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Impact of the Global Financial Crisis on the Efficiency of Indian IT Firms

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Abstract

This study uses a balanced scorecard framework to identify proxy variables for the inputs and outputs of a sample of firms in India's information technology and IT-enabled services sector. It uses these variables and an additive data envelopment analysis model to identify and analyse the inefficiency of these firms for three years before and after the global financial crisis of 2008. In particular, the study focuses on the responses of Indian firms to economic adjustments made by their clients in developed countries after the crisis.
JEL Codes: C610, L860

Keywords: DEA; BSC; India; Information Technology; Financial Crisis

1. Introduction

India's information technology and IT-enabled services (IT&ITeS) sector plays a critical role in foreign exchange earnings. Software services accounted for 49% of services sector exports (India Brand Equity Foundation 2023) and 7.4% of India's GDP (India Brand Equity Foundation 2022) in the 2022 financial year (FY22). In terms of generating work opportunities, an estimated 445,000 new practitioners were appointed in FY22, taking the workforce to 5.1 million.

India has attracted the attention of English-speaking developed countries since at least the late 1990s due to India's ability to provide IT&ITeS from India to firms across manufacturing and services sectors in developed countries at 30%–65% lower costs (Kathpalia and Raman 2014). The global financial crisis in 2008 significantly impacted world economies (Jawadi and Arouri 2011); however, there is no literature on the performance of Indian IT firms impacted by this global crisis. This paper analyses the response of these firms from the perspective of the use of input factors and the production of output factors in response to the global financial crisis 2008.

2. Data and Methodology

An integrated balanced scorecard-data envelopment analysis (BSC-DEA) model (Asosheh, Nalchigar and Jamporazmey 2010; Kadarova et al. 2015) provides both qualitative and quantitative approaches to give a comprehensive view of the business performance. The four perspectives of BSC—(1) financial, (2) customer, (3) internal business processes, and (4) innovation, learning, and growth—help identify the input-output proxy variables for DEA analyses.

The following proxy variables were used as the three inputs: cost of goods and services sold (CoGS) (internal business processes); selling, administrative, and general expenses (SAGE) (customer perspective); and total liabilities (TL) (financial perspective). Revenue (customer perspective) and earnings before interest, tax, depreciation, and amortization (EBITDA) (financial perspective) were the two output variables. CoGS primarily consists of wage costs in the industry, and SAGE represents administrative expenses, including promotional expenses. TL signifies the financial capital employed: firms are principally debt-free and traditionally financed by the equity market.

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Since there are negative values for EBITDA, a translation was required to make them non-negative, and an additive data envelopment analysis (ADD-DEA) was applied (Cooper, Seiford, and Tone 2007). ADD-DEA is a particular type of DEA that optimizes both inputs and outputs and is translation invariant. Last, the study uses a panel data regression framework to explain the inefficiency scores for each input and output.

Information regarding the selected variables was collected from the Prowess database of the Centre for Monitoring the Indian Economy (CMIE) for the IT&ITeS sector for all financial years between FY06 and FY11. Complete information for all the years was available for 74 firms. The sub-periods 2006 to 2008 and 2009 to 2011 are henceforth referred to as the pre-crisis and post-crisis periods, respectively. However, we excluded the learning and growth perspective because of the unavailability of data for its proxies (e.g., R&D expenses and intangible assets).

INR-USD exchange rates over the years are one control variable because these firms earn most of their revenue in USD and spend their earnings mostly in INR; therefore, all the input and output variables are denominated in INR. Outward orientation (export revenue as a proportion of total revenue) is another control variable.

Three dummy variables represent the firms' characteristics based on additional data collected from the websites of each firm and Bloomberg: business orientation (IT consulting or otherwise), industry specialization (in multiple or only one industry), and geographic market specialization (catering to all regions or only the domestic market). The age of a firm is expressed in years from the year of incorporation, and market capitalization is a proxy for size.

Multicollinearity is absent to any significant degree in the data set. The Durbin-Wu-Hausman (Hausman 1978) test identified endogeneity in specific cases. A one-period lagged value of the suspect instrument variable was used to address this issue.

3. Results and Discussion

The number of efficient firms varied between 16 and 20 (n=74) per year (Table 1), although only one was efficient throughout the period. There were no changes in this aspect before or after the crisis.

Table 1. Average Inefficiencies from ADD-DEA

Year	Number of Inefficient Firms	Input Inefficiency[a,b]			Output Inefficiency[a,b]	
		CoGS	SAGE	TL	Sales	EBITDA
2006	54	5.8%	35.5%	33.3%	17.6%	17.2%
2007	58	8.2%	46.2%	40.0%	1.6%	25.9%
2008	55	10.3%	18.1%	35.6%	8.4%	7.0%
2009	56	16.4%	40.3%	37.6%	4.4%	9.7%
2010	55	18.0%	60.5%	40.2%	0.5%	20.6%
2011	57	11.5%	39.1%	25.4%	1.4%	26.8%

Notes: a: Inefficiency is expressed as an absolute value (before translation) percentage of respective input/output variables. b: Reported inefficiency values are the average of inefficient firms in the sample

Average revenue and average exports to total revenue increased in the post-crisis period for efficient and inefficient firms. This indicates that the economic crisis in the US and Europe led to a larger proportion of work migrating to Indian IT&ITeS companies across all types since there was no significant difference between efficient and inefficient firms. The regression results (Table 2) demonstrate that the revenue slack ratio increased for both efficient and inefficient firms after the crisis. A greater outward orientation is associated with a higher revenue slack ratio. This is consistent with higher initial entry costs (relative to revenue) in international markets (Melitz 2003).

