Impact of Product Diversity and International Diversity on Performance in the Global Automotive Industry

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ABSTRACT

This study examines the relationships between product diversity, international geographical diversity, and company financial performance in the global automotive industry. A sample of the top twenty global automobile manufacturers of 2012 is used to test the hypotheses. ROS has been employed as the performance indicator, while the number of countries in which a company has manufacturing facilities is an indicator of international geographical diversification. Two different measures have been employed as product diversity indicators – a simple model count, and a modified measure of the Herfindahl index. Also, the company's age and size are used as control variables. According to the analysis of this study, product diversity has a positive and statistically significant impact on financial performance, but international diversity has a nonsignificant negative relationship with performance. This research also uncovers that international diversity has a positive association with product diversity, while the company's age negatively affects performance and positively impacts product diversity.

Keywords: Product Diversity, International Diversity, Financial Performance.

ÖZ

Bu çalışma, küresel otomotiv sektöründe ürün çeşitliliği, uluslararası coğrafi çeşitliliği ve şirketlerin mali performansları arasındaki ilişkileri incelemektedir. 2012 yılında faaliyette olan en büyük yirmi küresel otomobil üreticilerinden oluşan bir örneklemeyi kullanarak bu çalışmanın hipotezleri test edilmiştir. Satış getirisi (ROS) performans göstergesi olarak kullanılmıştır. Bir şirketin üretim tesisleri bulunduğu ülkelerin toplam sayısı ise uluslararası coğrafi çeşitlendirmenin bir göstergesidir. İki farklı yöntemle ürün çeşitliliği göstergeleri ölçülmüştür - birinde sadece toplam araç model sayısı yapılmış ve diğerinde Herfindahl endeksin değiştirilmiş bir versiyonu geliştirilmiştir. Ayrıca, şirketin yaşı ve büyüklüğü kontrol değişkenleri olarak kullanılmıştır. Bu çalışmanın analizine göre, ürün çeşitliliği, finansal performans üzerinde pozitif ve istatistiksel olarak anlamlı bir etkisi vardır, ancak uluslararası çeşitlilik şirket performansı ile anlamlı olmayan ve negatif bir ilişkisi vardır. Bu araştırma aynı zamanda da ürün çeşitliliği ve uluslararası coğrafi çeşitliliği arasında pozitif bir ilişki, ve şirketin yaşı performansı olumsuz etkilediğini ama ürün çeşitliliği üzerinde olumlu bir etkiye sahip olduğunu ortaya çıkarmıştır.

Anahtar Kelimeler: Ürün Çeşitliliği, Uluslararası Çeşitliliği, Finansal Performans.

Dedicated to my wife, Pegah
for her love ...

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INTRODUCTION

1.1 Diversification and Performance Relationship

One of the most important research issues in the sphere of strategic management and international business has been the study of the relationship of geographic and product diversification and their relationship with company performance (e.g., Buhner, 1987; Grant, 1987; Daniels & Baker,1989; Geringer et al., 1989, Haar, 1989; Tallman & Li, 1996; Hitt et al., 1997; Delios & Beamish, 1999; Gomes & Ramaswamy, 1999; Geringer et al., 2000; Kotabe et al.,2002; Caper & Kotabe, 2003; Chao & Kumar 2010). Companies have been confronted with challenges in their endeavors to diversify their geographical markets and product offerings for many years (Tallman & Li, 1996). Many researchers have investigated this theme, and found divergent results. Diversification should be profitable up to a limit in theory (Tallman & Li, 1996). Core competency (Prahalad & Hamel, 1990), and resource based theory (Barney, 1991) say that competitive advantage lays with the inner competencies of a company, and suggest that product diversification that uses the existing "rent-yielding" resources of the company will result in economies of scope, and consequently will generate superior profitability. Conversely, transaction cost theory suggests that extreme growth will ultimately result in increased governance cost and decrease the profits (Jones & Hill, 1988).

The importance of international diversification is that it represents a growth strategy (Chandler, 1962; Ansoff, 1965) that has a great potential effect on company performance (Caper & Kotabe, 2003). In this regard, some findings have found that an inverse U-shape curvilinear relationship between international diversification and performance, as contradictory to the linear relationship, which was put forward in earlier studies (Hitt et al., 1997; Gomes & Ramaswamy, 1999). In addition, Lu and Beamish (2004) found a nonlinear relationship between performance and geographical diversification. They argued that there is a horizontal S-shaped relationship between geographic diversification and performance which is negatively associated with company performance at high and low levels of internationalization, while at moderate levels of internationalization, greater geographical diversification resulted in higher performance.

The numerous studies of both geographical and product diversification impact on performance resulted in inconsistent and inconclusive outcomes, as Grant (1987), Grant, Jammine, and Thomas (1988), Datta, Rajagopalan, and Rasheed (1991) can attest to. Accordingly, consecutive endeavors in this context seem to be useful (Tallman & Li, 1996; Annavarjula & Beldona, 2000). However, many studies examining this relationship were based mostly on samples of manufacturing firms (Habib & Victor, 1991). This study probes into the automotive industry sector, and tries to find the impact of a company's expansion, both geographical and in its product offering, on company performance.

Nowadays, as competition increases in this sector, new players such as Chinese and Indian companies try to compete with American, European, and Japanese firms. On the other hand, consumers' expectations are diversifying and changing significantly.

Hence, companies have to decide the best choice in their strategies to become prosper in the global market. Geographical diversification related to the automotive sector across their activities refers to where automobiles or automobiles' parts are manufactured. Product diversification in automotive industries consists of factors such as automobile's platform variety, price difference, engines power level diversity, types of different fuel which automobiles consume, and the number of specific automobile's models of each company.

This study examines the international and product diversification-performance relationship by using a sample of 20 top ranking automotive industry's companies that include 66 automobile brands (motorcycles, buses, and heavy trucks are not included).

1.2 History of the Automobile

History of the automobile divides into five main periods: the first period began in ancient times on until 1884, in this section of history the first automobile was made in 1769, that worked with a steam engine and was dedicated for human transportation (Eckermann, 2001). The second period is between 1884 and 1918, in these days Daimler, Maybach and Benz introduced automobiles with a four-stroke engine, and these engines were the first petrol engine on the automobiles (Eckermann, 2001). By 1888, Andreas Flocken, the German engineer built the first automobile powered by an electric engine (Schrader, 2002). Daimler's assistant Wilhelm Maybach had developed the carburetor in 1893, and with this development the petrol engine overtook diesel, electric and steam engines (Ivory, Genus, 2009). In 1901, the first gasoline-electric hybrid automobile was developed by Ferdinand Porsche (Anderson & Anderson, 2010). Between 1919 and 1945, the automobile

emerged as an industrial product (Eckermann, 2001), as in this period automobiles were produced with front-engine, closed bodies and standardized controls (Georgano, 1985). The first automatic transmission was invented in 1924 by Hermann Rieseler which had two speeds, with lockup clutch and torque converter; however, it never goes into production (Csere, 1988). Most of the mechanical technology that used in today's automobiles such as front-wheel drive and independent suspension had been invented in the 1930s (Csere, 1988). The fourth period of the automobile history (between 1946 and 1979) is the mass-produced automobile (Eckermann, 2001). Throughout the 1950s, automobile designed more integrated and high-wrought, vehicles became faster and benefited from powerful engines, and cars spread all across the world. Competition became more intense between automobile producers in the 1960s, Japan emerged as a vigorous car producer, and European automobile makers applied ever-higher technology (Sedgwick, Gillies, 1986). American automobile industries emphasized performance as a principal focus of marketing, represented by muscle cars and pony cars such as the Chevrolet Camaro and Ford Mustang. The significant technologies of this decade were the gas turbine and the turbocharger. Since the 1970s conditions changed as the 1973 oil crisis, and automobile emissions control rules, Japanese and European imports, and stagnant innovation brought devastation on the American industry. Although, the current technology of hybrid automobiles developed by Victor Wouk in this period, this plan was rejected by the United States Environmental Protection Agency (EPA) (Berman, 2006). The last period began from 1980 to the current year, in this term the automobiles was classified as a consumer good (Eckermann, 2001). In this era, engine output and fuel efficiency improved significantly; platform sharing, standardization, and computer-aided design appeared. The first mass-produced

hybrid automobile was introduced by Toyota and Honda in 1997 (Lake, 2001). The big change that affects the automobile industry after technological improvements is China. By 2009, China had turned into the largest automobile producer in the world and enjoyed a market with nearly 14 million vehicles of annual sales (APCO, 2010). Finally, the prevalent body types of automobiles' can now be categorized into nine main classes, such as micro-car, hatchbacks, sedans, station wagons, sport cars, convertible, off-roads, multi-purpose vehicles, and vans, and each group further divides into other subcategories.

