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Financial Distress, Employees' Welfare and Entrepreneurship Among SMEs

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Abstract The study predicts ex-ante financial distress in small and medium-sized enterprises (SMEs) and examines its significance in entrepreneurial activity. Thus, the study provides the dynamic characterization of the link between financial distress, employment and the growth in the establishment of SMEs. The study further examines employees' welfare and financial distress of SMEs. The results reveal that financial ratios and market variables are significant in predicting financial distress risks. In the wake of financial distress, the results reveal contractions in the growth of SMEs. In addition, financial distress in SMEs induces an adverse effect on the level of employment and a reduction in employees' welfare.

Keywords Entrepreneur · Financial distress · Clogit · SMEs

JEL Classification F23 · L26 · L25

1 Introduction

Small and medium-sized enterprises are considered the backbone of an economy in most developing countries and developed countries by being the dominant form of business organizations. They contribute immensely to the generation of employment and help to increase welfare and economic growth. In the US, they constitute about 99 % of all firms, generate 65 % of net new private sector jobs and provide over 50 % of private sector jobs.[1] According to the data from Census and Small Business Administration (SBA) Advocacy,

[1] Information is retrieved from the TradeUp white paper (2014): http://www.growadvisors.com/uploads/2/7/9/9/27998715/state_of_sme_finance_in_the_united_states_-tradeup_2014.pdf.

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in 2006, 99.9 % of private US nonfarm businesses are classified as SMEs.[2] Higher employment growth is recorded for firms with 100-499 employees when compared to small firms, which reflects the dynamics of growing and contracting firms over time. From 2007 to 2012, the percentage of total employment of SMEs has fallen from 49.6 to 48.4 %.[3] Apart from employment creation, SMEs remain important to the US economy by contributing significantly to growth in GDP, playing important roles in innovation and creating more opportunities for citizens to establish and grow new businesses and develop entrepreneurial skills.

Access to cash flow as well as credit is needful for the survival of these firms. In the wake of the financial crisis, the credit condition of US SMEs deteriorates and further deterioration is expected. The report from the TradeUp white paper highlights that financing for SMEs appears to be recovering from the effects of the global financial crisis. However, banks have concentrated on large and less nascent companies in the provision of credit for business venturing. While lending to SMEs has improved, it is yet to return to its pre-crisis levels. Detrimental consequences may abound, as SMEs have fewer sources of external financing and are largely dependent on banks for financing. It becomes essential for proper management of the available funds in order to avoid sudden exit because of bankruptcy or financial distress.

With the rapidly changing economic environment, the ability to manage risk becomes an essential element in business management strategy. Failure or financial distress can depict a complex phenomenon that induces detrimental effects on an enterprise and the entrepreneur. Failure in the form of bankruptcy/liquidation or financial distress represents an essential phenomenon in entrepreneurship. Its causes and consequences for organizations, society and individuals remain important issues in enterprise development. Inability to predict insolvency will pose grave consequences in the operations of the small and medium-sized enterprises (SMEs). An evaluation of the financial health of these firms becomes an important development.

Drawing from quantitative approach, the study predicts financial distress (FD) in SMEs by employing information as contained in the financial ratios and market variables and test the importance of FD in entrepreneurial activity. Thus, the study provides the dynamic characterization of the link between financial distress and the growth of SMEs. The study further advances knowledge on distress risk by examining the state of employees' benefits among financially distressed SMEs. As an entrepreneurial activity, we examine the decline in the workforce among distressed firms. We make a seminal contribution by employing a dynamic model. Lastly, we contribute to knowledge on SMEs' default risk by exploring financial distress other than bankruptcy or liquidation.

The results are intriguing. The mixed-models employed are capable of predicting distress among SMEs with high degree of accuracy. Specifically, mixed models are capable of predicting financial distress with about 90 % accuracy, 1 year before its manifestation. As timely prediction is essential for creditors, it becomes useful as a tool in averting the costs associated with financial distress or bankruptcy, as well as the provision of guidance in the operation and management of these small firms.

The results from the simultaneous equation specifications reveal that the growth of SMEs contracts in the wake of financial distress. Given that firm growth may represent a

[2] Refer to the report by United States International Trade Commission http://www.usitc.gov/publications/332/pub4125.pdf.

[3] The information is obtained from https://www.census.gov/content/dam/Census/library/publications/2015/econ/g12-susb.pdf.

solution in spurring entrepreneurial activity, financial distress becomes an undesirable impediment in the realisation of entrepreneurial goals. On the examination of employees' compensation, a similar effect is uncovered. In addition, financial distress induces an adverse effect on employment growth in SMEs.

2 Background

Over the past 5 decades, a considerable number of academic literatures have been devoted to the prediction of financial distress or bankruptcy among firms. The introduction of credit scoring in business lending has assisted in the generation of enormous literatures, each examining the best model or method to track failure in business establishments. The availability of various accounting and market data has assisted in the analysis of credit scoring and in the evaluation of firm performance. The application of these risk models in tracking failure in small and medium-sized enterprises (SMEs) is essential. Because of economies of scale, the performance of SMEs might not be comparable to their larger counterparts. The prediction of failure in SMEs can provide an insight on the determinants of failure in SMEs.

With alternative econometric approaches and numerous independent variables, various competing models of bankruptcy or financial distress prediction have evolved over time. Methodological evolution on distress studies has been another major area of contribution. Apart from the multiple discriminant analysis (Altman 1968), other methods such as the conditional logit (Ohlson 1980), probit (Zmijewski 1984) models have been developed. More recently, the development and use of hazard models (Shumway 2001), which are dynamic models have emerged. Panel models of logit and probit methods have also been developed and employed in some studies such as Pindado et al. (2008) and Tinoco and Wilson (2013). These modelling approaches have employed various definitions of bankruptcy or financial distress. In most of these studies, a binary dependent variable that takes a value of 1 for distressed condition and otherwise 0 is usually employed in the determination of the predictive power of each model or variable. From financial statements, various accounting ratios such as liquidity, leverage and profitability measures have become increasingly important in distress analysis [examples include Altman (1968) and Ohlson (1980)]. Other studies have relied on market variables such as stock prices, return and their volatility [examples include Shumway (2001) and Hillegeist et al. (2004)] while more recently, the introduction of macroeconomic variables is encouraged [example include Tinoco and Wilson (2013)]. Based on the financial statements of various organizations, a definition of financial distress that is wider in scope has also been developed [examples include Wruck (1990) Grice and Dugan (2001) and Pindado et al. (2008)].

