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ORIGINAL RESEARCH

Firms' Financing Choices and Firm Productivity: Evidence from an Emerging Economy

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Abstract
Emerging economies can compete in the global markets only through productivity improvements. Most firms in developing economies are inefficient, making misallocation of resources highly likely. Finance is not only a factor of production but also a facilitator of other factors of production. When finance is misallocated, the aggregate productivity and firm competitiveness deteriorate. Formal financial intermediaries are expected to mitigate misallocation through efficient screening. Small firms, that form most of the firms in developing economies, often do not have enough information to facilitate efficient screening. Under these circumstances, are formal lenders able to allocate capital efficiently? What are the factors that determine access to finance and firm productivity? Does access to finance improve firm productivity? This study attempted to answer these questions by analysing Indian small firms. In the first stage of the analysis, Data Envelopment Analysis was used to estimate relative efficiency, which was used in a simultaneous equations model in the second stage. The results indicated that despite the lenders preferring highly efficient firms, external finance was detrimental to productivity. The interest of the formal lender is in the quick and safe repayment of the loan whereas the return on productivity improvements can only be realised in the long-term. It is argued that this mismatch causes formal finance to hamper the productivity of funded firms. Without facilitating productivity improvements, external finance cannot provide sustainable growth and firms cannot compete in the global markets. Consequently, the country may never graduate to the next stage of economic development.

Keywords Productivity · Capital structure · SME · Emerging economy · Formal finance · Informal finance

JEL Classification D24 · G23 · G21

Introduction

In its simplest form, productivity[1] is the ratio of output(s) to input(s) (Bryan et al. 2013). It measures how efficiently the input(s) is converted into the output(s). To be efficient, a firm must produce more outputs using lesser inputs, resulting in a lower cost per unit of output (cost benefit). Higher productivity has been identified to be a major contributor to growth (Du and Temouri 2014; Moschella and Tamagni 2019). Yu et al. (2017) summarises the two channels through which productivity can promote firm growth. Firms with higher productivity can either pass on the cost benefits to the customers through low prices and thus achieve higher market share or by not reducing the price the firms with higher productivity can have higher profitability which can be reinvested to expand the business and thus capture a higher market share. Productivity is especially important for developing countries as explained by Acs et al. (2008) and detailed below.

According to Porter et al. (2002), economic development takes place in three stages: the factor-driven stage, the efficiency-driven stage, and the innovation-driven stage. In the factor-driven stage, countries witness high levels of self-employment and firms compete with low cost efficiencies (Acs et al. 2008). In the efficiency-driven stage, countries

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[1] Throughout this paper, the terms productivity, efficiency, and productive efficiency have been used interchangeably.

are marked by an educated workforce, diminishing entrepreneurial activity and more larger firms that compete by increasing their productive efficiencies. Most developed countries fall in the third stage of economic development—the innovation stage—where firms compete with innovation. India, along with Brazil, Russia and China, is in the second stage of economic development (Ayyagari et al. 2014), where, firms compete with their productive efficiencies. Therefore, to be more competitive, these developing economies and their firms must monitor and improve their productivity levels (Carayannis and Grigoroudis 2014; Oral et al. 1999). Much of the hope for developing countries in this regard rest on smaller businesses.

Small firms[2] are prioritised in developing countries due to their contribution to industrialisation, Gross Domestic Product (GDP), exports, employment, and entrepreneurial activity. For instance, in Portugal, SMEs account for 99.6% of all businesses (Zelia 2011); in Sweden, they account for almost 99% of all firms and provide employment to 70% of Sweden's labour force (Yazdanfar and Öhman 2015); in India, MSMEs account for about 30% of the country's GDP (Government of India 2018), 45% of the manufactured output and 40% of its exports and employ 60 million people.[3] The resultant prioritisation of SMEs has not gone unopposed. Audretsch (2002) summarised two different views on the relationship between small firms and economic growth. The static view observes that the scale of small firms is too small that it is impossible for them to be efficient. On the contrary, the dynamic view observes that some small firms of today will graduate to large firms in the future and over time, they even become highly productive. The static view considers small firms as a burden to the society while the dynamic view considers that the current losses due to the inefficiency of small firms will be countervailed by the future gains in efficiency.

Most small firms in developing countries are founded as a last resort, in order to provide a livelihood. In such cases, the founder has no growth aspirations with such 'lifestyle firms' starting small and remaining small. Without small firms graduating to medium-sized firms, the country would have a missing middle problem, where there are many small and larger firms but very few medium-sized firms. The existence of too many lifestyle firms corroborates the lower firm productivity found in developing countries. Syverson (2011) states that the low productivity of developing countries like China, Brazil and India (Bloom et al. 2010) is not primarily because all firms are inefficient but because most firms are. Firms in developing economies also face higher degrees of financial constraints. With the presence of too many inefficient firms in developing economies, it is highly important that the productive firms have access to required resources (including finance) in order to grow. Besides being a factor of production, finance is a scarce resource that influences other factors of production too.

Misallocation[4] is highly likely in developing economies due to the presence of too many inefficient firms (Syverson 2011). Formal lenders are known to ration credit while lending to smaller businesses. By rationing credit, lenders spread the risk over many firms. When formal lenders fund many firms and most firms are inefficient, there is a high chance that many inefficient firms will be funded, leading to capital misallocation at the macroeconomic level. Firms in emerging economies are also known to face greater financial constraints, making finance a scarce resource that plays a major role in determining a firm's productivity. By screening out inefficient firms and firms that lack potential, formal lenders are expected to play a major role in alleviating misallocation of financial resources, in turn promoting productivity. But small firms often do not possess enough information to facilitate efficient screening. Given the circumstances, do formal lenders efficiently allocate capital? Employing a two-stage method, this paper ventures to answer the above question by investigating the determinants of firm finance and firm productivity. Firms' efficiency is calculated using the Data Envelopment Analysis (DEA) in the first stage of the analysis. In the second stage, the calculated efficiency is used in a Simultaneous Equations Model (SEM) that accounts for the potential endogeneity between firm funding and efficiency.

