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Abstract

This study examines the impact of business volatility on employee performance. We posit that employees work harder in a more volatile business environment as prior research links business volatility to increased use of performance-based compensation systems, which may result in better employee performance. Our results suggest that business volatility has a significant and positive impact on employee performance. Furthermore, we find that the relationship between business volatility and employee performance is stronger for larger firms and firms with higher labor intensity.

Keywords: business volatility; employee performance; employee productivity; employee efficiency; employee cost.
Data availability: Data are available from sources identified in this paper.

Business Volatility and Employee Performance

1. Introduction

Business volatility is defined as "the variability of change that characterizes environmental activities relevant to an organization's operations" (e.g., Child 1972). Business volatility has been of interest to organizations for many decades as the global economy is becoming increasingly uncertain due to rapid technological advances, constantly changing customer demands, increased deregulations, and the disappearing of trade barriers (Mia and Clarke 1999; Leifer, O'Connor, and Rice 2001; Puranam, Singh, and Zollo 2006). Much of the prior research on business volatility has focused on how organizations (i.e., managers) respond to a changing business environment in order to reduce the level of volatility. For example, Ghosh and Olsen (2009) document that managers are likely to use more accounting discretion when the external business environment becomes more volatile. Despite the obvious impact of business volatility on managers, there is limited empirical evidence on whether and how a volatile environment affects employees, an important stakeholder group.

The purpose of this study is to examine the impact of business volatility on employee performance. Following anecdotal evidence[1], we posit a positive relationship between business volatility and employee performance. Using a 53-year panel sample with 3,306 unique U.S. firms and 29,065 firm-year observations, we find a significant and positive relationship between business volatility and employee performance, suggesting that employees work harder when the external business environment becomes more volatile. Consistent with prior research (e.g., Stuebs and Sun 2010), we follow the DuPont technique to decompose the employee performance ratio into two components: the employee efficiency component and the employee cost

[1] Schulz, Wu, and Chow (2010) find survey evidence to suggest that employees tend to work harder in a more volatile environment.

component. The employee efficiency component measures how efficiently a firm uses total employee costs to generate sales. The employee cost component measures how well a firm controls employee costs to generate sales. The regression analysis reveals a significantly positive relationship between business volatility and the two components, suggesting that employee efficiency increases with the level of volatility and that firms tend to pay their employees more in such environment. In other words, firms with higher levels of business volatility tend to have employees that are more productive due to higher levels of efficiency, despite higher costs per employee. We also perform various additional tests including using alternative business volatility measures, changes analysis, fixed effects regression, two-stage OLS regression (2SLS), and additional control variable. Our results remain qualitatively unchanged across all tests. Overall, our evidence suggests that business volatility has a positive impact on employee performance. Furthermore, we find that our results are stronger for larger firms and firms with higher labor intensity.

This study makes the following important contributions. First, our study links and contributes to two streams of literature: employee/labor cost management from the accounting literature and business volatility (i.e., environmental uncertainty) from the management literature. Whether business volatility affects employee performance remains an interesting question that has not been definitively answered empirically. To the best of our knowledge, this is the first empirical study that directly examines the relationship between business volatility and employee performance at the firm level. Further, our study provides insight into the motivation for, and objectives of, employee performance management given the firm-specific context of business volatility.

Second, anecdotal evidence from Schulz et al. (2010) suggests that employees tend to work harder when the external business environment becomes more volatile. We document a significant positive relationship between business volatility and employee performance. Thus, our study extends Schulz et al. (2010) by providing empirical evidence to support the validity of their prediction. Moreover, other studies (e.g., Tang, Hull, and Rothenberg 2012; Sun and Yu 2015) also indirectly imply that external environmental volatility may induce employees to work harder. Taken together, our findings strengthen the prediction in prior research by documenting employee performance increases in business volatility.

Third, our study also has several practical implications to different stakeholder groups, by providing evidence that yields a richer understanding of how volatile operating environments affect firms' employees. Our results should interest policymakers who design and implement guidelines on employee performance. For example, when companies evaluate their employees' performance, they may use more challenging performance benchmarks in a volatile environment. Our findings should also interest shareholders (i.e., investors) by providing them with evidence that a volatile business environment may have a positive impact on their employees' performance. Hence, shareholders should continue to invest in their companies even in a more volatile environment. In the context of managerial implications, our results can help managers better understand the impact of business volatility on employee performance. More importantly, managers may need to improve their abilities to better cope with a more volatile environment, in order to match their employees' performance. Further, our results show a positive relationship between business volatility and employee costs, suggesting that employee costs (e.g., salaries) increase in business volatility. Thus, managers should be more willing to pay their employees more in a more volatile environment.

The remainder of this paper is organized as follows. Section 2 presents literature review and hypothesis development. Section 3 describes the research design and Section 4 presents the main results. Section 5 presents the results of additional analyses and Section 6 concludes this study.

2. Literature Review and Hypothesis Development

Prior research (e.g., Child 1972; Tung 1979; Dess and Beard 1984; Drago 1998; Ghosh and Olsen 2009) defines business volatility as "the variability of change that characterizes environmental activities relevant to a firm's operations". Business volatility is stochastic and unpredictable in nature. Milliken (1987) states that business volatility represents (1) an inability to predict as to the likelihood of future events (Duncan 1972; Pfeffer and Salancik 1978); (2) a lack of information to predict cause-effect relationships (Lawrence and Lorsch 1967; Duncan 1972); and (3) an inability to predict the outcomes of a decision (Hickson, Hinings, Lee, Schneck, and Pennings 1971; Duncan 1972; Downey and Slocum 1975; Schmidt and Cummings 1976).

Business volatility is a core concept in operations management and organizational theory (Dill 1958; Lawrence and Lorsch 1967; Thompson 1967; Duncan 1972; Ghosh and Olsen 2009). Because the external environment is always changing, it is critical for managers to cope with changes in order to succeed. Hence, Snyder and Glueck (1982) argue that a firm's response to business volatility has a significant impact on its performance. Ghosh and Olsen (2009) suggest that, although the external business environment places considerable constraints on firms, managers should still be able to identify opportunities to respond strategically to cope with volatility. In other words, when facing business volatility, managers may still have discretion and flexibility to develop different strategies to survive and then achieve maximum returns for their shareholders and themselves.

Prior research (e.g., Mia 1993; Mangaliso 1995; Chong and Chong 1997; Schulz et al. 2010; Hammad, Jusoh, and Ghozali 2013) finds that business volatility increases the need for more useful information in managers' decision-making process. Therefore, managers, when faced with more volatile environments, must attempt to gather more useful information in order to make better decisions for their companies. Some studies (e.g., Gordon and Miller 1976; Gordon and Narayannan 1984) find that the need for external and non-financial information also increases dramatically as the business environment becomes more volatile. Additional studies suggest that managers who fail to gather useful financial and non-financial information make inaccurate decisions for their firms. For example, Hill (2000) argues that, in a volatile business environment, organizations without adequate detailed information make uninformed decisions that reduce the net income and the quality of products. Similarly, Goodman, Neamtiu, Shroff, and White (2014) find that a volatile business environment increases management forecast inaccuracy, leading to poor investment decisions, due to the lack of sufficient information. Overall, the above studies suggest a positive relationship between business volatility and information asymmetry at the firm level. That is, information asymmetry increases in business volatility.

Other studies look at how companies respond to changes in the level of business volatility by shifting the structure of the company. Alexander (1991) finds increased levels of decentralization as a response by managers to business volatility, such that top-level managers tend to delegate a greater amount of responsibility to low-level managers. Cheng and Kesner (1997) show that more resources are allocated towards activities enhancing external market effectiveness in a volatile business environment. Dunk and Nouri (1998) find that volatile business environments tend to cause managers to increase budgetary slack. Davila and Wouters

(2005) suggest that a firm's budgeting process is impacted by its business volatility, and companies tend to increase slack more as the demand on business processes increases. With respect to earnings management, Ghosh and Olsen (2009) find that managers respond to a more volatile business environment by using more discretionary accruals as a means to mitigate the variability in reported earnings. Schulz et al. (2010) uses survey data to argue that firms with high levels of business volatility may be more likely to adopt and implement performance-based compensation systems. Furthermore, Schulz et al. (2010) predict that employee performance may be positively related to business volatility. However, there is scarce empirical evidence.

Taken together, the above literature review suggests that firms need to make more necessary adjustments in order to succeed when the external business environment becomes more volatile. Much of the prior research on business volatility focuses on the role of managers in a volatile business environment. Surprisingly, very few studies have ever investigated the response of employees in such an environment. Employees are the most important stakeholder group, and the success of a company largely depends on its employees' performance (Rajan and Zingales, 1998; Carlin and Gervais, 2009; Sun and Yu 2015). Ittner and Larcker (2001) suggest that employees are important value drivers in the organizational strategy implementation process. In addition, Stuebs and Sun (2010) argue that employee costs are a significant cost component to a firm. Edmans (2011) documents empirical evidence to support the notion that companies should focus on their employees as the key assets. Given the importance of employees and employee costs, it is interesting to investigate the impact of business volatility on employee performance.

If managers are more likely to adopt and implement performance-based compensation systems in a volatile business environment, then we predict that employees tend to work harder

in such environment because prior studies (e.g., Schulz et al. 2010) link the use of performance-based compensation systems to enhanced employee performance. In addition, Tang et al. (2012) suggest that environmental uncertainty (i.e., business volatility) may have a positive impact on a firm's corporate social responsibility activities, and Sun and Yu (2015) find that socially-responsible firms demonstrate stronger employee performance. Taken together, both studies indirectly imply that environmental uncertainty and employee performance are positively associated. Therefore, we expect a positive relationship between business volatility and employee performance.[2] We propose the following hypothesis:

H1: Business volatility is positively related to employee performance.