An extensive study on bankruptcy or financial distress has emerged since the study by Altman (1968). Most literatures have relied on the accounting ratios (Altman 1968), market based information (Merton 1974) in the analysis of distress risk of companies. In recent times, studies that combine both measures have emerged [such as Chava and Jarrow (2004) and Shumway (2001)]. In addition, studies that include macroeconomic variables in bankruptcy or failure prediction have emerged [such as Tinoco and Wilson (2013)]. The combination of these variables seems to yield greater predictive power than single models.

This study contributes to the literature by presenting distress prediction models for SMEs. We contribute to SMEs studies by employing a panel of SMEs in US. In this study, we examine the ability of financial ratios and market variables in predicting financial

distress among SMEs. One of the motivations of this study stems from the established fact that bankruptcy may not represent all forms of failure. Thus, the determination of distress condition that is independent of its legal consequence is essential among SMEs. Thus, the study applies an ex-ante approach in predicting financial distress. By employing a conditional mixed process model, efficient and consistent estimates are retrieved from continuous and binary dependent specifications. The prediction of distress prior to its observation ensures that the dynamic nature of the data is captured. Thus, dynamism in the nature of SMEs' operation is captured directly through the lag of the time-varying covariates. Consistent with an ex-ante approach, we employ two definitions of financial distress in examining the predictive power of the mixed-models selected. Given that the focus of this paper is twofold, we therefore examine the following hypotheses:

1. Mixed models are capable of predicting financial distress among SMEs.
2. Financial distress generates a contraction in the establishment of new firms.
3. Financial distress lowers the level of employment in SMEs.
4. Financial distress affects the welfare of SMEs' employees.

3 Review and Definitions

3.1 SMEs, Financial Distress and Entrepreneurial Activity

The definition of SMEs varies from country to country. In the US, the Small Business Administration (SBA) is in charge of politics relating to SMEs and defines SMEs in relation to the North American Industry Classification System (NAICS). The identification of small and medium-sized enterprises hinges on four criteria: is organized for profit, has a unit in the US, contributes significantly to the US economy by paying taxes or using American products, labour or material and meets the numerical size standards.[4] For SMEs, the maximum number of employees is limited to 500 and the average annual receipts ought to be less than $28.5 million in most cases. However, the harmonization of this definition is not easy as different limits apply to different industries.

In many economies, the contribution of small and medium-sized enterprises (SMEs) to economic growth is enormous. Accounting for a larger part of employment, the SMEs are the predominant establishments in Organisation for Economic Co-operation and Development (OECD) economies. In the US, the percentage of large firms to the total number of firms has remained low relative to the SMEs.[5] Given the vitality of SMEs in the US, the government has ensured its continuous growth and success through favourable policies. Large firms differ from SMEs in many respects. However, research on default risk for SMEs is substantially lacking. Dietsch and Petey (2004) reveal that the asset correlation of SMEs in France and Germany is lower than large businesses, but these SMEs remain riskier.

The availability of external finance for small and medium-sized enterprises has maintained a central position in the research on SMEs and constitutes a vital policy issue around the globe. In the comprehension of markets and institutions that aid to make funds available to SMEs, the conceptual framework of current research has been helpful. However, Berger and Udell (2006) argue that the introduction of key elements of the

[4] See https://www.urmc.rochester.edu/purchasing/supplier/vendorins.cfm.

[5] This data is accessible from http://www.census.gov//econ/susb/data/susb2007.html.

financial system that affect the availability of credit to SMEs is essential. They lay emphasis on the causal chain from policy to financial structures, which affects the profitability and feasibility of different lending technologies.

Favourable financial conditions and access to credit are important in the attainment of business success among SMEs given that banks might prefer to issue loans to larger firms or to their established clients. The provision of capital and the financial condition in which these firms operate are important factors in successful operation of these ventures. While exploring the bargaining power and information on SMEs lending, Grunert and Norden (2012) examine the bargaining power of the borrower by exploiting the cross sectional variation of loan terms for borrowers whose default risk is the same and by starting at the end of the loan contracting process. They show that the bargaining power of the borrowers improves with more favourable soft than hard information.

In the corporate sector, investors and lenders demand timely and accurate information on the probability of default risk. The building of probability default risks that capture or relate to the features of corporate sub-populations (private companies, SMEs and sector specific models among others) are required by banks for an effective development of 'Internal Rating Systems' (*IRB*). With increasing competition with other sectors, lending to SMEs is of considerable importance to lending agencies.

Empirical research on bankruptcy of SMEs is scarce, as most studies concentrate either on all firms or on the industrial firms. The existing work on US SMEs comes from Altman and Sabato (2007) who develop a distress prediction model for SMEs sector based on financial ratios and analyse its effectiveness when compared to the corporate model. Failure or financial distress can depict a complex phenomenon that induces detrimental and serious effect on an enterprise and the entrepreneur.

Altman and Sabato (2007) hypothesize that when a default prediction model developed on a large corporate data is applied to SMEs, the entire corporate portfolio is likely to yield a poorer performance than when SMEs and large companies have separate models. In addition, this will result in a lower predictive power of the model. They point to the significance of modelling SMEs' credit risk separately from those in large organizations. Thus, they suggest that banks should apply different procedures in the management of SMEs.

