating performance and establishes the following hypotheses.

*H1: The association between audit firm size and firm performance is positive.*

<u>Firm Performance Comparisons in Different Time Periods</u>

After two mergers of international firms in 1999 and 2003, audit market in Taiwan is more concentrated in Big 4 period (2003-2012) compared to Big 5 period (1999-2002) and Big 6 period (1992-1998). Further, mergers between two firms leads to synergy, substantial cost savings, increased revenues, and economies of scale (Banker et al., 2003). Audit firm mergers increase audit quality, indicating that larger auditors provide higher audit quality due to the increased incentives provided by larger quasi-rents (Chan and Wu, 2011). Such mergers are also likely to increase the competency of merged audit firm to provide higher audit quality (DeFond & Zhang, 2014).

Audit fees have mostly been reported to increase with increased audit market concentration (Elbardan et al., 2023). In theory, increasing market concentration facilitates monopolistic pricing and allows the obtaining of abnormal profits (Dunn et al., 2011). Prior studies find a positive association between audit market concentration and audit fees (Eshleman & Lawson, 2017; van Raak et al., 2020; Chang et al., 2009). Contrarily, audit fees have been reported to decrease with market concentration increase because of intense competition among the remaining suppliers, or economies of scale (Cahan et al., 2021; Ettredge et al., 2020). Prior research finds that market concentration increased during the 4-international-firm period but market shares of the surviving 4 firms became more equal compared to the 5-international-firm period (Abidin, Beattie and Goodacre, 2010; Dunn et al., 2011).

However, market share of international firms in Taiwan reveals some variants to the findings in prior studies. As shown in Table 1, the merger between Price Waterhouse and Coopers & Lybrand in 1999 leads to the changes in mean auditing industry market share (Market Share 1) and public company market share (Market Share 2). Market Share 1 of Arthur Andersen was 10.45% in Big 6 period and 13.14% in Big 5 period. Its Market Share 2 was 25.57% in Big 6 period and rose to 35.23% in Big 5 period. After the merger between Arthur Andersen and Deloitte Touche, Market Shares 1 and 2 became more unequal compared to the Big 6 and Big 5 periods. Market Share 1 of Arthur Andersen was 13.14% in Big 5 period and grew to 25.53% in Big 4 period. Its Market Share 2 was 25.57% in Big 6 period and rose to 35.23% in Big 5 period.

After Enron, both DTTL and KPMG occupied 40.94% of the entire auditing industry (Market Share 1) and 63.19% of the public company auditing market (Market Share 2).

In this study, international and national firms are eligible for the provision of audit services to public companies, and they compete for the same customer base. After Enron, competition intensifies either between international and national firms or within the international firms. According to DTTL, the number (capital raised in billion NT dollars) of IPO was 39 (14.8) in 2017, 60 (23.5) in 2018, 35 (28) in 2019, 29 (14.7) in 2020, and 28 (32.1) in 2021 in Taiwan capital market. The market share of IPO occupied by DTTL was 62%, 47%, 46%, 52%, and 50%. Although soliciting over fifty IPOs of KY-company, DTTL faces the toughest crisis in its history because of audit failure in some of its KY-company clients. KY is an abbreviation of the Cayman Islands. The business community attributes the accounting scandals of financial statements fraud in the KY-company to fierce competition among the 4 international firms.

According to the Survey Report of Audit Firms in Taiwan published by the Financial Supervisory Commission, the number of national firms reveals a decreasing tendency. Mean number of national firms was 59.6 in the Big 6 period and grew slightly to 62.6 in the Big 5 period but decreases sharply to 42.8 in the Big 4 period. However, both regional and local firms grow year by year. The number of regional firms was 86 in 1992 and tripled to 242 in 2020. Similarly, there were 364 local firms in 1992 and 762 in 2020.

Although international and national firms are qualified for rendering audit service to public companies, the market power of international firms grows steadily during the sample period. Table 1 indicates that international firms occupied 71.75% of the public company auditing market in Big 6 period and 82.41% in the Big 5 period. In the Big 4 period, 91.28% of the public company auditing market belongs to international firms with 8.72% left for national firms.

In practice, national, regional and local audit firms locate in the same market and compete for the clients of small and medium-sized enterprises (SME). When more and more auditors enter the SME auditing market, competition intensifies. Hence, national, regional and local audit firms face a more competitive audit market in the Big 4 period than in the Big 5 and Big 6 periods. Accordingly, we claim that Taiwanese auditing market structure becomes increasingly intense during the sample period. Hence, we predict that operating performance in the Big 6 period will be better than in the Big 5 and Big 4 periods, and in the Big 5 period will be better than in the Big 4 period and we hypothesize:

*H2a: Audit firm performance in the Big 6 period is better than in the Big 5 and Big 4 periods.*
*H2b: Audit firm performance in the Big 5 period is better than in the Big 4 period.*

Alliance Performance Comparisons between Different Categories of Audit Firms

Audit firms provide audit and non-audit services. In Taiwan, audit services include attestation of financial statements for public companies and private companies, for granting a bank loan and for special purposes, and attestation of corporate income tax returns. Non-audit services are composed of tax planning, tax administrative remedy, other tax matters, management advisory service, corporate registration, and accounting and bookkeeping services. Recently, audited clients demand advisory services such as business performance consulting, information technology, cybersecurity, digital transformation, workforce development, data analysis and marketing advisory. Audit firms experience the largest growth in technology consulting and attest services. Over 70% audit firms in the US render IT and data security services (Accounting Today, 2021).

For example, Taiwanese PWC renders various IT services, including SAP S/4 HANA, technology consulting, CRM salesforce, and cloud computing. However, joint provision of audit and non-audit services to the same audit clients is supposed to impair independence of auditors (Ashbaugh et al., 2003). Both SEC

and American Institute of Certified Public Accountants concerned about auditor's independence in the past few decades. Further, Section 201 of the SOX imposes severer regulations on audit firms in rendering non-audit services. To overcome the dilemma in joint service provision, audit firms can strategically ally with a consulting company (Brown et al., 1996; Dopuch and King, 1991). The SEC regards consulting company as a separate and distinct legal entity from audit firms (SEC, 1988).

In terms of resource-based view (RBV), the alliance benefits audit firms and consulting companies as well. By the alliance, they mutually support businesses to maintain auditor independence and increase income for each other. From the perspective of RBV, the strategic alliance possesses advantages between both parties, including cross-referring businesses, expanding the scope of services by flexible deployment of human resources, and sharing professional knowledge (Chen et al., 2022).

Because consulting companies are a legal entity, some audit firms set up even more than one company. For example, the PWC in Taiwan establishes alliance with nine consulting companies (Chen et al. 2022). In addition to the international audit firms, non-international audit firms establish strategic alliances to render non-audit services. Size of audit firms facilitates the establishment of strategic alliance, which brings about revenue enhancement for the alliance. Accordingly, we postulate that size determines alliance performance. In addition, Taiwanese auditing market structure becomes increasingly competitive during the sample period. We predict that the alliance performance in the Big 5 period will be better than in the Big 4 periods and hypothesize:

*H3a: The association between audit firm size and alliance performance is positive.*
*H3b: Alliance performance in the Big 5 period is better than in the Big 4 period.*

**RESEARCH METHODOLOGY**

<u>Sample Selection</u>

We obtain empirical data from the 1992-2020 Survey Report of Audit Firms in Taiwan. The annual survey is administered by the Financial Supervisory Commission (FSC), an equivalent of the SEC in USA. The purpose of the survey is to gain insights into the operations of audit firms, analyze macro-economic conditions, and form industrial policies. The annual survey is conducted pursuant to the Statistics Act which obligates all audit firms to accurately complete the questionnaire by the specified deadline, thus receiving an annual response rate of more than 80 percent and representing the reality of auditing practices in Taiwan. To ensure the confidentiality of business transactions, the FSC provides no identity information on individual audit firms. Hence, the survey provides a pooled cross-sectional data, which combine cross-sectional and time series information. Many studies have used pooled data which enables researchers to exploit the entire available sample. In contrast to annual estimates, the results from pooled data reflect the mean effects of independent variables during the sampling period. Accordingly, the statistics obtained from the pooled data are more accurate (Geletkanycz & Hambrick, 1997). However, pooled data suffer from the econometric problem of a correlation between residual terms. To account for the problem, we conduct the Durbin-Watson (DW) test for verification and obtain DW statistics between 1.93 and 2.07, which implies a low correlation between residual terms. Because the sample period covers 29 years, we use the yearly Consumer Price Index to deflate all monetary variables to control for inflation.

In terms of market segmentation, we classify all samples into four groups: international, national, regional, and local audit firms. International firms are the Big N audit firms. National (regional) firms are defined as partnership audit firms who offer (do not offer) audit services to public companies. Local firms are proprietorship audit firms. During the 29-year sample period, two mergers between international firm occurred in 1998 and 2002. Based on the changes in market structure, we divide the sample years into three time periods: Big 6, Big 5, and Big 4. Big 6 period is defined as the six years between 1992 and 1997, and

Big 5 period the five years between 1998 and 2002. Big 4 period is defined as the eighteen years period between 2003 and 2020. As shown in Table 2, the final number of firm-year observations is 23,445, consisting of 133 international firms, 1,442 national firms, 5,499 regional firms, and 16,371 local firms. There are 3,803 observations in the Big 6 period, 3,815 observations in the Big 5 period, and 15,827 observations in the Big 4 period. Further, the number of audit firms establishing alliance with consulting company is 2,040, consisting of 90 international firms, 157 national firms, 685 regional firms, and 1,109 local firms.

Table 2: Sample Distribution

| Period | Year | International Firms | National Firms | Regional Firms | Local Firms | Total |
|--------|------|--------------------|----------------|----------------|-------------|-------|
| Big 6 | 1992 | 6 | 55 | 86 | 364 | 511 |
| | 1993 | 6 | 54 | 123 | 407 | 590 |
| | 1994 | 6 | 53 | 145 | 427 | 631 |
| | 1995 | 6 | 64 | 142 | 462 | 674 |
| | 1996 | 6 | 71 | 152 | 477 | 706 |
| | 1997 | 6 | 61 | 157 | 467 | 691 |
| | Subtotal | 36 | 358 | 805 | 2,604 | 3,803 |
| Big 5 | 1998 | 5(5) | 69(17) | 164(21) | 501(43) | 739(86) |
| | 1999 | 5(5) | 66(16) | 176(33) | 524(40) | 771(94) |
| | 2000 | 5(5) | 68(13) | 177(32) | 555(45) | 805(95) |
| | 2001 | 5(5) | 55(8) | 172(22) | 525(41) | 757(76) |
| | 2002 | 5(5) | 55(9) | 175(34) | 508(35) | 743(83) |
| | Subtotal | 25(25) | 313(63) | 864(142) | 2,613(204) | 3,815(434) |
| Big 4 | 2003 | 4(4) | 54(10) | 174(23) | 477(43) | 709(80) |
| | 2004 | 4(4) | 47(5) | 161(22) | 447(38) | 659(69) |
| | 2005 | 4(4) | 52(8) | 173(26) | 473(42) | 702(80) |
| | 2006 | 4(4) | 46(7) | 184(23) | 479(38) | 713(72) |
| | 2007 | 4(4) | 48(7) | 198(24) | 518(44) | 768(79) |
| | 2008 | 4(3) | 52(10) | 225(31) | 608(46) | 889(90) |
| | 2009 | 4(4) | 49(7) | 219(30) | 571(50) | 843(91) |
| | 2010 | 4(4) | 46(5) | 212(32) | 588(47) | 850(88) |
| | 2011 | 4(2) | 45(2) | 216(29) | 683(47) | 903(80) |
| | 2012 | 4(4) | 41(4) | 217(30) | 679(53) | 941(91) |
| | 2013 | 4(4) | 41(4) | 229(29) | 656(53) | 930(90) |
| | 2014 | 4(4) | 42(6) | 218(33) | 665(44) | 929(87) |
| | 2015 | 4(4) | 39(4) | 222(30) | 667(46) | 932(84) |
| | 2016 | 4(3) | 38(4) | 227(33) | 685(54) | 954(94) |
| | 2017 | 4(3) | 37(2) | 234(40) | 736(54) | 1,011(99) |
| | 2018 | 4(3) | 34(3) | 239(33) | 745(63) | 1,022(102) |
| | 2019 | 4(3) | 29(2) | 240(36) | 760(69) | 1,033(110) |
| | 2020 | 4(4) | 31(3) | 242(39) | 762(74) | 1,039(120) |
| | Subtotal | 72(65) | 771(93) | 3,830(543) | 11,154(905) | 15,827(1,606) |
| | Total | 133(90) | 1,442(156) | 5,499(685) | 16,371(1,109) | 23,445(2,040) |

*This table indicates that the final number of firm-year observations is 23,445, consisting of 133 international firms, 1,442 national firms, 5,499 regional firms, and 16,371 local firms. There are 3,803 observations in the Big 6 period, 3,815 observations in the Big 5 period, and 15,827 observations in the Big 4 period. Further, the number of audit firms establishing alliance with consulting company is 2,040, consisting of 90 international firms, 157 national firms, 685 regional firms, and 1,109 local firms. Numbers in the parentheses are audit firms establishing alliance with consulting companies.*

Empirical Model

The structure-conduct-performance (SCP) paradigm links market structures, firm behavior, and economic performance (Ray, 1992; Cowling and Waterson, 1976; Lee, 2012). Based on SCP theory, we estimate the following regression equation to test our hypotheses.

$$PFM\_{firm}(PFM\_{alliance}) = \beta_0 + \beta_1 DV + \beta_2 EDU + \beta_3 EXP + \beta_4 CPE + \beta_5 AGE + \beta_6 SIZE + \beta_7 GDP + \varepsilon \quad (1)$$

Dependent variable, *PFM*, is defined as revenues of audit firms. Revenues contain information about future earnings and cash flows because the new information can be immediately reflected in revenues. Compared to earnings or net income, revenues are more useful in summarizing the performance of firms and in conveying new relevant information to the market (Chandra and Ro, 2008; Gordon, 1989; Rouse, Maguire and Harrison, 2011). Our first dependent variable is firm performance, $PFM\_{firm}$, measured by the total revenues of audit firms alone. Another is alliance performance, $PFM\_{alliance}$, is defined as the sum of total revenues of audit firms and consulting companies. *DV* is an indicator variable used to capture different categories of audit firms and different time periods. When comparing performance between different categories of audit firms, we set indicator variables of *BIG_N, NR, NL,* and *RL*. For the different time periods, we establish three time-period indicator variables, including *TIME5, TIME4,* and *TIME54*.