3. Research Design

3.1 Measuring Business volatility

Three business volatility measures are studies by Tosi, Aldag, and Storey (1973): sales volatility, earnings volatility, and technological volatility. Tosi, et al. (1973) find that the correlations among the three measures vary significantly by industry type. For example, while the business volatility measures are negatively correlated in marketing firms, they are positively correlated in manufacturing firms. Snyder and Glueck (1982) examine the sales volatility and technological volatility measures from Tosi et al. (1973) and find that both objectively capture external business volatility. However, Ghosh and Olsen (2009) suggest that sales volatility is a better measure of business volatility than technological volatility as there is more management discretion when it comes to the technological components (such as R&D expenditures and capital expenditures). As an example, when volatility is high in the external environment,

[2] It is possible that a negative relationship may exist between business volatility and employee performance. For example, when the business volatility is long-term or/and chronic, better employees may choose to leave their companies. Additionally, it is more difficult for these companies to attract and retain employees with better performance.

managers may be more likely to cut back R&D. Therefore, Ghosh and Olsen (2009) suggest that technological volatility, unlike sales volatility, is "more of a response by management to the external environment as opposed to a direct measure of business volatility" (pg. 193). It has also been suggested in both the accounting and management literature (e.g., Milliken 1987; Kren 1992; Ghosh and Olsen 2009; Huang, Sun and Zhang 2017) that sales volatility is an appropriate proxy for the firm's environment.

Following the above studies, we use the coefficient of variation of sales (BV) as the primary business volatility or business uncertainty measure in our study. The formula to calculate the raw sales volatility is expressed as below:

$$COV\ (Sales_i) = \frac{\sqrt{\sum_{i=1}^{5} \frac{(Sales_i - Sales_{mean})^2}{5}}}{Sales_{mean}}$$

where, $Sales_i$ is a firm's sales in year *i*, and $Sales_{mean}$ is the mean of sales over a rolling five-year period. Following prior studies (e.g., Tosi et al. 1973; Ghosh and Olsen 2009), we calculate *COV* of sales by year and industry (based on the first 2-digit of SIC code), and then normalize the raw firm-specific business volatility by dividing it by the average business volatility for that firm's industry for the same fiscal year to mitigate time and industry effects[3]. A higher (lower) value of *COV* (sales) indicates a higher (lower) level of business volatility.

3.2 Measuring Employee Performance

Consistent with Stuebs and Sun (2010) and Sanchez and Benito-Hernandez (2015), we use employee productivity as the main measure of employee performance in our study.

[3] For example, in order to calculate the business volatility score for firm X in year 2006, we first calculate the coefficient of variation of sales of firm X for the prior 5 years, namely 2001, 2002, 2003, 2004, and 2005, then we normalize the coefficient of variation of sales of firm X by dividing it by the mean business volatility score in the same industry (i.e., the same first 2 digits of SIC code) and the same year (i.e., 2006).

Employee productivity is computed by dividing total net sales by the number of employees. The formula is as follows:

$$Employee\ Performance\ (EMPPRO) = \frac{Sales\ (SALE, \#12)}{Number\ of\ Employees\ (EMP, \#29)}$$

We follow the DuPont technique to decompose the employee productivity ratio into two components:

$$Employee\ Performance\ (EMPPRO)$$
$$= Employee\ Efficiency\ Component\ (EMPEFF)$$
$$\times Employee\ Cost\ Component\ (EMPCOST)$$

Where,

$$Employee\ Efficiency\ Component\ (EMPEFF) = \frac{Sales\ (SALE, \#12)}{Total\ Employee\ Cost\ (XLR, \#42)}$$

$$Employee\ Cost\ Component\ (EMPCOST) = \frac{Total\ Employee\ Cost\ (XLR, \#42)}{Number\ of\ Employees\ (EMP, \#29)}$$

Employee efficiency component (*EMPEFF*) captures how efficiently a firm uses total labor costs to generate sales revenue. Employee cost component (*EMPCOST*) measures how well a firm controls labor costs to generate sales revenue.

3.3 Empirical Specification

We use the following regression model to test the association between business volatility and employee performance:

$$EMPLOYEE\ PERFORMANCE_{i,t} = \beta_0 + \beta_1 \boldsymbol{BV_{i,t}} + \beta_2 SIZE_{i,t} + \beta_3 ROA_{i,t} + \beta_4 LEV_{i,t} + \beta_5 MTB_{i,t} + \beta_6 ADV_{i,t} + \beta_7 RD_{i,t} + Industry\ \&\ Year\ Indicators + \varepsilon_{i,t} \quad \text{[Equation 1]}$$

In Equation (1), the dependent variable (*EMPLOYEE PERFORMANCE*) represents one of the three employee performance variables, namely employee productivity, employee efficiency

component, and employee cost component. The independent variable of interest (*BV*) captures the level of business volatility. In testing our hypothesis (H1), we expect a positive relationship (i.e., $\beta_1 > 0$) between business volatility and the employee performance variables. We use clustered standard errors regression as our primary analysis to better control for the firm and time effects (Petersen 2009). All variables are defined in Appendix 1.

In addition to variables of interest, we control for factors associated with employee performance/productivity established in prior literature. Specifically, following Stuebs and Sun (2010), Sanchez and Benito-Hernandez (2015), and Sun and Yu (2015), we control for the size of total assets (*SIZE*), return on assets (*ROA*), leverage ratios (*LEV*), market to book ratios (*MTB*), advertising expenditures (*ADV*), and research and development expenditures (*RD*). We winsorize the variables at the level 1% and 99% and include year- and industry-dummies (by the first 2-digit of SIC industry classification) in the regression analysis.

3.4 Sample Selection and Descriptive Statistics

From Compustat, we obtain financial statement data, including total assets (*AT*, #6), book value of equity (*CEQ, #60*), common stock shares (*CSHO, #25*), long-term debt (*DLTT, #9*), number of employees (*EMP, #29*), income before extraordinary items (*IB, #18*), net income (*NI*, #18), stock price at fiscal-year end (*PRCC_F, #24*), sales (*SALE, #12*), advertising expenses (*XAD, #45*), employee costs (*XLR, #42*), and research and development expenses (*XRD, #46*) from 1957 to 2015. Because the calculation of business volatility requires prior 5-year data on sales, the starting year of our sample is 1962. We remove firm-year observations with missing data. The final sample with complete data consists of 29,065 firm-year observations from 1962 to 2015, representing 3,306 individual firms. Our sample size is relatively small because only a small proportion of firms in Compustat report employee costs (*XLR, #42*).

Panel A of Table 1 reports the distribution of firm-year observations by fiscal year for the sample firms. For example, there are 233 firm-year observations in 1962 and 726 observations in 2015. The year of 2013 has the largest number of observations (868). Panel B of Table 1 reports the distribution of firm-year observations by industry (first 2 digits of SIC code). For instance, there are 880 firm-year observations in oil and gas extraction industries and 1,690 observations in chemical industries. The most heavily represented industry is utilities services (17.51%, SIC 49), followed by chemicals (5.81%, SIC 28), and business services (4.83%, SIC 73).

[Insert Table 1 about here]

Table 2 presents sample descriptive statistics. Specifically, Table 2 reports the mean, standard deviation, 25th percentile, median, and 75th percentile of the following variables: employee productivity (*EMPPRO*), employee efficiency component (*EMPEFF*), employee cost component (*EMPCOST*), business volatility (*BV*), natural log of total assets (*SIZE*), return on assets (*ROA*), leverage ratio (*LEV*), market to book ratio (*MTB*), advertising expenses (*ADV*), and research and development expenses (*RD*). For example, the mean (median) values of *EMPPRO* and *BV* are 0.240 (0.114) and 0.843 (0.714), respectively. The mean (median) values of *EMPEFF* and *EMPCOST* are 5.787 (4.088) and 0.042 (0.028), respectively. The median value of *ROA* is 0.044, suggesting that our sample firms demonstrate normal financial performance. Overall, the descriptive statistics of the variables are in line with those in prior studies (e.g., Sun and Stuebs 2010; Sun and Yu 2015).

[Insert Table 2 about here]

Table 3 provides the correlation matrices for selected variables for our sample firms. For each pair of variables, the Pearson correlation coefficients and related (two-tailed) p-values are provided. Table 3 reports a significant and positive relationship between business volatility (*BV*)

and employee performance (*EMPPRO*) and its two components (*EMPEFF* and *EMPCOST*). This positive association suggests that employees demonstrate better performance when their firms are faced with more volatile environments, consistent with our hypothesis. Overall, results in Table 3 lend support to the hypothesis.

[Insert Table 3 about here]

4. Main Results

Table 4 reports the clustered standard errors regression results examining the impact of business volatility on employee performance. Regression (1) examines the impact of business volatility on the employee performance/productivity measure (*EMPPRO*). The impact of the variable *BV*, which represents the level of business volatility, is positive (coefficient of 0.065) and statistically significant at the 99% confidence level (p-value < 0.0001). This suggests that employee productivity improves under increased levels of business volatility, supporting H1.

