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Research and Development Expenditure in Innovative Companies

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Abstract

Investors in innovative technology sectors tend to part ways with fundamental valuation methods. It has proven to be impossible to properly value an innovative company of this era, albeit research suggests that a company's research & development expenses could be the main ingredient of the secret success formula. Instead of trying to solve the impossible puzzle that is computing R&D expenses effect on future cash flows, this paper investigates the actual market capitalization progress of the top 30 R&D spenders from the 2012-2018 Global Innovation 1000 study by PwC's strategy consulting business, Strategy&. The market capitalization of the top R&D spenders are later compared to the rest of the companies in the Global Innovation 1000 list, as well as their respective sector. The findings concluded that looking at the changes in market capitalization alone is not enough to determine R&D activities real effect on the market value. The hypothesis that higher research and development expenses in innovative companies will result in higher future market values, as well as the hypothesis that top R&D spenders will outperform their industries, cannot be rejected.

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1 Introduction

1.1 Background

How important is the allocation of economic resources on our planet? It was not long ago that we experienced the most severe financial crisis since the great depression. The collapse of Lehman Brothers triggered the housing bubble in the United States of America in 2007-2008 and almost immediately the economic chain-reaction put the whole world in recession. Irresponsible, greedy actions by the biggest investment banks in the world could likely have been avoided with proper regulations and actions. The investment banks borrowed to operate their businesses and they were all in too deep in real estate. This led to even bigger losses once the housing bubble burst (Gisiger, 2018). Millions of people lost their jobs, and it took almost a decade for the economy to stabilize. Hence, the allocation of economic resources is essential for our economy.

Throughout history, this process has become more complex. Many refer to Benjamin Graham as the "father of value investing" and his work has inspired people around the world to invest in low-priced companies with good dividends (Graham & Zweig, 2005). The process of predicting future cash flows for the rest of a company's lifespan, and then discount the value of these cash flows back to present value is still practised by investors today. But with continuous research and practice, this process has become more complicated.

Recently a new "problem" occurred in the financial market. Many of our world's largest and most innovative companies are not profitable. The problem can be illustrated by looking at the article published by Forbes contributor, Jon Markman (2017), who believes this is due to a change in the public eye, more specifically, in how investors believe their money will grow in the hands of Amazon Inc. and hence, are less interested in dividend. Markman explains that when Amazon does indeed record a profit, investors prefer their profits to be put back into the business again. In other words, investors today tend to believe that more is always better when it comes to R&D and other expenses that could improve the company's future performance. The result of expectations like this is that innovative company's today burn through cash at an unprecedented pace, and the most drastic change has been their research and development expenses (Strategy&, 2018). Speculations have been made that we are heading toward a new global tech bust (Vardi, 2016).

1.2 Problem discussion

For investors to properly allocate capital, as well as gaining an edge towards competitors on the stock market, the accurate valuation of a company is of importance to both retail- and institutional investors. This task has proven to be impossible, and Koller et al. (2005) explains this is mainly because of the problem of estimating a continuous growth rate in an innovative company, because any growth rate at all will likely require additional working capital and fixed assets. Although some methods are more applicable than others, most investors today rely on discounted-cash-flow models to estimate the value of a company and its stocks price target. However, these models are built upon estimated data inputs and can therefore only be as accurate as the investor's predictions. This is mainly the reason we see stock prices fluctuate from day to day, and why price targets of financial analysts often differ - even for the same company.

Accurately estimating the value of a company is not only difficult due to estimated data input. Unfortunately, this is just the tip of the iceberg. Financial metrics used to dictate a company's future varies depending on its size, industry, competitors, customers, location, growth and so forth. So, instead of getting entangled by all the confusing key figures that may or may not help to predict the future, it can be beneficial to look at the big picture and as illustrated with the article of Jon Markman (2017) in the background of this paper investors tend to believe that when it comes to expenses linked to higher future market values, more is always better.

