Heliyon 5 (2019) e02664

Contents lists available at ScienceDirect

Heliyon

journal homepage: www.heliyon.com

Research article

Geographical diversification, firm size and profitability in Malaysia: A quantile regression approach

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ARTICLE INFO

Keywords:
Business
Firm size
Quantile regression
Profitability
Geographical diversification

ABSTRACT

The relationship between geographical diversification (GDI) and profitability (ROA) has yielded mixed findings across various developed countries. This study re-examined the relationship using data of public firms listed on the main market of Bursa Malaysia for the period of 2010–2014 using quantile regression approach. The firms are categorised into small firms and large firms based on the firm size median value. The empirical results show that GDI affects ROA heterogeneously in various quantile levels of the ROA for all firms, small firms and large firms. GDI significantly (positive relationship) influences ROA in the middle quantile region (from quantile 0.25 to 0.75) for all firms, in the low quantile region (from quantile 0.1 to 0.5) for the sample of small firms and in the high quantile region (from quantile 0.5 to 0.9) for the sample of large firms. Therefore, GDI activities could benefit firms, provided that the activities are conducted wisely by taking into account the profitability levels of firms as well as the size of firms. This study contributes to literature on geographical diversification by providing empirical support in the context of an emerging market.

1. Introduction

Studies examining the relationship between firm's business strategies such as geographical diversification (GDI) and profitability (ROA) have been growing in recent years, especially in the context of developed markets (Benito-Osorio et al., 2016; Bhaumik et al., 2010; Sudhir et al., 2015). Geographical diversification (GDI) refers to diversification of similar business across multiple countries mainly for the purpose of generating earnings for the firm. GDI has been found to impose both benefits (Pangarkar, 2008; Hauschild and zu Knyphausen-Aufseß, 2013; Ravichandran et al., 2009) and costs (Braakmann and Wagner, 2011; Colpan, 2008) to multinational firms. Generally, in the context of developed markets, firms have high sales growth and large market capitalisation, advanced business environment and high per capita income. The studies conducted in this environment should be able to provide reliable results. However, the findings so far have been inconclusive and no consensus has therefore been reached on the GDI-ROA link.

In the context of emerging economies (outside America and Europe), studies on the GDI-ROA link are limited. As discussed by Geringer et al. (2000), major differences are found in the GDI-ROA link in both developed and developing countries as strategies of business expansion, organisational relationship, relationship with stakeholders and control systems are all influenced by culture. The emerging market is characterised by an under-developed institutional environment with firms generally having a concentrated type of ownership pattern that can promote a sense of belonging, rapid business expansion in the international markets and a steady increase in business income of firms (Sudhir et al., 2015; Carney and Child, 2013). Specifically, in Malaysia, most of the public firms were majority-owned by the family shareholders and their related family members (Carney and Child, 2013; Subramaniam, 2018). The family shareholders usually have concentrated share ownership in the firm which is owned through multiple blocks of shares. This unique ownership structure can initiate firms to be managed by strong family culture, hence business decisions would be made in the interest of the family. Therefore, it is difficult to infer the nature and shape of the GDI-ROA relationship in developing markets solely based on the results of studies conducted in developed markets. Additionally, market imperfections in emerging economies may provide primary benefits to firms involved in international expansion (Chakrabarti et al., 2007) as geographically diversified firms can create and exploit their

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https://doi.org/10.1016/j.heliyon.2019.e02664
Received 27 January 2019; Received in revised form 23 April 2019; Accepted 11 October 2019

internal capital market to generate more profits for the business group (Singh and Gaur, 2009). Therefore, in view of the differences in these characteristics, the GDI-ROA link can produce significantly different results from that of developed markets.

This study therefore provides new insights into the GDI-ROA link as the investigation on the link is carried out in the emerging market context where the institutional environment is different compared to those in the developed counterparts. The focus in this study is on Malaysia were GDI activities have become more significant in recent years (Lee and Li, 2012; Kamaluddin, 2008; Ahmed et al., 2002). With the formation of the ASEAN Free Trade Area (AFTA) which sought to promote free trade region among the ASEAN countries, Malaysian firms are encouraged to venture their businesses internationally. Various promotional activities on diversification conducted by the Malaysian government such as trade exhibitions and subsidies on tax treatments have encouraged domestic firms to go abroad. Consequently, GDI activities in Malaysia have resulted in an unexpected rise of investments amounting to Ringgit Malaysia (RM) 70 billion in 2014 (Doaei et al., 2014). Survey conducted by Standard Chartered Bank reveals that 60% of Malaysian firms are keen to expand their business, especially across ASEAN countries (Lim, 2015). There are many reasons for doing so but the main reasons are to curb business competition that is increasing rapidly in the domestic market and to fulfil the increase in demand for their products and services. Through their involvement in GDI activities, firms could contribute greatly to the country's GDP as GDI is the crucial engine for economic growth and job creation in the country. In this regard, GDI should be able to generate profits for the firms. Since Malaysia is a developing country, the results from this study would therefore contribute significantly to the body of knowledge. Additionally, the intensity of the results obtained in the Malaysian context can be highlighted as the focus on international business expansion has been on the rise recently.

In their examination of the relationship between GDI and ROA, prior studies have incorporated findings based on central tendency using either Ordinary Least Squares (OLS), Weighted Least Square (WLS), Two-stage Least Square (2SLS) or panel data estimations. However, these studies have neglected the heterogeneity of the possible outcomes in the various levels of profit. In this study, contribution can be established on the GDI-ROA link that is not uniform and varying across firms of 'good' and 'poor' levels of profitability. Quantile regression (QR hereafter) can provide a solution in examining potential heterogeneity involved in the data (Lee and Li, 2012). It is possible to explore a range of possible outcomes in the various forms of conditional quantile heterogeneity using QR approach. The estimations using QR would provide room to relate the link between the outcome and explanatory variables in multiple manners of firm profitability (good profit firms vs. poor profit firms). Thus, to the extent that QR can jointly determine sample segmentation and non-uniform reactions of the outcome and explanatory variables, the potential misinterpretation of the previous evidence can therefore be overcome. This study applies quantile-based statistical techniques (QR) on profitability in an attempt to bridge the gap in previous empirical findings on the relationship between geographical diversification (GDI) and profitability (ROA) as through the QR technique, the dynamism of GDI-ROA can be investigated based on the different levels of profits made by the firms.

Using a longitudinal dataset comprising 712 firms listed on the main market of Bursa Malaysia with a total of 2,881 firm-year observations, the GDI-ROA link is investigated using quantile regression (QR) approach. In the QR approach, the GDI-ROA link is examined at various ROA quantile levels (from quantile 0.1 to 0.9). Such an extension was made as firms with different levels of profits usually develop different business strategies using available resources (e.g., assets, cash) and information in the firm to generate profits. Additionally, the data ae also categorised into small and large firms. Although most firms generally compete extensively in the international environment, the size of the firm may affect the GDI-ROA link differently because of the differences in resources, shareholdings and organisational structure as well as management structure (Pangarkar, 2008; Benito-Osoria et al., 2016). The GDI-ROA link is examined for these two types of firms at various levels of ROA quantiles as well. An investigation on the GDI-ROA link in the context of an emerging market can provide additional information on the nature of this link based on the levels of profitability and size of firms.

The results based on OLS regression show that the same firms have significant GDI-ROA link (positive relationship) regardless of their profitability level. However, the findings using quantile regression (QR) show that the GDI is significantly (positive relationship) related to ROA only for firms with medium level of profitability (from quantile 0.25 to 0.75) in the overall sample. Therefore, the QR analysis provides a detailed analysis that takes into account the heterogeneity of the responses in relation to profitability level through GDI activities. Nonetheless, when all the firms are categorised into small and large firms, the results are substantially different in terms of the magnitude and significance levels of the coefficients. Based on the OLS results, GDI is found to be significantly related to ROA in both the small and large firms (positive relationship). However, when using the QR approach, GDI is found to be significantly related to ROA (positive relationship) in the low levels of profitability for the sample of small firms and high levels of profitability for the sample of large firms. The positive relationship in the GDI-ROA link is based on the arguments of resource-based view and internationalisation hypotheses.

