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International Diversification and Performance: Evidence from Singapore

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Abstract. This study focuses on how international diversification affects a firm in terms of multiple performance measures (accounting-based, market-based, and intangible value creation). The study is unique as it uses segment data made available only recently, which enables the examination of both product and international diversification with performance. The period studied coincided with Singapore firms' performance during the Asian Financial Crisis. In contrast to previous studies on Singapore, our results show that product diversification is negatively correlated to all measures of performance, while international market diversification is positively correlated. We attribute the difference to the time period which covers both upswings and downturns of the economy, unlike previous studies which considered only the former. Other control measures were incorporated; firm size is highly significant in explaining all measures of performance but not so for firm age, leverage, risk and industry. For top managers, we suggest that regardless of economic climate, the dominant diversification strategy is to take a focused approach to product diversification, but a broad approach to international diversification.

Keywords: product diversification, international diversification, firm performance

1. Introduction

As documented by Anju (1998), diversification is a fairly common occurrence in Asia, such as for the conglomerates of India (Tata Group) and the chaebols of South Korea (Hyundai). A great deal of research (recent work such as Denis et al., 2002; Palich et al., 2000) has investigated the value of diversification as a corporate strategy, and its impact on corporate performance. Traditionally, the U.S. market has been the focus of these studies, so we know little about the strategic value of diversification in an Asian country such as Singapore. It is not because the incidence of diversification in Singapore is small. On the contrary, almost three-quarters of all listed firms engage in multiple industries (Tan, 1999), and a number of firms have foreign operations. Further, according to Classens et al. (2000), Singapore ranked highest in terms of multi-segment firms in East Asia (including Japan).

Given the small size of Singapore's domestic market, it is not surprising that the Singapore government continually exhorts firms to venture and to expand business overseas. Segment

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data suitable for studies on the diversification-performance relationship have only been available recently from the year 1995 and the period coincided with the Asian Financial Crisis (AFC) led by 1997 devaluation of the Thai baht. Given that the effects of international diversification on performance are relatively unknown in this region, the conditions are ideal for an investigation. Our paper contributes to the literature by studying Singapore using more recent data during a volatile period from 1995–1999.

The remainder of this paper is organized as follows. Section 2 discusses the theoretical bases for the diversity-performance nexus. Section 3 lists the hypotheses, explains the operationalization of the diversification, performance and independent control variables. It also details the data collection process, the sample set, and the statistical methods used for analysis. Section 4 presents and discusses the findings. Finally, conclusions, implications, and limitations are provided in Section 5.

2. Going international for improved performance

Most studies on diversification are conducted in the U.S. context and focus on what is commonly known as 'product diversification'. This refers to the relatedness of the firm's products, or the extent to which a firm's different lines of business or industries are linked. Many researchers find support for the argument that the more unrelated the diversification of a firm from its core industry, the more its performance will suffer (Rumelt, 1974; Bettis, 1981; Christensen and Montgomery, 1981; Bettis and Mahajan, 1985). By its very nature, unrelated product diversification provides few operating synergies. Recent research shows that product diversification negatively impacts performance in general (Berger and Ofek, 1995; Denis et al., 1997), and supernormal performance is confined to firms that follow a thrust of diversification similar to the characteristics of their base industry (Palepu, 1985; Lang and Stulz, 1994).[1]

In Asia, the other concept of diversification, i.e., international diversification (or geographic diversification) may be more important given the need for most firms to expand markets overseas. Hisey and Caves (1985) classify firms that are horizontally or vertically integrated across different national markets as firms with international market diversification. Industrial organization economists (Kindleberger, 1968; Hymer, 1970) theorize that this dimension of diversification arose out of market imperfections. Highly international market diversified firms are characterized by highly developed yet under-utilized skills, technologies, or know-how.

Kim et al. (1993) make a précis of the advantages associated with firms engaged in international market diversity. Three unique opportunities leading to superior firm performance are exclusive to such firms:

1. International market diversity permits the exploitation of economies of scale and scope above and beyond the potential of product diversification, and possible synergies that may be generated from better product-market fit (Grant, 1988).
2. The variety of stimuli arising from non-domestic operations is a learning opportunity, and these foreign exposures allow such firms to develop diverse capabilities that can

be deployed across the organization (Kogut, 1983; Ghoshal, 1987). Thus, international market diversity fosters innovation and prepares firms for dynamic and adverse environments.

3. Porter (1990) categorically identifies different factor endowments among different nations which determine the competitiveness of a nation-state, a view upheld by Grant (1991). Where inefficient markets exist, a globally diversified firm can gain a cost advantage, by locating each chain of its value-added chain in the corresponding least-cost country (Kogut, 1985).

Internationally diversified firms also enjoy the following benefits (Kim et al., 1993):

1. The presence of operations in different national markets provides an option of countering aggressive expansion by competitors (Hill and Jones, 1998).
2. Markets in emerging economies face varying degrees of imperfection (Khanna and Palepu, 1997) and greater geo-political instability (Fong, 1999). Hence, the probability of either adverse or favorable changes (for example in contractual regulations, wage rates, raw material prices or taxation structure) occurring in emerging economies is greater. A firm with bases in many of these economies has the option of operational mobility.
3. An internationally market diversified firm will not be held hostage to the fluctuations of demand and constraints of supply of any one national market.

Results of empirical studies on the relationship between international diversification and performance have been mixed. Hitt et al. (1997) find a U-shaped relationship between international diversification and performance of U.S. firms, moderated by product diversification. Geringer et al. (2000) find that international diversification of Japanese firms does not enhance profitability but improves other measures such as growth. Lee et al. (2003) report that Korean firms show a positive association with regard to international diversification and performance.

