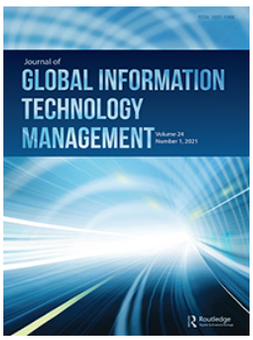

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ARTICLE

International Subsidiary Closure in the Software Services Sector: The Experience of Indian Software Services Multinationals

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ABSTRACT

Physical presence through establishment of subsidiary is one of the salient features of internationalization of Indian multinationals in the software services sector. However, closure of such subsidiaries has received limited limelight than the success stories. The paper examines the less explored event of international subsidiary closure using a representative sample of Indian software services multinationals and the associated subsidiaries closed during 2007–2017. Cox proportional hazard function is estimated using host-country, parent-firm and subsidiary-specific factors. Results show that the three levels of factors have significant impact on subsidiary closure. While economic growth in host country reduced probability of closure, the smaller subsidiaries and less profitable ones had higher probability of closure. Business group affiliation was found to have direct and independent impact on reducing probability of subsidiary closure. However, the liability of inter-regional foreignness due to higher geographical breadth of internationalization was not supported in the case of Indian software multinationals.

KEYWORDS

International subsidiary closure; cox regression; business group; internationalization; software services; emerging multinationals

Introduction

The multinationality-performance relationship has evolved considerably ever since Lu and Beamish (2004) had reported S-shaped relationship between the degree of internationalization and performance. Later on, while some researchers had found partial support for S-shaped relationship (Ruigork, Amann, & Wagner, 2007), others contradicted S-shaped relationship and noticed alternative patterns. This led to discovery and testing of M-shaped, U-shaped or W-shaped relationship between multinationality and performance (Almodovar & Rugman, 2014; Berry & Kaul, 2016; Fernandez-Olmos, Gargallo-Castel, & Giner-Bagues, 2016; Lee, 2010, 2013).

The internationalization-performance relationship deals with explaining multinationals' performance in relation to the degree of internationalization. However, the internationalization-performance relationship does not explicitly capture extreme events like international subsidiary closure at various stages of internationalization. The focus of this paper is to explain international subsidiary closure, which is different from offshore project failure. The latter is dealt with in Haried and Claybaugh (2017) and Ebad (2017). As performance and survival have different antecedents (Delios & Beamish, 2001), we examine the closure of international subsidiary in an attempt to extend the internationalization-performance literature.

We have considered software services multinationals from India where the software services sector is one of the competitive sectors. However, the sector is pyramidal in structure that contains handful of large firms. We have examined the closure of international subsidiaries that were established by the Indian parent firms in the sector. The examination is done in relation to three levels of factors namely host country-specific, parent firm-specific and subsidiary-specific. Several hypotheses are developed

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involving these three levels of variables. We estimate the hazard ratio of these variables using Cox proportional hazard model. Further, standardized coefficients of the variables are also estimated. Our particular focus has been the impact of market growth (captured by GDP growth in the host country) since the subsidiaries in the sector are established primarily with market-seeking motive. Besides, we have investigated the impact of subsidiary size and profitability on closure probability. Further, the role of parent firm-specific attributes are investigated. In particular, the role of business group affiliation and the geographical breadth of internationalization of the parent are prime considerations. A three-step process was followed to collect relevant data on closed subsidiaries. Multiple data sources have been used for the study.

The results provide at least three important evidence as regards the closure of overseas subsidiaries of emerging multinationals in the software services sector. First, market growth is crucial host-country factor determining subsidiary survival or closure in the software services which validates the market-seeking motive of outward foreign direct investment (FDI) in the sector. Thus, economic growth in a host country is like bellwether for the sector. The significant impact of market growth on subsidiary survival in the software sector is in contrast to the findings from natural resource-based sector (Das & Mahalik, 2020). Second, we find significant impact of subsidiary-specific variables on the probability of closure of overseas subsidiaries. Our results are advancement over past studies that excluded subsidiary-specific variables from analysis (Garg & Delios, 2007). In particular, size and profitability have significant impact on closure or survival of subsidiaries. Third, business group affiliation of the parent firm has direct and independent impact on foreign subsidiary closure, which is a modification of results obtained in past studies that excluded subsidiary-specific variables from their analysis (Garg & Delios, 2007). However, in the case of multinationals from emerging country, the evidence supporting liability of inter-regional foreignness due to higher geographical breadth of internationalization was not found in the case of emerging multinationals from India. The finding contributes to the internationalization-performance framework in that extreme events need not be due to higher internationalization. Firms from the sector have further scope for internationalization through subsidiary mode in multiple host countries.

The paper is organized as follows. We present an overview of Indian software industry and related research in section 2. The conceptual framework and associated hypotheses relating to closure of overseas subsidiaries in the software services sector are presented in Section 3. Methodology of the study including model to be estimated, description of variables and data sources is presented in section 4. The results and discussion of findings are provided in Section 5 and Section 6 respectively. Managerial and practical implications are provided in Section 7.

Indian Software Industry

The Indian software services industry took wing in the 1990s from being practically non-existent in the 1980s (Arora & Gambardella, 2005). Many factors are behind the evolution of India's software industry and accordingly the role of a number of factors is widely acknowledged. Among the contributing factors, a mention has been made about the role of resource endowment such as quality manpower, human capital accumulation and the entry of transnational corporations (Patibandla & Petersen, 2002; Upadhya, 2004), presence of Indian diaspora (Patibandla, Kapur, & Petersen, 2000), export orientation (Kumar, 2001), knowledge transfers within industry clusters that are based on trust (Dayasindhu, 2002), Indian professionals' personal network in the developed world, early investment in technical and management education and government support to build data communication infrastructure (Bhatnagar, 2006; Parthasarathy, 2010), regional innovation system and regional policies (Chaminade & Vang, 2008), active local entrepreneurship and technological upgrading (Parthasarathy & Aoyama, 2006), among others. A mixture of benign neglect and active encouragement from government also played a role in the growth of the sector (Arora, Arunachalam, Asundi, & Fernandes, 2001). Freedom from production licensing in software

favoured entrepreneurial experimentation in the early period of the industry's growth (Athreye, 2005).[1]

According to NASSCOM (2019), apex industry body for Information Technology and Business Process Management (IT-BPM) sector in India, India's IT-BPM sector has reached a size of 177 USD billion in terms of revenue during the financial year 2018–19 (a growth of 6.1%) up from 167 billion in the previous year ($100 billion in 2012). The export earning was to the tune of 136 USD billion in 2018–19 (8.3% growth from previous year) and provided 4.14 million employment. The sector's contribution to GDP rose from 1.2% of GDP in 1998 to 8.1% in 2014 (NASSCOM, 2014). The information technology sector's contribution to India's GDP stood at 7.9% in 2017–18 (IBEF, 2018). The market size information technology/software services was roughly 850 USD billion globally, of which Indian information technology/software firms supplied about 10% ($80 billion) in 2014 (see Chatterjee, 2014).