This study focuses on the period that is free from the effect of financial crisis, namely from 2010 to 2014, which is after the 2008/2009 financial crisis period. Studies conducted during the crisis period could provide contradictory results as the financial position of firms during the crisis period can affect the firms' decision regarding their diversification activities and hence, the results may not be reliable. Additionally, this study period is limited to the year 2014 as the data were only available up to this year when the data collection process of this study was completed.

The next section reviews existing literature on the relationship between GDI and ROA. This is followed by a section on the development of the hypotheses for this study. The empirical model is then discussed followed by the presentation of the data collection method for this study. The subsequent section discusses the results of the analyses and the final section provides the conclusion of this study.

2. Theory

In a world where economies are globally integrated, it has become crucial for the long-term survival and business growth of local firms that they go for international business expansion. Firms that do not diversify their business geographically may face closure as a result of the mounting competition with local and foreign firms. Therefore, managers have no choice but to actively seek opportunities in multiple market segments in order to increase firm's profitability. The involvement of firms in diversification activities has created strong academic interest especially in the context of emerging markets (Gaur & Kumar, 2010; Benito-Osorio et al., 2016). Studies on GDI and its interrelationship with firm performance in general, and profitability specifically, have provided important insights on the outcome of GDI activities in many countries even though the findings are largely inconclusive.

According to prior literature, geographical diversification (GDI) presents both benefits and costs to firms' ability to generate profit (Benito-Osorio et al., 2016; Thomas, 2006). The benefits can be discussed through theories such as the resource-based view (RBV) theory and internationalisation (IZ) theory. According to the RBV theory, geographical diversification is usually conducted to enhance firm's profitability (Contractor, 2007; Benito-Osorio et al., 2016; Hauschild and zu Knyphausen-Aufseß, 2013) as compared to other types of diversification. Firms could extend the use of their existing resources into different market environments in the geographically diversified business group to gain incremental benefits. As discussed in the RBV theory, geographically diversified firms in the same business group can usually create an internal capital market to allocate and share resources among

themselves rather than outsource it externally (Gopalan et al., 2014; Hauschild and zu Knyphausen-Aufseß, 2013). Thus, firms could easily improve their profits by utilising cost-effective internal resources. They could also accentuate their existing core competencies, and gain experience and access to substantial growth opportunities in the foreign markets. Therefore, in the long-run, these firms can achieve economies of scope and scale.

From the perspective of the IZ theory, it is argued that the expansion of the business organisational form can provide substantial financial gains to the multinational firm as the market capitalisation is expanded across multiple locations (Kim et al., 2015; Borda et al., 2017). By diversifying across multiple market segments, firms can reduce fluctuations in sales revenue and business risks can be mitigated. Additionally, firms can also develop market power through the increase in market capitalisation and this can be used to control the suppliers, customers and distributors. Again, to this extent, the cost can be brought down even further, and the internal resources can be maximally utilised. Hence, firms can reap benefits in exploiting the locational differences and cost-effective input (e.g., employees and capital) and output markets (Gaur and Delios, 2015; Lu and Beamish, 2004; Contractor, 2007).

3. Hypothesis

Studies that support a positive linear relationship between GDI and ROA also mainly support the notion that geographically diversified firms could have the opportunity to exploit imperfections of the underdeveloped market in emerging countries through the use of the firm's intangible assets (Lu and Beamish, 2004), the exercise of market monopoly that can influence decisions in sales and purchase (Contractor, 2007), investment in firm's learning, knowledge and innovation that can provide competitive advantage (Contractor et al., 2003; Hitt et al., 1997), enhancement of business experience in the international market (Contractor, 2007; Contractor et al., 2003), mitigation of business risk in the case of political instability, risk of foreign exchange and economic cycle (Contractor et al., 2007) and consideration of business shift from less-profitable to more-profitable segments (Benito-Osorio et al., 2016).

The high degree of geographical diversification may also give rise to costs which may outweigh the benefits. Geographical diversification can create costs for the firms in the sense of newness of the firms at the foreign locations (Lu and Beamish, 2004; Cavusgil and Knight, 2015). Uncertainty in the foreign marketplace is a major cost consequence to the business group in generating their profits. It includes discriminatory hazards in foreign markets and unfamiliarity of the business environment (Gaur and Delios, 2015), high cost in relation to obligation to the new foreign ventures (Lu and Beamish, 2004), cost of adoption to the foreign business environment and culture (Contractor et al., 2007), cost of business coordination (Contractor et al., 2003), management misalignment among the firms in the business group (Lu and Beamish, 2004; Denis et al., 2002) and lack of knowledge and experience in the target market possibly at the early stage of the diversification activity (Johanson and Vahlne, 1977). However, over time, geographically diversified firms could benefit tremendously through the employment of optimal diversification strategy. The benefits of GDI activities can reduce the overall organisational costs (Roth, 1992) which directly increases the ability of firms to generate profits.

Although the relationship between GDI-ROA is bi-directional based on past literature, most empirical findings support the view that the profits generated as a result of geographical diversification can outweigh the costs to the firm (Hauschild and zu Knyphausen-Aufseß, 2013; Ravichandran et al., 2009). From the Malaysian perspective, firms that diversify geographically should be able to achieve greater profitability as the promotion of GDI activities in the country is carried out rigorously. Prior studies have documented evidence from linear estimations that are based on the central tendency and conditional mean score (Gopalan et al., 2014; Lee and Li, 2012). However, the relationship that estimates on the different levels of profit (ROA) still remains silent. This study, therefore, postulates that the relationship of GDI may well vary at the different levels of profitability (ROA). Firms that generate low profits (poor profit firms) may have constraints in cash-holdings; hence, they may not invest substantially in GDI activities that can generate profits (Duchin, 2010; Park and Jang, 2013). Additionally, firms in the emerging market context such as in Malaysia usually have difficulties in raising sufficient fund externally because of the under-developed characteristics of the institutional environment. Consequently, it is difficult for these firms to finance their GDI activities; hence, they may not generate marginal profits. Furthermore, firms with poor profits have high levels of operating risk mainly from the use of high leverage that collateralises the assets of the firms (Abel, 2018; De Simone and Lester, 2018). Thus, poor profit firms cannot gain stability even in the domestic market. Their international business expansion will be limited, and firms may not be able to generate profits significantly. As the firms' profitability level increases, a substantial amount of cash can be generated to finance GDI activities of the firms. Firms can also gain greater stability and dependence on external debt will be reduced. Therefore, significant results of the GDI-ROA link can be produced for firms with high levels of profitability.

Based on these arguments in the emerging market context, the following is therefore expected:

Hypothesis 1. There will be a significant relationship between geographical diversification and profitability in Malaysia.

The relationship between GDI and ROA may vary based on the size of the firm as size is directly related to the firm's cash-holdings, availability of resources, behaviour of the managers, their future action plan, organisational structure (Fisch, 2012; Pangarkar, 2008) and many other factors. Although GDI activities have rapidly evolved in recent years, the nature of the relationship for small firms may be limited when compared to their larger counterparts (Benito-Osorio et al., 2016). The undertaking of small firms in the global position is not as strong as the large firms as they lack managerial resources (Fisch, 2012) and information (Karagozoglu and Lindell, 1998; Qian and Li, 2002). This can result in coordination and integration issues, leading to greater problems in their management system. However, in terms of the entry point to GDI activities, small firms tend to get immediately involved in the early stage of GDI compared to the large firms which usually have to contend with management's bureaucracy before any decisions are approved (Benito-Osorio et al., 2016; Pangarkar, 2008). The quick involvement in the early stage of GDI may generate an immediate return to the small firms, provided the benefits gained outweigh the cost of initial investments. However, in the long-term, resource disadvantage may not allow the small firms to overtake the large firms which usually conduct high levels of GDI activities. Thus, the small firms may not be able to compete with the large firms in the long-run. Moreover, large firms tend to identify and choose optimal business strategies and opportunities in GDI as they can utilise their skilful employees to carry out feasibility studies before entering any foreign markets (Yang and Driffield, 2012). Therefore, large firms should record high GDI involvement which can generate better ROA than their small counterparts.

