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The impact of marketing and R&D investments on the financial performance of firms

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SUMMARY

Abstract

The market expansions, the great technological developments, and the continuous fluctuation in consumer needs have led to increasing competition between companies in various fields. Therefore, companies are required to put a large amount of energy and expenditures on marketing investment and research and development (R&D) in order to achieve success measured as sales and profitability. Relying on the theory of marketing firms, this dissertation focuses on investigating the joint and separate effects of each of the firm investments in marketing and R&D on market share and return on assets in different time frame. For this purpose, a sample of 10,197 publicly traded companies in the United States and the United Kingdom over 18 years, enabled panel analysis with generalized estimating equations, with two dependent variables (market share and return on assets). This dissertation sample includes 12 different business sectors in two locations (UK and USA) as control variables, in addition to controlling the total assets and the relative competitors in the industry. The results of the dissertation display that there are separate and joint positive effects of expenditure in R&D and marketing investments on the firm financial performance. However, their effects do not occur in the same proportion. The importance of this dissertation and its contribution comes from its study of the mutual as well as the separate effects of investment in R&D and marketing on the firm financial performance, within a lag of 4 years period. It is expected to contribute to highlighting the important role of investment separately and jointly in R&D and marketing on the firm financial performance.

Keywords: R&D investment, Marketing investment, financial performance, firm performance.

1. Introduction

At the time of current economies, globalization, and high-velocity technological developments, many changes and challenges happened in the amount of concurrence leading to pressures of efficiency (Elango & Pattnaik, 2013). Firms that do not respond appropriately to the new entrants and competitive conditions tend to fail. On the other hand, firms that respond well can prosper in such circumstances. Therefore, such environments may spell opportunity or demise for firms, depending on their strategic responses and the ability to adapt well to changing and challenging situations (Foxall, 2019).

To obtain a lucrative position in the market and to have a remarkable market share in the long run, a firm should have an investment mechanism and optimize the balance between investments horizons, growth goals and acceptable risk (Davcik & Grigoriou). For this end, it is mostly true that diversification of assets activities and resources increases profits and shareholder value as well as stock returns and firm value (Sridhar et al., 2014).

In this vein, marketing capabilities allow a firm to deepen its customer relationships, expand its market share, and enjoy greater financial gains (Chen, 2012). Similarly, research and development (R&D), as true value driver, is one of the potentials of firms' value creation and competitive advantage. It creates new technologies, products, and solutions designed in order to satisfy customer needs (Kor & Mahoney, 2005). The interdependency and integration of both marketing with R&D have a positive effect on the effectiveness of better and new product development (NPD) performance (Leenders & Wierenga, 2008) and enable firms to have differentiation and innovation that are important drivers to shape a brand's performance (Davcik and Sharma, 2015). This involves creating a brand that is perceived to be unique and distinctive in comparison to others on offer (Davcik & Grigoriou, 2019).

1.1. Problematization

In the current economic interactions and the fierce competitiveness, companies have no options but to enhance their capabilities, and financial returns through carrying out activities like investment in innovation and to give priority to marketing investment in order to maximize revenue and profitability (Chan et al., 2014). Nevertheless, managers face pressure from investors to reduce costs and increase current profits, which leads to a reduction or fall in marketing and R&D costs, both together because marketing and R&D are included in the expenses item in the balance sheet (Chung & Low, 2017).

As customers are the most valuable asset for firms, competitive advantages stemming from practices designed to increase customer satisfaction are important to increase financial performance and profitability (Kosan, 2014), Firms try to increase their performance by spending on marketing activities and R&D. In this regard, once a company heavily invests in R&D to create a new product or service, it enjoys a higher return if the innovation can be marketed on a larger scale. the relevant results of such an activity confirm the positive relationship between a business's R&D expenditure and its financial performance. (Sridhar et al., 2014). With regard to marketing investments, they have significant effects on brand performance leading to a lucrative position in the market and yielding premium prices and market (Davcik & Grigoriou, 2019).

Firm size mostly has a positive impact on the propensity to invest in intangible assets. Large firms are better able than small ones in making use of economies of scale in intangible assets accumulation. They can be more effective in protecting their intangible stock, and thus have a greater incentive to invest (Arrighetti et al., 2014). This advantage, however, does not mean that a larger firm will always outperform the small firms in terms of innovation because the progress of the technological process in the former might be hindered by routine bureaucratic procedures. Moreover, the size of the company also plays a role in the relationship between investment in marketing and firm profitability (Sharma et al., 2016). This relationship has already been tested by some researchers like Jaisinghani & Kanjilal (2019), who found out that this relation is positive in the small-sized firms, unlike the larger sized firms in which investment in marketing negatively affects the firm profitability.

At the administrative level, managers 'decisions regarding investment and innovation might be influenced by the impact of such decisions on their position in the firm. Besides the firm's goals, managers also strive to achieve their personal goals and what guarantees their job security, which is mainly related to immediate results in the short term. While the results of investments in R&D often need a long time to be materialized. This may lead managers to reduce their spending on marketing and R&D favoring short-term profitability.

This in turn raises some questions: Which of the two investments (R&D or Marketing) has the greatest effect on market share and return on assets (ROA)? Can these effects interact and affect indicators of the firm's financial outcome in a different time frame? Over time, does the effect of marketing investment on market share differs from the effect of R&D on market share and what is the importance of having different effects in subsequent years? Although the answers to these questions are somehow controversial, it is important to highlight them in order to come to the conclusions of this dissertation.

Notwithstanding that many researches have studied the effect of investment on R&D and marketing on firm performance, there is still a big gap in current literature as most of the relevant researches concentrate either only on R&D (Ehie & Olibe, 2010; Lantz & Sahut, 2005; Vanderpal, 2015; Elnasri & Fox, 2017) or only on marketing (Cook & Talluri, 2017; Hughes et al., 2019; Kumar et al., 2011; Lee & Yoo, 2012; Sacui & Dumitru, 2014; Pucci et al., 2015) despite that both of them are interrelated. Furthermore, some researchers discuss the separate effects of R&D and marketing on the firm performance without discussing their joint effects (Lin et al , 2006; Chen, 2012; Chan et al, 2014; Chen et al, 2016; Peterson & Jeong, 2010) or ignoring the separate effect and only discuss the joint effect (Li, 1999; Grimpe et al., 2017; Leenders & Wierenga, 2008; Shim et al., 2016; Rubera et al., 2012). Another gap is that some researchers studied lag is short despite the fact that the outcomes of investment with regard to firm performance need more than one year to start to appear (Chakravarty & Grewal, 2011; Chan et al., 2014; Chen, 2012; Gemser & Leenders, 2011; Chen et al., 2016). Moreover, a gap appears as researchers focus only on a certain sector (Chen, 2012; Heil & Bornemann, 2017) when they discuss the effects of marketing and R&D, despite the possibility that these effects can appear in several sectors at the same time.

Out of what is abovementioned, comes the importance of this dissertation and its contribution. It studies the mutual as well as the separate effects of investment in R&D

and marketing on the firm financial performance represented by the return on assets and the market share, within a lag of 4 years period beginning when the firm starts to invest. It uses 12 different business sectors, firms in different locations (namely UK and USA), total assets and the relative competitors in the industry as control variables. The dissertation is based on the theory of marketing firms, so that to probably help in having a more accurate understanding of the impact of firm activities on financial performance.

1.2. The objective

In the light of the relevance of R&D and marketing investment, the objective of this dissertation is to study the joint and separate effects marketing and R&D investments on market share and return on assets in a different time frame.