Enumerating the interdependent and multifaceted nature of the costs of failure, Cope (2011) reveals that failure has significant physiological, financial, social, emotional, entrepreneurial and professional effects. Failure in form of bankruptcy/liquidation or financial distress represents an essential phenomenon in entrepreneurship. Its causes and consequences for organizations, society and individuals remain important issues in enterprise development.[6]

While examining the effects of global financial crisis on the anxiety of workers, Kler et al. (2015) argue that the level of responsibilities and commitments of a worker would be an important determinant of the effects of anxiety. While concentrating of workers who are overeducated and are known to have lower levels of satisfaction in job security, their results reveal significant exhibition of lower satisfaction with job security among partnered workers after the crisis, which increases when they have children. This points to the fact that other aspects of wellbeing may be affected apart from the potential fall in income or employment in the wake of a financial crisis or distress.

Economic growth and wealth creation can be linked to the evolution of firms with innovative services and products. In their examination of studies on business growth,

[6] The relationship between trust and financial crisis experiences is given in van der Cruijsen et al. (2015).

Achtenhagen et al. (2010) argue that entrepreneurship research has focused on outcome measures that can be operationalised and assessed easily while the increment in the number of employees has been the political and public expectation on entrepreneurs. They lay emphasis on internal growth processes such as staff qualification activities and obtaining certification according to the standards of the International Organization for Standardization (ISO). These are embodied in the quality and range of products, the strength of the organization and the level of development of the resource base. These internal development processes relate directly to value generation in the eyes of entrepreneurs. Thus, they view the heterogeneity in business growth perspectives as problematic, especially when the gap between the perceptions of the study subject and object is not acknowledged. Thus, in this study, we examine employees' benefits as an internal growth process or welfare package.

Various measures of the rate of entrepreneurial activity exist in the literature. The prevalence of small enterprises, the number of enterprise start-ups or the number of self-employed people is one common approach to proxy for entrepreneurial activity (Evans and Leighton 1989). Significant advances in entrepreneur measurement have evolved over time. These measures can be obtained from records of business registries or self-reports of individuals who are randomly selected. Gartner and Shane (1995) provide a review of entrepreneurship measurement over time. These include the number of self-employed individuals, firm creation, rates and stocks. Individuals who report wages, but not wages paid to them by organizations or other individuals fall into this category. However, the difficult in this categorization is that once a self-employed person employs another person, he/she is no longer fit in this category. Thus, they argue that these measures have some merits and some limitations. Thus, in this study, we consider the growth in the number of firms, welfare package and employment in SMEs.

3.2 Overview of Bankruptcy/Financial Distress Risk Models

Methodological improvement of the financial distress models has continued to evolve over time. After the introduction of discriminant analytical models; Z-score model (Altman 1968) and the ZETA model (Altman et al. 1977), further methodological improvements such as; the conditional logit model (Ohlson 1980), the probit model (Zmijewski 1984), and the mixed logit model (Jones and Hensher 2004) have evolved over time. The application of dynamic models; the panel logit as used in Pindado et al. (2008) and the hazard models (Shumway 2001) have been encouraged. Shumway (2001) argues that the static models are not appropriate in forecasting bankruptcy. He introduces a model that uses market driven variables in the identification of failing firms. He argues that the model has better out of sample forecasts than alternative models. While evaluating the forecasting ability of bankruptcy prediction models of Altman (1968), Shumway (2001) and Zmijewski (1984), Chava and Jarrow (2004) show the importance of including industry effects in the estimation of hazard model. They reveal a better performance of monthly samples.

Apart from methodological improvements, another stream of literature has concentrated on the selection of appropriate pool of variables that can detect imminent bankruptcy or financial distress. One of the criticisms of the accounting ratios is that they reflect past information and not future expectation. Their inabilities to capture more subtle conditions in the capital market and their weak linkage with an underlying theoretical model have been major concerns in the use of accounting ratios to predict distress conditions. However, these models have remained competitive in the prediction of distress risk occurrence.

Hillegeist et al. (2004) recommend the use of the market-based model against the accounting variables. They assert that the values of assets, particularly for intangibles and fixed assets can be understated because of conservatism principle. They argue that the probability of distress as measured by bankruptcy filing is a future event while accounting ratios are designed to trace past performance. More so, the failure to incorporate asset price volatility in the prediction of distress risk with the accounting based measures is a major deficiency. Owing to the fact that asset price volatility can reveal the risks of default in debt obligation. Thus, the stock market remains a potential and superior source of information by aggregating information from various sources other than the financial statements. The option-pricing model adds strength to the market-based models by providing a theoretical framework for analysing the determinants of the likelihood of bankruptcy. However, the violation of its assumption impairs its predictive power. In addition, its limitation roots in the fact that the stock price may not reflect all publicly available information. Sloan (1996) reveals the limitation of the stock market in revealing the information about future earnings contained in the cash flow and current earnings' accrual.

From Black and Myron (1973) and Merton (1974) (BSM) option pricing model, the evolution of the market based models becomes a reality. Given that the strike price of the call option is equal to the face value of the firm's liabilities, the payoffs to call options are similar to the payoffs to equity. At the time of maturity, bankruptcy occurs if the face value of the liabilities is greater than the value of the asset. Thus, as given by McDonald (2002) and modified in Hillegeist et al. (2004) while accounting for a stream of dividend payment, the probability of failure is:

$$BSM_{prob.} = N\left(-\frac{ln\left(\frac{V_A}{X}\right) + \left(\mu - \delta - \left(\frac{\sigma_A^2}{2}\right)\right)T}{\sigma_A\sqrt{T}}\right) \tag{1}$$

where $N()$ represents the cumulative normal density function, X represents the face value of its liabilities, V_A represents the current value of the firm's asset, μ represents the expected firm's return, δ represents the dividend rate (total dividends/(market value of equity + total liabilities) σ_A is the volatility of an asset and T is the maturity time (taken as 1-year).