The relationship between GDI-ROA in this study was not investigated solely using central tendency (either derived through OLS, WLS, 2SLS or panel data estimations) as conducted by prior studies such as in Benito-Osorio et al. (2016) and Gopalan et al. (2014). To address the heterogeneity of outcomes across various levels of profits in both small and large firms, this study used the QR approach as well. The estimation using the QR approach could explain the different nature of the GDI-ROA link for firms in the region of extremely low levels of profitability to the ones in the region of extremely high levels of profitability in relation to firm size. The highly profitable firms regardless of size (either small or large firms) should be able to use the GDI business activities to generate more profit. This is consistent with the argument that the highly profitable firms can make use of their large cash-holdings in the diversification activities to generate even more profit (Lins et al., 2010). The cash can also be used to conduct feasibility studies and to come up with proper

plans before diversification in the foreign market is conducted. This can be more suitable for large firms as they usually have a higher number of skilful employees (Wijewardena and Cooray, 1994). They can get their employees to conduct comprehensive studies before any decision on geographical diversification is taken in the firm. Therefore, this study attempted to examine the following hypotheses in the context of Malaysia:

Hypothesis 2(a). There is a significant relationship between geographical diversification and profitability of a small firm in Malaysia.

Hypothesis 2(b). There is a significant relationship between geographical diversification and profitability of a large firm in Malaysia.

4. Model

4.1. Empirical model

The following equation was formulated to examine the above hypotheses for all firms in Malaysia and also for the data of small and large firms.

$$ROA_{it} = \alpha_0 + \beta_1 GDI_{it} + \beta_2 SG_{it} + \beta_3 FS_{it} + \beta_4 BS_{it} + \beta_5 IDR_{it} + \beta_6 DUM\_IND_{it} + \beta_7 DUM\_YR_{it} + \in_{it} \quad (1)$$

where:

ROA (Profitability) – measured by return on assets ratio; total earnings before interest and taxes divided by total assets.
GDI (Geographical diversification) - measured by (1 – the total squared proportion of sales of the m^{th} market over the total group sales of the firm).
SG (Sales growth) – measured by the annual growth rate of the total sales of a firm for a particular year as compared to its previous year.
FS (Firm size) – measured by the natural logarithm of total assets.
BS (Board size) – measured by the number of directors on the board (BODs).
IDR (Board independence) – measured by the proportion of independent directors over the total number of directors on the board.
$\boldsymbol{DUM\_IND_{it}}$ is the dummy variable for sectors or industries in the study, where the value is 1 if the sectors are those sectors examined in the study and if otherwise, it is 0.
$\boldsymbol{DUM\_YR_{it}}$ is the dummy variable for years of analysis in the study, where the value is 1 if the years are the examined years and if otherwise, it is 0.
$\boldsymbol{\alpha_0}$ is the intercept of the regression line.
β is the coefficient of the variables which measure regression steepness.
i indexes the inclusion of all cross-sections (firms) in the analysis
t indexes the inclusion of all time-series (year) in the analysis
$\in_{it}$ is the error term.

The dependent variable, profitability, is measured by the return on assets ratio of the firm, which measures the ability of a firm to generate revenue by utilising its total assets. Firms that have high ROA are effectively managed as they can optimally generate revenue by utilizing their total assets. Accounting-based measurement is commonly used by scholars (among others, Chen and Yu, 2012; Park and Jang, 2013) where it is used to evaluate the performance of firms and their managers and thus, the outcomes of business activities such as diversification can be measured reliably in these firms (Lee and Li, 2012). Accounting-based measures are also reliable for the stakeholders of firms, including banks, other creditors or even future investors. On the other hand, market-based measures such as price and market capitalisation may not represent the actual operating performance and business valuation of the firm as it may take a long time for the market to react on the information of the firm and it also depends on the business environment as well. Accounting-based measures such as profitability can be very beneficial to the shareholders of firms including existing and future investors as it would enable them to examine whether the common goal of the firms is achieved or otherwise.

Geographical diversification (GDI) is used as the independent variable in this study. It is measured by using one minus revenue based on the Herfindahl index. The formula for the Herfindahl index is squared values of sales revenue per geographical segment as a fraction of total sales revenue of a firm. If a firm has sales in only one segment, then the value of the Herfindahl index is one (zero diversification). The value of the Herfindahl index increases with the increase in the number of segments generating sales revenue for the firm. Prior studies such as Nigam and Gupta (2018) and Phung and Mishra (2016) have used Herfindahl index to measure corporate diversification in their studies.

This study also includes control variables such as sales growth, firm size, board size and board independence to control for the characteristics of firms that are related to their profitability. These variables are used in prior studies that have studied geographical diversification and profitability. The study also uses sector dummy and year dummy to control on the factor of industry of firms and time of results in the analyses. The measurements of each variable with their expected signs and the prior studies that have used similar measurements are provided in Table 1.

4.2. Data description

Data of all firms listed on Bursa Malaysia are used in the study. The data of these firms were collected from the Bloomberg database over a five (5) year period from 2010 to 2014. The data does not include financial firms as their business activities such as diversification are governed by different sets of regulations from that of non-financial firms (Gomez-Mejia et al., 2010; Renneboog and Trojanowski, 2011). After the elimination of data with missing values, the final data consists of 712 firms with 2,881 firm-year observations.

4.3. Methods

The data are then analysed using multiple analyses such as descriptive statistics (to present overall description of the data), non-parametric Kruskal-Wallis (chi-squared) test (to observe differences in mean between data of small firms and large firms), correlation analysis (to identify the closeness among the variables) and regression analyses (to test the association between the dependent and independent variables). Both the Ordinary Least Squares (OLS) and the Quantile Regression (QR) approaches are used in the study to test the dynamism in the relationship between GDI and ROA. Most prior studies have applied standard-based examinations (either OLS, Weighted Least Square or Two-Stage Least Square) in their analysis. These approaches are based on the regression analysis that uses central tendency to derive the results. Thus, they have neglected the heterogeneity of possible outcomes in the regression analysis. The results of QR approach can provide heterogeneity of outcomes in various levels of quantile (Lee and Li, 2012). In this regards, the GDI-ROA link can be examined across firms with 'good' or 'poor' profit. The non-uniformity of responses as well as the dynamism of relationship can be highlighted using the QR-based statistical techniques. In order to analyse differences across various quantiles of QR regression, the F-test of equality-of-coefficient parameters that are between quantile 0.10 and 0.90 and also between 0.25 and 0.75 are examined. Further, the differences of results between OLS and QR approaches are also presented to highlight the meaningful differences between the approaches. The differences are also presented in the form of graph-plots for OLS and QR approaches. The graph-plot for OLS is more linear in nature across all the observations as it is based on the central tendency of outcomes between the GDI and ROA, while for QR approach, the graph-plot is in non-linear trend. The plot patterns vary depending on the quantile points of the observations. Finally, tests to examine endogeneity and reverse causality are also undertaken using Granger Causality (GC) univariate and

Table 1
Measurement of variables.