2.Literature Review

According to Schumpeterian approach, innovation creates market-based advantages as well as the advantages that are linked to superior financial performance. In addition, marketing theory generally asserts that for a firm, to increase customer satisfaction and to be successful, it needs to provide products that are superior to the competition (Gök & Peker, 2017). The firm is supposed to respond to the consumer choices and needs as well as achieving its financial goals. To be competitive and fulfil the commercial objectives, it is obliged to practice marketing-oriented management (to secure resources from other functional areas) or customer-oriented management. It is required to harmoniously bring together the various firm's functions and integrating them into an output and marketing mix (Foxall, 2019) . In this connection, to reach and maintain the consumers, to achieve good performance and to move from an investment-driven stage to an innovation-driven stage, firms are required to spend more and invest in R&D and marketing (Ho et al., 2005).

2.1. Firm innovation

Worldwide speedy and fundamental changes in regulation and technology make it increasingly difficult for firms to compete successfully, secure competitive advantage, and enhance their innovative capabilities (Pérez-Luño et al., 2011). Innovation, often seen as synonymous with technological development (Audretsch et al., 2014), is not an ideology for the maximization of the marketing department or function but a philosophy of integrating the firm's functions to achieve its objectives (Foxall, 2019). It is argued

that for its continuation, a firm is increasingly dependent on its ability to develop and innovate (Leenders & Wierenga, 2008) and that only after innovative strategies been successfully implemented that it can reach a superior competitive position, gain sustained long-term advantage, and cultivate leadership over competitors (Chen, 2012). It can create an advantage by making use of the dynamic marketing capability (DMC) to generate revenue by satisfying current customers, exploiting existing products, distribution channels, and advertising existing brands (Sharma et al., 2016), as well as making use of the important resources of marketing assets. The various marketing resources, whilst they differ in their overt and tacit contribution to competitive advantage (Foxall, 2019), are important drivers of a firm's business strategy in order to gain a competitive advantage over direct or latent competitors and lead to better performance (Davcik & Sharma, 2016).

For survival and growth, firms have to ensure a sufficient level of innovation, technological and marketing resources so that to launch and effectively use new product resources and capabilities that maximize their return (Leenders & Wierenga, 2008). The related marketing assets in this process include information, intelligence, and knowledge (Foxall, 2019). Innovation is a major driver of business growth and expansion that allows the firm to become more adaptive and develop the ability to learn, exploit new ideas (Sharma et al., 2016) and leads it to move the economy away from its equilibrium position and cause it to expand (Audretsch et al., 2014). Innovation allows firms to not only develop new market segments and expand its current market segments and product (Sharma et al., 2016), but also enables marketing strategists to win customers as well as markets and use assets and competencies to bring in immense value to the firm (Kanagal, 2015).

Firms with a history of increased efforts to innovate may gain a strategic competitive advantage over their counterparts that show weak commitment to intense resource deployments (Rubera & Tellis, 2013). Innovative firms are more likely to grow and survive than the non-innovative ones (Eiriz et al., 2013), tend to have new markets and higher sales growth rates (Audretsch et al., 2014). They can maximize their current market share (Hanaysha & Hilman, 2015) depending on R&D as driver to innovate or redesign manufacturing processes that lower production costs, improve product quality (Chen, 2012). Through innovation, firms can respond to the consumer requirements (Rajapathirana & Hui, 2018), create trademark that can meet his expectations (Daragahi,

2017) and at the same time achieving the firm's financial goals through practicing marketing-or customer-oriented management (Foxall, 2019).

To be innovative is even more insisting in economic recessions, wherein firms having timely introduced innovative products or service, based on R&D activities, show a more stable growth development and are better prepared to face the decline in economy (Audretsch et al., 2014). In such times consumers will keep on buying only best products and sort out relatively inferior and non-innovative products and services (Spescha & Woerter, 2019). In this regard, knowledge helps firms to invest resources in R&D, to enhance their growth through both product and process innovations (Fixler, 2015), to possess competitive capabilities and reducing search costs (Ahn & Kim, 2017) and to incorporate new technologies to develop highly innovative first products (Song et al., 2011).

Furthermore, knowledge transfer within and between firms and individuals is the raw material of innovation and is one of the most important aspects of knowledge creation (Filieri & Alguezaui, 2014). It enables firms to get overt information such as market research data and tacit information such as methods of investigating markets, production innovations, and plans for marketing mix management (Foxall, 2019) as well as to understand the customer needs and preferences (Rubera et al., 2012).

2.2. R&D and marketing investment

Due to the market expansions and increased competition between companies in various fields, there is a great priority for R&D and marketing investments in order to realize economic growth. Companies are required to make use of all kinds of assets, to put a large amount of energy and new offerings to achieve this purpose. There has been a great deal of recent attention directed to the importance of investments in intangibles in the growth of economies (Ehie & Olibe, 2010). Thus, the new product alters the existing product–market structure of an industry and creates a new market (Darroch & Miles, 2011).

Actually, marketers are paid to bring outcomes to the company in terms of revenue and profit. Some activities carried out by these professionals are marketing planning, brand management, market and business development, telemarketing, advertising, and promotion. Each of these activities leads to expenditures, but on another hand, it generates a future benefit and continuity to the practices of these policies (Porto & Foxall, 2019).

Marketers try to deepen firm's customer relationships, expand its market share, and enjoy greater financial gains (Chen, 2012). According to Foxall (2019), they recognize that marketing is logically prior to production, without meaning that it can always precede it temporally. Nevertheless, determining the level of funds to be invested in marketing is one of the constant critical area for firms and that an overall marketing capability requires augmented investments in marketing for multiple years, persistent and timely investments in marketing, knowledge and care for current and future needs of customers and commitment to their service (Rubera, & Tellis, 2013).

Market-creating firms that have capabilities in both the R&D and marketing enjoy stronger efficiencies, manage costs better and make more profitable use of their assets (Darroch & Miles, 2011). By investment in R&D, firms facilitate leadership and create high profit in introducing new products or improving process efficiency and service, thereby realizing product differentiation strategies vis a vis their competitors (Chen et al., 2016). However, very little is known about the characteristics of market-creating firms or whether its strategy brings benefits to the firm market-creating innovations regarding advances in science and technology, thus causing a shift in the science and technology profile of the industry. Furthermore, in continuously changing and hypercompetitive high-technology industries with shrinking technology life cycles, R&D-intensive firms risk becoming obsolete when they do not access new external knowledge and markets (Heil & Bornemann, 2017).

Investments in R&D and marketing constitute tangible efforts to build and maintain innovative and marketing capabilities, and firms often differ significantly in the intensity of such tangible efforts. Early investments in R&D capability may produce superior absorptive capacity for assimilating new information and knowledge (Rubera & Tellis, 2014). Firms with an increasing investment history are distinguished from their discontinuous investment counterparts. The firms with discontinuous investment will not be able to keep pace with developments and fluctuations in the markets and consumer tastes. They will not be able to fulfil their consumers' current and future needs because knowledge is smaller and weaker and therefore less skills and ability (Kor & Mahoney, 2005). For many firms, intangible assets are becoming more and more important and increasingly surpass physical assets both in value and contribution to growth. Hence, big profits and dominant competitive positioning are achieved by the right deployment of intangibles. They are also achieved with other types of assets such as raw materials,

financials or productions facilities. Innovative performance is the outcome of these complex processes and the ability of firms to develop, produce and successfully introduce innovations (Höflinger et al., 2018).

Many researchers classify firm resources into three categories, physical resources, human resources, and organizational resources (Ho et al., 2005). Sustainable competitive advantage depends on the equilibrium among firms' internal resources, capabilities, and the changing situations of their external milieu. Intangible assets are viewed amongst the most critical resources for the sustainable competitive advantage which, in turn, enhances a firm's financial and market performance. Intangible assets provide a composition of knowledge, information, intellectual property, and experience (Tahat et al., 2017). The capability of a firm lies in its capacity to use the various resources in order to prioritize its investments and to reap maximum benefits from their core competence. The core competence for manufacturing firms lies in the production of innovative products, thus, R&D is a crucial resource for manufacturing firms (Ho et al., 2005).