3. Methodology

While the focus of the paper is on international diversification, both product and international market aspects must be considered to obtain a picture of the global diversification intensity of a firm (Pearce, 1983; Kim et al., 1989). In line with the results from previous research, our 1st proposition is as follows:

Proposition 1. *Non-product diversified firms outperform product diversified firms. Proposition* 1 *is tested under the following three hypotheses*:

Hypothesis 1(a). Non-product diversified firms generate higher accounting returns than their diversified counterparts.

Hypothesis 1(b). Non-product diversified firms are bestowed greater capital appreciation by the financial market than their diversified counterparts.

Hypothesis 1(c). Non-product diversified firms create greater intangible value than their diversified counterparts.

While the literature is less clear about the effects of international diversification, we present our 2nd proposition as follows:

Proposition 2. *International market diversified firms outperform their non-diversified counterparts. Proposition* 2 *is tested under the following hypotheses.*

Hypothesis 2(a). International market diversified firms generate higher accounting returns than their non-diversified counterparts.

Hypothesis 2(b). International market diversified firms are bestowed greater capital appreciation by the financial market than their non-diversified counterparts.

Hypothesis 2(c). International market diversified firms create greater intangible value than their non- diversified counterparts.

3.1. Operationalization of diversification

Studies using an objective approach classify industries based on Standard Industrial Classification (SIC) codes. This assumes equal dissimilarity between distinct SIC classes, enough cause for Rumelt (1974) to come up with a different, albeit subjective, measure of diversification.

As Pitts and Hopkins (1982) stress, the choice of the measure should be guided by the research question at hand. Diversification should be treated as a continuous variable, rather than a bivariate or developing categories based on arbitrary cutoff points (Ramanujam and Varadarajan, 1989). Objectivity is also preferred for cross-comparison basis. This leaves us with the Herfindahl index and the entropy measure.

The entropy measure as developed by Jacquemin and Berry (1979) is chosen for this study as it can be easily replicated and can also be decomposed directly into managerially meaningful and additive elements. Furthermore, Hoskisson et al. (1993) establish strong construct validity for the entropy measure. The entropy measure takes the form of:

$$E = \sum_{i=1}^{I} P_i \ln(1/P_i) \tag{1}$$

where P_i represents the size of a firm's operations in segment i, in proportion to the total size of the firm; I represents the total number of segments the firm operates in Eq. (1) is

hence a weighted average of proportional size of business segments, with the weight of each segment being the natural logarithm of the inverse of the proportion.

This measure shows that the more product diversification, the more unrelated the diversification. We adopt this approach for 2 main reasons. First, Singapore data does not facilitate further breakdown, as the data does not follow the U.S. classification system with SIC 4 or 2 digit codes index. Classification of industries/product classification was determined in accordance with local capital market system (our data sources: Singapore Exchange, Business Times and Singapore Companies Handbook) of unrelated business sectors. Arguably, we could do a subjective breakdown of Singapore data into related and unrelated forms of product diversification. However, we felt that the form we adopted is adequate for the purpose of this study, i.e., to treat the measure as a unidimensional construct (product diversification is inversely related to relatedless). This approach is similar to the paper by Lee et al. (2003). Secondly, information on segmental sales revenues of Singapore firms is limited to sales within an industry type, and industry sales data divided on a per country market basis are not reported.

According to Kim (1988), unrelated product diversification is:

$$PDT = \sum_{m=1}^{M} P_m \ln(1/P_m) \tag{2}$$

where M is the number of industry segments, P_m represents the proportion of the mth industry segment to the firm's total size. PDT is a weighted average of the proportional size of operations of all industry segments in which a firm operates. Given that the level of unrelatedness remains similar irrespective of the manner in which industries are distributed across market areas, PDT captures the extent of diversification across industry segments, without considering the international market diversity.

In terms of international market diversification, for a Singapore firm operating in N countries:

$$GEO = \sum_{n=1}^{N} P_n \ln(1/P_n) \tag{3}$$

Now, while the SIC index is the generally accepted classification scheme for product diversification, Kim (1988) observes that there is no generally accepted principle to classifying international segments. Kim et al. (1993) suggest that the relevancy of geographic unit should be based on between-market heterogeneity.

The criteria of grouping international markets can be done either through classification of all non-domestic countries as foreign, or through aggregating the regions by country. The former classification (domestic versus foreign), although adopted by Grant (1988) and Geringer et al. (1989), may not adequately contrast the distinctions between markets. While we should strive for between-market heterogeneity in our classification, we are constrained by a general lack of uniformity among Singapore companies in reporting their geographic revenue figures. Even if we proceed on a basis of classification that is permitted by the boundaries of our data, this will introduce some subjectivity as to how countries should be aggregated. These considerations leave us with a bi-polar treatment for the domains

of geographic revenues: developed markets versus emerging markets. For objectivity, the study adheres to how the U.N. and I.M.F categorize the economies accordingly. Hence *Pn* in Eq. (3) represents the proportion of developed markets revenues to emerging markets revenues. *Ceteris paribus*, the higher the *GEO* index, the more a firm is international market diversified.

3.2. Operationalization of performance

The measurement of firm performance and diversification are alike in the sense that they are both equally contentious, with results sensitive to the measures used to perform the comparisons (Lang and Stulz, 1994). Keats (1990) documents that different yardsticks used to capture firm performance inevitably leads to inconsistent findings on the diversity-performance relationship. Therefore, we first developed a set of criteria on the best measures of firm performance. In line with Merchant and Bruns (1986), this study requires that the performance measures possess the following attributes (in order of priority): correctness, objectivity, and understandability.