Chapter 2

LITERATURE REVIEW

2.1 Diversification Studies

Despite the literature on diversification garnering great interest from management scholars, results have not lead to a consensus (Tallman & Li, 1996). There are several articles provide wide-ranging reviews of this literature (see the Grant, 1987; Grant et al., 1988; Vachani, 1991; Datta et al., 1991; Tallman & Li, 1996; Caper & Kotabe, 2003; Lu & Beamish 2004; Osorio, Martin, & Vicente 2012); this section summarize their findings which particularly concentrated on the key issues that addressed in this research.

According to prior studies, diversification is bifurcated into international or geographical diversity and product diversity (e.g., Ansoff, 1965; Tallman & Li, 1996; Kaymak, 2009). Moreover, there are some researchers that divided each of those factors (product and geographical diversity) into two branches, for instance, Vachani (1991) divided international geographic diversification into related and unrelated subdivisions, and also many articles separated related and unrelated product diversity (e.g., Hitt and Ireland, 1986; Markides & Williamson, 1996; Becerra, 2009; Lahovnick, 2011). Related international geographic diversification is described as spreading multinational's activities across countries have relatively similar characteristics and unrelated international geographic diversification is referred to scattering international operations across dissimilar geographic regions

(Vachani 1991). Likewise, related product diversification is referred to disperse firm's activities across business segments within industries and unrelated product diversification is described as scattering firm's activities across different industries (e.g., Wrigley 1970; Rumelt, 1974; Vanchani 1991). However, this study focused on related product diversification across the automotive industry, and also the scope of international operations of companies is taken into account as international diversity.

2.1.1 International Diversity – Performance Relationship

International diversity refers to firms' enlargement through the boundaries of global regions and countries into diverse geographic markets or locations (Hitt, Hoskisson, & Kim, 1997). Geographic diversification can be defined as firm's activities in various geographic markets concurrently (Barney and Hesterly, 2008). International diversity has a noteworthy effect on company performance (Hitt et al., 2006) and takes an essential part in a company, such as the strategic behavior of multinational enterprises (MNE) (Hitt, Hoskisson, & Ireland, 1994).

An important position of the modern theory of the multinational enterprise was the belief that multinationals offered ownership advantages to compete with foreign companies in foreign environments (Hymer, 1960). Internalization became a fundamental concept in the theory of multinational enterprise in the 1970s and 1980s (Buckley & Casson 1976; Dunning, 1981; Rugman, 1981; Hennart, 1982; Rugman, 1982; Caves, 1982; Teece, 1986; Dunning, 1988). Casson (1986 & 1987) argued that ownership advantages are probably crucial for continued growth and profitability.

Grant (1987) suggested that international diversification itself should provide advantages over non-multinational firms. In this theory, multinational firms have opportunities to derive superior returns due to intangible assets, greater market

power, the ability to scatter their market risks and pursue less price-sensitive markets and less costly inputs (Kim, Hwang, & Burgers, 1993). In order to control output markets and diminish input costs, multinational firms are able to benefit from differences in input prices resulting in greater influence over the market (Kogut, 1985). Buhner (1987) suggested that international diversification presents prospective market opportunities, which provides opportunity of greater growth for firms.

The most accepted argument for international diversification has been grounded on the theoretical hypothesis that firms take advantage of the benefits of internationalization in international markets (Hymer, 1976; Rugman, 1981; Caves, 1982). Market international diversification results in some advantages such as economics of scale, scope, and learning (Kogut, 1985; Ghoshal, 1987; Kim et al., 1989, 1993), and spreading core competencies among diverse geographical markets and business divisions (Hamel, 1991).

Commonly, international diversification hassled to superior operating performance, but when factors like national identity, company size, and sectoral conditions are used as control variables, its importance declines (Grant, 1987). In spite of multinational firms expected to have lower levels of risk, market returns exhibit both positive and negative relationship to international diversification (Tallman & Li, 1996). Sundaram and Black (1992) suggeste that multinational firms can achieve further competitive advantages by benefiting from cross-border transactions and market imperfections, and can also gain a superior bargaining position, or with increased size.

Recent research on the relationship between geographic diversity and firm performance have focused on the nonlinear manner in this content, firstly focusing on the U-shape relationship, has more recently protracted to the S-shape relationship (Contractor et al., 2003; Contractor, 2007). This posits that a primarily negative international diversity-performance relationship is due to from organizational costs and complexity related to foreign development outweighing its benefits, before the foreign direct investment has positive returns (Qian, 1997; Ruigrok and Wagner, 2003). Other research realized an inverted U-shape relationship that proposes international diversification up to optimal level is associated with superior firm performance and after that point it has negative influence on firm performance (Yang and Driffield, 2012). This drawback in firm performance results from the liabilities associated to foreign development and the complexity of organizational synchronization across diverse culture and legal environments (Gomes and Ramaswamy, 1999; Qian et al, 2008).

In summary, Buhner (1987), Grant (1987), Grant, Jammine, and Thomas (1988), Kim, Hwang, and Burgers (1989), and Siddharthan and Lall (1982) have found a positive relationship between international diversity and performance; Chang and Thomas (1989), and Collins (1990) uncovered a negative relationship; an S-shaped relationship was discovered by Contractor, Kundu, and Hsu (2003), Lu and Beamish (2004), Thomas and Eden (2004), and Li (2005); Daniel and Bracher (1989), Geringer, Beamish, and DaCosta (1989), Sullivan (1994), and Hitt, Hoskisson, and Kim (1997) realized an inverted U-shaped relationship; and Buckley, Dunning, and Pearce (1978), Haar (1989), Collins (1990), and Sambharya (1995) have found no relationship.

2.1.2 Product Diversity – Performance Relationship

A core area of interest in strategic management field is the the relationship between product diversification and performance (Chatterjee and Wernefelt, 1991; Palich et al., 2000; Miller, 2004; Chen and Chu, 2010; Park and Jang, 2011). The extensive studies existing on product diversification-performance provide two main conclusions (Osorio, Martin, & Vicente 2012): First, there is no consensus on the actual relationship between product diversification and performance as we have both divergent theoretical approaches and to methodological tools related to the use of dissimilar databases, periods of study, samples, operationalization of variables, or econometric methods (Hoskisson and Hitt, 1990; Datta et al., 1991; Dess et al., 1995; Palich et al., 2000); second, the necessity of clearly considering the importance of the domestic environment and time period when considering the relationship between performance and product diversification. Until recently the majority of studies occurred in developed countries (Osorio, Martin, & Vicente 2012). Nevertheless, more recently we have witnessed that most empirical of the research has been conducted in transition and emerging countries (Peng and Delios, 2006; Lee et al., 2008).

During the 1960s and 1970s theoretical arguments which were developed by financial researchers and economists were greatly optimistic about product diversification effects on performance, and simultaneously most companies undertook considerable diversification programs during this period (Osorio, Martin, & Vicente 2012). Regarding to this charitable assessment of the aptly named linear premium model has been developed (Palich et al., 2000). This model was established on the proposition that the degree of product diversification is positively associated with performance in a leaner manner, it means companies which more product

diversified overtake rivals which are less product diversified that consequences from outweighing the cost by using the advantages of the high levels of product diversification (Osorio, Martin, & Vicente 2012). Superiority of more diversified firms supported by the main arguments which are drawn from industrial organization economics (IOE), traditional financial theory (TFT) or transaction cost economics (TCE). The first advantage is that highly product diversified firms are able to achieve several market power advantages which created by practicing different mechanisms (Scherer, 1980; Caves, 1981; Palich et al., 2000). Second, by utilizing internal markets for obtaining funds these firms also able grasp significant financial advantages (Berger & Ofek, 1995; Stein, 1997; Palich et al., 2000). Third, bankruptcy risk is reduced due to scattering of risk to different businesses and also this "coinsurance effect" enabling these firms to take advantage of using greater debt capacity (Servaes, 1996). In the end, due to the tax-efficient inner firm transaction, more diversified firms may also take advantages of having lower tax burdens than rather less diversified firms (Berger & Ofek, 1995; Servaes, 1996).