Apart from accounting and market variables, recent papers have examined the prediction accuracy when accounting ratio, market variables and macroeconomic variables are introduced. In their study on listed UK companies, Tinoco and Wilson (2013) reveal the importance of combining market, accounting and macroeconomic variables in bankruptcy and financial distress predictions. In the evaluation of the financial health status of companies, the use of bankruptcy or financial distress models is a long age tradition in the financial literature (examples include Subramanyam and Wild (1996); Purnanandam (2008) among others). Apart from bankruptcy, Grice and Dugan (2001) include liquidation, bonds vulnerable to default and low stock rating in their definition of financial distress.

According to Wruck (1990), financial distress occurs in a situation where current obligations are not covered because of insufficient cash flow. These obligations can range from potential or actual damages from litigation, unpaid debts to employees and suppliers and default (missed interest payment or principal under borrowing agreements). Thus, a default in debt repayment can be a signal to an imminent distress. Asquith et al. (1994) define financial distress as a condition in which a firm's reported interest expense is greater than its earnings before interest, taxes, depreciation and amortization for two consecutive years or EBITDA is less than 80 % of its interest expense in any 1 year. According to Pindado et al. (2008), financial distress is a condition in which a firm's market value falls

for two consecutive periods and its financial expenses are greater than its earnings before interest and taxes, depreciation and amortization (EBITDA) for two consecutive periods. These definitions fall under ex-ante approach, which identifies firms' financial distress other than bankruptcy, liquidation or closure. Consistent with the ex-ante approach, we employ two types of financial distress. In the first case, we employ the definition as given by Pindado et al. (2008) and this is labelled as (FDA). In the second case, we define FD as a condition in which the EBITDA is less than 80 % of a firm's financial (accrued) expense in any three consecutive years and this is labelled as (FDB).

4 Methodology

4.1 Duration Model

The hazard models in the existing literature usually take the functional form of a discrete hazard model. An example can be seen in Shumway (2001), who reveals that the discrete time hazard model is equivalent to a multi period logit model. At each point in time, the discrete hazard model estimates the default risk probability by using time varying variables. The binary dependent variable captures failure or survival in $t + 1$. Failure is conditioned on survival until time t. Following Chava and Jarrow (2004), Campbell et al. (2008) and Bauer and Agarwal (2014), the discrete probability of default at time t is given as:

$$P_{i,t}\left(Y_{i,t+1} = 1\right) = \frac{1}{1 + e^{-\alpha_t - \beta X_{i,t}}} \tag{2}$$

where $P_{i,t}$ is the default probability risk at time t given that firm i will fail in the next period, $Y_{i,t+1}$ takes the value of 1 if firm i fails in $t + 1$ and 0 otherwise, α_t is the baseline hazard function (time dummies and macroeconomic variables) while $X_{i,t}$ represents the vector of time varying covariates known at time t. The coefficients are embedded in β. The probability of distress is estimated in the year prior to the financial distress observation $(t - 1)$. Shumway (2001) shows that the likelihood function of the discrete time hazard model is equivalent to the likelihood function of a multiperiod logit model. Within the panel logit framework, the estimation of the hazard model with time-varying covariate is equivalent to the multiperiod logit functions. Thus, we estimate the conditional logit model in the preliminary (FD prediction) analysis.

4.2 Simultaneous Equation Model

In estimating the relationship between financial distress and entrepreneurial activity, the conditional mixed process estimator (CMP) methodology of Roodman (2011) is followed. The CMP model allows for simultaneous-equation systems with recursivity (triangular matrix of coefficients of endogenous variables) and observability (all right-hand side endogenous variables appear in the equation as observed). Consistent estimates under observability condition are obtained by being able to fit seemingly unrelated regression (SUR) models. The author derives consistent estimates from the mixed-process recursive simultaneous systems using the maximum likelihood of the SUR. Following this model, our specification is:

$$f_{it}^{*} = \propto + \beta D_{it} + \varepsilon_{it} \tag{3}$$

$$y_{it} = \propto + \gamma O_{it} + \delta f_{it}^{*} + \mu_{it} \tag{4}$$

$$f = g(f^{*}) = \begin{cases} 0 & if\, f^{*} \leq 0 \\ 1 & if\, f^{*} > 0 \end{cases}$$

where f is the financial distress variable (a dichotomous dependent variable, which takes the value of 1 for financially distressed firms and 0 otherwise), y is a measure of entrepreneurial activity, β, γ and δ are vectors of coefficients, D is a vector of financial distress determinants, while O is a vector of factors that affect the operation of an enterprise. i is the index of firms and t is the time index $\epsilon = (\varepsilon, \mu)' \sim \mathrm{N}(0, \Sigma), \Sigma = \begin{bmatrix} 1 & \rho \\ \rho & 1 \end{bmatrix}$ and the endogeneity of f_{it} in y_{it} equation is measured by ρ. Heteroskedasticity is treated by using the robust estimates. As long as one varying predetermined variable appears in each equation, a general recursive multiequation probit model is identified (Wilde 2000). Though the imposition of exclusion restrictions to satisfy the order condition may yield more robust identification [detailed information can be found in Roodman (2011)].

4.3 Data and Variables

To obtain high accuracy in the prediction of FD event, mixed models that combine accounting and market variables are used. The good performance of mixed models is established in the extant literature.[7] We present the variables employed for each of the basic three models under the two financial distress measures. 1–3 represent the models used under FDA distress event. In model 1, the ratios used are: measure of a firm's size (total assets/gross national product (GNP) price-level index) (SIZE), sales to total asset ratio (SAL), a change in net income $(NI_t - NI_{t-1})/(|NI_t| + |NI_{t-1}|)$ (CHIN), and firms' stock return (RET). In model 2, the ratios employed include: SIZE, earnings before interest and taxes/total assets (EBT) and firms' realised volatility (VRT). In model 3, the ratios employed include: SIZE, RET and retained earnings (RE). These three models are repeated in the second definition of financial distress (FDB) and are labelled as A, B, C respectively. The parsimonious selection of regressors provides more stable results in terms of magnitude, significance and coefficient sign (Pindado et al. 2008). Thus, many variables may not be needful in achieving efficiency in the discriminant models [see for example Zmijewski (1984)].