Contrary to the Amazon shareholders' beliefs, Hansen and Birkinshaw (2007), claims that R&D expenses will affect every company differently depending on where in the *innovation value chain* the R&D activities are focused.

By looking at the innovative companies with the highest research and development expenses and then compare their performance to their respective sector, as well as to the other most innovative companies in the world, one could validate or reject the Amazon shareholders theory.

1.3 Research Questions

- Will innovative companies with the highest R&D expenses outperform other innovative companies?

- Will innovative companies with high R&D expenses outperform their industries?

1.4 Purpose

The purpose of this thesis is to provide and contribute to the current research on R&D expenditure and its effect on the companies' market value over time. Although prior research fails to address the origin of an explicative coefficient of determination over time, the illustration of R&D's effect to market value over time in innovative companies could help amplify its argued effect. Additionally, by comparing innovative companies market value with its competitors i.e., the sector, it can also strengthen the theory of innovation value chains effect.

1.5 Limitations and delimitations

This is a quantitative study based on data presented in 2012-2018 Global Innovation 1000 study by PwC's consulting business, Strategy&. The study is focused on research and development spending in innovative companies only. This decision was made because of the valuation problem being most apparent in innovative companies where the future growth factor is hard to estimate. For ethical reasons this study will aim to show the R&D expenditures effect in general, and therefore companies name will not be presented. The limited-time series will likely result in absent changes to financial key value drivers from R&D spending, so we rely on the stock market's ability to correctly value these investments. Although profits from R&D investments may take more than 15 years, this study does not consider different research stages. The decision to not include a linear regression analysis may or may not limit the main findings of this study. It is also assumed that R&D is a key value driver in all listed innovative companies, although that may not necessarily be the case.

2 Theoretical framework

This section will cover the fundamental concepts of evaluating a company. By unfolding the most used methods, one can grasp what is covered in an issued price target. Secondly, this section will cover the current financial role of intangible assets, as well as why research and development expenses have gone from being frowned upon to being an attractive post for many investors.

2.1 Valuation of a company

The simple concept of business value creation has been publicly known since as early as 1890, when Alfred Marshall (Principles of Economics) first described how companies that earn a return on capital higher than their cost of capital created value. However, as explained in the introduction of this paper, the valuation process has become a lot more complicated than simply looking at return on invested capital (ROIC). It is important to understand that maximising short-term profits is not the same as creating shareholder value, and if the two are confused, both shareholder value and stakeholder interests are at risk. Firms often manipulate earnings to outperform analysts estimates (Damodaran, 2012). Earnings can keep rising smoothly by planning investments and sales of assets ahead of time. Furthermore, a company with good revenue recognition can capitalize operating expenses, book revenues early or write off restructuring charges over time periods best suited for it. For the maximization of a current share price to be equivalent to maximizing a company's value over time, the investors would have to possess complete information of what is going on both inside, and outside of the company. But since the investors never have complete information, it has been easy for companies to manipulate their price per share in the short run by simply shortchanging its investments into product development, research, brand building etc. This has historically been done with a short lived success as result (Koller et al, 2005).

Today, investors know better than to buy into key figures presented in financial reports. Although managers still tend to heavily focus on earnings per share for any given transaction, there has been no empirical evidence linking earnings per share to the value created by a transaction (Dobbs et al. 2005). Hence, the source of our economy's problem with short-termism are not the shareholders, but rather managers trying to live up to obsolete expectations.

This does not mean that fundamental principles of value creation are not important. Earnings multiples are still to this day used in investment-banking pitches and analysts' reports to communicate values to a broader audience. However, analysts tend to rely on discounted-cash-flow valuations for innovative companies (Koller et al, 2005).

