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Article

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FINANCIAL ECONOMICS | RESEARCH ARTICLE

Predictors of firm growth in India: An exploratory analysis using accounting information

Sibanjan Mishra^{1*} and Soumya G. Deb²

Abstract: This paper aims at identifying relevant financial factors which critically affects firm revenue growth. We specifically focus on the dynamic nature of such factors across up or down-market cycles and also for different scales and size of business. The study uses annual data of 17 accounting and financial variables for a sample of 1,450 Indian firms which exist continuously between 2003 and 2014 and generate a framework for identification of critical factors which affect firm revenue growth. We employ a variable reduction technique via principal component analysis (PCA), and then use the “*principal factors*” identified thereon, in a logistic regression approach to develop such a framework. The study finds efficiency in management of current assets and capital (both short- and long-term) to be the most critical factors, determining the firm revenue growth in Indian context. The relative importance of capital deployment efficiency is more for small firms than for large firms whereas asset management efficiency is the most critical factor in larger firms. Long-term solvency supersedes all other factors during market downturns. These findings may have important implications for firms and its stakeholders as a priori knowledge on the importance of critical factors regarding firm’s revenue growth could enable the managers to support them in their decision-making process.

Subjects: Corporate Finance; Accounting; Financial Management; Financial Statement Analysis

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PUBLIC INTEREST STATEMENT

In the existing competitive and dynamic business-environment, it is essential for the firm and its stakeholders to identify the key factors influence firm growth. Firm growth is important for survival, contributes to creation of jobs and increase economic activity. This research attempts to identify the relevant financial factors which critically affect firm revenue growth for Indian firms. The findings suggest efficiency in management of current assets and capital (both short- and long-term) to be the most critical factors, determining the firm revenue growth in Indian context. For small firms, capital deployment efficiency and for the large firms, asset management efficiency are the most critical factor. During market downturns, the long-term solvency supersedes all other factors in the priority of importance.

Keywords: firm performance; revenue growth; financial information; logistic regression
JEL classifications: G31; G32; M100; M400

1. Introduction

The crucial importance of firm growth in corporate finance has been studied widely in finance literature. Few studies highlight, that firms experiencing continuous growth have more likelihood of survival, contributes to creation of jobs and increase economic activity (Audretsch & Lehmann, 2005; Batjargal et al., 2013; Coad, Segarra, & Teruel, 2016; Thornhill & Gellatly, 2005). There are studies which reflect that at times, highly innovative firms may record low growth and vice versa. This may suggest that growth and survival cannot be studied in isolation (Mason & Brown, 2014; Nightingale & Coad, 2014). Moreover, Caves (1998) posit that reallocations of activity from the less efficient to the more efficient are extremely important for the optimal use of resources, and hence more evidence (obtained through research) is needed on how competitive conditions within an industry affect the speed with which the more efficient (high growth firms) displace the less efficient (low growth firms).

From the neoclassical to modern researchers, each school of thought have defined firm growth with different propositions however, the universal way is: a firm has to start, grow with various challenges, then mature and finally decline. In each stage several factors congregate in order to enable the firm's progression allowing it to move to the next stage. For instance, while the neoclassical research confer that a firm will grow till an "optimal size" is achieved, the proponents of the "theory of growth of firm" suggests that there exists no limit to growth of a firm if its resources are effectively used and finally, the modern finance theorists, believes that due to excessive competition and significant technology changes the "theory of competitive advantage" is more appropriate for firms to grow. Despite the contradictions among different schools, the consensus among all is firm growth is beneficial for all the stakeholders like employees, managers, shareholders, creditors and even regulators and policy makers (Coad et al., 2016, Thornhill & Gellatly, 2005, Whetten, 1987).

In this paper, we attempt to identify the critical factors influencing firm revenue growth in India, using several financial statement-based measures. We use a balanced panel data of 17,400 firm years between 2003 and 2014 across 17 financial variables. We employ a variable reduction technique, namely principal component analysis (PCA) followed by application of qualitative response regression model. Our primary results reflect that the capital deployment efficiency and current asset management are the most critical factors in determining the firm revenue growth in Indian context. The relative importance of capital deployment efficiency is more for small firms than for large firms whereas asset management efficiency is the most critical factor in larger firms. Long-term solvency supersedes all other factors during market downturns. As highlighted above, we believe that these findings can have significant implications for multiple firm level stakeholders.

Our paper is different from some of the previous related works and contributes to the existing literature in the following ways. (i) Although much has been clarified on this issue for developed markets in US, Europe and Pacific Basin, not a lot of work has been done so far in emerging countries like India. (ii) We use a rich and extensive updated data of around 17,400 firm years (1,450 firms over 12 years). The results obtained should therefore be reasonably robust. (iii) It is possible, that the firm level parameters could be having variable predictive ability for sales growth, during periods of general exuberance in the market vis-a-vis periods of relative discomfort and uncertainty. To check for differential patterns, we divide our full sample period into market movement-based sub-samples (bull and bear) and do a sub-sample analysis separately for each. To the best of our knowledge, these have not been attempted before in related research. (iv) It is also possible that the association of firm level parameters and sales growth can be varying cross-sectionally (large firms and small firms). To capture that we repeat sub-sample analysis against a size dimension also. (v) A major criticism of

return measures like Return on Asset (ROA henceforth) and return on equity (ROE) used in previous empirical studies, is the problem arising out of using asset or equity value at the end of accounting years (Baucus, Golec, & Cooper, 1993) or at the beginning (Brick, Palmon, & Venezia, 2015), in this study we modify our assessment to address that issue. Finally, we substantiate all our results obtained from the main analysis, through a series of robustness test as detailed in the methodology section.

The remaining part of the paper is organized as follows: the next section discusses the background theories and reviews relevant literature, Section 3 provides the data description and methodology adopted for the study. Section 4 presents the empirical results; Section 5 discusses the same while Section 6 provides the summary and conclusion.

2. Firm growth: background theory and related literature

A significant amount of work has been conducted to study the factors responsible for firm growth. However, there is no unified approach or theory to determine the critical factors promoting firm growth (Correa & Sharma, 2003). Therefore, we present a brief review of the theories of growth of firms in order to develop a framework to identify the factors influencing the firm growth.

The neoclassical economists like Viner (1931) believe that firms strive for growth till an optimal size is achieved, to exploit economies of scale to the fullest, beyond which they stop growing as the cost of managing such a large organization starts superseding the benefits. Following this hypothesis Coase (1937) in his seminal article came up with the “transaction cost theory of firms,” which states that the optimal boundary of growth of the firms is determined by the trade-off between advantages of coordination via authority in a hierarchy and advantages of coordination through price mechanism. They infer that, if the transaction costs are high, the firms are expected to expand and if low then the boundary of firm growth is expected to be small. In addition, Lucas (1978) linked firm growth with the managerial talent. He argued that large firms grow rapidly as their managers successfully use their skills which small firms are unable to achieve.

In contrast to the neoclassical school of thought, Penrose (1960) in his “theory of the growth of the firm” laid a resources-based perspective instead of limiting the “optimal size” of a firm. He emphasized that firm growth has no limit and results from optimum utilization of resources like managerial experience and managerial attention. The theory advocates that firm’s performance lies on the ability to create and use resources and continuously re-design the resource portfolio. In addition, Marris (1963, 1964) observed with his “managerial” theory that utility maximizing managers expedite the firm’s growth rate subject to heavier incentives to them in form of compensation, bonuses and other perquisites. Even-though testing the “managerial” theory is difficult the author came up with an interesting conclusion that manger-driven firms’ growth rate is significantly higher than the owner-driven firms (empirical support in Hay & Kamshad, 1994). Marris (1963, 1964) also hinted on the fact that firm growth can be achieved by diversification. Muller (1969) extended this perspective and concludes that mergers are fastest way of growth compared to internal growth and the manger’s role become eminent for carrying out such expansions.

Furthermore, the principle of “growth of the fitter” evolved in the modern economies characterized by technical changes and cut-throat competition etc. This principle founded by Schumpeter, followed literature in form of theory (Alchian, 1950; Downie, 1958; Nelson & Winter, 1982) and empirical works (Metcalf, 1993, 1994, 1998; Dosi, Marsili, Orsenigo, & Salvatore, 1995; Marsili, 2001; Hardwick & Adams, 2002; Baily & Farrell, 2006). These researchers find that two factors that impact firm growth are profitability and productivity. Hence they attributed these parameters as indicators of “fitness.”

In summary, the background theories on firm growth are contentious at best. However most of them highlight that there exist some systematic factors that impacts the process of firm growth.

In order to delve into identifying the factors, we conduct a survey of empirical works relating to some of these critical variables influencing firm growth.

2.1. Size

Firm size is considered as the important factor influencing firm growth in the neoclassical theory. In order to test whether firm size is independent of firm growth, Gibrat (1931) proposed the “law of proportionate effect” or Gibrat’s law. The empirical model runs as:

$$\log(X_t) = \alpha + \beta \log(X_{t-1}) + \varepsilon,$$

where X_t is the size of the firm and X_{t-1} is the lagged size of the firm. The hypothesis of independence between firm size and firm growth holds if the β coefficient value is one. If it is less than one, then smaller firms grow faster than larger ones and if more than one, the larger firm’s growth is supposed to be more than the smaller firms. Empirical research on these suppositions provides conflicting results with some studies (like Hart, 1962; Prais, 1974; Samuels, 1965) suggest positive relationship between firm size and growth rate while others (like Bottazzi & Secchi, 2003; Dunne & Hughes, 1994; Evans, 1987a, 1987b; Hall, 1987; Kumar, 1985) reports a negative relationship. Other studies like (Hart & Oulton, 1996; Lotti, Santarelli, & Vivarelli, 2003; Mowery, 1983) reports a nonlinear relationship between firm size and firm growth.

