

**The effect of international diversification on firms' performance: evidence of
US based multiproduct manufacturing and service firms**

By

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Abstract:

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This study investigates whether the relationship between international diversification on manufacturing and service firms' performance is linear or non-linear. This study was conducted by selecting a sample of 335 US based manufacturing firms and 348 US based service firms for 2009-2012. For inclusion in the manufacturing sample, firms were 1) mid-sized or large sized multiproduct public manufacturing companies with current employees more than 200; 2) had average sales exceeding \$100 million between 2009 and 2012; 3) all firms selected were product and international diversified manufacturing firms; 4) the study categorized firms into regions, which include Africa, Asia, Pacific, Europe, and America; 5) The sample consisted of four types of manufacturing industries: Consumer Cyclical, Consumer Non-cyclical, Energy, and Industrial. In addition, for inclusion in the service sample, firms were 1) mid-sized or large sized multiproduct public service companies that firms' current employees are greater than 200. 2) Had average sales exceeding \$100 million between 2009 and 2012. 3) All firms selected were product and international diversified service firms. 4) The study divided the firms to regional areas which include Africa, Asia, Pacific, Europe, and America. 5) The sample consisted of four types of service industries: Retailing, Information Technology, Telecommunication services, and utilities.

The results of the study showed that the relationship between international diversification and manufacturing firms' performance is U-shaped. Furthermore, there was an inverse U-shaped relationship between international diversification and service firms' performance. Finally, the study also demonstrated that the effect of international diversification was independent of types of manufacturing and service firms.

Table of Contents

Acknowledgment.....	I
Abstract:	II
Chapter 1: Introduction	1
1.1 Purpose of the study:	1
1.2 Statement of the problem:	1
1.3 Background:	2
1.4 Need for study	4
Chapter 2 Literature Review	6
2.1 Overview of the relationship between international diversification and firms' performance.....	6
2.2 International diversification and firm performance in manufacturing firms	9
2.3 International diversification and firm performance in service firms	9
Chapter 3 Research Methodology	11
3.1 The Model	11
3.2 Variables and measures	12
3.3 Hypothesis.....	13
3.4 Sample	13
Chapter 4. Results and findings.....	15
4.1 International diversification and manufacturing firms	15
4.2 International diversification and service firms	19
4.3 Test.....	22
Chapter 5 Conclusion	25
Chapter 6 Recommendation	26
References	27
Appendix A	30
Appendix B	31
Appendix C	32

List of Figures

Table 4.1.....	17
Table 4.2.....	18
Table 4.3.....	21
Table 4.4.....	22
Table 4.5.....	23

Chapter 1: Introduction

1.1 Purpose of the study:

The first objective of this study is to examine the relationship between international diversification and product expansion manufacturing and service firms. The second objective of this study is to distinguish the effect between the moderate internationalization and high internationalization on firms' performance. The third objective of the study is to find the effective and efficient opportunity to improve firms' performance based on the results of this empirical study.

1.2 Statement of the problem:

The relationship between international diversification and multiproduct firms' performance has become one of the most controversial topics for researchers to analyze firms' behavior. However, the relationship is hard to be identified. For instance, Buhner (1987) argued that international diversification has a positive relationship with product diversified manufacturing firms' performance as it offers firms the opportunity to generate increased capital appreciation. In spite of the positive relationship, other studies have shown either a negative relationship or no relationship at all (Siddhartan and Lall, 1982; Kumar, 1984). Most of these studies have assumed that the relationship between international diversification and performance is linear (Gomes and Ramaswamy, 1999). However, there are some researchers have found an inverse U-shaped relationship between international diversification and multiproduct manufacturing firms' performance (Tallman and Li, 1996; Hitt et al., 1997; Gomes and Ramaswamy, 1999; Kotabe et

al., 2002). On the other hand, it has been argued that theories developed to explain the behavior of multinational manufacturing firms may not be applicable to multinational service firms. For instance, Capar and Kotabe (2003) argued that the relationship is U-shaped curvilinear for service firms. All in all, the various previous studies have identified that the relationship between international diversification and multiproduct firms' performance will depend on firms' classification and the level of diversification.