A single measure that completely satisfies all the criteria does not yet exist. Moreover, it would be desirable to employ multiple measures, in order to establish the robustness of subsequent findings vis-à-vis the choice of measure and provide an integrative view, as advocated by Amit and Livnat (1988).

Therefore, an accounting-based measure (ROA), a market-based measure (share price), and a value-based measure (Tobin's *Q*) are chosen to be the dependent variables for performance. Each measure has its intrinsic strengths and weaknesses, but used together, we can obtain a more holistic picture.

3.2.1. Accounting-based measure (ROA). Accounting information is the most widely used measure of performance in diversification research (Venkatraman and Grant, 1986; Hoskisson and Hitt, 1990; Keats, 1990). Holzmann et al. (1975) argue for the legitimacy of accounting-based measures, since managers usually make their decisions regarding diversification using profitability data derived from financial statements.

Return on Assets (ROA) is the first dependent variable of choice. In testing for the efficiency of asset utilization while controlling for differences in financial structure, ROA is well suited for this type of research (Montgomery, 1985). ROA is defined as:

$$ROA = (Net\ \ Income + ((Int.exp - Int.cap) \times (1 - tax\ \ rate)))/Total\ \ Assets \tag{4}$$

where

Int.exp. = Interest expense on debt,
Int.cap. = Interest capitalized,
Net Income = Net income before preferred dividends.

In this treatment of ROA, the second component within the numerator removes the small tax shield effect by debt financing, allowing fairer comparisons between companies predominantly financed by equity versus those predominantly financed by debt.[2]

3.2.2. Market-based measure (Share price). The share price is also another important performance measure. It is computed as:

$$Sharepx = \frac{SP_n - SP_i}{SP_i} \times 100 \tag{5}$$

where

$Sharepx$ = percentage change of share price over initial value,
SP_i = initial value of share price (prior to base year of study),
SP_n = share price in year N.

Share price for the sample firms is taken at the close of each of their financial year as listed on the stock exchange.[3]

3.2.3. Value-based measure (Tobin's Q). Comment and Jarrell (1993) demonstrate that the value of firms increased during periods when they become more focused in terms of product diversity. Lang and Stulz (1994) further show that product diversified firms have lower Tobin's Q than equivalent portfolios of specialized firms.

The question of whether diversification creates value is captured by the Tobin's Q ratio: if diversification contributes value, it becomes an intangible asset that increases market value relative to replacement cost. Tobin's Q incorporates the capitalized value of the benefits from diversification. However, the flip side is that Tobin's Q reflects what the market thinks are the benefits from diversification, whether illusory or not (Lang and Stulz, 1994). Hence the use of Tobin's Q assumes that financial markets are at least weak form efficient, and a firm's market value is an unbiased estimate of the present value of its cash flows. Tobin's Q is operationalized as:

$$Tobin's\,Q = Market\ value\ (MV)\ of\ company/Replacement\ cost\ of\ assets \tag{6}$$

Numerator = MV of common equity + MV of preferred equity + MV of long term debt

- MV of common equity is computed as market price X number of shares outstanding, or market capitalization.
- Preferred equity is assumed as zero, since most Singaporean firms have no preferred equity.
- MV of debt is assumed to take book value.

The numerator therefore represents the claims of the market on the firm.

Denominator = total assets without inventories, plant & equipment (P&E) + replacement cost of inventories + replacement cost of P&E.[4]

The formula for the replacement cost of P&E is:

$$\begin{aligned} \textit{Replacement cost}(Yr_n) &= [B(1+i_n)^n(1+g_n)^n] - [B(1+i_n)^n(1+g_n)^n n\alpha] \\ \textit{Simplifying into} &:= [B(1+i_n)^n(1+g_n)^n](1-n\alpha) \end{aligned} \tag{7}$$

where

n = no. of years from base year,
B = book value of P & E at year 0,
i = GNP inflator for year,
g = growth of total assets for year,
α = depreciation rate.

The first component of the formula represents P & E adjusted for inflation and growth in assets as acquired by the company, or negative growth for divestments of assets. The second component factors in accumulated depreciation of the P & E. The growth rate of assets g is necessary in order to factor in management acquisition of lumpy assets. Without this factoring, Tobin's Q may be artificially high (caused by management acquisition of assets), boosting market valuation of the firm, but not capturing the management ability of creating intangible assets. For depreciation, we assume a rate of 5% per year.

The above algorithm is akin to the one proposed by Lindenberg and Ross (1981), except for the treatment of inventories. The assumption of the technological parameter is zero and there being no technological discontinuity follows Smirlock et al. (1984).

3.3. Independent and control variables

There are other relevant variables which can influence firm performance: firm size, age, leverage, risk, industry membership, and country GNP. These are briefly explained in turn.

3.3.1. Firm size. This study pursues an investigation of the diversity-performance relationship independent of size effects; hence firm size must be controlled for. Superior performance may simply be attributable to size differences (Tosi and Gomez-Mejia, 1989).