2.2. Profitability

Several recent studies like (Coad, 2007, 2009; Goddard et al. 2004) believes that firm growth and profitability is linked to each other. Early theoretical studies relating firm growth and profitability justify that growth has positive impact on profitability (see Verdoorn, 1949 and Kaldor, 1966, empirically supported in the works of Chandler & Jansen, 1992; Coad, 2007, 2009; Cowling, 2004, among others). They claim that growth enhances productivity as the firms achieve the benefits of economies of scale leading to higher profits. Alchian’s (1950) principle of “growth of the fitter” also suggests that fittest firms grow and survive in the market and it is possible that profit rates reflect the fitness of the firm to survive other tend to exit. However, Muller (1977) argues through the persistence of profits (POP) theory that as firms has free entry and exit any profit opportunity fades quickly and the profitability returns to its long-run average. But, there exist empirical studies which claim to have a negative relationship between firm growth and profitability (Markman Gartner, 2002; Reid, 1995).

2.3. Age

The theoretical work relating to firm growth and firm age of Arrow (1962) argues that if the “learning-by-doing” theory works than the firms with long existence have advantage over the young firms in the market. However, Evans (1987a, 1987b) and Dunne, Roberts and Samuelson (1988, 1989) analyzing the role of age in firm growth reports that for a given firm size its growth decreases proportionally as the firm gets older and vice versa for young firms. Empirical evidence on the inter-linkage between firm age and growth is also mixed in nature. (Dunne & Hughes, 1994; Fizaine, 1968; Variyam & Kraybill, 1992) report a negative relationship between firm age and growth, while Das (1995) reports a positive relationship in the Indian context.

2.4. Productivity

Theoretically, growth should be closely associated with productivity of the firm. However, there exist several perspectives like Jovanovic (1982) in the “passive learning” model entails that as the firm is small, its growth is bound by the fixed productivity level but Ericson and Pakes (1995) with their “active learning” model claimed that firms can influence their productivity levels by investing in research and development. However, empirical results suggest that this supposition may not be always true. Griliches and Regev (1995), Bottazzi, Cefis, and Dosi (2002), Bottazzi & Secchi (2006)), Baily and Farrell (2006) and Foster, Haltiwanger, and Syverson (2008) posit that productivity cannot be treated as a predictor of growth particularly in the industry set-up lacking competition.

2.5. Liquidity

Liquidity reveals a firm's ability to meet its short-term obligations and quickness in converting an asset into cash at its fair market value. Current ratio and quick ratio are the most commonly used liquidity measure in finance (Mateev & Anastasov, 2010). Good liquidity management can improve operating results and enhance firm growth, whereas poor liquidity management can lead to weak operating profits and hurt firm growth (Moyer, McGuigan, & Kretlow, 2001). The results of empirical studies on impact of liquidity on firm growth is also somewhat mixed in nature, while some suggest a positive relationship between liquidity and firm growth (Baskin, 1987; Opler, Pinkowitz, Stulz, & Williamson, 1999); others posit a negative correlation (Shin & Soenen, 1998).

2.6. Financial leverage

Financial leverage captures a firm's capital structure (debt versus equity) and reflects a firm's ability to meet its long-term obligations exposed to financial risk (Mao & Gu, 2008). Debt in the capital structure has clearly some advantages (tax-shield) but beyond a certain level, the fixed interest and principal commitments of debt can really hurt the ability of a firm to operate freely and effectively. Given the mixed arguments about debt, some theories (Modigliani & Miller, 1963) in capital structure suggest usage of an optimal amount of debt for best results. Grossman and Hart (1986), Harris and Raviv (1990), and Zantout (1997) empirically document a positive association between financial leverage and firm growth, whereas Capon, Farley, and Hoenig (1990) and John (1993) showed a negative impact of financial leverage on firm growth.

2.7. Asset utilization efficiency

Asset utilization efficiency measures management's efficiency in using firm assets to create sales over a certain period of time. Activity reveals how rapidly noncash assets flow through a firm and how quickly these assets generate revenue (Moyer et al., 2001). A positive relationship between assets, efficiency, and firm performance has been proposed and is empirically supported (Kiymaz, 2006).

In summary, various firm-wise financial factors (i.e., liquidity, financial leverage, asset utilization, profitability, size) are proposed as predictors of firm growth with inconclusive results. One possible reason for such conflicting results may be use of different measures of firm growth. Various measure typically used as proxy for firm growth are ratio of R&D expenses over sales revenue (Titman & Wessels, 1988), percentage sales growth (Wald, 1999), growth in total assets (Norvaišienė & Stankevičienė, 2007), market to book ratio (Beevan and Danbolt, 2002, 2004; Booth, Aivazian, Demirguc-Kunt, & Maksimovic, 2001; Rajan & Zingales, 1995). This important issue of assessing predictability of firm growth remains mostly unaddressed in emerging markets particularly in India, barring a few and far between (Bhaduri, 2002a, 2002b; Bhole & Mahakud, 2004; Kakani, 1999).

3. Data and methodology

The study employs cross sectional time series panel data of 1,450 NSE listed firms screened for financial companies and companies with missing values. The data is collected from Prowess database of Centre for Monitoring Indian Economy (CMIE). To understand the factors which help in predicting sales growth, the study identifies 17 financial ratios or accounting variables (explained in Table 1) for the period 2003–2014. The rationale behind the number of variables selected is the precedence of using around 15–20 variables in the previous studies (see e.g. Molinero and Larraz, 2005; Uyar and Okumus, 2010).

3.1. Sub-samples

To explore differential patterns, in the association between firm level financial variables and firm performance, if any, between sub-groups within our sample, we conduct all the analyses across sub-samples created along time and size partitions. The sub-sample creation modality is discussed hereunder:

Table 1. Variables description

Variables	Descriptions
<i>SGR</i>	Sales Growth Rate (Dependent Variable)
<i>TA</i>	Total Assets
<i>NS</i>	Net Sales
<i>ROE</i>	Return on Equity ($ROE = PAT/Total\ Equity$)
<i>ROC</i>	Return on Capital Employed ($ROCE = PAT/Avg.\ Capital\ Employed$)
<i>ROA</i>	Return on Assets ($ROA = PAT/Total\ Assets$)
<i>GM</i>	Gross Margin ($GM = Gross\ Profits/Sales$)
<i>CR</i>	Current Ratio ($CR = Current\ Assets/Current\ Liabilities$)
<i>QR</i>	Quick Ratio ($QR = (Receivables + Cash\ Balance + Marketable\ Securities)/Current\ Liabilities$)
<i>DER</i>	Debt to Equity Ratio
<i>ICT</i>	Interest Cover Ratio ($PBIT/Interest\ Expenses$)
<i>CTR</i>	Capital Turnover Ratio ($CTR = Sales/Capital\ Employed$)
<i>FAR</i>	Fixed Asset ratio ($FAR = Sales/Fixed\ Assets$)
<i>CAT</i>	Current Assets Turnover ($CAT = Sales/Current\ Assets$)
<i>WCT</i>	Working Capital Turnover ($WCT = Sales/Working\ Capital\ Employed$)
<i>DTR</i>	Debtors Turnover Ratio ($DTR = Sales/Avg.\ Debtors$)
<i>FGT</i>	Finished Goods Turnover ($FGT = Sales/Finished\ Goods$)

This table display all the 17 variables used in the study with their explanation. The dependent variable (*SGR*) is classified as 1 and 0. 1 implies that sales have grown compared to previous period and 0 implies sales have fallen compared to previous period.

3.1.1. Sub-samples based on firm size

As already mentioned in the previous section, firm size can have both positive and negative effects of firm performance (Berman, Wicks, Kotha, & Jones, 1999; Fama & French, 1993; Keating, 1997; Rogers, Helmers, & Koch, 2010; Westphal, 1998; Wu, 2006). To explore that possibility, we divide our full sample panel which comprises of 17,400 observations (i.e. Panel for 12 years of 1,450 companies) into two broad categories; large firms and small firms. The basis for such classification is based on the average total assets of the firms during the study period. For it, the full sample panel of 17,400 observations is divided into five quintiles each of 3,480 observations, the upper two quintiles (6,960 observations) form the sample for Large companies and the lower two quintiles (6,960 observations) forms the sample for the Small Companies panel.

3.1.2. Sub-samples based on time

It is possible, that the firm level parameters could be having variable predictive ability for sales growth, during periods of general exuberance in the market vis-a vis periods of relative discomfort and uncertainty. To explore such a possibility, we also classify our full panel across a time dimension into two broad categories: bull market periods and bear market periods. This is with the assumption that the general sentiment and expectation level of most stakeholders in the economy is adequately captured by the stock market movements, and that in turn should be affecting firm level prospects. The period for which market return has been less (more) than the risk free rate is considered to be bear (bull) years. We consider CNX Nifty Total Return index as the proxy for market and annualized 91-day T bill yields as the proxy for risk free rate. Thus our study considers 2003–2007, 2009, 2012 and 2014 as bull years and forms the panel consisting of 13,050 observations and 2008, 2011 and 2013 as bear years having 4,350 observations.