1.3 Background:

International diversification may be defined as expansion across the borders of global regions and countries into different geographic locations, or markets (Hitt et al, 1997). Product diversification refers to a corporate strategy to increase sales volume from new products and new markets. It could mean expanding into a new segment of an industry that the business is already in, or investing in a promising business outside of the scope of the existing business. Therefore, the level of geographical expansion can be determined by the number of markets in which it operates and their importance to the multiproduct firms. Furthermore, internationalization and product diversification can provide manufacturing firms with opportunities and great competitive advantages to diversify their products to foreign markets and to generate higher returns for companies. The evidence by Rugman (1979) confirms that international diversification is important because it is based on exploiting foreign market opportunities and imperfections through internationalization. Furthermore, Caves (1996) argued that diversification enables manufacturing firms to realize economies of scale and scope. This strategy does spread out the average cost over more units of output. It also helps it to reduce fluctuations in revenue by

spreading its investment risks over different countries and different product lines (Kim et al, 1993). It also helps reduce costs and increase revenues by extending a firm's market power over its suppliers, distributors, and customers (Kogut, 1985). It lowers costs by enabling arbitrage of differences in input and output markets (Hennart, 1982).

Although international expansion and product diversification have the advantages for manufacturing firms' performance, the costs in this corporate strategy are typified by the problems of the liabilities of newness and foreignness (Hymer, 1976; Stinchcombe, 1965). When firms diversify their markets to foreign countries, they will be involved in establishing a new operations system such as purchasing, installing facilities, staffing, promotion, and establishing internal management systems and external business networks. This extra spending could drive the new subsidiaries into the disadvantageous position and decreases its competitiveness. Moreover, the foreign subsidiaries will face more obstacles and difficulties to operate compared with local firms as the higher costs the foreign subsidiaries will suffer from operating in other countries. Being foreign means mistakes in various business decisions are more likely. The likelihood of making competitiveness impairing mistakes and the costs associated with the liability of foreignness become attenuated with experience, in a learning-by-doing process (Barkema & Vermeulen, 1998). On the other hand, the costs associated with product diversification also apply to international diversification, such as coordination costs, information asymmetry, and incentive misalignment between headquarters and divisional managers in multidivisional firms can also be manifest in multinational enterprises between headquarters and subsidiary managers (Denis et al., 2002; Harris et al, 1982). Therefore, as the level of diversification is going beyond a certain level, the relative governance costs will exceed the

diversification benefits.

A service firm is an organization that provides to some extent an intangible item that also requires some interaction between the buyer and the seller (Berthon et al., 1999). As service firms have the same purpose for diversification, the underlying rationale to identify the advantages and disadvantages of using diversification strategy is similar to manufacturing firms. Dunning (1989) argued that multinational service firms could benefit from global economies of scale in various aspects of the value chain. Similarly, Campbell and Verbeke (1994) suggested that multinational service firms could achieve economies of scale in marketing activities. However, these arguments are based on the assumption that service firms, just like manufacturing firms, would incur certain fixed costs that are to some extent independent of a company's output (Katrishen and Scordis, 1998).

In this research paper, we investigate the effects of international diversification on the performance of both multiproduct manufacturing and service firms. Moreover, we examine whether the effects are the same under both less diversified firms and well diversified firms.

1.4 Need for study

A lot of research has done to examine the relationship between international diversification and manufacturing firms' performance. However, the results for their research are significantly different. For instance, some studies found out the positive linear relationship, some found out the nonlinear relationship. As a result, this research paper is going to determine whether the

relationship between international diversification and manufacturing firms' performance is linear or not. Furthermore, as there is less evidence to show the relationship for service firms; this study also tries to examine the effect of international diversification on service firms' performance.

The paper is broken down into five distinct chapters. This current chapter provides a brief review of the research topic and the purpose of the study. Chapter 2 provides the purpose and scope of literature review. Chapter 3 discusses the methodology utilized in this research. Finally, the analysis, conclusions, and recommendations based on the results of the study are contained in Chapter 4.

Chapter 2 Literature Review

This chapter provides a review of the literature which mainly focuses on the effect of international diversification on US based multiproduct manufacturing and service firms' performance. The previous research literature showed whether the international diversification has positive or negative effect on multiproduct manufacturing and service firms, and indicated whether the geographical expansion is linear or curvilinear on both types of firms. Furthermore, some previous arguments have identified that the relationship between international diversification and multiproduct firms' performance will depend on firms' classification and the level of diversification.

2.1 Overview of the relationship between international diversification and firms' performance

International or product diversification can be defined as expanding firms' products into different geographical locations and markets. Hitt, et al (1994) argued that both international and product diversification play key roles in the strategic behavior of large firms. Thus, a firm's level of diversification is reflected by the different markets in which it operates and their importance to the firm.