Adopting effective resource allocation decisions needs to be based on long-term profitability, rather than on one-time transactional sales or profits (Kumar et al., 2011). The allocation of limited financial and human resources of entrepreneurial firms among competing R&D projects can be critical in the firm organizational capabilities. Firms can assess the likelihood of success among multiple avenues of R&D investments and thus dedicate resources to high-margin R&D projects in which the firm is more likely to achieve sustainable competitive advantage (Rubera & Tellis, 2013). On the other hand, regarding allocation and financing R&D projects, it is well-known that they may be financed by outside capitalists, but in this case, there is the risk of firms misusing the funds made available by the third party. One way to overcome such a problem is to monitor the firm or the research unit and to control whether the firm is investing in R&D rather than misusing the funds. However, high monitoring costs may also make investors hesitant to invest in R&D projects (Helena & Lee, 2012).

Another point to discuss in this context is related to shareholder value. Researchers observed that marketers are mostly concerned with financial measures that better reflect shareholder value, such as net present value and cash flows rather than the traditional marketing measures. For this purpose, marketers are adopting a new perspective that customers and channels are not simply objects of marketing's actions but rather as assets that must be cultivated and leveraged (Cook & Talluri, 2017). The increasing shareholder

value is an important objective for any organization, aiming at delivering value to investors. This implies maximizing the difference between the organization's total market value and the amount of capital invested in the company. This difference is called market value added (MVA) and is determined like a difference between the total market value of the company and the value of invested capital (Sacui & Dumitru, 2014).

The companies, which are weakly reinforced and cannot maintain investing in marketing should change the level of effort, either by reducing this kind of investment and in turn decreasing the size and existence of the company or by seeking different sources to fund the level of the required marketing activities. Porto and Foxall (2020) argued that under a social and economic context, the implementation of marketing activities can generate to the firm financial returns as well as externalities, which refer to the cost of executing business activities, including marketing and R&D.

Nevertheless, marketing activities may have different repercussions for consumers and firms. For firms, they can drive revenue and profits, but they generate expenses, which may raise doubts about the actual effectiveness of these organizational actions. Within this process, researchers stress that increasing satisfaction and decreasing costs can lead to financial returns on marketing investments and increasing revenues. Hooley et al., (2005) and Chen et al., (2016) develop and empirically test scales for measuring marketing resources and assess their impact on performance outcomes. Their findings indicate that R&D and marketing resources impact financial performance indirectly, through creating customer satisfaction and loyalty, lead to superior market performance, increase a firm's innovative capability and therefore enhance the ability of the firm to reap better performance in the marketplace.

It is to admit that marketing has been criticized for being too myopic and tricky in its choice of issues and metrics. The American Marketing Association (AMA), in its conference entitled Marketing Educators Conference, indicated that marketing fails to recognize the impact of marketing decisions on such variables as inventory levels, working capital needs, financing costs, debt-to-equity ratios and stock prices (Cook & Talluri, 2017). It is also argued that competitive advantage from R&D investments erodes quickly. Essentially, if firm's existing R&D capabilities are not renewed to deliver superior value to customers (Rubera &Tellis, 2013). Moreover, R&D projects can be risky and may cause inefficiencies in financing R&D efforts. The investor may be unwilling to invest simply because of the high probability of failure (Helena & Lee,

2012). They often underreact to R&D investment because they are misled by conservative accounting rules which do not properly account for the future impact of R&D spending (Kor & Mahoney, 2005. They understand the true impact of R&D spending only with a delay so that it takes time for excess returns to adjust to their true levels (Dockner & Siyahhan, 2015) and the inability of marketers to quantify the benefits of the marketing budget, means that this marketing budget will be the first item to be cut near the end of the fiscal year (Lee & Yoo, 2012).

2.3 The impact of R&D and marketing investment on firm performance and profitability

Many scholars have extensively studied the effect of investments in R&D and marketing on firm performance offering mixed findings. For example, Porto and Foxall (2019) call for an increase in such investments to bring a positive impact on firm performance, which includes corporate market value. To guarantee the firm prosperity and its continuity and to have a kind of balance, the firm needs links and contact channels between its different departments and the requirements of the different interests of each of the investors, managers, and customers. Therefore, identifying the right level of marketing investment and its utilization and assessing the value of marketing to business remains a controversial issue and has been a common problematic issue for firms.

The managers' experience in the resources of the companies that they are managing has a positive role in improving the economic returns resulting from R&D deployment intensity. The economic results and competitive advantages of the firms stemming from the process of marketing deployments lead to strengthening institutional ownership and sending positive signals about the firm to the markets (Rubera & Tellis, 2013).

Generally, the goal of the firm is the creation of marketing mixes that respond to consumer requirements as well as to improve its financial performance (Foxall, 2019). A firm should either be sensitive to changes in its competitors' positions and introduce productivity plans to boost financial outcomes or focus on long-term sales and fulfil revenue-growth schemes to enhance profitability. This strategy focuses on stressing the firm's need to be aware of the consumer needs and trying to have valuable, rare, non-substitutable, and thus inimitable product leadership (Chen, 2012).

Even though there are different interpretations and varying results regarding the benefits of R&D and marketing investment, most scholars suggest that marketing expenditures have a positive impact on corporate market value and firm performance (Chen et al., 2016), and despite firms significantly have different attitudes in their efforts regarding developing resources and dynamic capabilities, which may have effects on firm performance (Rubera & Tellis, 2013), R&D and the marketing resources remain essential to the strategic process of the entrepreneurs and managers responsible for the discovery of opportunities and for their planning, implementation and increasing revenues. Similarly, the specialized marketing assets, which are integral to this process, consisting of the information, intelligence, and knowledge that are brought about in the course of this essential process (Foxall, 2019).

Investments in both R&D and marketing are needed to have an ensuing influence on the overall financial performance of firms. Pathak et al., (2019) argue that there is a direct association between R&D expenditures and firm performance, as is often reflected in the deferred operating performance. According to Ehie & Olibe (2010), manufacturing and non-manufacturing firms choose different mixes of R&D investment and different approaches because of the differences in their relative orientation. Manufacturing firms produce tangible products that are distinguishable and interchangeable, while service firms are engaged in intangible, often perishable, service delivery. It is argued that investment in R&D contributes positively to firm performance for both manufacturing and service firms and that there are different marginal returns in the manufacturing firm between R&D investment and firm growth (Chen et al., 2016).

Due to competitive environments, electronics firms must continually invest in innovative R&D activities. They are required to quickly respond to customer demand by introducing new products or developing new processes and to lower costs. However, non-electronics companies, as indicated by Chen et al., (2016), must invest more in marketing to differentiate their products because they usually operate in more mature markets with lower competitive barriers. Firms respond to the market by exploiting consumers' desires for the products and serving the interest of producers as well as the objectives of the shareholders who care about the returns (Foxall, 2019).

As marketing investments produce and generate more certain, immediate payoffs than do R&D investments, debt-holders would prefer marketing investments versus R&D investments. Further, R&D investments lead to value creation through the development

of new products. Marketing investments also contribute to value creation by helping firms to develop products that meet consumer needs (Ruberai & Tellis, 2010). While ideally firms should invest in both R&D and marketing, the limited number of resources available to firms forces companies to choose between the two. In this case, as mentioned by Darroch & Miles (2011), divestitures with high strategic emphasis tend to sacrifice short-term gains (marketing investment) for long-term performance (R&D investment). Furthermore, under debt-holders' pressure to maximize immediate returns, emerging firms start their life with a strict emphasis on marketing investments at the expense of R&D investments. It is worth mentioning that R&D investments accumulate over time to create the know-how necessary to develop breakthrough innovations providing divestitures that emphasize R&D over marketing (Borisova & Brown, 2013).