Table 2. Regression Analysis

Dependent Variables	Input Inefficiency			Output Inefficiency	
Dependent Variables	CoGS	SAGE	TL	Sales	EBITDA
	Coefficient (p-value)				
Age	-0.0018 (0.387)	0.0060 (0.027)	0.0028 (0.757)	-0.0014 (0.956)	-0.0479 (0.112)

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Size	0.0000 (0.626)	0.0000 (0.91)	0.0000 (0.755)	0.0000 (0.443)	0.0000 (0.569)
Outward orientation	0.2754 (0.048)	0.0221 (0.248)	-0.6887 (0.327)	1.6138 (0.000)	-0.3943 (0.281)
Exchange rate	0.0191 (0.299)	0.0021 (0.111)	0.0500 (0.253)	-0.0077 (0.586)	0.0831 (0.559)
Industry specialization	-0.0238 (0.53)	0.1247 (0.024)	-0.0299 (0.846)	-0.4150 (0.418)	-0.2842 (0.644)
Business orientation	-0.0109 (0.749)	-0.0247 (0.627)	-0.0394 (0.773)	-0.6414 (0.173)	-0.0815 (0.885)
Geography market specialization	0.0601 (0.355)	-0.0335 (0.654)	-0.3831 (0.187)	2.8017 (0.00)	-0.2165 (0.795)
Financial Crisis	-0.0043 (0.911)	0.0471 (0.201)	-0.0638 (0.500)	1.2319 (0.042)	-0.6336 (0.328)
Constant	-0.8537 (0.308)	0.0000	-1.5554 (0.445)	0.0000	-1.8429 (0.767)
Instrumented	Outward Orientation	Exchange Rate	Outward Orientation	Exchange Rate	Outward Orientation
Instrument	1 year Lag	1 year Lag	1 year Lag	1 year Lag	1 year Lag
Dummy	Year	Year	Year	Year	Year
	Diagnostics				
Wald chi2(7)	12.6300	152.9500	5.1100	61.4900	6.1300
Prob> chi2	0.2453	0.0000	0.8835	0.0000	0.6331

While the average EBITDA of all firms increased from the pre- to post-crisis period, the average return on equity declined sharply for inefficient firms, mainly due to substantial losses for a few firms in specific years. None of the independent variables, including the dummy variable for the financial crisis, significantly influenced the EBITDA slack ratio, implying that inefficient firms consistently generated less EBITDA than efficient firms.

For inefficient firms, input inefficiency was greater than output inefficiency. Suppliers from India are required to achieve targets set by their clients (usually not adjustable after contracts are signed) on the output side; however, similar non-negotiable agreements do not bind the use of inputs.

Greater outward orientation is associated with a higher CoGS slack ratio, implying the deployment of a larger number of employees to support revenue. Firms catering to the domestic market require fewer employees to generate comparable revenue.

The average foreign exchange spent on travel as a percentage of total sales was higher for inefficient firms than for efficient firms. Efficient firms reduced their expenditure during the post-crisis period. This expenditure increased in the post-crisis period for inefficient firms but fell in 2011. This implies that inefficient firms spent more on marketing efforts in the post-crisis period, but only for the first two years. Older firms were characterized by a higher SAGE slack ratio, indicating higher overheads and administrative expenses. Specialization in only one specific industry also led to a higher SAGE slack ratio.

There was no significant difference in the average net fixed assets as a percentage of total assets for efficient and inefficient firms before and after the crisis. On average, efficient firms' capital work in progress as a percentage of total assets declined significantly compared to inefficient firms, except in 2011, when inefficient firms reported a steeper fall. Overall, physical capital declined for both efficient and inefficient firms. This indicates that all the firms reduced their investment in real estate in the face of the crisis.

Investment in equity shares, bonds, and mutual funds as a percentage of total assets increased significantly for efficient firms compared to inefficient firms during the post-crisis period. The average cash and bank balance as a percentage of total assets for efficient firms was higher than for inefficient firms during both periods; however, there was no

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significant change between the periods. Overall, investment in bonds, equity shares, mutual funds, and cash and bank balances remained steady as a percentage of total assets. That is, retained profits (invested in financial assets) remained unaffected by the crisis for all firms.

4. Conclusion:

This study uses a balanced scorecard framework to identify proxy variables for the inputs and outputs of a sample of firms in India's information technology and IT-enabled services sector. It uses these variables and an additive data envelopment analysis model to identify and analyse the inefficiency of these firms for three years before and after the global financial crisis of 2008. In particular, the study focuses on the responses of Indian firms to economic adjustments made by their clients in developed countries after the crisis. The results show that revenue and exports increased for all firms after the crisis, the revenue slack ratio also increased, implying that marginally more resources (inputs) were required than before the crisis to generate marginal revenue. However, due to the continuous depreciation of the INR during the post-crisis period, the EBITDA of the firms was not significantly impacted. The overall cost was controlled mainly by reducing foreign travel costs. Also, these firms efficiently managed their financials by curtailing investment in physical capital by shifting from ownership to lease/rent agreements during the post-crisis period, while financial investments remained unchanged across the sub-periods.

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