3.2. Correlation across variables

Table 2 shows that 47 out of 136¹ (i.e. 35%) of the correlations across variables selected by us are highly significant signaling the presence of considerable multi-collinearity problem amongst the

Table 2. Descriptive statistics

Variables	Full sample			Size wise sample						Time wise sample					
	All firms			Large firms			Small firms			Bull phase			Bear phase		
	N	μ		N	μ		N	μ		N	μ		N	μ	
SGR	17,400	260.533**		6,960	27.911**		6,960	110.296*		13,050	187.568**		4,350	27.642**	
TA	17,400	47,605.324**								13,050	13,079.09**		4,350	22,363.019**	
NS	17,400	13,633.954**								13,050	42,356.595**		4,350	68,405.743**	
ROE	17,400	5.016**		6,960	15.165**		6,960	2.76**		13,050	16.606**		4,350	4.197**	
ROC	17,400	5.325**		6,960	9.699**		6,960	-3.141**		13,050	17.602*		4,350	2.542**	
ROA	17,400	196.661**		6,960	34.009**		6,960	37.47**		13,050	25.132**		4,350	6.37**	
GM	17,400	1,016.7**		6,960	36.196**		6,960	605.644**		13,050	76.507**		4,350	0.584**	
CR	17,400	1.916**		6,960	1.801**		6,960	3.396**		13,050	3.046**		4,350	2.4*	
QR	17,400	1.366**		6,960	0.901**		6,960	2.128**		13,050	1.904**		4,350	2.119**	
DER	17,400	1.771**		6,960	1.941**		6,960	1.389**		13,050	1.339**		4,350	1.57**	
ICT	17,400	83.968**		6,960	155.839**		6,960	13.381**		13,050	71.729**		4,350	122.048**	
CTR	17,400	1.058**		6,960	1.417**		6,960	1.134**		13,050	4.269**		4,350	1.763**	
FAR	17,400	9.862**		6,960	8.469**		6,960	14.229**		13,050	11.054**		4,350	1.155**	
CAT	17,400	2.284**		6,960	2.643**		6,960	2.47**		13,050	8.085**		4,350	16.738**	
WCT	17,400	5.875**		6,960	2.674**		6,960	5.069**		13,050	2.335**		4,350	2.306**	
DTR	17,400	18.013**		6,960	14.531**		6,960	29.823**		13,050	18.588**		4,350	-2.446**	
FGT	17,400	242.379**		6,960	625.077**		6,960	81.2**		13,050	416.29**		4,350	225.68**	

This table presents the mean statistics of the 17 variables under study classified into three segments namely: full sample, size wise classification and time wise classification. Under size wise classification the mean values of TA & NS are absent as we intended to study the effect of rest of the variable on SGR when the full sample is classified on size basis. More than 90% of the variable's mean are statistically significant which implies absence of outliers and missing data because the t-stat depends upon sample mean and sample variance which are both sensitive to outliers. In order to strive for model parsimony, we have checked for the specification error (i.e. inclusion of critical predictor variable and deletion of irrelevant variables). The practical significance of the variables is validated as most of the variable's mean are in acceptable range (for instance FGT in full sample is 242 times which is more clear in size wise classification with a FGT of 625 times for large firm and 81 times for the smaller firms, when the sample is classified on bull and bear phase wise again FGT reflects that FGT increases to 415 times in bull and 225 times in bear time periods).

* Significance at 10% level.

** Significance at 5% level.

explanatory variables. This may result in large variances and co-variances resulting in high standard error of the regression coefficients making precise estimation difficult. Standard regression models will thus fail to make accurate estimations in this scenario. In this context the standard procedures for estimation are standard variable reduction techniques like, *partial least squares* (PLS) and *principal component analysis* (PCA). As mentioned before, in the context of this particular question, PCA is more widely used in recent literature (Delen, Kuzey, & Uyar, 2013). We thus use PCA as our variable reduction technique in this study.

3.3. Research method

3.3.1. Principal component analysis

Principal component analysis (PCA – a data reduction technique) is used to transform a number of (possibly) correlated variables into a (smaller) number of uncorrelated variables called principal components. In PCA, assuming that $X_{m \times n}$ is a data matrix, it is converted into a correlation matrix as $F = (1/N)XX^T$, where X^T is the transpose of X . We then diagonalize the $N \times N$ correlation matrix F in the form $F = VMV^T$, where M is the diagonal matrix of eigenvalues $\lambda_i = (\lambda_1, \lambda_2, \dots, \lambda_N)$ in descending order and V is an orthogonal matrix of the corresponding eigenvectors. Each eigenvalue and the eigen vector is shown as $\lambda_i = v_i F v_i^T = v_i \text{Cov}(F_t) v_i^T = \text{Var}(v_i^T F_t) = \text{Var}(Y_{i,t})$, where, $Y_{k,t} = v_k^T F_t$ is the K th principal component. The eigenvalues $\lambda_i = \text{Var}(Y_{i,t})$ denotes to the portion of total variance in F_t contributing to the principal component $Y_{i,t}$. Hence the total variance can be shown as $\sum_{i=1}^N \text{Var}(y_i) = \text{tr}(F) = \sum_{i=1}^N \lambda_i = N$. Thus, the proportion of total variance in F explained by the K th principal component is λ_i/N .

The first principal component has the highest degree of variance and the subsequent components describe less variance in the data set. From earlier research it is evident, that a 90% trace criterion is sufficient to describe the maximum of the variation in the data set. Kaiser (1960) recommends retaining only those principal factors whose eigenvalues are greater than 1. Cattell (1966) suggest a graphical method through Scree Test which captures the relevant principal factors as the ones whose eigenvalues feature in the sharpest decent area of the curve before flattening out. In the present study we retain only those factors whose eigenvalues are greater than 1 and this criterion captures 60–80% of the total variance.

3.3.2. Logistic regressions (LR)

Once the correlated explanatory variables are reduced to specific factors or components, understanding the relationship of these factors with the dependent variable, is the next objective of this study. For that we convert the dependent variable, representing revenue or sales growth as a binary response variable, for which the possible estimation techniques available are Ordinary Least squares (OLS), discriminant analysis (DA) and Qualitative response regression models, like logistic regression model. Pampel (2000) confirms the logistic regression results to be more robust over OLS and discriminant analysis which are bound by the following assumption:

- (1) in OLS and DA independent variables should have a multivariate normal distribution;
- (2) The variance co-variance matrix of all the independent variables should be homogenic.

Moreover, LR uses maximum likelihood estimation instead of ordinary least square to derive parameters which becomes more relevant in case of large sample. Hence, we studied the impact of financial ratios on revenue growth of Indian firms in the logistic regression framework.

3.4. Robustness test

3.4.1. Repeating analysis over a winsorized sample

It is possible that our overall patterns visible may not reflect the generic trend due to presence of outliers. To control for that, we have winsorized the sample to limit the extreme values in the

sample and to reduce the effect of possible spurious outliers. To do that, we sort the dependent variable (SGR) of full and sub-sample samples based on time and size dimension in ascending order. We then drop top 10% and bottom 10% from sample data of each sample, i.e. full as well as sub-samples. On the remaining 80% of the sample data, we repeat the data reduction technique, i.e. PCA and logistic regression for all the samples under study. The results of the robustness test are discussed in the following section.

4. Empirical results

Table 3 presents the results of the PCA. The table cells indicate eigenvalues and percentage of variance of the unrotated principal components. PCA leads us to extract the factor with common characteristics in the sample data (i.e. variables with high correlations are grouped in a factor, which we name as components and are presented in the table as Com-1,2,3, etc. In this study the criterion used to group variables into a factor are: latent root criterion (in which factors with eigenvalues more than 1 will be retained); percentage of variance criterion (in which factors will be retained till they explain a requisite amount of variance, based on past literature cumulative % of variance ranging in between 55% and 65% and more is accepted) and scree test criterion (in which factors are retained till the point the latent roots decline and flatten). As presented in Table 3, the full sample retains 7 components satisfying all the criterions. As far as the sub-sample analysis is concerned, with respect to size-based classification, PCA for the large and small firms identifies, respectively, 7 and 6 components, whereas for time-based classification, bull and bear phase identifies 7 and 5 components, respectively. The corresponding scree plots are shown in Figure 1.

The unrotated principal components reduce the number of relevant variables originally considered from 17 to 7 in full sample case. However, it does not provide meaningful information regarding the factors or components derived. Hence the factors are rotated till practical significance results from it, in order to interpret the variables and factors meaningfully.