The results suggested that informal finance eased small firms' access to formal finance. Small firms were found to be aware of promoting productivity. Unleveraged firms exhibited higher efficiency than leveraged firms. Debt was found to be detrimental to firm productivity even though more efficient firms were more likely to be leveraged. These results and their implications are discussed in the results and discussion part of this paper.

The paper is structured as follows: The first section explains the concepts and motivations behind this study. The next section presents a brief summary of relevant past research. The third section briefs about the data and the methodology adopted for this study. The fourth section

[2] The terms 'MSMEs', 'SMEs' and 'Small Businesses' are used to refer to small firms. Even though, this paper toggles between the use of these terms in this paper, the focus of the paper is on small firms as defined by the Ministry of Micro, Small and Medium Enterprises, Government of India. The definition of 'small firms' as used in this research is given in the methodology section of the paper.

[3] Government of India (2010)—Report of Prime Minister's Task Force on Micro, Small and Medium Enterprises, Government of India, 2010, Page 1.

[4] In the context of this paper, misallocation refers to the inefficient allocation of funds at the macroeconomic level where undeserving firms receive capital and deserving firms don't.

presents and discusses the results and the final section summarises.

Review of Literature

Firm Productivity

Productivity measures the efficiency with which inputs are converted into outputs. At the macroeconomic level, productivity growth is known to contribute heavily to economic prosperity by generating gains that increase incomes which results in improved living standards (Heil 2017). At the firm level, firms with higher productivity and higher productivity growth are more likely to grow (Du and Temouri 2014; Moschella and Tamagni 2019). Aw (2002) further elaborates that productive firms grow and because they grow, they get access to more resources that facilitate higher productivity, thus creating a virtuous cycle between growth and productivity. Productivity is a matter of firm survival (Syverson 2011) and firms that are more productive are less likely to become sick (Datta 2013). Productivity is also crucial for sustainable profitability in the long term (Foreman-Peck et al. 2006). As such, productivity should be a major criterion for public policies that target growth (Aw 2002) and for lenders and borrowers that look to avoid bankruptcy (Bryan et al. 2013).

Finance and Productivity at the Firm Level

Finance, besides being a major factor of production by itself, also determines access to other factors of production. As such, finance plays a significant role in productivity. Some researchers have identified lack of finance to hamper productivity growth (Levine and Warusawitharana 2019) while few other studies have found that financial constraints improve productivity (Chen and Song 2013; Sena 2006). The negative effect of financial constraints is attributed to the inability of the constrained firms to access necessary resources and the positive effect is attributed to the pressure exerted on the firms to use up the financial slack they may already have.

Likewise, literature provides evidence for both positive impact (Caglayan and Demir 2014; Girma and Vencappa 2015; Mok et al. 2007; Roger and Khatiwada 2017) and negative impact (Coad et al. 2015) of debt finance on productivity. Debt is argued to have a positive impact on productivity through the fear of bankruptcy (Chen and Guariglia 2013). Accordingly, the positive impact gains more strength as finance becomes costlier (Levine and Warusawitharana 2019). Coricelli et al. (2012) explains the negative impact of debt on productivity through the cost involved. Levered firms are distracted from productivity improvements by the financial burden of generating sufficient and timely cash flows to service the debt. Costlier financing is also expected to play a role in the negative impact of debt on productivity as it reduces possible reinvestment and thereby hampers productivity. Too much debt (debt overhang) is another explanation for the negative impact of debt on productivity (Li et al. 2018). Coricelli et al. (2012) further explains that the attention of highly levered firms is on generating the required cashflows to service the debt rather than on productivity improvements.

As firms that are more productive can better service the debt (Bryan et al. 2013), such firms are considered as less risky borrowers. Therefore, banks would prefer lending to more productive firms. Productive firms would also prefer borrowing because they would aim to grow (Du and Temouri 2014; Moschella and Tamagni 2019; Yu et al. 2017). And, without external finance, growth would be limited to the internal finance that the firms could generate. Therefore, the following hypothesis is formulated:

Hypothesis 1 Firm productivity has a positive impact on external finance.

External finance comes with a financial obligation, which when not fulfilled can lead to bankruptcy. The fear of bankruptcy has been identified to increase the productivity of the borrowing firms (Chen and Guariglia 2013). The financial obligations must be met at frequent intervals. Therefore, firms would concentrate on generating the funds required to service the debt in order to avoid bankruptcy and compromise on productivity improvements (Coricelli et al. 2012). The net effect of these two forces would determine the impact of external finance on firm productivity, leading to the formulation of the following hypothesis.

Hypothesis 2 External finance has a significant impact on firm productivity.

Forms of Debt and Firm Productivity

Recently, few researchers have shown interest in understanding how different forms of debt influence firm productivity. Ayyagari et al. (2010) analysed 2400 Chinese firms and found that the productivity growth of firms with formal financing is at least equal to that of firms funded by non-bank sources. Mallick and Yang (2011), on analysing a cross-country dataset on 47 countries, found that bank loans had a negative impact on efficiency. While comparing firms from developed economies to firms from developing economies, they found that debt had less adverse impact

on productivity among developing countries. They attributed it to the lower levels of debt among firms in developing economies and the resultant lower probabilities of financial distress. Girma and Vencappa (2015) measured performance by Total Factor Productivity growth and found that, relative to retained earnings, both bank and non-bank finance had a positive impact on the performance of Indian manufacturing firms. Thus, it is evident that even though the direction of impact is inconclusive, finance plays a major role in the productivity of firms.