In empirical researches regarding the impact of R&D investments on corporate profitability, R&D investment is an important element among the activities of high-tech industries because R&D expenditure can not only create new products but also develop more efficient production processes. However, the influence of R&D investment on firm growth varies according to the sectors (Ho et al., 2005). Accordingly, R&D investment can positively influence the growth of firm belonging to high-tech sectors, but not found in non-high-tech sectors. In the same context, Chen et al., (2016) advocate that R&D intensity is a factor that restricts growth in non-high-tech in small and medium-sized Enterprises (SMEs), regardless of the level of R&D intensity. Whereas, only the higher level of R&D intensity stimulates firm growth in the high-tech SMES. Moreover, it is also clarified that firm value and unexpected growth in advertising expenditures are positively related to firms that advertise above the advertising response threshold.

While R&D and marketing are expected to have a positive impact on a firm's financial performance, the interaction between the two may have a negative interrelation. For example, R&D during the early stages of the commercialization of a product may lead to knowledge spill over and reveal the firm's innovative ideas, offering competitors the opportunity to copy the innovation. Such an effect can be even worse when suppliers also become competitors, as in the case of Apple and Google reducing gains in performance as derived from the focal firm's own R&D efforts (Pathak et al.,2019). Furthermore, many have asked whether Information Technology (IT) commodities can provide a sustainable competitive advantage because they are easy to replicate in a competing firm. Even worse, firms may overspend if the resource is neither rare nor

highly relevant to strategic advantage. This point of view ignores the fact that IT innovations may be fundamental drivers of organizational transformation for successful business outcomes. Hence, the evaluation of IT should focus on the planning, execution, and management of all investments (Chen, 2012).

To determine the time lag between R&D investment and getting the returns of this investment is one of the firm problems (Ehie & Olibe, 2010). It is certain that investment in R&D creates value (despite of its risk and uncertainty), yet finding a direct relationship between R&D and future performance of a company is still questionable and it is always difficult for an investor to estimate its impact on business results (Bouaziz, 2016). Various things play a role in explaining the direct impact on R&D investment on a firm's profitability level such as the accounting alternatives concerning the R&D efforts, the firm's strategy to increase or gain market share and the speed or skills to market the innovations into the offerings that respond to the consumer needs (Vanderpal, 2015). Hence, it is difficult to precisely quantify the total effects of cumulative investments in R&D as the time lag gets long (Rubera, & Tellis, 2013) and to determine whether R&D investment has a negative or positive effect on the financial performance of the firm. Anyhow, many scholars indicate that there is a positive and negative linkage between R&D intensity and profitability indicators, in addition to a positive relationship among R&D activities and return on equity and return on assets in the process of the firm's future profitability and revenue increase (Vanderpal, 2015). This in turn leads to difficulty in determining whether R&D investment has a negative or positive impact on the financial performance of the firm. Therefore, it is posited that:

H_{1a}: R&D investments have a main low and positive effect on profitability.

H_{1b}: Current R&D investments have a lower and positive effect on market share.

Studying the impact of the marketing function on the firm's performance has always been a hot topic for many recent studies (Krasnikov & Jayachandran, 2008). The firm's financial performance is affected by both diversification strategies such as product, service and international diversification and functional capabilities such as marketing and operations (Nath et al., 2010). It is to mention that there are many concerns related to measurement the return on marketing spends, linking marketing activities, investments to the firm's financial performance and its value as well as how marketing expenditure adds to shareholder value. Yet, the market-based assets are considered appropriate means to

measure the impact of marketing activity on the financial outcomes and value of the company (Sacui & Dumitru, 2014). Among investments horizons, marketing investment in brand is considered as an expenditure intended to increase the firm's promotional activities, the quality and reputation of the brand itself as well to have a lucrative position in the market, in the long run. Further, these marketing investments have important effects on brand performance (Davcik & Grigoriou, 2019). The literature highlighted that some marketing actions, such as sales promotions produce quick effects and have influence on the short time periods comparative with other marketing actions, such as service quality improvements and advertising that have influence on the long time periods (Sacui & Dumitru, 2014). However, Porto & Foxall (2020) argued that marketing investment is ineffective and has no role in generating any effect over ROA, when there is economic booming and firm is financially flourished. In such conditions, especially in short-term, usually there is no priority for operational efficiency. Therefore, the firm is not required to increase marketing investment. Based on the above argument, the second hypothesis will be:

H_{2a}: Current marketing investments have a major and positive effect on short-term market share.

H_{2b}: Current marketing investments have no effect on short-term profit.

Somehow, there is little knowledge about the drivers of firm growth, and the impact of interactions among various firm capabilities on firms' performance and its growth (Feng et al., 2017). Marketing has been looked at as focusing on ensuring high value to customers and the firm at a lower cost and that it is a vital prerequisite of firm's ability to strengthen its market share and minimize the impact of the competition (Adewale et al., 2013), while many previous researches did not lead to a consensus about the impacts of intense R&D expenditures on the firm's sales and financial performance (Lantz & Sahut, 2005). Nevertheless, both practitioners and academics recognize that high investment in marketing and R&D could lead to generating and commercializing new product ideas and technologies as well as fulfilling customer requirements. Such investment could create good firm performance and form more complex innovation capabilities (Hughes et al., 2019). It is not to forget as well that while R&D and marketing strive to follow up their goals, their actions might come into conflict and that firms, in order to avoid that, try to match the power of R&D and marketing, through departmental power, in a way that ensures the innovative product programs (Stock & Reiferscheid, 2014) . Firms are

prompted to intensify their efforts to integrate marketing and R&D activities and even, as some finding suggest, to seek the most sophisticated customers as a factor to motivate their marketing-R&D interface (Li, 1999). Firms tend, through the investments of R&D and marketing capabilities, to build their competitiveness, to create value for new products and services (Vorhies & Bush, 2011). The alliances between complementary investments (of marketing and R&D) can improve a company's performance (Lee & Chang, 2014) and achieve long-term profitability. Such alliances ensure repeated product (or service) renewal, seize business opportunities and better market share (Lin et al., 2006). Hence, R&D and marketing are integrated and therefore are better to be analysed jointly, taking into consideration that new technological solutions become available, customer needs change and that competitors offer new products (Griffin & Hauser, 1996). Thus, the third hypothesis will be:

H_{3a}: Current investments in R&D do not interact with marketing investments to generate market share.

H_{3b}: The greater the current investments in R&D, the greater are the positive effects of marketing investments on return on assets permanently.

Finally, this chapter is highly connected with the empirical study wherein a highlight of the theoretical foundation has been adopted for data analysis. The figure on section 3.1 explains the dependent, independent and control variables. Section 3.2 explains the collected data and the sectors. It focuses on explaining the time series and the approach used in the empirical study. The last section explains the equations used in this dissertation in order to show that the independent variables have not only individual effects on the dependent variables, but also joint ones. The other thing that distinguishes this study is that the sample collected is taken from companies that belong to 12 different sectors.