[Insert Table 4 about here]

Regressions (2) and (3) study the decomposed measures of employee cost efficiency (*EMPEFF)* and employee cost per employee (*EMPCOST*). In regression (2), *EMPEFF* is positive (coefficient of 1.096) and statistically significant at the 99% confidence level (p-value < 0.0001). This finding implies that the improved employee performance/productivity is due, at least in part, to improved efficiency per employee in firms with high business volatility. However, in regression (3) the variable *EMPCOST* is also statistically significant (at the 99% confidence level, p-value = 0.002) and positive (coefficient of 0.002). Combining the effects from regressions (1), (2), and (3) indicates that higher levels of business volatility result in employees that are more efficient, but require higher compensation. As the net effect is a positive impact on performance/productivity, the positive effect on efficiency significantly offsets the increased compensation, resulting in a positive overall effect on the firm. Our findings are

economically meaningful. Given that the average *EMPPRO* of the sample firms is 0.240, a one standard deviation increase of *BV* (approximately 0.622) is associated with an increase of *EMPPRO* of about 0.97%.

The above evidence suggests that employees work harder and firms have to pay them more in a more volatile environment. In the context of managerial implications, managers should improve their abilities to better cope with a more volatile environment and be more willing to pay their employees more in such environment.

Regressions (1), (2), and (3) include a number of pertinent control variables from prior literature, as well as year and industry fixed effects. Larger firms are found to have stronger employee performance/productivity as the result of more efficient employees, despite higher employee cost per person. Firms with higher returns on asset generally consist of employees that are both more efficient and receive lower compensation. Firms with higher leverage, advertising expenses, and research and development expenses tend to have employees with lower measures of employee performance.

We also examine the robustness of our primary findings across different sample periods. Specifically, we separately estimate Equation (1) in the following periods: 1962-1971, 1972-1981, 1982-1991, 1992-2001, and 2002-2015. We still obtain consistent results in each of the five sample periods. Therefore, our primary findings hold across different periods.

5. Additional Tests

5.1 Alternative Measure of Business Volatility – *BVTECH*

To ensure that the results found in Table 4 are not due to the definition of business volatility utilized, we re-test our regressions with alternative definitions. The first alternative definition utilized is *BVTECH,* which measures business volatility via the coefficient of variation of the ratio of research and development expenditures and capital expenditures to total assets.

Prior studies (e.g., Tosi et al. 1973; Synder and Glueck 1986) suggest that technology volatility can be useful as an alternative measure of business volatility. Technology input is measured as the ratio of the sum of research and development expenditures and capital expenditures to total assets at the firm level. Thus, we use the coefficient of variation of technology input to capture technology volatility (*BVTECH*). The formula to calculate *CV* of technology is expressed below:

$$CV(Tech) = \frac{\sqrt{\sum_{i=1}^{5} \frac{(Tech_i - Tech_{mean})^2}{5}}}{Tech_{mean}}$$

Where $Tech_i$ is a firm's technology input in year *i*, and $Tech_{mean}$ is the mean of technology input over a rolling five-year period. Similar to *CV* of sales, a higher value of *CV* of technology indicates a higher level of business volatility. We collect additional data on research and development expenditures[4] (*XRD, #46*) and capital expenditures (*CAPX, #128*) to calculate the alternative *BV* measure (*BV_TECH*).

Table 5 presents the results of clustered standard errors regressions similar to those in Table 4, except it replaces the previous measure *BV* with *BVTECH*. The findings remain mostly unchanged. As in Table 5, the coefficients on the variable of interest are positive and statistically significant for all three regressions. However, the impact of business volatility on employee cost drops statistical significance to just below the 99% confidence level (p-value = 0.012), while employee productivity and employee efficiency maintain statistical significance at the 99% confidence level (p-values < 0.001). The implication remains that firms with higher levels of volatility tend to have employees that are more productive due to higher levels of efficiency, despite higher costs per employee. These findings are, once again, consistent with H1.

[Insert Table 5 about here]

[4] To keep as many observations as possible, we set missing R&D expenditures to be zero.

5.2 Alternative BV measure – *HIGHBV*

A second alternative measure of business volatility is the measure *HIGHBV*, which is a dummy variable set to equal one if the *BV* variable is above the median, and zero otherwise. This measure allows examination of whether high values of business volatility have the same results when ignoring scaling. By using a dummy variable rather than the continuous measure, the impact of outliers potentially carrying the results would be nullified.

Table 6 presents the results of the clustered standard errors regression using the *HIGHBV* variable in place of *BV*. The results once again remain mostly unchanged. The impact of business volatility maintains the same sign and similar magnitude across all three dependent variables. However, as in Table 5, the statistical significance of employee cost is weakened using the alternative measure as the statistical significance falls to the 90% confidence level (p-value = 0.064). Regardless, the general finding holds that firms with higher business volatility tend to have greater employee performance due to increased efficiency, more than offsetting an increase in cost per employee. The net result is an increase in employee productivity.

[Insert Table 6 about here]

5.3 Changes Analysis

The above analyses rely on a level specification that regresses employee performance variables on the variable of interest and various control variables. To mitigate the concern that correlated omitted variables may influence employee performance we employ a changes analysis to provide additional evidence that differences in business volatility can be attributed to differences in employee performance. Specifically, in addition to the above regressions, a regression is conducted based on the change in each variable relative to the prior fiscal year to examine the impact of shifts across time on the employee performance variable and its components. The dependent variables in regressions (1), (2), and (3) are altered from *EMPPRO*,

EMPEFF, and *EMPCOST* to Δ*EMPPRO*, Δ*EMPEFF*, and Δ*EMPCOST*, respectively. Each of these new dependent variables represents the change in the measure from the prior year. Likewise, all independent variables, including the measure of business volatility, have been replaced with the change relative to the prior fiscal year of the variable. This bivariate changes analysis allows examination of whether or not variation in business volatility causes changes to the dependent variable. Year and industry fixed effects are maintained in the regression analysis.

The results are presented in Table 7. The findings in Table 7 reveal similar trends to Table 4, Table 5, and Table 6. The impact of increasing levels of business volatility is consistent with the impact of high raw levels. Firms experiencing an increase in business volatility tend to also have an increase in productivity of their employees. This result is statistically significant at the 99% confidence level (p-value = 0.001). As in the raw analysis, this increase can be attributed to an increase in employee efficiency (statistically significant at the 95% confidence level, p-value = 0.035), despite an increase in cost per employee (statistically significant at the 90% confidence level, p-value = 0.056). This finding provides further evidence that business volatility is indeed a "root cause" of the increased employee performance.

[Insert Table 7 about here]

5.4 Fixed Effects Regression

We perform a fixed-effects regression, in order to mitigate potential concern of bias due to the possibility of omitted variables that may affect business volatility and employee performance (or employee efficiency/cost). In the fixed-effects regression, cross-sectional variation is removed. Therefore, the regression examines only the within firm variation over time. As the industry dummies do not vary with time, industry fixed effects are removed from the regression. Table 8 presents the results of the fixed-effects regression for all three of the dependent variables. Once again, the results are consistent in the direction of impact for business

volatility on each of the three dependent variables. The variable *BV* has a positive coefficient with statistical significance at the 99% confidence level for both *EMPPRO* and *EMPEFF* (p-values < 0.001). The coefficient is positive and statistically significant at the 95% confidence level for *EMPCOST* (p-value = 0.034). This confirms that the findings from previous tables are not likely to be driven by bias caused by omitted control variables.

[Insert Table 8 about here]

5.5 Two-Stage OLS Regression Analysis (2SLS)

To ensure that our results are not driven by other endogeneity issues such as reverse causality or self-selection bias, we conduct two-stage least squares regression (2SLS) analysis. As 2SLS requires the use of an instrumental variable for the variable of interest, we use the average business volatility score (*BV_Mean*) for firms in the same industry (industries defined by the first 2-digit SIC code). In the first stage of the two-stage analysis, *BV_Mean* is used to calculate the instrumented estimate of business volatility (*BV_Instrumented*). All control variables, as well as year and industry fixed effects, are included. The second stage of the analysis uses the instrumented estimate of business volatility as the independent variable of interest. Once again, all control variables and year and industry fixed effects are maintained in the regression analysis.

Table 9 reports the results from the two-stage least squares analysis. In Stage 2, regressions (1), (2), and (3) remain consistent in sign and each are statistically significant at the 99% confidence level (p-values < 0.001). As in each of the regressions utilized throughout the study, the findings remain constant. For example, in stage 2, the coefficient on *BV_Instrumented* is 0.065 (p-value < 0.0001) where the dependent variable is *EMPPRO*. Increased levels of business volatility result in improved employee performance/productivity as the result of increased efficiency. The increased efficiency has a positive net effect on overall performance

despite being paired with an increase in cost per employee. The findings of Table 9 suggest that these findings are not likely to suffer from endogeneity issues.

[Insert Table 9 about here]

5.6 Large Firms vs. Small Firms

The primary results suggest that firm size is an important factor in our study. We argue that our results may be stronger for larger firms because larger firms tend to have more employees, relative to smaller firms. Furthermore, larger firms may have more resources to hire and retain employees with greater ability. We decompose our sample into two subsamples: large firms vs. small firms, based on the median value of total assets (*SIZE*), and perform the same regression analysis to both subsamples. Panel A of Table 10 shows that the coefficient on *BV* is 0.130 (p-value < 0.0001) for large firms and 0.033 (p-value < 0.0001) for small firms. Coefficient comparison test indicates that the coefficient on *BV* of large firms is significantly higher than that of small firms (p-value < 0.0001). Thus, evidence from Table 10 suggests that the relationship between business volatility and employee productivity is stronger for larger firms than for smaller firms.