The Role of Financial Intermediaries in Firm Productivity

As explained in the introduction section of this paper, productivity is especially important for emerging economies. But less developed countries usually have less developed financial markets with inefficient allocation of capital that results in lower productivity (Moll 2014). On a similar note, Bloom et al. (2010) found that the productivity of developing economies were lesser than that of developed economies. Syverson (2011) stated that most firms in developing economies are poorly managed and have low productivity. Most small firms in developing economies are founded as a last resort to provide a livelihood for the founder. Such lifestyle firms prioritise today's profitability over tomorrow's (Foreman-Peck et al. 2006). When sustainable profitability is not the objective, productivity is ignored, resulting in inefficient firms. In the presence of too many inefficient firms, the probability of resources being misallocated increases.

Proper functioning of the formal financial intermediaries ensures that capital is channelled to the most productive use (Beck et al. 2009). By efficiently screening loan applicants, formal lenders are expected to weed out non-productive activities out of the economy, thereby making the scarce financial resource available for more productive activities. Misallocation of capital has a detrimental effect on the productivity of the economy. This has been identified to be particularly true for India. Hsieh and Klenow (2009) argued that misallocation of capital and labour is the cause of lower aggregate Total Factor Productivity in India and China. Oura (2008) claimed that correcting misallocation of resources in India could result in major productivity gains. Cole et al. (2016) claimed that if the financial system of India were as developed as that of the United States, the Total Factor Productivity of India would be 46% more, thus highlighting the importance of finance and its efficient allocation and productivity for India and other emerging economies.

Based on the above literature review, it is comprehended that the evidence on the relationship between firm financing and firm productivity is equivocal. Productivity is highly important for emerging economies because it is with productivity that these economies can compete in the global scenario and thus graduate to the next level of economic development (Acs et al. 2008; Ayyagari et al. 2014). But, it has been identified that the productivity of emerging economies are lower than that of the advanced economies (Bloom et al. 2010), mainly attributable to the presence of too many inefficient firms (Syverson 2011). The presence of too many inefficient firms increases the likelihood of resource misallocation, where firms that are inefficient get access to resources while efficient firms don't. This would again result in greater aggregate inefficiency, thus creating a vicious cycle. Finance being a scarce resource and a major determinant of productivity, its misallocation proves detrimental to firms and economy. The power to mitigate the misallocation of financial resources lies with financial intermediaries, who make sure that the funds reach the right firms through their screening process and that the funds are put to the most productive use through their monitoring process. In emerging economies, most firms are smaller enterprises and much of the entrepreneurial growth is driven by the small business sector (Yu et al. 2013). But small firms are prone to information asymmetry that hampers the screening process of financial intermediaries.[5]

The screening process being affected by information asymmetry, are formal lenders able to allocate funds efficiently? What determines access to external finance? What factors influence firm productivity? This paper answers these questions by analysing the effect of firm-specific factors on the capital structure and productivity of small firms and the effect of the resultant capital structure on firm productivity.

Data and Methodology

This study adopted the definition of small firms provided by the Micro, Small and Medium Enterprises Development Act (MSMED Act), 2006. In India, investment in plant and machinery is the base of classification for manufacturing enterprises while investment in equipment is the base of classification for service enterprises. The MSMED Act, 2006 prescribes the following limits on investment to be classified as small enterprises. Manufacturing enterprises are classified as small if the investment in plant and machinery ranges from INR 2.5 million to less than INR 50 million. Service enterprises are classified as small if the investment in equipment ranges from INR 1 million to less than INR 20 million.

In defining formal and informal finance, this study followed Bhavani and Bhanumurthy (2014) as they also used data obtained from the Government of India. Formal finance includes funding from government, co-operative societies/

[5] The paper focuses on the formal financial intermediaries.

Table 1 Description of variables used in data envelopment analysis

Variable	Description
Gross input	Includes total value of raw materials consumed, total value of fuel consumed and other expenses. Other expenses include: (a) cost of contract and commission work done by others on material supplied by the unit. (b) cost of repair and maintenance of fixed assets (c) License fees, cess and other local taxes (other than excise and indirect taxes) (d) rent payable on all fixed assets (other than Land and Building) (e) paper, printing, stationary and communication expenses Averaged over 3 years
Total wages	Wages paid to employees during the year 2006–2007
Net Working Capital (NWC)	This was calculated using the average networth value (Current assets + Fixed assets − Current Liabilities) less the value of fixed assets. This figure is averaged over 2 years
Long term liabilities (LTL)	Current Assets + Fixed assets − Current Liabilities, where current assets and fixed assets would equal total assets and therefore equal total liabilities. When current liabilities is deducted from total liabilities, what is left is the long-term liabilities. This figure is averaged over 2 years
Gross output	Total ex-factory value/gross sale value of products and by-products manufactured as well as other receipts from non-industrial services rendered to others, work done for others on material supplied by them, value of electricity produced and sold, sale value of goods sold in the same condition as purchased, addition in stock of semi-finished goods and own construction Averaged over 3 years

Source: The report on the fourth census of Micro, Small and Medium Enterprises: Registered Sector, 2011, Government of India

banks, commercial banks including Regional Rural Banks, Insurance, Provident funds, and financial corporations. Informal finance consists of funding from money lenders, friends, and family.

The data for this research was obtained from the Government of India and pertained to the Fourth All-India Census of Micro, Small and Medium Enterprises: Registered Sector. The base year for the dataset is 2007–2008. The data collection drive was launched in 2008. It is the latest available data on Indian SMEs and covers even the smallest of small registered enterprises, addressing the widely mentioned issue of lack of data on small businesses in emerging economies.

Initially, the dataset had information on 15,063 small private firms. Filtering the data for private limited and perennial SMEs older than 4 years and cleaning the data for inconsistent data and univariate outliers left 9040 small firms. Consequently, attempts to achieve multivariate normality by dropping extreme multivariate outliers resulted in 8062 small private firms.

Methodology

This study used a two-stage method to achieve its objectives. In the first stage, efficiency was calculated with Data Envelopment Analysis (DEA). In the second stage, the calculated efficiency was used in a Simultaneous Equations Model (SEM) to analyse and understand the relationship between different categories of finance and firm productivity.