Theoretical arguments suggested that internationalization and product diversification have both value- enhancing and reducing effects. For example, some have argued that international diversification offers prospective market opportunities (Buhner, 1987). Thus, it affords the opportunity for greater firm growth. However, the most prominent argument offered in the literature is that international diversification provides the opportunity to exploit the benefits of

internalization. Furthermore, Berger and Ofek (1995) argued that the potential benefits of operating different lines of business within one firm include greater operating efficiency, less incentive to forego positive net present value projects, greater debt capacity, and lower taxes. Moreover, they indicated that the potential costs of diversification include the use of increased discretionary resources to undertake value-decreasing investments, cross-subsidies that allow poor segments to drain resources from better-performing segments, and misalignment of incentives between central and divisional managers. International business scholars have argued that international diversification is important because it is based on exploiting foreign market opportunities and imperfections through internalization (Rugman, 1979).

Although, the moderate international diversification may provide benefits for firm performance, there are also some significant costs associated with international diversification. First of all, escalating geographic dispersion can greatly enhance transaction costs and managerial information-processing demands (Hitt et al., 1994; Jones and Hill, 1988). For example, geographic dispersion increases coordination, distribution, and management costs. Secondly, Hitt et al (1997) argued that although international markets and associated operations may yield new opportunities, they also present increased competitive challenges from international and local competitors. For example, logistical costs, trade barriers, and cultural diversity make management of internationally diversified firms highly complex.

“Additionally, institutional and cultural factors establish strong barriers to the transfer of competitive advantages across country borders” (Kogut, 1985).

As a result of the transaction costs and complex management, the costs of international diversification may eventually exceed the benefits of such diversification.

The relationship between international diversification and firm performance has been an important topic for researchers in strategic management and international business (e.g., Buhner, 1987; Grant, 1987; Daniels and Bracker, 1989; Haar, 1989; Tallman and Li, 1996; Hitt et al., 1997; Gomes and Ramaswamy, 1999; Kotabe et al., 2002). Despite the conflict arguments of whether the relationship between internationalization and firm performance is positive or negative, numerous studies have concluded that there is a U-shaped curvilinear relationship between international diversification and firms' performance: Hitt et al (1997) had proposed a curvilinear relationship between international diversification and firm performance that begins positive, but eventually becomes negative with increasing international diversification as firms experience increasing transaction costs with greater international diversification. For instance, coordination between units in different geographic regions is necessary to exploit the potential economies of scope with internal resources. At some point, however, the coordination required (multiple transactions among many geographically diverse units) costs more than the benefits derived from sharing resources and exploiting market opportunities. These transaction costs then begin to produce diminishing returns for going international. Furthermore, they expected product diversification to positively moderate the international diversification and performance relationship. For example,

“product diversification can build managerial capabilities that allow more effective management of international diversification. In other words, organizational learning theory suggests that experience with product diversification provides the ability to deal with some of the complex challenges posed by international diversification” (Hitt, Hiskisson & Kin, 2013).

2.2 International diversification and firm performance in manufacturing firms

Many arguments have demonstrated a positive relationship between multinational manufacturing firms and their performance (Daniels and Bracker, 1989; Haar, 1989; Gomes and Ramaswamy, 1999), while other studies have shown either a negative relationship or no relationship at all (Siddhartan and Lall, 1982; Kumar, 1984). Most of these studies have assumed that the relationship between international diversification and performance is linear (Gomes and Ramaswamy, 1999). On the other hand, there is another stream of research that has examined a non-linear relationship between multinational firms and their performance (Tallman and Li, 1996; Hitt et al., 1997; Gomes and Ramaswamy, 1999; Kotabe et al., 2002). These studies have found a non-linear relationship between international diversification and manufacturing firm performance (inverse U-shaped relationship), where performance is improved in the first place, and levels off.

2.3 International diversification and firm performance in service firms

Many researchers have paid more attention to analyzing the relationship between multinationals and service firm performance. They considered the relationship between international diversification and performance for service firms is somewhat different than for manufacturing firms. In contrast to a positive linear or an inverse U-shaped relationship between multicultural manufacturing firms and performance, which has been the premise and evidence in earlier studies, we argue that the relationship is a U-shaped curvilinear relationship for service firms (Capar and Kotabe, 2003).

Based on the previous literature review, the main purpose of this study is to examine the relationship between international diversification and product expansion manufacturing firms. In addition, the study also explains the relationship between international diversification and product expansion service firms. The second objective of this study is to distinguish the effect between the moderate internationalization and high internationalization on firms' performance. The third objective of the study is to find the effective and efficient opportunities to improve firms' performance based on the results of the empirical study.