[Insert Table 10 about here]

We further examine the relationship between *BV* and the two employee productivity components (*EMPEFF* and *EMPCOST*) for both subsamples. Panel B of Table 10 reports that, where the dependent variable is *EMPEFF*, the coefficient on *BV* is 2.030 (p-value < 0.001) for large firms and 0.630 (p-value < 0.0001) for small firms. The coefficient comparison test indicates that the coefficient on *BV* of large firms is significantly higher than that of small firms (p-value < 0.0001). Thus, evidence from Table 10 suggests that the relationship between the business volatility and employee efficiency components is stronger for larger firms than for

smaller firms. Where the dependent variable is *EMPCOST*, the coefficient on *BV* is -0.000 (p-value = 0.835) for large firms and 0.003 (p-value < 0.001) for small firms, suggesting that the significant and positive relationship between *BV* and *EMPCOST* in our study is largely driven by smaller firms. In other words, smaller firms tend to pay their employees more in response to business volatility than larger firms.

5.7 High Labor Intensity Firms vs. Low Labor Intensity Firms

Sun and Yu (2015) suggest that employee performance in high labor intensity industries (i.e., restaurants and hotels) is different from that in low labor intensity industries (i.e., high tech firms). High (low) labor intensity firms tend to have more (less) employees. We posit that our results are stronger in labor-intensive firms. We decompose our sample into two subsamples: high labor intensity firms vs. low labor intensity firms, based on the median value of labor intensity (*XLR/SALE*), and perform the same regression analysis to both subsamples. Panel A of Table 11 shows that the coefficient on *BV* is 0.110 (p-value < 0.0001) for high labor intensity firms and 0.004 (p-value = 0.054) for low labor intensity firms. The coefficient comparison test indicates that the coefficient on *BV* of high labor intensity firms is significantly higher than that of low labor intensity firms (p-value < 0.0001). Thus, evidence from Table 11 suggests that the relationship between business volatility and employee productivity is stronger for high labor intensity firms than for low labor intensity firms.

[Insert Table 11 about here]

We further examine the relationship between *BV* and the two employee productivity components (*EMPEFF* and *EMPCOST*) for both subsamples. Panel B of Table 11 reports that, where the dependent variable is *EMPEFF*, the coefficient on *BV* is 1.646 (p-value < 0.0001) for high labor intensity firms and 0.037 (p-value = 0.003) for low labor intensity firms. Coefficient

comparison test indicates that the coefficient on *BV* of high labor intensity firms is significantly higher than that of low labor intensity firms (p-value < 0.0001). Thus, evidence from Table 11 suggests that the relationship between business volatility and employee efficiency component is stronger for high labor intensity firms than for low labor intensity firms. Where the dependent variable is *EMPCOST*, the coefficient on *BV* is 0.004 (p-value < 0.0001) for high labor intensity firms and 0.002 (p-value = 0.053) for low labor intensity firms, suggesting that the relationship between business volatility and employee cost component is stronger for high labor intensity firms than for low labor intensity firms.

5.8 Alternative Measure of Employee Productivity

Following Stuebs and Sun (2010), we use the ratio (net income divided by the number of employees) as an alternative measure of employee productivity, and re-run the regression analysis. We still obtain similar results, indicating a significantly positive relationship between business volatility and employee productivity. Results are not tabulated for brevity.

5.9 Additional Control Variable – Managerial Ability

Demerjian, Lev, and McVay (2012) suggest that more-able managers can better manage firm resources including human resources, implying that managerial ability may have a positive impact on employee performance. To control for this effect, we re-estimate Equation 1 by including managerial ability[5] and report results in Table 12. As shown in Table 12, the coefficients on *BV* are significantly positive, consistent with our primary findings. Table 12 also shows that managerial ability is significantly and positively related to our employee performance variables, suggesting that more-able managers can improve employee performance and also pay them more.

[5] We obtain managerial ability data from Dr. Demerjian's website - http://faculty.washington.edu/pdemerj/data.html

[Insert Table 12 about here]

6. Conclusion

In this study, we investigate the impact of business volatility on employee performance. Consistent with anecdotal evidence, we document a positive relationship between business volatility and employee performance at a significant level, suggesting that employees work harder when the external business environment becomes more volatile. We further decompose the employee performance measure (i.e., employee productivity) into two components: employee efficiency and employee cost components, and find a significant and positive relationship between business volatility and both components. Overall, our results suggest that firms with higher levels of volatility tend to have employees that are more productive due to higher levels of efficiency, despite higher costs per employee. These findings are consistent with the hypothesis posited in the study. Our findings have practical implications. We provides evidence that firm risk (i.e., business volatility) is an important factor related to employee performance. The results should not only provide practitioners with useful insights into what influences employee performance, but also interest shareholders by providing them with evidence that a volatile business environment may have a positive impact on their employees' performance.

To managers, our results can help managers better understand the impact of business volatility on employee performance. In particular, managers may need to improve their abilities to better cope with a more volatile environment. In other words, managers may need to improve their productivities to match their employees' productivities especially in a more volatile environment. Our findings also suggest that companies need to pay employees more when the external business environment becomes more volatile. Thus, managers should be more willing to pay their employees more in a more volatile environment in order to retain or/and attract employees with strong performance.

This study has several limitations. First, the business volatility measure is an approximate measure. Many prior studies use survey data to capture the level of business volatility. Better volatility measures may yield stronger results. Second, our sample is relatively small due to the limited data availability on employee costs (*XLR*, #42) in the Compustat database. Third, our sample firms are primarily large firms since firms that report labor costs tend to be large firms. Lastly, managers may develop market-sensing skills to adapt to a volatile environment, which may mitigate the impact of business volatility on employee performance. Additionally, it is unclear whether the business volatility leads to the adaption or a lack of such adaption causes the business volatility. Further, our study does not differentiate short-term volatility from long-term volatility. It is possible that the above volatilities may yields different outcomes. Taken together, readers need to exercise caution when generalizing our findings. The above issues can be investigated in future research.

References

Alexander, J. A. 1991. Adaptive change in corporate control practices. *Academy of Management Journal* 34: 162-193.

Carlin, B., and S. Gervais. 2009. Work ethics, employment contracts, and firm value. *Journal of Finance* 64: 785-821.

Chenhall, R. H., and D. Morris. 1986. The impact of structure, environment, and interdependence on the perceived usefulness of management accounting systems. *The Accounting Review* 61 (1): 16-35.

Cheng, J., and I. Kesner. 1997. Organizational slack and response to environmental shifts: The impact of resource allocation patterns. *Journal of Management* 23 (1): 68-86.

Child, J. 1972. Organizational structure, environment, and performance: the role of strategic choice. *Sociology* 6: 1-22.

Chong, V. K., and K. M. Chong. 1997. Strategic choices, business volatility and SBU performance: a note on the intervening role of management accounting systems. *Accounting and Business Research* 27 (4): 268-276.

Daft, R. L., J. Sormunen, and D. Parks. 1988. Chief executive scanning environmental characteristics and company performance: an empirical study. *Strategic Management Journal* 9 (2): 123-139.

Davila, T., and M. Wouters. 2005. Managing budget emphasis through the explicit design of conditional budgetary slack. *Accounting, Organizations and Society* 30 (7/8): 587-608.

Demerjian, P., B. Lev, and S. McVay. 2012. Quantifying managerial ability: A new measure and validity tests. *Managerial Science* 58 (7): 122-1248.

Dess, G., and D. Beard. 1984. Dimensions of organizational environments. *Administrative Science Quarterly* 29: 313-327.

Dill, W. R. 1958. Environment as an influence on managerial autonomy. *Administrative Science Quarterly* 2: 409-443.

Downey, H. K., and J. W. Slocum. 1975. Volatility: measures, research and sources of variation. *Administrative Science Quarterly* 18: 562-577.

Drago, W. A. 1998. Predicting organizational objectives: role of stakeholder influence and volatility of environmental sectors. *Management Research News* 21 (9): 16-28.

Duncan, R. B. 1972. Characteristics of organizational environments and perceived business volatility. *Administrative Science Quarterly* 17: 313-327.

Dunk, A. S., and H. Nouri. 1998. Antecedents of budgetary slack: A literature review and synthesis. *Journal of Accounting Literature* 17: 72-96.

Edmans, A. 2011. Does the stock market fully value intangibles? Employee satisfaction and equity prices. *Journal of Financial Economics* 101 (3): 621-640.

Ghosh, D., and L. Olsen. 2009. Business volatility and managers' use of discretionary accruals. *Accounting, Organizations and Society* 34 (2): 188-205.

Goodman, T. H., M. Neamtiu, N. Shroff, and H. D. White. 2014. Management forecast quality and capital investment decisions. *The Accounting Review* 89 (1): 331-365.

Gordon, L. A., and D. Miller. 1976. A contingency framework for design of accounting information systems. *Accounting, Organizations and Society* 9 (1): 33-47.

Gordon, L. A., and V. K. Narayannan. 1984. Management accounting systems for hospitals: a research framework. *Industrial Management & Organizational Change* 1 (2): 125-140.

Hammad, A. A., R. Jusoh, and I. Ghozali. 2013. Decentralization, perceived business volatility, managerial performance and management accounting system information in Egyptian hospitals. *International Journal of Accounting and Information Management* 21 (4): 314-33.

Hickson, D. J., C. R. Hinings, C. A. Lee, R. E. Schneck, and J. M. Pennings. 1971. A strategic contingencies' theory of intraorganizational power. *Administrative Science Quarterly* 16: 216-220.

Hill, N. T. 2000. Adoption of costing systems in US hospitals: an event history analysis 1980-1990. *Journal of Accounting and Public Policy* 19 (1): 41-71.

Huang, H. H., L. Sun, and J. Zhang. 2017. Environmental uncertainty and corporate tax avoidance. *Advances in Taxation* 24: 87-128.