On the other hand, during the 1980s and 1990s that optimistic view was substituted by a pessimistic view of product diversification, so in this decade specialization became more favorable (Osorio, Martin, & Vicente 2012). According to analyzing the previous decade which done by economists and financial researchers, they empirically validated a new model that is the aptly named linear discount model (Denis et al., 2000). The basic premise of this approach is that performance is negatively associated with performance in a leaner manner, it means focused firms overtake rivals which are more products diversified due to outweighing the benefits by the expenses tied to greater degrees of product diversification (Osorio, Martin, & Vicente 2012). There is a loss that arises to more diversified firms supported by the

some main arguments which include: inefficient allocation of capital, and lower inducements of the lucrative business due to cross-subsidization among businesses (Meyer et al., 1992; Berger & Ofek, 1995; Palich et al., 2000; Schmid and Walter, 2009); information asymmetries that result in higher synchronization, control and management costs (Harris et al., 1982; Myerson, 1982; Markides, 1992; Palich et al, 2000); and repetitious clashes of interest between shareholders and managers that result in higher agency cost (Wan et al, 2011).

Over the past two decades, the resource-based view (RVB) greatly impacts the study of relationship between product diversification and performance (Osorio, Martin, & Vicente 2012). Proposition of this view is that a firm can adopt specific type of diversification strategy and its performance depends on its pool of capabilities and resources; according to this view a new international perception emerges that emphasizes firms' incentive to maximize their pool of capabilities and resources through similar sector diversification (Wan et al., 2011). The resource-based view suggests that related diversified firms should have better firm performance in comparison to widely diversified and one business firms (Rumelt, 1982; Wernerfelt, 1984; Barney, 1991; Wan et al., 2011). This proposition led to the aptly named inverted-U model that is grounded in terms of the degrees of diversification; the basic conjecture concerns how product diversification across low to moderate levels of diversification (related product diversification) is positively related to firm performance and across moderate to high levels of diversification (unrelated product diversification) is negatively related to firm performance (Palich et al., 2000).

In the sphere of product diversification and performance relationship, prior studies have found chiefly six different results: positive and significant linear effects,

negative and significant linear effects, related diversified firms overcoming unrelated diversified firms, unrelated diversified firms overcoming related diversified firms, significant curvilinear effects and even no relationship (Osorio, Martin, & Vicente 2012). For instance, Grant et al. (1988), Miller (2006), and Kuppuswamy and Villalonga (2010) found positive and significant linear effects; Lu and Beamish (2004), Grass (2010), and Braakmann and Wagner (2011) elicited negative and significant linear effect; Markides and Williamson (1996), Tallman and Li (1996), and Becerra (2009) discovered related diversified firms overcoming unrelated diversified firms; Hitt and Ireland (1986), Elsas et al. (2010), and Lahovnick (2011) revealed unrelated diversified firms overcoming related diversified firms; significant curvilinear effects found by Nachum (2004), and Li and Yue (2008); Sambharya (2000), and Ravichandran et al (2009) found no significant effects.

2.1.3 International Diversity – Product Diversity Relationship

International and product diversification are two approaches for companies to develop and exploit their resources (Ansoff, 1965). Accordingly, both forms of diversification absorb existing capabilities and resources; consequently we expected that growth along one aspect affect growth of the second form of diversification. Thus, this premise conveys two significant implications (Kumar, 2009).

The first implication is that growth along one aspect is expected to have positive impact on the second alternative while both forms of diversification are established on economies of scope in replaceable intangible resources (e.g., production know-how and marketing capability) (Teece, 1980, 1982; Hennart, 1982). Adversely, if simultaneous diversification along both forms is resulting in short-run restrictions due to absorptive capacity limitations (Cohen and Levinthal, 1990; Vermeulen and Barkema, 2002) and the restraints resulting from relocating tacit knowledge and

casually ambiguous capabilities (Teece, 1977; Zander and Kogut, 1995; Szulanski, 1996; Martin and Salomon, 2003), companies may be obligated to trade-off between the two approaches of diversification that results in negative relationship (Caves, 1975).

The second implication mentions that while both approaches of diversification are established on existing capabilities and resources, it is expected that product diversification and international diversification grow simultaneously rather than separately. Therefore, from a methodological point of view, examining the relationship of those has potential biases in estimating the association between them (Kumar, 2009).

Resource-based view (RBV) suggested that diversification enables firms to exploit economy of scope in many resources (Penrose, 1959; Panzar and Willing, 1981; Teece, 1980, 1982; Wernerfelt, 1984; Peteraf, 1993; Tanriverdi and Venkatraman, 2005). This presence sends signal to firms to diversify along both product and geographical scope in order to utilize various opportunities (Kumar, 2009). On the other hand, this practice also leads to various short-run constraints that may decrease opportunities which enable firms to use advantages of the both kind of diversification during a specific time period (Kumar, 2009).

Barkema and Vermeulen (1998) found that by increasing product diversity, firms tend to develop their foreign operation through a greenfield expansion rather than using an acquisition due to this notion that states that diversity improves the ability to assimilate knowledge by providing diverse experiences, which allows firms to develop their own complementary knowledge toward the market.

Chapter 3

HYPOTHESES DEVELOPMENT

3.1 Proposed Hypotheses

The relationship of international diversity and product diversity to firm performance levels in the automotive industry is examined in this thesis. In this study it is expected to find that higher levels of diversity for geographical and product to be associated with higher level of performance in the automotive industry. In addition, I expect to find a positive relationship between the geographical scope of international operations and the extent of product diversification. There is no consensus on the results of this sphere in previous research (Tallman & Li, 1996), and also no one has applied this topic exclusively to the global automotive industry, according to Stimpert and Duhaime (1997), the industry context to the company is a cardinal contributing factor of the level of product diversification, therefore further research might be a necessity in order to increase the value of the whole subject of study. According to what has been suggested in the literature, the premises of this study to be tested are presented below:

Core competency (Prahalad and Hamel, 1990), dynamic capability (Teece, Pisano, and Shuen, 1990), and resource-based (Conner, 1991) theories all suggest that competitive advantages based on firms distinctive internal factors affect performance positively. Product diversification, which is considered in this study, is related product diversification that is suggested to leverage firm performance by many

researchers such as Berger and Ofek (1995), Tallman and Li (1996), Park (2003), Miller (2006), and Colpan (2008). Consequently, regarding the degree of diversity, the first hypothesis is constructed as:

Hypothesis 1: The extent of product diversification is positively related to company performance in the automotive industry.

The findings of studies on geographical scope and firm performance relationship in comparison to results of studies on the relationship of product divarication and firm performance have been more conclusive (Delios and Beamish, 1999). In this context, most studies argue that higher level of international diversification result in a superior performance which arise from firms' ability to achieve higher returns through exploiting idiosyncrasy capabilities, such as patents and brand equity across the global markets (Delios and Beamish, 1999). International diversified companies also benefit from scattering risk across more host countries, more market powers, and enjoying lower cost inputs (Kim, Hwang, and Burger, 1993). A positive relationship between international diversification and firm performance has been found by some researchers like Wolf (1975), Rugman (1979), Kim, Hwang, and Burgers (1989), Tallman and Li (1996), Hitt et al. (1997), and Helpman et al. (2004). Therefore, the second hypothesis of this study is put forward as:

Hypothesis 2: The geographical scope of international operations has a positive effect on company performance in the automotive industry.

In the context of the association between geographic scope of international operations and the extent of product diversification there are some arguments which

suggest a positive association between both of them. Chandler (1991), Hitt, Hoskisson, and Ireland (1994), and Hitt et al. (1997) have argued the approaches of diversification may provide various common dynamic capabilities. Furthermore, a firm may also advance effective procedures to assign rare sources, such as human capital and financial resources (Burgelman, 1983). Besides, other structural mechanisms like a multidivisional structure (Hitt, et al., 1994) may help firm to synchronize and learn among its various markets. According to these premises, the third hypothesis is structured as:

Hypothesis 3: There is a positive association between the geographic scope of international operations and the extent of product diversification.

Chapter 4

METHODOLOGY AND DATA ANALYSIS

4.1 Methodology

This study aims to analyze effects of product and the geographical diversification on company performance in the global automotive industry. The twenty top global automobile manufacturer companies are selected and analyzed. This research is led on the proposition that variables like product diversity and geographical scope of operations may impact company performance in the automotive industry; a quantitative case study approach has been used to uncover and investigate the effect of geographical and product diversification on the company performance in the automotive industry. Information have been gleaned from various online data bases and entered in the Microsoft Excel program and then converted to measurable data. All the data have been analyzed with the IBM SPSS statistics package.

4.1.1 Research Sample and Measures

The sample used in this study consisted of the twenty top automotive companies listed by their financial result found in the 2012 preliminary via CNN Money annual ranking of the largest corporations, which included 66 automobile brands. Two companies not mentioned by CNN Money are Fiat-Chrysler and Subaru; Fiat-Chrysler information omitted in result of a legal problem over it ownerships (it is held privately by a hedge fund). Moreover, CNN Money listed the first 500 largest corporations around the world, so Subaru ranked as lower than 500 and thus was not

included by the list. Therefore, information on those companies was compiled from other sources rather than CNN Money (Table 1).