To account for the possibility of size effects, the market value of a firm is computed with the degree of diversification of the firm at the same period, thus avoiding mistakes due to misalignment of data periods. The same was done for the other independent variables as well. Market value is more reflective of true value of a firm than book value, and to reduce the range of figures, the natural logarithm of market value is applied.

$$\begin{aligned} \textit{Market Value } (MV) &= \textit{share price} \times \textit{number of shares outstanding} \\ \textit{Firm Size} &= Ln(MV) \end{aligned} \tag{8}$$

3.3.2. Age. Many firms that have built up strong brand names over the years will try to leverage them and diversify into other lines of business. In effect, they are trying to

capitalize on the reputation and goodwill associated with the company (Loken and John, 1993; Milberg et al., 1997).

In the same line of logic that drives companies to use "established since..." as a selling point, age of a firm is used to proxy goodwill and reputation. Age is controlled to ensure goodwill and reputation accumulated over time does not erroneously affect the diversity-performance relationship, and is measured from when a firm is first listed on the stock exchange.

3.3.3. Leverage. The financial structure of the firm may play a role in affecting its performance. The lower beta of debt versus the higher beta of equity means that a highly leveraged firm more reliant on cheaper debt financing tends to reap more profits per dollar of equity in good times, but faces greater losses in times of woe.[5]

Tan (1999) documents that the leverage effect of Singaporean firms was significant in predicting performance. Effects from the sources of financing should be removed in order to obtain a true picture of the effects of diversification on performance, and the leverage ratio of a firm acts as a good proxy for our control purposes.

$$\textit{Leverage ratio} = \textit{Total Debt}/\textit{Total Equity} \tag{9}$$

3.3.4. Risk. Economic and finance theories postulate a riskier investment will require a higher expected *ex-ante* return (Samuelson, 1961; Armour and Teece, 1978). However, Bowman (1980) discovers a paradox in that risk is not only associated with higher profits/returns, but it is actually associated with lower profits/returns as well, calling into question the positive association between risk and return. This paradox applies when risk is considered at the level of the firm defined as variance of accounting returns, but not at the level of security markets (Kim et al., 1993).

In any case, any study attempting to capture effects of firm performance, should control for the risk profile of the firm. Standard deviation of ROA over the study period is used here as a measure of risk, in accordance with research and professional practice.

$$\textit{Risk} = \textit{Standard deviation of ROA} \tag{10}$$

3.3.5. Industry membership. As with risk, extensive empirical work had shown that industry differences is a strong predictor of, or at least highly correlated with firm performance (Porter, 1980; Bettis, 1981; Montgomery, 1985). Indeed, Rumelt (1991) later estimates industry membership to be responsible for 17% to 20% of the variance in financial performance.

In Singapore, Tan (1999) records industry membership to have a significant impact on firm performance. The algorithm proposed by Tan (1999) in controlling for industry membership is found suitable for the objective of this study as well. Firms in the data set were classified according to their sector of operations as listed on the Singapore Exchange (SGX), and were assigned dummy variables accordingly. The sectors were: multi-industry, manufacturing, commerce, transportation (including storage and communications), finance, construction, property, and hotels (including restaurants).

3.3.6. Gross national product (GNP). The diversity-performance relationship is affected by the prevailing economic climate. The macro-economic variable GNP is selected to denote external effects from the business cycle. Other macro-economic variables such as marginal propensity to consume, export/import levels, stock market index and savings were considered, but dropped as they are highly correlated with GNP.[6]

3.4. Data

The sample comes from firms listed in the Singapore Exchange (SGX). The 1995–1999 period is chosen particularly in order to examine firm performance before, during, and after the Asian crisis. Years prior to 1995 are left out because most firms have not yet segmented their revenues by geographic markets. Altogether, the sample size analyzed is 626. A table summarizing the dependent and independent variables, as well as the data sources, is listed in Appendix A.

4. Analysis and results

Preliminary checks were made on the variables to ensure that they meet assumptions of independence, normality, linearity, and homoscedasticity required for the statistical processes.

Table 1 shows the Pearson covariance matrix of all the variables. The vector of correlations is examined, firstly to check for high correlations, and secondly to ensure that the directional sign here is consistent with that of the standardized betas in the regression models later. For the first indication that multi-collinearity does not exist, only 2 out of 153 pairs of correlation values are greater than 0.3 or less than –0.3. In our regression models obtained later, the Tolerance collinearity statistics were all well above the threshold level of 0.1. With these examinations, we can conclude that the regression models are free from multi-collinearity problems.

Table 1(a), extracted from the Pearson covariance matrix, highlights the correlations between our three dependent variables: ROA, Sharepx, and Tobin's Q. We find that although some correlation exists as expected, the correlations indicate that the variables are not close substitutes of one another. As posited, the selected variables do indeed capture different aspects of performance, supporting our usage of all three dependent variables as measures of performance.

Generalized least squares multiple regression were used to test the hypotheses.

At the final level of analysis, MANOVA is used to determine the significance, if any, of the following factors: industry effects on performance; industry effects on diversification; and interaction effects of product diversification with international market diversification on performance. For the last case, the product diversification and international market diversification variables were converted into nominal form.[7]

Using a median-split, the dataset of product diversification is divided into high product diversifiers versus low product diversifiers.[8] The same is repeated for the international diversification dataset. The advantage of the median-split method is that it guarantees there will be approximately similar sample sizes in each cell to be analyzed. Therefore, in the

Table 1. Pearson correlation matrix.