Ittner, C. D., and D. F. Larcker. 2001. Assessing empirical research in managerial accounting: a value-based management perspective. *Journal of Accounting and Economics* 32: 349-410.

Jiraporn, P., N. Jiraporn, A. Boeprasert, and K. Chang. 2014. Does corporate social responsibility improve credit ratings? Evidence from geographic identification. *Financial Management* 43 (3): 505-531.

Kren, L. 1992. Budgetary participation and managerial performance: The impact of information and business volatility. *The Accounting Review* 67 (3): 511-526.

Lawrence, P. R., and J. W. Lorsch. 1967. Organization and environment: Managing differentiation and integration. Harvard Business School, MA.

Leifer, R. G., C. O'Connor, and M. Rice. 2001. Implementing radical innovation in mature firms: the role of hubs. *Academy of Management Executive* 15 (3): 102-113.

Mangaliso, M. P. 1995. The strategic usefulness of management information as perceived by middle managers. *Journal of Management* 21 (2): 231-250.

Mia, L. 1993. The role of MAS information in organizations: an empirical study. *The British Accounting Review* 25 (3): 269-285.

Mia, L., and B. Clarke. 1999. Market competition, management accounting systems and business unit performance. *Journal of Management Accounting Research* 6 (2): 47-52.

Milliken, F. 1987. Three types of perceived volatility about the environment: State, effect, and response volatility. *Academy of Management Review* 12 (1): 133-143.

Petersen, M. 2009. Estimating standard errors in finance panel data sets: Comparing approaches. *Review of Financial Studies* 22 (1): 435-480.

Pfeffer, J., and G. R. Salancik. 1978. The external control of organizations: A resource dependence perspective. New York: Harper and Row.

Puranam, P., H. Singh, and M. Zollo. 2006. Organizing for innovation: managing the coordination-autonomy dilemma in technology acquisitions. *Academy of Management Journal* 49 (2): 263-280.

Rajan, R., and L. Zingales. 1998. Power in a theory of the firm. *Quarterly Journal of Economics* 113: 387-432.

Sanchez, P.E., and S. Benito-Hernandez. 2015. CSR Policies: Effects on Labour Productivity in Spanish Micro and Small Manufacturing Companies. *Journal of Business Ethics* 128 (4): 705-724.

Schmidt, S. M., and L. L. Cummings. 1976. Organizational environment, differentiation and perceived business volatility. *Decision Science* 7: 447-467.

Schulz, A. K., A. Wu, and C. W. Chow. 2010. Business volatility, comprehensive performance measurement systems, performance-based compensation, and organizational performance. *Asia-Pacific Journal of Accounting & Economics* 17: 17-40.

Snyder, N. H., and W. F. Glueck. 1982. Can environmental volatility be measured objectively? *Academy of Management Journal* 25 (1): 185-192.

Stuebs, M., and L. Sun. 2010. Business reputation and labor efficiency, productivity, and cost. *Journal of Business Ethics* 96 (2): 265-283.

Sun, L., and R. Yu. 2015. The impact of corporate social responsibility on employee performance. *Review of Accounting and Finance* 14 (3): 262-284.

Tang, Z., C. E. Hull, and S. Rothenberg. 2012. How corporate social responsibility engagement strategy moderates the CSR-financial performance relationship. *Journal of Management Studies* 49 (7): 1274-1303.

Tosi, H., R. Aldag, and R. Storey. 1973. On the measurement of the environment: an assessment of the Lawrence and Lorsch business volatility subscale. *Administrative Science Quarterly* 18: 27-36.

Thompson, J. D. 1967. Organizations in action. New York: McGraw-Hill.

Tung, R. L. 1979. Dimensions of organizational environments: An exploratory study of their impact on organizational structure: a test of competing models. *Management Science* 42 (6): 672-693.

Appendix 1
Variable Definition

Variable		Definition
EMPPRO	=	employee productivity, as total sales (SALE, #12) divided by total number of employees (EMP, #29);
EMPEFF	=	employee efficiency component, as total sales (SALE, #12) divided by total employee costs (XLR, #42);
EMPCOST	=	employee cost component, as total employee costs (XLR, #42) divided by total number of employees (EMP, #29);
BV	=	business volatility, calculated as the coefficient of variation of sales to capture business volatility. The formula is expressed below: $COV\ (Sales_i) = \frac{\sqrt{\sum_{i=1}^{5} \frac{(Sales_i - Sales_{mean})^2}{5}}}{Sales_{mean}}$.
BVTECH	=	an alternative measure of business volatility, calculated as the coefficient of variation of the ratio of research and development expenditures (XRD, #46) and capital expenditures (CAPX, #128) to total assets (AT, #6). The formula is expressed below: $COV\ (Tech_i) = \frac{\sqrt{\sum_{i=1}^{5} \frac{(Tech_i - Tech_{mean})^2}{5}}}{Tech_{mean}}$.
HIGHBV	=	an indicator variable, which equals 1 if the BV score is above the median value and 0 otherwise;
SIZE	=	the natural log of total assets (AT, #6);
ROA	=	income before extraordinary items (IB, #18) scaled by total assets (AT, #6);
LEV	=	long-term liabilities (DLTT, #9) scaled by total assets (AT, #6);
MTB	=	market value of common shares (CSHO, #25) × (PRCC_F, #24) divided by total book value of common shares (CEQ, #60);
ADV	=	advertising expenses (XAD, #45) scaled by total sales (SALE, #12);
RD	=	research and development expenses (XRD, #46) scaled by total sales (SALE, #12).
MA_ABILITY	=	managerial ability scores in Demerjian et al. (2012).

Table 1
Sample Distribution

Panel A: Firm-year observations by fiscal year

Year	Obs.	Percent	Year	Obs.	Percent
1962	233	0.80%	1989	463	1.59%
1963	186	0.64%	1990	501	1.72%
1964	209	0.72%	1991	524	1.80%
1965	288	0.99%	1992	517	1.78%
1966	438	1.51%	1993	515	1.77%
1967	450	1.55%	1994	494	1.70%
1968	472	1.62%	1995	501	1.72%
1969	478	1.64%	1996	488	1.68%
1970	516	1.78%	1997	480	1.65%
1971	560	1.93%	1998	458	1.58%
1972	567	1.95%	1999	427	1.47%
1973	601	2.07%	2000	478	1.64%
1974	599	2.06%	2001	497	1.71%
1975	631	2.17%	2002	473	1.63%
1976	654	2.25%	2003	493	1.70%
1977	662	2.28%	2004	526	1.81%
1978	669	2.30%	2005	533	1.83%
1979	697	2.40%	2006	540	1.86%
1980	664	2.28%	2007	539	1.85%
1981	632	2.17%	2008	535	1.84%
1982	628	2.16%	2009	537	1.85%
1983	592	2.04%	2010	556	1.91%
1984	542	1.86%	2011	787	2.71%
1985	509	1.75%	2012	847	2.91%
1986	476	1.64%	2013	868	2.99%
1987	487	1.68%	2014	839	2.89%
1988	483	1.66%	2015	726	2.50%
			Total	29,065	100.00%

This panel presents the firm-year observations by fiscal year. The sample consists of 29,065 firm-year observations from 1962 to 2015, representing 3,306 individual firms.

Panel B: Firm-year observations by industry

2 SIC	Description	Obs.	Percent	2 SIC	Description	Obs.	Percent
01	Agricultural Crops	25	0.09%	45	Air Transportation	962	3.31%
02	Agricultural Livestock	7	0.02%	46	Pipelines	11	0.04%
07	Agricultural Services	7	0.02%	47	Transportation Services	127	0.44%
08	Forestry	11	0.04%	48	Communications	1,310	4.51%
10	Metal Mining	588	2.02%	49	Utilities Services	5,089	17.51%
12	Coal Mining	69	0.24%	50	Wholesale Durable	365	1.26%
13	Oil & Gas Extraction	880	3.03%	51	Wholesale Nondurable	188	0.65%
14	Mining	129	0.44%	52	Building Materials	55	0.19%
15	Building Construction	28	0.10%	53	General Stores	129	0.44%
16	Heavy Construction	60	0.21%	54	Food Stores	200	0.69%
17	Special Construction	5	0.02%	55	Automotive Service	40	0.14%
20	Food	935	3.22%	56	Apparel Stores	47	0.16%
21	Tobacco	62	0.21%	57	Furniture Stores	88	0.30%
22	Textile	204	0.70%	58	Eating & Drinking	1,019	3.51%
23	Apparel	133	0.46%	59	Miscellaneous Retail	200	0.69%
24	Lumber	144	0.50%	60	Depository Institutions	52	0.18%
25	Furniture	103	0.35%	61	Nondepository Institutions	492	1.69%
26	Paper	795	2.74%	62	Brokers	711	2.45%
27	Printing	508	1.75%	63	Insurance Carriers	293	1.01%
28	Chemicals	1,690	5.81%	64	Insurance	267	0.92%
29	Petroleum	674	2.32%	65	Real Estate	236	0.81%
30	Rubber	335	1.15%	67	Investment Offices	312	1.07%
31	Leather	5	0.02%	70	Hotels	85	0.29%
32	Stone Clay Glass	340	1.17%	72	Personal Services	92	0.32%
33	Primary Metal	670	2.31%	73	Business Services	1,404	4.83%
34	Fabricated Metal	390	1.34%	75	Auto Repair	35	0.12%
35	Industrial Machinery	945	3.25%	78	Motion Pictures	61	0.21%
36	Electronic Equipment	907	3.12%	79	Amusement	287	0.99%
37	Transportation Equipment	892	3.07%	80	Health Services	677	2.33%
38	Measuring Instruments	613	2.11%	81	Legal Services	3	0.01%
39	Other Manufacturing	99	0.34%	82	Educational Services	68	0.23%
40	Railroad	378	1.30%	83	Social Services	30	0.10%
41	Local/Suburban Transit	30	0.10%	87	Engineering & Accounting	228	0.78%
42	Motor Freight	912	3.14%	99	Nonclassified	256	0.88%
44	Water Transportation	73	0.25%		Total	29,065	100.00%

This panel presents the firm-year observations by industry. The sample consists of 29,065 firm-year observations from 1962 to 2015, representing 3,306 individual firms.