Tables 4 and 5 panels (A–C) presents the rotated factor matrix based on Varimax Criterion² containing the factor loadings for each variable on each factor for the full sample, size-based sub-samples and time-based sub-samples, respectively. Based on Varimax criterion, the seven components derived in Unrotated Matrix are labeled as STSOL: Short-Term Solvency; Size; LTSOL: Long-Term Solvency; AMEFF: Asset Management Efficiency; CADEFF: Capital Deployment Efficiency; CAEFF: Current Asset Efficiency; under the rotated Structure. Following are our principal observations:

- (1) The highest factor loading seems to be in the Factor short-term solvency (STSOL) which is contributed primarily from variables current ratio (CR) having a factor loading of 0.978 and quick ratio (QR) having a factor loading of 0.978.
- (2) Total assets (TA) and net sales (NS) contribute significantly to the broad factor Size,
- (3) Debt-equity-ratio (DER) contributes negatively to long-term solvency (LTSOL) which implies higher the DER adverse the LTSOL of the firm,
- (4) Return on asset (ROA) and fixed asset ratio (FAR) contribute significantly to asset management efficiency (AMEFF),
- (5) Return on capital (ROC) and capital turnover ratio (CTR) contributes to capital deployment efficiency (CADEFF),
- (6) Current asset turnover (CAT) and debtors' turnover ratio (DTR) contributes to form current asset efficiency (CAEFF).

All the factors seem relevant as they are backed by variables which correctly reflect the practical significance.

Table 3. Correlations matrix for the full sample (2003–2014)

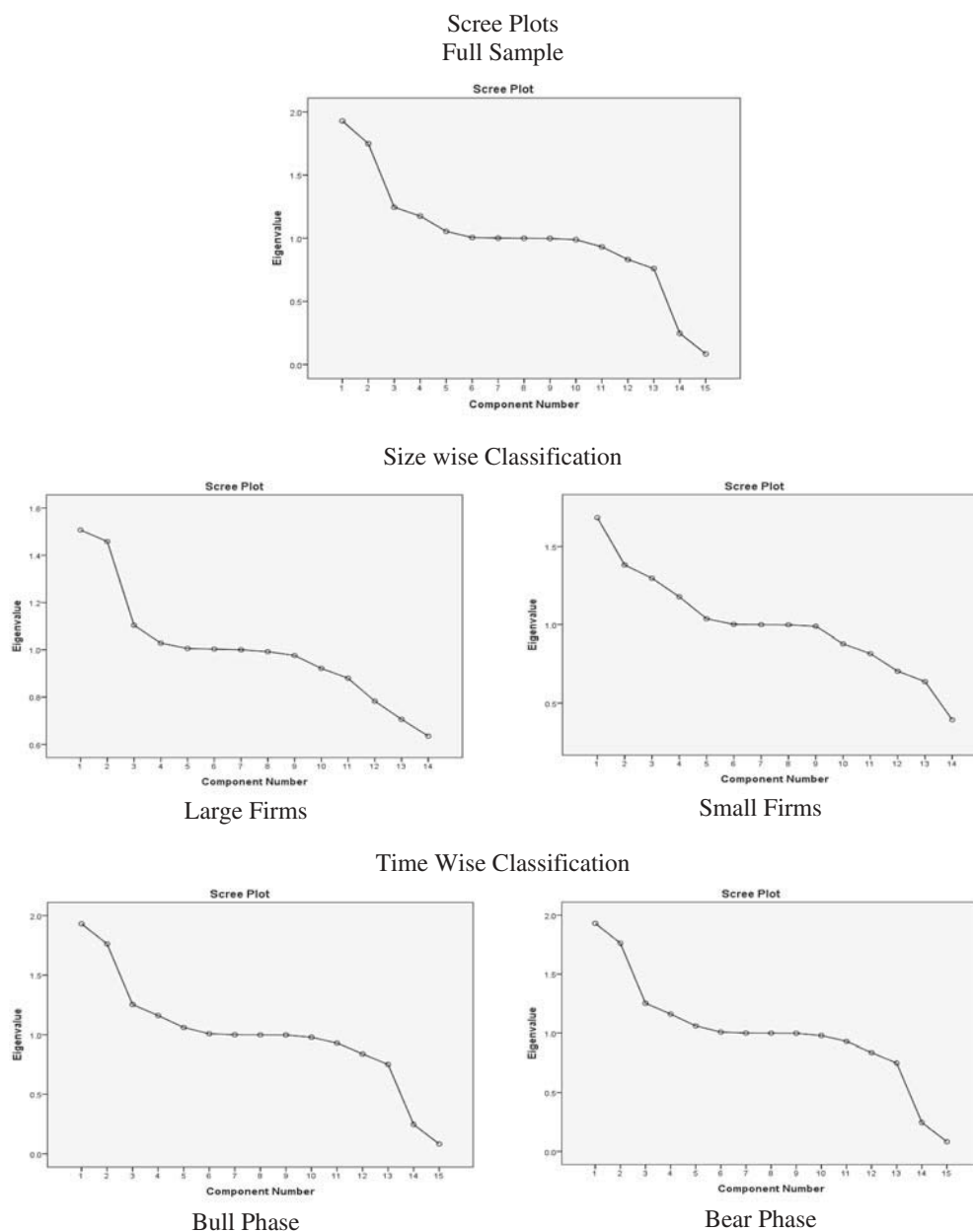
Variables	SGR	TA	NS	ROE	ROC	ROA	GM	CR	QR	DER	ICT	CTR	FAR	CAT	WCT	DTR	FGT	Correlation significant at 1/5%
SGR	1																	
TA	.001	1																0
NS	.003	.799**	1															1
ROE	.026**	.013**	.016**	1														3
ROC	.033**	.019*	.021*	.437**	1													4
ROA	.056**	.015	.013	.362**	.466**	1												3
GM	.000	-.001	-.003	.003	.009	.006	1											0
CR	-.002	-.019*	-.015	-.009	-.006	.026**	.002	1										2
QR	.000	-.015	-.016	-.007	.001	.048**	.005	.896**	1									2
DER	-.001	-.006	-.004	-.130**	-.044**	-.040**	-.001	-.011	-.014	1								3
ICT	.000	.110**	.031**	.046**	.083**	.114**	.000	.000	.006	-.008	1							5
CTR	.001	-.001	.016**	.028**	.063**	.018**	-.003	-.007	-.009	-.001	.002	1						4
FAR	.001	.008	.071**	.023*	.020*	.242**	-.006	-.001	.007	-.005	.005	.057**	1					5
CAT	.007	.022*	.078**	.069**	.075**	.001	-.019*	-.085**	-.088**	.003	.002	.047**	.088**	1				9
WCT	.000	-.001	.001	.000	-.001	.001	.000	.000	.000	.000	-.001	.000	.001	.001	1			0
DTR	.000	.000	.005	.028**	.041**	-.002	-.002	-.009	-.112**	-.002	.001	.011	-.001	.135**	.001	1		4
FGT	.000	.117**	.009	.113**	.006	.006	-.001	-.004	-.002	-.002	-.002	.001	-.001	-.004	-.001	-.002	1	2

This table shows that 47 out of 136 (i.e. 35%) of the correlations are highly significant signaling the presence of collinearity amongst the explanatory variables. This may result in large variances and co variances also high standard error of the regression coefficients making precise estimation difficult. It may also widen confidence intervals making true population coefficient as zero. Thus a reduced number of factors will be appropriate for further analysis hence Principal Component Analysis (PCA) is used as a data reduction technique in the current study.

*Correlation is significant at the .05 level.

**Correlation is significant at the .01 level.

Figure 1. Scree plots.



Factor loadings are the correlations of each variable and the factor. It indicates the degree of correspondence between the variable and the factor and variables with high factor loadings represents the factor significantly. Theoretically with a sample size of more than 400 observation factor loading of even of 30% is considered fit, however to make our results more robust we consider factor loading of 50% or more as fit in the study. The same methodology is followed for classifying the variables into the factors in case of full sample, size-based sub-samples (large and small firms) and time-based sub-samples (bull and bear phases).

Table 6 panels (A–C) present the results of LR estimation model for the full sample and the sub-samples based on size and bull-bear phase. Panel A presents the results for the full sample while panels B and C shows the results for the sub-samples based on size and bull-bear phase. The table cells show Wald statistics and odds ratio or $\exp(b)$ values for each factor, from which one can

Table 4. Unrotated principal components: eigenvalues and % of variance

Principal component	Com-1	Com-2	Com-3	Com-4	Com-5	Com-6	Com-7
Full sample							
All Firms							
Eigenvalue	1.929	1.749	1.245	1.175	1.055	1.005	1.001
% of total variance	12.861	11.661	8.301	7.835	7.032	6.703	6.675
Cum. Eigenvalues	1.929	3.678	4.924	6.099	7.153	8.159	9.160
Cum % of variance	12.861	24.522	32.823	40.658	47.690	54.393	61.068
SIZE WISE FIRMS							
Large Firms							
Eigenvalue	1.507	1.458	1.104	1.028	1.006	1.003	
% of total variance	10.762	10.415	7.888	7.345	7.182	7.164	
Cum. Eigenvalues	1.507	2.965	4.069	5.097	6.103	7.106	
Cum % of variance	10.762	21.177	29.065	36.410	43.592	50.756	
Small Firms							
Eigenvalue	1.685	1.382	1.297	1.178	1.037		
% of total variance	12.037	9.875	9.265	8.413	7.410		
Cum. Eigenvalues	1.685	3.068	4.365	5.543	6.580		
Cum % of variance	12.037	21.912	31.177	39.590	47.000		
TIME WISE FIRMS							
Bull Phase							
Eigenvalue	1.918	1.767	1.250	1.160	1.065	1.016	1.001
% of total variance	12.787	11.782	8.332	7.730	7.099	6.772	6.674