Variables	Notation	Explanation	Previous works	Expected sign
Dependent variable				
Profitability	ROA	Total earnings before interest and taxes divided by total assets	Ayoib et al. (2003); Benjamin et al. (2016)	n/a
Independent variables				
Geographical diversification	GDI	(1 - the total squared proportion of sales of the firm in the market, m, over the total group sales of the firm) $GDI = 1 - \sum_{k=1}^{n} S^2m$	Aw and Batra (1998); Nachum (2004); Phung & Mishra (2016); Nigam & Gupta (2018)	+
Control variables				
Dividend	DY	Cash dividend divided by market capitalisation (total market value of common shares at the end of the year)	Gonzalez et al. (2014); Ramli (2010)	+
Sales growth	SG	The annual growth rate of the total sales of a firm for a certain year as compared to the previous year	Hoechle et al. (2012); Bokpin (2011)	-
Firm size	FS	Natural logarithm of total assets	Ayoib et al. (2003); Kang and Lee (2014)	+
Board size	BS	Number of directors on the board (BODs)	Ramli (2010); Boone et al. (2007)	+
Board independence	IDR	The proportion of independent directors over the total number of directors on the board.	Benjamin et al. (2016);	+
Dummy variables				
Sector dummy	DUM_IND	Industry dummy, value equals to 1 if the firms are in the examined sectors (industries) or 0 for otherwise.	Gaur & Kumar (2010); Hoechle (2012); Park and Jang (2013)	n/a
Year Dummy	DUM_YR	Year dummy, value equals to 1 for the examined years or 0 for otherwise.		n/a

bivariate test. None of the relationships are considered to be biased and no reverse causality of relationships have been recorded for the models tested in the study.

The results of these analyses are presented in the next section.

5. Results and discussion

5.1. Descriptive statistics

Table 2 lists the descriptive statistics for the variables used in this study. The data for all the firms used in the study were then categorised into small firms and large firms by using the median value of firm size (natural log value of total assets) of 2.58. Firms with size smaller than 2.58 were categorised as small firms while those larger than 2.58 were categorised as large firms. This approach has been used by the scholars such as Katsikeas and Morgan (1994). Mean and standard deviation were calculated for the data of all firms, small firms and large firms. Next, the mean of the variables between the small firms and large firms was compared through the use of non-parametric Kruskal –Wallis (chi-s-quared) test.

For profitability (ROA), the mean profitability ratio for the overall sample is 0.06. This shows that Malaysian firms can only generate profit of about RM 0.06 for every RM 1 of total assets invested in the business. In comparing the mean ROA for the small firm and large firm samples, it is found that small firms generate significantly lower profits compared to large firms (0.05 vs. 0.07). This is consistent with many prior studies such as Isik et al. (2017) and Storey et al. (2016). Large firms can generate high profits as they have a substantial volume of resources, i.e. both financial and non-financial resources that can be utilised to expand the business geographically. The earnings generated from this geographical business expansion can be re-invested in the business group through the use of their internal capital market. Hence, cost can be effectively managed and high profits can therefore be made (Gopalan et al., 2014; Manos et al., 2012).

From the perspective of geographical diversification (GDI), the mean of GDI for all firms is 0.19, while, the mean of GDI for small firms is 0.20. For large firms, the mean of GDI is 0.18. Thus, the results indicate that the small firms are highly involved in geographical diversification activities compared to the large firms and the difference in mean of GDI between these groups is significant at the 5% level. As discussed in Benito-Osorio et al. (2016), small firms tend to invest immediately in the early phase of diversification compared to large firms which usually have to contend with management's bureaucracy before any of their business discussion is approved. Additionally, large firms usually plan their actions after conducting detailed studies on their business ventures.

Mean sales growth (SG) for all firms in Malaysia is 13% where the average growth of sales for a year compared to its previous year is 13%. The large firms obtained higher mean sales growth compared to the small firms and the mean difference is highly significant at the 1% level. This result is consistent with prior studies such as the ones by Sleuwaegen and Onkelinx (2014) and Boermans and Roelfsema (2016) where they argue on the favourable relationship between international business ventures and sales growth. In the case of firm size, the overall mean value of the natural log of total assets in Malaysia is 2.7. The mean firm size for the

Table 2
Descriptive statistics.

Variables	All firms		Small firms (a)		Large firms (b)		Test of Mean Differences
	Mean	SD	Mean	SD	Mean	SD	(a) – (b)
Profitability (ROA)	0.0591	0.0834	0.0506	0.0926	0.0675	0.0722	-0.0169***
Geographical Diversification (GDI)	0.1881	0.2475	0.1997	0.2525	0.1766	0.2419	0.0231**
Sales growth (SG)	13.409	72.112	11.169	61.552	19.035	143.93	-7.8660***
Firm size (FS)	2.6779	0.6461	2.1759	0.2729	3.1795	0.5067	-1.0036***
Board size (BS)	7.5557	2.0923	7.0826	1.8385	8.0285	2.2205	-0.9459***
Board independence (IDR)	0.4543	0.1293	0.4533	0.1292	0.4552	0.1295	-0.0019
N	2881		1440		1441		

ROA is measured by total earnings before interest and taxes divided by total assets, GDI is geographical diversification index measured by 1 - total squared proportion of sales of the firm in market, m, over the total group sales of the firm, SG is annual growth rate of the total sales of a firm for a certain year as compared to the previous year, FS is natural logarithm of total assets, BS is number of directors in the Board (BODs) and IDR is proportion of independent directors over the total number of directors in the board. Differences in mean are derived using Kruskal-Wallis (Chi-squared test). ***, ** & * stand for significance at the 1%, 5% & 10% level, respectively.

small firms is 2.18 while for the large firms, it is 3.18. The mean difference between these two groups is highly significant at the 1% level. For board size, the mean board size for the overall sample is 7.5 members, which is rounded to the nearest number i.e. eight (8) members. Since large firms are bigger, their board is also filled with significantly more members compared to small firms (8.03 vs. 7.08). As large firms are usually involved in multiple networks with outsiders in various foreign locations, they need to provide placement for the affiliated outsiders to be the directors of their firm (Beleska-Spasova and Glaister, 2010). Thus, there are more members in the board of the large firms. The mean of board independence for all firms in Malaysia is 0.45. It shows that 45% of board members in Malaysia are independent directors (directors who are not involved directly in business affairs). Large firms are found to have slightly higher board independence than the small firms (0.46 vs. 0.45) and their mean difference was statistically insignificant.

Table 3 presents the descriptive statistics (i.e., mean and standard deviation) for the variables used in the study which is presented based on the ROA quantile points.

The mean for profitability increases with the increase of the quantile points; for instance, mean of ROA for quantile point 0.1 is -0.054 while mean of ROA for quantile point 0.9 is 0.1041. For the independent variable, GDI, it is observed that the mean value of GDI for below the median quantile points (below quantile 0.5) is lower than the mean value of GDI for above the median quantile points (above quantile 0.5). Therefore, it shows that the higher the profitability levels of the firm, the higher the GDI activities in the firm. As highlighted in Gopalan et al. (2014) and Manos et al. (2012), firms that are highly diversified can usually generate high profits as they can make use of their resources effectively through the use of the internal capital market. A similar scenario is also recorded for the control variables such as sales growth (SG) and board size (BS). Firms that generate high profits have high SG and BS. While for FS and IDR, the value of mean variables for quantile points below the median (below quantile 0.5) is higher than the mean value for quantile points above the median (above quantile 0.5). In terms of number of observations, the highest is for quantile 0.25 while the lowest is for quantile 0.5 (565 vs 405 observations). Mean differences between these observations are also analysed using one-way analysis of variance (ANOVA). Significant differences in the mean of GDI, SG, FS, BS and IDR are observed across the different ROA quantile levels.

In summary, the data from Table 3 seems to show that geographical diversification (GDI) may be positively related to firms' profitability (ROA). Thus, significant positive relationship can be expected between GDI and ROA, especially across quantile points above 0.5. The regression analyses for these variables are presented in the next section.

Table 4 presents the correlation coefficients and significance levels between the variables used in the study. All the variables recorded correlation coefficient values within the value range of –0.7 to 0.7 and the highest correlation is recorded for BS and IDR at -0.3547. Since the correlations for all the variables are found to be within the above value range, the issue of multicollinearity in the regression estimations can be ruled out (Gujarati and Porter, 2009).