Table 2
Sample Descriptive Statistics

Variable	Observations	Mean	Std Dev	P1	Median	P3
EMPPRO	29,065	0.240	0.507	0.050	0.114	0.245
EMPEFF	29,065	5.787	6.408	2.827	4.088	6.387
EMPCOST	29,065	0.042	0.050	0.013	0.028	0.052
BV	29,065	0.843	0.622	0.453	0.714	1.030
SIZE	29,065	6.375	2.401	4.800	6.388	7.979
ROA	29,065	0.005	0.288	0.020	0.044	0.071
LEV	29,065	0.224	0.178	0.074	0.205	0.348
MTB	29,065	2.000	3.563	0.863	1.378	2.326
ADV	29,065	0.006	0.017	0.000	0.000	0.000
RD	29,065	0.052	0.687	0.000	0.000	0.005

This table reports the descriptive statistics of the variables. Specifically, this tables reports pooled means, standard deviations, 25^{th} percentile, median, and 75^{th} percentiles of all dependent variables, independent variable of interest, and control variables. The sample consists of 29,065 firm-year observations from 1962 to 2015, representing 3,306 individual firms. All continuous variables are winsorized at 1% and 99% percentiles. See Appendix 1 for variable definitions.

Table 3
Correlation Matrix

	EMPPRO	*EMPEFF*	*EMPCOST*	*BV*	*SIZE*	*ROA*	*LEV*	*MTB*	*ADV*
EMPEFF	0.556								
p-value	*<.0001*								
EMPCOST	0.536	0.014							
p-value	*<.0001*	*0.020*							
BV	0.050	0.061	0.079						
p-value	*<.0001*	*<.0001*	*<.0001*						
SIZE	0.213	0.191	0.088	-0.248					
p-value	*<.0001*	*<.0001*	*<.0001*	*<.0001*					
ROA	0.012	0.068	-0.234	-0.271	0.285				
p-value	*0.047*	*<.0001*	*<.0001*	*<.0001*	*<.0001*				
LEV	-0.046	-0.022	-0.081	0.018	0.126	-0.053			
p-value	*<.0001*	*0.000*	*<.0001*	*0.003*	*<.0001*	*<.0001*			
MTB	0.019	0.014	0.031	0.034	0.030	0.080	-0.075		
p-value	*0.001*	*0.019*	*<.0001*	*<.0001*	*<.0001*	*<.0001*	*<.0001*		
ADV	-0.070	-0.044	-0.057	0.016	-0.060	-0.029	-0.083	0.075	
p-value	*<.0001*	*<.0001*	*<.0001*	*0.008*	*<.0001*	*<.0001*	*<.0001*	*<.0001*	
RD	-0.022	-0.049	0.167	0.087	-0.081	-0.212	-0.038	0.037	0.020
p-value	*0.000*	*<.0001*	*<.0001*	*<.0001*	*<.0001*	*<.0001*	*<.0001*	*<.0001*	*0.001*

This table reports the Pearson correlations based on the sample of 29,065 firm-year observations over the period of 1962-2015, representing 3,306 individual firms. For each pair of variables, the Pearson correlation coefficients and related (two-tailed) p-values are provided. All continuous variables are winsorized at the 1% and 99% percentiles before the correlation analysis. Refer to Appendix 1 for variable definitions.

Table 4
Business Volatility and Employee Performance
Main Results

	Dependent Variable = EMPPRO		Dependent Variable = EMPEFF		Dependent Variable = EMPCOST	
Variables	Estimate	Pr > |t|	Estimate	Pr > |t|	Estimate	Pr > |t|
Intercept	0.384***	<.0001	5.005***	<.0001	0.087***	<.0001
BV	**0.065*** **	**<.0001**	**1.096*** **	**<.0001**	**0.002*** **	**0.002**
SIZE	0.022***	<.0001	0.225***	<.0001	0.001***	<.0001
ROA	0.092***	<.0001	2.136***	<.0001	-0.022***	<.0001
LEV	-0.082***	<.0001	-1.677***	<.0001	-0.002	0.520
MTB	-0.001	0.290	0.009	0.454	0.000**	0.014
ADV	-0.662***	<.0001	-0.482	0.843	-0.128***	<.0001
RD	-0.030***	<.0001	-0.300***	<.0001	0.005***	<.0001
YEAR	Yes		Yes		Yes	
INDUSTRY	Yes		Yes		Yes	
Observations	29,065		29,065		29,065	
Adj. R^2	0.2636		0.2114		0.4247	

This table reports the results from the clustered standard errors regression of regressing employee performance variables on business volatility over the period of 1962-2015 based on the following model equation:

$$EMPPRO\ (EMPEFF,\ EMPCOST) = \beta_0 + \beta_1 \times BV + \beta_x \times Control\ Variables + Year\&Industry\ Dummies + \varepsilon$$

The dependent variable *EMPPRO* measures the employee performance/productivity. We also use the two components of *EMPPRO*: employee cost efficiency (*EMPEFF*) and employee cost per employee (*EMPCOST*), as our dependent variables. The independent variable of interest (*BV*) captures the level of business volatility. The industry-specific and year-specific intercepts are omitted for brevity. Continuous control variables are winsorized at 1% and 99% percentiles each year before entering the regression tests. *, **, and *** represent significance at the 10, 5 and 1 percent (two-tailed) confidence levels, respectively. Refer to Appendix 1 for variable definitions.

Table 5
Business Volatility and Employee Performance
Using Alternative BV Measure (BVTECH)

	Dependent Variable = EMPPRO		Dependent Variable = EMPEFF		Dependent Variable = EMPCOST	
Variables	Estimate	Pr > |t|	Estimate	Pr > |t|	Estimate	Pr > |t|
Intercept	0.242***	<.0001	5.350***	<.0001	0.083***	<.0001
BVTECH	**0.024*** **	**<.0001**	**1.273*** **	**<.0001**	**0.003** **	**0.012**
SIZE	0.029***	<.0001	0.236***	<.0001	0.000	0.584
ROA	0.033***	<.0001	1.697***	<.0001	-0.024***	<.0001
LEV	-0.041	0.157	-2.732***	<.0001	0.009	0.157
MTB	-0.001*	0.068	-0.027*	0.085	0.000	0.987
ADV	-0.230	0.103	10.610**	0.035	-0.126***	0.000
RD	-0.020***	<.0001	-0.252	<.0001	0.005***	<.0001
YEAR	Yes		Yes		Yes	
INDUSTRY	Yes		Yes		Yes	
Observations	7,096		7,096		7,096	
Adj. R^2	0.4250		0.2670		0.5238	

This table reports the results from the clustered standard errors regression of regressing employee performance variables on business volatility over the period of 1962-2015 based on the following model equation:

$$EMPPRO\ (EMPEFF,\ EMPCOST) = \beta_0 + \beta_1 \times BVTECH + \beta_x \times Control\ Variables + Year\&Industry\ Dummies + \varepsilon$$

The dependent variable *EMPPRO* measures the employee performance/productivity. We also use the two components of *EMPPRO*: employee cost efficiency (*EMPEFF*) and employee cost per employee (*EMPCOST*), as our dependent variables. The independent variable of interest (*BVTECH*) captures the level of business volatility using research and development expenses and capital expenditures. The industry-specific and year-specific intercepts are omitted for brevity. Continuous control variables are winsorized at 1% and 99% percentiles each year before entering the regression tests. *, **, and *** represent significance at the 10, 5 and 1 percent (two-tailed) confidence levels, respectively. Refer to Appendix 1 for variable definitions.

Table 6
Business Volatility and Employee Performance
Using Alternative BV Measure (HIGHBV)

	Dependent Variable = EMPPRO		Dependent Variable = EMPEFF		Dependent Variable = EMPCOST	
Variables	Estimate	Pr > |t|	Estimate	Pr > |t|	Estimate	Pr > |t|
Intercept	0.437***	<.0001	5.774***	<.0001	0.089***	<.0001
HIGHBV	**0.062*** **	**<.0001**	**1.259*** **	**<.0001**	**0.001***	**0.064**
SIZE	0.021***	<.0001	0.205***	<.0001	0.001***	<.0001
ROA	0.070***	<.0001	1.799***	<.0001	-0.023***	<.0001
LEV	-0.081***	<.0001	-1.689***	<.0001	-0.002	0.539
MTB	-0.001	0.481	0.014	0.270	0.000**	0.021
ADV	-0.639***	<.0001	-0.005	0.998	-0.127***	<.0001
RD	-0.029***	<.0001	-0.297***	<.0001	0.005***	<.0001
YEAR	Yes		Yes		Yes	
INDUSTRY	Yes		Yes		Yes	
Observations	29,065		29,065		29,065	
Adj. R^2	0.2316		0.2100		0.4242	

This table reports the results from the clustered standard errors regression of regressing employee performance variables on business volatility over the period of 1962-2015 based on the following model equation:

$$EMPPRO\ (EMPEFF,\ EMPCOST) = \beta_0 + \beta_1 \times HIGHBV + \beta_x \times Control\ Variables + Year\&Industry\ Dummies + \varepsilon$$

The dependent variable *EMPPRO* measures the employee performance/productivity. We also use the two components of *EMPPRO*: employee cost efficiency (*EMPEFF*) and employee cost per employee (*EMPCOST*), as our dependent variables. The independent variable of interest (*HIGHBV*) captures the level of business volatility. *HIGHBV* equals one if the business volatility score is above the median, and zero otherwise. The industry-specific and year-specific intercepts are omitted for brevity. Continuous control variables are winsorized at 1% and 99% percentiles each year before entering the regression tests. *, **, and *** represent significance at the 10, 5 and 1 percent (two-tailed) confidence levels, respectively. Refer to Appendix 1 for variable definitions.