In order to remain competitive the industry has transformed itself both through internationalization and innovation. While internationalization was characterized by addition of new geographies, acquisition of large and midsized global in-house centres to migrate end-to-end work, acquisitions building information technology and business process outsourcing capabilities, acquisitions focusing on enterprise capabilities and cloud; the innovation-led strategy strongly focused on intellectual property-led acquisitions, product portfolio, and cloud computing.

The magnitude of outflow of FDI from India was to the tune of 30.86 billion dollar in 2011–12. The services sector (excluding construction) accounted for nearly 50% of the outflows registered in that year (Das & Banik, 2015). Although separate figure for software services industry is not reported, business services (including financial, insurance) accounted for 20% of India's total FDI outflows in 2011–12. The increase in outward FDI of information technology firms from India has been attributed to investment in innovation and technology sourcing (Narayanan & Bhat, 2011). Recent studies have also highlighted the increase in the intensity and the speed of internationalization of Indian information technology firms (Jain, Celo, & Kumar, 2019; Paul & Gupta, 2014).

In the changing external environment since the onset of global financial crisis of 2008, the Indian software services industry is undergoing tremendous changes due to internationalization and business model innovation. The business model of information technology/software services firms have historically been linear i.e. increase revenue by increasing people. This is undergoing a change due to innovation and value creation in client's business.

The Indian software services sector, which is a part of the information technology sector, exhibits a pyramidal structure with a handful of large firms with service offerings encompassing the entire value chain of information technology and a large number of smaller firms that excel in niche services.[2]

Indian information technology industry is characterized by a few native Indian large firms and a large number of small and medium-sized firms (Wang, Chen, & Ganapati, 2012). The presence of multinational corporations (MNC) since mid-1980s facilitated the process of outsourcing, export, and external market participation by small and medium-sized enterprises in the sector that addressed specific market niches. India's experience with multinational presence in the information technology sector is distinct from other developing countries. While in other countries the MNCs had focussed on computer equipment manufacturing and localizing MNCs computer products for domestic market, in India, MNCs focused on software services and outsourcing/exports. Export of software from India has been led by Bangalore. Bangalore accounted for about 40% of India's software services exports by 2001 (Patibandla & Petersen, 2002). The local enterprises have also played an increasingly important role in technology up-gradation with shift from low-skilled to high-skilled services.

While the big firms took advantage of internationalization through multiple modes, the small and medium enterprises tapped into large-scale international and worldwide market by participating in information and communication technology boom through outsourcing and exporting.

Globally, the capabilities of software services industry are linked to repeated interaction with clients and project management capabilities (Ethiraj, Kale, & Krishnan, 2005). The evolution of software

industry in India can be understood through the framework of dynamic capability. Favourable factor endowments led to export success. However, export success over time was driven by the organizational capabilities developed during 1990s (such as the capability to scale up quickly in response to demand growth, software process management capabilities, human resource management capability, the ability to manage overseas operations etc.) of a few large software services firms in the domain of outsourcing (Athreye, 2005).

Internationalization process is not equally complex in all industries. It is less costly in terms of monetary and organizational resources in service industries due to lower transportation costs, trade barriers and limited fixed investment (Lopez, Kundu, & Ciravegna, 2009; O'farrell, Wood, & Zheng, 1998). However, despite ease of internationalization, service firms from developing country are found to internationalize only gradually and ventured into regional market in the early stages of internationalization (Lopez et al., 2009).

There are a number of studies on information technology/software sector's competitiveness. Indian software service industry has been subject of discussion from many vantage points. The sector experienced the phenomenon of rapid internationalization, in particular, the physical presence of service subsidiaries across many countries. However, very less is known about the nature and causes of closure of such service subsidiaries in the software services sector.

In a study by Ferragina, Pittiglio, and Reganati (2012), it was found that the subsidiaries owned by foreign multinational enterprises (MNE) (both in manufacturing and services sectors) were more likely to exit the Italian market than the Italian national firms. They also found that Italian domestic multinationals in the service sector have higher probability of survival than the subsidiaries of foreign MNE. This suggests that foreign MNE, especially in the service sector, are inherently footloose.

As the information technology and software services sector differs from other sectors in terms of internationalization motive (Das & Banik, 2015), intensity and speed of internationalization (Jain et al., 2019; Paul & Gupta, 2014), skill requirement, locational advantages etc., a separate inquiry into the drivers of emerging multinationals' foreign subsidiary closure in the sector is warranted to decipher the causes.

Subsidiary Closure in the Software Services Sector: Research Model and Hypotheses

The conceptual framework for this research is illustrated in Figure 1. The framework relates subsidiary closure to three sets of factors that are) host country-specific, b) subsidiary-specific and c) parent firm-specific. The following sub-sections explain the rationale behind the framework and the associated hypotheses that are tested in this paper.

The Rising Tide Lifts All Boats Hypothesis

Analogous to the observation that growing economy is necessary for betterment of citizens, the subsidiary performance can be affected by the economic growth in the host country. This can be particularly true in the services like software services where outward investment is driven by market-seeking motive. Consequently, subsidiaries operating in a growing economy are likely to face lower risk of closure. The growth of the economy creates demand for technology and various other software services. Although information technology has an enabling role as far as economic growth in a country is concerned (Edwards, 2002; Kim, 2003; Md & Alam, 2014), however, there is a limited knowledge about the effect of economic growth on subsidiary survival or closure.

Chung, Lee, Beamish, and Isobe (2010) contend that subsidiaries in the manufacturing and service industries may react to economic crisis in different ways. Previous research suggests that MNE subsidiaries with stronger across-country orientation can take advantage of economic downturns (in host country) than the subsidiaries with stronger within-country orientation (Chung et al., 2010). However, their sample (Chung et al., 2010) was limited to manufacturing subsidiaries alone. Although we do not measure subsidiary's market orientation due to specific sectorial focus, we expect that

economic growth of the host country will have a positive impact on subsidiary survival in the software services sector. Considering the market-seeking motive of Indian software services firms, and in view of the sparse literature on the impact of economic growth (or crisis) in the host country on subsidiary closure, we hypothesize that economic growth in the host country will lower the probability of closure of software services subsidiary.

H1: the probability of closure of overseas subsidiary in the software services sector reduces with economic growth in the host country.

Real Option Perspective

Subsidiaries that are smaller in size have higher risk of closure. This phenomenon is partly due to the real option perspective that says that a smaller unit has higher real option as it can be winded up in the event of unfavourable business conditions. Empirical evidence in this regard can be found in Song (2014a), Ferragina et al. (2012), Fisch (2011). Previous research has also found that larger affiliates of large parent investors survive longer (Giovannetti, Ricchiuti, & Velucchi, 2017). Song (2014a) found that foreign subsidiaries of Korean multinationals making smaller investment were more likely to engage in early exits than subsidiaries making larger investments. Broda, Geleilate, Newburry, and Kundu (2017) has documented the positive impact of firm size on firm survival in the Italian service sector. However, there can exceptions to the size and exit relationship (see Bottazzi & Tomagni, 2011).

H2: overseas software services subsidiaries that are bigger in size experience lower probability of closer than the smaller ones.