Table 4
Correlation analysis (Pairwise Correlation) for all firms.

	ROA	GDI	SG	FS	BS	IDR
ROA	1					
GDI	0.0377**	1				
SG	0.0507***	-0.0241	1			
FS	0.1234***	0.023	0.0363**	1		
BS	0.1223***	0.0043	0.0224	0.3419***	1	
IDR	-0.1118***	0.0148	0.0032	-0.0090	-0.3547***	1

ROA is measured by total earnings before interest and taxes divided by total assets, GDI is geographical diversification index measured by 1 - total squared proportion of sales of the firm in market, m, over the total group sales of the firm, SG is annual growth rate of the total sales of a firm for a certain year as compared to the previous year, FS is natural logarithm of total assets, BS is number of directors in the Board (BODs) and IDR is proportion of independent directors over the total number of directors in the board. ***, ** & * stand for significance at the 1%, 5% & 10% level, respectively.

5.2. Regression analyses

Two types of regression estimation results are presented in the study. Firstly, regression estimations based on Ordinary Least Square (OLS) are calculated for the different samples of overall firms, small firms and large firms. These estimations are used to examine the central tendency for the relationship between GDI and ROA (including control variables). Secondly, regression estimations based on quantile points (Quantile Regression) are estimated for the data of all firms, small firms and large firms. Quantile Regression (QR) is used to examine the relationship between GDI and ROA (including control variables) at various levels of profitability (ROA). Next, the results of both OLS and QR are compared to describe the pattern of relationship between GDI and ROA in all firms, small firms and large firms. The results of OLS and QR are presented in Tables 5 and 6, respectively.

5.2.1. Ordinary least square (OLS) estimation

Table 5 presents the results of OLS estimation using ROA as the dependent variable. The OLS estimations are generated for the sample of all firms, small firms and large firms. Based on the results, GDI is found to be significantly positive in influencing ROA in all firms, regardless of the size of firms. However, in the sample of small firms, the significance of the relationship is slightly lower at the 10% level. Therefore, the results imply that in general, firms that venture into geographical diversification activities can generate high profits in Malaysia. This is consistent with the arguments presented in resource-based view theory and internationalisation theory. Firms can allocate and share resources within the

Table 3
Variable means and standard deviations by ROA quantiles.

Variables	Quantiles											
	0.1		0.25		0.5		0.75		0.9		1	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Profitability (ROA)	-0.054	0.0709	0.0212	0.008	0.0451	0.005	0.069	0.0083	0.1041	0.0112	0.1875	0.0693
Geographical Diversification (GDI)	0.1725	0.2406	0.1607	0.2336	0.1778	0.2433	0.1974	0.253	0.2355	0.2618	0.19	0.248
Sales growth (SG)	10.6928	200.237	11.681	77.202	11.1595	50.583	14.216	43.545	22.188	133.77	21.775	71.348
Firm size (FS)	2.3591	0.5403	2.7004	0.6107	2.8428	0.725	2.8098	0.6641	2.7554	0.6338	2.6119	0.5803
Board size (BS)	6.957	1.9544	7.423	2.022	7.5975	2.3184	7.8715	2.2383	7.8106	2.0272	7.7091	1.839
Board independence (IDR)	0.4823	0.133	0.4676	0.1378	0.4477	0.1244	0.4468	0.1262	0.4401	0.1239	0.4357	0.1214
N	488		565		405		529		454		440	

ROA is measured by total earnings before interest and taxes divided by total assets, GDI is geographical diversification index measured by 1 - total squared proportion of sales of the firm in market, m, over the total group sales of the firm, SG is annual growth rate of the total sales of a firm for a certain year as compared to the previous year, FS is natural logarithm of total assets, BS is number of directors in the Board (BODs) and IDR is proportion of independent directors over the total number of directors in the board.

Table 5
OLS regression analysis.

Variables	All firms	Firm Size	
		Small firms (SF)	Large firms (LF)
	ROA (1)	ROA (2)	ROA (3)
Intercept	0.0320***	-0.099***	0.0904***
	(0.0105)	(0.0243)	(0.0147)
GDI	0.0128**	0.0164*	0.0168**
	(0.0062)	(0.0093)	(0.0080)
SG	0.00004***	0.0002***	0.0002
	(0.0000)	(0.0000)	(0.0000)
FS	0.0132***	0.0559***	-0.0016
	(0.0025)	(0.0088)	(0.0040)
BS	0.0021***	0.0056***	0.0002
	(0.0008)	(0.0014)	(0.0010)
IDR	-0.0595***	-0.0383*	-0.0498***
	(0.0128)	(0.0202)	(0.0157)
Sector dummy	Yes	Yes	Yes
Year dummy	Yes	Yes	Yes
Pseudo R2	0.0315	0.0824	0.0114
N	2881	1440	1441

ROA is measured by total earnings before interest and taxes divided by total assets, GDI is geographical diversification index measured by 1 - total squared proportion of sales of the firm in market, m, over the total group sales of the firm, SG is annual growth rate of the total sales of a firm for a certain year as compared to the previous year, FS is natural logarithm of total assets, BS is number of directors in the Board (BODs) and IDR is proportion of independent directors over the total number of directors in the board. ***, ** & * stand for significance at the 1%, 5% & 10% level, respectively. Standard errors are reported in parenthesis under the coefficient estimates.

geographically diversified business group to achieve greater profits (Benito-Osorio et al., 2016; Hauschild and zu Knyphausen-Aufseß, 2013). Furthermore, firms that expand their business internationally can mitigate their business risk and reduce the fluctuation in business revenue for the whole business group (Kimet al., 2015; Borda et al., 2017).

Specifically, the extent of profitability in large firms is found to be greater than in small firms. This finding is consistent with many prior studies that argued on the substantial availability of resources (Isik et al., 2017; Storey et al., 2016) and the extreme reliance on the internal capital market (Gopalan et al., 2014; Manos et al., 2012) by large firms compared to the small firms. In addition, as presented in the descriptive statistics, large firms tend to be highly profitable and have higher sales growth even though the extent of their involvement in GDI activities is lower than their smaller counterparts. The board size of large firms is also bigger than that of the small firms. Having a large board size also suggests that more board members can contribute to a greater extent to the success of the large firms in generating more profits (Storey et al., 2016) in comparison to their smaller counterparts.

For the control variables, SG, FS, BS, IDR are found to be significantly related to ROA for the sample of overall firms and for the small firms sample. In contrast, for the large firms, only IDR is significantly related to ROA. In terms of the coefficient sign of the variables, all control variables positively influence ROA except for IDR in the overall sample and also in the sample of small firms. For the case of large firms, only SG and BS are found to be positively related to ROA. The R-squared value, which indicates that the coefficient of determination of regression estimation (degree of fitness of data on regression line) (Frost, 2013), for all firms is 0.0315. Since R-squared represents degree of fitness of data in the regression estimation, a high r-squared value is preferable in estimation line. However, the estimations with low r-squared value are not necessarily bad for the estimation as it usually happens in the area of behavioural finance (Frost, 2013). The behaviour of organisations can be dynamic in nature; hence it is difficult to derive a standard pattern of observation. The data for small firms is having higher coefficient of determination (r-squared value) than the large ones.

5.2.2. *Quantile regression (QR) estimation*

Table 6 presents the results of the relationship between GDI and ROA based on various quantile points of ROA for the data of all firms, small firms and large firms. The estimation of GDI coefficient varies in magnitude and significance. In terms of the directional sign of the coefficient, in all the quantile points, GDI records a positive relationship with ROA. For the sample of all firms in Malaysia, GDI seems to be significantly related to ROA only in the middle quantile levels (from quantile region of 0.25–0.75). Therefore, this supports Hypothesis 1 and the arguments in the resource-based view theory and internationalization theory. Thus, this finding seems to indicate that GDI activities can only generate profits if it is conducted by medium profit-making firms. At the lowest (quantile 0.1) and the highest level (quantile 0.9) of quantile, GDI is found to be insignificantly related to ROA. Firms that make extremely low profits (poor profit firms) and those that make extremely high profits

Table 6
The relationship of GDI and Control variables with profitability (ROA) by various quantile levels.