Because audit quality significantly affects the operating performance of audit firms, previous researches identify some key determinants or drivers of audit quality, such as the education level of auditors (*EDU*) (Lee et al., 1999; Liu, 1997; Brocheler et al., 2004; Collins et al., 2004; Fasci & Valdez, 1998), the work experience of auditors (*EXP*) (Aldhizer et al., 1995; FRC, 2006; Collins et al., 2004; Chen et al., 2008; Fasci & Valdez, 1998; Arens et al., 2012), and the professional training of auditors (*CPE*) (Meinhardt et al., 1987; FRC, 2006; Bonner & Pennington, 1991; Grotelueschen, 1990; Thomas et al., 1998). Our regression equation includes the audit quality drivers as control variables and is an audit-quality-controlled model. Following prior studies, we also include some variables to control the regression model, including the age of audit firms (*AGE*) (Chen et al. 2008), size of audit firms (*SIZE)* (Shockley and Holt, 1983; Deis and Giroux, 1992) and external environment effects (*GDP*) (Reynolds & Francis, 2001). Table 3 provides the definitions of all variables in the regression equation.

Table 3: Variable Definitions

| Variable | Definition |
|---|---|
| $PFM\_{firm}$ | Firm performance. |
| $PFM\_{alliance}$ | Alliance performance. |
| BIG_N | Dummy variable, defined as 1 if the audit firm is an international firm, and 0 otherwise. |
| NR | Dummy variable, equal to 1 if the audit firm is a national firm, and 0 otherwise. |
| RL | Dummy variable, set to be 1 if the audit firm is a regional firm, and 0 otherwise. |
| TIME5 | Dummy variable, designated as 1 if the years are between 1998 and 2002, and 0 otherwise. |
| TIME4 | Dummy variable, equal to 1 if the years are between 2003 and 2020, and 0 otherwise. |
| TIME54 | Dummy variable, set to be 1 if the years are between 1998 and 2020 and 0 otherwise. |
| EDU | Education level of auditors. |
| EXP | Work experience of auditors. |
| CPE | Professional training of auditors. |
| AGE | Age of audit firms. |
| SIZE | Size of audit firms, measured as a natural log of the total number of auditors. |
| GDP | External environment effects, defined as the local gross domestic product. |

*This table defines all variables used in the regression equation.*

## RESULTS

<u>Descriptive Statistics</u>

Table 4 presents the descriptive statistics of regression variables for the three time periods. As shown in Panel A, mean firm performance ($PFM\__{firm}$) of international firms is \$2,684,051,074 which grows from \$700,818,530 in the Big 6 period to \$4,015,547,522 in the Big 4 period. Average alliance performance ($PFM\__{alliance}$) is 2,866,459,816, which is \$1,867,281,237 in Big 5 period and expands to 4,296,217,465 in the Big 4 period. National and regional firms experience tendency similar to international firms. However, both firm performance and alliance performance of local firms shrinks period to period. In addition, international firms have youngest auditors ($EXP$) with the highest educational level ($EDU$), the longest age of establishment ($AGE$), and devote the most expenditures in professional training ($CPE$). Data of strategic alliance provided by FSC are available since 1998. Hence, no information of alliance performance ($PFM\__{alliance}$) appears in Big 6 period.

Table 4: Descriptive Statistics

| Panel A: International Firms | | | | |
|---|---|---|---|---|
| | **Full Sample Period** | **Big 6 Period** | **Big 5 Period** | **Big 4 Period** |
| $PFM\__{firm}$ | 2,684,051,074 | 700,818,530 | 1,705,196,170 | 4,015,547,522 |
| $PFM\__{alliance}$ | 2,866,459,816 | -- | 1,867,281,237 | 4,296,217,465 |
| EDU | 16.27 | 16.16 | 16.04 | 16.40 |
| EXP | 31.17 | 30.38 | 31.24 | 31.54 |
| CPE | 18,958,708 | 9,722,438 | 19,670,643 | 23,329,642 |
| AGE | 32.05 | 28.89 | 31.44 | 33.83 |
| SIZE | 7.66 | 6.12 | 6.99 | 7.57 |
| **Panel B: National Firms** | | | | |
| | **Full Sample Period** | **Big 6 Period** | **Big 5 Period** | **Big 4 Period** |
| $PFM\__{firm}$ | 63,678,106 | 43,774,743 | 58,273,177 | 75,114,094 |
| $PFM\__{alliance}$ | 64,425,526 | -- | 59,442,863 | 76,037,138 |
| EDU | 15.50 | 15.16 | 15.16 | 15.80 |
| EXP | 33.98 | 32.26 | 32.55 | 35.36 |
| CPE | 225,418 | 136,108 | 154,551 | 295,657 |
| AGE | 17.99 | 12.66 | 15.94 | 21.29 |
| SIZE | 3.81 | 3.53 | 3.83 | 3.93 |
| **Panel C: Regional Firms** | | | | |
| | **Full Sample Period** | **Big 6 Period** | **Big 5 Period** | **Big 4 Period** |
| $PFM\__{firm}$ | 14,794,113 | 13,316,270 | 13,277,523 | 15,446,854 |
| $PFM\__{alliance}$ | 15,151,317 | -- | 13,765,746 | 15,849,579 |
| EDU | 15.40 | 14.77 | 14.79 | 15.67 |
| EXP | 36.74 | 32.48 | 34.22 | 38.21 |
| CPE | 67,410 | 49,463 | 51,397 | 74,794 |
| AGE | 14.87 | 6.86 | 10.04 | 17.64 |
| SIZE | 2.73 | 2.75 | 2.78 | 2.71 |
| **Panel D: Local Firms** | | | | |
| | **Full Sample Period** | **Big 6 Period** | **Big 5 Period** | **Big 4 Period** |
| $PFM\__{firm}$ | 3,989,092 | 4,214,056 | 4,003,868 | 3,933,110 |
| $PFM\__{alliance}$ | 4,159,596 | -- | 4,196,342 | 4,138,274 |
| EDU | 15.21 | 14.48 | 14.62 | 15.52 |
| EXP | 40.14 | 35.59 | 37.13 | 41.91 |
| CPE | 24,794 | 27,349 | 19,839 | 25,359 |
| AGE | 12.95 | 9.21 | 10.07 | 14.49 |
| SIZE | 1.78 | 1.88 | 1.86 | 1.74 |

*This table shows the descriptive statistics for different categories of audit firms in different time periods. PFM_ firm = firm performance; PFM_ alliance = alliance performance; EDU = education level of auditors; EXP = work experience of auditors; CPE = professional training of auditors; AGE = age of audit firms; SIZE = size of audit firms.*

Univariate Comparisons of Performance between Different Categories of Audit Firms in Different Time Periods

Table 5 displays the results of performance comparison between different categories of audit firms and in different time periods. First, we compare audit firm size by two variables, total number of owners of audit firms (*TCPA*) and total number of auditors (*TEMPLOYEE*). In terms of either *TCPA* or *TEMPLOYEE*, size of international firms is greater than that of national firms, so on and so forth. Next, Panel A shows that the larger the size of audit firms, the better the firm performance (*PFM_ firm*) and alliance performance (*PFM_ alliance*). In sum, both size and performance of international firms is greater and better than that of national firms, so on and so forth. We graphically present the results in Figure 1. In panel B, we report the comparisons of alliance performance (*PFM_ alliance*) and firm performance (*PFM_ firm*) in Big 5 and Big 4 periods. As shown, alliance performance (*PFM_ alliance*) is better than firm performance (*PFM_ firm*) for the international firms, national firms, regional firms, and local firms.

Table 5: Comparisons of Audit Firm Size and Performance

| Panel A: Comparisons Between Different Categories of Audit Firms | | | | |
|---|---|---|---|---|
| | *TCPA* | *TEMPLOYEE* | *PFM_ firm* | *PFM_ alliance* |
| International firms | 63.33 | 1,467.66 | $2,684,051,074 | $2,866,459,816 |
| National firms | 6.47 | 62.85 | 63,678,106 | 64,425,526 |
| Difference | 56.86 | 1,401.82 | $2,620,372,968 | $2,802,034,290 |
| t-statistic | 53.72*** | 56.05*** | 49.23*** | 50.36*** |
| International firms | 63.33 | 1,467.66 | $2,684,051,074 | $2,866,459,816 |
| Regional firms | 2.88 | 18.40 | 14,794,113 | 15,151,317 |
| Difference | 60.45 | 1,449.26 | $2,669,256,961 | $2,851,308,499 |
| t-statistic | 114.57*** | 115.29*** | 98.56*** | 100.60*** |
| International firms | 63.33 | 1,467.66 | $2,684,051,074 | $2,866,459,816 |
| Local firms | 1.00 | 6.03 | 3,989,092 | 4,159,596 |
| Difference | 62.33 | 1461.63 | $2,680,061,982 | $2,862,300,220 |
| t-statistic | 211.50*** | 201.90*** | 170.98*** | 174.45*** |
| National firms | 6.47 | 62.85 | $63,678,106 | $64,425,526 |
| Regional firms | 2.88 | 18.40 | 14,794,113 | 15,151,317 |
| Difference | 3.59 | 44.45 | $48,883,993 | $49,274,209 |
| t-statistic | 50.67*** | 43.48*** | 46.92*** | 46.97*** |
| National firms | 6.47 | 62.85 | $63,678,106 | $64,425,526 |
| Local firms | 1.00 | 6.03 | 3,989,092 | 4,159,596 |
| Difference | 5.47 | 58.82 | $59,689,014 | $60,265,930 |
| t-statistic | 166.71*** | 105.42*** | 107.36*** | 107.28*** |
| Regional firms | 2.88 | 18.40 | $14,794,113 | $15,151,317 |
| Local firms | 1.00 | 6.03 | 3,989,092 | 4,159,596 |
| Difference | 1.88 | 12.37 | $10,805,021 | $10,991,721 |
| t-statistic | 148.52*** | 81.61*** | 78.08*** | 76.65*** |
| Panel B: Comparisons Between Big 5 and Big 4 Periods | | | | |
| | **International Firms** | **National Firms** | **Regional Firms** | **Local Firms** |
| **Big 5 Period** | | | | |
| *PFM_ alliance* | $1,867,281,237 | $59,442,863 | $13,765,746 | $4,196,342 |
| *PFM_ firm* | $1,705,196,170 | $58,273,178 | $13,277,523 | $4,003,868 |
| Difference | $162,085,067 | $1,169,685 | $488,224 | $192,473 |
| t-statistic | 8.49*** | 7.06*** | 7.47*** | 7.55*** |
| **Big 4 Period** | | | | |
| *PFM_ alliance* | $4,296,217,465 | $76,037,139 | $15,849,579 | $4,138,274 |
| *PFM_ firm* | $4,015,547,522 | $75,114,094 | $15,446,854 | $3,933,110 |
| Difference | $280,669,944 | $923,045 | $402,725 | $205,164 |
| t-statistic | 10.45*** | 6.31*** | 11.96*** | 9.21*** |

*Table 5 shows the results of performance comparison between different categories of audit firms and in different time periods. In addition, \*, \*\*, \*\*\* denote significance at 10-percent, 5-percent, and 1-percent confidence levels for two-tailed tests. PFM_ firm = firm performance; PFM_ alliance = alliance performance; TCPA= total number of owners of audit firms; TEMPLOYEE =total number of auditors.*

Comparisons of Firm Performance between Different Category of Audit Firms

Panels A through C of Table 6 present the regression results of firm performance in the three time periods. Except Panel A, we report the regression results on research variables, *BIG_N, NR, NL,* and *RL*, and omit that of control variables to save of space. In Panel A, we report statistically significant coefficients on *BIG_N* for the Big 6 (t = 25.65), Big 5 (t = 25.43), and Big 4 periods (t = 14.46), respectively. These findings suggest that the firm performance of international firms is much better than that of national firms in the Big 6, Big 5, and Big 4 periods. In Panels B and C, we find similar results that international firms significantly outperform both regional firms and local firms in the three time periods. As shown in Panels D through F of Table 6, the firm performance of national firms is better than that of both regional firms and local firms. The firm performance of regional firms is better than that of local firms in the three time periods. In sum, Panels A through F report that the larger the size of audit firms, the better the firm performance (*PFM_firm*). Accordingly, H1 receives supports, indicating the association between audit firm size and firm performance is positive.