3. Method

3.1 Model and description

The dissertation seeks to identify the impact of investments in R&D and marketing on financial performance as shown in Figure 1.
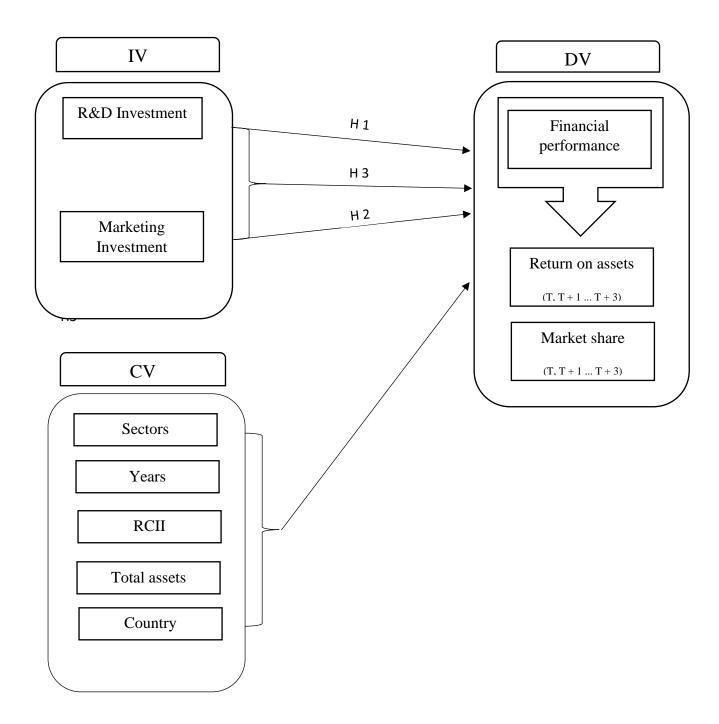

Figure 1 Conceptual research model

Figure 1 illustrates the model of this dissertation. It explains the relationship between

independent variables (IV), which are R&D and marketing investments, and their effect on dependent variables (DV), analysed in (T, T + 1 ... T + 3), which are return on assets and market share. The control variables (CV) cover several sectors and years, relative competitors in the industry (RCII), the total assets of the companies, and the country where the companies are located. Market share, and the return on assets, as indicated in Figure 1, show the analyses the individual and joint effects of the R&D and marketing investment on the financial performance over different time frame.

3.2 Data and sample

In this dissertation, data is collected from the years 2000 until 2017. It has been reached from the S&P Capital IQ platform, which is a financial tool for S&P Global Market Intelligence. The sample is built from an unbalanced dashboard of publicly traded companies and the data is divided as follows:

For market share models, the total sample of 6989 with 1030 firms. For return on assets models, the total sample of 3208 with 513 firms in both USA and UK by Using a longitudinal design. In terms of location, the firms that find in UK represent 16,1% of the sample covered by the dissertation, while firms from US constitute a larger ratio of 83,9% of the sample. The sample provides information about marketing expenses, general and administrative expenses as well as financial indicators, such as corporate income, industry revenue, return on assets, net income margin, approved free cash flow, total assets, and the company's total value in the stock market. The abovementioned firms are selected to provide data of at least four years. Most firm have a large amount of total assets (the Log of total assets presented a mean of 4.12 with a Standard Deviation of 3.75). Firms operating in consumer staples (food distributors, tobacco…etc.) represent 4.0% of the total, the consumer discretionary sector (movies and entertainment, computer and electronics retail…etc.) represents 15.6%, industrials (industrial machinery, office services and supplies…etc.) 12.6%, information technology 16.7%, healthcare 12.3%, energy 6.9%, materials (specialty chemicals, diversified metals and mining…etc.) 6.2%, financials 22.7%, utilities (water utilities, renewable electricity…etc.) 1.3%, and real estate accounts for 1.8%.

The sample contains firms from different sectors: food distributors, tobacco, the consumer discretionary sector (movies and entertainment, computer and electronics retail…etc.), industrials (industrial machinery, office services and supplies…etc.),

information technology, healthcare, energy, materials (specialty chemicals, diversified metals and mining…etc.), financials, utilities (water utilities, renewable electricity…etc.), and real estate accounts. Most of the firms used were founded in the United States, with the remainder in the UK.

3.3 Measurement

Table 1. The dependent and independent variables and descriptive analysis.

Variable	Measure	Mean	St. Deviation
Total assets	Total assets in a specific year equal to total of liabilities plus owner's Equity.	7457.34	87443.09
Marketing investment	Marketing investment is the investment in all marketing activities undertaken by the firm in a specific year, divided by covering expenses in marketing fees, divided by general and administrative expenses and sales expenses minus marketing expenses	108.13	526.10
R&D investment	Expenses in R&D are calculated and divided by the firm revenues.	120.26	688.45
Market share	Total revenue of firm i in time t divided by the total revenue of the industry in time t.	12.70	24.31
ROA	Operating income of firm i in time t divided by the average total assets (t, t+3) of firm i in time t.	10.85	232.39
Competitors in the industry	If the number of relative competitors in the industry is more than 1.00, it means that the company in the industry has more than 222.16 competitors.	222.16	253.60
Relative competitors in the industry	If the number of Relative competitors in the industry is less than 1.00, it means that the company has less than 222.16 competitors.	1.00	1.14

Note. 1Expenses in marketing investment those incurred in: marketing consultancy fees, advertising, market development, marketing and business development, promotion, telemarketing, and brand marketing. 2Selling, general and administrative expenses represent those incurred in equipment, salaries and other employee benefits, occupancy, insurance, stock-based compensation, general and administrative, net rental, lease and rent, other general and administrative expenses, and other rental expenses.

The majority of firms have a large size of total assets. Standard deviation (SD) indicates the fit of the data to the model; in other words, it shows how well the mean representing the data is. If the SD is small in relation to the mean, this indicates that the data points are close to the mean (low dispersion). If the SD is large, then this means that

the data points are far from the mean, showing that the mean is not an accurate representation of the data (high dispersion). From table 1, it can be seen that the standard deviation is greater than the mean in each of the variables and this indicates that the variables are dispersed around the mean. The standard deviation is the measure of dispersion (Cooper, & Sun 2003). Before assessing the performance of each of both models, all the ratio of independent and dependent variables is transformed into logarithms, making log-log models. The log transformation is used to make highly skewed distributions less skewed. and by doing that, it is possible to make patterns in the data more interpretable and help to meet the assumptions of inferential statistics. Marketing investment is the investment in all marketing activities undertaken by the firm in a specific year, divided by covering expenses in marketing fees, divided by general and administrative expenses and sales expenses minus marketing expenses (Porto & Foxall, 2019). As for R&D, expenses in R&D are calculated and divided by the firm revenues. Regarding the relationship between the intensity of R&D, according to Vanderpal (2015), there is significant increase in revenues.

The market share of the firm is the firm total revenue in the year divided by the total revenue of the industry in that same year. The return on assets is the firm operating income divided by the average between the assets of the current year and the previous year, it documents how much income a firm can make with its total assets (Porto & Foxall, 2019). While the dependent variable of equations is in the current period, the independents are in lag 4 years (t$\rightarrow$ t+1$\rightarrow$ t+2$\rightarrow$ t+3).

3.4 Analyses

- $Y_{i,t+1} = a_{i,t} + bR\&D_{i,t-1,-2-,3,...} + bMI_{i,t-1,-2,-3,...} + bCV_{i,t} + \varepsilon_{i,t}$

- $Y_{i,t+1} = a_{i,t} + bR\&D_{i,t-1,-2-,3,...} + bMI_{i,t-1,-2,-3,...} + bR\&D*MI_{i,t-1,-2-,3,...} + bCV_{i,t} + \varepsilon_{i,t}$

- $\grave{Y}_{i,t+1} = a_{i,t} + bR\&D_{i,t-1,-2-,3,...} + bMI_{i,t-1,-2,-3,...} + +bCV_{i,t} + \varepsilon_{i,t}$

- $\grave{Y}_{i,t+1} = a_{i,t} + bR\&D_{i,t-1,-2-,3,...} + bMI_{i,t-1,-2,-3,...} + bR\&D*MI_{i,t-1,-2-,3,...} + bCV_{i,t} + \varepsilon_{i,t}$

Explanation of equations:

$Y_{(i,t+1)}$ indicates the market share variable of firm i in time t. $bR\&D_{(i,t-1,-2-,3,...)}$ indicates the R&D investment variables of firm i in time t-1,-2,-3,.....

$bMI_{(i,t-1,-2,-3,...)}$ indicates the Marketing investment variables of firm i in time t-1,-2,-3,....