(Continued)

Table 4. (Continued)							
Principal component	Com-1	Com-2	Com-3	Com-4	Com-5	Com-6	Com-7
Cum. Eigenvalues	1.918	3.685	4.935	6.095	7.160	8.175	9.177
Cum % of variance	12.787	24.569	32.901	40.632	47.731	54.503	61.177
Bear Phase							
Eigenvalue	1.979	1.745	1.637	1.346	1.154	-	-
% of total variance	15.195	13.636	12.916	10.977	9.693	-	-
Cum. Eigenvalues	1.979	3.725	5.362	6.709	7.863	-	-
Cum % of variance	15.195	28.831	41.747	52.724	62.417	-	-

Observing high correlation amongst the explanatory variables presented in Table 2, the necessity of conducting component analysis becomes inevitable. It leads us to extract the factor with common characteristics in the sample data (i.e. variables with high correlations are grouped in a factor, commonly known as components as presented in the table as Com-1, 2, 3, etc.). In this study, the criterion used to group variables into a factor are: latent root criterion (in which factors with eigenvalues more than 1 will be retained); percentage of variance criterion (in which factors will be retained till they explain a requisite amount of variance, based on past literature cumulative % of variance ranging in between 55% and 65% and more is accepted) and scree test criterion (in which factors are retained till the point the latent roots decline and flatten). As presented in the table, the full sample retains 7 components satisfying all the criterions. Scree plot is given in Figure 1. Large and Small firms under size wise classification consider 6 and 5 components, respectively. Bull and Bear Phase under Time wise classification considers 7 and 5 components, respectively. Scree plots for each are given in Figure 1.

Table 5. (A) Rotated factor coefficients, (B) size wise classification, and (C) time wise classification

Panel A								
Rotated Factor Coefficients								
Full Sample (All Firms)								
Variable	STSOL	SIZE	LTSOL	AMEFF	CADEFF	CAEFF	WCEFF	
TA		.932						
NS		.926						
ROE								
ROC					.716			
ROA				.759				
GM								
CR	.978							
QR	.978							
DER			-.786					
ICT			.785					
CTR					.688			
FAR				.756				
CAT						.682		
WCT							.774	
DTR						.535		
FGT								

Panel B
Size Wise Classification

The large firm sample produces six factors STSOL: Short Term Solvency; LTSOL: Long Term Solvency; AMEFF: Asset Management Efficiency; CADEFF: Capital Deployment Efficiency; CAEFF: Current Asset Efficiency; WCEFF: Working Capital Efficiency under the rotated Structure.							The small firm sample produces five factors STSOL: Short Term Solvency; LTSOL: Long Term Solvency; AMEFF: Asset Management Efficiency; CADEFF: Capital Deployment Efficiency; CAEFF: Current Asset Efficiency;						
Large Firms							Small Firms						
Variable	STSOL	LTSOL	AMEFF	CADEFF	CAEFF	WCEFF	Variable	STSOL	LTSOL	AMEFF	CADEFF	CAEFF	
ROE							ROE		.803				
ROC		.487		.460			ROC				.782		
ROA			.570				ROA			.876			
GM							GM						
CR	.714						CR	.822					
QR	.714						QR	.822					
DER		-.236					DER		-.804				
ICT		.666					ICT						
CTR				.761			CTR				.575		
FAR			.679				FAR			.889			
CAT					.412		CAT					.681	
WCT						.964	WCT						
DTR					.753		DTR					.636	
FGT							FGT						

Panel C
Time Wise Classification

The Bull phase sample produces 7 factors STSOL: Short Term Solvency; SIZE: Long Term Solvency; AMEFF: Asset Management Efficiency; CADEFF: Capital Deployment Efficiency; WCEFF: Working Capital Efficiency under the rotated Structure.								The Bear Phase sample produces five factors STSOL: Short Term Solvency; SIZE: Long Term Solvency; AMEFF: Asset Management Efficiency; CADEFF: Capital Deployment Efficiency;					
Bull Phase								Bear Phase					
Variable	STSOL	SIZE	LTSOL	AMEFF	CADEFF	CAEFF	WCEFF	Variable	STSOL	SIZE	LTSOL	AMEFF	CADEFF
TA		.929						TA		.932			
NS		.909						NS		.931			

(Continued)

Table 5. (Continued)

ROA						.761				ROA				.815	
ROC						.728				ROC				.700	
ROE							.788			ROE			.816		
GM									-.560	GM					
CR				.979						CR			.981		
QR				.979						QR			.980		
DER										DER					
ICT										ICT					
CTR										CTR					
FAR						.758			.712	FAR				.860	
CAT										CAT					
WCT										WCT		.938			
DTR										DTR					
FGT										FGT					

Based on Varimax criterion, the seven components derived in Unrotated Matrix are labeled as STSOL: Short-Term Solvency; Size; LTSOL: Long-Term Solvency; AMEFF: Asset Management Efficiency; CADEFF: Capital Deployment Efficiency; CAEFF: Current Asset Efficiency; WCEFF: Working Capital Efficiency under the rotated Structure. The highest factor loading in Factor STSOL are from variables CR (.978) & QR (.978); TA & NS contributes significantly to SIZE, DER contributes negatively to LTSOL implies higher the DER adverse the LTSOL of the firm, ROA and FAR contributes to AMEFF, ROC & CTR forms the capital deployment efficiency/CADEFF, CAT & DTR groups to form CAEFF, WCT significantly affects WCEFF. All the factors seem relevant as they are backed by variables which correctly reflect the practical significance.

derive the increase in odds for increment in the dependent variable per unit of increment of the independent factor, one at a time, *ceteris paribus*. We present the principal observations hereunder:

- (1) We find that all the factors (7 in all) are statistically significant at 10% or less.
- (2) Based on odds ratio values, CADEFF seems to be the most critical factor while STSOL seems to be the least critical in determining revenue growth.
- (3) STSOL seem to be negatively related to sales growth as well as having a relatively small odds ratio in terms of magnitude. This implies that, with increment in these factors the sales growth reduces but the impact is considerably small in magnitude. So working capital management, in Indian context, at least based on the data and time period used in this study, seems to be less one of the less critical factors in determining sales growth per-se, although it could positively affect the cash flow scenario in the short run.
- (4) CADEFF seems to be the most critical factor with an odds ratio equal to 4.150 which implies that for one-unit increment in this particular factor raises the odds of increase in sales by more than 300%.
- (5) Next in the pecking order of criticality is CAEFF standing at an odds ratio of 2.549 which implies than an increment in one unit of this factor raises the odds of increase in sales by more than 150%.
- (6) Combining observations (3) and (5) above leads to an interesting conclusion. Short-term solvency which might be significantly contributed by cash holding seems to be not a critical factor while current asset efficiency which might include all items of current assets including cash holdings is a critical factor. This might imply that cash holding may be having a negative impact on sales growth.
- (7) SIZE, LTSOL and AMEFF are all having positive odds ratio of 1.18, 1.15 and 1.28 implying that the odds of increase in sales for one-unit increase in each of these factors are 18%, 15% and 28%, respectively.

Overall, capital deployment efficiency, current asset management efficiency, firm size, long-term solvency and asset management efficiency seem to be positively affecting revenue growth in decreasing order of importance. Short-term solvency is having an almost insignificant impact, which again points a possible negative impact of excess cash holding on the sales prospects.

Panels B and C of Table 6 shows the results of the subsamples. The overall results in both these samples are more or less in line with the full sample. We however present here the important incremental observations:

- (1) CADEFF and AMEFF are both critical factors for small as well as large firms, but the relative importance of CADEFF is more for small firms than for large firms, visible from the relatively higher odds ratio. It may be mentioned here that AMEFF refers to efficiency in managing primarily fixed assets while CADEFF refers to efficiency in managing the total capital deployed. This probably implies that, current assets form a less significant proportion for large firms while it is a significant in case of smaller firms. As such current asset management efficiency has a relatively lower criticality in case of large firms substantiated by lower odds ratio of 1.005 against CAEFF vis-a-vis an odds ratio of 1.206 for small firms (Table 6, Panel (B)).
- (2) Between bull and bear periods, again CADEFF is the most critical factor in both phases. One important observation, however, seems to be the relative importance of LTSOL during bull and bear periods. LTSOL seems to be an extremely critical factor during bear phases, representing periods of uncertainty (second only to CADEFF), while it is not so during bull periods, representing periods of exuberance. This is something in line with logical expectation, as during periods of overall uncertainty and fear, long-term solvency can certainly prove to be a differentiating factor for generating additional sales.