Table 6: Regression Results of The Firm Performance Between Different Category of Audit Firms

| $PFM\_firm = \beta_0 + \beta_1 DV + \beta_2 EDU + \beta_3 EXP + \beta_4 CPE + \beta_5 AGE + \beta_6 SIZE + \beta_7 GDP + \varepsilon$ | | |
|---|---|---|
| **Panel A: International Firms vs National Firms** | | |
| | **Big 6 Period** | **Big 5 Period** | **Big 4 Period** |
| **Variables (Predicted Signs)** | **Std. Coeff. (t-statistics)** | **Std. Coeff. (t-statistics)** | **Std. Coeff. (t-statistics)** |
| *BIG_N* (+) | 0.520*** | 0.705*** | 0.396*** |
| | (25.65) | (25.43) | (14.46) |
| *EDU* (+) | 0.030** | -0.057*** | -0.014 |
| | (2.17) | (-3.46) | (-0.95) |
| *EXP* (?) | 0.010 | 0.019 | 0.023 |
| | (0.75) | (1.13) | (1.59) |
| *CPE* (+) | 0.347*** | 0.142*** | 0.490*** |
| | (23.29) | (7.08) | (19.96) |
| *SIZE* (+) | 0.254*** | 0.205*** | 0.143*** |
| | (12.62) | (8.00) | (7.23) |
| *AGE* (+) | -0.009 | -0.015 | -0.097*** |
| | (-0.64) | (-0.84) | (-7.41) |
| *GDP* (+) | 0.038*** | 0.019 | 0.079*** |
| | (3.03) | (1.22) | (5.38) |
| $R^2$ | 0.943 | 0.919 | 0.897 |
| Adjusted $R^2$ | 0.941 | 0.918 | 0.896 |
| F-statistic | 896*** | 539*** | 1,042*** |
| N | 394 | 338 | 843 |
| **Panel B: International Firms vs Regional Firms** | | |
| | **Big 6 Period** | **Big 5 Period** | **Big 4 Period** |
| *BIG_N* (+) | 0.624*** | 0.836*** | 0.396*** |
| | (42.69) | (50.76) | (32.64) |
| N | 841 | 888 | 3,902 |
| **Panel C: International Firms vs Local Firms** | | |
| | **Big 6 Period** | **Big 5 Period** | **Big 4 Period** |
| *BIG_N* (+) | 0.688*** | 0.864*** | 0.402*** |
| | (94.97) | (99.22) | (56.34) |
| N | 2,640 | 2,638 | 11,226 |

Table 6: Regression Results of The Firm Performance Between Different Category of Audit Firms (continued)

| Panel D: National Firms vs Regional Firms | | | |
|---|---|---|---|
| | **Big 6 Period** | **Big 5 Period** | **Big 4 Period** |
| *LM* (+) | 0.085*** | 0.051** | 0.123*** |
| | (4.24) | (2.22) | (11.44) |
| N | 1,163 | 1,177 | 4,601 |
| **Panel E: National Firms vs Local Firms** | | | |
| | **Big 6 Period** | **Big 5 Period** | **Big 4 Period** |
| *LS* (+) | 0.237*** | 0.142*** | 0.238*** |
| | (14.26) | (7.57) | (28.29) |
| N | 2,962 | 2,926 | 11,925 |
| **Panel F: Regional Firms vs Local Firms** | | | |
| | **Big 6 Period** | **Big 5 Period** | **Big 4 Period** |
| *MS* (+) | 0.081*** | 0.132*** | 0.047*** |
| | (5.39) | (9.59) | 7.28 |
| N | 3,409 | 3,477 | 14,984 |

*This table presents the regression results of firm performance between different categories of audit firms in the three time periods. In addition, \*, \*\*, \*\*\* denote significance at the 10-percent, 5-percent and 1-percent levels, respectively (one-tailed where coefficient sign has prediction, two-tailed otherwise). All variables are defined in Table 3.*

Comparisons of Alliance Performance between Different Category of Audit Firms

Table 7 presents the comparisons of alliance performance between different categories of audit firms. Because of the data availability about strategic alliance, comparisons of alliance performance are limited to the Big 5 and Big 4 periods. For brevity, coefficients on control variables are not reported in Panels B, C, D, E and F of Table 6 due to the stability of their coefficients across models. As shown in Panel A, we find statistically significant coefficients on *BIG_N* in Big 5 period (t = 7.79) and Big 4 period (t = 5.93), respectively. This indicates that the alliance performance of international firms is much better than that of national firms during Big 5 and Big 4 periods. Also, Panels B and C report that the alliance performance of international firms is better than that of both regional and local firms.

Panels D reveals that the alliance performance of national firms is better than that of regional firms in the Big 4 period only (t = 5.45). Furthermore, Panel E displays that the alliance performance of national firms is inferior to that of local firms in Big 5 period (t = -3.13) but superior to local firms in Big 4 period (t = 5.45). Panel F reports an insignificant difference in the alliance performance between regional and local firms. When we take market segments and market structure into account simultaneously, H3a receives a support in international firms. Namely, international firms have better alliance performance than national, regional and local firms in the Big 5 and Big 4 periods.

Table 7: Regression Results of Alliance Performance Between Different Category of Audit Firms

| $PFM\_{alliance} = \beta_0 + \beta_1 DV + \beta_2 EDU + \beta_3 EXP + \beta_4 CPE + \beta_5 AGE + \beta_6 SIZE + \beta_7 GDP + \varepsilon$ | | |
|---|---|---|
| **Panel A: International Firms vs National Firms** | | |
| | **Big 5 Period** | **Big 4 Period** |
| **Variables (Predicted Signs)** | **Std. Coeff. (t-statistics)** | **Std. Coeff. (t-statistics)** |
| *BIG_N* (+) | 0.637*** | 0.405*** |
| | (7.79) | (5.93) |
| *EDU* (+) | -0.018 | -0.048 |
| | (-0.34) | (-1.17) |
| *EXP* (+) | 0.012 | 0.014 |
| | (0.33) | (0.45) |
| *CPE* (+) | 0.187*** | 0.239*** |
| | (4.31) | (5.09) |
| *AGE* (+) | -0.121* | -0.317*** |
| | (-1.90) | (-0.989) |
| *SIZE* (+) | 0.302*** | 0.460*** |
| | (3.74) | (7.34) |
| *GDP* (+) | 0.039 | 0.251*** |
| | (1.09) | (7.82) |
| $R^2$ | 0.897 | 0.889 |
| Adjusted $R^2$ | 0.895 | 0.887 |
| F-statistic | 107*** | 96*** |
| N | 88 | 158 |
| **Panel B: International Firms vs Regional Firms** | | |
| | Big 5 Period | Big 4 Period |
| *BIG_N* (+) | 0.686*** | 0.383*** |
| | (7.38) | (9.74) |
| N | 167 | 608 |
| **Panel C: International Firms vs Local Firms** | | |
| | Big 5 Period | Big 4 Period |
| *BIG_N* (+) | 0.722*** | 0.358*** |
| | (9.05) | (10.82) |
| N | 229 | 970 |
| **Panel D: National Firms vs Regional Firms** | | |
| | Big 5 Period | Big 4 Period |
| *NR* (+) | -0.068 | 0.142*** |
| | (-1.35) | (5.45) |
| N | 205 | 636 |
| **Panel E: National Firms vs Local Firms** | | |
| | Big 5 Period | Big 4 Period |
| *NL* (+) | -0.162*** | 0.140*** |
| | (-3.13) | (5.19) |
| N | 267 | 998 |
| **Panel F: Regional Firms vs Local Firms** | | |
| | Big 5 Period | Big 4 Period |
| *RL* (+) | -0.023 | -0.013 |
| | (-0.427) | (-0.527) |
| N | 346 | 1,448 |

*Table 7 displays regression results to compare the alliance performance between different categories of audit firms. In addition, *, **, *** denote significance at the 10-percent, 5-percent and 1-percent levels, respectively (one-tailed where coefficient sign has prediction, two-tailed otherwise). All variables are defined in Table 3.*

Comparisons of Firm and Alliance Performance Between Different Time Periods

Table 8 reports the comparisons of firm and alliance performance between different time periods. As can be seen in Panel A, we have significantly negative coefficients on dummy variable of Big 5 period (*TIME5*) (t = -2.97) and Big 4 period (*TIME4*) (t = -1.98) in the international firm column. This implies firm performance of international firm in the Big 5 and Big 4 periods is inferior to that of in the Big 6 period. Similarly, the coefficients on dummy variable of Big 5 period (*TIME5*) and Big 4 period (*TIME4*) are significantly negative for the national, regional and local firms. The results show their firm performance in Big 6 period is better than in Big 5 and Big 4 periods. H2a receives support. Next, the Wald test shows an insignificant difference in coefficients between the *TIME5* and *TIME4* for international and regional firms, indicating performance of these two firms in the Big 4 period is not inferior to that of in the Big 5 period. However, firm performance of national and local firms in the Big 5 period is significantly better than that of in the Big 4 period (F = 12.16 and F = 6.44, respectively). H2b receives a support in national and local firms. Panel B displays the comparisons of alliance performance between Big 5 and Big 4 periods. The coefficients on *TIME54* indicate an insignificant difference in alliance performance (*PFM_alliance*) between Big 5 and Big 4 periods for the international, national, regional, and local firms. H3b receives no support.

Table 8 Regression Results of the Firm and Alliance Performance Between Different Time Periods

| Panel A: Firm Performance | | | | |
|---|---|---|---|---|
| $PFM\_firm = \beta_0 + \beta_1\ TIME5 + \beta_2\ TIME4 + \beta_3\ EDU + \beta_4\ EXP + \beta_5\ CPE + \beta_6\ AGE + \beta_7\ SIZE + \beta_8\ GDP + \varepsilon$ | | | | |
| Variables (Predicted Signs) | International Firms | National Firms | Regional Firms | Local Firms |
| | Std. Coeff. (t-statistics) | Std. Coeff. (t-statistics) | Std. Coeff. (t-statistics) | Std. Coeff. (t-statistics) |
| *TIME5* (-) | -0.113*** (-2.97) | -0.050*** (-2.82) | -0.026** (-2.31) | -0.015** (-2.27) |
| *TIME4* (-) | -0.115** (-1.98) | -0.147*** (-5.46) | -0.053*** (-3.39) | -0.042*** (-4.45) |
| *EDU* (+) | 0.122*** (4.90) | 0.053*** (2.95) | 0.131*** (13.03) | 0.113*** (18.34) |
| *EXP* (+) | 0.069*** (2.76) | 0.088*** (4.83) | 0.095*** (8.61) | 0.001 (0.14) |
| *CPE* (+) | 0.096*** (3.60) | 0.168*** (10.74) | 0.318*** (36.65) | 0.168*** (32.62) |
| *AGE* (+) | 0.594*** (9.71) | -0.054*** (-3.32) | -0.019* (-1.77) | 0.051*** (8.163) |
| *SIZE* (+) | -0.365*** (-12. 35) | 0.783*** (46.50) | 0.680*** (66.16) | 0.746*** (111.75) |
| *GDP* (+) | 0.384*** (8.07) | 0.118*** (4.57) | 0.008 (0.55) | 0.045*** (5.35) |
| $R^2$ | 0.938 | 0.708 | 0.621 | 0.575 |
| Adjusted $R^2$ | 0.936 | 0.706 | 0.619 | 0.572 |
| F-statistic | 242*** | 434*** | 1,116*** | 2,735*** |
| N | 133 | 1,442 | 5,499 | 16,371 |

Table 8 Regression Results of the Firm and Alliance Performance Between Different Time Periods (continued)

**Panel B: Alliance Performance**

$PFM\_{alliance} = \beta_0 + \beta_1 TIME54 + \beta_2 EDU + \beta_3 EXP + \beta_4 CPE + \beta_5 AGE + \beta_6 SIZE + \beta_7 GDP + \varepsilon$

| Variables (Pred. Signs) | International Firms Std. Coeff. (t-statistics) | National Firms Std. Coeff. (t-statistics) | Regional Firms Std. Coeff. (t-statistics) | Local Firms Std. Coeff. (t-statistics) |
|---|---|---|---|---|
| TIME54 (-) | -0.041 (-1.16) | -0.051 (-0.84) | -0.055 (-1.59) | -0.13 (-0.368) |
| EDU (+) | 0.117*** (4.37) | 0.065 (1.31) | 0.168*** (5.59) | 0.152*** (4.71) |
| EXP (+) | 0.018 (0.63) | 0.018 (0.38) | 0.089*** (2.79) | 0.080** (2.17) |
| CPE (+) | 0.072*** (2.80) | 0.224*** (4.65) | 0.107*** (4.22) | 0.094*** (3.36) |
| AGE (+) | 0.671*** (14.24) | -0.144*** (-2.85) | 0.012 (0.381) | 0.006 (0.20) |
| SIZE (+) | -0.246*** (-6.84) | 0.806*** (15.50) | 0.778*** (26.41) | 0.428*** (12.28) |
| GDP (+) | 0.273*** (5.55) | 0.069 (1.00) | 0.030 (0.83) | -0.044 (-1.12) |
| $R^2$ | 0.955 | 0.759 | 0.582 | 0.156 |
| Adjusted $R^2$ | 0.953 | 0.758 | 0.580 | 0.155 |
| F-statistic | 259*** | 70*** | 136*** | 30*** |
| N | 90 | 156 | 685 | 1,109 |

*This table reports the comparisons of firm and alliance performance between different time periods. Furthermore, *, **, *** denote significance at the 10-percent, 5-percent and 1-percent levels, respectively (one-tailed where coefficient sign has prediction, two-tailed otherwise). All variables are defined in Table 3.*

## CONCLUSIONS

Findings

In this study, we empirically examine the financial performance of audit firms under different segments in different market structures. In terms of different segments, international firms have better firm performance and alliance performance than national, regional, and local firms. For different market structures, firm performance in Big 6 period is better than in Big 5 and Big 4 periods for international, national, regional, and local firms. Next, we find firm performance of national and local firms in the Big 5 period is significantly better than that of in the Big 4 period. Further, no significant difference in alliance performance between Big 5 and Big 4 periods for the international, national, regional, and local firms.