Chapter 3 Research Methodology

3.1 The Model

The model used in this study is taken from Capar and Kotabe (2003) to determine the relationship between international diversification and multiproduct manufacturing firms' performance. In addition, this model also helps to examine the effect of geographical expansion on multiproduct service firms' performance. There are two regression equations included in this model. The first one predicts a linear effect of international diversification on two firms' performance, and the second one represents a curvilinear effect. Equation 3.1 and 3.2 represent their model.

$$\text{Perf}=\beta_0+\beta_1\text{SIZE}+\beta_2I_1+\beta_3I_2+\beta_4I_3+\beta_5\text{ID}+e \quad 3.1$$

$$\text{Perf}=\beta_0+\beta_1\text{SIZE}+\beta_2I_1+\beta_3I_2+\beta_4I_3+\beta_5\text{ID}+\beta_6\text{ID}^2+e \quad 3.2$$

where size is the firms' size, I_i the type of service and manufacturing industry; ID is the international diversification; and ID^2 is the squared term of ID; e is the error term. As can be seen, Equation 3.1 represents the linear model, and Equation 3.2 represents the curvilinear model, where the ID^2 will be entered to test for curvilinearity. The curvilinear model will be supported if the R^2 associated with the curvilinear model is significantly higher than the linear model and the coefficient of the squared term for international diversification (ID) variable, β_6 , is positive and significant.

3.2 Variables and measures

Dependent variables: Three accounting measures are considered as the best indicators of firm performance: return on assets (ROA), return on sales (ROS), and return on equity (ROE). In general, ROA is always used to analyze the firms' performance. For instance, Farris et al (1992) have indicated that if ROS is used as dependent variable, it might reflect mathematical artifacts as well as true relations. Hitt (1997) has indicated that ROE should be ruled out because it is more sensitive to capital structure differences. However, data involved in calculating ROA are not widely available on the public website. Hitt et al. (1997) have indicated that both ROA and ROS have generated similar findings and that they were highly correlated ($r=0.91$). Therefore, ROS is used in this study to examine the effect of international diversification on firms' performance.

Control variables: The study considers firms' size and industry effects as control variables. Measured by the natural logarithm of number of employees, this was used to control for the potential effect of scale economy differences (Capar & Kotabe). Moreover, the study uses dummy variables to test industry effects. The industry effect in manufacturing firms covers four industries: (I1=Industry, I2=Consumer cyclical, I3=Consumer non-cyclical and I4=Energy). The energy industry is the residual dummy variable (that is, when all I's=0). The industry effect in service firms represents four industries as well: (I1=Retailing, I2= Utilities, I3=Communications and I4= Technology). The technology industry is the residual dummy variable (that is, when all I's=0). From previous studies, ID was operationalized as the ratio of foreign sales to total sales (FSTS) in this study (e.g., Stopford and Wells, 1972; Grant, 1987; Habib and Victor, 1991; Tallman and Li, 1996). Because of data availability constraints and for comparison purposes, the FSTS ratio has been used. Therefore, this study also used FSTS as one of the control variables.

3.3 Hypothesis

The purpose of this study is to examine the relationship between internationalization and firms' performance. Thus, the study is trying to test the following hypothesis based on Capar and Kotabe (2013):

Hypothesis 1: The relationship between international diversification and performance in manufacturing firms will be U-shaped curvilinear, with performance decreasing up to a certain point, beyond which higher levels of international diversification will increase performance.

Hypothesis 2: The relationship between international diversification and performance in service firms will be U-shaped curvilinear, with performance decreasing up to a certain point, beyond which higher levels of international diversification will increase performance.

3.4 Sample

The sample comprises of two sets of data which were drawn from S&P capital IQ. The first set of data includes 94 US based operating public multiproduct manufacture firms. For inclusion in the sample, firms have to be 1) mid-sized or large sized multiproduct public manufacturing companies with current employees more than 200. Usually small firms have significant amounts of missing data are less representative samples to be studied; 2) have average sales exceeding \$100 million between 2009 and 2012. The \$100 million is the minimum value to ensure firms achieve economic benefits; 3) all firms selected are product and international diversified manufacturing firms; 4) the study categorizes firms into regions, which include Africa, Asia, Pacific, Europe, and America. The reason the regional data have been selected is because the sales of other foreign divisions are not open to the public. 5) The sample consists of four types of

manufacturing industries: Energy, Consumer Cyclical, Consumer Non-cyclical, and Industrial. Furthermore, the study used a three year average for the 2009 through 2012 period for each variable.

The second set of data includes 129 US based public operating product diversified service firms, and those firms have to be 1) mid-sized or large sized multiproduct public service companies that firms' current employees are greater than 200. 2) Have average sales exceeding \$100 million between 2009 and 2012. 3) All firms selected are product and international diversified service firms. 4) The study divided the firms to regional areas which include Africa, Asia, Pacific, Europe, and America. 5) The sample consists of four types of service industries: Retailing, Information Technology, Telecommunication services, and utilities.