$bR\&D*MI_{(i,t-1,-2-,3,...)}$ indicates both the R&D and Marketing investment variables together of firm i in time t-1,-2,-3,....

$\grave{Y}_{(i,t+1)}$ indicates the return on assets variable of firm i in time t.

$C_{i,t}$ indicates the control variable (sector, and time dummies) of firm i in time t.

$a_{(i,t)}$ is the constant term. εi,t is the error term.

3.5 Result

The results are divided into two parts. The first part shows the separate and joint effects of the firm's marketing and R&D investments on market share at the time (t, t+1, t+2, t+3). The second part discusses the separate and joint effects of marketing and R&D investments on return on assets at time frame (t, t+1, t+2, t+3). Before reaching the final statistical analysis, the statistical tests with Pooled Ordinary Least Square models are resorted to. The initial models showed problems with normality and linearity and, therefore, the variables were transformed into a natural log. The variables did not have a multicollinearity problem (VIF < 2). However, the White Test showed a problem of

heteroscedasticity (White Test < 0.05), and so the robust error estimator in the final Generalized Estimating Equation (GEE) analysis is used. It is a semiparametric technique for estimating the average response over a population (Ziegler, 2011). The Durbin Watson test showed problems with temporal dependence and, therefore, different models were considered considering an advance of a time (t+1, t+2…) for each dependent variable. The Breusch-pagan test was significant (p <0.01), favoring the fixed effects model. The Hausman test was also significant (p <0.01), favoring the use of a fixed effects model. The GEE used in the final models then considers the fixed effect.

3.5.1 The effects of the marketing and R&D investments individually and jointly on the market share

In table 2 the covariance matrix is chosen with estimators and an independent and most suitable correlation structure matrix, which refers to eliminating data endogeneity problems. [The quasi-likelihood under Independence Model Criterion (QIC) and The Corrected Quasi-likelihood under Independence Model Criterion (QICC) presented lower values]. that choosing the most suitable correlation structure matrix refers to eliminating data endogeneity problems. The smaller the values of these criteria, the better the model. From table 2, the QIC and QICC decline from t to t+3. R2 (also called the coefficient of determination), represents the proportion of variance in the dependent variable that can be explained by the independent variables (Chuda & Tribhuvan, 2018). Note that the R2 in periods t → t+3 is between 60.70% and 58.30%.
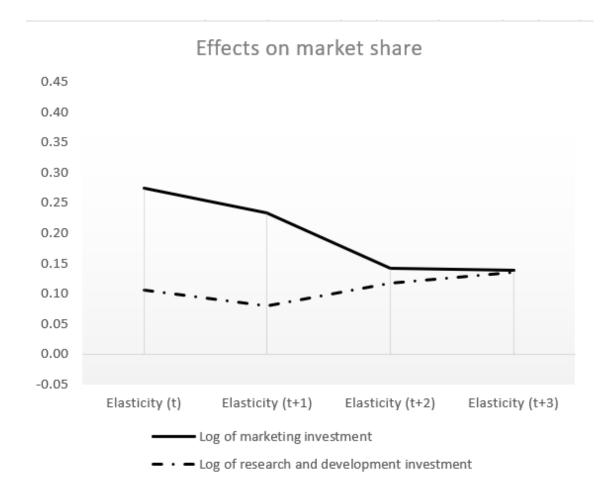
Table 2 shows the separate and the joint effect of the independent variables (Marketing and R&D investments), with the control variables (total assets, country and competitors in the industry) on the dependent variable (market share). The interpretation in table 2 is given in elasticities and is divided into 4 periods (t → t+3), each of which is also divided into two parts. The first part deals with the separate effect, while the second part talks about the joint effects. In part 1 Period t, the increase in firm total assets of 1% significantly rises the market share by 0.51%. The increase of marketing investment by 1% significantly raise the market share by 0.27%, while the increase in R&D investment significantly raise the market share by 0.11%. Part 1 period t+1, the increase of the total assets by 1% significantly increases the market share by O.51%. The increase in the marketing investment by 1% significantly increases the market share by 0.23%. While the increase by 1% in R&D investment significantly increases by 0.08%. Part 1 of period t+2, shows that the total assets still significantly affect the market share by 0.52%. The

increase in marketing investment by 1% leads to significant increase in the market share by 0.14%. An increase of 1% in R&D investment raises the market share by 0.12%. Part 1 period t+3, the increase in total assets by 1% raises significantly the market share by 0.47%. the increase in the marketing investment by 1% raises the market share by 0.14%. The increase in R&D investment significantly raises the market share by 0.14% as well.

The second part of all the periods (t → t+3) shows that the joint effect of the marketing and R&D investments is consistently unchangeable. The increase of the joint effects of R&D and marketing investment by 1% leads to insignificant raise in the market share by 0.01%. In table 2 as well, the firms in UK have significant market share as the estimate number, through all the periods is close to 1 (the estimate number is 0.92 to 1.08). This means that the dominant firms are from UK. Coming to the control variable the competitors in the industry table line, it significantly decreases the market share in the four periods, putting in mind that the estimate number is less than 1 during all the periods (between -0.60 to -0.64), which means that the number of competitors in industry is less than 222.16 (as mentioned in Table 1).

Table2. Effect of dependent variables with control variables on market share

Independent variables	Log of ms (t)			Log of ms (t)			Log of ms (t+1)			Log of ms (t+1)			Log of ms (t+2)			Log of ms (t+2)			Log of ms (t+3)			Log of ms (t+3)		
	B	S.E.	Sig.	B	S.E.	Sig.	B	S.E.	Sig.	B	S.E.	Sig.	B	S.E.	Sig.	B	S.E.	Sig.	B	S.E.	Sig.	B	S.E.	Sig.
Intercept	-5.49	0.37	***	-5.52	0.37	***	-4.95	0.23	***	-5.16	0.23	***	-4.83	0.27	***	-4.88	0.27	***	-4.35	0.34	***	-4.35	0.34	***
Log of total assets	0.51	0.03	***	0.51	0.03	***	0.51	0.03	***	0.52	0.03	***	0.52	0.03	***	0.52	0.03	***	0.47	0.04	***	0.46	0.04	***
Country (U.S.A. = 0; UK = 1)	1.02	0.27	***	1.02	0.27	***	1.08	0.28	***	1.08	0.28	***	0.92	0.28	***	0.92	0.28	***	1.05	0.30	***	1.05	0.30	***
Log of competitors in the industry	-0.61	0.09	***	-0.61	0.09	***	-0.61	0.09	***	-0.61	0.09	***	-0.64	0.09	***	-0.64	0.09	***	-0.60	0.10	***	-0.60	0.10	***
Log of marketing investment	0.27	0.03	***	0.27	0.03	***	0.23	0.03	***	0.24	0.03	***	0.14	0.03	***	0.14	0.03	***	0.14	0.03	***	0.13	0.03	***
Log of R&D investment	0.11	0.03	***	0.11	0.03	***	0.08	0.03	***	0.08	0.03	***	0.12	0.03	***	0.12	0.03	***	0.14	0.04	***	0.14	0.04	***
Log of marketing investment * Log of R&D investment				0.00	0.01					0.00	0.01					0.00	0.01					0.00	0.01	
QICC	31317.73			31318.52			27635.09			27658.99			24909.61			24915.23			22407.96			22450.30		
QIC (reference - only intercept)	1023613.40			1023613.40			969399.70			969399.70			916944.50			916944.50			862317.50			862317.50		
R^2	60.70			60.70			60.90			60.90			59.50			59.50			58.30			58.00		

Note. ** $p \leq 0.05$ *** $p \leq 0.01$

Variable are in log.

The control variable year, sector, and company are not shown due to space.

Ms = market share, R&D = research and development, B = estimate, S.E. = standard error

Figure 2. The separated effect of marketing and R&D on market share.