Table 1: CNN Money annual ranking of the world's largest corporations (2013)

World Ranking	Automotive Industry Ranking	Company	Revenues ($ billion)	Profits ($ billion)
8	1	Toyota Motor	265.7	11.6
9	2	Volkswagen	247.6	27.9
22	3	General Motors	152.3	6.2
23	4	Daimler	146.9	7.8
28	5	Ford Motor	134.3	5.7
45	6	Honda Motor	119.0	4.4
47	7	Nissan Motor	116.0	4.1
?	8	Fiat-Chrysler	107.9	5.0
68	9	BMW	98.8	6.5
103	10	SAIC Motor	76.2	3.3
104	11	Hyundai Motor	75.0	7.6
118	12	Mitsubishi	71.9	4.3
121	13	Peugeot	71.3	-6.4
184	14	Renault	53.0	2.3
227	15	Volvo	44.9	1.6
252	16	Kia Motors	41.9	1.2
316	17	Tata Motors	34.7	1.8
367	18	Suzuki Motor	31.0	1.0
440	19	Mazda Motor	26.6	0.4
?	20	Subaru	18.5	0.5

Notes: Companies are ranked by total revenues for their respective fiscal years ended on or before March 31, 2013.
For Fiat-Chrysler and Subaru information was obtained from their financial reports of 2012 which related to their consolidated financial statements.
This table just used as preliminary input in this study, further data which used as input for data analysis will be represented revenues and profits arose from the automotive related operation.

Actually, these twenty companies comprise a significant part of the international automotive market; moreover, according to the international automotive market competition characteristic new entrants are unable to satisfy international demands and also keep themselves profitable, therefore, we can argue that from a global perspective these companies are the main suppliers of the international market demands.

The information used in this study is principally associated with 2012 operations, and productions, sales, and financial outcomes of those twenty automotive companies. However, it was inevitable that some factors remained from the 2011 companies' operation, such as sales of the 2011's models in the year 2012 or production the 2012's models during 2011. In addition, some activities have been done during the 2012 by the companies in propose of using them in the 2013.

4.1.2 Data Collection

All the data which used in this study gleaned from the web databases, such as companies' webpages, online business, financial and economic publications and credible webpages that are related to automobiles and the automotive industry. The automobile models counted by at least four different sources included the companies' global webpages, brands' official webpages, Autoevolution.com and Yahoo Autos (autos.yahoo.com) during the year 2012, in the end all the collected data compared with each other in order to reach higher accuracy. Information related to the geographical operations had been collected mainly from original corporations' webpages and some other relevant and valid sources such as online business publications during the 2012 and first quarter of the 2013. The financial statistics of the 2012 were gathered from companies' financial reports and CNN Money during

the first half of the year 2013. In some rare cases of information ambiguity, direct contact with companies has been used, such as e-mail communications.

4.1.3 International Diversity Measure

In the past studies, researchers often used more than one measure of international diversity, for instance, Tallman and Li (1996) used two factors: multi-nationality which was measured as the proportion of foreign sales divided by total sales of firm, and country scope which was measured as the number of foreign countries in which a firm had operating subsidiaries; Ramaswamy (1993) used both foreign country counts and foreign plants counts as measures of international diversity. However, in this study, international diversity is measured solely by counting the countries in which a company has manufacturing facilities.

4.1.4 Product Diversity Measure

In the context of product diversification measuring, Herfindahl-type quantitative indices are more frequently used measure which had been used by many researchers like Grant et al. (1988), Tallman and Li (1996), and Kaymak (2009) that is defined as:

$$H = \left(1 - \sum_{i=1}^{n} {S_j}^2\right)$$

Where S_j is the proportion of a firm's sales, which is reported in product group j. Due to ambiguity existed in some companies' annual report about exact sales of each brand, and no common method presence to categorizing automotive products in sub-categories' group this index has to change to:

$$H = \left(1 - \sum_{i=1}^{n} {P_i}^2\right)$$

Where P_i being the proportion of different automobiles' models count under the each sub-category i, and also P_i should be the proportion of different automobiles' models count under the each brand's name i. After entering companies' information into this formula, three pitfalls has been found; the first one occurred when one company doesn't produce automotive in one or more sub-categories, in this situation, that sub-category spontaneously being abolished so it shows that company is more diversified than other company which has products in more sub-categories but the proportion of products' count in one group is much greater than other sub-categories; second error happened when one company is producing the same number of products under the each sub-categories (models are equally distributed under the each subcategories), and third error emerged when one company just produces in one brand (there is not difference company produce 1 product or more than 100 products), in this situation, the Herfindahl index shows that firm product diversification equal to zero, but in this research, each automobile's model (each model of auto mobile has some different trims) considered as a different product, but related diversification under the same industrial group. However, these errors happened because the Herfindahl index was invented in order to use with different inputs, so by some modification this index can be altered in order to match with this new framework:

$$PDIV = 1 - \sqrt[3]{\frac{2 - \sum_{i=1}^{n} {P_i}^2}{Ng}}$$

Where P being the proportion of different automobiles' model count in production group i, g being number of sub-categories or brands that a company has been producing automobiles, and N is the sum of all models that have been manufactured by one company. As it mentioned this new way of measuring has three different inputs so it named as the 3D measure for product diversification (Appendix).

After gathering the data from at least four reliable sources all the information was consolidated for each company under their brand names, then brands were counted as well as automobile models for each company for further data procedure (Figure 1). In addition, automobile models are clustered in the five main sub-categories for each company as cars, crossovers and SUVs, vans, pick-up trucks, and hybrids and electrics (Figure 2). Product diversification is measured through two different ways, first by counting all the automobiles' models manufactured by each company, and second by putting automobile models count under the each brands' names in the enhanced formula that this paper refers to as the 3D measure for product diversification, then sub-categories' models count for each company entered in that formula, and finally, obtained results for each single company are added up and those consolidated numbers are considered as the second factor for product diversification in data analysis processes. All the hypotheses will be tested twice with these two different inputs for each company. The whole data process in this section has been conducted by using the Microsoft Excel program.

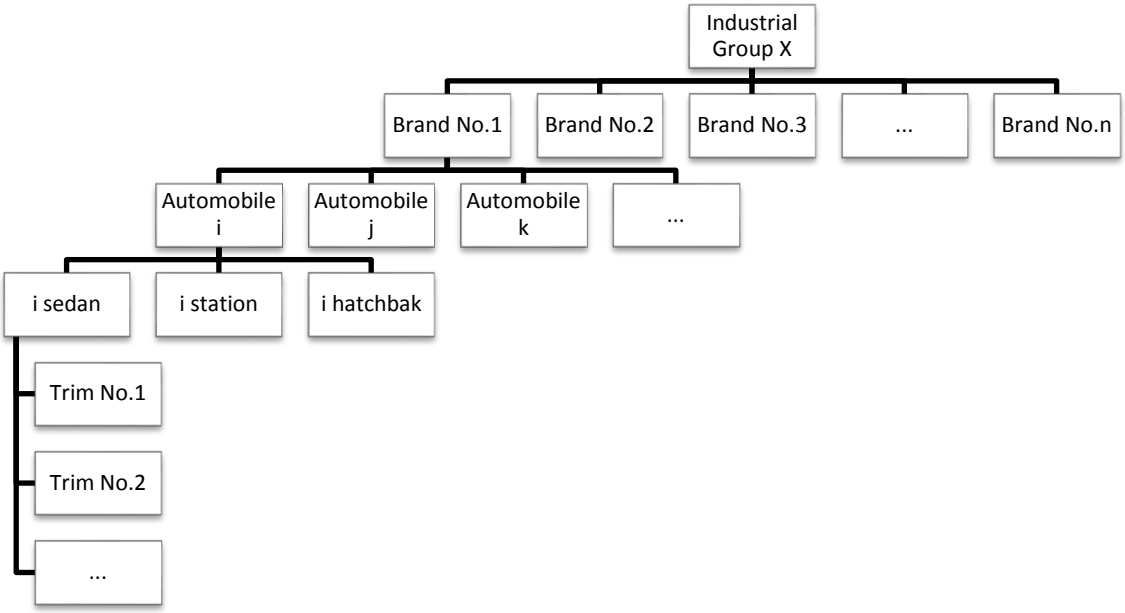

Figure 1: Product Diversification System for Companies with brands multiples
Note: Trims are not counted as a different product