The set of companies had been screened and collected from S&P Capital IQ based on the list of requirements above, and uploaded into Excel. However, due to the limitation of the S&P Capital IQ, companies, foreign sales cannot be uploaded from the system. Therefore, we tried using the Bloomberg system to find out the companies' number of employees, total revenue, and foreign revenue of companies. Nevertheless, some companies' foreign sales data are not available from the Bloomberg system, and we deleted those companies from the sample. Finally, we came up with 335 observations for manufacturing firms and 348 observations for service firms from 2009 to 2012.

Chapter 4. Results and findings

4.1 International diversification and manufacturing firms

The first part of Table 4.1 reports means, standard deviations, and correlations for the variables used in the linear and Non-linear regression study. Based on the results, Table 4.1(a) does not show that a statistically significant linear relationship exists between ID and performance at 5% level of significance as $p > 0.05$. Among the control variables in the linear and non-linear regression, only firm size is statistically significant and has a positive slope coefficient. In other words, we observed some tendency that the larger the firm size (in terms of total number of employees), the higher the firm performance (in terms of ROS), assuming the level of international diversification to be constant. In addition, the second part, Table 4.1(b) supports our hypothesis that there is a U-shaped relationship (curvilinear effect) between international diversification and manufacturing firm performance. As can be seen, the coefficient of ID² is 0.2724657, and the overall model is significant at $p < 0.05$. In addition, the sign of the linear effect becomes negative in the second model whereas the sign of the curvilinear effect is positive, indicating a U-shaped relationship.

In other words, the explanatory power of the model increases significantly when the squared term of international diversification, ID² enters to the model. As can be seen from Table 4.1(b), the adjusted R² increases significantly from 0.0418 to 0.1035. This indicates that the curvilinear model fits the data better than the linear model, thus rendering support for our hypothesis and the argument of other studies ((Tallman and Li, 1996; Hitt et al., 1997; Gomes and Ramaswamy,

1999; Kotabe et al., 2002).

As can be seen from Table 4.1(a) and (b), the sign of the coefficient of ID changes from positive to negative on linear and non-linear models. This result indicates that performance is decreasing up to a certain point, beyond which higher levels of international diversification will increase performance. Based on the result, the curvilinear model can be written as $ROS = -0.2244973 - 0.2444001ID + 0.2724657ID^2$, assuming the firm size has no effect on the firm performance. Therefore, to show how international diversification affects firm performance, a partial

derivative of the curvilinear regression equation is taken with respect to ID: $\frac{\partial(ROS)}{\partial(ID)} = -0.2444001 + 0.5449314ID$. Therefore, the threshold level can be calculated as $0.2444001 / 0.5449314 = 0.4485$. As explained from above, the incremental effect of international diversification reaches approximately 44%, above and beyond this 44% threshold level, international diversification is expected to improve firm performance.

As a follow up, we also conducted a t-test to examine to see whether there was any group difference in ROS for firms below and above the 44% threshold level. As presented in Table 4.2(a) and (b), the mean and standard deviation are significantly different between the groups with $ID > 44\%$ and $ID < 44\%$. Firms with higher international diversification ($ID > 44\%$) have greater means and standard deviation than firms with lower international diversification ($ID < 44\%$). If a linear relationship was analytically forced on the data, we would expect ID to be positively related to ROS. This is consistent with our linear model results presented in Table 4.1. In conclusion, the relationship between international diversification and performance in manufacturing firms will be U-shaped curvilinear, with performance decreasing up to 44% beyond which higher levels of international diversification will increase performance. This result

does go against some findings by Gomes and Ramaswamy (1999) and by Hitt et al. (1997), whose evidence is in favor of an inverse U-shaped relationship between internationality and manufacturing firm performance. The possible explanation is that those findings explained the true inverse U-shaped relationship during the years of financial crisis for countries based outside of the US. Therefore, results will differ as samples are changed.

Table 4.1 Means, Standard deviations, and correlations (N=335) for linear and non-linear models

a) Linear

```
. regress y id size dn dc di
```

Source	SS	df	MS			
Model	.365150554	5	.073030111	Number of obs =	335	
Residual	6.14284647	329	.018671266	F(5, 329) =	3.91	
Total	6.50799702	334	.019485021	Prob > F =	0.0019	
				R-squared =	0.0561	
				Adj R-squared =	0.0418	
				Root MSE =	.13664	

y	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
id	.0033808	.0225192	0.15	0.881	-.040919	.0476806
size	.0144011	.0044322	3.25	0.001	.005682	.0231201
dn	-.005144	.0207881	-0.25	0.805	-.0460384	.0357504
dc	-.0404281	.0192426	-2.10	0.036	-.0782821	-.0025741
di	.0461582	.0339076	1.36	0.174	-.0205448	.1128612
_cons	-.1871733	.0994288	-1.88	0.061	-.3827696	.0084231