The empirical results of alliance performance above are subject to the following caveat. In practice, audit firms can establish strategic alliances with consulting companies by two ways: the consulting companies can either operate independently or jointly operate with audit firms. For example, all international firms establish strategic alliances with consulting companies. When the alliance form is the former, audit firms do not provide the information of consulting companies to our dataset. Hence, the number of international firms will differ from the number of audit firms establishing alliance in some years. As the alliance performance of audit firms is limited to the audit firms which jointly operate with consulting companies, this will lead to bias in the alliance performance for some audit firms.

Discussions and Future Study

Prior studies indicate combining two firms results in synergy, substantial cost savings, increased revenues, and economies of scale (Banker et al., 2003). Larger auditors via mergers increase audit quality due to the increased incentives provided by larger quasi-rents (Chan and Wu 2011) and big firm mergers are likely to increase the competency to provide higher audit quality (DeFond and Zhang 2014). Past research claims that the market concentration increases during the 4-international-firm period but market shares of the surviving 4 firms become more equal compared to the 5-international-firm period (Abidin, Beattie and Goodacre, 2010; Dunn et al., 2011). Audit market concentration is significantly associated with higher audit quality and audit fees (Eshleman and Lawson, 2017). According to the two events of big firm mergers in the world and Taiwan, we construct three market structures to extend prior studies. Consistent with prior studies, market concentration increases during the 4-international-firm period in Taiwan. Contrarily, we find market share of international firms becomes more unequal in Taiwan during the 4-international-firm period. Fierce competition between international firms leads to their firm performance in the Big 6 period is better than in the Big 5 and Big 4 periods.

International firms dominate auditing industry in Taiwan and western countries as well. In terms of the auditing industry and the public company audit market, the market share of international firms grows steadily over the past three decades. However, they are subject to more regulations and legal liabilities. The Securities and Exchange Act and the Regulations Governing the Preparation of Financial Reports by Securities Issuers directly apply to international firms in Taiwan. After SOX, the PCAOB exercises its supervisions over foreign audit firms offering services to companies issuing the American Depositary Receipt. For example, three Taiwanese international audit firms, KPMG, Ernst & Young and DTTL, were inspected by PCAOB in 2017, 2018 and 2022 (PCAOB, 2022). Prior studies report the inspections improve audit quality (DeFond & Lennox, 2011; Fargher, Jiang & Yu, 2018). In Taiwan, audit reports of public companies are required to be certified by two audit partners from the same audit firm and names of the audit partners should be disclosed on the reports. In addition, Taiwan Stock Exchange and Taipei Exchange, two main stock exchanges in Taiwan, were inspired by the SOX to set up a five-year mandatory partner rotation in 2004. The regulatory and supervisory systems lead to international firms being a symbol of high audit quality and charging higher audit fees, resulting in their performance superior to that of non-international firms.

Taiwan requires audit firms with two or more audit partners when rendering audit or attest services for some organizations, such as the state-own companies. In addition to international firms, national firms and regional firms are partnership audit firms which are qualified to provide audit services to a variety of organizations. Small and medium-sized enterprises (SMEs) account for over 97% of Taiwanese companies. Most SMEs are served by regional and local firms. Although regional and local firms assume less legal liabilities, SMEs change to international or national firms when they go public. Hence, size plays a critical role for the long-term development of audit firms. When size expands, audit firms can enjoy economy of scale. Also, profitable audit firms reinvest more resources to advance their service quality and they might recoup this investment through charging higher audit fees. To have profitable results and to expand businesses with audit quality, auditors are suggested to take firm size into account.

In this study, we find that both firm performance and alliance performance of international firms are better than that of national, regional and local firms. Prior research identifies an audit fee premium in the international firms due to greater expertise, audit quality, enhanced auditor independence and more resources owned. Human resources are critical inputs in audit firms, including education level of auditors, work experience of auditors, and professional training. Future studies are advised to investigate the role played by human resources in the productivities of audit firms to provide additional information on the audit fees.

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# RELATIONSHIP BETWEEN HIGHER EDUCATION AND ECONOMIC DEVELOPMENT: EVIDENCE FROM WEST VIRGINIA

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## ABSTRACT

*Investment in education is the key for economic growth of a country or a state where poverty is very prominent. Many studies have proven that human capital makes a substantial contribution to economic and income growth. Education that generates skilled labor force leads to increased development and improved quality of life i.e., economic development. This study investigates the effects of higher education on the economic labor force and income growth of the state for the last 2-3 decades, 1990-2023. The data collected mainly from the U.S. census Bureau, Bureau of labor statistics, West Virginia Higher Education Policy Commission (WVHEPC), USDA-ERS, City Data Book (C&CDB), and some from Appalachian Regional Commission (ARC) were used for the analysis. The key industrial sectors of the state are considered for the analysis separately to understand the labor force effects on those sectors. The study followed a series of simultaneous equations with three endogenous variables, using an annual state-level dataset. The results show that higher education has positive and significant effects on economic development in West Virginia, while investing in professional and business services, education and health care are delivering more results.*

**JEL:** O1, O2, O4

**KEYWORDS:** Education, Economic Development, West Virginia

## INTRODUCTION

West Virginia, one of the rural states, has 55 counties, where 44 percent of the population lives in rural areas. Only 8 of the 55 counties meet the standard definition of urban, 34 are rural, and 13 have areas that qualify as both urban and rural. In 2022, the state of West Virginia has a population of 1,775,513, having declined an annualized -0.5 percent over the five years to 2022, which ranks it 50th out of all 50 US states by growth rate. The largest ethnic group in West Virginia is White, accounting for 91.5 percent of the state's population. West Virginia's gross state product (GSP) in 2022 reached $71.7b, with growth of 0.1 percent over the 5 years to 2022. Businesses in West Virginia employed a total of 644,784 people in 2022, with average annual employment growth over the past five years of -0.4 percent. The top three sectors by total employment are Mining, Healthcare and Social Assistance, Manufacturing, while the unemployment rate across the state in 2022 was 4.0 percent (*State Economic West Virginia*, n.d.). The state of West Virginia employs 644,784 people in 2022, which ranks it 42nd out of all 50 US states. Employment in West Virginia has grown at an annualized rate of 0.7 percent over the five years to 2022, underperforming the national average of 3.7 percent. Major sectors by employment in West Virginia include Healthcare and Social Assistance, Retail Trade and Accommodation and Food Services, which employed 154,044, 92,119 and 64,417 people in 2022, respectively. West Virginia's unemployment rate is 4.0 percent in 2022, which ranks it 36th out of 50 states. West Virginia's unemployment rate has trended downwards at a rate of -5.0 percent over the five years to 2022, underperforming the US economy as a whole. Employment trends indicate the degree of tightness or slack in labor markets, in addition to the

overall strength of an economy. The Healthcare and Social Assistance, Retail Trade and Accommodation and Food Services sectors contributed the most to employment in West Virginia in 2022, representing a combined 52.4 percent of state employment (West Virginia Employment Trends, 2023).

In West Virginia, 25.2 percent of the population has a bachelor's or higher (ARC, 2020). The West Virginia public school system (prekindergarten through grade 12) operates within districts governed by locally elected school boards and superintendents. In 2022, West Virginia had 263,486 students enrolled in a total of 683 schools in 55 school districts (BALLOTPEDIA, 2022). There were 283,044 teachers in the public schools, or roughly one teacher for every 14 students, compared to the national average of 1:16. In 2020, West Virginia spent on average $12,697 per pupil (2020 Annual Survey of School System Finances, 2022). The state's graduation rate was 91 percent in the 2018-2019 school years (NCES, 2021).

West Virginia's colleges and universities are not only critical for improving the state's educational attainment and training the state's workforce, but they are also economic drivers in their communities and the state as a whole. Just 11 percent of the state's base budget, or about $497 million, is appropriated for higher education, according to a study by the West Virginia Center on Budget & Policy. The West Virginia Legislature cut higher education appropriations in Fiscal Year 2015 more than any other state except Wyoming, and it has decreased the per-student funding by more than 20 percent since the 2008 recession. As West Virginia's population continues to decline and higher education appropriations face additional cuts, there is a growing need to assess the value of public higher education and its contribution in both the state and local economies. Despite these ongoing cuts to higher education appropriations, the state's public higher education institutions continue to generate revenue that contributes one of the largest economic impacts of any agency or organization (Swisher, 2017). West Virginia intends to foster a state culture that values higher education as a means to individual, community, and economic development.

Objectives and Research Questions

In West Virginia, improved economic development is essential as the current performance is not adequate to make a difference. Though various regional and state level investments in different sectors are happening the expected outcomes are still delayed or inadequate. Therefore, it is important to analyze total economic changes of the state for the applications of effective and efficient investments and policies.  Even though economic analyses are abundant for economic growth, income, education, and employment growth in the United States as a whole, studies are limited to West Virginia (Krueger and Lingahl, 2001; Yogish, 2006; Chaudhary et al., 2009; Matsushita et al., 2006; Alam, 2009; Johnson, 2011; Bashir et al. 2013).This requires more studies to analyze the economic growth of West Virginia for productive decision-making. Due to the lack of research studies mentioned above, the current study attempts to find answers to the research question of the impact of education on employment growth and its significant contribution on state economic development. With significance of the above research question, the main objective of this study is to understand the relationship between education, employment, and income growth in West Virginia. Second, to estimate the relationship between higher education attainment, employment growth and income generation in West Virginia. Finally, to propose effective and practical policy suggestions to enhance economic growth in West Virginia.

Findings of this paper will have the following contributions. First, it will add a research study to the state that discusses some long-term implications of education and economic growth to the state and would help to compare the implications with different other studies of USA.  As West Virginia's population continues to decline and higher education appropriations face additional cuts, there is a growing need to assess the value of public higher education and its contribution in both the state and local economies. Findings will hopefully be useful to families and others to prepare for colleges and universities, administrators, and policymakers in educational investment planning of the state. The paper is organized into five sections.

Section 2 provides the literature review, Section 3 presents methodology and data sources and section 4 presents empirical results and discussion, followed by the last section of conclusions.

**LITERATURE REVIEW**

The role of education has been broadly recognized by economists and decision-makers (Ranis et al. 2000; Hanushek and Wobmann, 2007; Gilead, 2012). The use of infrastructure and technology requires that the higher education system plays an important role in regional economic development (NICA and POPESCU, 2014). Economists estimate that investing in education or human capital increases labor production and productivity. Investing in human capital is critical in the future as the economy transforms into a knowledge-based economy from the post-industrial economy (Abel and Deitz, 2012; Pera, 2014). Maurova and Khan (2016) revealed that public investments, especially in education, transportation, health, police and fire, and welfare, significantly contribute to the economic development of a state.

Moretti (2004) backs up the claim that more educated individuals raise the wages of less-educated individuals, suggesting that educational externalities exist. According to Moretti, a 1 percent increase in the supply of college graduates' results in a 0.4 percent increase in the salaries of college graduates, a 1.6 percent increase in the wages of high school graduates, and a 1.9 percent increase in the wages of high school dropouts. French and Fisher (2009) found that having more education increases one's chances of participating and succeeding in the job market. Berger and Fisher (2013) reported that investing in education can result in better outcomes based on state-level data analysis. The strength of a state's economies can be increased by increasing the number of well-educated workers.