Variable	ROA	Sharepx	Tobin's *Q*	Intl divers	Product divers	Firm size	Age	Leverage	GNP	Risk	Multi-industry	Manu	Commerce	Transport/ comms	Finance	Construction	Property	Hotels
ROA	1.000																	
Sharepx	.204	1.000																
Tobin's *Q*	−.029	.197	1.000															
International diversification	.164	.240	.173	1.000														
Product diversification	−.072	−.067	−.153	.153	1.000													
Firm size	.241	.233	.177	−.007	.148	1.000												
Age	−.065	−.072	−.085	−.123	.051	.198	1.000											
Leverage	−.180	−.115	−.057	.007	.100	−.081	−.024	1.000										
GNP	−.140	−.095	−.172	−.014	−.044	−.194	.062	.102	1.000									
Risk	.065	.031	.182	.021	−.067	−.138	.153	−.140	−.032	1.000								
Multi-industry	−.056	−.054	−.139	.027	.431	.137	.248	.022	−.068	−.085	1.000							
Manufacturing	.067	.081	.165	.200	−.148	−.225	−.346	−.093	−.001	.108	.991	1.000						
Commerce	.034	−.028	−.103	−.044	−.133	−.116	.005	−.015	.033	−.001	.987	.992	1.000					
Transport/ Comms	.078	−.018	0.07	−.076	.103	.174	−.101	−.068	−.020	−.043	.978	.982	.979	1.000				
Finance	.042	.106	−.079	−.103	−.229	.107	.123	−.011	.041	.037	.983	.987	.983	.974	1.000			
Construction	−.118	−.066	−.083	−.037	.196	−.119	−.070	.232	.034	−.018	.980	.985	.981	.972	.977	1.000		
Property	−.049	−.047	−.045	−.122	−.036	.231	.124	.072	−.021	−.016	.986	.991	.987	.978	.983	.980	1.000	
Hotels/ Restaurants	−.074	−.053	.111	.003	−.034	−.014	.212	−.027	.005	−.017	.983	.987	.984	.974	.979	.977	.983	1.000

Table 1a. Pearson correlation matrix (dependent variables).

Variable	ROA	Sharepx	Tobin's Q
ROA	1.000		
Sharepx	.204	1.000	
Tobin's Q	−.029	.197	1.000

Table 2. Manova design.

		Product diversification	
	Sample size	High (1)	Low (0)
International diversification	High (1)	184	129
	Low (0)	129	184

Multivariate: ROA-Sharepx-Tobun's Q.

event that the assumption of equivalence of covariance matrices for MANOVA is violated, the impact of the violation will be minimal (Hair et al., 1998).[9] Table 2 demonstrates the MANOVA design.

Results of the regression models are shown in Table 3. In addition, Tables 4–6 contrast the findings from MANOVA tests of between subject effects.

This study should be distinguished from other studies that attempt to identify the major factors of firm performance. The objective of our study is to infer the effects of diversification on firm performance, and not on prediction or model building. Hence, the adjusted R^2 obtained in our three regression models, ranging from 14.3% to 21.6%, is neither a cause for concern, nor the focus of our findings. In fact, obtaining a high R^2 is counter-intuitive; many other variables linked to firm performance (such as top leadership, management competencies, and control systems, to name a few examples) are not part of the regression model, so adjusted R^2 values cannot be too high. The F-statistic of our regression models is of greater importance. The F-statistic ranges from 7.938 to 12.439, all significant at a conservative 0.1%. Therefore, the regression models are good fits to the population, and findings can be accurately inferred.

4.1. Discussion of Proposition 1: Non-product diversified firms outperform product diversified firms

From Table 3, we find support for all three hypotheses: non-product diversified firms do generate higher accounting returns than their diversified counterparts ($p < 0.05$), non-product diversified firms are indeed bestowed greater capital appreciation by the financial market than their diversified counterparts ($p < 0.05$), and non-product diversified firms do create greater intangible value than their diversified counterparts ($p < 0.01$). The Standardized Beta Coefficient is negative in all regression models for product

Table 3. Multiple regression results (dependent variables = ROA, Sharppx, Tobin's Q. Testing of independent variables on performance).

Dependent variable	ROA		Sharepx		Tobin's *Q*	
	Model 1: H1(a) & 2(a)		Model 2: H1(b) & 2(b)		Model 3: H1(c) & H2(c)	
	Std coeff beta	Significance	Std coeff beta	Significance	Std coeff beta	Significance
Constant		.016		.000		.374
International diversification	.161	.000***	.237	.000***	.153	.000***
Product diversification	−.090	.048*	−.092	.041*	−.210	.000***
Firm size	.281	.000***	.289	.000***	.279	.000***
Age	−.069	.118	−.085	.053+	−.092	.029*
Leverage	−110	.005**	−.069	.079+	.052	.171
Risk	.083	.036*	.052	.183	.220	.000***
Multi-industry	−.123	.111	−.106	.169	−.163	.027*
Manufacturing	−.115	.258	−.094	.355	−.096	.323
Commerce	−.046	.552	−.083	.279	−.197	.007**
Transport/comms	−.030	.622	−.106	.070+	−.027	.637
Finance	−.065	.323	.013	.839	−.218	.001**
Construction	−.106	.092+	−.055	.383	−.100	.097+
Property	−.167	.026*	−.146	.051+	−.194	.007***
Hotels/restaurants	−.135	.040*	−.101	.122	.026	.681
GNP	−.072	.062+	−.032	.401	−.115	.002**
	Adjusted R^2: .143. $N = 626$. F Statistic: 7.938***		Adjusted R^2: .148. $N = 626$. F Statistic: 8.214***		Adjusted R^2: .216. $N = 626$. F Statistic: 12.439***	

***Significance Level .001; **Significance Level .01; *Significance Level .05; +Significance Level .1.

diversification.