The simplest measure of productivity being the ratio of an output to an input, labour productivity is the most commonly used measure of productivity (Aga and Francis 2017; Ayyagari et al. 2014; Bloom et al. 2010; Coad et al. 2015; Moschella and Tamagni 20198; Yang and Tsou 2017). While the single input measures focus on the efficient utilisation of the concerned input, it ignores the contribution of other inputs and is an imperfect measure of efficiency (Palia and Lichtenberg 1999). Total Factor Productivity (TFP), on the other hand, considers multiple inputs in measuring efficiency and has been used widely (Antonelli et al. 2015; Mallick and Yang 2011; Martikainen et al. 2009; Satpathy et al. 2017). Another equally common approach to estimating productive efficiency is the Data Envelopment Analysis (DEA). It is a non-parametric method which, unlike other traditional parametric methods, does not impose a specific functional form for the production process (Bryan et al. 2013) and therefore avoids possible misspecification problems (Kao et al. 2017).

Following previous studies (Alvarez and Crespi 2003; Bryan et al. 2013; Doi 1992; Margaritis and Psillaki 2010), this paper also utilises DEA to estimate the productive efficiency of firms. Our DEA considered the contributions of four inputs—gross inputs, total wages, net working capital and long-term liabilities—in creating one output—the gross output and estimated the relative efficiency of 8062 Indian small firms. The variables used in DEA are described in Table 1. The definitions have been sourced from the report on the fourth census of Micro, Small and Medium Enterprises: Registered Sector published in the year 2011 by the Government of India.

The descriptive statistics of the variables used in DEA are given in Table 2. An examination of the descriptive statistics reveals the true nature of the dataset. The minimum and maximum values of the variables indicate that the dataset is a representation of the heterogenous small business sector and includes even the smallest of the small firms.

Table 2 Descriptive statistics of variables used in DEA

$N=8062$	Minimum	Maximum	Mean	Median	Std. dev
Gross output	0.243	5925	63	14	183
Gross input	0.027	2732	48	9	132
Total wages	0.04	418	2	1	8
Net working capital	− 5966	300	− 7	− 0.61	90
Long term liabilities	0.387	304	24	10.5	38
Efficiency	0.05	1.00	0.267	0.206	0.197

Gross Output, Gross Input, Total Wages, Net Working Capital, Long Term Liabilities are given in millions of rupees

Table 3 presents the correlation matrix for efficiency and the variables used to estimate efficiency. It is observed that gross input and gross output are highly correlated. This is no surprise as the output depends on the input. It should also be observed that neither gross output nor input is significantly and highly correlated with efficiency, which is the output of the estimate. None of the other variables have significantly high correlation values.

Under DEA, the efficient firms have an efficiency score of one. The other less efficient firms are scored relative to the efficient firms. As such, efficiency ranges between zero and one. One caution that should be observed in DEA is that the inclusion of too many inputs would result in too many efficient firms. To confirm that this has not happened and to understand the distribution of the efficiency scores, Table 4 presents the distribution of efficiency scores.

Only 0.63% of the firms are found to be efficient assuring that not too many firms have been identified to be efficient (Table 4). More than 75% of the firms are observed to fall below 30% efficiency. Therefore, it is ensured that not too many firms are classified as efficient in our estimate of productive efficiency. This calculated efficiency score is then used in a simultaneous equations model.

To deal with the endogeneity issue caused by the bi-directional relationship between productivity and funding source, simultaneous equations modelling (SEM) was employed. Potential endogeneity between financing structure and firm productivity has been documented in studies like Ayyagari et al. (2010), Du and Girma (2012) and Girma and Vencappa (2015). The endogeneity can be attributed to the lenders preferring lending to productive firms because they have less default risk (Foreman-Peck et al. 2006; Bryan et al. 2013; Datta 2013) and the efforts to service the debt having either a positive (Chen and Guariglia 2013) or negative (Coricelli et al. 2012) impact on firm productivity. Bollen-Stine bootstrapping was incorporated in SEM to deal with the non-normality in the data. Bollen-Stine bootstrapping was preferred over other techniques that address non-normal data because it has been identified to better control Type I error and provide more accurate probability values (Finney and DiStefano 2006). Stability index of the model was less than one. Other model fit indices are given in Table 5.

Table 4 Range-wise distribution of efficiency

Range of efficiency	Frequency	Percentage	Cumulative percentage
0 to < 0.1	533	6.611	6.611
0.1 to < 0.2	3327	41.268	47.88
0.2 to < 0.3	2290	28.405	76.28
0.3 to < 0.4	724	8.980	85.26
0.4 to < 0.5	311	3.858	89.12
0.5 to < 0.6	169	2.096	91.22
0.6 to < 0.7	117	1.451	92.67
0.7 to < 0.8	213	2.642	95.31
0.8 to < 0.9	210	2.605	97.92
0.9 to < 1	117	1.451	99.37
1	51	0.633	100
Total	8062	100	

Table 5 Model fit indices

Index	Value
Stability Index	0.576
CMIN/DF	24.198
RMR	0.000
GFI	0.998
CFI	0.993
FMIN	0.024
RMSEA	0.054

Table 3 Correlation matrix for variables included in DEA

	Output	Input	Total wages	NWC	LTL	Efficiency
Output	1					
Input	0.936***	1				
Total wages	0.233***	0.243***	1			
NWC	0.050***	0.054***	0.010	1		
LTL	0.376***	0.402***	0.334***	0.180***	1	
Efficiency	0.005	− 0.034***	− 0.139***	− 0.098***	−0.283***	1

***Significant at 1% level; **significant at 5% level; *significant at 10% level

Table 6 Composition of data

	$N = 8062$	n	% of all firms
FUND_SOURCE	FOR	2150	26.67
	INF	236	2.93
	CO-FUND	600	7.44
	INT	5076	62.96