Table 6. (A) Full sample, (B) size wise classification, and (C) time wise classification

Panel A Full Sample										
Principal Components		B	S.E.	Wald	df	Sig.	Exp(B)			
STSOL		-.052	.018	8.518	1	.004	.949			
SIZE		.166	.037	20.351	1	.000	1.180			
LTSOL		.139	.028	24.963	1	.000	1.149			
AMEFF		.247	.048	26.954	1	.000	1.281			
CADEFF		1.425	.081	312.778	1	.000	4.159			
CAEFF		.936	.143	42.800	1	.000	2.549			
WCEFF		-.094	.049	3.745	1	.053	.910			

PANEL B Size –Wise Classification														
Large Firms						Small Firms								
Principal Components		B	S.E.	Wald	df	Sig.	Exp(B)	Principal						
Components		B	S.E.	Wald	df	Sig.	Exp(B)							
STSOL		-.087	.037	5.550	1	.018	.916	STSOL	-.082	.029	7.875	1	.005	.921
LTSOL		.230	.094	5.951	1	.015	1.259	LTSOL	.113	.060	3.530	1	.060	1.119
AMEFF		.645	.106	37.004	1	.000	1.906	AMEFF	.108	.062	3.041	1	.081	1.114
CADEFF		.608	.073	68.420	1	.000	1.836	CADEFF	.600	.089	45.723	1	.000	1.821

(Continued)

Table 6. (Continued)

Panel C											
Time-Wise Classification											
Principal Components	Bull Period						Bear Period				
	B	S.E.	Wald	df	Sig.	Exp(B)	Principal				
Components	B	S.E.	Wald	df	Sig.	Exp(B)					
STSOL	-.042	.021	3.968	1	.046	.959	STSOL	-.04	.033	1.484	.223
SIZE	.164	.032	25.745	1	.000	1.179	SIZE	.176	.078	5.063	.024
LTSOL	.168	.034	24.450	1	.000	1.182	LTSOL	.320	.125	6.591	.010
AMEFF	.052	.029	3.274	1	.070	1.053	AMEFF	.159	.060	6.961	.008
CADEFF	1.455	.101	208.189	1	.000	4.285	CADEFF	.853	.083	104.673	.000
CAEFF	.268	.077	12.209	1	.000	1.307					
WCEFF	-.013	.023	.332	1	.564	.987					

Dependent variable: SGR-Sales Growth Rate.

Independent variables: STSOL, SIZE, LTSOL, AMEFF, CADEFF, CAEFF, WCEFF.

5. Discussion of results

Overall, our results reveal, that factors related to CADEFF, CAEFF, SIZE, LTSOL and AMEFF are positively affecting sales growth in decreasing order of importance. STSOL, is negatively related to sales growth although its impact is almost insignificant. This implies that STSOL, which is significantly contributed by cash holding, is not a critical factor, while CAEFF which includes all items of current assets including cash holdings is a critical factor. Combining these two observations the obvious conclusion is that excess cash holding may be having a negative impact on sales growth. This seems to be logical and one can easily identify three significant negative effects of excess cash holdings: lowering the return on assets, increasing the cost of capital and increasing the business risk by creating an overly confident management (Opler et al., 1999).

In the time-based sub-sample analysis, we find that during bull periods, i.e. periods of exuberance the results are almost similar to the findings obtained in full sample analysis. However, during bear cycles, i.e. period of discomfort and uncertainty, the importance of long-term solvency supersedes the current asset efficiency. This implies that in Indian context at least, during periods of overall uncertainty and fear, manifested long-term solvency in a firm generates positive expectations from the firm's stakeholders and the market in general that translates into producing additional firm growth.

In the size-based sub-sample analysis, we find that, capital deployment efficiency is the most critical factor determining revenue growth for small firms while asset management efficiency is the most critical factor in case of large firms. This, we believe, must be resulting from relatively higher criticality of fixed asset management efficiency for large firms compared to small firms. For smaller firms, deployment of precious funds in fixed assets is probably less. This might be causing a marginal loss of economies of scale for them, which goes to the larger firms with greater deployment of funds in fixed assets. This improves the criticality of the AMEFF factor in larger firms. This, in conjunction with the observation that SIZE (proxied by total assets of firms) is also one of the critical factors impacting revenue growth, confirms this conjecture.

5.1. Robustness test results

Tables 7(A)–(C) present the results of the robustness test conducted through winsorizing the data. Panel A shows the results of analysis on the winsorized full sample. We find that these results are exactly similar to the results from the main analysis with CADEFF, CAEFF and AMEFF getting manifested as critical factors responsible for revenue growth. Panels B and C show robustness test results on winsorized sub-samples based on size and time dimension. Here also we find that, the findings are in line with our principal results. For small firms the results are exactly similar while for large firms the results are almost similar with CADEFF, CAEFF and AMEFF being the critical factors in determining the firm revenue growth. Only the sequence of criticality changes a little bit. Again, along time dimension for the winsorized sub-sample the results are exactly similar to our principal results. However, for the bull period winsorized sub-sample, once again the results are more or less similar with CADEFF, CAEFF and AMEFF getting manifested as principal factors in determining firm revenue growth with marginal change in criticality sequence of these factors. On the whole, we can say that the findings from the robustness test adequately substantiate findings from our main analysis.

6. Conclusion and implication

The findings reveal that efficiency in capital deployment (captured by ROC and CTR) and managing current assets (captured by CAR and DTR) are the factors positively affecting firm revenue growth. Long-term solvency (captured by DER and ICT) and asset management efficiency (captured by ROA and FAR) exhibits weak positive impact on firm revenue growth. Short-term solvency (captured primarily by cash holding) has weak negative impact on revenue growth. This along with the previous observation that efficiency in current asset which includes all items of current assets including cash holdings is a critical factor; thus implying that excess cash holding has a negative impact on firm revenue growth.

Table 7. Robustness test results

Robustness Test Results										
Panel A										
Winsorized Full Sample										
Principal Components	B	S.E.	Wald	df	Sig.	Exp(B)				
STSOL	-.022	.032	6.456	1	.025	.979				
SIZE	.086	.103	2.689	1	.040	1.090				
LTSOL	-.039	.032	5.428	1	.023	.962				
AMEFF	.164	.065	6.342	1	.012	1.178				
CADEFF	.258	.029	108.36	1	.000	2.159				
CAEFF	.048	.070	13.457	1	.002	1.186				
WCEFF	-.109	.049	15.74	1	.033	.924				

Panel B										
Size -Wise Classification										
Large Firms						Small Firms				
Principal Components	B	S.E.	Wald	df	Sig.	Exp(B)	Principal Components	B	S.E.	Wald
STSOL	.180	.293	.378	1	.539	.805	STSOL	-.092	.036	6.491
LTSOL	.230	.094	5.951	1	.015	1.259	LTSOL	.005	.052	.008
AMEFF	.557	.237	5.551	1	.018	1.746	AMEFF	1.437	.029	2.391
CADEFF	.284	.181	2.453	1	.017	1.329	CADEFF	.352	.099	12.693
CAEFF	.115	.016	5.268	1	.038	1.875	CAEFF	.161	.052	9.431
WCEFF	.102	.039	3.819	1	.009	1.007				

Table 8.

Panel C. Time wise classification

Principal components	Bull Period						Bear Period						
	B	S.E.	Wald	df	Sig.	Exp(B)	Principal components	B	S.E.	Wald	df	Sig.	Exp(B)
STSOL	.070	.105	.449	1	.503	.871	STSOL	.039	.136	.080	1	.777	1.039
SIZE	-.061	.027	5.084	1	.024	.941	SIZE	-.110	.045	5.970	1	.015	.896
LTSOL	.929	.272	11.682	1	.001	2.533	LTSOL	.267	.118	2.106	1	.084	1.306
AMEFF	.126	.034	13.969	1	.000	1.135	AMEFF	.625	.339	3.407	1	.065	1.868
CADEFF	-.144	.057	6.423	1	.011	.866	CADEFF	.516	.176	8.603	1	.003	1.675
CAEFF	.214	.102	4.420	1	.036	1.238							
WCEFF	-.063	.029	4.622	1	.032	.939							

Dependent Variable: SGR-Sales Growth Rate.

Independent Variables: STSOL, SIZE, LTSOL, AMEFF, CADEFF, CAEFF, WCEFF.

The implication of the study is manifold. For instance, organizations view higher growth rate as a critical in achieving competitive advantage over rivals through lower production costs with economies of scale and scope and diversification of business risk. The employees and managers, see higher revenue growth as increase in their opportunities for promotion, higher compensation and enhanced reputation. Shareholders' preview higher firm growth rates to translate effectively into higher returns on investment. Policy makers think higher firm growth has significant implications, as that has potential to impact employment and economic growth which are important tools of macroeconomics. Thus, a prior knowledge of the importance of these factors will allow firms to be conscious and, in the position, to improve their performance.

The limitation of the current study lies in the fact that individual firms have idiosyncratic reason for the growth due to large heterogeneity between them; hence, possible further research can be directed toward industry centric firms. The present study also may be impacted by country specific syndrome which allows for a cross-country study as the critical factors regarding firm's operation and its revenue growth can be identified for better management decisions.

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Notes

1. Total number of correlation coefficients estimated = $(17 \times 17 - 17)/2 = 136$.
2. Varimax Criterion is considered over Quartimax and Equimax criterions as it simplifies the interpretation of variable-factor correlation by indicating clear positive or negative correlation or complete lack of association. Varimax rotation is an orthogonal rotation of the factor axes to maximize the variance of the squared loadings of a factor (column) on all the variables (rows) in a factor matrix, which has the effect of differentiating the original variables by extracted factor. Each factor will tend to have either large or small loadings of any particular variable. A varimax solution yields results which make it as easy as possible to identify each variable with a single factor. This is the most common rotation option.