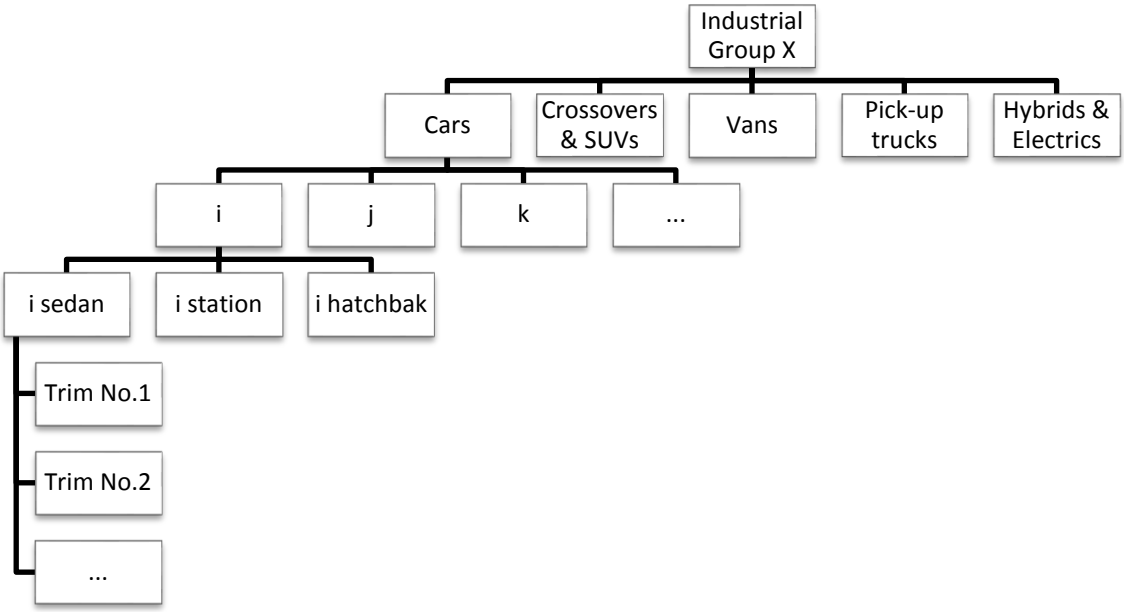

Figure 2: Product Diversification System for Companies using sub-categories
Note: Trims are not counted as a different product

Table 2: Companies product and international diversification data

Company	Number of Models	Number of Brands	3D PD Brands	3D PD Sub-categories	Aggregate PD	Foreign Operations
Toyota Motor	92	5	0.85	0.85	1.70	26
Volkswagen	226	9	0.90	0.89	1.80	26
General Motors	159	10	0.89	0.87	1.77	30
Daimler	57	4	0.81	0.81	1.62	19
Ford Motor	71	2	0.80	0.83	1.63	23
Honda Motor	26	2	0.70	0.76	1.46	7
Nissan Motor	52	2	0.77	0.81	1.58	20
Fiat	118	12	0.89	0.85	1.74	40
BMW	43	3	0.78	0.78	1.56	14
SAIC Motor	12	2	0.60	0.67	1.27	2
Hyundai Motor	26	1	0.66	0.76	1.43	8
Mitsubishi	21	1	0.64	0.71	1.34	30
Peugeot	60	2	0.77	0.83	1.60	12
Renault	47	3	0.78	0.81	1.59	17
Volvo Cars	12	1	0.56	0.61	1.18	4
Kia Motors	21	1	0.64	0.74	1.38	8
Tata Motors	33	3	0.75	0.77	1.51	5
Suzuki Motor	14	1	0.59	0.70	1.28	23
Mazda Motor	22	1	0.64	0.74	1.38	4
Subaru	12	1	0.56	0.61	1.17	2

Notes: Number of Brands is automobile brands count; 3D PD Brands is product diversity which is measured by the new modified index considering brands as production groups; 3D PD Sub-categories is product diversity which is measured by the new modified index considering sub-categories as production groups; Aggregate PD is sum of 3D PD Brands and 3D PD Sub-categories; and Foreign operations is the numbers of countries which companies have automobile manufacturing facilities in them.

4.1.5 Performance Measure

In this study return on sales (ROS) is used as the measure of firm performance as some other researchers used these before like Tallman and Li (1996) and Kaymak (2009). Despite the fact that some automotive companies are active in other financial sections as well, for instance, they are producing heavy commercial trucks, buses, and motorcycles, so consolidated financial information contains some non-automobile related data which will possibly influence results, therefore all the

financial information associated with the automotive industry operations elicited from financial reports published by companies. However, in some companies those differences did not impact the companies' performance noticeably.

4.1.6 Control Variables

The age of companies and logarithm of total assets of companies are used as control variables in this study. The company's age is how long a company has been active in the automotive industry (some companies started their businesses in other sectors primarily and then they were developed or switched into the automotive industry later, such as BMW and Mitsubishi). The logarithm of total assets of a company is represented the size of that company.

Table 3: Return on Sales, Logarithm of total assets, and Age of companies

Company	ROS	A.Log	Age
Toyota Motor	0.038	2.58	79
Volkswagen	0.132	2.61	75
General Motors	0.052	2.17	104
Daimler	0.071	2.33	116
Ford Motor	0.058	2.28	109
Honda Motor	-0.013	2.58	64
Nissan Motor	0.054	2.61	79
Fiat	0.045	2.17	113
BMW	0.102	2.33	96
SAIC Motor	0.163	2.28	17
Hyundai Motor	0.100	2.58	45
Mitsubishi	0.023	2.61	42
Peugeot	-0.039	2.17	130
Renault	0.018	2.33	113
Volvo Cars	0.000	2.28	85
Kia Motors	0.109	2.58	68
Tata Motors	0.089	2.61	67
Suzuki Motor	0.017	2.17	103
Mazda Motor	0.018	2.33	92
Subaru	0.037	2.28	58

*Note*s: ROS is return on sales of 2012 operations; Age is the age of each company; and A.Log is the logarithm of total assets.

Chapter 5

FINDINGS

5.1 Descriptive Statistics

The top twenty global automobile manufacturer companies have been studied by examining the impacts of product diversity, geographical diversity, and the company's age and size on firm performance.

According to the descriptive statistics which are presented in Table 4, companies have on average 56 different automobile models with a minimum of 12 and a maximum of 226 models. The average product diversification is 1.4995 with a range between 1.17 and 1.80. The mean of geographical diversification is 16 countries with a minimum of 2 and a maximum of 40 countries. The mean of ROS as the performance indicator of companies is 5.38% with a range between -3.9% and 16.3%. The first control variable is companies' size which measured by logarithms of total assets of the companies has a mean of 2.395, and 2.17 and 2.61 as minimum and maximum respectively. The age of the company as the second control variable has an average of 82.75 years and a minimum of 17 and a maximum of 130 years.

Table 4: Descriptive Statistic (n = 20)

Variables	Mean	Minimum	Maximum	Std. Deviation
Number of Models	56.20	12	226	55.566
Product Diversity	1.4995	1.17	1.80	.19105
International Operations	16.00	2	40	11.055
Return on Sales	.05376	-.039	.163	.050523
Log of Assets	2.3949	2.17	2.61	.17504
Age	82.75	17	130	28.939

5.2 Results of the Tests for the Proposed Hypotheses

Table 5: Correlation Matrix Analysis

Variables	MC	PD	IO	IO²	IO³	LA	AGE	ROS
MC	1							
PD	**.825****	1						
IO	**.643****	**.668****	1					
IO²	**.612****	**.580****	**.959****	1				
IO³	**.545***	**.503***	**.875****	**.975****	1			
LA	.008	.055	-.100	-.165	-.206	1		
AGE	.311	**.512***	.404	.311	.259	**-.549***	1	
ROS	.215	.103	-.073	-.054	-.50	.284	**-.488***	1

Notes: ** Correlation is significant at the p < 0.01 level (2-tailed).
* Correlation is significant at the p < 0.05 level (2-tailed).
MC is models count or number of models; PD is product diversity; IO is international operations; IO² is international operations square; IO³ is international operations cube; LA is logarithm of total assets; AGE is age of company; and ROS is return on sales.

The bivariate correlations' analysis for evaluating the relationship between the independent variable and dependent variable (ROS) is presented in the Table 5. Regarding the correlation analysis results, there is a positive non-significant relationship between models count (as the first factor of product diversity indicator) and ROS (r = .215, p<.05). Correlation results show a positive non-significant relationship between product diversity and ROS (r = .103, p<.05). A negative non-significant relationship exists between international operations and ROS regarding to the bivariate correlation analysis results (r = -.073, p<.05). In addition, in order to uncover a U-shaped relationship and an S-shaped relationship between international operations and ROS, international operations' square and cubic terms are also tested which yield non-significant negative relationships for both of them between ROS (r = -.54, p<.05; and r = -.50, p<.05 respectively). The correlation between logarithm

of total assets (as the first control variable) and ROS is positive and non-significant (r = .284, p<.05). Finally, a negative and significant relationship is found between the company's age (as the second control variable) and ROS at a significance level of p < .05 (r = -.488).