As smaller companies might have a higher probability of default, an adjustment for the size of a firm becomes important. The cumulative profitability of a firm is measurable through its retained earnings. This remains an important variable as profitability over time is captured. This ratio implicitly takes the age of a firm into consideration. A change in net income captures any progressive losses over the two most nearest periods. Earnings before interest and taxes/total assets ratio is a measure of productivity or profitability among firms. The sales generating power of an asset is evident in the capital turnover ratio. This reflects broadly, the competitiveness of the management strategies. These ratios are used to predict financial distress prior to its observation (t − 1). These variables are expected to lower the rate of default or failure in firms. In addition to these variables, we obtain the firm's level of employment (EMP), investment (INV) and total revenue (TR) and a measure of realised volatility (square return, VRT). Similar to Tinoco and Wilson (2013), the variables are transformed using the hyperbolic tangent transformation. The essence of this transformation is to address extreme values of observations, which might after the predictive

[7] See for example Tyler Shumway (2001) Chava and Jarrow (2004) and Campbell et al. (2008).

power of the models. While reducing the values that fall outside the expected range, a linear transformation of input values located near the expected values can be generated (Godfrey 2009). He shows that the real line is mapped into [−1,1] range. In cases where x is small valued, then $\tanh(x) \approx x$.

The source of the data is the Compustat database. We obtain these data for a panel of US SMEs, between the periods of 1998 and 2011. Yearly observations of variables are used. To achieve this we restrict our sample to firms that have employees not greater than 500 (1174 firms retained) (This is based on the definition of SMEs by the number of employees). To exclusively capture SMEs, we further exclude 20 firms who have less than 500 employees but whose total revenue is much (exceeds 7000 million). The conditional logit model is used in the preliminary analysis (prediction of FD).

Given that these firm variables are used in the prediction of financial distress risk, variables that will affect the level of employment or firm growth are needed. Thus, we obtain macroeconomic variables from the *Datastream*. These include the inflation rate (GINF) and *GNP* price index. We obtain the real interest rate (GRR) from World Bank database. We also obtain the number of SMEs establishment (GEST), the number of employees (GEMP) and the annual payroll (GEARN) from the Statistics of U.S. Businesses- Consensus Bureau. We employ the growth rate of these variables. The Consensus data are sourced based on North American Industry Classification System (NAICS) and are made to match with Compustat data (firms with missing NAICS are excluded). The annual payroll consists of all forms of compensation, such as wages, salaries, commissions, vacation allowances, bonuses, sick-leave pay, and the value of payments in kind.[8]

5 Results and Discussion

5.1 Financial Distress Prediction

We document the predictive power of the models to be used in the system analysis in Fig. 1 and Table 1. As discussed earlier, 1, 2 and 3 models are used to predict FDA while A, B and C models are used to predict FDB. In this preliminary analysis, a panel conditional logit estimation is employed in predicting each type of financial distress likelihood. For model 1, 2 and 3, the results reveal that the area under the receiver operating characteristic curve (ROC) is 0.76, 0.75 and 0.73 respectively. Under this financial distress type (FDA), the predictive powers of these models are relatively above average. A direct and an appropriate measure of the predictive ability of a model is the area under the receiver operating characteristic curve (ROC). With this, the overall performance of a test is achievable for the observed variables (DeLong et al. 1988). The curve is obtained by varying the cut-off point used in the determination of values of the observed variables, which appear to be abnormal. A summary of the performance of a model is given by the risk scores, which range from 0 to 1, as 1 depicts a perfect predictive ability.

Under the second financial distress condition (FDB), these models have the AUC of 0.84, 0.91 and 0.83 respectively. The accuracy ratios of these models are more competitive. An examination of the total percentage performance in the determination of both distress and non-distress financial events reveals that these models have higher classification power in predicting FDA (1, 2, 3) than FDB (A, B, C). However, their performance under FDB is preferable as a risk manager might be interested in the accurate classification of distress

[8] Refer to http://www.census.gov//econ/susb/definitions.html.