b) Non-linear

```
. regress y id size dn dc di id2
```

Source	SS	df	MS			
Model	.673865695	6	.112310949	Number of obs =	335	
Residual	5.83413133	328	.017786986	F(6, 328) =	6.31	
Total	6.50799702	334	.019485021	Prob > F =	0.0000	
				R-squared =	0.1035	
				Adj R-squared =	0.0871	
				Root MSE =	.13337	

y	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
id	-.2444001	.0634071	-3.85	0.000	-.3691361	-.1196641
size	.0178066	.0044025	4.04	0.000	.0091459	.0264673
dn	-.0368933	.0216739	-1.70	0.090	-.0795307	.0057441
dc	-.0515793	.0189712	-2.72	0.007	-.0888997	-.0142588
di	.0271915	.0334066	0.81	0.416	-.0385267	.0929097
id2	.2724657	.065401	4.17	0.000	.1438075	.401124
_cons	-.2244973	.0974584	-2.30	0.022	-.4162197	-.032775

Table 4.2 the mean difference in return on sales between high and low-international diversification (ID) groups (t-test)

a) ID>44%

```
. ttest id==118
```

One-sample t test

Variable	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf. Interval]	
id	118	.7683898	.0184853	.2008017	.7317807	.804999

mean = mean(id)

t = -6.3e+03

b) ID<44%
 . ttest id==216

One-sample t test

Variable	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf. Interval]	
id	216	.1590741	.0108581	.1595811	.1376721	.1804761

mean = mean(id) t = -2.0e+04

4.2 International diversification and service firms

Table 4.3 presents the means, standard deviations, and correlations (N=348) for linear and non-linear models of service firms. In contrast with manufacturing firms, for the control variables in the linear regression, only size was statistically significant with a p value less than 0.05, and has a positive slope coefficient. The positive sign means the size of the firm has the positive effect on service firm performance. Moreover, as other control variables have p values greater than 0.05 in both linear and non-linear models, they are not significant in those models. However, with using 10% level of significance, the p value of ID² is less than 0.1, and we can conclude that international diversification has curvilinear relationship with performance of service firms. From the table, the sign of the linear effect becomes positive in the second model whereas the sign of the curvilinear effect is negative, indicating an inversed U-shaped relationship. In addition, Table 4.3 reports that R-squared increases slightly from the linear model to the curvilinear model, which indicates that the curvilinear model fits the data better.

As can be seen from the table, the curvilinear model can be written as $ROS = -0.3969432 + 0.4399923ID - 0.4841305ID^2$, assuming the firm size has no effect on firm performance. Therefore, to show how international diversification affects firm performance, as we did for manufacturing firms, a partial derivative of the curvilinear regression equation was

taken with respect to ID: $\frac{\partial(ROS)}{\partial(ID)} = 0.4399923 - 0.968261ID$. Therefore, the threshold level can be calculated as $0.4399923 / -0.968261 = -0.4544$. As explained from above, the incremental effect of international diversification reaches approximately 45%. Below this 45% threshold level, international diversification is expected to improve firm performance.

As a follow up, we also conducted a t-test to examine to see whether there was any group difference in ROS for firms below and above the 45% threshold level. As presented in Table 4.4, the mean and standard deviation are significantly different between the groups with $ID > 45\%$ and $ID < 45\%$. Firms with higher international diversification ($ID > 45\%$) have greater means and standard deviation than firms with lower international diversification ($ID < 45\%$). If a linear relationship was analytically forced on the data; we would expect ID to be negatively related to ROS. This is consistent with our linear model results presented in Table 4.1. In conclusion, the relationship between international diversification and performance in manufacturing firms will be inverse U-shaped curvilinear; with performance increasing up to 45% below which lower levels of international diversification will increase performance. This result does go against the findings by Capar and Kotabe (1999), who found evidence in favor of a U-shaped relationship between internationality and service firm performance. The possible explanation is that those researchers' findings explained the true U-shaped relationship based on countries outside US. Therefore, the result is different from the samples that the study applies to.