Moreover, as it is expected, there is a positive and significant relationship between models count and product diversification at a significance level of p < .01 (r = .825). The relationship between model counts and international operations, and international operations square and cubic terms are positive and significant (r = .643, p < .01; r = .612, p < .01; and r = .545, p < .05 respectively), and also a positive and significant relationship at a significance level of p < .01 are found between product diversity and international operations (r = .668), international operations square (r = .580), and at a statistical significance level of p < .05 for the cubic term of international operations (r = .503); therefore the third hypothesis which was postulated there is a positive correlation between the geographical scope of international operations and the extent of product diversification is supported by both of the product diversity indicators.

In addition, there is a positive and significant relationship between product diversity and company's age at a significance level of p < .05 (r = .512). Lastly, the correlation results show a negative and significant correlation between logarithm of total assets and company's age at a significance level of p < .05 (r = -.549). Correlations between different terms of international operations (square and cubic terms) are the axiom, because all numbers are more than zero so correlations between simple numbers, square and cubic terms of those numbers have to be exist.

As it mentioned in chapter 3, all the hypotheses have been tested six times due to the presence of two factors for indicating the company's product diversity, and three different terms of international operations in order to uncover different kinds of relationship between international diversity and ROS. Accordingly, the VIF (variance inflation factor) analysis has conducted twelve times which indicates that there is no correlation between the predictor variables as no sign of multicollinearity has been observed in the results. In this study none of the measured VIF values exceeded than 2.2 for the all models which is much lower than 4 as the multicollinearity limit of warrants further consideration, and also far lower than 10 which indicates a serious correlation between independent variables.

According to the existence of two inputs as product diversification factors and three different terms of international operations' inputs, twelve different linear regression analysis have been run; the first group of linear regressions has been conducted by the models count as the dependent variable (Table 6) and the second group has been conducted with product diversity as the dependent variable (Table 7). Also in order to test the relationship between the geographical scope of international diversification and product diversity six more regressions have been analyzed which are represented in Table 8 and Table 9.

Table 6: Linear regression analysis Group I with ROS as the dependent variable (*n* = 20)

Independent variables	Coefficients	t-statistics
Number of Models	.512	1.936*
International Operations	-.156	-.575
Log of Assets	-.081	-.332
Age	-.630	-2.371**
R^2	.406	
Number of Models	.543	2.072*
International Operations^2	-.201	-.785
Log of Assets	-.115	-.469
Age	-.659	-2.581**
R^2	.416	
Number of Models	.530	2.096*
International Operations^3	-.191	-.785
Log of Assets	-.131	-.525
Age	-.676	-2.649**
R^2	.416	

Notes: ** Significant at significance level of $p < 0.05$.
* Significant at significance level of $p < 0.10$.
All the coefficients are standardized beta.

According to the results, the regression analysis yield that the independent variables (model counts, international operation diversity, logarithm of total assets and company's age) explain 40.6 percent (*R* square) of the variance of corporate performance (ROS), and yield *R* square equal to .416 for both models when the square and cubic terms of international operations are substituted for international operations. The t-test results in the first group of regression analysis represent a positive and significant impact of product diversity on ROS which is stated in the first premise. Accordingly, the first hypothesis is supported with a significant level of $p<.10$.

The second hypothesis was proposed to indicate whether there is a positive relationship between the geographical scope of international operations and the financial performance. The t-test results in the first group of regression analysis show the geographical diversity of company affects ROS negatively but not significantly. According to the *R* squares (both are .416) and the t-test results (both are -.785), this non-significant negative relationship tends to be inverse U-shape or S-shape more than linear form. Consequently, the second hypothesis is not supported with a statistical significance level of $p<.10$.

Beyond the first two hypotheses, results of the t-test of the first group of regression analysis also indicates a negative and significant relationship between the company's age and ROS with a significance level of $p<.05$. Moreover, the first group of regression analysis does not find any significant relationship between firm size (logarithm of total assets) and the ROS of companies.

Table 7: Linear regression analysis Group II with ROS as the dependent variable (*n* = 20)

Independent variables	Coefficients	t-statistics
Product Diversification	.756	2.476*
International Operations	-.224	-.873
Log of Assets	-.302	-1.174
Age	-.951	-3.219**
R^2	.473	
Product Diversification	.785	2.618*
International Operations²	-.255	-1.066
Log of Asset	-.353	-1.337
Age	-1.005	-3.374**
R^2	.485	
Product Diversification	.774	2.652*
International Operations³	-.250	-1.089
Log of Assets	-.373	-1.385
Age	-1.025	-3.401**
R^2	.486	

Notes: ** Significant at significance level of $p < 0.01$.
* Significant at significance level of $p < 0.05$.
All the coefficients are standardized beta.

The second group of regression analysis indicates that the independent (product diversity, international operation diversity, logarithm of total assets and company's oldness) variables explain 47.3 percent (*R* square) of the variance of financial performance (ROS), and also shows *R* square equal to 48.5 percent for the model with square term and R square equal to 48.6 percent for the model with cubic terms of international operations are substituted instead of international operations.

Similar to the first t-test results in the regression analysis, the second group t-test results shows a positive impact of product diversity on ROS which is stated in the first hypothesis with a statistical significance level of $p<.05$. As it obtainable, the product diversity which was measured by new modified formula yields a greater statistical significance level in comparison to the simple models count.

There is no support found for the second hypothesis in the second group of regression analysis t-test results, however, the international operations diversity slightly affects ROS negatively and does not even reach a statistical significance level of $p<.10$. According to the *R* squares and the t-test results, this non-significant negative relationship inclines to be S-shape more than linear and inverse U-shape form.

Similar to the first regression analysis group t-test results, there is a negative and significant relationship between the company's age and corporate performance with a statistical significance level of $p<.01$. In addition, the second regression analysis group also does not uncover any significant relationship between firm size (logarithm of total assets) and the ROS of companies.

Table 8: Linear regression analysis Group III with models count as the dependent variable ($n = 20$)

Independent variables	Coefficients	t-statistics
International Operations	.596	2.862*
Log of Asset	.155	.623
Age	.153	.669
R^2	.433	
International Operations^2	.568	2.873*
Log of Assets	.252	1.120
Age	.273	1.171
R^2	.435	
International Operations^3	.519	2.564*
Log of Assets	.304	1.300
Age	.344	1.452
R^2	.393	

Notes: * Significant at significance level of $p < 0.05$.
All the coefficients are standardized beta.

According to the third linear regression analysis group results which represented in Table 8, the independent variables (international operation diversity, logarithm of total assets and company's age) explain 43.3 percent (*R* square) of the variance of models count as dependent variable, and also by substituting square and cubic terms of the international operation diversity *R* square shows 43.5 and 39.3 percent respectively.

The t-test results in the group of regression analysis indicate that there is a positive and significant relationship between scope of international diversity and models count at the statistical significance level of $p<.05$, accordingly, the third hypothesis which proposed to analyze the positive relationship between product diversity and scope of international operations is supported with that statistical significance level. In addition, there are very slight differences between *R* squares and t-statistic values which are obtained from substituting different terms of international diversity, however, those differences show the relationship between international diversity and product diversity (which is obtained from model counts) tend to be inverse U-shape.

Moreover, the third group of linear regression analysis does not show any significant relationship between those two control variables (logarithm of total assets and company's age) and models count as the dependent variable.

Table 9: Linear regression analysis Group IV with product diversification as the dependent variable (n = 20)

Independent variables	Coefficients	t-statistics
International Operations	.494	2.905*
Log of Assets	.530	2.620*
Age	.396	2.126*
R^2	.623	
International Operations²	.463	2.848*
Log of Assets	.478	2.584*
Age	.631	3.287**
R^2	.618	
International Operations³	.432	2.626*
Log of Assets	.521	2.737*
Age	.686	3.559**
R^2	.598	

Notes: ** Significant at significance level of $p < 0.01$.
* Significant at significance level of $p < 0.05$.
All the coefficients are standardized beta.

Finally, the fourth linear regression analysis group shows that the independent variables (international operation diversity, logarithm of total assets and company's age) explain 62.3 percent (*R* square) of the variance of product diversity as dependent variable, and furthermore by substituting square and cubic terms of the international operation diversity *R* square equals 61.8 and 59.8 percent respectively.

Similar to the third linear regression analysis group, the fourth linear regression analysis also supports the third proposed hypothesis that indicates that there is a positive and significant relationship between product diversity and the scope of international operations at a statistical significance level of $p<.05$, and it is more inclined to be a linear rather than non-linear relationship.