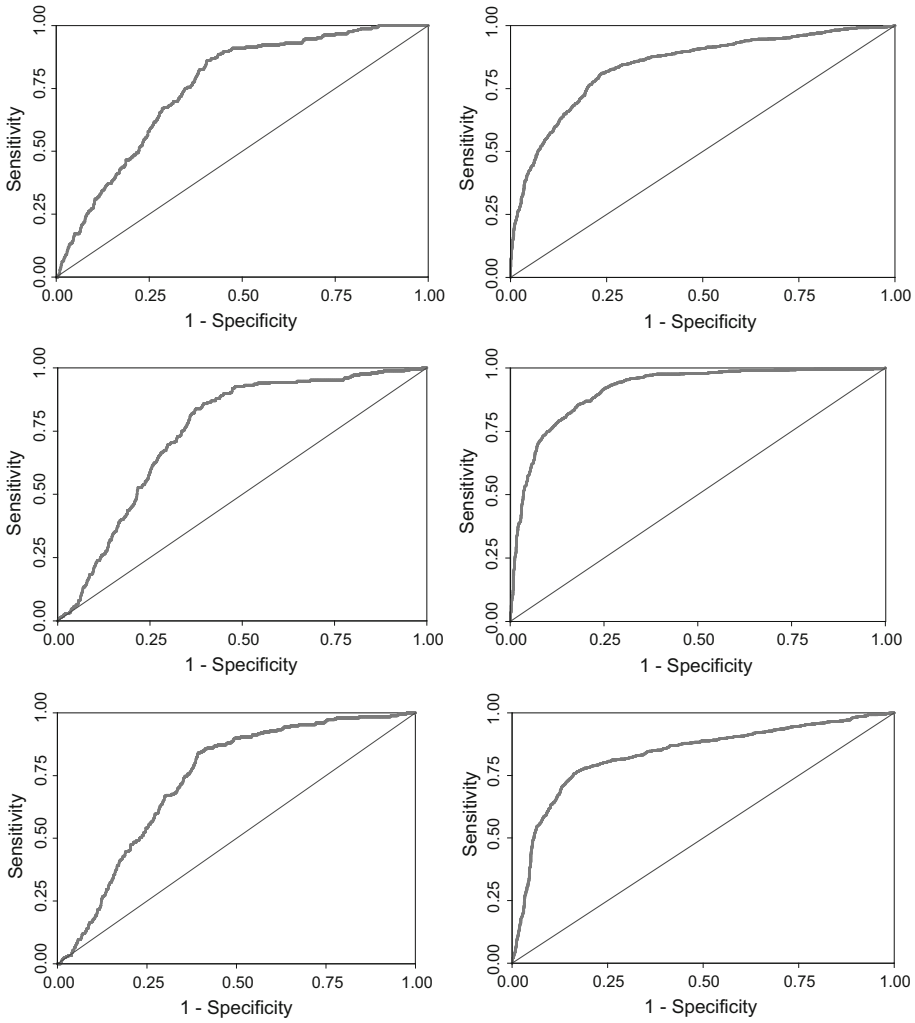

Fig. 1 The figures represent the areas under the ROC curve. The *left wing* (*top–bottom*) contains the graphs from model 1–4. Similarly, the graphs from model A–D are in the right wing

condition than non-distress situation. In general, these models remain competitive in comparison with results from the extant literature. This reveals the importance of combining accounting and market variables in the prediction models.

As Balcaen and Ooghe (2006) argue, the omission of non-accounting variables will mean that all relevant failure indicators are captured by the accounting variables. Apart from the generation of superior predictive models through the inclusion of equity prices, the improvement of the timeliness is another advantage (Keasey and Watson 1991). This is a desirable combination in the risk prediction models. As noted in Agarwal and Taffler (2008), market prices contain information that is available in the accounting ratios as well as information not available in the accounting ratios. Given that the major focus of this paper is on the marginal effect we, proceed to the system analysis.

Table 1 Area under the ROC curve

Model	Observation	AUC	SE	AR	Total (%)
1	3896	0.76	0.013	0.52	90
A	3812	0.84	0.008	0.68	75
2	4404	0.75	0.013	0.50	90
B	3446	0.91	0.005	0.82	86
3	5124	0.73	0.013	0.46	87
C	3973	0.83	0.008	0.66	57

1–3 are models used to predict FDA while A–C are models used to predict FDB. AUC is the area under the ROC curve estimated as the Wilcoxon statistic. AR is the accuracy ratio, which is computed as 2*(AUC-0.5). SE represents standard errors. The models are computed a year prior to the observation of financial distress

5.2 Financial Distress and Entrepreneurship

In this section, we relate financial distress among SMEs to entrepreneurial activities. Thus, we capture growth in the number of establishments, the level of employment and growth in the welfare package for SMEs' workers under two types of financial distress events. To fit a model that remains consistent and efficient, we employ the CMP model and undertake more robustness check by using different prediction models. The results from the system are heteroskedastic-consistent. Thus, the robust standard errors from the final stage estimation are given. The marginal effects from each equation are reported. In the binary model, the marginal effect is computed through the partial derivative of the probability of an event with respect to the regressor.

In Table 2, the relationship between financial distress risk and growth in the number of establishments is presented. The marginal effects of the variables are reported for the 3 risk models that are fitted under FDA and FDB. The results reveal that sales/total asset ratio, change in net income and size are significant determinants of financial distress risk among these SMEs. The stock return is relevant in predicting financial distress risk. The results are economically and statistically significant. These accounting and market variables lower the likelihood of financial distress among SMEs. This confirms to theoretical expectation in terms of coefficient signs.

The creation and the operation of new businesses as an entrepreneurial activity can be a process of discovering facts (Kirzner 1997). Failure in the form of bankruptcy/liquidation or financial distress represents an essential phenomenon in entrepreneurship. Its causes and consequences for organizations, society and individuals remain important issues in enterprise development. In the second equation, the effect of financial distress risk on the growth of establishments among SMEs is uncovered. Financial distress (FDA) reveals a detrimental effect on the growth of SMEs. FDA lowers growth in the number of establishments by about 0.02 %. As control variables, growth in employment relates positively to firms' growth while inflation lowers the growth in the number of establishments.

Growth in employment is a reflection of a healthy economic state. A positive relationship with the number of establishments conforms to theoretical expectation. The expectation is that in the long-run, rising inflation will dampen economic prospects through its influence on total factor productivity. Instability in the price level due to rising level of inflation can be costly for firms (menu costs). Thus, inflation can dampen outcome in the long-run and consequently, a detrimental effect on business establishment is not far-fetched.