In addition, in Tables 4 to 6, which contrast the findings from MANOVA tests of between subject effects, reinforce the regression results. Looking at the main effect of product diversification on the dependent variables, we observe that product diversification has a strong adverse impact on accounting returns and the creation of intangible value ($p < 0.01$). However, its impact is much weaker/more moderate on share capital appreciation ($p < 0.1$).

Based on our outcomes, there is strong evidence that, even while controlling for other influencing variables, product diversification impedes the performance of firms. At this juncture, let us tackle the issue of why we manage to find that product diversification hurts all aspects of firm performance, when previous studies in the Singapore context conducted by Tan (1993), and Tan (1999), or the Hong Kong context by Wan (1998), did not discover a significant relationship between product diversification and accounting performance. Two distinct differences explain this divergence of

Table 4. Hypotheses 1(a) & 2(a).

MANOVA
Dependent variable = ROA. Tests of between-subject effects

Dependent variable	ROA		
Source of variance	Mean square	*F*	Significance
Corrected model	903.482	11.398	.000***
Intercept	6034.02	76.120	.000***
DUMMYGEO	2422.10	30.555	.000***
DUMMYPDT	564.708	7.1240	.008**
DUMMYGEO[a] DUMMYPDT	52.5830	.66300	.416
Error	79.2690		

Descriptive statistics

PDT	GEO	Mean	Std. dev.	*N*
Low	Low	2.415	7.527	184
	High	5.822	12.16	129
	Total	3.819	9.836	313
High	Low	−.1036	9.014	184
	High	4.482	7.244	129
	Total	2.592	8.320	313
Total	Low	1.377	8.252	184
	High	5.034	9.587	129
	Total	3.206	9.123	313

***Significance Level .001; **Significance Level .01; *Significance Level .05; +Significance Level .1.

results.

First, past studies which used only single-period data when the economic cycle was in an upswing, assume that the performance-diversity relationship is temporally stable and time invariant. This assumption is unsound. Ciscel and Evans (1984), and Hill (1983) show that the business cycle significantly influences the relationship by amplifying the performance of diversifiers during upturns and aggravating it on downturns; Michel and Shaked (1984) underscore that the diversity-performance relationship is not time invariant. Our study used data from the time period 1995–1999; the later half of this time period was a period of economic downturn (due to the AFC from mid-1997), in contrast with the earlier half of upswing. This treatment is more balanced than only selecting data from the 'boom' portion of the business cycle as a strong period of economic growth can mask the inefficiencies resulting from product diversification. It is more difficult for a firm to lose money when all sectors of an economy are flourishing. We perform MANOVA to verify the influence of GNP

Table 5. Hypotheses 1(b) & 2(b).

MANOVA
Dependent variable = Sharepx. Tests of between-subject effects

Dependent variable	Sharepx		
Source of variance	Mean square	*F*	Significance
Corrected model	3.074	5.561	.001**
Intercept	21.21	38.38	.000***
DUMMYGEO	8.292	15.00	.000***
DUMMYPDT	1.760	3.185	.075+
DUMMYGEO[a]DUMMYPDT	.2340	.4230	.516
Error	.5530		

Descriptive statistics

PDT	GEO	Mean	Std. dev.	*N*
Low	Low	−.2697	.3776	184
	High	3.42E-03	.8969	129
	Total	−.1571	.6571	313
High	Low	−.3381	.3137	184
	High	−.1436	1.051	129
	Total	−.2238	.8351	313
Total	Low	−.2979	.3538	184
	High	-8.30E-02	.9915	129
	Total	−.1904	.7515	313

***Significance level .001; **Significance level .01; *Significance level .05; +Significance level .1.

solely, on firm performance. Table 7 shows that GNP was strongly significant in explaining all three dependent variables: ROA, Sharepx, and Tobin's Q ($p < 0.01$). Clearly, the adverse impact of product diversification becomes apparent when we examine a balanced time period instead.

Just as importantly, our study has incorporated the international market dimension of diversification. Theoretically, Kim et al. (1989) documents interaction effects between the different dimensions of diversification, establishing that the impact of unrelated diversification varies contingent upon the extent of international market diversification. In reality, corporate executives do not make 'what to diversify into' decisions, independent of 'where to diversify' decisions.

Again, findings from MANOVA complement our regression models. From Table 6, we detect that there are strongly significant interaction effects between product diversification and international market diversification on the Tobin's Q performance variable. Without the international market dimension of diversification, interaction effects will not be observable,

Table 6. Hypotheses 1(c) & 2(c).

MANOVA
Dependent variable = Tobin's Q. Tests of between-subject effects

Dependent variable	Tobin's Q		
Source of variance	Mean square	F	Significance
Corrected Model	22.112	21.725	.000***
Intercept	787.81	774.008	.000***
DUMMYGEO	28.630	28.129	.000***
DUMMYPDT	25.291	25.143	.000***
DUMMYGEO*DUMMYPDT	20.203	19.850	.000***
Error	1.0180		

Descriptive statistics

PDT	GEO	Mean	Std. dev.	N
Low	Low	.9452	.7809	184
	High	1.745	1.746	129
	Total	1.275	1.328	313
High	Low	.8994	.7374	184
	High	.9689	.5799	129
	Total	.9403	.6494	313
Total	Low	.9263	.7624	184
	High	1.289	1.263	129
	Total	1.108	1.058	313

***Significance level .001; ** Significance level .01; *Significance level .05; +Significance level .1.

and the adverse impact of product diversification will not be apparent. When we classify revenue generation by 'domestic versus foreign' for computing international market diversification, we find the adverse impact of product diversification not to be significant in our regression models. This weak treatment of international market diversification is inadequate to produce interaction effects, further supporting our findings.