Educational investment has a variety of non-monetary benefits for society. Dee (2004), Glaeser and Saks (2006), and Milligan et al (2004) observed that better education leads to civic activity and good governance. Deming (2011), Lochner (2011), and Lochner (2011) demonstrate that crime rates are lower with increased education. Lochner (2011), Wheeler (2007), and Wolfe and Haveman (2002) found that higher education can help people lead lives that are more beneficial for public health, intrafamily productivity, marital choice efficiency, and child health. Cutler and Lleras-Muny (2008) demonstrated that the connection between higher education and better life expectancy significantly boosts private returns on education. According to Haaga (2004), workers who have persevered and succeeded in their academic career are more likely than others to have specific skills, general knowledge, the ability to acquire new skills, and other personal characteristics that employers value.

Winters (2016) revealed that increasing college graduates are important for regional economic growth though those graduates are quite geographically mobile. Drucker (2016) asserts that regional economic development drives higher education institutions to offer more advanced degrees that are positively associated with entrepreneurial activity. This encourages the traditional missions of research and teaching, as well as general policies that promote entrepreneurship, to support economic performance. According to Vogel and Keen (2010) and Selingo (2016), colleges and universities are becoming more widely acknowledged by US policymakers as sources of economic growth and development. Higher expenditures on education are supposed to lead to increased levels of human capital in an economic system. This leads to an increase in productivity, earnings, new business attractions, and other positive externalities, with a boost in economic performance (Abhijeet and Islamia 2010; Erdem and Tugcu 2012).

The system of higher education in the USA is more dispersed than that of most other industrialized nations (Koedel, 2014). State governments control the majority of public institutions. The regulation and oversight of private institutions vary depending on the state but are greatly affected by federal financial aid allocations. In the United States, most high-school graduates go on to pursue more education due to the educational demands of well-paying jobs and as a significant factor in social and income mobility (Perfetto, 2012; Baum, et al., 2013). Regarding West Virginia, it has reported low educational attainment levels and

high unemployment rates compared to many states in the United States. Even though the government has spent more on education investment for human capital formation, the number of higher education graduates working in the state has decreased over time (Hough, 1996). Nevertheless, the State's public higher education institutions are essential for enhancing the educational achievement of its residents and workforce. According to Swisher (2017), the state's public higher education institutions continue to generate revenue and have one of the largest economic impacts of any agency or organization.

In West Virginia, access to postsecondary education depends on three central factors: adequate preparation, accessible information, and feasible cost (Wagner, 2010). West Virginia already has one of the least educated workforces in the country, and with a struggling economy, a growing share of future jobs will require a college education. West Virginia is part of a region that has not historically valued higher education (Higginbotham & Witt, 2010). However, according to Herndon (2008), expenditures on investment in education for human capital formation have increased in West Virginia, but the number of higher education graduates working within the state have decreased over time (Hammond, 2012). Investing in higher education to keep tuition affordable and provide quality education at public colleges and universities would help West Virginia develop the skilled and diverse workforce it will need to grow its economy (Scholar & Arcadipane, 2014).

## METHODOLOGY

### Data

The data for the analysis for the period of 1990 to 2023 were collected mainly from US census of Bureau, Bureau of labor statistics, West Virginia Higher Education Policy Commission (WVHEPC), USDA-ERS, City Data Book (C&CDB), and some from Appalachian Regional Commission (ARC). The analysis was based on annual data at the state level, and the statistical package STATA was used for the analysis. Table 1 contains definitions for all endogenous and exogenous variables utilized in this study.

Table 1: Definition For Variables and Summary Statistics

| Variable | Variable definition | Mean | Std. Dev. | Min | Max |
|---|---|---|---|---|---|
| TEMP | Total employment | 732, 793 | 28,480 | 671,085 | 805,561 |
| PCI | Per Capital Income | 29,791.44 | 10,500.97 | 14,608 | 49,200 |
| HEDU | Number over 25 of age who having Bachelor or higher degree | 311,521 | 61,138 | 219,382 | 430,312 |
| PHEDU | Percentage of population over 25 years old having Bachelor or higher degree | 17.141 | 3.41 | 12.2 | 24.1 |
| EEDHS | Employees in education and healthcare services in 1000' | 109.18 | 18.14 | 66.29 | 130.31 |
| ECONS | Employees in construction sector in 1000' | 35.32 | 4.18 | 29.75 | 46.85 |
| EPBSS | Employees in professional and Business service sector in 1000' | 57.01 | 11.21 | 33.37 | 71.82 |
| EMANU | Employees in manufacturing sector in 1000' | 52.69 | 6.98 | 43.68 | 64.70 |
| CRIME | Crime rate foe 100,000 population | 285.47 | 57.94 | 169.30 | 366 |
| PRATE | Poverty rate % | 17.96 | 0.82 | 16 | 19.25 |
| TPOPL | Total population | 1,817,747 | 23,639 | 1,766,945 | 1,857,446 |
| PCHGE | Annual population change | -0.059 | 0.39 | -0.78 | 0.59 |

*Table 1 shows the definitions, average, standard deviation, minimum and maximum values of the variables considered for the analysis. The table was created using annual data for the period of 1990-2023. Column 1 gives the variable codes used and column 2 gives the definition of the variables. The rest of the columns give summary statistics.*

### Method

A model with a system of simultaneous equations is used for analysis. Number of people having a bachelor's degree or higher as the level of education (HEDU), total number of employees (TEMP), and Per Capital income (PCI) at state level were used as endogenous variables, while population change (PCHGE),

poverty rate (PRATE), Crime rate (CRIME) and some other socioeconomic variables were used as exogenous variables. All the variables were applied at the state level for the period of 1990 to 2023, for 34 years. A system of equations estimates all the identified structural equations together as a set. The most important advantage of this method is to have a small asymptotic variance. According to Zellener and Thiel (1962), 3SLS is more efficient than a two-stage least squares (2SLS) estimator and the method can take account of restrictions on parameters in different structural equations. The focus of this study is to analyze the relationship between higher education and economic growth represented by the changes of per capita income, total employments, and number in higher education. The general form of the three simultaneous equations model is as follows:

$$TEMP = f(HEDU, PCI/X^{TEMP} \qquad\qquad (1)$$
$$HEDU = f(TEMP, PCI/X^{HEDU} \qquad\qquad (2)$$
$$PCI = f(HEDU, TEMP/X^{PCI} \qquad\qquad (3)$$

where TEMP, HEDU and PCI are endogenous variables, while $X^{TEMP}$, $X^{HEDU}$, $X^{PCI}$ are set of exogenous variables having either direct or indirect effects on the endogenous variables.

Empirical Model

Starting from the theoretical model, the estimated econometric models for each dependent variable can be written as:

$$LHEDU = \beta0 + \beta1\,LTEMP + \beta2\,LPCI + \beta3\,PRATE + \beta4PCHGE + eit \qquad (4)$$
$$LTEMP = \beta0 + \beta1\,LPCI + \beta2\,LHEDU + \beta3\,PRATE + \beta4PCHGE + + \beta5CRIME + eit \qquad (5)$$
$$LPCI = \beta0 + \beta1\,LHDU + \beta2\,PRATE + \beta3\,PCHGE + \beta4LEPBSS + 5LEEDHS +$$
$$\beta6CRIME + eit \qquad\qquad (6)$$

**RESULTS AND DISCUSSION**

Descriptive Analysis

Figure 1 shows the changes of total population total employment, per capita income, poverty rate as well as some employment changes in leading sectors of West Virginia for the period of 1990-2023, for 34 years. According to the graphs in figure 1, and based on other research outcomes, it is clear that West Virginia faces problem of population declining with the time being. It was serious in recent years with the pandemic impact as well. However, total employment numbers and the per capital income show increasing rates while some industrial sectors maintain a good number of employees. It seems the poverty rate has declined slightly with the time being.

Figure 1: Population Changes in West Virginia, 1990-2023

Total Population 1990-2023



Population change -1990-2023
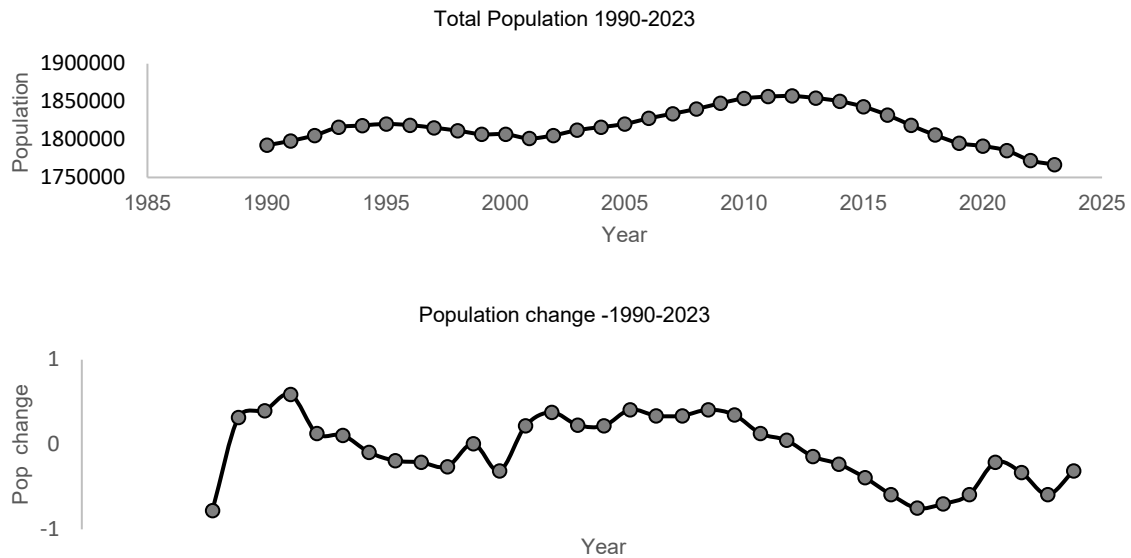


*Figure 1 shows two graphs. The first graph depicts the total population for the period 1990-2023. The second graph depicts population changes for the same period. The population in West Virginia is decreasing overall, as shown by both graphs. Graph 2 demonstrates a positive change in population over the past 4-5 years, indicating a slower decline in total population.*