Table 7
Business Volatility and Employee Performance Changes Analysis

	Dependent Variable = ΔEMPPRO		Dependent Variable = ΔEMPEFF		Dependent Variable = ΔEMPCOST	
Variables	Estimate	Pr > |t|	Estimate	Pr > |t|	Estimate	Pr > |t|
Intercept	-0.089***	<.0001	-0.837***	<.0001	-0.001	0.115
ΔBV	**0.015*** **	**0.001**	**0.123****	**0.035**	**0.000***	**0.056**
ΔSIZE	0.026***	<.0001	0.160*	0.074	0.001	0.186
ΔROA	0.054***	<.0001	1.088***	<.0001	0.001	0.627
ΔLEV	-0.054***	<.0001	-0.755***	0.000	-0.001	0.574
ΔMTB	0.000*	0.086	-0.001	0.893	0.000	0.269
ΔADV	-0.188*	0.07	-1.979	0.361	-0.007	0.769
ΔRD	-0.024***	<.0001	-0.316***	<.0001	0.002***	<.0001
YEAR	Yes		Yes		Yes	
INDUSTRY	Yes		Yes		Yes	
Observations	25,759		25,759		25,759	
Adj. R^2	0.0796		0.0501		0.0201	

This table reports the results from the clustered standard errors regression of regressing the change in employee performance variables on the change in business volatility over the period of 1962-2015 based on the following model equation:

$$\Delta EMPPRO\ (\Delta EMPEFF, \Delta EMPCOST) = \beta_0 + \beta_1 \times \Delta BV + \beta_x \times \Delta Control\ Variables + Year\&Industry\ Dummies + \varepsilon$$

The dependent variable *ΔEMPPRO* measures the change in employee performance/productivity. $\Delta EMPPRO_t = EMPPRO_t - EMPPRO_{t-1}$. We also use the two components of *EMPPRO*: the change in employee cost efficiency (*ΔEMPEFF*) and the change in employee cost per employee (*ΔEMPCOST*), as our dependent variables. $\Delta EMPEFF_t = EMPEFF_t - EMPEFF_{t-1}$. $\Delta EMPCOST_t = EMPCOST_t - EMPCOST_{t-1}$. The independent variable of interest (*ΔBV*) captures the change in business volatility. $\Delta BV = BV_t - BV_{t-1}$. The industry-specific and year-specific intercepts are omitted for brevity. Continuous control variables are winsorized at 1% and 99% percentiles each year before entering the regression tests. *, **, and *** represent significance at the 10, 5 and 1 percent (two-tailed) confidence levels, respectively. Refer to Appendix 1 for variable definitions.

Table 8
Business Volatility and Employee Performance
Firm Fixed Effects Regression

	Dependent Variable = EMPPRO		Dependent Variable = EMPEFF		Dependent Variable = EMPCOST	
Variables	Estimate	Pr > |t|	Estimate	Pr > |t|	Estimate	Pr > |t|
BV	**0.023*** **	**<.0001**	**0.248*** **	**<.0001**	**0.001** **	**0.034**
SIZE	0.014***	<.0001	-0.002	0.973	-0.001***	<.0001
ROA	0.092***	<.0001	1.786***	<.0001	-0.009***	<.0001
LEV	-0.104***	<.0001	-0.902***	<.0001	0.000	0.769
MTB	0.001**	0.026	0.027***	<.0001	0.000***	<.0001
ADV	-0.270*	0.063	-8.160***	<.0001	-0.028*	0.050
RD	-0.014***	<.0001	-0.094**	0.028	0.002***	<.0001
YEAR	Yes		Yes		Yes	
INDUSTRY	No		No		No	
Observations	29,065		29,065		29,065	
Adj. R^2	0.8638		0.8278		0.8653	

This table reports the results from the fixed effects regression of regressing employee performance variables on business volatility over the period of 1962-2015 based on the following model equation:

$$EMPPRO\ (EMPEFF,\ EMPCOST) = \beta_0 + \beta_1 \times BV + \beta_x \times Control\ Variables + Year\&Industry\ Dummies + \varepsilon$$

The dependent variable *EMPPRO* measures the employee performance/productivity. We also use the two components of *EMPPRO*: employee cost efficiency (*EMPEFF*) and employee cost per employee (*EMPCOST*), as our dependent variables. The independent variable of interest (*BV*) captures the level of business volatility. The industry-specific and year-specific intercepts are omitted for brevity. Continuous control variables are winsorized at 1% and 99% percentiles each year before entering the regression tests. *, **, and *** represent significance at the 10, 5 and 1 percent (two-tailed) confidence levels, respectively. Refer to Appendix 1 for variable definitions.

Table 9
Business Volatility and Employee Performance
Two-Stage OLS Regression Analysis (2SLS)

	Stage 1		Stage 2					
	Dependent Variable = BV_Instrumented		Dependent Variable = EMPPRO		Dependent Variable = EMPEFF		Dependent Variable = EMPCOST	
Variables	Estimate	Pr > |t|	Estimate	Pr > |t|	Estimate	Pr > |t|	Estimate	Pr > |t|
Intercept	0.531***	<.0001	0.384***	<.0001	5.005***	<.0001	0.087***	<.0001
BV_Mean	1.136***	<.0001						
BV_Instrumented			**0.065*** **	**<.0001**	**1.096*** **	**<.0001**	**0.002*** **	**<.0001**
SIZE	-0.053***	<.0001	0.022***	<.0001	0.225***	<.0001	0.001***	<.0001
ROA	-0.452***	<.0001	0.092***	<.0001	2.136***	<.0001	-0.022***	<.0001
LEV	0.027	0.238	-0.082***	<.0001	-1.677***	<.0001	-0.002	0.296
MTB	0.011***	<.0001	-0.001	0.200	0.009	0.340	0.000***	<.0001
ADV	0.023	0.916	-0.662***	<.0001	-0.482	0.828	-0.128***	<.0001
RD	0.028***	<.0001	-0.030***	<.0001	-0.300***	<.0001	0.005***	<.0001
YEAR	Yes		Yes		Yes		Yes	
INDUSTRY	Yes		Yes		Yes		Yes	
Observations	29,065		29,065		29,065		29,065	
Adj. R^2	0.1472		0.2636		0.2085		0.4226	

This table presents the results of two stage OLS regression analysis (2SLS) with industry and year effects based on the full sample. In the first stage of 2SLS, we estimate the instrumented business volatility (*BV*) using the average business volatility scores (*BV_Mean*) in the same industry. We include all of the control variables, as well as the industry and year dummy variables. In the second stage of 2SLS, we use the instrumented values of *BV* (*BV_Instrumened*) from the first stage and include them as independent variables in the second stage regression. We use the same control variables in the second stage regression. The above procedures are applied in previous studies (e.g., Jiraporn, Jiraporn, Boepraset, and Chang 2014). The industry-specific and year-specific intercepts are omitted for brevity. Continuous control variables are winsorized at 1% and 99% percentiles each year before entering the regression tests. *, **, and *** represent significance at the 10, 5 and 1 percent (two-tailed) confidence levels, respectively. Refer to Appendix 1 for variable definitions.

Table 10
Business Volatility and Employee Performance
Large Firms vs. Small Firms

Panel A: BV and EMPPRO

	Large Firms =		Small Firms =	
	Dependent Variable EMPPRO		Dependent Variable EMPPRO	
Variables	Estimate	Pr > |t|	Estimate	Pr > |t|
Intercept	0.210	0.003	0.428	<.0001
BV	**0.130*** **	**<.0001**	**0.033*** **	**<.0001**
SIZE	0.041***	<.0001	0.012***	<.0001
ROA	0.061	0.462	0.076***	<.0001
LEV	-0.137***	0.004	-0.034**	0.049
MTB	-0.003***	0.004	0.001	0.294
ADV	0.324	0.110	-1.023***	<.0001
RD	-0.087***	<.0001	-0.025***	<.0001
YEAR	Yes		Yes	
INDUSTRY	Yes		Yes	
Observations	14,533		14,532	
Adj. R^2	0.2821		0.2412	

Coefficient Comparison	F-stat	p-value
Test of BV of large firms = BV of small firms	112.31	<0.0001

This panel reports the results from the clustered standard errors regression of regressing employee performance variables on business volatility for two subsamples (large firms vs. small firms) over the period of 1962-2015 based on the following model equation:

$$EMPPRO = \beta_0 + \beta_1 \times BV + \beta_x \times Control\ Variables + Year\&Industry\ Dummies + \varepsilon$$

The dependent variable *EMPPRO* measures the employee performance/productivity. The independent variable of interest (*BV*) captures the level of business volatility. The industry-specific and year-specific intercepts are omitted for brevity. Continuous control variables are winsorized at 1% and 99% percentiles each year before entering the regression tests. *, **, and *** represent significance at the 10, 5 and 1 percent (two-tailed) confidence levels, respectively. Refer to Appendix 1 for variable definitions.