Quantile	Intercept	GDI	SG	FS	BS	IDR	Sector Dummy	Year Dummy	Pseudo R2	N
Panel A: Quantile regression for all firms										
0.1	-0.0813***	0.0036	0.0004	0.0315***	0.001	-0.0692***	YES	YES	0.0738	2881
0.25	-0.0203***	0.0094**	0.0002*	0.0156***	0.0011*	-0.0354***	YES	YES	0.0285	2881
0.5	0.0502***	0.0248***	0.0005***	0.0057***	0.0011*	-0.0558***	YES	YES	0.016	2881
0.75	0.1058***	0.0278***	0.0002***	-0.0023	0.0020**	-0.0562***	YES	YES	0.0136	2881
0.9	0.1854***	0.0202	0.0002***	-0.0194***	0.003*	-0.0324	YES	YES	0.0117	2881
Panel B: Quantile regression for small firms										
0.1	-0.2966***	0.0248*	0.0002*	0.115***	0.0037*	-0.0620*	YES	YES	0.0944	1440
0.25	-0.1567***	0.0333***	0.0001**	0.0709***	0.0028**	-0.0497**	YES	YES	0.0565	1440
0.5	-0.0199	0.0272***	0.0002***	0.0292***	0.0029**	-0.0487***	YES	YES	0.0390	1440
0.75	0.0153	0.0185	0.0005***	0.0177	0.0064***	-0.0254	YES	YES	0.0354	1440
0.9	0.1154**	-0.0187	0.0005***	-0.0363**	0.0126***	0.0594*	YES	YES	0.0279	1440
Panel B: Quantile regression for large firms										
0.1	-0.0248	0.0157	-0.0000	0.0120***	0.0013	-0.0435***	YES	YES	0.0271	1441
0.25	0.0136	0.0087	-0.0000	0.0083***	0.0003	-0.0342***	YES	YES	0.0119	1441
0.5	0.0758***	0.0199***	0.0000	-0.0037	0.0003	-0.0245*	YES	YES	0.0037	1441
0.75	0.1431***	0.0230**	0.0000	-0.0092*	0.0002	-0.0502**	YES	YES	0.0092	1441
0.9	0.2348***	0.0392***	-0.0000	-0.0197**	-0.0014	-0.0599*	YES	YES	0.0150	1441

ROA is measured by total earnings before interest and taxes divided by total assets, GDI is geographical diversification index measured by 1 - total squared proportion of sales of the firm in market, m, over the total group sales of the firm, SG is annual growth rate of the total sales of a firm for a certain year as compared to the previous year, FS is natural logarithm of total assets, BS is number of directors in the Board (BODs) and IDR is proportion of independent directors over the total number of directors in the board. ***, ** & * stand for significance at the 1%, 5% & 10% level, respectively.

(good profit firm) do not benefit significantly from their GDI activities. As highlighted by Duchin (2010) and Park and Jang (2013), poor profit firms usually have constraints in cash-holdings; thus, they cannot invest substantially in the GDI activities that can generate significant profits to the firms. Moreover, due to the imperfect characteristics of the market in Malaysia (emerging market), it is difficult for these firms to borrow capital externally and expand their business across the foreign markets. This has resulted in them relying solely on the domestic business revenue that is subject to operational risk exposure mainly from the use of high asset collateralised leverage (Abel, 2018; De Simone and Lester, 2018). Thus, firms cannot gain stability and significant profits cannot be generated through the GDI business activities. On the other hand, for the extremely profitable firms (good profit firms), the insignificant GDI-ROA link may indicate the need for the firms to limit their international business venture after achieving the highest level of profitability. At this level of profitability, firms need to focus on existing business operations. They need to use the available fund to accelerate firm-specific criteria such as the innovative capabilities of their employees to create multiple dynamism in product lines in the existing market (Tran et al., 2015) rather than continuing to spend fund on the new business expansion.

When the data are categorised into small and large firms, the GDI-ROA relationship also varies significantly. It is significant only at the low quantile levels (from quantile 0.1 to 0.5) for the small firms sample and at the high quantile levels (from quantile 0.5 to 0.9) for the large firms sample. In terms of the directional sign of the coefficient, GDI is positively related to ROA in all quantile points in both the small firms (except in quantile 0.9) and large firms. Therefore, the findings support Hypotheses 2(a) and 2(b) of the study. The positive relationship between GDI and ROA is consistent with the argument discussed in the resource-based view theory that states resources can be allocated and shared efficiently using the internal capital market. Additionally, based on the internationalisation theory, firms that are involved in GDI activities can mitigate their business risk and reduce the fluctuation in business revenue to generate profits for the firm. In the case of small firms, they usually have fewer tangible resources (e.g., non-current assets) and less information than the large firms (Fisch, 2012; Qian and Li, 2002). Thus, their approach on GDI business activities is different from that of large firms. For the small firms with low levels of profitability (poor profit firms), they usually make optimal use of their limited resources and information to achieve greater profits (Fisch, 2012). They cannot afford to simply invest in GDI activities without a proper plan of execution. Furthermore, it is also found that the board of directors in firms with low profitability is composed of more independent directors compared to the board in firms with high profitability, as was also seen in the descriptive results (refer to Table 3). These independent directors can provide valuable independent advice for the firms to facilitate their efficient venture into the international market. As the level of profit increases, the concentration on the optimal use of resources and information may slowly cease. Hence, GDI activities can no longer generate significant profits for the firms. For the large firms, only firms that are highly profitable can utilise their resources and information on the GDI activities to generate more profits. Moreover, results also show that in terms of sales growth, both the large firms and the firms that are highly profitable obtained higher sales growth compared to their smaller counterparts (refer Table 2 and Table 3 of descriptive results). Firms with higher sales growth can make use of the increase in annual sales revenue to achieve high profits. Large firms with low profitability levels may have more tangible resources (e.g., properties and investments); however, the constraint in cash-holdings because of the low profits can limit their investment in the GDI business expansion (Fisch, 2012). As a result, they cannot generate significant profits.

As highlighted by Benito-Osorio et al. (2016) and Pangarkar (2008), small firms tend to immediately invest at the early stage of GDI compared to large firms. However, in the context of this study, only small firms that generate low levels of profit (poor profit firm) show significant positive relationships in the GDI-ROA link. The reason is poor profit firms are more actively initiated to the challenges because of their constraint in terms of resources (low cash-holdings and assets) compared to the highly profitable firms (Chen and Hambrick, 1995). Their responsive behaviour is also more visible; hence, they can immediately achieve business success and can be on par with their rivals. However, small firms that generate high profits (good profit firms) generally have substantial cash-holdings (Lins et al., 2010). Therefore, they use the cash to accelerate their existing business operation that can generate high profits rather than invest in the GDI activities across the international market that require a comprehensive plan. As a result of this, GDI does not generate significant profits for these firms. In the case of large firms, the GDI-ROA link was significant for the firms that are highly profitable. Again, this has reaffirmed the above arguments by Benito-Osorio et al. (2016) and Pangarkar (2008) in that large firms may not get involved immediately in GDI activities because their management has to contend with bureaucracy before any decisions can be approved. The management of large firms usually carry out comprehensive studies and accumulate their resources before diversifying their business (Yang and Driffield, 2012). Thus, highly profitable firms that are large in size (firms with more resources in terms of assets and cash) could benefit significantly through their GDI activities. In relation to firms with low profitability, they may have resources in terms of their total assets; however, they lack cash-holdings as a result of low profits, consistent with Lins et al. (2010). Hence, it is difficult for the management of these firms to approve the GDI business strategies. These results are consistent with the descriptive results for the board size presented in Table 2 and Table 3. Board size for the large and the highly profitable firms are always bigger than their smaller counterparts. For these firms, having more board members suggests that greater assistance can always be provided to the business to attain greater profits through the GDI activities.