Figure 2: Employment and Per Capita Income Change in West Virginia, 1990-2023

Total Employment -1990-2023



Per Capita Income 1990-2023
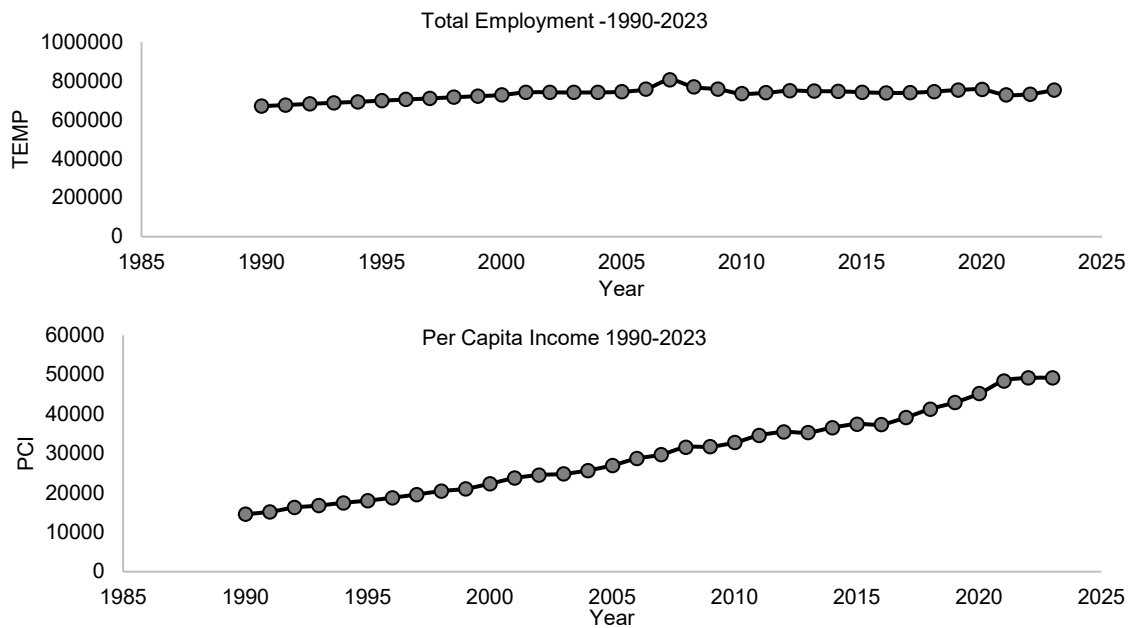
Figure 3: Employment Sectors and Per Capita Income Change in West Virginia, 1990-2023
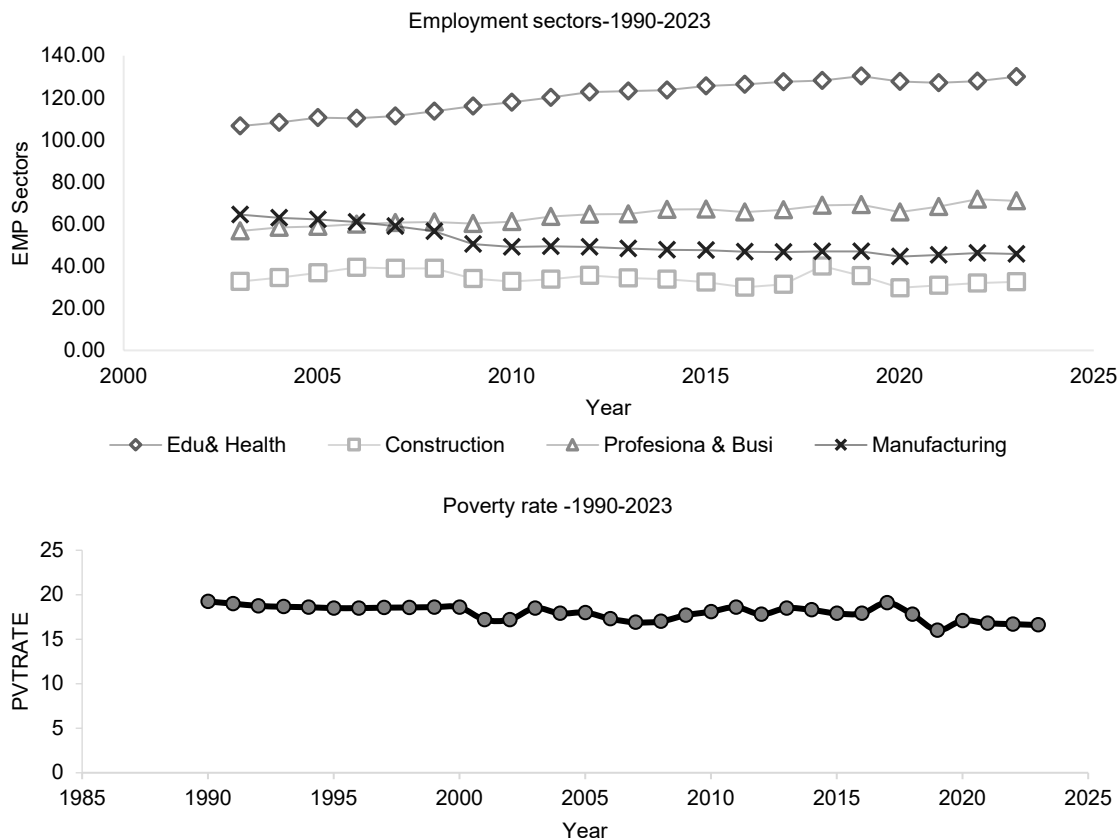


*Figure 3 displays two graphs. The first graph shows the total employment number in the selected sectors of education & health, constructions, professional & business, and manufacturing in West Virginia for the period 1990-2023. The graph shows that education & health, and professional & business sectors are becoming the primary sources of employment in West Virginia. The second graph shows the poverty rate in West Virginia for the same period, which shows a slight decrease over time.*

Regression Analysis

The results of the system of three simultaneous equations are shown in Table 2. Log forms of the endogenous variables (LHEDU, LTEMP, LPCI) were the best fit for the results presented in Table 2 after checking the statistical tests including multicollinearity and heteroscedasticity. Exogenous variables used in each equation are displayed in the first column of the Table. Columns 2 and 3 indicate results for higher education (LHEDU) equation while columns 4 and 5 present results for total employments (LTEMP). Result for the income (LPCI) equation is shown in columns 6 and 7. The empirical results for higher education (LHEDU) equation indicate that increasing total employment number (LTEMP) increases the number of higher education (LHEDU) significantly and positively, i.e., an increase in total employment by one percent leads to an increase in higher education by 0.91 percent. The result is supported by numerous studies as well (Johnson, 2011; Bashir et al., 2013; Maurova & Khan, 2016). Thus, there is a high potential for increasing income growth through investing more in higher education in West Virgnia. Also, results show that increasing Per capital income (LPCI) brings a positive and significant impact on increasing higher education (LHEDU). A one percent increase in per capita income would increase higher education by 0. 47 percent. In general, people would like to achieve higher knowledge and skills if they have better income opportunities. The decrease in population growth (PHGE) has a negative impact on increasing the LHEDU. This means that if there are fewer people, there will be fewer higher-educated individuals in the long run. This could negatively affect the local economic growth of West Virginia. By making better investments in

education and other income-generating activities, population decline could be minimized. Results show that increasing the rate of poverty (PRATE) has a positive impact on higher education (HEDU) in West Virginia.

Table 2: Results of 3SLS Regression Analysis

| Variable | LHEDU | | LTEMP | | LPCI | |
|---|---|---|---|---|---|---|
| | Coefficient | P >Z | Coefficient | P >Z | Coefficient | P >Z |
| LTEMP | 0.9126*** (0.336) | 0.007 | - | | - | - |
| LPCI | 0.4731 *** (0.0453) | 0.000 | -6.65e-06*** (0.001) | 0.000 | - | - |
| LHEDU | - | - | 0.4582*** (0.098) | 0.000 | 2.445*** (0.441) | 0.000 |
| PRATE | 0.0324** (0.0149) | 0.031 | -0.2496*** (0.008) | 0.002 | -0.0532 (0.034) | 0.128 |
| PCHGE | -0.0782 *** (0.0277) | 0.005 | 0.0392*** (0.014) | 0.007 | 0.1448** (0.074) | 0.052 |
| LEPBSS | - | - | | - | 0.6438* (0.363) | 0.077 |
| LEEDHS | - | - | - | - | 0.1012 (0.411) | 0.805 |
| CRIME | - | - | 0.0001 (0.001) | 0.830 | 0.0004 (0.003) | 0.915 |
| CONS | -5.1262 (4.337) | 0.238 | 8.358 (1.171) | 0.000 | -17.584 (-4.562) | 0.000 |
| N | 34 | | 34 | | 34 | |
| $R^2$ | 0.93 | | 0.56 | | 0.88 | |
| $Chi^2$ | 516.45 | | 81.60 | | 308.68 | |

*Table 2 shows the results of 3 SLS regression analysis. Column one shows the independent variables used for the analysis. Column two shows results for the log form of endogenous variable, number of people having a bachelor's degree or higher as the level of education (LHEDU) while column three shows the relevant P>Z. Column 4 shows results for the log form of endogenous variable, total number of employees (LTEMP) while column five shows its relevant P>Z values. Column six shows results for the log form of endogenous variable, Per Capital income (LPCI) while column seven shows the relevant P>Z values of each independent variable. \*\*\* means reaching the 1% significant level, \*\* means reaching the 5% significant level: \* means reaching the 10% significant level.*

According to the empirical results for total employment (LTEMP), an increase in per capita income (LPCI) could decrease LTEMP, but the impact is highly insignificant. Interestingly, higher education (LHEDU) shows positive and significant results, indicating the importance of higher education on total employment growth of the state. A 0.46 percent increase in total employment can be achieved by increasing higher education by one percent. It appears that the growth of higher education and employment coincides with the growth of economic growth. Thus, the development of comprehensive investment schemes is crucial to enhance economic growth in the state. Further, results show that high poverty rate (PRATE), decreases the employment growth in the state, while population change (PCHGE) brings positive impacts.

The regression results for per capital income (LPCI) shows that increasing higher education number (LHEDU) significantly increases the per capita income of the state. A one percent increase in higher education increases per capita income by 2.44 percent. The result is supported by some studies that highlight the importance of more investments in education (Herndon, 2008; Scholar & Arcadipane, 2014). Increasing the employment growth in professional and business services (LEPBSS) brings more impact on per capital income. A one percent change in EPBSS would bring about a 0.64 percent change in per capita income for West Virginians. As the EPBSS is one of the most growing sectors, improving the sector would bring multiplicative impacts to the state. Also, decreasing population change (PCHGE) impacts positively and significantly on PCI. It is obvious when the number decreases per person income allocation could be high.

A Path Forward

The study reinforces the connection between higher education and economic development, resulting in many positive spillover effects for a poor economy like West Virginia. According to various research findings, this is true for many states and countries worldwide. However, in the sense of higher education it needs to prioritize the major employment sectors of a state that demands various levels of knowledge and skills for efficient allocation of investments. The potential exists for this to differ from state to state, region to region, and country to country. This needs a better connection between two parties of higher educational institutions and different employment sectors to bring quick and immense economic changes. It appears

that this connection is still not well established in West Virginia, despite the occasional identification of economic-boosting sectors. According to literature, attempting to connect regionally would result in better outcomes. There is a need for more research and studies on this.

## CONCLUSION AND FUTURE WORKS

The study examines the importance of skilled labor in economic development. The main focus of the study was to understand the significant relationship between education, employment, and income growth in West Virginia in order to evaluate the importance of higher education on the economy of West Virginia. The study used secondary data collected mainly from the US Census Bureau, Bureau of Labor Statistics, West Virginia Higher Education Policy Commission, USDA-ERS, City Data Book, and some from the Appalachian Regional Commission. The study followed 3 SLS analysis using simultaneous equations with 3 endogenous variables of number of people having a bachelor's degree or higher as the level of education (HEDU), total number of employees (TEMP), and Per Capita Income (PCI). To analyze equations, the STATA statistical package was utilized.

The study found significant relationships between higher education and economic growth in West Virginia. The results show a significant and positive connection between higher education, total employment, and Per Capita income. It clearly indicates the importance of higher education for increased employment growth in the state, and vice versa. The study found that professional and business services, as well as education and healthcare services, are the most demanding employment sectors in West Virginia. Thus, compared to sectors like construction, mining, and manufacturing in West Virginia, these sectors appear to be better investments to boost the economy of West Virginia. The results are crucial for scholars, policy makers, and all other economic agents, particularly when it comes to investing and improving research and education opportunities in West Virginia, which will lead to fulfilling the skilled labor requirement of the state. The study findings prompt further research into the most demanding employment sectors to pinpoint the exact educational skills needed for them. This would lead to spillovers in the state's economic growth.

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# REPUTATION, A PERFORMANCE LEVER? EVIDENCE FROM EURONEXT PARIS

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## ABSTRACT

*The reputation of the company is certainly its most precious intangible asset but also the most difficult to assess because it incorporates multiple dimensions. Despite the lack of a clear and precise consensus on the definition of reputation, many previous studies have endeavored to analyze the link between reputation and business performance. The results of this previous research generally highlight a positive impact of reputation on performance but also a reciprocal relationship between performance and reputation. Through this research, we seek to explore this link and its reciprocity by studying the large French capitalizations listed on the Paris Stock Exchange. This link is analyzed here in an economic and financial context disrupted by the Covid 19 health crisis. The data on which the econometric tests are carried out are the data for the year 2020. The results confirm that even in such a context of crisis, the reciprocity of the relationship between reputation approached by the Price to Book ratio and economic (ROA) and financial (ROE) performance is maintained, suggesting the existence of a virtuous circle between reputation and performance.*

**JEL**: M30, C21, G30

**KEYWORDS:** Reputation, Financial Performance, Economic Performance, Price to Book Ratio

## INTRODUCTION

Reputation is a concept that is still seeking its definition (Tomak, 2014; Sontaité, Kristensen, 2009; Wartick, 2002;) but its role is considered extremely important for an organization, since it is an element of corporate capital (Gibson et al., 2006). Its impact on a company's overall resources has been highlighted by Boistel (2007), and it is examined as a strategic element since it enables the organization to create a competitive advantage (Greyser, 1996; Maathuis, 1993) that is sustainable since it is difficult to imitate (Boistel, 2008). However, Taeuscher (2019) considers that reputation, in highly congested markets, can no longer represent a scarce resource and constitute a source of competitive advantage. Nonetheless, it remains an important source of value for companies. De Marcellis-Warin and Teodoresco (2012) state that reputation is the single most important driver of value creation or destruction within a company. Reputation is an intangible asset, and intangible resources drive organizational performance (Zigan, 2013). This is because they are the rarest and most valuable and therefore difficult to imitate and replace, offering competitive advantage and superior performance to the organization (Brahim and Arab, 2011; Boistel, 2007,). Corporate reputation is considered one of the most important intangible resources (Pires and Trez, 2018) and is seen as a driver of organizational performance (Vance and Angelo, 2007). Pires and Trez (2018) point out that literature is divided on the link between reputation and performance. Some argue that corporate reputation affects organizational performance, while others stipulate that organizational performance affects corporate reputation. For example, Deephouse (2000)

established a link with corporate performance. Roberts and Dowling (2002) have shown that companies with good reputations generally perform better in the long term due to the reputation effect.

The aim of our research is therefore to analyze the links between reputation and performance in a financial context disrupted by the health crisis. To this end, this study focuses on the 149 French companies listed on Compartment A - Euronext Paris (situation in May 2022) and explores the possible reciprocal link between their reputation and their level of economic and financial performance in 2020. We first present an analysis of the literature on the links between performance and reputation, followed by the methodology and finally the discussion and managerial proposals before concluding.