Financial Performance (Carrot and Stick) Hypothesis

Subsidiaries with better financial performance usually do not face the risk of closure. On the other hand, international subsidiaries that fail to perform are expected to face the stick. Much of the literature on survival of subsidiary in foreign countries (irrespective of the sector) implicitly relates closure with bad performance of the foreign subsidiary.

While good performance is linked to several factors, the implication of bad financial performance is far from clear. We recognize that exit/closure may be due to reasons other than bad performance (Mata & Portugal, 2000). The acquisition-reorganization-sell off can be a means of making a profit. Divestment and closure may be due to strategic consideration rather than due to problem in the subsidiary or in the parent company (Tsetekos & Gombola, 1992). Thus, in many cases, the decision to continue or close a subsidiary can be strategic. As a consequence, the impact of financial performance on closure is not very clear as the latter can be either due to bad performance or due to a strategic reasons. Nevertheless, when market-seeking motive is dominant, which has been argued to be the case with Indian software services firms, a poor performance could lead to complete retreat or substantial equity dilution leading to loss of subsidiary status.

H3: a bad (good) financial performance of the software services overseas subsidiary increases the probability of closure (survival).

Business Group Affiliation/Network Affiliation Hypothesis

Business group affiliation is a dominant organizational resource of firms from emerging economies. However, Garg and Delios (2007) suggested that business group affiliation does not have an

independent influence on subsidiary survival. The finding is however questionable as the analysis excluded subsidiary-specific variables i.e. there could be omitted variable bias. As firms from emerging markets lack traditional monopolistic/firm-specific advantages, such firms build capabilities to work in international market through other ways. One of the ways is to learn from the international experience of parental and foreign networks (Elango & Pattnaik, 2007). Such dual network can enhance the access to resources and bring cross-country experience to the table. Leveraging external network can be done through collaboration, innovation and access to supplier networks. One the internal front, business group affiliation provide easy access to the home network, information resource, and internationally valuable managerial resources (Lamin, 2013; Tan & Meyer, 2010). As business group affiliation plays a resource enhancing role in the internationalization process, therefore, we hypothesize that business group affiliation will have independent and direct role in reducing the probability of international subsidiary closure.

Nevertheless, the benefits of business group affiliation beyond the home market i.e. in the case of international subsidiary have been contested. A recent strand of literature argues that the benefits of business group affiliation beyond national borders can be context-specific (Castaldi, Beugelsdijk, Gubbi, & Kunst, 2019). These contexts can be whether the international subsidiary is located in similar or developing markets or not, sector of the parent firm, the levels of ownership in the foreign subsidiary etc.

We further argue that retaining lossmaking subsidiary can put a strain on parent's resources and affect internal network dynamics. Lossmaking subsidiary can impact the reputation of the business group. Such bad news can affect stock price, valuation and borrowing terms and conditions from financial institutions. In addition, a business group already has large network size and therefore strategic consideration could be much lesser with respect to loss-making subsidiary. Due to network support and dual embeddedness[3] (Demeter & Rácz, 2016; Figueiredo, 2011) the business group affiliated subsidiaries do not have size disadvantage. Unlike standalone firms, the business group affiliated foreign subsidiary will have specific task to perform and these subsidiaries get the support of both internal and external networks in carrying out these specific tasks. Therefore, keeping the contexts and exceptions in mind, we set the following hypothesis.

H4: business group affiliated overseas subsidiary in the software services sector experiences lower probability of closure than the subsidiary of standalone parent firm.

Liability of Inter-regional Foreignness Hypothesis

Internationalization experience can be one of the vital firm-specific advantages for emerging MNEs. Firms with limited past international experience may be compelled to abandon an overseas subsidiary due to highly specific nature of business under the host's local conditions. However, the probability of closure seems to decline with experience (Mata & Portugal, 2000). Parent's international orientation especially in the service sector can play a crucial role in subsidiary's success. Further, the Linkage, Leverage and Learning (LLL) framework (Mathews, 2006; Thite, Wilkinson, Budhwar, & Mathews, 2016) suggests that emerging multinationals are fast to learn from international forays. This element could reduce or help in overcoming the negative impact such as closure due to higher geographical breadth of internationalization.

On the contrary, although large network size such as a business group can generate firm-specific advantages, however, geographically diversified network may not be helpful as operation in too many countries can complicate things. Although a positive-sloped relationship is found between internationalization and performance of service firms from emerging countries (Contractor, Kumar, & Kundu, 2007), we contend that the benefit of parent's international orientation could be non-linear, especially for emerging MNEs, due to differences in firm-specific resources, non-replicability of international experience across countries, and the host-country contexts. Therefore, we investigate

the impact of the geographical breadth of internationalization of the MNEs on subsidiary closure. MNEs establishing subsidiary outside their home region can face difficulty as there can be inter-regional liability of foreignness such as coordination, control and motivation, and difficulty in transferring specific business model. The net benefits of internationalization for such MNEs are affected if the extra cost of handling these issues exceed the benefits of internationalization. Further, expanding to too many countries increases the network size but it can have a drag on vital organizational resources. Such over-internationalization may affect company performance as suggested by Contractor (2007) and Lee (2010).

However, it is not clear whether greater geographical breadth internationalization will lead to extreme event like closure. This is one of the areas where we have tested the argument about the limits to geographical breadth of internationalization in reference to emerging software services multinationals. Expanding to too many countries can have adverse impact on subsidiaries that are either not well integrated with the parent or due to lack adequate attention and transfer of firm-specific resources to the subsidiary, or due to adverse host-country contexts. It could also happen if parent firm fails to learn from geographical spread of operation. This suggests that under such circumstances the parent firms with higher geographical breadth of internationalization will close some of the subsidiaries to reduce the liability of inter-regional foreignness.

H5: closure of foreign subsidiaries is affected by the software services multinationals' geographical breadth of internationalization across multiple host countries.

In addition, we have controlled for variables that have been shown to affect firm survival in past studies. Parent firm-specific characteristics such as firm age can have an impact on subsidiary survival (Li, Shang, & Slaughter, 2010). Younger firms lack international experience to effectively manage overseas subsidiary in difficult times. In sum, context-specific factors discussed during hypotheses formation are captured through a set of control variables. These include GDP per capita, dummy for developed country, parent firm's age and degree of internationalization, and dummy for direct versus step-down subsidiary. The following section deals with the methodology to test the stated hypotheses.

Methodology

Indian IT-BPM sector is dominated by a few large firms followed by a large number of smaller firms. The number of firms with an annual turnover greater than US$ 1 billion was only 11 in FY 2013 (Bhattacharjee & Chakrabarti, 2015). Smaller firms tend to serve international clients through export of service, whereas large firms have both export and physical presence through overseas subsidiary.

In order to get a representative sample, we obtained the list of software services firms from Prowess, a private corporate database. There were 1240 software services firms. Thereafter, we searched for annual reports of all these companies in AceEquity, another corporate database. We found annual reports of 152 software services firms for varying number of years. However, more than half of these firms did not have foreign subsidiary. This suggests to the continuation of pyramidal structure in the sector. Further, although smaller private limited companies prepare the annual reports and make it available to the shareholders and to the regulator but those reports were not publicly available, neither in corporate database nor in the company websites. We can safely assume that internationally active firms have better dissemination of financial reports not only to existing investors but also to the potential ones. Therefore, we are confident of having a representative sample of internationally active software services firms that have internationalized through the subsidiary mode through this search process.