Figure 2. Out of the results, the marketing investment has a major positive effect on the firm's market share. This effect starts to appear from the first studied year t, then it gradually declines till the end of the year t +1. While in the years t+2 and t+3 marketing investment is stable, the effect of investment in R&D on the market share start to slightly decline till the year t+1, then after, it starts to increase till the year t+3.

Combined effects on market share

Figure 3. The combine effect of marketing and R&D on market share.

Figure 3 shows the elasticity of the joint effect of Marketing and R&D investments on the market share. This effect is high at the beginning of t and slightly starts to decrease. Then after, it slightly increases till t+3, putting into consideration that throughout the whole periods the effect is positive.

3.5.2 The effects of marketing and R&D investments individually and jointly on the return on assets

Table 3 shows that the QIC and QICC of the model decline from t to t+3. However, the very low R2 has a low statistical indication during all the periods. It also shows the results about the separate and the joint effects of the independent variables (Marketing and R&D investments), with the control variables (total assets, country and competitors in the industry) on the dependent variable (Return on assets). Table 3 shows elasticities and is divided into 4 periods (t → t+3), each of which is also divided into 2 parts:

Part 1 period t, the increase in the total assets by 1% leads to a significant decrease in the return on assets by -0.07%, the increase in R&D investment by 1% leads to a significant increase in the return on assets by 0.08%. Part 2 period t, there is a variation in the numbers so that the increase in the total assets by 1% leads to a significant decrease in the return on assets by -0.09%, increasing on the joint effect of R&D and marketing investment by 1% significantly increases the return on assets by 0.02. In part 1 period t+1, the increase in total assets by 1% significantly decreases the return on assets by -0.13%. The increase in R&D investment by 1% leads to a significant increase on the return on assets by 0.13%. Part 2 period t+1, the increase in total assets by 1% significantly decreases the return on assets by -0.15%. The increase in R&D investment by 1% significantly raises the return on assets by 0.09%, increasing the joint effect of R&D and marketing investment by 1% and significantly increases the return on assets by 0.02. Part 1 period t+2, the increase in total assets by 1% significantly decreases the return on assets by -0.08%. While the 1% increase of the R&D investment significantly raises the return on assets by 0.11%. Part 2 period t+2, the increase in total assets by 1%, significantly decreases the return on assets by -0.09%. The increase of the joint effect of R&D and marketing investment by 1% significantly increases the return on assets by 0.02. Part 1 period t+3, the increase in total assets by 1% significantly decreases the return on assets by -0.04%. The second part of all the periods (t → t+3) shows that, the joint effect of the marketing and R&D investments is somehow unchangeable. The increase of the joint effects of R&D and marketing investment by 1% leads to significant raise in the return on assets by 0.02%. In table 3, country line, the estimate number through all the periods is close to 0 (0.24 to 0.17). This means that the dominant firms are from US. Coming to the control variable the competitors in the industry table line, it insignificantly decreases the return on assets in the four periods, putting in mind that the

estimate number is less than 1 during all the periods (between -0.02 to 0.00), which means that the number of competitors in industry is less than 222.16 (as mentioned in table 1).

Table 3. Effect of dependent variables with control variables on return on assets.

Independent variables	Log of ROA (t)			Log of ROA (t)			Log of ROA (t+1)			Log of ROA (t+1)			Log of ROA (t+2)			Log of ROA (t+2)			Log of ROA (t+3)			Log of ROA(t+3)		
	B	S.E.	Sig.	B	S.E.	Sig.	B	S.E.	Sig.	B	S.E.	Sig.	B	S.E.	Sig.	B	S.E.	Sig.	B	S.E.	Sig.	B	S.E.	Sig.
Intercept	0.91	0.18	***	1.10	0.19	***	1.59	0.18	***	1.73	0.18	***	1.14	0.17	***	1.31	0.17	***	1.36	0.18	***	1.51	0.19	***
Log of total assets	-0.07	0.04		-0.09	0.04	**	-0.13	0.04	***	-0.15	0.04	***	-0.08	0.04	**	-0.09	0.04	***	-0.04	0.04		-0.05	0.04	
Country (U.S.A. = 0; UK = 1)	0.18	0.13		0.21	0.13		0.22	0.13		0.24	0.13		0.18	0.13		0.21	0.13		0.17	0.14		0.19	0.14	
Log of competitors in the industry	-0.02	0.04		-0.02	0.04		0.00	0.05		0.00	0.05		-0.01	0.05		0.00	0.05		-0.02	0.05		-0.01	0.05	
Log of marketing investment	0.02	0.02		-0.02	0.03		0.02	0.02		-0.02	0.03		0.00	0.02		-0.04	0.02		0.01	0.03		-0.03	0.03	
Log of R&D investment	0.08	0.04	**	0.03	0.04		0.13	0.04	***	0.09	0.04	**	0.11	0.04	***	0.07	0.04		0.07	0.04		0.03	0.04	
Log of marketing investment * Log of R&D investment				0.02	0.00	***				0.02	0.00	***				0.02	0.00	***				0.01	0.00	***
QICC		3762.40			3733.40			3489.90			3460.10			3151.10			3125.70			2867.00			2848.60	
QIC (reference - only intercept)		60527.10			60527.10			57494.30			57494.30			54791.20			54791.20			52147.30			52147.30	
R^2		8.90			9.80			9.80			10.80			9.30			10.60			10.1			11.1	

Note. ** $p \leq 0.05$ *** $p \leq 0.01$

Variable are in log.

The control variable year, sector, and company are not shown due to space.

ROA = return on assets, R&D = research and development, B = estimate, S.E. = standard error
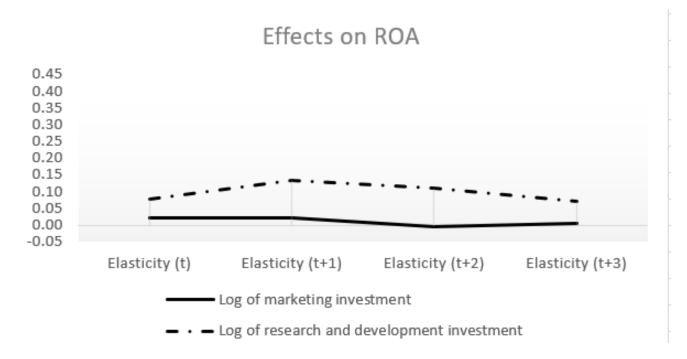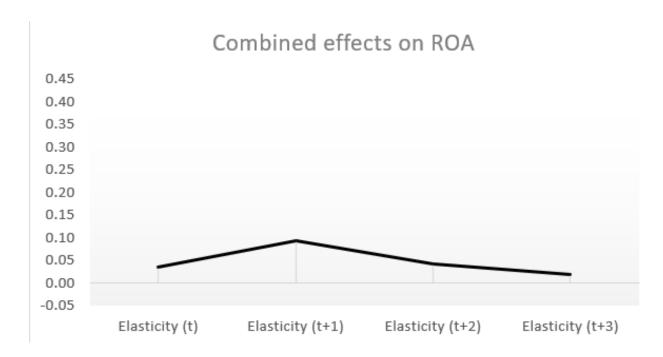
Figure 4. The separated effect of marketing and R&D on ROA.

Figure 4 shows that the effect of marketing investment on the return on assets is horizontally positive, despite being little and insignificant, during the whole period. On the other hand, the positive effect of R&D investment on the return on assets is significant except the year t+3.

Figure 5. The combine effect of marketing and R&D on ROA.

Figure 5 shows that the joint effect of marketing and R&D on return on assets investments is significantly positive despite of some ups and downs.