In relation to the control variables, their coefficient estimations vary widely in sign, magnitude and significance levels. SG is observed to have a significant positive relationship with ROA in most of the quantile points for all firms in Malaysia (except for quantile point 0.1) and for the small firms. For the large firms, SG is not significantly related to any of the ROA levels. Therefore, in these large firms, the ability to generate profits is not related to the growth of sales of the firms. Probably, the operational expenditure incurred by the large firms are substantial, and thus the changes in sales growth do not affect much in their ability to generate profits. In terms of firm size, the size of the firm is mostly related to ROA except for some quantile points such as quantile point 0.75 for all firms and small firms and quantile point 0.5 for large firms. In terms of the coefficient sign, the size of the firms is adversely related to ROA in higher quantile levels (extremely profitable firms) in both small (in quantile point 0.9) and large firms (quantile point from 0.5 to 0.9). This is consistent with the notion that highly profitable firms should maintain their firms rather than expand it further which can increase business management cost. On the other hand, firms with low earnings should expand their business so that they can improve their profitability power to tap more opportunities in multiple markets.

For board size, the QR estimation indicates that BS is significantly positive in affecting ROA at all the ROA quantile levels for the overall firm sample (except in the lowest quantile of 0.1) as well as for the small firms sample. Thus, the role of the board members is significantly important in relation to the generation of profits in these firms. By employing more members on the board, firms can benefit from multiple skills and professional experience of the board members. However, when the size of the firms becomes larger, the role of the board members is no longer necessary for the firms to make profits, regardless of the magnitude of profits generated. Based on the QR estimations for IDR, it is found that IDR was negatively related to ROA in all levels of profits for both small and large firms except for quantile point 0.9 for small firms. Consistent with the findings reported in Benjamin et al. (2016) and Setia-Atmaja et al. (2009), firms in Malaysia generally assemble weaker board (less independent directors); hence, their activities in the firm could not be subjected to the scrutiny of these independent directors. The

Table 7
Test of Equality of coefficient estimates across various quantiles of all firms.

Quantile	F-Statistics	p-value
0.10 vs. 0.90	1.40	0.2361
0.25 vs. 0.75	8.27	0.0041***

Note: *** stands for significance at the 1% level.

firms' behaviour of employing less-independent directors can be due to the ownership structure of firms in Malaysia where firms are often highly controlled by family shareholders (Carney and Child, 2013). Only small firms that are extremely profitable tend to employ more independent directors, probably to serve the board as an internal governance provider. For all the QR estimations in the overall firms sample, the R-squared value (coefficient determination) is in the range of 0.0117–0.0738. This value of R-squared is low and it usually happens for data in the area of behavioural finance (Frost, 2013). This is because the behaviour of firms is dynamic in-nature and could not be certain. The range of R-squared value in small firms is from 0.0279 to 0.0944 and in large firms is from 0.0037 to 0.0271.

Table 7 presents the F-tests of the equality-of-coefficient parameters across various quantiles for the firms in Malaysia. The differences between coefficient estimates at the quantile @, against the quantile (1-@) are presented in Table 7. For all firms in Malaysia, the comparison shows that the differences across firms in various ROA quantiles were significant at the 5% level only for the central region (0.25 vs. 0.75). The rest of the quantiles, namely quantile 0.1 and 0.9 were not significantly related.

5.2.3. *Differences between OLS and QR estimations*

There are several implications noted from the results of the regression estimations (both in OLS and QR estimations). By limiting the findings of OLS on the GDI-ROA relationship, it can be concluded that GDI positively affects ROA in Malaysia, regardless of the levels of profitability and the size of firms. The OLS results only represent the central tendency of the relationship. By estimating the results across different levels of profitability for all firms, small firms and large firms, the findings are varied. Thus, the levels of profitability in a firm do determine the direction of influence in the GDI-ROA relationship and it specifically differs in the sample of small and large firms. For instance, GDI activities can only generate profits if it is conducted by medium profit-making firms in Malaysia. It means that firms which are extremely profitable and firms that are slightly profitable should not be involved in GDI activities as it could not significantly create profits for them. In addition, the GDI-ROA relationship in all firms is completely different from the one in small

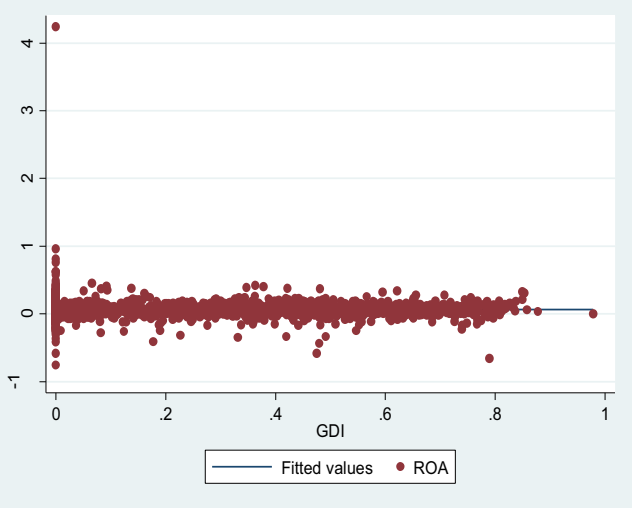

Fig. 1. Graph-plot for OLS regression.

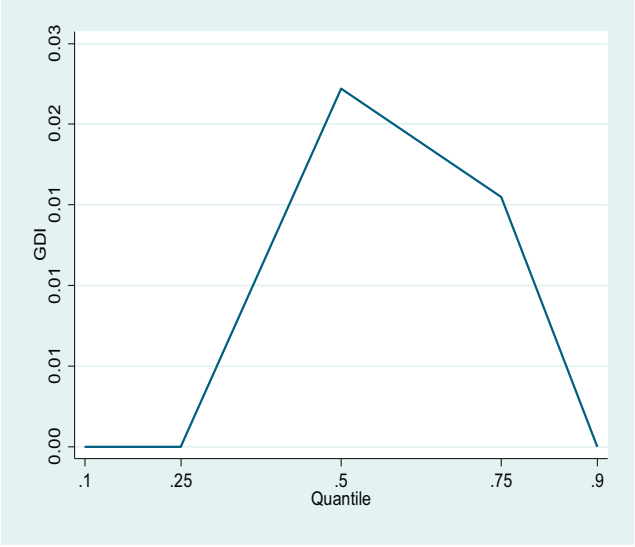

Fig. 2. Graph-plot for quantile regression (QR).

firms and large firms across the levels of ROA quantile. Therefore, these results provide clarity in understanding the mixed findings of prior research that did not control the two factors in their studies, i.e. the levels of profit and the size of firms. Moreover, by not considering the heterogeneity of the results in the QR estimations, the traditional OLS results could generate incomplete conclusions in relation to the GDI-ROA link. In order to compare between the quantile regression and OLS regression parameters, the below graph-plots are presented in Figs. 1 and 2.

As shown in Fig. 1, graph-plot based on OLS regression for GDI-ROA link is linear for all the observations. This relationship is based on central tendency of observations, of which the geographical diversification (GDI) is in linear relationship with all the values of profitability (ROA). However, graph-plot in Fig. 2 shows that the GDI-ROA link is not in linear relationship. The value of GDI is varies across quantile points of the ROA (from poor-profit to good-profit firms). Hence, examination of relationship through quantile regression approach can generate different outcomes with that of multiple regression using OLS.