**LITERATURE REVIEW**

Performance and reputation: an ambiguous link? According to the literature, reputation and performance are reciprocally linked: reputation affects performance and vice versa. The literature states there is a link between an organization's performance and its reputation (Dimov et al., 2007; Fischer and Reuber, 2007; Pollock and Gulati, 2007; Rindova et al., 2007), even if some are not totally convinced, such as Rose and Thomsen (2004), who state that it is plausible that reputation influences performance. In order to understand how reputation affects performance, there are several sources of explanation, each of which belongs to a particular stream of research. Reputation affects company performance through its signaling effect (Taeuscher, 2019). Reputation is an informative signal (Ackerlof, 1970) representing a contract guarantee (Cornell and Shapiro, 1987). It consists in informing stakeholders about the quality of unobservable organizational characteristics, and in particular consumers about product quality (Rindova et al., 2010; Jensen and Roy, 2008; Dimov et al., 2007; Rindova et al., 2005). This disseminated information can explain the demand for a company's specific products (Shapiro, 1982), since it reduces consumer uncertainty and consequently increases their probability of purchase (Shapiro, 1982; 1983).

A second source of explanation lies in resource theory (Barney, 1991), which states that reputation is an intangible resource or asset (Rindova et al., 2010; Boyd et al., 2009; Deephouse, 2000; Barney, 1991). Intangible resources can be seen as an element in the creation of competitive advantage and performance (Grant, 1996). This reputational resource helps build a source of competitive advantage (Boistel, 2008) leading to corporate performance (Bergh et al., 2010; Roberts and Dowling, 2002). As Boistel (2007) has shown, this competitive advantage is sustainable because companies do not have the same resources, and reputation management requires prior work that is not visible to competitors, making it virtually impossible to copy in the short term, while at the same time generating positive effects in terms of sales, human resources, and financial gains. As a result, "it is presented as a unique element, difficult to imitate and copy" (Boistel, 2014). Taeuscher (2019) notes this phenomenon as the competitive effect of reputation.

There are other ways of understanding the impact of reputation on corporate performance. The stakeholder's theory initiated by Freeman (1984) stipulates the company cannot neglect its influential stakeholders. There is thus a social contract between the organization and its stakeholders, based on acceptance of society's values and expectations. Reputation is thus a social structure characteristic of our society, constituting an instrument of control representing a dominant collective convention built on what the individual knows (Camic, 1992; Lang & Lang, 1988). Reputation is then the ongoing evaluation of the company by all its stakeholders in terms of the social norms and expectations it generates (Boistel, 2008). As a result, the company and its practices are better accepted, and this has an impact on its performance. Guimaraes (1985) has shown that a company with an excellent reputation can raise more capital on the stock market (up to 20 times) for the same level of profit as a company with a poor reputation, and the better the reputation, the lower the cost of capital to raise.

More pragmatically, since reputation has an impact on customers, performance is undoubtedly positively affected, since reputation makes it possible to create and maintain a more qualitative marketing approach

that promotes greater profitability (Boistel, 2008). Reputation acts on purchase intention (Yoon, 1993), increases confidence in products (Shimp and Bearden, 1982) and enables prices to be raised as soon as products are of high quality (Herbig and Milewicz, 1995), all of which naturally have an impact on company performance. Similarly, there is a correlation between consumer satisfaction and reputation (Andreassen and Lindestad, 1998), the latter helping to build a competitive advantage (Boistel, 1994) that promotes sales and protects products from the competition, since it makes products imperfectly replaceable and imitable (Boistel, 2008). These elements thus contribute to better financial performance if marketing investments do not outweigh the gains. Even so, a company with superior financial performance can positively influence its reputation (McGuire et al., 1990). This is a different signaling effect from the one at the beginning of this paragraph, but it does have an impact on reputation. Rose and Thomsen (2004) found that studies along these lines are few and far between. Their conclusions are more nuanced, as these authors reject the hypothesis that reputation improves performance, but do not reject the hypothesis that company's financial performance affects reputation. Thus, they state that strengthening a company's reputation is not a sure-fire way to achieve financial success.

However, financial market theories indicate that a company's value is built on a combination of realized values and market expectations (Dowling, 2002). Numerous empirical studies have long confirmed this fact. Companies ranked in Fortune achieve better financial performance (Roberts and Dowling, 1997). Fombrun and Shanley (1990) conclude from their study of 292 major US companies that historical performance and other non-economic indices influence reputation. Roberts and Dowling (2002), based on a longitudinal study of the most admired companies (Fortune ranking) from 1984 to 1988, state that companies with good reputations have a higher probability of maintaining superior results over time. There is therefore a relationship between profitability and reputation (Gale, 1987; Buzzell, 1983).

For shareholders, too, reputation is a source of gain, since it appears as a market signal favoring risk reduction (Aaker and Jacobson, 1994). Companies with good reputations increase the duration of financial gains relative to their competitors (Dowling, 2002). Reputation helps to understand the gap between the market value and book value of companies (Pires and Trez, 2018; Vomberg et al., 2015; Boj et al., 2014; Zigan, 2013; Amadieu and Viviani, 2010; Kumar, 2009; Perez and Fama, 2006). Reputation helps a company to survive because of the risk management associated with capital markets, particularly when these become highly volatile and investor behavior is no longer based on rational logic but on fear (Rose and Thomsen, 2004). Thus, an autocorrelation exists between reputation and firm value, "indicating that past values of reputation and firm value affect current values" (Rose and Thomsen, 2004). Michalisin et al (2000) found a relationship between intangible strategic assets (including reputation) and relative return on equity. Barry and Epstein (2000) also showed that companies with the best reputation ratings were the most innovative and scored the highest in terms of management quality.

The Difficulty of Measuring Reputation

Exploring the link between reputation and performance is no easy task, given the difficulty not only of defining reputation, but also of measuring it (Walker, 2010). The difficulty of measurement lies in the intangible nature of reputation (Cravens et al., 2003). Trotta and Cavallaro (2012) identify two categories of reputation measurement. Firstly, the category traditionally used in the literature is based exclusively on a qualitative approach. The authors recall that until 1997, the only reputation score used was Fortune's Most Admired Companies. Since then, the literature has been enriched by other types of reputation scores, the most common of which are the Reputation Quotient by Fombrun and Van Riel (1997), the Reputation Index model by Cravens et al. (2003) and the RepTrak system developed by The Reputation Institute since 2006 (Cherchiello, 2011). However, this qualitative approach is often associated with a subjectivity bias (Trotta and Cavallaro, 2012). The second approach is purely quantitative. It was developed to overcome the main bias of the qualitative approach (Trotta and Cavallaro, 2012; Cherchiello, 2011). The three most common quantitative measures of reputation (Tomak, 2014, Trotta and Cavallaro, 2012; Cherchiello, 2011) explain

each of the three measures of reputation developed based on a quantitative approach: the intellectual capital approach, the marketing approach, the accounting approach.

Tomak (2014) and Cherchiello (2011) indicate that intellectual capital approach is based on the prediction of five dimensions such as trademarks, service marks, copyrights, authorizations, and exclusive rights. The authors point out that, although the values of these intangible elements are traceable in balance sheets, the different accounting practices implemented within companies limit comparisons. They also point out that sudden items are not included in the model, and that this can have an impact on reputation. The marketing approach, according to Tomak (2014) and Cherchiello (2011), reduces reputation to the brand. However, in doing so, this approach neglects a whole series of other dimensions of reputation. Regarding the accounting approach, these same authors stress the need to introduce fair value measurement criteria. In this regard, Pirez and Trez (2018) recall the existence of the two methods generally used in this accounting approach to reputation. The first method, which for the authors is the least relevant, apprehends it through accounting indicators and historical returns. The second method considers the value of shares, on the understanding that this is directly linked to the market's perception of a company's reputation. A company's reputation is therefore captured by the difference between its book value and its market value. Despite their a priori differences, Trotta and Cavallaro (2012) point out that accounting approach and the intellectual capital approach are both based on the idea that there is a gap between the market value of listed companies and their book value. This gap represents the value of intellectual capital in the first approach, and the value of intangible assets in the accounting approach. It is therefore an estimate of reputation. The Latter Approach is Chosen for the Remainder of this Paper.

## METHODOLOGY

This research focuses on French companies listed on Compartment A of Euronext Paris. According to Euronext criteria, these are companies with market capitalizations more than €1 billion. Table 1 shows the breakdown of companies listed on Compartment A in Paris in May 2022. Over 84% of companies listed in Compartment A of the Paris stock exchange are of French nationality. The decision to study only French companies in this compartment is linked to the year chosen for the study. Indeed, we focused on the link between reputation and performance in 2020 (annual data were used), which was a particularly turbulent year in economic terms due to the health crisis. We therefore limited our field of study to companies operating in the same crisis economy.

Table 1: Sample Presentation

| Filters | Number of Companies |
|---|---|
| Compartment A – Euronext Paris (situation in mai 2022) | 177 |
| Focus on French companies | 149 |

*Table 1 presents the sample of this study. It focuses on French companies listed in Euronext Paris.*

To understand the reputation of these companies, we chose the second method proposed by Pires and Trez (2018). The latter apprehends reputation by identifying the surplus market value that it can confer on the company in relation to its book value, which is equivalent to calculating the Price to Book ratio. This ratio relates a company's market value to the book value of its assets. A Price to Book ratio greater than 1 can potentially mean two things. Firstly, it may mean the market, i.e., all investors, is valuing the company's assets higher than their book value. However, a large proportion of intangible capital, including reputation, is not recorded in company accounts. Consequently, a Price-to-Book ratio greater than 1 can also mean the company's market value includes the value of its intangible assets, of which reputation is an integral part. However, to use the Price to Book ratio as a proxy for reputation, it is necessary to consider that, from an informational point of view, the market is efficient in the semi-strong form. The postulate adopted in this study is that, if the market is informationally efficient in the semi-strong form, then a company's share price

incorporates all available information. The company's share price, which is originally derived from the equilibrium between supply and demand for the stock, then crystallizes the company's market value in the sense that it represents the discounted sum of all future cash flows linked to the holding of the stock.

The additional market value in relation to the company's book value in the context of a Price to Book ratio greater than 1 therefore approaches the value of the company's intangible assets and serves, in the context of this study, as a measure of the reputation perceived by investors. Like Tomaz (2014), we therefore consider that reputation, a multidimensional concept, constitutes part of the intrinsic value of the company, which is considered in the market value of the share if it cannot be fully valued in the company's financial statements. Indeed, according to Soumia and Amar (2019), reputation is an invisible asset that justifies part of the gap between a company's book value and its market value. Financial performance and economic performance, on the other hand, are approached in a conventional way, using, respectively, return on assets (net income/total assets) and return on equity (net income/equity).

Regression Models

The link between reputation and performance is examined on cross-section data for the year 2020. The ordinary least squares method is used to first identify the impact of reputation on the performance of French companies listed on Compartment A of the Paris stock exchange. We then test the reciprocal by analyzing the impact of performance on reputation. Stata 13.1 software is used to test the following two models:

$$Performance = \alpha + \beta1 * Reputation + \beta2 * size + \beta3 * \text{level of debt } \beta4 * sector \qquad (1)$$

$$Reputation = \alpha + \beta1 * Performance + \beta2 * size + \beta3 * level\ of\ debt + \beta4 * sector \quad (2)$$

We have also chosen to include the following control variables: size, sector of activity and degree of debt. These variables are classically used in the literature. All data are extracted from the Factset database. Table 2 presents the definitions and measures of the variables used in the specification of the two models.

Table 2: Variables Definitions and Measures

| Definitions | Measures | Code |
|---|---|---|
| Financial Performance | Return on Equity = Net Income/ Equity | ROE |
| Economic Performance | Return on Asset = Net Income/total Assets | ROA |
| Reputation | Price to Book = market capitalization / book value | PTB |
| Sector | Dummy variables based on this sector segmentation | SEC |
| | Finance | SEC Fin |
| | Consumption | SEC Cons |
| | IT Communication | SEC IT&C |
| | Services | SEC Serv |
| | Industry | SEC Ind |
| | Health | SEC Health |
| Level of Debt | Debt/ total Assets | DEBT |
| Size | Ln total assets | SIZE |

*Table 2 shows the variables used in this study and how they are measured. As reputation proxy we used the price to book ratio. ROE and ROA are used as financial and economic performance measures.*

## RESULTS AND DISCUSSION

Descriptives Statistics and Correlation

Table 3 presents the descriptive statistics for the variables included in this study. The average economic performance (ROA) of our sample is 2.3%, meaning that €100 of assets generates €2.3 of net income.The average financial performance (ROE) is 3.12%, meaning that €100 contributed by shareholders generates €3 of net income. However, we note the volatility of ROE is higher than that of ROA, underlining the greater dispersion of financial performance data within the database. Reputation, approximated by the Price to Book ratio, averages 2.8, meaning the market value of the shares of the companies in the database represents 2.85 times their market value. The reputation perceived by investors concerning the companies in the database therefore appears to be positive on average on this market, but the volatility of the indicator remains high, implying a high degree of variability in the reputation of companies in Compartment A of the Paris stock exchange.