Table 2 FDL and establishment

Model	1		2	3
Distress	FDA	FDB	FDA	FDA
SAL		−0.372*** (0.019)		
SIZE	−0.110*** (0.010)	−0.433*** (0.011)	−0.117*** (0.010)	−0.090*** (0.007)
CHIN	−0.054*** (0.014)	−0.018 (0.026)		
RET	−0.018** (0.008)	−0.054*** (0.012)		−0.011** (0.005)
EBT			0.006 (0.009)	
VRT			−0.026 (0.015)	
Establishment				
FDA	−0.016*** (0.002)		−0.017*** (0.003)	−0.018*** (0.002)
FDB		0.000 (0.001)		
VRT			0.001 (0.001)	0.001 (0.001)
TR	0.000 (0.001)	−0.001 (0.001)	0.000 (0.001)	0.000 (0.001)
GEMP	0.255*** (0.016)	0.267*** (0.019)	0.213*** (0.019)	0.213*** (0.019)
GINF	−0.025*** (0.001)	−0.023*** (0.001)	−0.023*** (0.001)	−0.023*** (0.001)
lnsig_2	−4.026*** (0.016)	−4.126*** (0.019)	−4.021*** (0.019)	−4.020*** (0.019)
atanhrho_12	0.604*** (0.077)	0.039 (0.047)	0.508*** (0.075)	0.543*** (0.069)
Wald (p value)	0.00	0.00	0.00	0.00
Observation	6224	5158	4415	5169

Robust standard errors are in parenthesis. Wald Chi^2 gives overall fitness of the model

***, ** indicate significance at 1, and 5 % respectively

Table 3 presents the effect of financial distress on entrepreneurs' employment. Examining Table 3, both financial ratios and stock return remain significant in predicting distress risk events. In addition, retained earnings/total asset ratio and earnings before interest and taxes/total asset ratio aid to lower FDB. Across the two measures of financial distress, the marginal effects of these variables are almost similar. The results are consistent with the results of the previous table and SIZE is significant in each equation. Thus, size remains an important variable in the operation of SMEs.

In the second system of the simultaneous specification, the effect of financial distress on employment by SMEs is examined. FD significantly affects the level of employment in these firms. The fall in employment under any of the FD events remains high. This ranges

Table 3 FDL and employment

Model	1		2		3	
Distress	FDA	FDB	FDA	FDB	FDA	FDB
SAL	−0.078*** (0.016)	−0.281*** (0.014)				
SIZE	−0.277*** (0.019)	−0.545*** (0.010)	−0.294*** (0.045)	−0.378*** (0.023)	−0.249*** (0.019)	−0.392*** (0.013)
CHIN	−0.000 (0.016)	0.010 (0.016)				
RE					−0.004 (0.010)	−0.152*** (0.010)
RET	−0.001 (0.008)	−0.024*** (0.008)			−0.005 (0.007)	−0.020*** (0.007)
EBT			0.040 (0.040)	−0.300*** (0.031)		
VRT			−0.016 (0.019)	0.014 (0.018)		
Employment						
FDA	−0.752*** (0.021)		−0.737*** (0.046)		−0.778*** (0.023)	
FDB		−0.653*** (0.012)		−0.651*** (0.033)		−0.673*** (0.011)
INV	0.092*** (0.012)	0.065*** (0.010)	0.111*** (0.011)	0.043*** (0.012)	0.100*** (0.012)	0.025*** (0.009)
TR	0.374*** (0.022)	0.226*** (0.017)	0.420*** (0.017)	0.295*** (0.018)	0.403*** (0.021)	0.274*** (0.016)
GRR	−0.014 (0.011)	−0.009 (0.011)			−0.012 (0.011)	0.000 (0.011)
lnsig_2	−0.950*** (0.006)	−0.988*** (0.008)	−0.962*** (0.007)	−0.976*** (0.012)	−0.947*** (0.005)	−0.980*** (0.008)
atanhrho_12	2.216*** (0.154)	1.901*** (0.081)	1.827*** (0.228)	1.780*** (0.197)	2.005*** (0.116)	1.724*** (0.057)
Wald (p value)	0.00	0.00	0.00	0.00	0.00	0.00
Observation	6437	5215	7294	6073	6437	5215

Robust standard errors are in parenthesis. Wald Chi^2 gives overall fitness of the model

***, ** indicate significance at 1, and 5 % respectively

from 0.65 to 0.78 %. This result is in conformity with the theory of financial distress and underemployment as developed in Nosal (1998). He argues that a firm may face bankruptcy in very low state of the world (either the productivity of the firm or the demand of the firms' product represents the state of the world). To cope with this situation, a firm may embark on a cost- saving measure by dramatically lowering its input use. Financial consideration may adversely affect employment in the low state of the world. Thus, financial distress affects the ability of the firms to continue with its operation and a decline in the level of employment is its aftermath. As control variables, the level of investment and total revenue have positive effects on employment among SMEs. The results conform to theoretical expectation of the effect of investment on the success of firms.

In Table 4, the results from the first system in each of the 3 models further confirm the significance of financial and market variables in predicting financial distress likelihood among SMEs. In developing a more detailed knowledge of financial distress and the operation of SMEs, the response of workers' benefit, if any is explored under FDA and FDB. Given that firms in financial distress may decide either to lower the level of employment or act by lowering the cost of labour. This will reflect in workers' welfare. In this study, we capture welfare by growth in annual payroll, which include all forms of compensation, such as salaries, commissions, wages, vacation allowances, bonuses, sick-

Table 4 FDL and welfare

Model	1		2		3	
Distress	FDA	FDB	FDA	FDB	FDA	FDB
SAL		−0.360*** (0.019)				
SIZE	−0.110*** (0.010)	−0.426*** (0.011)	−0.126*** (0.011)	−0.130*** (0.021)	−0.095*** (0.008)	−0.157*** (0.016)
CHIN	−0.058*** (0.014)	−0.017 (0.026)				
RE						−0.276*** (0.010)
RET	−0.027*** (0.009)	−0.063*** (0.014			−0.010 (0.010)	−0.040*** (0.011)
EBT			0.010 (0.010)	−0.621*** (0.259)		
VRT			−0.020 (0.016)	0.039 (0.027)		
Welfare						
FDA	−0.043*** (0.007)		−0.037*** (0.005)		−0.024*** (0.005)	
FDB		−0.011*** (0.004)		−0.010*** (0.003)		−0.011*** (0.003)
INV	−0.002 (0.002)	−0.003 (0.002)				
TR					−0.002 (0.003)	−0.006 (0.004)
GEMP			−0.004*** (0.002)	−0.004 (0.002)	−0.003 (0.002)	−0.003 (0.002)
GINF			0.054*** (0.002)	0.059*** (0.002)	0.054*** (0.002)	0.059*** (0.002)
lnsig_2	−2.825*** (0.014)	−2.837*** (0.016)	−3.028*** (0.017)	−3.065*** (0.019)	−3.033*** (0.017)	−3.064*** (0.019)
atanhrho_12	0.322*** (0.076)	0.098** (0.046)	0.338*** (0.055)	0.137** (0.056)	0.158*** (0.047)	0.120*** (0.045)
Wald (p value)	0.00	0.00	0.00	0.00	0.00	0.00
Observation	6437	5215	6362	5156	6393	5172