5.3. *Endogeneity issue*

The issue of endogeneity is always a concern in empirical examination. Following the study of Hu and Izumida (2008) and Thomsen et al. (2006), the issue of endogeneity is examined in this study through the use of Granger Causality (GC) test. The advantage of using GC test is that there are no necessities for using instrumental variables. In this study, two types of GC test are conducted on the estimations, namely the simple univariate GC test and the bivariate GC test. In the simple univariate GC test, the suspected lagged independent variable (IV) is tested on the

Table 8
Granger causality test (Univariate test).

Relationship	F-Statistic	P-value	Hypothesis result (significance)	Endogeneity
GDI_{t-1} does not granger causes ROA	0.26	0.7723	Insignificant	NO
ROA_{t-1} does not granger causes GDI	0.13	0.7259	Insignificant	

ROA is measured by total earnings before interest and taxes divided by total assets, GDI is geographical diversification index measured by 1 - the total squared proportion of sales of the firm in the market, m, over the total group sales of the firm.

causality of the outcome variable (DV) (in both the IV-DV and DV-IV relationship). The results of the simple univariate GC test are presented in Table 8.

From the results, the lagged IV do not granger cause any of the dependent variables, as indicated by the p-value of the granger cause relationship which is higher than the 5% significance level. Therefore, the endogeneity issues in the estimation models can be ruled out.

The detailed Granger Causality (GC) test is conducted through a bivariate regression test, consistent with the approach used by Adjaoud and Ben-Amar (2010). The GC bivariate regression estimations are tested based on the models as follow:

$$ROA_t = \alpha_0 + \beta_1 GDI_{t-1} + \beta_2 ROA_t + \beta_3 ROA_{t-1} + Other\ Control\ Variables + U_t \quad (2)$$

$$GDI_t = \alpha_0 + \beta_1 GDI_{t-1} + \beta_2 ROA_t + \beta_3 ROA_{t-1} + Other\ Control\ Variables + \in_t \quad (3)$$

As presented in Table 9, the exogenous variable (ROA) do not significantly influence the endogenous variable (GDI) in any estimations of the sample of all firms, small firms and large firms. Therefore, reverse causality effects between ROA-GDI are not detected in any of the estimations. These estimations are also regressed using the one year lagged value of exogenous and endogenous variables to purge the estimates of endogeneity.

6. Conclusion

The purpose of this study is to examine the heterogeneity of reaction between geographical diversification (GDI) and profitability (ROA) in the context of emerging market, i.e. Malaysia. Prior findings on this relationship have been mixed, in that GDI and ROA are either positively or negatively related. In order to provide insights into this issue, this study has used quantile regression approach to examine the GDI-ROA link. Using data of public firms listed on the main market of Bursa Malaysia from the year 2010–2014, the results show that the GDI-ROA link in the Malaysian firms varies significantly across the levels of ROA quantiles. Specifically, GDI was found to be significantly related to ROA (positive relationship) only in the middle region of ROA quantile (from quantile points of 0.25–0.75) for all firms in Malaysia. Therefore, GDI activities can only generate profits for the firms that are in the medium profitability region. For those firms that are extremely profitable (good profit firm) and slightly profitable (poor profit firm), GDI activities do not seem to benefit them. Thus, these types of firms should not prioritise international business expansion as their main business growth strategy. Firms that have poor profit should concentrate on increasing their sales revenue in the domestic market and gradually, if they have sufficient cash-holdings, they can proceed with GDI activities in multiple foreign markets. On the other hand, for firms that are highly profitable, they should concentrate on their existing business operations in multiple locations rather than continue to invest in GDI activities. The variation in sign, magnitude and significance was also observed when all firms in the data were categorised into small firms and large firms. For instance, the GDI-ROA link for the small firms was positively significant at the low levels of ROA quantile (from quantile 0.1 to 0.5) while for the large firms, the GDI-ROA link was positively significant at the high levels of ROA quantile (from quantile 0.5 to 0.9). Therefore, it can be observed that for the small firms, they should not continuously invest in GDI activities if they are already making good profits from their existing business expansion. Conversely, for the large firms, only firms that are extremely profitable should invest in GDI activities. As the highly profitable firms have a steady income flow with large cash-holdings and resources, they can therefore confidently venture into GDI activities that require substantial initial expenditure. The results of the study are also robust to the potential issue of endogeneity. Therefore, the problem of reverse causality is not detected in the estimations.

Several limitations can be identified in this study even though it has been conducted empirically to ensure the application of the related theories. The first limitation is on the data used in the study which is limited to the firms listed on the main market of Bursa Malaysia. In the future, this study can be extended to include the firms listed on the other markets of Bursa Malaysia such as ACE and LEAP market that consist of much smaller-sized firms in terms of their revenues and total assets. The findings of the study can be generalised for all public firms listed on the Bursa Malaysia stock exchange if firms in all markets are used in the study. Additionally, as more than 90% of Malaysian firms are categorised as Small and Medium Enterprises (SMEs) (Saleh and Ndubusi, 2006), the scope of the study can also be extended to include the private SME firms. However, the availability of data for these firms needs to be verified before conducting the study.

Secondly, similar to other studies, the results of this study may not be the best-fitted results of the estimations. Possibly, there might be some omitted control variables which might have affected the analyses. Therefore, other relevant control variables such as the dividend pay-out ratio, capital expenditure and investment opportunities can be used in the future to provide more accurate results that can better explain the GDI-ROA link in Malaysia. In addition, in terms of the dependent variable, future studies can consider using market-based dependent variables such as Tobin's Q or P/E ratio which can include the market element of firm performance. Market-based variables are not subjected to possible manipulations by the firms as they are not produced by the firms. Finally, future studies can also consider using dividend as the dependent or the outcome variable. Hence, the relationship between GDI and the extent of dividend distribution by firms in Malaysia can be examined. Shareholders usually prefer firms that distribute dividends if they have successfully generated profits from their diversification activities conducted across multiple markets.

Table 9
Granger causality test (Bivariate test).

Variables	All firms	Small firms (SF)	Large firms (LF)
	DV: GDI	DV: GDI	DV: GDI
Intercept	0.0127	0.0496	-0.1845
	(0.0148)	(0.0369)	(0.0215)
GDI (t-1)	0.9285***	0.9194***	0.9321***
	(0.0087)	(0.0135)	(0.0115)
ROA	-0.0166	0.018	-0.0489
	(0.0402)	(0.0555)	(0.0622)
ROA (t-1)	0.1043***	0.0504	0.1845***
	(0.0395)	(0.0541)	(0.0611)
SG	0.0000	-0.0001	0.0001
	(0.0000)	(0.0001)	(0.0000)
FS	0.0028	-0.0132	0.0095*
	(0.0036)	(0.0134)	(0.0057)
BS	-0.0014	-0.0008	-0.0016
	(0.0012)	(0.0022)	(0.0014)
IDR	-0.0013	-0.0044	-0.0026
	(0.0182)	(0.0304)	(0.0226)
Sector dummy	Yes	Yes	Yes
Year dummy	Yes	Yes	Yes
Pseudo R2	0.8515	0.8367	0.866
N	2012	933	1079

ROA is measured by total earnings before interest and taxes divided by total assets, GDI is geographical diversification index measured by 1 - total squared proportion of sales of the firm in market, m, over the total group sales of the firm, SG is annual growth rate of the total sales of a firm for a certain year as compared to the previous year, FS is natural logarithm of total assets, BS is number of directors in the Board (BODs) and IDR is proportion of independent directors over the total number of directors in the board. ***, ** & * stand for significance at the 1%, 5% & 10% level, respectively. Standard errors are reported in parenthesis under the coefficient estimates.

Declaration

Author contribution statement

V. Subramaniam, S. Wasiuzzaman: Conceived and designed the experiments; Performed the experiments; Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data; Wrote the paper.

Funding statement

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Competing interest statement

The authors declare no conflict of interest.

Additional information

No additional information is available for this paper.

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