From Table 5, it can be verified that the stability index of the model is less than one (0.576). This indicates that the model is stable. The GFI and CFI are closer to one. FMIN and RMSEA values are less than the threshold of 0.5 and 0.8, respectively. Therefore, the model can be considered to be of good fit. The equations estimated are given below:

$$\text{FUND\_SOURCE} = \alpha_{11}\text{EFF} + \beta_{11}\text{ACC\_EXIST} + \beta_{12}\text{PREF\_TREAT} + \beta_{13}Xi + \gamma_{11}\text{INDUSTRY} + \gamma_{12}\text{STATE} + u_{1i}, \quad (1)$$

$$\text{EFF} = \alpha_{21}\text{FOR} + \alpha_{22}\text{INF} + \alpha_{23}\text{CO} - \text{FUND} + \beta_{21}\text{KNOWHOW} + \beta_{22}\text{KNOWHOW} \times \text{SIZE} + \beta_{23}Xi + \gamma_{21}\text{INDUSTRY} + \gamma_{22}\text{STATE} + u_{2i}, \quad (2)$$

where, X is a set of control variables consisting of ACTIVITY, ANCILLARY, EXPORT, AGE, SIZE and LOCATION. α has been used to indicate the co-efficient of major variables of concern (funding source and efficiency). β has been used to indicate control variables and γ has been used to indicate the industry and state factors. The results of the above estimation are given in Tables 6, 7.

Description of Variables

FUND_SOURCE depicts how a firm is funded. In the context of this study, a firm is funded in one of the following four ways: (1) exclusively with formal finance (*FOR*) (2) exclusively with informal finance (*INF*) (3) both by formal and informal finance (*CO-FUND*) and (4) exclusively by internal finance (*INT*). The base of this categorical variable in the model is *INT*, that consists of unleveraged firms.

Table 6 details the composition of the dataset used in the analysis concerning this paper.[6] It also gives the percentage of firms falling under each category to facilitate easier understanding of the dataset. It can be observed that most small firms (63%) rely on internal financing and remain unleveraged. About 27% of small firms borrow from formal sources. Three percent of small firms borrowed from informal sources and 7% borrowed from both formal and informal sources.

EFF is a calculated measure of efficiency. It was estimated using the non-parametric approach of Data Envelopment Analysis. The values range from zero to one, with the most efficient firm marked one and the least efficient firm marked zero.

ACC_EXIST indicates whether the firm maintains accounts (coded one) or not (coded zero). *KNOWHOW* is a categorical variable coded one if the firm uses external know-how and zero otherwise. KNOWHOW*SIZE is an interaction of KNOWHOW and *SIZE*. *PREF_TREAT* is a variable that identifies if the firm was treated as part of SSI (Small Scale Industries) before it was classified as an MSME, due to the revised definition[7] that came into effect from 2006. *PREF_TREAT* is considered in the model to account for the preferential treatment that SSIs received even before the introduction of MSMEs.

ACTIVITY states if a firm is a manufacturing firm (coded zero) or a service firm (coded one). *ANCILLARY* is a nominal variable that is coded one if a firm is an ancillary unit and zero otherwise. Ancillary units provide not less than 50% of their output to other businesses (parent units). *EXPORT* identifies if a firm is an exporting unit or not. *LOCATION* states if the firm is located in an urban area (coded one) or not (coded zero).

AGE indicates how old a firm is. It is measured by the number of years in production as of 2007. Firms with less than 4 years in production were removed so that the average values were not affected. *SIZE* is measured by the log of long-term liabilities.

INDUSTRY, classified into nine categories, indicates the industry to which the firm belongs. This classification is based on the National Industrial Classification (NIC) 2004, as the industries are coded using NIC 2004 in the dataset. *STATE* is a categorical variable that states the category of states the firm belongs to. The dataset originally had 35 states and union territories which are classified into four categories based on Singh (2017).[8]

Having described the variables used in the simultaneous equations model and explained the methodology adopted in

[6] Statistics are based on the dataset of 8062 Indian small firms used in this study.

[7] Previously, the manufacturing enterprises were classified as micro enterprises if the amount of investment was within INR 2.5 million and as small enterprises if the investment ranged between INR 2.5 million and INR 10 million. Service enterprises were classified as micro enterprises if their investment was less than INR 1 million. These firms were then known as Small Scale Industries (SSIs). The variable, Preferential Treatment, indicates the small firms in the overlapping region (2.5 million INR to < 10 million INR) that enjoyed preferential treatment even before 2006.

[8] Available at https://hbr.org/2017/12/you-dont-need-an-india-strategy-you-need-a-strategy-for-each-state-in-india

Table 7 Results of simultaneous equations model

$N = 8062$	FOR	INF	COFUND	EFF
FOR	N/A	N/A	N/A	− 0.502*** (0.012)
INF	N/A	N/A	N/A	− 0.206*** (0.019)
COFUND	N/A	N/A	N/A	− 0.447*** (0.018)
EFF	0.576*** (0.112)	0.195*** (0.022)	0.551*** (0.059)	N/A
ACC_EXIST	0.038*** (0.028)	− 0.004 (0.01)	0.009 (0.016)	N/A
ACTIVITY	− 0.025* (0.028)	− 0.009 (0.01)	− 0.005 (0.016)	0.044*** (0.01)
ANCILLARY	0.001 (0.021)	0.028** (0.007)	− 0.023** (0.012)	0.02** (0.008)
EXPORT	0.008 (0.016)	0.02* (0.006)	0.006 (0.009)	0.038*** (0.006)
KNOWHOW*SIZE	N/A	N/A	N/A	0.19*** (0.017)
KNOWHOW	N/A	N/A	N/A	− 0.089*** (0.005)
	− 0.004 (0.01)	− 0.001 (0.003)	− 0.02* (0.006)	− 0.025** (0.004)
SIZE	0.485*** (0.012)	0.138*** (0.003)	0.404*** (0.006)	− 0.615*** (0.002)
PREF_TREAT	0.016 (0.013)	0.001 (0.005)	− 0.046*** (0.008)	N/A
LOCATION	− 0.146*** (0.012)	0.042*** (0.004)	0.022* (0.007)	− 0.041*** (0.005)

Standard errors in parenthesis. Detailed results given in Appendix. The number of observations is 8062
***Significant at 1% level; **significant at 5% level; *significant at 10% level

this study, the next section presents the results of the simultaneous equations model and discusses them.