The key in survival analysis is the establishment and exit dates of subsidiary, which are not readily available in corporate databases. In the absence of a consolidated database that provides subsidiary history with financial details, we resort to parent companies' annual reports (various years) to collect available information meticulously. We searched for closed subsidiaries and located the starting and

closing years from the available annual reports. Once the entry and exit dates (if available) are known, the subsidiary is retained in our sample for survival analysis. Our sample consisted of 227 foreign subsidiaries during 2007–2017. Out of the 227 subsidiaries, 58 were closed in any of the year between 2007 and 2017. Remaining 169 subsidiaries were functional till the cutoff year 2017. The next task was to obtain subsidiary-specific, parent firm-specific and host-country specific factors that could have impacted the closure or survival. These information have been collected using various sources (see Table 1 for details).

Cox Function

We have applied Cox proportional hazard regression to identify the determinants of subsidiary closure in the software services sector. The Cox regression is quite popular method in survival analysis.[4] The Cox (1972) proportional hazard model describes the probability of an event's occurrence conditional on other variables. The cox model addresses both the event (closure or no exit) and duration of each unit of observation (subsidiary age in years in the present case). In the present case, the hazard function is used to determine the probability that the subsidiary experiences and event (i.e. closure) given that it has survived up to time t.

The hazard function $h_i(t)$ of a subsidiary i is expressed as

$$h_i(t) = h_0(t)\exp(x_i)\beta$$

Where $h_0(t)$ is the (unspecified) baseline hazard function representing the probability of closure (when the values of all covariates equal to zero) conditional on the fact that the subsidiary has survived until time t, x_i is a vector of measured explanatory variables pertaining to the i^{th} subsidiary (measuring subsidiary, parent firm, and host country-specific attributes that can affect exit of subsidiaries). These x variables are expected to shift the hazard proportionally each year. β is the vector of unknown parameters to be estimated such that a negative coefficient imply a decrease in the hazard rate. We report the hazard ratio associated with explanatory variables. Furthermore, the standardized coefficients are also reported separately.

Censored Cox Model

The Cox method makes it possible to adjust for censored data (survived cases after the cutoff year). Among the subsidiaries, those that were closed during 2007–2017 were treated as failure cases and subsidiaries that were still alive (till the last year of dataset) were treated as censored cases during the analysis. Censored cox models have found several applications in international business (Dhanaraj & Beamish, 2004; Giovannetti et al., 2017; Song, 2014a) and health economics (Khan & Awan, 2017). In censored model, the dependent variable is made up of two components. The first component is the length of time in years a subsidiary takes to liquidate or cease operation within the time frame of analysis. The second component is an indicator function for closure (Getachew & Beamish, 2017). The hazard function to be estimated assumes the following specific form.

$$h_i(t) = h_0(t)\exp\left(\beta_1 gdp\_gr_i + \beta_2 l\_tover_i + \beta_3 pat\_tover_i + \beta_4 bg_i + \beta_5 no\_oc_i + \gamma_j control_i\right)$$

Survival function: The survival function follows the subsidiary through time and observes at what point in time it experiences an event of closure. This is one of the advantages of using the Cox proportional hazard model.

$$S(t) = 1 - F(t)$$

Hazard ratio: the hazard rate i.e. the rate at which subsidiary exits at time t given that the subsidiary has lasted in t-1, is

$$h(t) = \frac{f(t)}{1 - F(t)}$$

The hazard ratios less (more) than one imply that the exit rate decreases (increases) and the corresponding probability of survival increases (decreases). The parameter $h(t)$ captures the effect of different regressors.

The specified hazard function $h_i(t)$ is estimated using maximum likelihood method. We include three levels of regressors, which are described in the following section.

Further, we test the robustness of results using standardized coefficient of the variables. For this the independent variables are transformed by dividing mean subtracted observations by standard deviation of the variable. The standardized coefficients provide relative magnitude of the impact of the predictors i.e. a higher (lower) value of standardized coefficient implies greater (lesser) chances of subsidiary closure. Further, the standardized coefficients neutralize the unit of measurement of variables.

Variables and Data

Three distinct categories of variables are used in estimating the hazard function. These are subsidiary-specific, parent firm-specific, and host country-specific. The subsidiary-specific variables are subsidiary turnover as a proxy for size (H2), and profitability (H3), and whether the subsidiary is directly held or not is control factor. The parent firm-specific variables include the geographical breadth of internationalization (H5), business group affiliation (H4). The degree of internationalization and age of the firm are firm controls. The host country-specific variables include GDP growth rate (H1), with controls that include GDP per capita measuring market intensity and whether the host is developed country or not (see Table 1 for details).

Sample Selection

The sample has been identified using a multi-step process. The first step was to identify the software services (Main product: software services, NIC code: 62013; Industry group: computer software) firms. This was traced from the Prowess database. Many of these firms could also be traced in the Reserve Bank of India's database of overseas direct investment. The next filter was to identify firms for which annual reports could be accessed. We used AceEquity database to obtain annual reports. In some cases, company websites were also used to increase the number of such reports. The annual reports contain information

Table 1. Description of variables and data sources.

Variable	Description	Data source	Hypothesis	Hazard ratio
gdp_gr	GDP growth in the host country	World Development Indicators	H1	<1
l_tover	Size (log of turnover at the subsidiary)	Compiled from parent's annual report	H2	<1
pat_tover	Profitability (profit after tax/turnover of subsidiary)	Compiled from parent's annual report	H3	<1
bg	Business group affiliation of the subsidiary/parent (1 if yes, 0 if no)	Constructed using information retrieved from Prowess database	H4	<1
no_oc	Presence in x number of overseas country (geographical breadth of internationalization)	Constructed using information retrieved from annual reports	H5	>1
gdppc	GDP per capita of the host country	World Development Indicators	Control	
develop	Whether subsidiary is in the developed country (1 if yes, 0 if no)	Constructed (using GDP per capita value)	Control	
fage	Parent firm's age	Retrieved from Prowess and AceEquity	Control	
osub	Number of overseas subsidiary of the parent firm (degree of internationalization)	Constructed using information retrieved from annual reports	Control	
direct	Whether the subsidiary is directly held (1 if yes, 0 if no)	Constructed using information retrieved from annual reports	Control	

Source: Author's compilation

about subsidiaries and joint ventures. Companies in India require to report statutorily the details about subsidiaries and joint ventures under section 212(8) of the Companies Act 1956 & under section 129(3) of the revised Companies Act 2013. However, we do not include joint ventures in our sample as this mode can have a termination date in the contract itself. The third step was to identify overseas subsidiaries that were closed during the study period (2007–2017). All available annual reports are used to carry out this exercise as the survival analysis requires the entry and exit dates of the subsidiary.