Panel B: BV and EMPEFF/EMPCOST

	Large Firms		Small Firms		Large Firms		Small Firms	
	Dependent Variable EMPEFF		Dependent Variable EMPEFF		Dependent Variable EMPCOST		Dependent Variable EMPCOST	
Variables	Estimate	Pr > |t|	Estimate	Pr > |t|	Estimate	Pr > |t|	Estimate	Pr > |t|
Intercept	4.530***	<.0001	5.507***	<.0001	0.064***	<.0001	0.094***	<.0001
BV	**2.030*** **	**<.0001**	**0.630*** **	**<.0001**	**-0.000**	**0.835**	**0.003*** **	**0.000**
SIZE	0.324***	<.0001	0.075*	0.057	0.002***	<.0001	0.001***	<.0001
ROA	3.899***	0.003	1.882***	<.0001	-0.017**	0.011	-0.022***	<.0001
LEV	-3.843***	<.0001	-0.296	0.292	0.010**	0.011	-0.006*	0.072
MTB	-0.006	0.744	0.032*	0.061	0.000	0.140	0.000*	0.059
ADV	5.368*	0.089	-2.303	0.530	-0.086***	<.0001	-0.122***	0.000
RD	-1.298***	0.001	-0.234***	<.0001	0.032***	<.0001	0.004***	0.001
YEAR	Yes		Yes		Yes		Yes	
INDUSTRY	Yes		Yes		Yes		Yes	
Observations	14,533		14,532		14,533		14,532	
Adj. R^2	0.2717		0.1499		0.4300		0.4444	

Coefficient Comparison	F-stat	p-value
EMPEFF:		
Test of BV of large firms = BV of small firms	45.13	<0.0001

This panel reports the results from the clustered standard errors regression of regressing employee performance variables on business volatility for two subsamples (large firms vs. small firms) over the period of 1962-2015 based on the following model equation:

$EMPEFF/EMPCOST = \beta_0 + \beta_1 \times BV + \beta_x \times Control\ Variables + Year\&Industry\ Dummies + \varepsilon$

Employee cost efficiency (*EMPEFF*) measures how efficiently a firm use total labor cost to generate sale revenue, and employee cost per employee (*EMPCOST*) measures how well a firm control labor cost to generate sales revenue. The independent variable of interest (*BV*) captures the level of business volatility. The industry-specific and year-specific intercepts are omitted for brevity. Continuous control variables are winsorized at 1% and 99% percentiles each year before entering the regression tests. *, **, and *** represent significance at the 10, 5 and 1 percent (two-tailed) confidence levels, respectively. Refer to Appendix 1 for variable definitions.

Table 11
Business Volatility and Employee Performance
High Labor Intensity Firms vs. Low Labor Intensity Firms

Panel A: BV and EMPPRO

	High Labor Intensity Firms		Low Labor Intensity Firms	
	Dependent Variable = EMPPRO		Dependent Variable = EMPPRO	
Variables	Estimate	Pr > |t|	Estimate	Pr > |t|
Intercept	0.584	<.0001	0.217	<.0001
BV	**0.110*** **	**<.0001**	**0.004***	**0.056**
SIZE	0.017***	<.0001	0.009***	<.0001
ROA	0.145***	0.003	0.020***	<.0001
LEV	-0.226***	<.0001	0.009	0.293
MTB	0.000	0.959	-0.001**	0.017
ADV	-1.197***	<.0001	-0.176***	0.007
RD	-0.303***	0.000	-0.015***	<.0001
YEAR	Yes		Yes	
INDUSTRY	Yes		Yes	
Observations	14,532		14,533	
Adj. R^2	0.3100		0.3575	

Coefficient Comparison	F-stat	p-value
Test of BV of high labor intensity firms = BV of low labor intensity firms	400.73	<0.0001

This panel reports the results from the clustered standard errors regression of regressing employee performance variables on business volatility for two subsamples (high labor intensity firms vs. low labor intensity firms) over the period of 1962-2015 based on the following model equation:

$$EMPPRO = \beta_0 + \beta_1 \times BV + \beta_x \times Control\ Variables + Year\&Industry\ Dummies + \varepsilon$$

The dependent variable (*EMPPRO*) measures the employee performance/productivity. The independent variable of interest (*BV*) captures the business volatility. The industry-specific and year-specific intercepts are omitted for brevity. Continuous control variables are winsorized at 1% and 99% percentiles each year before entering the regression tests. *, **, and *** represent significance at the 10, 5 and 1 percent (two-tailed) confidence levels, respectively. Refer to Appendix 1 for variable definitions.

Panel B: BV and EMPEFF/EMPCOST

	High Labor Intensity Firms		Low Labor Intensity Firms		High Labor Intensity Firms		Low Labor Intensity Firms	
	Dependent Variable = EMPEFF		Dependent Variable = EMPEFF		Dependent Variable = EMPCOST		Dependent Variable = EMPCOST	
Variables	Estimate	Pr > |t|	Estimate	Pr > |t|	Estimate	Pr > |t|	Estimate	Pr > |t|
Intercept	10.228***	<.0001	2.123***	<.0001	0.108***	<.0001	0.062***	<.0001
BV	**1.646*** **	**<.0001**	**0.037*** **	**0.003**	**0.004*** **	**<.0001**	**0.002***	**0.053**
SIZE	-0.006	0.870	0.073***	<.0001	0.001***	0.001	0.001***	<.0001
ROA	1.909***	0.009	0.469***	<.0001	-0.019***	<.0001	0.000	0.938
LEV	-4.461***	<.0001	0.212***	<.0001	0.002	0.633	-0.002	0.550
MTB	0.022	0.377	-0.001	0.627	0.000*	0.075	0.000**	0.046
ADV	-13.265***	0.003	4.245***	<.0001	-0.146***	0.000	-0.092***	<.0001
RD	7.707**	0.028	-0.140***	<.0001	0.004***	0.001	-0.014***	0.001
YEAR	Yes		Yes		Yes		Yes	
INDUSTRY	Yes		Yes		Yes		Yes	
Observations	14,533		14,532		14,533		14,532	
Adj. R^2	0.2135		0.3894		0.5029		0.3674	

Coefficient Comparison	F-stat	p-value
EMPEFF:		
Test of BV of high labor intensity firms = BV of low labor intensity firms	171.46	<0.0001
EMPCOST:		
Test of BV of high labor intensity firms = BV of low labor intensity firms	35.06	<0.0001

This panel reports the results from the clustered standard errors regression of regressing employee performance variables on business volatility for two subsamples (high labor intensity firms vs. low labor intensity firms) over the period of 1962-2015 based on the following model equation:

$$EMPEFF/EMPCOST = \beta_0 + \beta_1 \times BV + \beta_x \times Control\ Variables + Year\&Industry\ Dummies + \varepsilon$$

Employee cost efficiency (*EMPEFF*) measures how efficiently a firm use total labor cost to generate sale revenue, and employee cost per employee (*EMPCOST*) measures how well a firm control labor cost to generate sales revenue. The independent variable of interest (*BV*) captures the level of business volatility. The

industry-specific and year-specific intercepts are omitted for brevity. Continuous control variables are winsorized at 1% and 99% percentiles each year before entering the regression tests. *, **, and *** represent significance at the 10, 5 and 1 percent (two-tailed) confidence levels, respectively. Refer to Appendix 1 for variable definitions.

Table 12
Business Volatility and Employee Performance
Additional Control Variable

	Dependent Variable = EMPPRO		Dependent Variable = EMPEFF		Dependent Variable = EMPCOST	
Variables	Estimate	Pr > |t|	Estimate	Pr > |t|	Estimate	Pr > |t|
Intercept	0.396***	<.0001	6.533***	<.0001	0.072***	<.0001
BV	**0.068*** **	**<.0001**	**1.353*** **	**<.0001**	**0.003*** **	**0.001**
SIZE	0.012***	<.0001	0.059**	0.030	0.001***	0.000
ROA	0.073***	<.0001	2.143***	<.0001	-0.016***	<.0001
LEV	0.019	0.469	-0.802***	0.009	0.002	0.423
MTB	-0.002***	0.001	-0.011	0.394	0.000	0.194
ADV	-0.458***	0.000	0.004	0.199	-0.043**	0.038
RD	-0.081***	<.0001	-0.702**	0.026	0.030***	<.0001
MA_ABILITY	0.539***	<.0001	9.778***	<.0001	0.002***	0.006
YEAR	Yes		Yes		Yes	
INDUSTRY	Yes		Yes		Yes	
Observations	15,395		15,395		15,395	
Adj. R^2	0.2724		0.2365		0.3227	

The table reports the results from the clustered standard errors regression of regressing employee performance variables on environmental uncertainty over the period of 1962-2015 based on the following model equation:

$$EMPPRO\ (EMPEFF, EMPCOST) = \beta_0 + \beta_1 \times BV + \beta_x \times Control\ Variables + Year\&Industry\ Dummies + \varepsilon$$

The dependent variables (EMPPRO) measures the employee performance/productivity. We also use the two components of EMPPRO: employee cost efficiency (EMPEFF) and employee cost per employee (EMPCOST), as our dependent variables. The independent variable of interest (BV) captures the level of business volatility. The industry-specific and year-specific intercepts are omitted for brevity. Continuous control variables are winsorized at 1% and 99% percentiles each year before entering the regression tests. *, **, and *** represent significance at the 10, 5 and 1 percent (two-tailed) confidence levels, respectively. Refer to Appendix 1 for variable definitions.