2.1.1 Key value drivers

Some of our economy's largest and most innovative companies do not make a profit, yet they are still actively traded on the stock market at high price to earnings ratios. The reason is that the expected future returns outweigh the present value or the short-term costs that the companies have. But without a fundamental understanding of what the key value drivers of a company are, one would find it hard to comprehend. In her article "A Bubble Scarier Than Big Tech is Brewing in China", Shuli Ren (2020) states that even a soy sauce maker can be valued at 100 times its earnings, this suggests that there is more to the valuation of a company than financial key value drivers.

It should be noted that the key value drivers are different for almost every company. But by looking at the building blocks of a valuation formula, one can grasp the idea. Hence, this section will cover a simplified key value driver formula (1) presented by Koller et al. (2005).

$$Key\ value\ driver\ formula: \quad Value = \frac{NOPLAT_{t=1}(1 - \frac{g}{ROIC})}{WACC - g} \tag{1}$$

Where the net operating profit less adjusted taxes *(NOPLAT)* are profits from the company's core operations subtracted by the income taxes at time one.

$$NOPLAT = \ core\ operation\ profits - core\ operations\ income\ taxes \tag{2}$$

The constant g is the projected growth in NOPLAT, or more specifically return on invested capital (ROIC) times the investment rate (IR).

$$g = ROIC \cdot IR \tag{3}$$

The investment rate (IR) represents the portion of NOPLAT that is put back into the company.

$$IR = \frac{g}{ROIC} \tag{4}$$

Ultimately, weighted average cost of capital (WACC) is simply the discount rate for free cash flow and consequently the expected rate of return from investing in the company.

Determining a realistic value of growth may be an easy task for the small towns' local grocery store, but when dealing with highly innovative companies it is rarely feasible (Kothari et al, 2002). As can be seen from the equations above, the key value driver formula is hence only applicable when dealing with constant return and growth rates. The formula is therefore overly restrictive for innovative companies whose key value drivers are bound to change.

2.1.2 Discounted-cash-flow valuation

In the prior section, the uncertainty problem investors and analysts face when dealing with innovative companies' future were covered. Contrary to Courteau et al. (2006) findings, that price-to-earnings multiples can be successfully applied with some modifications. Models based on price-to-earnings multiples will fail to perform when earnings are highly volatile and cannot be used at all when earnings are negative. Besides, they give little to no insight into what drives a company's valuation (Koller et al, 2005).

When changes in key-value drivers occur, predicting ROIC or growth rates become increasingly difficult. It is advantageous to forecast the company's free cash flow and the markets' long-term development and work backwards from there. This is precisely what a DCF valuation is intended to do. By estimating the cumulative values of future cash flows, discounted-cash-flow valuation is used to estimate the fundamental value of a company. This is the reason why it is the only method that succeeds where others fail (Uzma, Singh & Kumar, 2010).

Analysts must put their imagination and predictability to the test when creating an accurate DCF model. It is beneficial to construct plenty of DCF valuations built on various probability-weighted scenarios and then work backwards until the present value of a predicted value driver is reached (Koller et al, 2005). This allows for continuous modifications to a model, which can further improve the predictability of future market values.

Since the discounted-cash-flow model is intended to cover the value creation of all future investments, the return on capital measured against the discounted value will always be less than the cost of capital in a growing business (Koller et al. 2005). This further explains why the valuation problem at hand is more apparent in innovative companies. Gajek & Kuciński (2017) identifies the shareholders option to abandon investments in the future as one of the biggest problems with DCF valuations and describe the capital injections and their duration as "option-like".

2.2 Intangible assets

Intangible assets are assets that are not physical in nature but are still valuable to a company. Some examples are intellectual property, trademarks, research & development, and patents. Although Core et al. (2003) fails to provide evidence of a "New Economy", the interest in intangible assets has been increasing for more than 40 years and it is almost 40 years since Pakes (1985) first suggested that research and development activities had a positive effect on market valuation. Xiao-wei (2011) could also confirm that the value drivers of agricultural high-tech companies partly come from intangible assets such as innovation, internal operations and learning aspects. This goes in line with a previous finding by Niven (2006) which claimed that research at the time suggested that approximately 75 per cent of an organization's value could have been derived from intangible assets.