4.2. Results and discussion for Proposition 2: International market diversified firms outperform their non-diversified counterparts

Extracting the relevant results from the tables reveals that the level of international market diversification is significantly related to all three aspects of performance ($p < 0.01$), supporting hypotheses 2(a), 2(b), and 2(c). With the Standardized Beta Coefficient exhibiting a positive sign, we conclude that international market diversified firms: (1) generate higher accounting returns, (2) are bestowed greater capital appreciation by the financial market, and (3) are conferred greater intangible value than their diversified

Table 7. MANOVA tests of between subject effect (Dependent variable = ROA. Independent variable = GNP).

Dependent variable	ROA				
Source of variance	Sum of squares	*Df*	Mean square	*F*	Significance
Corrected model	1431.109	2	715.554	8.813	.000***
Intercept	6891.212	1	6891.21	84.872	.000***
DUMMYGNP	1431.109	2	715.554	8.813	.000***
Error	50584.91	623	81.1960		
Total	58448.23	626			
Corrected total	52016.02	625			
Dependent variable			Sharepx		
Corrected model	11.030	2	5.515	10.047	.000***
Intercept	24.967	1	24.967	45.486	.000***
DUMMYGNP	11.030	2	5.515	10.047	.000***
Error	341.962	623	0.549		
Total	375.697	626			
Corrected total	352.992	625			
Dependent variable			Tobin's Q		
Corrected model	24.897	2	12.449	11.498	.000***
Intercept	692.086	1	692.086	639.218	.000***
DUMMYGNP	24.897	2	12.449	11.498	.000***
Error	674.527	623	1.083		
Total	1467.224	626			
Corrected total	699.424	625			

***Significance level .001; **Significance level .01; *Significance level .05; $^{+}$Significance level .1.

counterparts.

Furthermore, the MANOVA tests of between subject effects show similar results. From Tables 4 to 6, it is again evident that the main effect of international market diversification has a strong positive impact on all three aspects of performance ($p < 0.001$).

The conclusion that international market diversification positively boosts the performance of the firm does not come as a surprise; its merits have been well established at both empirical (for examples, Rugman, 1979; Bartlett and Ghostal, 1989; Caves, 1996) and theoretical

levels (for examples, Grant, 1988; Porter, 1990). However, this is the first study in the Singapore context that reinforces this concept.

4.3. Firm level effects

Results for the four firm level variables are shown in Table 3.

4.3.1. Firm size. We discover that firm size is significantly and positively related to all aspects of performance ($p < 0.01$). It is not surprising that firm size is the strongest firm level variable to be related to performance. Large firms can grow to their current sizes, very much because of superior past performance. Consequently, these firms are likely to possess the necessary attributes, such as experienced and competent management, to ensure future success and firm growth. Also, large firms have more resources to weather economic downturns and ride them out unscathed, without taking drastic measures that compromise long-term gains for short-term survival.

4.3.2. Age. The age of the firm is weakly related to the performance of firm. The fact that it is significant at the 5% level to the Tobin's Q performance variable belies the idea that older firms will have depreciated more of their base-year book value of P&E, a key variable in the computation of Tobin's Q. Once we account for this, the age variable becomes weakly related to share capital appreciation only, at a 10% level of significance. Hence, we establish a lack of relationship between age and firm performance, as found in Tan (1999).

4.3.3. Leverage. Our findings on leverage are not as clear-cut as the other firm level variables. While we note that leverage is negatively related to ROA ($p<0.01$), its relationship is a weak one to Sharepx (only at $p<0.1$), and the link becomes altogether insignificant with respect to Tobin's Q.

4.3.4. Risk. The relationship between risk and the Sharepx performance variable is not significant. Nonetheless, we document positive and significant relationships between risk, and the ROA ($p < 0.05$) and Tobin's Q ($p < 0.01$) performance measures. Our findings are also indicative that total risk has the same positive relationship with performance, when compared to systematic risk as proposed by finance theory.

5. Conclusions, implications, and limitations

Our findings differ from past research (Tan, 1993, 1999) in showing that in the case of Singapore firms, product diversification strategy is not directly related to firm performance. Yet, our same findings concur with other literature, primarily Kim et al. (1989, 1993). The key difference is that past studies on Singapore did not account for the international market

aspect of diversification. It is unlikely that past researchers were naïve; the far more probable explanation is that only recently Singaporean firms in this country began reporting segment data. This makes it possible for us to pioneer the incorporation of a firm's international market diversity. Therefore, future research should consider both the different and joint effects of these interactive dimensions of diversification.

Another thrust of our study is the employment of three performance variables, in order to capture the wide spectrum of firm performance. Each performance variable provides a snapshot of relatively different elements of a firm's performance, as evident from our preliminary analysis. Without the use of all three indicators, we would have failed to identify the full extent of associations between our variables. Hence, we emphasize that for future research, great attention must be paid to the selection and operationalization of the performance variables.

Our results provide some implications. First, research evidence suggests the superiority of firms engaging in international market diversification. Moreover, we find that an advantage arising from international market diversification is resilience during the tribulations of the business cycle. In contrast, while undesirable effects of pursuing a product diversification strategy can be mitigated when the economy is on an upswing, the same cannot be said during a downturn. Hence, the dominant strategy is: local firms should be less product diversified and more international market diversified instead. However, our empirical findings contradict Khanna and Palepu's (1997) arguments that the focused strategy is inappropriate for firms operating in emerging economies, if one considers Singapore to be an emerging economy; it is more suited for firms functioning in developed markets. This begs the question: what distinguishes an emerging economy from its developed counterparts?