Table 4.3 Means, Standard deviations, and correlations (N=348) for linear and non- linear

models

a) Linear

. regress y size id dm dr du

Source	SS	df	MS			
Model	4.76028971	5	.952057942	Number of obs = 348		
Residual	71.4232482	342	.208839907	F(5, 342) = 4.56		
Total	76.1835379	347	.2195491	Prob > F = 0.0005		
				R-squared = 0.0625		
				Adj R-squared = 0.0488		
				Root MSE = .45699		

y	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
size	.0606571	.014843	4.09	0.000	.0314621	.0898522
id	-.0435019	.0703625	-0.62	0.537	-.1818997	.0948959
dm	-.0041789	.0600144	-0.07	0.945	-.1222227	.1138649
dr	.0887654	.0630546	1.41	0.160	-.0352583	.2127892
du	-.0383792	.1942746	-0.20	0.844	-.4205026	.3437442
_cons	-.3763199	.1305206	-2.88	0.004	-.6330442	-.1195957

b) Non-linear

. regress y size id dm dr du id2

Source	SS	df	MS			
Model	5.51997085	6	.919995141	Number of obs = 348		
Residual	70.663567	341	.207224537	F(6, 341) = 4.44		
Total	76.1835379	347	.2195491	Prob > F = 0.0002		
				R-squared = 0.0725		
				Adj R-squared = 0.0561		
				Root MSE = .45522		

y	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
size	.0555583	.0150234	3.70	0.000	.0260081	.0851085
id	.4399923	.2620669	1.68	0.094	-.0754789	.9554635
dm	.0052385	.0599838	0.09	0.930	-.1127464	.1232234
dr	.1075724	.0635737	1.69	0.092	-.0174736	.2326184
du	-.0233081	.1936818	-0.12	0.904	-.4042695	.3576532
id2	-.4841305	.2528526	-1.91	0.056	-.9814777	.0132166
_cons	-.3969432	.1304603	-3.04	0.003	-.6535514	-.140335

Table 4.4 The mean difference in return on sales between high and low-international diversification (ID) groups (t-test)

a) ID>45%

```
. ttest id==135
```

One-sample t test

Variable	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf. Interval]	
id	135	.818	.0162174	.1884295	.7859248	.8500752

mean = mean(id)

t = -8.3e+03

b) ID<45%

```
. ttest id==207
```

One-sample t test

Variable	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf. Interval]	
id	207	.1476812	.0099891	.1437177	.1279872	.1673751

mean = mean(id)

t = -2.1e+04

4.3 Test

The results of the above test did assume that the effect of international diversification on firms' performance is independent with the types of manufacturing and service firms. On the other hand, we have conducted the study that did assume the effect of international diversification on firms' performance is dependent with the types of manufacturing and service firms. The following model was used in the study.

$$\text{Per (manufacturing firms)} = \beta_0 + \beta_1 \text{size} + \beta_2 * \text{dn} * \text{ID} + \beta_3 * \text{dc} * \text{ID} + \beta_4 * \text{di} * \text{ID} + e \quad 4.1$$

$$\text{Per (service firms)} = \beta_0 + \beta_1 \text{size} + \beta_2 * \text{dm} * \text{ID} + \beta_3 * \text{dr} * \text{ID} + \beta_4 * \text{du} * \text{ID} + e \quad 4.2$$

Manufacturing firms: The results from Table 4.5 indicated that the effect of geographical expansion on firms' performance is not dependent with types of manufacturing firms as p value of all types of manufacturing firms is greater than 0.05, which is statistically significant. Therefore, there is no relationship between the effects of geographical expansion on the performance of the other two kinds of manufacturing firms.

Service firms: To conclude from Table 4.6, the effect of international diversification on firms' performance is independent with types of service firms as the p values of those types of firms are all greater than 0.05.

Table 4.5: Whether the effect of geographical expansion on firms' performance is dependent with types of manufacturing firms:

```
. gen iddn=id*dn
. gen iddc=dc*id
. gen iddi=id*di
. regress y size iddn iddc iddi
```

Source	SS	df	MS			
Model	.329545537	4	.082386384	Number of obs =	335	
Residual	6.17845149	330	.01872258	F(4, 330) =	4.40	
Total	6.50799702	334	.019485021	Prob > F =	0.0018	
				R-squared =	0.0506	
				Adj R-squared =	0.0391	
				Root MSE =	.13683	

y	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
size	.0136001	.0043755	3.11	0.002	.0049928	.0222074
iddn	.0286712	.0248619	1.15	0.250	-.0202365	.0775789
iddc	-.0514049	.031088	-1.65	0.099	-.1125606	.0097509
iddi	.1004749	.058892	1.71	0.089	-.0153762	.216326
_cons	-.1825624	.097101	-1.88	0.061	-.3735774	.0084526

Table 4.6: Whether the effect of geographical expansion on firms' performance is dependent with types of service firms:

```
. gen iddm=dm*id
(40 missing values generated)

. gen iddr=id*dr
(40 missing values generated)

. gen iddu=id*du
(40 missing values generated)

. regress y size iddm iddr iddu
```