Discussion

The results of the dissertation display that there are separate and joint positive effects on expenditure in R&D and marketing investments. This, in return has been reflected on the firm performance through the adoption of mechanisms and techniques that enable them to have a kind of excellence and to ensure current and future profitability. Despite the importance of short-term profits, the survival of the company depends on its long-term investment plans, in particular its investing in intangible activities, through which the company's business will flourish (Foxall, 2019). Hence, firms are supposed to have good performance, distinguished products and continuity in the market through innovative capabilities. In this vein, the diversification of resources, assets and activities are essential for value creation. R&D and marketing are true value drivers for the firms' competitive advantage to satisfy customer needs and creating new technologies, products and solutions (Kor & Mahoney, 2005).

Whilst it is somehow risky to invest in R&D, the latter high returns to come to the

shareholders will satisfy them and draw their content (Ehie & Olibe, 2010). Firms can create an advantage by making use of the dynamic marketing capability (DMC) to generate revenue by satisfying current customers, exploiting existing products, distribution channels, and advertising existing brands (Sharma et al., 2016) .

The advantages of R&D and marketing investments and their benefits on firm performance has been intensively studied in literature. The dissertation reveals that R&D and marketing expenditures are necessary strategies to improve the firm economic benefits and have a positive impact on the firm financial performance. These findings are consistent with previous research (Chen, 2012; Chung & Low, 2017; Pathak, Sen, Jayaram, & Miller, 2019; Sridhar, Narayanan, & Srinivasan, 2014; Chen, Chan, Hung, & Hsiang, 2016; Dockner & Siyahhan, 2015).

With regard to the separated effect of R&D and marketing investments on the firm financial performance represented by the impact of both investments on the market share and the return on assets, the results show that the effect of R&D on the return on assets is positive and mostly significant during the studied period (4 years) although this effect is nonsignificant in the fourth year. Parallel to this, the effect of R&D investment on the market share is also positive and significant during the whole studied period despite some ups and downs as shown in figure 2. This result shows that R&D investments have positive and significant effect on market share and ROA, and that the current expenditure on R&D leads to future benefits. Accordingly, H1a and H2b are confirmed based on the results that accept them. This goes along with the studies of Vanderpal, (2015) and Chen (2016), which emphasize the positive relationship between R&D investments and the firm future profits, as well as with (Del Monte & Papagni, 2003), who used a panel data consisting of 500 Italian firms to study the effect of R&D activities and the growth of firms. They found that the growth rate of sales in firms that adopt R&D is 56% compared to those that do not rely on R&D whose sales grow up to 48%. At the personnel level, the growth is 18% in firms that conduct R&D while it is only 10% in firms with no R&D. On the other hand, the effect of marketing investment on the firm market share is positive with statistical significance during the four years despite its fluctuation as figure 2 shows.

Regarding the effect of marketing on the return on assets, it is slight with no statistical significance. This coincides with H2a and H2b. This is emphasized by Markovitch et al., (2020) who indicate that there is an important and direct evidence that investment in marketing activities enhances the firm profitability. Moreover, Davcik &

Grigoriou, (2019) and Porto & Foxall (2019) find out that the marketing resources and capabilities have a vital role in the firm economic profits especially with regard to its market share.

The results of the dissertation show that the effect of R&D on return on assets is greater than that of marketing and that its effect on the financial performance lasts longer than that of marketing investment, while the effect of marketing investment on market share is higher than that of R&D. In respect of the joint effect of marketing and R&D on the firm market share and return on assets, the results show that this effect, despite of being statistically nonsignificant, is strong on the market share. However, this same joint effect has positive statistical significance along the studied four years period and proves that there is an interacted impact between R&D and marketing investments on the firm financial performance. All this coincides with H3a and H3b and goes along with (Gemser & Leenders, 2011; Grimpe et al., 2017; Leenders & Wierenga, 2008).

With regard to both models, when controlling the firm's total assets, time, country and competitors in industry, the results show that the separate and joint effects of marketing and R&D on the financial performance are still statistically positive throughout the whole period, regardless of being significant or insignificant. On the other hand, the joint and separate effects of the marketing investment and R&D on the financial performance are different from one sector to another. The results of the dissertation suggest that firms are required to spend more money on marketing investment to make their products not only acceptable by consumers but also demanded and looked for, as indicated by the theory of the marking firm depicting that the function of a business is to create a consumer (Foxall, 2019). For this purpose, the products should be competitive, have preferable privilege and highly sold to achieve consequent financial returns. This result is the reason why most scholars suggest that R&D and marketing expenditures should be viewed as investment expenditures and that these expenditures should be capitalized. Firms are supposed to have permanent investments in R&D and marketing in order to achieve their goals and to maintain the economic cycle.

To sum up the above-mentioned context, it is worth to repeat that firms, through the utilization of their resources and assets including R&D activities, look for gaining a high market share, which is reflected in sales and increasing the ROA. They try to improve their investment policy to make new discoveries and innovations in order to produce reliable products and services. Thus, there is a need to focus on spending on R&D

activities, technological solutions and products and services. It has been shown that this type of expenditure can lead to increased sales and reduce resource wastage, consequent profits' increase and improved ROA. R&D expenditure in the current year leads to future benefit represented by larger market share, higher share price and better reputation in current and subsequent years. These results imply that it is very important for firms to change their policy with respect to investment in R&D activities (Razaq & Freihat, 2017). Similarly, marketing investment positively influences the firm's short- and long-term performance and should lead ultimately to superior growth and profitability as well as overall firm performance (Homburg et al., 2012). Investment in marketing takes into consideration the customers' latent needs viewed as a form of proactive market orientation and (placing emphasis on R&D investment to achieve technological opportunity) as well as his immediate needs viewed as a form of responsive market orientation (placing emphasis on marketing investment to achieve economic profitability). This conjunction shows the importance of focusing on the relationship between proactive and responsive strategies as well as marketing and R&D integration (Lamore et al., 2013).

Finally, with the objective of having a better understanding of the impact of firm activities on financial performance, the dissertation (relying on the theory of marketing firms), has its contribution through studying of the mutual as well as the separate effects of investment in R&D and marketing on the firm financial performance, represented by the return on assets and the market share.

Conclusion

Constant acceleration of technological development and competition necessitate the firms, in order to ensure continuity and profitability, to have more investment in intangible assets. The dissertation studied both the separate and joint effects of marketing and R&D investments on the firm financial performance represented by the market share and return on assets. It studied these effects through a sample volume of 10,197 including 12 sectors in UK and US. In this vein, firm location, sector, relative competitors in industry, total assets and time frame of 4 years period are used as control variables. The dissertation found out that even though there is a positive impact of R&D and marketing investments on the firm financial performance, the marketing investment's effect appeared straight since the beginning, while the effect of R&D investment took more time to appear but continued for a longer time than that of marketing investment. The results

of the dissertation showed that investing in marketing and R&D, whether it is separate or joint, has generated positive financial results, mainly on market share and ROA. However, their effects do not occur in the same proportion. The results also showed that although the effect of marketing investment on the market share appears since the beginning, it begins to diminish in the following years, unlike investment in R&D that needs more time to manifest its impact and lasts for a longer time. This requires firms and their managers to constantly spend and pump more money on marketing and R&D to ensure financial returns and to see the effectiveness of their efforts. They are demanded, as well, to integrate marketing and R&D in order to have balance between the firms short- and long-term profits.

As it is somehow rare to have a perfect study that covers all the aspects of a certain topic, this dissertation has few limitations that future research may address. It used samples of only large publicly traded companies in just two developed countries. In this sense, future research could investigate a sample including different small and medium size firms in other countries including developing ones, putting into consideration that the results, in this case, could be different. Moreover, although the dissertation sample included 12 different sectors, it did not focus on the different effects of R&D and marketing investments on each sector by itself. The future studies might take this into consideration and deeply study this subject as the impact of marketing and R&D investments in each sector could lead to different conclusions. Furthermore, the future studies might rely on more financial indicators as independent variables not only market share and return on assets.

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