Results and Discussion

The results are discussed under three major sub-headings, namely, funding sources and profitability, determinants of external finance and determinants of productivity.

Funding Sources and Productivity

Productivity had a positive effect on all categories of funding—formal (0.576), informal (0.195) and co-funding (0.551)—making efficiency a major determinant of external funding. Firms that were more efficient had better chances of being leveraged. But firms that received external finance were found to be less efficient. Formal finance had the highest detrimental effect on productive efficiency (− 0.502), followed by co-funding (− 0.447) and informal finance (− 0.206). On one hand, lenders prefer lending to productive firms because more productive firms have sustainable profits (Foreman-Peck et al. 2006), are less likely to default (Bryan et al. 2013) and become sick (Datta 2013). On the other hand, debt finance does not facilitate productivity improvements for the funded firms, the major reason being the prioritisation of servicing the debt. Possible reasons are undermentioned and discussed.

Informal finance being short-term and limited, cannot be invested in improving productivity. Formal finance, which is scalable and of longer maturity period, may still not promote productivity for the following reasons: (1) Efficiency results in intangible assets in the short run. Intangible assets cannot be seized and encashed in case of default (Bloom et al. 2010). (2) The benefits of efficiency are realised in the long run and involves current investments and opportunity costs. Therefore, investments in efficiency are considered risky and the returns, uncertain. (3) Since the financial obligations on the loan must be met at regular and short intervals, both the lender and the borrower might prioritise quick returns over efficiency and choose today's profits over tomorrow's, in an attempt to avoid financial distress. (4) External finance might actually be providing financial slack, resulting in inefficiency (Sena 2006).

Bloom et al. (2010) suggests that firms might be less efficient because they are not aware of efficiency and mechanisms that improve efficiency. That does not seem to be the case here among Indian small firms because the results indicate internal finance (the base category) to have a significantly positive impact on efficiency. This would mean that small firms are aware of improving efficiency and, in the absence of borrowings, they invest in efficiency improvements. In the absence of borrowings, firms are smaller and grow at low rates and therefore investing only a part of internal finance in productivity improvements proves sufficient.

Since firms with no external finance are found to be more efficient than firms that borrowed, it could also be argued

that even though firms are aware of the benefits of being efficient, they just don't bother when employing debt. It is widely accepted that firms borrow because they aim to grow. If growth is the objective, given that firms are cognizant of productivity improvements, it is expected that firms would want to be efficient and will be efficient even when they borrow, unless the debt causes them to be. The following section discusses how formal finance can cause a firm to be less efficient.

Formal finance is usually invested in business expansion and growth. The assets resulting from such activities are tangible and can be liquidated to pay at least a portion of the debt, in case of default. But improved efficiency cannot help pay back the debt in the short-run. Rampini and Viswanathan (2010) note that even though firms generate higher cash flows through an efficient deployment of capital, these cashflows cannot take the place of collateral as firms can abscond with the cashflows. While the lenders are concerned about the borrowing firm making enough profits during the loan period to pay back the loan, investments in efficiency takes a long time to be reflected in the profitability of the firm. Thus, the interest of the lenders and the result of investments in efficiency suffer from a major mismatch. The possibility of bankruptcy in the event of default of the loan might even automatically push the firms towards short-term profits and away from long-term efficiency. Both the lenders and the borrowers therefore become less concerned about long term and sustainable profitability and growth. The borrowing firms would then invest heavily in tangible assets involved in the expansion and growth of the business. Given that complexity is a function of firm size, borrowings would then lead to a complex and larger firm that lacks proportionate investment in firm efficiency. The negative effect of size on efficiency lends further support to this claim (Table 7). Therefore, it is concluded that firms with external finance do not invest appropriately in improving efficiency either because they are not allowed to or because they themselves do not find enough incentives to do so. Under such circumstances, firms may still grow but at a lower and inefficient rate.

Determinants of External Finance

The Role of Informal Finance

Under circumstances that involve information asymmetry and excessive inefficient firms leading to a higher probability of misallocation, it is identified that formal lenders, at least partially, base their lending decision on the informal finance employed by the firm. This is indicated by the impact of ACCEXIST, ACTIVITY and LOCATION on FOR and COFUND as explained below. This result finds support in the works of Degryse et al. (2016) and Madestam (2014).

While maintenance of accounts had a significant positive impact (0.038) on formal funding, it did not have a significant impact on co-funding. Books of accounts provide access to necessary information (Agostino and Trivieri 2014) which helps lenders make an informed decision. Therefore, it is no surprise that maintaining accounts, through the resultant effect on information asymmetry, has been found to improve firms' access to formal finance. But it did not have a significant impact on co-funding, which is the simultaneous use of formal and informal finance. This indicated that informal finance helped make up for the non-maintenance of books of accounts by filling up the information gap.

Compared to manufacturing firms, service firms were found to be less probable of receiving formal finance (− 0.025). Service firms usually require lesser finance than manufacturing firms (Cressy and Olofsson 1997; Yiu et al. 2013). While as many service firms as manufacturing firms may not demand external finance, collateral being a major determinant of debt (Agostino and Trivieri 2017; Cerqueiro et al. 2016; Thampy 2010), even if service firms demand external finance, they might not receive it due to insufficient collateral (Bhaumik et al. 2012). This result can therefore be an outcome of both supply side and/or demand side factors. In this case too, it is found that activity nature did not have a significant impact on co-funding, indicating even firms with insufficient collateral were funded by formal institutions in the presence of informal finance.