Singapore is an economy officially recognized on the global stage as an 'emerging market' by the U.N. and International Monetary Fund (IMF), among other pre-eminent institutions. Yet, on many other accounts, it is on par with the 'developed nations'. On economic indicators, per capita GNP and standard of living (purchasing power parity) are at comparatively high levels, while unemployment rates are lower than those found in 'developed nations' (even at the height of the economic crisis). In terms of financial indicators, national savings and foreign reserves surpass many OCED countries, while trade balances and current accounts are healthy.

Therefore, the more accurate picture is although Singapore may be listed as an 'emerging market' in form, but she is closer to being a 'developed nation' in substance. Consequently, the focused strategy should apply, and no contradiction in substance exists with Khanna and Palepu's (1997) propositions.

For future research, it will be interesting to discover the effects of diversification on performance, in other so-called "tiger economies" of Asia. Implications on the uniqueness of emerging markets can then be drawn across national boundaries, to see if results will hold, regardless of geographical context. Another area of research is longitudinal studies which incorporate the peaks and troughs of business cycles. The short time period for data we have for Singapore does not allow us to explicitly incorporate time in our research design, which is something to be pursued in a future study.

Appendix A

Summary of data sources and operationalization of variables.

No.	Variable	Operationalization	Type	Data source
	Dependent variables			
(1)	Return on asset (ROA)	Net income before taxes and minority interest/Total assets	FV; RV	WS
(2)	Share Price (Sharepx)	Percentage change of share price over initial value	CV; RV	DS; WS
(3)	Tobin's Q	Market value of company/ Replacement cost of assets	CV; RV	DS; WS
	Entropy diversification variables			
(4)	Product (PDT)	Weighted average of proportional size of unrelated industry segments, weights of each segment is natural logarithm of inverse of the proportion	CV	WS
(5)	International market (GEO)	Weighted average of proportional size of geographic markets segments, weights of each segment is natural logarithm of inverse of the proportion	CV	WS
	Firm level variables			
(6)	Size of firm	The market value of a firm (share price $\times$ number of shares)	CV	DS; WS
(7)	Age of firm	Age of firm based on listing or official quotation	FV	CH
(8)	Leverage ratio	Total debt/Total equity	CV; RV	DS; WS
(9)	Risk	Standard deviation of ROA	CV	WS
	Industry level variables			
(10)	Commerce	Firms in the commerce industry	DV	BT; SY
(11)	Construction	Firms in the construction industry	DV	BT; SY
(12)	Finance	Firms in the finance industry	DV	BT; SY
(13)	Hotels/Restaurants	Firms in the hotels/restaurants industry	DV	BT;SY
(14)	Manufacturing	Firms in the manufacturing industry	DV	BT; SY
(14)	Multi-industry	Firms in multiple industries	DV	BT; SY
(15)	Property	Firms in the property industry	DV	BT; SY
(16)	Transport/Storage/Telecoms	Firms in the transportation/ storage/telecommunications industry	DV	BT; SY
	Macro level variable			
(17)	Gross National Product	The level of Gross National Product	FV	SY

Definitions of Types of Variable: DV = Dummy variable (Dummy variables were coded 0 and 1, with 1 assigned when the quality being measured was present); FV = Fixed variable; CV = Computed Variable; RV = Ratio variable. Data sources: WS = Worldscope; DS = Datastream; CH = Companies handbook; BT = Business Times—Firm classification 2001; SY = Statistical yearbook of Singapore, 2000.

Notes

1. Palich et al's (2000) meta-analysis of product diversification studies suggest an inverted-U relationship; such a relationship may explain the contradictory results of some studies. This study focuses on the thrust of most studies which argues for the detrimental effects of product diversification.
2. The tax shield effect from using debt is not a great advantage because under Singapore's dividend tax imputation system, both dividends and interest income are effectively taxed at the individual level. A slight advantage arises out of differences in timing only.
3. Share price was the price taken at the close of the company financial year, so as to be in line with the other performance variables: ROA taken at financial year close, as well as the values for the Tobin's *Q*. Of course, this means we assume some minimal form of market efficiency in that market price is reflective of accounting results. There is no discernable difference between taking single period or mean/median over several days about the close of financial year.
4. Since GAAP in Singapore call for valuation of inventories by First-In-First-Out (FIFO), replacement cost of inventories is taken as book value. Inflation adjustment of inventories is less of an issue with FIFO, unless turnover rate of inventories is extremely low (for example, ship-building).
5. Indeed, pertaining to the collapse of the 'tiger economies' of Asia in the late 1990s, investigators find that the extremely high levels of cheap debt financing by firms is a factor contributing to the onset of the financial crisis (Letiche, 1998), particularly so in Korea, once a model of miraculous economic development during the decades of earlier growth (Cathie, 1998).
6. Lin et al. (1999) document high correlations of some of these variables with GNP. Correlations ranged from 0.81 to 0.85.
7. MANOVA requires independent variables to be in nonmetric form. The industry variables are already coded in nominal form.
8. Before using the median-split method, the datasets were examined to see if parsimonious sets of data could be developed instead. The entropy figures for product diversification did not exhibit any points of discontinuity across the sample set, hence making it unsuitable to obtain parsimony. The same can be said of the entropy figures for international market diversification.
9. This condition holds as long as the ratio of largest to smallest sample size in the cells does not exceed 1.5.

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