Table 3: Descriptive Statistics

| Variables | Obs | Mean | Std_Dev | Min | Max |
|---|---|---|---|---|---|
| ROA | 148 | 2.301 | 10.77 | -23.31 | 96.51 |
| ROE | 146 | 3.124 | 33.83 | -188.4 | 264.4 |
| PTB | 145 | 2.851 | 2.994 | 0.2151 | 18.66 |
| SIZE | 148 | 9.053 | 1.804 | 4.788 | 14.73 |
| DEBT | 145 | 161.4 | 233.1 | 1.219 | 2255.3 |

*Table 3 exhibits the descriptive statistics of the variables included in the study.*

Table 4 shows the correlations between the variables. As expected, there is a fairly strong correlation (0.8522) between the ROE and ROA performance variables. It is therefore customary to use the performance indicators ROE and ROA in separate models, as they are highly correlated. No other problematic correlations were found.

Table 4: Variables Correlations

| | ROA | ROE | PTB | SIZE | DEBT |
|---|---|---|---|---|---|
| ROA | 1.0000 | | | | |
| ROE | 0.8522 | 1.0000 | | | |
| PTB | 0.4687 | 0.3703 | 1.0000 | | |
| SIZE | -0.2848 | -0.1620 | -0.2957 | 1.0000 | |
| DEBT | -0.2221 | -0.3400 | -0.0767 | 0.2506 | 1.0000 |

*Table 4 shows the correlations between the variables. ROA and ROE are strongly correlated. There will be used in separated models.*

## REGRESSIONS

Table 5 first presents the results of testing model 1 (impact of reputation on performance). Model 1a regresses economic performance (ROA) on the set of independent variables retained, while model 1b regresses financial performance (ROE) on the same set of independent variables. Models 1a and 1b appear globally significant at a statistical significance level of 1%, suggesting correct model specification. A prior Breusch-Pagan / Cook-Weisberg test revealed the presence of heteroscedasticity in the residuals, necessitating the use of White's correction. The results of the 1a model test show a positive and significant impact (at the 5% threshold) of the Price to Book ratio on ROA, meaning that reputation has a positive effect on performance measured in economic terms. The results are similar when the model is tested on financial performance. The coefficient of the Price to Book ratio is even 2.7 times higher than the coefficient

obtained in the test of model 1.a. This means that financial performance is more sensitive to reputation, as measured by the Price to Book ratio, than economic performance.

Table 5: Reputation Impact on Financial and Economic Performance

| Dependent Variable: Performance | | |
|---|---|---|
| | Model 1a<br>ROA | Model 1b<br>ROE |
| Independants Variables | | |
| PTB | 1.7056* | 4.6266* |
| | (0.7252) | (2.069) |
| SEC Cons | -6.4507 | -20.29 |
| | (4.181) | (12.24) |
| SEC Ind | -6.2219 | -23.519 |
| | (4.1228) | (12.904) |
| SEC Health | -8.3999 | -26.645 |
| | (6.6978) | (18.976) |
| SEC Serv | -8.3130* | -22.262 |
| | (4.1732) | (11.961) |
| SEC T&C | -7.9325 | -7.6312 |
| | (4.3870) | (11.76) |
| SIZE | -0.9365 | -0.1846 |
| | (0.6411) | (1.8563) |
| DEBTS | -0.0096** | -0.0559** |
| | (0.0027) | (0.0083) |
| _Cons | 13.319 | 17.916 |
| | (7.7130) | (22.485) |
| | | |
| Observations | 144 | 144 |
| $R^2$ | 0.3352 | 0.3021 |
| Adjusted $R^2$ | 0.2958 | 0.2607 |
| F | 2.67** | 6.41** |

*Table 5 displays the regression results of the impact of reputation on performance. Model 1a uses ROA as economic performance measure while Model 1b uses ROE as financial performance measure. ***, ** and * indicate the significance at the 1, 5 and 10 percent levels respectively.*

Following the example of Taeuscher's work (2019), we discover that reputation affects performance. We can assume that this reputation, illustrated in our case by the Price to Book ratio, represents a competitive advantage (Boistel, 2008) that leads to better performance (Bergh et al., 2010; Roberts and Dowling, 2002), both economic and financial. Moreover, if the company enjoys a better reputation, it can count on confidence in its products (Shimp and Bearden, 1982), secure purchase intentions (Yoon, 1993) and thus afford to raise prices when its products are judged to be of high quality (Herbig and Milewicz, 1995), which most likely influences its net income, the key element in financial and economic performance ratios.

In both models 1a and 1b, our results show a statistically significant (at the 1% threshold) and negative impact of the overall degree of debt. Thus, the higher the debt-to-equity ratio, the lower the economic and financial performance. This result is certainly related to the way in which performance ratios are calculated. Indeed, the numerator of ROA and ROE is based on net income, which is a purely accounting concept and comes from the bottom of the income statement. Net income is therefore highly sensitive to negative influences, particularly those linked to interest expenses. Despite this, our results tend to show that performance of the companies in our database is sensitive to their financing structure.

The results also show in the 1a model test that belonging to the service sector rather than the financial sector (corresponding to category 0 of the dummy variable) has a negative impact on economic performance (at the 5% threshold). This result is not at all confirmed by the Model 1b test, as this variable appears to be statistically insignificant at the maximum 5% threshold. This result is undoubtedly linked to the period studied. Indeed, the sectoral impact of the economic crisis linked to the Covid 19 pandemic was very different from one sector to another. The statistical study by Bignon and Garnier (2020) shows that crisis had a far greater impact on the service sector than on the industrial and construction sectors. Table 6 shows the test results for model 2 (impact of performance on reputation). As previously explained, the high correlation between the two performance variables does not allow us to show these two variables in a single model. We therefore regressed reputation first on the set of independent variables including ROA (model 2a) and then on the same set of variables but this time including ROE (model 2b).

Table 6: Impact of Economic and Financial Performance on Reputation

| Dependant Variable: Reputation (PTB) | | |
|---|---|---|
| | Model 2a | Model 2b |
| Independent Variable | | |
| ROA | 0.1272** | |
| | (0.0183) | |
| ROE | | 0.0359** |
| | | (0.0086) |
| SEC Cons | 2.0597** | 2.0481** |
| | (0.6384) | (0.6773) |
| SEC Ind | 1.5842** | 1.6882** |
| | (0.4483) | (0.4716) |
| SEC Health | 3.6642* | 3.7208* |
| | (1.4421) | (1.4512) |
| SEC Serv | 1.7830** | 1.5719** |
| | (0.4848) | (0.4807) |
| SEC T&C | 1.4077 | 0.6985 |
| | (0.7646) | (0.6721) |
| SIZE | -0.2124 | -0.3465** |
| | (0.1215 | (0.1118) |
| DEBT | 0.0016 | 0.0024** |
| | (0.0009) | (0.0008) |
| _Cons | 2.6872 | 4.0229 |
| | (1.2486) | (1.1712) |
| | | |
| Observations | 144 | 144 |
| $R^2$ | 0.3442 | 0.3016 |
| F | 14.11 | 8.23 |

*Table 6 displays the regression results of the impact of performance on reputation. Model 2a uses ROA as economic performance measure while Model 2b uses ROE as financial performance measure. ***, ** and * indicate the significance at the 1, 5 and 10 percent levels respectively.*

The specification of models 2a and 2b is satisfactory, given the respective F stat of each model. It should be noted that here too, the Breusch-Pagan / Cook-Weisberg test carried out previously highlighted the presence of heteroscedasticity in the residuals. White's correction was again used to test models 2a and 2b. The results in Table 6 show that inverse relationship between reputation and performance is verified, since our results show that both economic and financial performance positively influence the PTB, which we use here as a proxy for reputation. Companies with better economic and financial performance would have a higher PTB ratio, reflecting a better reputation. These results corroborate the work of Fombrun and Shanley

(1990) and McGuire et al. (1990). Furthermore, the results of model 2b suggest that reputation, as measured by the PTB ratio, is negatively affected by company size. This somewhat surprising result is undoubtedly linked to the variable SIZE itself. The variable is captured by the natural logarithm of total assets. It would therefore seem that the larger a company is in terms of total assets, the lower its PTB ratio will be. As a result, the market value attributed by investors to companies with large amounts of assets is relatively lower than that attributed to companies with lower levels of assets. Reputation is therefore not a question of company size. The results of the Model 2b test also show a positive influence of the overall degree of indebtedness on the level of reputation approached by the PTB ratio, at a statistical significance level of 1%. This means that companies with more debt are also those with a better reputation. This result is related to Ross's (1977) signal theory. According to this theory, a company that takes on debt sends a positive signal to the market in the sense that it signals to all its investors its ability to repay its debt. This conclusion can also be seen from a reputational point of view. As the concept of reputation is protean and multidimensional, it also encompasses the more specific dimensions of the relationship between a company and its creditors. A company listed on the stock exchange is seen by its investors as a company with a reputation for being able to repay its debts.

**CONCLUSION**

The literature review suggests an ambiguous relationship between reputation and performance. The ambiguity lies in the reversibility of the relationship between reputation and performance. Indeed, several authors have identified a positive relationship between reputation and performance, whether economic or financial, while others advocate the existence of a positive relationship, this time between performance and reputation. The lack of consensus in the literature on this subject can be explained in several ways. Firstly, the difficulty of unanimously defining corporate reputation (Tomak, 2014; Sontaité and Kristensen, 2009; Wartick, 2002) is a major obstacle to the comparability of results from previous studies. Secondly, the fact that reputation is an intangible asset makes it very difficult to measure. Thirdly, existing measures of reputation all have relatively significant weaknesses: even if the majority of authors agree on the recognition of the intangible nature of reputation, it has to be said that qualitative and quantitative measures of reputation fail either to capture all the dimensions covered by reputation, or to capture only the dimensions relating to reputation. In this research, we wanted to analyze the link between reputation and performance in the light of a particular year for French large caps listed on the Paris stock exchange. This particular year is 2020, which was strongly marked by an economic crisis linked to the COVID19 pandemic.

The results of our study, in line with the findings of previous studies, showed the existence of a positive reciprocal relationship between reputation and the economic and financial performance of these companies, even in an economic and financial context that had suffered numerous disruptions. Thus, companies with better reputations have better levels of economic and financial performance, and better-performing companies have better reputations because they have more internal funds to devote to their intangible assets, of which reputation is one. This reciprocal relationship suggests the existence of a virtuous circle between reputation and performance, even when companies are experiencing an economically difficult and financially troubled year. In this sense, our results highlight the existence of a synergistic relationship between reputation and financial performance (Tomak, 2014).

The key role thus played by reputation and the link with performance imply the importance for managers to do what it takes to maintain, or even better, enhance, this reputation. From investor point of view, it's an interesting indicator to keep an eye on, especially if performance is a priority. The originality of our study undoubtedly lies in the use of the Price to Book ratio as a proxy for reputation, and in the analysis of its link with performance in a troubled economic and financial context. Indeed, the Price to Book ratio leaves it up to the market, i.e., all investors, to assess a company's fair value in relation to its book value. This way of measuring reputation is fully in line with the accounting approach to quantitative measures of reputation assumed to be more relevant by Pires and Trez (2018). On the other hand, our research is

perfectible in several respects. First, approaching the reputation of a listed company through the Price to Book ratio requires a relatively strong assumption regarding the level of informational efficiency of the Euronext Paris market. However, in a troubled financial context, the semi-strong informational efficiency assumption may not be met throughout 2020. As a result, the share price may simply be the equilibrium price between supply and demand for these shares, and not an approximation of their true value. In such a scenario, the Price to Book ratio is unable to capture any additional value granted to intangible assets by the market. Furthermore, even if the semi-strong informational efficiency hypothesis were respected, approaching reputation using the Price to Book ratio may lead to another bias in the sense that it can only be a reputation perceived by investors, which is not really the same thing as a proven reputation. Similarly, this market-perceived reputation may also differ from other measures of reputation, which would be based more on a customer approach. It is, in fact, the company's customers who enable it to generate sales. Approaching reputation through a market indicator such as the Price to Book ratio can therefore create a kind of distortion of corporate reality. Indeed, the reputation perceived by investors on the financial market may be totally different from that perceived by the company's other stakeholders.

This study could also be improved by including French companies listed on the other two compartments of the Paris stock exchange. This would provide us with a different spectrum of company sizes and could give us a better idea of the influence of size on reputation. Furthermore, the integration of other types of variables could enable us to better control our results. For example, it would certainly be useful to analyze the impact on reputation of French companies' membership of the CAC40 index, and also to include variables that better capture the tangible nature of the asset. An analysis based on panel data could also be envisaged to verify the temporal consistency of the results. Despite the perfectible nature of this study, the results concerning the positive reciprocal link between reputation and the economic and financial performance of companies undeniably demonstrate the strategic importance of reputation for companies. Thus, even in financially and economically complicated times, reputation is an essential driver of performance. At a time of repeated health scandals, this observation takes on its full meaning.

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