2.2.1 Research and development

Out of all the intangible assets, research and development expenditure is the most talked about today. In 2018, R&D spending increased by 11.4% in the companies listed in the Global Innovation 1000 study, and interestingly the biggest R&D spenders are also the most R&D intense (Strategy&, 2018).

It was not long ago that the Financial Accounting Standards Board (FASB) could not confirm any relation between research and development costs and subsequent future profits. Therefore, it has up until recently been required for innovative companies to include the full expensing of research and development expenditures in the financial reports. This is not always the case today. According to GAAP (Generally Accepted Accounting Principles) in the United States, R&D expenses are normally directly expensed due to their uncertain future cash flows. However, costs of intangible assets related to such R&D activities can be seen as capitalized assets and thus will depreciate over time.

Since Pakes findings in 1985, the correlation between long-term total returns to shareholders and investments in R&D has been shown by regression many times (Koller et al, 2005). However, since multi-linear regression analysis are partly built on other key value drivers that are built upon estimations, and because the key value drivers of high-growth companies are changing from year to year, it is important to follow up on prior research to confirm that the findings are similar. Arnum (1999), Bartoy et al. (2002), Chambers et al (2002), Al-Horani et al. (2003) and Xu & Cai (2005), all have similar findings that R&D activities have a positive impact on a company's market value and its competitiveness. The link between R&D expenditure and a firm's market value can further be strengthened by the findings of Duqi & Torluccio (2010). They investigate the same relationship in European firms in the period 2001-2007. While controlling for the way companies in their study account for their R&D expenditures, they too find the strong positive influence of R&D expenditure on market value. However, in their study, they find that the result varies between different countries and in line with prior referenced research, they also find that the effect is the strongest in companies operating in high-tech markets and weaker in old and low-tech firms.

More recently, Yu et al. (2021) study examines the innovation performance of high-tech companies in China using a dynamic network data envelopment analysis (DEA) approach. Indeed, they too find that R&D activities help the companies improving innovation performance and gain innovative competitiveness. The positive relation between R&D expenditure and market value has also been confirmed in the North American Stock Exchanges for the period 1993-2013, by Pazarzi & Sorros (2018). While their goal was to prove that the relationship changes over time, the results suggest a positive relation between R&D expenses and market value, as well as a positive relation between R&D expenses and earnings.

Tubbs (2007), later suggests that a company that compares its R&D intensity to the average R&D intensity in its sector should be careful doing so, since sector definitions can be very broad, and misleading conclusions can therefore be made.

A handful of regression analysis has been done on the valuation relevance of R&D expenditures. In his early work, Sougiannis (1994) fails to find a significant relationship between R&D and future benefits but found it had a significant correlation with market value. This is also in line with the findings in Lev & Sougiannis later articles (1996, 1999), where they suggest that the estimated R&D capital is not fully reflected in stock prices, but instead significantly linked with subsequent returns. According to Green et al. (1996), this may not be the case in the UK. They suggest that there is little evidence that the stock market in the UK fails to recognize the valuation relevance of R&D expenditures. The subject is later brought up again by Chan et al. (2001), where a new attempt to link stock prices to R&D expenditures future value is made. The study fails to show evidence of the relationship between R&D expenditures and stock prices. However, they do manage to show stronger evidence that R&D to market value could be linked to future stock returns. Chan et al. (2001) findings are very similar to Eberhart et al. (2004), but Eberhart et al. compares the R&D expenditures to assets instead of sales.

But, contrary to the findings above, Callen & Morel (2005) found weak empirical support for the value relevance of R&D expenditures in their earnings-based valuation model. Only in 25 per cent of the sample firms did R&D investments affect the companys' market value.