Following this process, we have collected a list of subsidiaries that were closed. The initial sample consisted of more than 116 closed subsidiaries. These subsidiaries belonged to 73 Indian software services firms. However, data availability pertaining to subsidiary-specific variables reduced the number of subsidiary observations that finally qualified for hazard function estimation. There are many reasons for this reduction. In some cases, details of several subsidiaries were clubbed while reporting in annual reports leading to reduction in the number of subsidiary observations. Similarly, subsidiaries which were reorganized after acquisition have been excluded due to lack of details. Further, some observations were lost in the process of estimating the hazard function primarily due to a) use of ratios such as profit/turnover, and/or b) erroneous data and/or non-availability of relevant data in respective section of the annual report. For example, suppose that a firm reports the foreign subsidiary's financial information in Indian Rupees (in millions) but the actual turnover is much lesser than a million, which is normally the case in the case of subsidiaries closer to the year of winding off, the turnover gets reported as zero (0.00 million). As a result the profit turnover ratio cannot be derived (it goes to infinity!). This leads to omission of the observation during hazard function estimation. Similarly, in the case of erroneous entries (say negative turnover), the subsidiary observation is lost in the process of estimating of the specified hazard function. The hazard analysis is finally based on 227 subsidiaries (see appendix Table A1 for year-wise distribution) of which 58 were closed and 169 were surviving till 2017, the cutoff year for censoring. These sample subsidiaries belonged to 20 software services firms. Closed subsidiaries were located in 19 countries (see appendix Table A2 for year-wise distribution).[5] Overall, the 227 subsidiaries were spread across 54 host countries. It may be noted that 65% (146 out of 227) of sample subsidiaries were established during 2007–2017 and the remaining 35% of the sample subsidiaries were established before 2007.

We do not distinguish between subsidiaries opened through M&A and greenfield mode. Our sample consists of software services parent companies which are (mostly) CMMI level 5 companies. CMMI is one of the most highly acclaimed accreditation in the global software industry. Its earlier version was known as CMM was brought out by Software Engineering Institute (SEI). A CMMI-Level 5 software firm possesses an environment that fosters continuous improvement, with learning from quantitative feedback and controlled experiments besides all other capabilities of the previous four levels. There were 58 CMM level 5 companies in India in 2009, out of which 33 (only one in 1994) were based in Bangalore (Wang et al., 2012). CMMI level 5 accreditation is considered a rare resource as fewer than 5% of Indian software firms had got this certification by 2011 (Jain et al., 2019).

The variables used to test the hypotheses stated in the previous section are described below. Readers may refer to Table 1 for the complete list of variables used in the estimation of hazard function. The GDP growth is used to represent rising tide hypothesis (H1). The growth rate is in percentage form. Size is measured using turnover of the subsidiary. The use of turnover is prompted by the nature of the sector. Unlike in manufacturing, asset may not capture the true size of a software services firm. We take natural logarithm of the turnover as a proxy for subsidiary size (H2). However, log form is avoided while estimating the standardized coefficient. In the similar vein, the profitability is measured using the ratio of profit after tax to turnover (H3). Business group affiliation is based on the parent firm's affiliation to a business house (say 3i Infotech is part of ICICI Group). This is a dummy variable that takes value 1 for business group affiliated subsidiary, 0 otherwise (H4). The geographical breadth of internationalization (liability of inter-regional foreignness hypothesis) has been captured using the number of overseas countries where the software service firm is present through subsidiary mode of operation (H5).

Results

Before explaining the econometric results, we have examined the financial performance of the closed subsidiaries over their lifetime. The median of the profitability ratios is presented in Figure 2. The time variable (horizontal axis) represents the number of years since establishment, or since it became a subsidiary of the Indian parent, and not the calendar year. For example, a subsidiary established in 2005 would have completed 5 years in 2010. Similarly, a subsidiary established in 2009 would have completed only one year in 2010. This kind of longitudinal assessment follows from the Uppsala approach (Johanson & Vahlne, 1977, 2009; Vahlne, Ivarsson, & Johanson, 2011).

The median profit-turnover ratio (secondary axis, Figure 2) was much lower in most of the years during its lifetime and primarily hovered around in the range of 0 to 2%. The median return suggests that, at least in 50% cases, the subsidiaries had demonstrated limited potential to contribute to parent firm's financial performance.

The descriptive statistics of the variables are reported in Table 2. The average size of subsidiary was Indian Rupees 235 million [exp(5.46)] i.e. over three million US dollars in terms of turnover around the year of closure. The average return was negative with profit-turnover ratio of −0.37 (−37% since turnover seems to decline toward the event of closure).

GDP growth in the host country (on average) was 3.11%. Subsidiaries located in developed countries accounted for 60% of the sample. Business group affiliated subsidiaries consist of 91% of the sample. The average age of the parent firm was 39 years and hence represented a sample of established firms as opposed to born globals). The software services parent firms in the sample had established subsidiaries in 28 countries and had 49 overseas subsidiaries on average. Direct subsidiaries were 63% of the closed subsidiaries.

A graphical representation of the failure function is presented in Figure 3. In the sample, failure cases can be observed starting from year two. Thereafter, there are failures in successive years. Approximately 25% of sample observations experienced the event of failure on or before the eight-year.

Using Cox regression, we have estimated the impact of various factors (described in the previous section) on the probability of closure of foreign subsidiaries of Indian software services firms. The estimates along with robust standard errors are reported in Tables 3 and 4. Table 3 contains the hazard ratios whereas Table 4 presents the standardized coefficients. Both the set of results have qualitatively similar inference as far as the validity of the stated hypotheses is concerned.

It may be noted that the estimation has been carried out after verifying the multicollinearity issues. Multicollinearity test using Variance Inflation Factor (VIF) of the explanatory variables suggested that the firm-level variables (*no_oc, osub* and *fage*) were correlated. When all the variables are used in the regression model, with the indicator *closed* as the dependent variable, the individual VIFs exceeded 10 for *no_oc* and *osub* (and mean VIF of all the variables was 16.58). To address the problem some of the firm-level variables have been excluded from the later models (refer to column 5–8, Tables 3 and 4).

Table 2. Descriptive statistics.

Variable	Mean	Standard deviation	Number of subsidiaries
gdp_gr	3.11	2.32	227
l_tover	5.46	2.75	227
pat_tover	−0.37	2.27	227
bg	0.91	0.29	227
no_oc	28.40	15.73	227
gdppc	33494.22	21906.94	227
develop	0.60	0.49	227
fage	39.41	22.09	227
osub	49.24	29.68	227
direct	0.63	0.48	227
closed	0.26	0.44	227

Source: Author's calculation

With these exclusions, none of the individual VIF exceeded 5. The mean VIF of variables included in these regression models are 2.12 (column 5), 2.04 (column 6), 1.88 (column 7), and 1.87 (column 8). Thus, the cox regression results presented in column 5 through column 8 in both Tables 3 and 4 are free from serious multicollinearity problem.

Hypothesis 1, about the impact of GDP growth, has been supported (with hazard ratio below one). Further, the standardized coefficient of *gdp_gr* has come with a negative sign indicating lower closure probability due to economic growth. Thus, rising tide has been found to lift all boats in the software services sector. Nevertheless, the impact of per capita income level (market intensity as control variable) that ultimately drives demand for various software services was not a distinct factor in determining subsidiary survival. Therefore, software services firms experience locational advantages and disadvantages depending on the magnitude of GDP growth in the host country.