Robust standard errors are in parenthesis. Wald Chi^2 gives overall fitness of the model

***, ** indicate significance at 1, and 5 % respectively

leave pay, and the value of payments in kind (e.g., lodgings and free meals). As shown in Table 4, the results from the second system in each of the 3 models reveal that financial distress events lower the welfare of workers in these SMEs. Under FDA, welfare falls by about 0.02–0.04 % and falls by 0.01 % under FDB. Thus, in both financial distress events reductions in welfare in the wake of financial distress are uncovered.

The effect of a financial crisis on wage will depend largely on wage rigidity or flexibility. Wage rigidities might constitute an impediment in restoring employment. As Nosal (1998) explains, in low states of the world, underemployment of inputs may occur due to financial consideration. In this state, low level of well-being or utility is obtained since low demand will characterize workers' services. Thus, welfare may fall until inefficiency is mitigated and labour becomes efficiently employed. Low states of the world will be characterized by low levels of workers' welfare until a positive change in the state of the world occurs to reverse the workers' welfare condition. As control variables, growth in employment relates negatively with welfare while inflation has a positive relationship with welfare. The results conform to theoretical expectation. Under wage flexibility, workers will demand high nominal wage as inflation soars.

Through a quantitative approach, this study points to the importance of failure in business organization. Thus, the study helps to advance knowledge on entrepreneurial success. Most entrepreneurial studies have examined factors that mitigate failure or influence the success of new ventures. Failure or financial distress can depict a complex phenomenon that induces detrimental and serious effect on an enterprise and the entrepreneur.

Due to financial frictions, a fraction of the future output can only be borrowed by individuals with productive projects. This results into inefficient allocation of some resources to unproductive projects as constrained credit demand leads to a depression of the loan rate (von Hagen and Zhang 2008). By ameliorating information asymmetry on the credit market, financial development will aid productive individuals to access loan and tend to push up the loan rate. This may further worsen welfare and businesses conditions particularly for SMEs in financial constraint.

Enumerating the interdependent and multifaceted nature of the costs of failure, Cope (2011) reveals that failure has significant physiological, financial, social, emotional, entrepreneurial and professional effects. Kler et al. (2015) reveal significant exhibition of lower satisfaction with job security among partnered workers after the financial crisis, which increases when they have children. This points to the fact that other aspects of wellbeing may be affected apart from the potential fall in income or employment in the wake of a financial crisis or distress. Thus, as shown by the results, financial distress has implications on entrepreneurship.

6 Conclusion

As a means of assessing the risk of companies, the techniques of modelling corporate failures or insolvency of small and medium-sized enterprises has received little or minor attention in the literature. Thus, we extend the existing works by introducing market variables and make a seminal contribution to both SMEs and corporate prediction models by examining the real effect of financial distress. Given that bankruptcy might not entirely represent financial distress, we employ an ex-ante measure of distress among SMEs. Two measures of financial distress are examined. Summarily, this paper undertakes an analysis

on the prediction of financial distress and the effect of financial distress on entrepreneurial activities. The study employs data on US SMEs between 1998 and 2011 periods. In a simultaneous equation the empirical relationship between these variables are explored.

The results reveal that both accounting and financial variables are important in predicting the financial distress likelihood. Financial distress constrains the growth in the number of establishment and welfare of employees. In addition, the level of employment falls in financially distressed SMEs.

Appendix

See Tables 5 and 6.

Table 5 Descriptive statistics

Variable	N	Mean	SD	Variable	N	Mean	SD
FDA	7295	0.038	0.192	SAL	6759	0.578	0.328
FDB	6074	0.176	0.381	CHIN	4352	0.028	0.217
SIZE	6775	0.686	0.386	RET	5219	−0.026	0.482
EBT	6738	−0.048	0.299	RE	6677	−0.133	0.514
VRT	4448	0.206	0.229	INV	7915	0.857	0.467
EMP	7922	0.485	0.401	GINF	6079	0.126	0.330
TR	7922	0.923	0.245	GRR	7922	1.277	0.537
GEST	7922	12.274	1.084	GEARN	7922	18.529	1.078
GEMP	7922	14.850	1.185				

The descriptive statistics of the variables are presented in this table. N stands for the number of observation, SD is the standard deviation

Table 6 Correlation matrix

	FDA	TSIZE	TEBT	VRT	TSAL	TCHIN	RET	TRE
FDA	1.0000							
TSIZE	−0.2381	1.0000						
TEBT	−0.1251	0.5016	1.0000					
VRT	0.0346	−0.2394	−0.2819	1.0000				
TSAL	0.0322	−0.0217	0.3471	−0.0946	1.0000			
TCHIN	−0.1007	0.0607	0.1552	−0.0745	0.0990	1.0000		
RET	−0.0542	0.0697	0.2056	0.0301	0.0583	0.1260	1.0000	
TRE	−0.1156	0.5594	0.6580	−0.3464	0.2799	0.0582	0.1000	1.0000
VIF	1.07	1.73	2.12	1.16	1.25	1.05	1.05	2.17

The correlation of the variables with FDA is presented The severity of multicollinearity among variables are quantified through the Variance Inflation Factor (VIF). Multicollinearity is absent from the VIF values

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