In addition, the fourth linear regression analysis also shows a positive and significant relationship between control variables (logarithm of total assets and company's age)

and product diversity as the dependent variable at the statistical significance level of $p<.05$, $p<.01$, and $p<.01$ respectively.

In summary, twelve linear regression analysis have been conducted, the first linear regression analysis support the first proposed hypothesis at the statistical significance level of $p<.10$; the second linear regression analysis also support the first proposed hypothesis, but at the statistical significance level of $p<.05$; and both the third and the fourth groups of linear regression analysis indicate a positive and significant relationship between product diversity and the scope of international operations at the statistical significance level of $p<.05$, so the third proposed hypothesis is supported by both of them. There is no support for the second proposed hypothesis, nevertheless, the regression analysis indicate a negative relationship between international operations and ROS, but not significant at the statistical significance level of $p<.10$, and this relationship tends to be inverse U-shape or S-shape more than linear form. Additionally, a negative and significant relationship between the company's age and corporation performance (ROS) uncovered by the first and the second groups of linear regression analysis, at the statistical significance level of at the statistical significance level of $p<.05$ and $p<.01$.

Chapter 6

DISCUSSION

In this study the first hypothesis which postulates that a higher level of product diversity has a positive impact on the company's financial performance in the automotive industry was supported. Several researchers in the product diversification context have found a positive linear relationship between product diversification and firm's performance (e.g., Park, 2003; Miller, 2006; Elsas et al., 2010; Kuppuswamy and Villalonga, 2010). Rumelt (1974) and Bowman (1982) believed that managers employ product diversification in order to enhance a further company's financial performance when a company is in an unprofitable industry. According to the resource-based view a firm can undertake a specific type of diversification strategy and its performance depends on its pool of resources and capabilities, consequently, a new international perception has emerged that emphasizes firms' motives to exploit their pool of capabilities and resources through related business diversification (Wan et al., 2011). The resource-based view also postulates that related product diversity should yield superior financial performance for companies in comparison to unrelated product diversity and single business strategy (Rumelt, 1982; Wernerfelt, 1984; Barney, 1991; Wan et al., 2011). Regarding the context of this study, related product diversity has been examined, therefore, in general form, this study found a positive linear relationship between related product diversification and the company financial performance. Tallman and Li (1996) suggest that the product diversification and company performance is more multifarious than the linear relationship which has

been used in most studies, however, their findings support that the related diversification has a positive impact on companies financial performance.

According to this study correlation test, there is a positive relationship between firm's age and the level of product diversification in the automotive industry, which should arouse from the company's experiences and knowledge which has been accumulated over the years, on the other hand, the regression analysis shows a negative correlation between the company's age and financial performance (this relationship tend to be an inverse curvilinear shape), it also displays a positive relationship between the level of product diversity and financial performance coincidentally. Hence, if a company able to accelerate its normal trend of product diversity growth may obtain a superior financial performance.

In the context of the firm's age and performance relationship, this research found similar results with some of the prior studies. For example, Cooley and Quadrini (2001) found that financial constraints make firms unable to raises all the capitals required for the marginal product of capital to equivalent its opportunity cost, therefore, the firm's marginal product decrease as the firm's capital increases over time. Pastor and Veronesi (2003) explain this negative relationship by proposing a risk argument. According to this view, as the firm get older, investors' uncertainty becomes lower consequently (Berger and Udell, 1990). According to the decrease in investors' uncertainty, the variability of stock return is negatively associated with the listing age (Cheng, 2008) and incorporation age (Adams et al., 2005). Expected rates of return alters with risk, by risk reduction, the required rate of return decreases, therefore, as a company gets older, financial performance is expected to decline. In addition, Finkelstein and Hambrick (1990), and Graham, Harvey, and Puri (2008)

also found this negative relationship arise from managers become older as firm aging.

The second hypothesis of this study was constructed to examine the relationship between the company's operation international geographic diversity and financial performance in the global automotive industry, and was postulated that there is a positive relationship between those factors in that industry sector. Conversely, the linear regression analysis found that there is a negative and non-significant relationship between them and this relationship was more likely to be non-linear. Considering Lu and Beamish (2004), who uncovered that international geographical diversification is negatively impact the firm's financial performance, whereas geographical diversification at moderate levels is associated with higher financial performance. According to the transaction cost theory, costs that derive from diversification chiefly arise from the internal transaction costs. Diversified firms are more likely to be complex and also have to deal with more complicated issues, such as various markets' regulations, cultural differences in organization behaviors and customer needs, and various natural environments (Egelhoff, 1982; Jones and Hill, 1988; Hitt et al., 1994). According to Buckley and Strange (2011), the internal transaction costs may significantly increase in dealing with factors such as, coordination, motivation, and information costs.

Other researchers like Wernerfelt and Montgomery (1988), Berger and Ofek (1995), and Denis et al. (2002) also found a negative relationship between international geographical diversification and firm performance. Some other studies have postulated a non-linear correlation between firm performance and geographic diversification like Gomes and Ramaswamy (1999), Kotabe et al. (2002) found an

inverse U-shaped relationship. Conversely, a U-shaped relationship between the level of geographic diversification and firm performance was uncovered by Capar and Kotabe (2003). Bausch and Krist (2007) found that effect of international geographic diversification on firm financial performance is depending on other causes, such as the level of product diversification, the company's age, firm size, and the country of a foundation.

According to the third and the fourth group of regression analysis t-test results, this study found a positive and significant relationship between product diversification (which is related product diversification) and international geographical diversification in the global automotive industry, this relationship was linear rather than non-linear. As it mentioned before in the literature review, this relationship is expected to exist because both product and geographical diversification absorb existing resources and capabilities of the company. Considering the resource-based view (RBV) diversification empowers companies to exploit the economies of scope of many resources (Penrose, 1959; Panzar and Willing, 1981; Teece, 1980, 1982; Wernerfelt, 1984; Peteraf, 1993; Tanriverdi and Venkatraman, 2005), accordingly firms that can diversify along both product and geographical extent may be in a positive exploit to several opportunities (Kumar, 2009).

While this study found a positive and significant linear relationship between product diversification and company performance, and a negative non-significant relationship between international scope of geographical operations diversity and company's performance, it also uncovered that there was a positive and significant relationship between international geographic and product diversification in the automotive industry. Hence, as the international operations of a company are extended, the

degree of product diversification increases, and with the product diversity growth, the company's performance is expected to enhance. Accordingly, it gave the impression that geographic diversification alters the company's performance in a non-linear manner in the automotive industry, and findings in this study are in agreement with Lu and Beamish (2004) finding that suggests that geographical diversification negatively influence the firm's financial performance, whereas geographical diversification at moderate levels is associated with higher financial performance.

Moreover, the fourth group of regression analysis yields that there were positive and significant relationships between company size and age, and the extent of product diversity in the global automotive industry. These relationships are expected to exist due to the company's demand of facilities in order to manufacturing more models, and an accumulation of knowledge during the years may seem as a requisite factor in the quest to produce various types of automobiles.

Based on the existence of a negative and significance relationship between the company's financial performance and age, and a positive and significant relationship between the company's degree of product diversity and age in the automotive industry simultaneously, it can be said that there is an equilibrium point between these two factor in which the company financial level is at an optimal level. Consequently, when a company is aging, its accumulated knowledge in the automotive industry enables that company to produce more models, and this condition continues up to an optimal level, and after that deteriorates the positive impact of product diversity on performance. This optimal level exists due to knowledge often becomes obsolete after a technological alteration across the whole

industry. For instance, in the past most of the automobile's parts had been assembled by humans while today most of those processes have been done by robots. Thus, after a specific period of time companies have to synchronize their existing knowledge with new technology in order to remain in the competition.

Lastly, the correlation matrix analysis shows a negative and significant relationship between firm's age and logarithm of total asset (as a company size indicator). It shows that as a company is older the relative size of that company is smaller than the younger ones in the automobile industry.

In this study, as it mentioned before, only twenty companies which operate in the global automotive industry have been analyzed. The sample is chosen from the global top 25 automotive corporations from their 2012 annual profits. However, a bigger sample size may bestow more conclusive final results. For example, geographical diversification negative impact on the company's performance might become statistically significant while studying fifty companies instead of accumulated. Furthermore, this study just investigated in the top global automotive companies which have been operated internationally; consequently market diversification for all of them is chiefly the same, so there was limited difference in the geographical market diversification measure (as other aspect of international geographical diversification). This drawback can be abolished by adding domestic automobile manufacturers which are just operating in one country and selling their automobiles to a narrower market than the global market into the sample; additionally, this act may enable researchers to find out the difference between multinational and domestic companies' performances in the automotive industry.