References

- Alchian, A. A. (1950). Uncertainty, evolution, and economic theory. *Journal of Political Economy*, 58(3), 211–221. doi:10.1086/256940
- Audretsch, D. B., & Lehmann, E. E. (2005). Does the knowledge spillover theory of entrepreneurship hold for regions? *Research Policy*, 34(8), 1191–1202.
- Baily, M. N., & Farrell, D. (2006). Breaking down barriers to growth. *Finance and Development*, 43(1), 23.
- Baskin, J. (1987). Corporate liquidity in games of monopoly power. *The Review of Economics and Statistics*, 312–319. doi:10.2307/1927239
- Batjargal, B., Hitt, M. A., Tsui, A. S., Arregle, J.-L., Webb, J. W., & Miller, T. L. (2013). Institutional polycentrism, entrepreneurs' social networks, and new venture growth. *Academy of Management Journal*, 56(4), 1024–1049. doi:10.5465/amj.2010.0095
- Baucus, D. A., Golec, J. H., & Cooper, J. R. (1993). Estimating risk-return relationships: An analysis of measures. *Strategic Management Journal*, 14(5), 387–396. doi:10.1002/(ISSN)1097-0266
- Berman, S., Wicks, A., Kotha, S., & Jones, T. M. (1999). Does stakeholder of orientation matter? The relationship between stakeholder management models and firm financial performance. *Academy of Management Journal*, 42(5), 488–506.
- Bevan, A. A., & Danbolt, J. (2002). Capital structure and its determinants in the UK—a decomposition analysis. *Applied Financial Economics*, 12(3), 159–170.
- Bevan, A. A., & Danbolt, J. O. (2004). Testing for inconsistencies in the estimation of UK capital structure determinants. *Applied Financial Economics*, 14(1), 55–66. doi:10.1080/0960310042000164220
- Bhaduri, S. N. (2002a). Determinants of capital structure choice: A study of the Indian corporate sector. *Applied Financial Economics*, 12(9), 655–665. doi:10.1080/09603100010017705
- Bhaduri, S. N. (2002b). Determinants of corporate borrowing: Some evidence from the Indian corporate structure. *Journal of Economics and Finance*, 26(2), 200–215. doi:10.1007/BF02755986
- Bhole, L. M., & Mahakud, J. (2004). Trends and determinants of corporate capital structure in India: A panel data analysis. *Finance India*, 18(1), 37.
- Booth, L., Aivazian, V., Demircuc-Kunt, A., & Maksimovic, V. (2001). Capital structures in developing countries. *The Journal of Finance*, 56(1), 87–130. doi:10.1111/0022-1082.00320
- Bottazzi, G., Cefis, E., & Dosi, G. (2002). Corporate growth and industrial structures: Some evidence from the Italian manufacturing industry. *Industrial and Corporate Change*, 11(4), 705–723. doi:10.1093/icc/11.4.705
- Bottazzi, G., & Secchi, A. (2003). Why are distributions of firm growth rates tent-shaped? *Economics Letters*, 80(3), 415–420. doi:10.1016/S0165-1765(03)00142-3
- Bottazzi, G., & Secchi, A. (2006). Explaining the distribution of firm growth rates. *The Rand Journal of Economics*, 37(2), 235–256. doi:10.1111/(ISSN)1756-2171

- Brick, I. E., Palmon, O., & Venezia, I. (2015). On the relationship between accounting risk and return: Is there a (Bowman) paradox? *European Management Review*, 12(2), 99–111. doi:10.1111/emre.2015.12.issue-2
- Capon, N., Farley, J. U., & Hoenig, S. (1990). Determinants of financial performance: A meta-analysis. *Management Science*, 36(10), 1143–1159. doi:10.1287/mnsc.36.10.1143
- Cattell, R. B. (1966). The scree test for the number of factors. *Multivariate Behavioral Research*, 1, 245–276. doi:10.1207/s15327906mbr0102_10
- Caves, R. E. (1998). Industrial organization and new findings on the turnover and mobility of firms. *Journal of Economic Literature*, 36(4), 1947–1982.
- Chandler, G. N., & Jansen, E. (1992). The founder's self-assessed competence and venture performance. *Journal of Business Venturing*, 7(3), 223–236.
- Cinca, C. S., Molinero, C. M., & Larraz, J. G. (2005). Country and size effects in financial ratios: A European perspective. *Global Finance Journal*, 16(1), 26–47.
- Coad, A. (2007). Firm growth: A survey.
- Coad, A. (2009). *The growth of firms: A survey of theories and empirical evidence*. Edward Elgar Publishing.
- Coad, A., Segarra, A., & Teruel, M. (2016). Innovation and firm growth: Does firm age play a role? *Research Policy*, 45(2), 387–400. doi:10.1016/j.respol.2015.10.015
- Coase, R. H. (1937). The nature of the firm. *Economica*, 4(16), 386–405. doi:10.1111/ecca.1937.4.issue-16
- Correa, J. A., & Sharma, S. (2003). A contingent resource-based view of proactive corporate environmental strategy. *Academy of Management Review*, 28(1), 71–88. doi:10.5465/amr.2003.8925233
- Cowling, M. (2004). The growth-profit nexus. *Small Business Economics*, 22(1), 1–9.
- Das, S. (1995). Size, age and firm growth in an infant industry: The computer hardware industry in India. *International Journal of Industrial Organization*, 13(1), 111–126. doi:10.1016/0167-7187(94)00453-9
- Delen, D., Kuzey, C., & Uyar, A. (2013). Measuring firm performance using financial ratios: A decision tree approach. *Expert Systems with Applications*, 40(10), 3970–3983. doi:10.1016/j.eswa.2013.01.012
- Dosi, G., Marsili, O., Orsenigo, L., & Salvatore, R. (1995). Learning, market selection and the evolution of industrial structures. *Small Business Economics*, 7(6), 411–436. doi:10.1007/BF01112463
- Downie, J. (1958). *The competitive process*. G. Duckworth.
- Dunne, P., & Hughes, A. (1994). Age, size, growth and survival: UK companies in the 1980s. *The Journal of Industrial Economics*, 115–140. doi:10.2307/2950485
- Dunne, T., Roberts, M. J., & Samuelson, L. (1988). Patterns of firm entry and exit in US manufacturing industries. *The RAND Journal of Economics*, 495–515.
- Dunne, T., Roberts, M. J., & Samuelson, L. (1989). The growth and failure of US manufacturing plants. *The Quarterly Journal of Economics*, 104(4), 671–698.
- Ericson, R., & Pakes, A. (1995). Markov-perfect industry dynamics: A framework for empirical work. *The Review of Economic Studies*, 62(1), 53–82.
- Evans, D. S. (1987a). Tests of alternative theories of firm growth. *Journal of Political Economy*, 95(4), 657–674. doi:10.1086/261480
- Evans, D. S. (1987b). The relationship between firm growth, size, and age: Estimates for 100 manufacturing industries. *The Journal of Industrial Economics*, 35, 567–581. doi:10.2307/2098588
- Fama, E. F., & French, K. R. (1993). Common risk factors in the returns on stock and bonds. *Journal of Financial Economics*, 33(1), 3–56. doi:10.1016/0304-405X(93)90023-5
- Fizaine, F. (1968). Analyse statistique de la croissance des entreprises selon l'âge et la taille. *Revue d'Economie Politique*, 78, 606–620.
- Foster, L., Haltiwanger, J., & Syverson, C. (2008). Reallocation, firm turnover, and efficiency: Selection on productivity or profitability? *American Economic Review*, 98(1), 394–425. doi:10.1257/aer.98.1.394
- Gibrat, R. (1931). *Les Inégalités Économiques*. Paris: Librairie du Recueil Sirey.
- Goddard, J., Molyneux, P., & Wilson, J. O. (2004). Dynamics of growth and profitability in banking. *Journal of Money, Credit and Banking*, 1069–1090.
- Griliches, Z., & Regev, H. (1995). Firm productivity in Israeli industry 1979–1988. *Journal of Econometrics*, 65(1), 175–203. doi:10.1016/0304-4076(94)01601-U
- Grossman, S. J., & Hart, O. D. (1986). The costs and benefits of ownership: A theory of vertical and lateral integration. *Journal of Political Economy*, 94(4), 691–719. doi:10.1086/261404
- Hall, B. H. (1987). The relationship between firm size and firm growth in the U.S. manufacturing sector. *The Journal of Industrial Economics*, 35(4), 583–606. doi:10.2307/2098589
- Hardwick, P., & Adams, M. (2002). Firm size and growth in the United Kingdom life insurance industry. *Journal of Risk and Insurance*, 69(4), 577–593. doi:10.1111/1539-6975.00038
- Harris, M., & Raviv, A. (1990). Capital structure and the informational role of debt. *The Journal of Finance*, 45(2), 321–349. doi:10.1111/j.1540-6261.1990.tb03693.x
- Hart, P. E. (1962). The size and growth of firms. *Economica*, 29–39. doi:10.2307/2601518
- Hart, P. E., & Oulton, N. (1996). Growth and size of firms. *The Economic Journal*, 106, 1242–1252. doi:10.2307/2235518
- Hay, M., & Kamshad, K. (1994). Small firm growth: Intentions, implementation and impediments. *Business Strategy Review*, 5(3), 49–68. doi:10.1111/busr.1994.5.issue-3
- John, T. A. (1993). Accounting measures of corporate liquidity, leverage, and costs of financial distress. *Financial Management*, 22, 91–100. doi:10.2307/3665930
- Jovanovic, B. (1982). Selection and the Evolution of Industry. *Econometrica: Journal of the Econometric Society*, 649–670.
- Kaiser, H. F. (1960). The application of electronic computers to factor analysis. *Educational and Psychological Measurement*, 20(1), 141–151. doi:10.1177/001316446002000116
- Kakani, R. K. (1999). The determinants of capital structure: An econometric analysis. *Finance India*, 13, 51–70.
- Kaldor, N. (1966). *Causes of the slow rate of economic growth of the United Kingdom: an inaugural lecture*. Cambridge University Press.
- Keating, A. S. (1997). Determinants of divisional performance evaluation practices. *Journal of Accounting and Economics*, 24(3), 243–273. doi:10.1016/S0165-4101(98)00008-1
- Kiyamaz, H. (2006). The impact of announced motives, financial distress, and industry affiliation on shareholders' wealth: Evidence from large sell-offs. *Quarterly Journal of Business and Economics*, 45(3–4), 69–89.
- Kumar, M. S. (1985). Growth, acquisition activity and firm size: Evidence from the United Kingdom. *The Journal of Industrial Economics*, 33, 327–338. doi:10.2307/2098540
- Lotti, F., Santarelli, E., & Vivarelli, M. (2003). Does Gibrat's Law hold among young, small firms? *Journal of*