It was found that while lesser urban firms (− 0.146) accessed formal finance, significantly more urban firms received informal funding (0.042) and co-funding (0.022). Petersen and Rajan (2002) suggested that (formal) lenders were located away from rural areas, indicating higher bank concentration in urban areas. In the presence of many choices, urban firms are less likely to borrow again from the same lender. Without assurance of future rents, formal lenders become risk-averse (Berger et al. 2004; Sethi 2018) and are more likely to reject loans. Even the loan applications that are not rejected would carry high interest rates, explaining urban firms' lesser probability of accessing formal finance (Dong and Men 2014; Petersen and Rajan 1995). On the other hand, the lack of bank competition in rural areas increases the likelihood of rural firms transacting with the same bank repeatedly even in the future. Therefore, banks in rural places have the incentive to subsidise the current loans, especially to young and small firms, with the view to make up for the subsidies with future rents, thus making formal finance more available to rural firms. Even in the absence of future rents, formal lenders were found to be willing to finance urban firms in the presence of formal finance, as indicated by the significant and positive impact of LOCATION on COFUND.

Thus, the results of ACCEXIST, ACTIVITY and LOCATION on COFUND indicated that, in emerging economies, formal lenders relied on the presence of informal finance, while lending to small firms.

Other Factors Influencing External Finance

Ancillary firms were less likely (− 0.023) to be co-funded but had no significant impact on formal finance. On the demand side, the parent firms assuming large parts of investments (Hancké 1998) could result in ancillary units not requiring formal finance. On the supply side, the ancillary unit status and the ready market it provides for at least 50% of the firm's output is not as attractive to the formal lenders as it should be, suggesting that ancillary units are exploited by parent units. Even though ancillary units benefit from their parent firms by way of investment, technology transfer, training and quality programs, parent units impart such benefits only to highly customise the products and processes of the ancillary units in order to keep them captive (Doi 1992). This exploitation angle is further supported by the finding that significantly more ancillary units borrowed from informal lenders (0.029) who are considered short-term fund providers.

More ancillary units using short-term loans (informal finance) is considered an indication of exploitation by the debtors to a firm (Michaelas et al. 1999). The debtors to an ancillary unit mostly consist of the parent firm. Delayed payments is a major issue for small firms (Nanjundan 1994; Subrahmanya 2008). Sahu and Narayanan (2011) found that, in India, almost 88% of ancillary units suffered delay in payments. Therefore, it is comprehended that ancillary firms employ informal finance extensively to cover for the payments delayed by parent units. Since parent units assume large investments of ancillary units, the ancillary units do not require the scalable formal finance that can provide large amount of debt. Or, due to the exploitation of ancillary units, formal finance is not allotted. The significant negative impact of ancillary unit status on co-funding further strengthens the argument that parents units provide financial assistance (probably, long-term) to ancillary units to the extent that formal funding is not required. Meanwhile, ancillary units become captive suppliers and suffer from delayed payments, which they cover up by employing informal finance.

Significantly more exporting firms (0.02) borrowed from informal lenders. Informal finance is more commonly used to finance short-term and smaller financial requirements. The working capital requirements are higher for exporting firms due to their longer cash conversion cycle and unpredictability of foreign sales. To meet the higher working capital requirement, they usually carry more short-term debt (Maes et al. 2019), explaining the positive impact of export status on informal finance.

While age did not have a significant impact on formal finance and informal finance, older firms were less likely to be co-funded (− 0.02). Capital invested (size) had a positive impact on formal (0.485), informal (0.138) and co-funding (0.404). This is consistent with the notion that larger firms are considered less risky and therefore attract external finance. This also extended support to the significant role played by external finance, mainly formal, in facilitating higher levels of investment. More firms that were previously classified as SSIs and had been part of priority sector lending were expected to have better access to formal funding. But the results indicated that significantly lesser SSIs were co-funded (− 0.046) and there was no significant impact on formal and informal finance.

Determinants of Productivity

Service firms were found to be more efficient (0.044). Margaritis and Psillaki (2010) argued that firms with high levels of intangible assets would adopt better technology faster, be better managed and be more efficient. Ancillary units were found to be more efficient (0.02) than their non-ancillary counterparts. The parent units have often been found to help ancillary units by way of technology transfer, training and quality programs explaining the higher efficiency of ancillary units (Hancké 1998; Nichter and Goldmark 2009).

Consistent with most studies (Caglayan and Demir 2014; Delgado et al. 2002; Grazzi 2012), exporting firms were found to be more efficient (0.038) than non-exporting firms. The product or service that is exported needs to be better than those produced by similar firms worldwide, implying that exporting firms should have better quality products and more efficient production processes (De and Nagaraj 2014). Researchers explain the higher efficiency of exporting firms through two different perspectives. One perspective (self-selection) is that more productive firms decide to export in order to make the best out of their higher productivity. The other perspective (learning by exporting) is that firms improve their productivity through exports (Du and Girma 2012; Sahu and Narayanan 2011).

Know-how had a negative impact on efficiency (− 0.089). When interacted with size, the impact is positive (0.19), indicating that larger firms benefitted more out of external know-how. Larger firms standing to gain more from employing external know-how evidenced the scale effects in the impact of know-how on firm productivity. In line with Chen and Guariglia (2013), Hall et al. (2009) and Nichter and Goldmark (2009), age had a detrimental effect on efficiency (− 0.025), suggesting that older a firm gets, the less efficient it becomes. Failure to invest adequately in more efficient technologies and the maintenance required for older assets/

Table 8 Mann–Whitney test results of size by location

Particulars		Size
Urban firms	*N*	5494
	Median	16.27
	Mean	16.37
Rural firms	*N*	2568
	Median	16.12
	Mean	16.09
Z value		7.883
P value		0.000

technology results causes firms to become less efficient as they age.