We found that hazard ratio associated with size of the subsidiary was significantly below one (hypothesis 2). Similarly, we have observed a highly negative and significant standardized coefficient of subsidiary size. Our finding supports Giovannetti et al. (2017) that larger affiliates of large investors survive longer but contradicts the exceptional stream of studies where size does not shield from failure (Bottazzi & Tomagni, 2011). Thus, the argument advanced in the hypothesis development section stands.

In addition, profitability yielded hazard ratio below one (hypothesis 3). Although past studies suggested that the closure of subsidiary need not be due to poor performance (Mata & Portugal, 2000; Tsetekos & Gombola, 1992), the direct impact of profitability on performance was quite evident from the results. The coefficient was found to be highly significant. The standardized coefficient provides similar inference as it comes with negative sign at 1% level of significance.

As hypothesized (hypothesis 4), the business group affiliation of the subsidiary reduced hazard ratio (hazard ratio much lesser than one). More importantly, the impact of business group affiliation on subsidiary survival has been directly significant, which is contrary to the results reported in Garg and

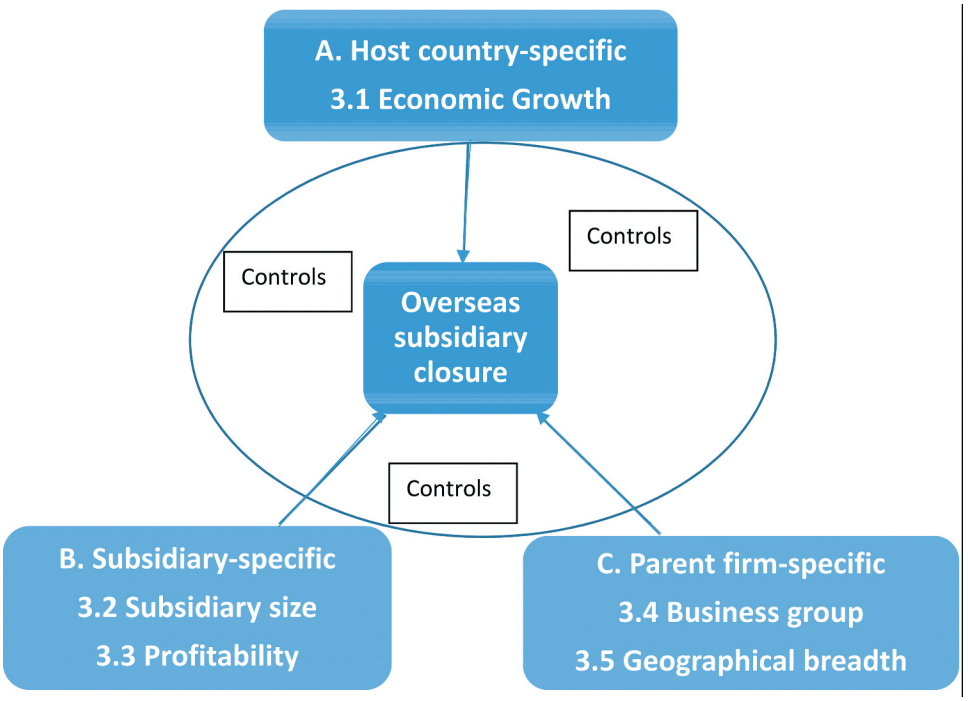

Figure 1. Conceptual Framework.

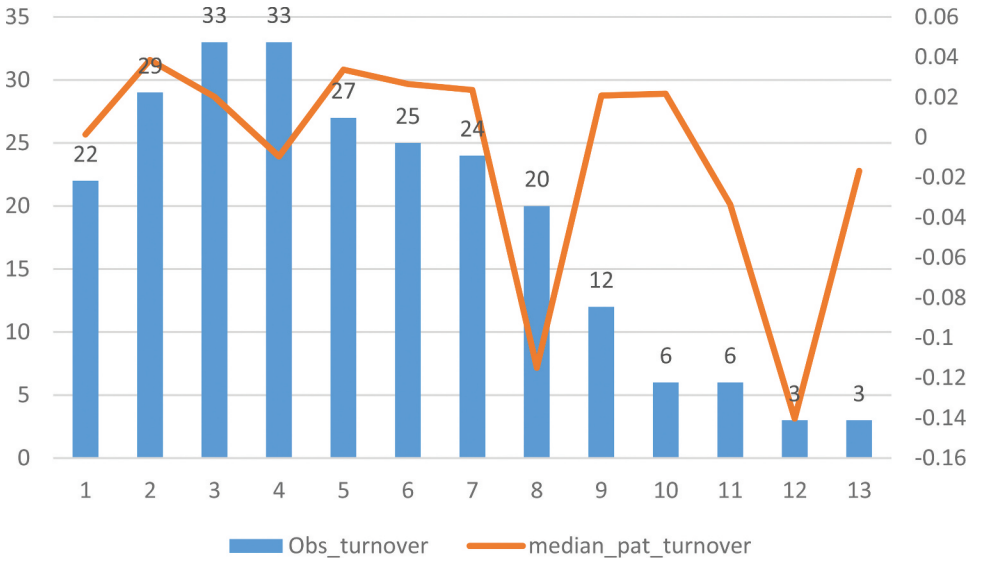

Figure 2. Median PAT/turnover of closed subsidiaries. Source: author's calculation. Note on Figure 2: Horizontal axis represents time dimension since it became subsidiary of Indian parent . Vertical axis represents the number of subsidiaries (primary axis) and profit-turnover ratio (secondary axis). It may be noted that there are missing observations. The reasons include the loss of observation while calculating profitability ratios and non-availability of relevant data either at the starting or ending years.

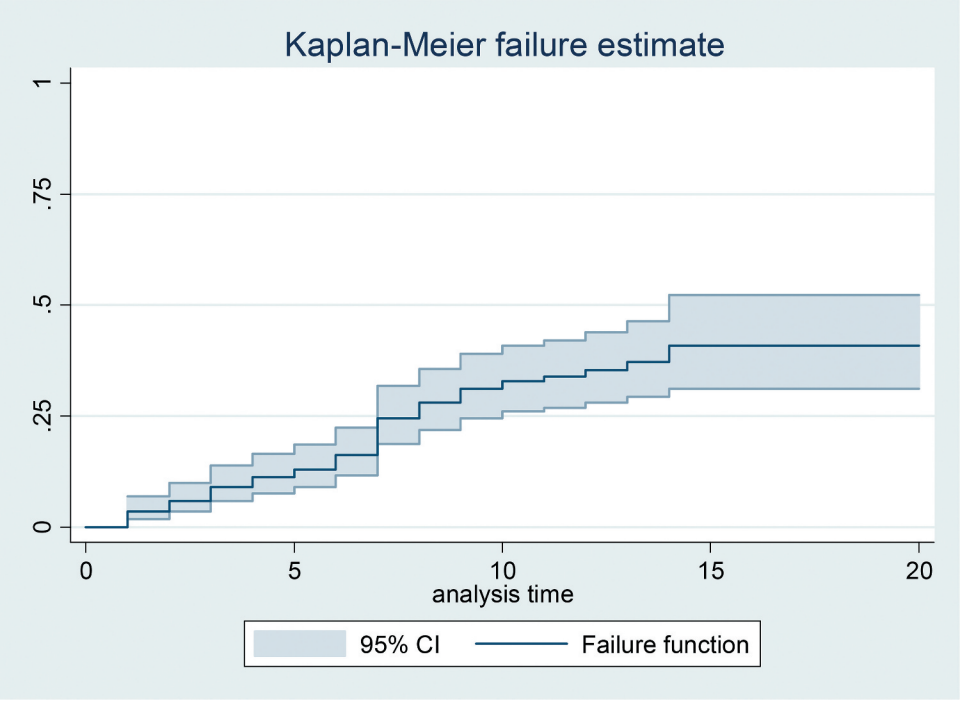

Figure 3. Span of subsidiary closure (horizontal axis=time, vertical axis=proportion). Source: author's calculation