- Evolutionary Economics*, 13(3), 213–235. doi:[10.1007/s00191-003-0153-0](https://doi.org/10.1007/s00191-003-0153-0)
- Lucas, R. E. (1978). On the size distribution of business firms. *The Bell Journal of Economics*, 9, 508–523. doi:[10.2307/3003596](https://doi.org/10.2307/3003596)
- Mao, Z., & Gu, Z. (2008). The relationship between financial factors and firm performance: Empirical evidence from US restaurant firms. *Journal of Foodservice Business Research*, 11(2), 138–159. doi:[10.1080/15378020801995564](https://doi.org/10.1080/15378020801995564)
- Marris, R. (1963). A model of the “managerial” enterprise. *The Quarterly Journal of Economics*, 77(2), 185–209. doi:[10.2307/1884399](https://doi.org/10.2307/1884399)
- Markman, G. D., & Gartner, W. B. (2002). Is extraordinary growth profitable? A study of Inc. 500 high-growth companies. *Entrepreneurship theory and practice*, 27(1), 65–75.
- Marris, R. (1964). *The economic theory of “managerial” capitalism* (Vol. 258). London: Macmillan.
- Marsili, O. (2001). *The anatomy and evolution of industries. Books.*
- Mason, C., & Brown, R. (2014). Entrepreneurial ecosystems and growth oriented entrepreneurship. *Final Report to OECD, Paris*, 30(1), 77–102.
- Mateev, M., & Anastasov, Y. (2010). Determinants of small and medium sized fast growing enterprises in central and eastern Europe: A panel data analysis. *Financial Theory and Practice*, 34(3), 269–295.
- Metcalfe, J. S. (1993). Some Lamarckian themes in the theory of growth and economic selection: Provisional analysis. *Revue Internationale De Systemique*, 7(5), 487–504.
- Metcalfe, J. S. (1994). Competition, Fisher’s principle and increasing returns in the selection process. *Journal of Evolutionary Economics*, 4(4), 327–346. doi:[10.1007/BF01236409](https://doi.org/10.1007/BF01236409)
- Metcalfe, J. S. (1998). *Evolutionary economics and creative destruction* (Vol. 1). Psychology Press.
- Modigliani, F., & Miller, M. H. (1963). Corporate income taxes and the cost of capital: A correction. *The American Economic Review*, 53(3), 433–443.
- Mowery, D. C. (1983). Industrial research and firm size, survival, and growth in American manufacturing, 1921–1946: An assessment. *The Journal of Economic History*, 43(4), 953–980. doi:[10.1017/S0022050700030837](https://doi.org/10.1017/S0022050700030837)
- Moyer, R. C., McGuigan, J. R., & Kretlow, W. J. (2001). *Contemporary financial management*, South.
- Mueller, D. C. (1969). A theory of conglomerate mergers. *The Quarterly Journal of Economics*, 83(4), 643–659.
- Nelson, R. R., & Winter, S. G. (1982). The Schumpeterian tradeoff revisited. *The American Economic Review*, 72(1), 114–132.
- Nightingale & Coad. (2014). Muppets and gazelles: Political and methodological biases in entrepreneurship research. *Industrial and Corporate Change*, 23(1), 113–143. doi:[10.1093/icc/dtt057](https://doi.org/10.1093/icc/dtt057)
- Norvaišienė, R., & Stankevičienė, J. (2007). The interaction of internal determinants and decisions on capital structure at the Baltic listed companies. *Engineering Economics*, 52(2), 7–17.
- Opler, T., Pinkowitz, L., Stulz, R., & Williamson, R. (1999). The determinants and implications of corporate cash holdings. *Journal of Financial Economics*, 52(1), 3–46. doi:[10.1016/S0304-405X\(99\)00003-3](https://doi.org/10.1016/S0304-405X(99)00003-3)
- Pampel, F. C. (2000). *Logistic regression: A primer* (Vol. 132). Sage Publications.
- Penrose, E. T. (1960). The growth of the firm—A case study: The Hercules powder company. *Business History Review*, 34(1), 1–23. doi:[10.2307/3111776](https://doi.org/10.2307/3111776)
- Prais, S. J. (1974). A new look at the growth of industrial concentration. *Oxford Economic Papers*, 26(2), 273–288. doi:[10.1093/oxfordjournals.oep.a041288](https://doi.org/10.1093/oxfordjournals.oep.a041288)
- Rajan, R. G., & Zingales, L. (1995). What do we know about capital structure? Some evidence from international data. *The Journal of Finance*, 50(5), 1421–1460. doi:[10.1111/j.1540-6261.1995.tb05184.x](https://doi.org/10.1111/j.1540-6261.1995.tb05184.x)
- Reid, G. C. (1995). Early life-cycle behaviour of micro-firms in Scotland. *Small Business Economics*, 7(2), 89–95.
- Rogers, M., Helmers, C., & Koch, C. (2010). Firm growth and firm size. *Applied Economics Letters*, 17(16), 1547–1550. doi:[10.1080/13504850903085043](https://doi.org/10.1080/13504850903085043)
- Samuels, J. M. (1965). Size and the growth of firms. *The Review of Economic Studies*, 32(2), 105–112. doi:[10.2307/2296055](https://doi.org/10.2307/2296055)
- Shin, H. H., & Soenen, L. (1998). Efficiency of working capital management and corporate profitability. *Financial Practice and Education*, 8, 37–45.
- Thornhill, S., & Gellatly, G. (2005). Intangible assets and entrepreneurial finance: The role of growth history and growth expectations. *The International Entrepreneurship and Management Journal*, 1(2), 135–148. doi:[10.1007/s11365-005-1125-7](https://doi.org/10.1007/s11365-005-1125-7)
- Titman, S., & Wessels, R. (1988). The determinants of capital structure choice. *The Journal of Finance*, 43(1), 1–19. doi:[10.1111/j.1540-6261.1988.tb02585.x](https://doi.org/10.1111/j.1540-6261.1988.tb02585.x)
- Uyar, A., & Okumuş, E. (2010). Finansal Oranlar Aracılığıyla Küresel Ekonomik Krizin Üretim Şirketlerine Etkilerinin Analizi: İMKB’de Bir Uygulama. *Muhasebe ve Finansman Dergisi*, (46), 146–156.
- Variyam, J. N., & Kraybill, D. S. (1992). Empirical evidence on determinants of firm growth. *Economics Letters*, 38(1), 31–36. doi:[10.1016/0165-1765\(92\)90157-T](https://doi.org/10.1016/0165-1765(92)90157-T)
- Verdoorn, J. P. (1949). On the factors determining the growth of labor productivity. *Italian economic papers*, 2, 59–68.
- Viner, J. (1931). The most-favored-nation clause, index. *Sevenka Handelsbanken: Stockholm* [Reprinted as Chapter 5 of *International Economics*, The Free Press: Glencoe, Ill, 1951].
- Wald, J. K. (1999). How firm characteristics affect capital structure: An international comparison. *Journal of Financial Research*, 22(2), 161–187. doi:[10.1111/jfir.1999.22.issue-2](https://doi.org/10.1111/jfir.1999.22.issue-2)
- Westphal, J. D. (1998). Board games: How CEOs adapt to increases in structural board independence from management. *Administrative Science Quarterly*, 43(3), 511–537. doi:[10.2307/2393674](https://doi.org/10.2307/2393674)
- Whetten, D. A. (1987). Organizational growth and decline processes. *Annual Review of Sociology*, 13(1), 335–358. doi:[10.1146/annurev.so.13.080187.002003](https://doi.org/10.1146/annurev.so.13.080187.002003)
- Wu, M. (2006). Corporate social performance, corporate financial performance, and firm size: A meta-analysis. *Journal of American Academy of Business*, 8(1), 163–171.
- Zantout, Z. Z. (1997). A test of the debt-monitoring hypothesis: The case of corporate R&D expenditures. *Financial Review*, 32(1), 21–48. doi:[10.1111/j.1540-6288.1997.tb00413.x](https://doi.org/10.1111/j.1540-6288.1997.tb00413.x)



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