Similar to the findings of Hall et al. (2009) and Diaz and Sanchez (2008), larger firms were found to be less efficient (− 0.615). In line with the Agency theory, bigger the size, more complicated will the production and managerial processes be (FitzRoy 1991). Larger firms are less efficient as they would not have invested in efficiency enhancing activities and technologies as much as they had invested in expansion and growth. The higher efficiency of smaller firms can also be explained by the absence of bureaucratic frictions and monitoring difficulties that larger firms suffer from (Diaz and Sanchez 2008). Inefficient small firms are also more likely to exit the market than inefficient larger firms, the remaining small firms being more efficient.

Urban firms were found to be less efficient (− 0.041). The Mann–Whitney test results presented in Table 8 suggest that the urban firms are significantly larger than rural firms. Rural firms, being smaller than urban firms, would be less complex and have lesser hierarchies, resulting in higher levels of efficiency.

Summary and Implications

Given that productivity is one of the major determinants of competitiveness, this study aimed to understand the relationship between productivity and different forms of finance. This was achieved by analysing 8062 Indian small firms using a two-stage method. In the first stage, the relative efficiency was estimated using the non-parametric Data Envelopment Analysis by specifying gross input, total wages, net working capital and long-term liabilities as input variables and gross output as the output variable. In the second stage, the estimated relative efficiency was used in a simultaneous equations model with Bollen–Stine bootstrapping to understand the relationship between different categories of funding and firm efficiency. Firms were categorised into four groups based on how they were funded: (1) Firms that were exclusively funded by formal sources, (2) firms that were exclusively funded by informal sources, (3) firms that were funded by both formal and informal sources—co-funded, and (4) firms that were unleveraged.

The first stage of the analysis revealed that only 0.63% of the firms were efficient corroborating with the claim that most firms in developing economies are inefficient. The presence of too many inefficient firms increases the probability of capital misallocation. But, productivity of the firms was found to be a major determinant of formal and informal finance. Therefore, it is established that more efficient firms had higher probabilities of accessing external finance. Even though productivity was considered important while making lending decision, external lenders did not facilitate productivity improvements, which is reflected in the negative impact of external funding on firm efficiency. This is a significant finding because external finance provides additional capital to a firm. The firm is expected to invest the additional capital in tangible assets that could be liquidated in case of financial distress, all the while expanding its business and churning out (quick) profits to pay the creditors back. The additional finance and the resultant business expansion result in a bigger and more complex firm. Without investing proportionately in efficiency enhancing activities, these firms become less efficient. For countries that must compete by increasing firm efficiency, this is a major red flag.

This study has broad implications for firms, lenders and policy makers for better decision making at both micro- and macro-levels in order to facilitate investments in productivity improvements and thereby achieve competitive advantage. The paper explains how the interests of the lenders and the result of productivity investments are misaligned. A fine balance must be achieved between credit and productivity investments if firms are to be competitive. Hsieh and Klenow (2009) questioned how much larger the Chinese and Indian economies would be if they had the efficiency of the United States in allocating inputs across production units. As for India, if formal finance does not find ways to promote productivity, we may never know.

This paper is limited by the cross-sectional nature of the data. Information on the duration of the loan or when firms start and stop using the loans are not available. Further research in this area might make use of longitudinal datasets if available.

Appendix

Detailed results of the simultaneous equations model

		Estimate	SE	CR	*P*
CO-FUND	Efficiency	0.551	0.059	12.596	0.000
	ACC_EXIST	0.009	0.016	0.783	0.434
	ACTIVITY	− 0.005	0.016	− 0.313	0.754
	ANCILLARY	− 0.023	0.012	− 1.986	0.047
	EXPORT	0.006	0.009	0.539	0.59
	AGE	− 0.02	0.006	− 1.711	0.087
	SIZE	0.404	0.006	12.799	0.000
	PREF_TREAT	− 0.046	0.008	− 3.642	0.000
	LOCATION	0.022	0.007	1.791	0.073
EFF	FOR	− 0.502	0.012	− 18.088	0.000
	INF	− 0.206	0.019	− 12.757	0.000
	COFUND	− 0.447	0.018	− 18.125	0.000
	ACTIVITY	0.044	0.01	3.479	0.000
	ANCILLARY	0.02	0.008	2.004	0.045
	EXPORT	0.038	0.006	3.736	0.000
	KNOWHOW*SIZE	0.19	0.017	16.913	0.000
	KNOWHOW	− 0.089	0.005	− 8.259	0.000
	AGE	− 0.025	0.004	− 2.451	0.014
	SIZE	− 0.615	0.002	− 51.683	0.000
	LOCATION	− 0.041	0.005	− 3.632	0.000
IS	EFF	0.576	0.112	11.626	0.000
	ACC_EXIST	0.038	0.028	3.197	0.001
	ACTIVITY	− 0.025	0.028	− 1.657	0.098
	ANCILLARY	0	0.021	0.035	0.972
	EXPORT	0.008	0.016	0.657	0.511
	AGE	− 0.004	0.01	− 0.322	0.747
	SIZE	0.485	0.012	13.809	0.000
	PREF_TREAT	0.016	0.013	1.221	0.222
	LOCATION	− 0.146	0.012	−11.795	0.000
NIS	EFF	0.195	0.022	7.816	0.000
	ACC_EXIST	− 0.004	0.01	− 0.347	0.728
	ACTIVITY	− 0.009	0.01	− 0.658	0.511
	ANCILLARY	0.028	0.007	2.504	0.012
	EXPORT	0.02	0.006	1.727	0.084
	AGE	0	0.003	− 0.026	0.979
	SIZE	0.138	0.003	6.64	0.000
	PREF_TREAT	0.001	0.005	0.118	0.906
	LOCATION	0.042	0.004	3.586	0.000

Standard errors in parenthesis. The number of observations is 8062

***Significant at 1% level; **significant at 5% level; *significant at 10% level

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