Source	SS	df	MS	
Model	4.54991424	4	1.13747856	Number of obs = 348
Residual	71.6336236	343	.208844384	F(4, 343) = 5.45
Total	76.1835379	347	.2195491	Prob > F = 0.0003
				R-squared = 0.0597
				Adj R-squared = 0.0488
				Root MSE = .45699

y	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
size	.0635518	.0146381	4.34	0.000	.03476	.0923435
iddm	-.0416631	.0961532	-0.43	0.665	-.2307873	.1474611
iddr	.1457151	.1054915	1.38	0.168	-.0617766	.3532067
iddu	-.3865089	1.243051	-0.31	0.756	-2.831471	2.058453
_cons	-.4024682	.1223812	-3.29	0.001	-.6431803	-.1617561

Chapter 5 Conclusion

This research had provided some important findings: there is a nonlinear and U-shaped relationship between international diversification and manufacturing firm performance. The sign of the linear effect became negative in the second model of Table 4.1 whereas the sign of the curvilinear effect was positive, indicating a U-shaped relationship. The threshold calculation indicated that manufacturing firms' performance was decreasing up to 44%; above and beyond this 44% threshold level, international diversification was expected to improve firm performance. Furthermore, the effect of geographical expansion on firms' performance was only dependent with non-cyclical consumer manufacturing firms as its p value was less than 0.05, which is statistically significant. As the p values of the other two kinds of manufacturing firms were greater than 0.05, there was no relationship between the effect of geographical expansion on the performance of industrial and consumer cyclical manufacturing firms.

In addition, the research also indicated that the relationship between geographical expansion and service firm performance was nonlinear and inverse U-shaped as the sign of the linear effect became positive in the second model of Table 4.2 whereas the sign of the curvilinear effect was negative. We had also calculated the threshold in this model was 45% which indicated that the incremental effect of international diversification reached approximately 45%: below this 45% threshold level, international diversification was expected to improve firm performance. Last, but not least, from Table 4.6, the effect of international diversification on service firms' performance was independent with types of service firms as the p values of those types of firms were all greater than 0.05.

Chapter 6 Recommendation

This study had some limitations. First of all, international diversification in this study was only measured by one indicator, which was FSTS. It is recommended to conduct the study with more different indicators in order to capture the international activities of firms more fully and precisely. Secondly, the study was only based on the sample of manufacturing firms and service firms in the US. Firms from other countries should also have to be made with caution in order to effectively investigate the effect of international diversification on manufacturing and service firms' performance. Thirdly, this study only selected four kinds of manufacturing firms and service firms. Focusing on other types of manufacturing and service firms might be a useful avenue of research, as they constitute another major set of manufacturing and service firms in the global basis. This would allow us to see whether the result of testing the relationship is still the same between the performance of other types of manufacturing and service firms. Furthermore, the study assume of all firms were product diversified instead of including this as the moderate variable into our study. Therefore, as demonstrated by Hitt et al. (1997), the relationship between international diversity and performance is moderated by product diversity. Kotabe et al (2002) said,

“it might be also useful to include R&D and advertising intensity as moderators, as these two variables are likely to add some explanatory power to the relationship between international diversity and firm performance”.

Finally, this study could also select the longer range data in order to examine whether the results of the study could hold over time.

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Appendix A

Description of S&P capital IQ manuf data file

Variable name	Variable label
IC	Industry Classification
EM	Number of total employees
ID	International Diversification=Foreign Sale/Total Sale
Y	Return On Sale=operating profit/total revenue
ID ²	ID* ID
dn	Diversified Consumer Non-Cyclical
dc	Diversified Consumer Cyclical
di	Diversified industrial
Size	Natural log of number of total employees

Appendix B

Description of S&P capital IQ service data file

Variable name	Variable label
IC	Industry Classification
EM	Number of total employees
ID	International Diversification=Foreign Sale/Total Sale
Y	Return On Sale=operating profit/total revenue
ID ²	ID* ID
dm	Diversified Communication
dr	Diversified Retailing
du	Diversified utility
Size	Natural log of number of total employees

Appendix C

STATA Code:

```
use "F:\MRP\New folder\Description of S&P capital IQ manuf data.xls
```

```
regress y id size dn dc di
```

```
regress y id size dn dc di id2
```

```
ttest id==118
```

```
ttest id==216
```

```
gen iddn=id*dn
```

```
gen iddc=dc*id
```

```
gen iddi=id*di
```

```
regress y size iddn iddc iddi
```

```
use "F:\MRP\New folder\Description of S&P capital IQ service data.xls
```

```
regress y size id dm dr du
```

```
regress y size id dm dr du id2
```

```
ttest id==135
```

```
ttest id==207
```

```
gen iddm=id*dm
```

```
gen iddr=id*dr
```

```
gen iddu=id*du
```

```
regress y size iddm iddr iddu
```