Delios (2007). Our results are improvement over Garg and Delios (2007) since we included subsidiary-specific variables in the analysis. It may be observed that the standardized coefficient of business group affiliation ceased to be significant. The benefits of business group affiliation beyond national borders can be context-specific (Castaldi et al., 2019). However, the sign of the standardized coefficient remained negative which is in line with the proposed hypothesis regarding the impact of business group affiliation.

However, we did not find support for the presence of liability of inter-regional foreignness (H5) from the analysis. Earlier research suggested that over-internationalization may affect company performance (Contractor, 2007; Lee, 2010). The hazard ratio of *no_oc* remained below one. Further, the standardized coefficient of *no_oc* yielded negative sign indicating that closure was not due to geographical breadth of internationalization. With correction for multicollinearity, the size of standardized coefficient of *no_oc* has reduced further (see Table 4). Therefore, the negative impact of going to too many countries has not yet set in for majority of Indian software services firms. This has differential implication for geographical diversification of software services firms from emerging countries. This could be attributed to learning from international expansion which is elaborated in the next section. This is a new empirical evidence with respect to internationalization of service sector multinationals from emerging countries. Similar inference could be obtained from the *degree of internationalization* measured by *osub*. The hazard ratio was found to be below one (column 8, Table 3). Further, the closure probability was negatively impacted by *osub* as the standardized coefficient was negative and significant.

Our results bring to the fore three important findings. First, growth markets are of crucial importance for service multinationals' internationalization. Second, subsidiary specific attributes like size and profitability have prominent role in shaping its survival. Large and profitable subsidiaries are a lower risk of closure. Third, firm-specific characteristics also impact survival. In particular, business group affiliation has direct and independent impact on subsidiary survival. However, the presence of liability of inter-regional foreignness was not supported in the case of software services multinationals from India, which could be attributed to learning from internationalization experience.

Discussion

Indian software services sector experienced rapid internationalization through overseas investment. There has been several successful forays. However, the closure of software services subsidiaries did not receive adequate attention in the internationalization discourse. This paper addresses this issue of subsidiary closure in the software services sector and highlights the importance of host-country's economic growth, subsidiary-specific, and parent firm-specific factors in shaping the extreme event of closure.

In the light of the market-seeking motive of internationalization of emerging MNEs in the software services sector, the importance of choosing growth market still has strategic relevance. The impact of host country's economic growth on survival (or performance) needs to be distinguished from other sectors where host country's economic growth does not affect performance of subsidiaries. It has been shown that economic growth did not have significant impact on performance of overseas subsidiaries in natural resource-based sectors (Das & Mahalik, 2020).

The subsidiary-specific variables such as size and profitability played a crucial role in subsidiary exit. The exception to the size and exit relationship (Bottazzi & Tomagni, 2011) was not supported. Results provide support to the real option perspective as hypothesized. Similarly, closure was found to be due to bad performance. Our results do not support the strategic motives of the software services firms (Mata & Portugal, 2000). However, we do not deny strategic motives in other sectors where strategic considerations drive outward FDI by emerging market firms.

Further, business group affiliation of subsidiary reduced the hazard rate directly and independently. Our results are robust to the inclusion of subsidiary-specific variables in the analysis, which was omitted in past studies on emerging multinationals (Garg & Delios, 2007). The lower hazard ratio of business group affiliated subsidiary is consistent with dual embeddedness and organizational resource literature (see Lamin, 2013). More importantly, our study extends the business group affiliation and

international subsidiary performance literature (Broda et al., 2017; Gaur & Kumar, 2009; Purukayastha, Kumar, & Lu, 2017) by explicitly modeling subsidiary closure, using three category of factors, in the software services sector.

The lack of support for the liability of inter-regional foreignness throws light on the phenomenon of learning due to geographical breadth of internationalization. The role of experience in reducing the probability of subsidiary closure has been acknowledged in past studies (Mata & Portugal, 2000). In recent times, the Linkage, Leverage and Learning (LLL) framework (Mathews, 2006) has provided additional support for the missing impact of higher breadth of internationalization. The framework suggests that emerging multinationals learn fast from the linkages they establish in their international forays. This could reduce the negative impact of the higher breadth of internationalization on subsidiary closure. Thite et al. (2016) in a recent study have used LLL framework to explain how Wipro, an Indian software powerhouse, adopted localization strategy in developing countries that is different from exploiting present potential in developed markets. Such innovative strategies can bring success in the internationalization of software services firms. Therefore, geographical breadth of internationalization need not be damaging the prospect of foreign subsidiaries if parent firm understands the context and apply their leanings to suit the subsidiary in question. A positive-sloped relationship between internationalization and performance of service firms from emerging countries in other studies (Contractor et al., 2007) could be attributed to the phenomenon of learning which is part of LLL framework. The implication of this finding for internationalization-performance theory is that the scope of the framework needs to expand as extreme events could be due to factors other than higher breadth of internationalization.

Further, despite ease of internationalization, software services multinationals from emerging countries may benefit by internationalizing gradually rather than in an accelerated fashion. This, in a way, reiterates importance of the Uppsala approach to internationalization (Johanson & Vahlne, 1977, 2009; Lopez et al., 2009; Vahlne et al., 2011).

The present study is based on a single sector, therefore, certain results may not hold when sectoral boundary is crossed than within the software services sector. For instance, the impact of host country's economic growth could affect closure and performance of subsidiaries differently in other sectors (Das & Mahalik, 2020). The motive of internationalization of the parent firm could moderate the impact of

Table 3. Cox regression results (hazard ratio).