Besides, this study examined the relationship between variables for the year 2012 while in most academic studies, the panel data technique is used for a minimum three to five years. Therefore, observing one year data for this analysis is not enough and may appear as a statistical artifact in which outcomes are established on insufficient evidence. However, collecting data in this industry was not straightforward, all the data had to collect from difference sources and collected data for each company had to be compared many times with the other sources in order to reach higher accuracy. In addition, using more than one year data in the automotive industry appears to be arduous due to transferring ownership were frequently happened during the previous years, and made data collection somewhat impossible.

In this study ROS (ratio of profit to total sales revenue) is used as the only financial variable to indicate the financial performance which is calculated for the 2012 fiscal years. However, prior studies are used often ROE, ROA, and Tobin's *Q* on the basis of three or four years in order to make the analysis more reliable. For instance, Hitt et al. (1997) had used ROA as their research dependent variable, Elango et al. (2013) chose ROE as the financial performance indicator, Lu and Beamish (2004) had used both ROA and Tobin's *Q*, and Greene and Segal (2004) chose both ROA and ROE.

This study analyzed the global automotive industry, so what has been analyzed and concluded in this study should not be generalized to other industries, settings, time periods and also domestic automobile manufacturers. Though, other industries have dissimilar market demands and also different manufacturing's conditions, results of this study not applicable for them. Thus, researchers ought to be cautious about the way they desire to generalize from a particular outcome.

Chapter 7

CONCLUSIONS

Studying the relationship between diversification and firm performance has been one of the most heavily researched areas in the strategic management context; however, there is no consensus on the findings of this sphere of study. This research was trying to analyze the relationship between product and geographical diversification and company's performance which was measured by return on sales (ROS) in the global automotive industry.

This study measured product diversity from three different aspects: the number of models (total models count) a company has been developed as the first measure; product diversity degree with considering the models count under each brand names (automobile brands) which are operating under the same production group (for instance, Volkswagen had been produced 226 models under 9 automobile's brand names); and the degree of product diversity with considering the number of models a production group is producing under each of the five sub-categories (cars, crossovers & SUVs, vans, pick-up trucks, and hybrids & electrics). The scope of international geographical diversification was measured by the number of countries in which a company had manufacturing facilities. Moreover, the company's age and size also analyzed in this study as control variables. The basic goal behind this study was finding the reasons of recent years' fluctuation in the automotive industry's

companies' financial performance from the extent of diversification employed by each company.

Furthermore, the descendants in this industry struggle to maximize their profits and somehow they have prospered (like SAIC Motors). On the other hand, some forerunners are partially less profitable in comparison to these new entrants (for example, Peugeot). Coincidently, these newcomers are less diversified in both extents (product and geographical).

The findings suggest that the degree of product diversification has a positive impact on the financial performance of a company, which is in agreement with Park (2003), Miller (2006), Elsas et al. (2010), Kuppuswamy and Villalonga (2010) in their studies of product diversification. Results also show a company's age influences that firm profitability negatively, which is in the line with (Berger and Udell, 1990), Cooley and Quadrini (2001), Pastor and Veronesi (2003), Adams et al. (2005), Cheng, (2008), and Holderness (2009) studies on firm age. This negative relationship between a company's age and performance may be considered as one of the substantial reasons which caused inferior relative companies' performance when compared to antecedents and descendants' financial performances. Therefore, the positive impact of product diversification on firms' performance deteriorates chiefly due to the presence of this negative relationship between firms' age and performance.

Besides, a negative and insignificant relationship between geographical international diversity and financial performance was uncovered by this research across the automotive industry, and this non-significant relationship has a tendency to be non-linear. According to Lu and Beamish (2004), geographical diversification is

negatively impact the company's financial performance, whereas geographical diversification at moderate levels is associated with higher financial performance.

Beyond the first and the second premises of this study, a positive and significant relationship was exposed in this study which is in agreement with the resource-based view which postulates that diversification enables companies to exploit an economy of scope in many resources (Penrose, 1959; Panzar and Willing, 1981; Teece, 1980, 1982; Wernerfelt, 1984; Peteraf, 1993; Tanriverdi and Venkatraman, 2005). Regarding the positive relationship between two types of diversification and the negative relationship between geographic diversification and financial performance, this conclusion can be obtained that these two types of diversification buttress company financial performance up to an optimal point, but after that point the negative effect of geographical diversity deteriorate the aggregate impact of both form of diversity.

Additionally, a positive and significant relationship was found between age and product diversification. Though the company's age also had significant negative effect, after a specific point this negative impact outweighs that positive impact over product diversification, consequently, declines financial performance in the automotive industry.

7.1 Implications for Managers

The findings of this study may help managers and strategic decision makers in the global automotive industry, to realize and schedule further diversification strategies. For the currently highly geographically diverse companies, it may be extravagantly costly to shut down current facilities; however, managers should not opt to scatter

their facilities over more places. On the other hand, those who are less geographical diversified ought to concern the negative impact of geographical diversification, and try to nullify it by exploit existing capabilities, such as through product diversification. Additionally, western auto manufacturers often try to employ more international and product diversification than their eastern competitors. This fact may represent different methods which practiced by these companies to supply their customers' demand. In view of that, the customers' taste appears as one important aspect that companies should be taken into account, and also characteristics of different markets should be scrutinized more profoundly.

According to the results, product diversification appears to be constructive to leverage in the less product diversified auto makers. However, more models need more facilities, and this fact may send this signal to companies that establishing manufacturing facilities abroad in order to take advantages of other countries' regulations and environments, such as lower tax rates and labor wages, and cutting the transportation cost by choosing the countries which already have more demand for that company's automobiles. Considering the insignificant negative geographical diversification impact, it gives the impression that managers should establish their facilities in foreign countries in which manufacturing operations impose less cost compared to the home country. However, the highly product diversified company should modify their degree of product diversification more precisely; indulging in enormous models requires a cogent reason behind it. Hence, whenever managers realize a demand for producing more models they should be cautious whether this extension over the model variety needs more facilities. Nevertheless, if that simply helps by exploiting current capacities and resources, they should opt to produce more models.

Finally, as this study found a substantial negative relationship between companies' age and performance, managers ought to offset this impact by using other instruments they possess. Although this negative impact between age and financial performance noticeably abates by higher product diversity (which is happened consequently by a firm aging), managers should countervail remained deteriorating impact of age by other financial instruments. As it is obvious, there is no way to stop a firm aging, therefore, a well-timed strategic future plan is indispensable in order to reach future higher relative performance.

7.2 Further Research Areas

Due to the inconclusiveness in some part of this study, further studies which analyze this subject by considering more variables and also employs larger sample size may provide better insight. In this exact industry context, differentiating between domestic and multinational automobile manufacturer might open the path to uncover a clearer relationship between international geographical diversity and financial performance. Moreover, examining other elements such as research and development measures, country of foundation, and also the corporate culture of companies may yield significant relationships between these variables and performance. Furthermore, further research from other viewpoints that include economic and marketing variables might convey additional implications in this industry.

Last of all, in the aim of finding more general implications on the diversity and performance issue, further studies should comprise data from diverse industry contexts and analyze them. These analyses may bestow particular inferences in this subject for each industry as well.

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APPENDIX

Herfindahl index:

$$H = \left(1 - \sum_{i=1}^{n} {P_i}^2\right)$$

Substituting $P = \left(\frac{n}{N}\right)$ by $P' = \left(\frac{N-n}{N}\right)$ and remove 1 from the first of the formula:

$$H' = -\sum_{i=1}^{n} {P'}_i^2$$

$$-g < -\sum_{i=1}^{n} {P'}_i^2 < g$$

$${P'}_i = \frac{N_i - n_j}{N_i}, n_j \geq 0,\ N_i > 1$$

$g =$ Number of total production group (brand names' or sub-categories)

$g \geq 1$

Accordingly new formula outputs will be between –g and g (, for lead outputs between 0 and 1 it should alter like below:

$$0 \leq 1 - \sqrt[3]{\frac{g - \sum_{i=1}^{n} {P'}_i^2}{N_i {g'}_i}} < 1$$

g' = number of categories in which company has been produced at least one product

So,

$$H' = 1 - \sqrt[3]{\frac{g - \sum_{i=1}^{n} {P'}_i^2}{N_i {g'}_i}}$$

Due to sake of simplicity new formula should rewrite like below:

$$H' = 1 - \sqrt[3]{\frac{2 - \sum_{i=1}^{n} P_i^{\,2}}{N_i g_i}}, \qquad P_i = \left(\frac{n_j}{N_i}\right), n_j \geq 1, N_i \geq 1$$

g = number of categories in which company has been produced at least one product