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
gdp_gr		1.015	-	0.887***	0.909**	0.909**	0.902***	0.907**
		(0.061)		(0.040)	(0.036)	(0.036)	(0.034)	(0.035)
l_tover	0.773***	-	-	0.771***	0.758***	0.761***	0.749***	0.747***
	(0.053)			(0.043)	(0.041)	(0.042)	(0.044)	(0.044)
pat_tover	0.950	-	-	0.932**	0.932**	0.931**	0.921***	0.921***
	(0.052)			(0.031)	(0.032)	(0.031)	(0.026)	(0.026)
bg		-	0.706	0.533*	0.469**	0.497**	0.489**	0.473**
			(0.250)	(0.187)	(0.164)	(0.174)	(0.170)	(0.164)
no_oc		-	0.804***	0.879	-	0.986	0.976**	-
			(0.058)	(0.090)		(0.013)	(0.011)	
gdppc		1.000	-	1.000*	1.000*	1.000*	1.000	1.000
		(9.05e-06)		(0.00001)	(0.00001)	(0.00001)	(0.00001)	(0.00001)
develop		2.815**	-	4.478***	3.367**	3.058**	3.506**	3.326**
		(1.141)		(2.557)	(1.670)	(1.766)	(1.750)	(1.651)
fage		-	0.935**	0.964**	0.971**	0.971*	-	-
			(0.026)	(0.017)	(0.014)	(0.014)		
osub		-	1.108***	1.066	0.995	-	-	0.988**
			(0.045)	(0.059)	(0.007)			(0.006)
direct	0.414***	-	-	0.480**	0.440***	0.448***	0.447***	0.442***
	(0.127)			(0.146)	(0.127)	(0.131)	(0.130)	(0.128)
log likelihood	−247.20	−277.97	−253.51	−227.39	−228.73	−228.49	−231.12	−231.29
wald chi2	56.26***	11.83***	28.19***	160.89***	155.13***	156.56***	194.37***	192.87***
no of obs.	227	227	227	227	227	227	227	227

Figures represent hazard ratio and not the coefficient of the variables. Robust standard errors are in the parentheses.*<10%, **<5%, ***<1%. Note that hazard ratio is the ratio between failure function and survival function.

Table 4. Cox regression (standardized coefficients).

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
gdp_gr		0.035	-	−0.216**	−0.157**	−0.154**	−0.165*	−0.153*
		(0.140)		(0.092)	(0.077)	(0.075)	(0.090)	(0.089)
turnover	−36.467**	-	-	−27.711*	−27.931*	−27.256*	−28.303*	−28.321*
	(18.492)			(14.719)	(14.661)	(14.443)	(15.706)	(15.739)
pat_tover	−0.257***	-	-	−0.251***	−0.260***	−0.259***	−0.277***	−0.279***
	(0.054)			(0.052)	(0.052)	(0.052)	(0.056)	(0.056)
bg		-	−0.346	−0.455	−0.580	−0.523	−0.444	−0.474
			(0.353)	(0.369)	(0.360)	(0.357)	(0.341)	(0.340)
no_oc		-	−3.438***	−2.109	-	−0.082	−0.378*	-
			(0.1.129)	(1.434)		(0.215)	(0.175)	
gdppc		−0.036	-	−0.430*	−0.337	−0.349	−0.254	−0.243
		(0.198)		(0.256)	(0.222)	(0.230)	(0.247)	(0.243)
develop		1.035**	-	1.281**	1.088**	1.118**	1.090**	1.063**
		(0.405)		(0.500)	(0.462)	(0.472)	(0.489)	(0.487)
fage		-	−1.480**	−1.067**	−0.894**	−0.873**	-	-
			(0.608)	(0.411)	(0.347)	(0.348)		
osub		-	3.039***	2.135	−0.009	-	-	−0.364**
			(1.170)	(1.464)	(0.224)			(0.174)
direct	−0.918***	-	-	−0.666**	−0.778***	−0.772***	−0.860***	−0.872***
	(0.308)			(0.290)	(0.279)	(0.280)	(0.286)	(0.288)
log likelihood	−246.61	−277.97	−253.51	−229.39	−230.92	−230.85	−235.50	−235.63
wald chi2	77.58***	11.83***	28.19***	122.41***	118.16***	116.72***	124.14***	124.27***
no of obs.	227	227	227	227	227	227	227	227

Figures represent standardized coefficient of the variables. Robust standard errors are in the parentheses.*<10%, **<5%, ***<1%.

host country's economic growth on subsidiary closure and performance. Future research can provide additional evidence using large sample from multiple sectors, which will further extend the frontier of internationalization-performance literature.

Managerial and Practical Implications

A growing market including that for the software services will continue to be like a bellwether, which can guide the software multinationals to stay afloat in the global locations. To increase chances of subsidiary survival, practitioners need to understand the drivers of economic growth in the target host countries. Before establishing high commitment mode, such as subsidiary, parent firms need to assess not only the growth potential but also the resource commitment and capability to support the subsidiary in difficult times or during loss making phases. Besides, understanding the nature of competition in the local host market will help to identify the challenges of operating at larger scale. The standalone firms need to be extra cautious in establishing foreign subsidiary as there could be lack of pooled knowledge or resources to support foreign subsidiary. Some of the closed subsidiaries in our sample were part of parent firms that have completely de-internationalized and decided to focus on domestic business. Therefore, achieving scale and competitiveness through home market expansion will have to be part of the internationalization strategy. Finally, software services firms must be mindful of absorptive capacity and learning in the internationalization process. Focus needs to be placed on knowledge management practices involving internationalization activities to maximize learning.

Notes

1. See Heeks (2006) and Bhattacharjee and Chakrabarti (2015) for a comprehensive assessment of the competitive advantage of Indian information technology industry.
2. Small and medium sized firms dominated the US computer software industry as well (Brouthers, Brouthers, & Werner, 1996).
3. The simultaneous integration of a subsidiary into its external and internal network (Figueiredo, 2011).

4. Some of the studies (during the past ten years) applying cox regression include Demirbag, Apaydin, and Tatoglu (2011), Ferragina et al. (2012), Song (2014a, 2014b)), Sen, Nelson, and Subramaniam (2015), Getachew and Beamish (2017), Giovannetti et al. (2017), Gang (2018), Cole and Sokolyk (2018).
5. Host countries with closed subsidiaries: Argentina, Australia, Bermuda, Canada, China, Colombia, Germany, Hong Kong, Japan, Malaysia, Morocco, Netherlands, Singapore, South Africa, Thailand, Tunisia, UK, and USA.

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Appendix

Table A1. Distribution of closed subsidiaries by parent-firm.

Company code	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017##
18395		1			1		1				7
88258				2				1			
96387									4		11#
100632				1			1				3
122948	1					4					
136494									1	1	16#
141201									2		4
146460									2		1
149899						1					
152087				1	3						11
162142							1				5
164646	1	1	2	1			3	1		1	44
176766								1			
213607							2				2
230148										5	
237560							1				
272724									1	1	66
275305				1				1			1
336002				1	1						
348418									1	1	
Total	**2**	**2**	**2**	**7**	**5**	**5**	**9**	**4**	**11**	**9**	**2 + 169**

#contains one closed subsidiary each ## contains 169 censored observations.

Table A2. Distribution of closed subsidiaries by host-country.

Host Country	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Argentina					1						
Australia						1	2		1	2	
Bermuda					1						
Canada				1	1				3		
China				2			1				2
Colombia									1		
Germany				1							
Hong Kong			1								
Japan						1	1	1		1	
Malaysia	1									1	
Morocco								1			
Netherlands							1				
Singapore			1	1		1	1			1	
South Africa										1	
Thailand				1					1		
Tunisia						1					
UK		1			1	1		1	4	2	
USA	1	1		1	1		3	1	1	1	
Total	**2**	**2**	**2**	**7**	**5**	**5**	**9**	**4**	**11**	**9**	**2**