2.2.2 The Innovation value chain

While most research confirms the positive correlation between R&D activities, innovation and future market valuations, other research suggests that the effect of R&D activities depends on multiple other factors. Tim Cook, CEO of Apple Inc. says that by only focusing on the product, a company will win the race in the long run (Safian, 2018). Hansen and Birkinshaw (2007) claim that the effect of R&D activities relies on where in the *innovation value chain* the R&D activities are focused. They offer a framework that compromises three main phases of innovation and claims that managers who use their framework will be able to pinpoint the companys' weakest link and tailor innovation accordingly, in order to strengthen those links.

3 Hypotheses development

The theoretical framework suggests that earnings multiples are widely used to communicate price targets and expectations to the public, but less applicable when dealing with high-growth innovative companies. Due to their estimated nature managers tend to manipulate reported key values to maximize the company's short-term performance (Damodaran, 2012). Financial metrics presented in quarterly reports are hence of varying importance to shareholders. Instead, a company's cash management seems to become increasingly important.

It is further suggested that intangible assets are becoming increasingly valued on the stock market and can according to Niven (2006), make up for 75 per cent of the value created. Research and development expenses are hence likely to be met with optimism on the market, which means that spendings of this nature should make way for increased market capitalizations.

With the theoretical framework in mind, two hypotheses aimed to answer each research question respectively are derived.

H_1: Higher Research and Development expenses in innovative companies will result in higher future market values.

H_2: Innovative companies with high Research & Development expenses will outperform their industries.

4 Method

4.1 Sample Data

Since the stock markets consist of both innovative, high-growth companies as well as established firms with little to no innovation, and because the valuation problem tied to the uncertainty of future ROIC and growth are very evident in high-growth companies, I have decided to focus this study on innovative companies only. As the purpose of this study is to find out whether more research and development expenses are always better, the study is based on data presented in the 2012-2018 Global Innovation 1000 study by PwC's consulting business, Strategy&. This intuitively excludes companies whose future ROIC and growth rate are easily identified and forecasted.

The market capitalization of each of the 1000 companies have been taken directly from Capital IQ's database. For this study, only yearly data has been considered and taken on January 1st each year. For simplicity, the summed market capitalisations for year 2012 have then been set to 1, and the market capitalizations for the following years have been divided by the market capitalization for 2012, to show the change in percentages. The percentage changes are then graphed in excel and presented in one section each.

It should also be noted that the top spenders' are not excluded from the 1000 list that they will be compared to, nor can they be excluded from their own sectors performance.

4.2 The top R&D spenders

According to Kar & Ramalingam (2013), there is no such thing as a magic number when it comes to sample size calculations, and 30 is not necessarily an adequate number. Depending on various factors like effect size, variability and level of significance a sample size or 10 or 50 could be adequate. But for simplicity in this study, with limited time to control for such factors, a portfolio consisting of the top 30 R&D Spenders is constructed. This portfolios' yearly market capitalization growth will then be compared to the market capitalization growth of the global 10000 list as a whole. Later the top R&D spenders are separated by their specific industry to then be compared to the growth per cent of each separate industry. The Industry data is taken from S&P Select Industry Data. This can help clarify if a certain industry is more susceptible to R&D activities. The separate industries that will be looked at are Pharmaceuticals, Automobiles and Software & Services.

One may think that the largest innovative companies are also the top spending ones. This would lead to the problem that the smaller companies with higher R&D intensity and higher growth rate would be ignored and the results would be misinformative. However, according to Strategy&'s 2018 report, the top R&D spenders are also the most R&D intense. Therefore, the top spenders R&D intensity is assumed to be the higher than the lower spending companies and will therefore not be considered in this study.

5 Results

This section will present the results of this study. The market capitalization growth of our portfolio consisting of the top 30 R&D spending companies from the 2012 Global Innovation 1000 study. The total market capitalization will be compared to the total market capitalization of all the 1000 innovative companies. Then, separate portfolios consisting of the top R&D spending companies from the top 30 list, in 3 specific sectors, are created. To represent each industry, the S&P Select Industry Indexes will be used.

5.1 The top 30 R&D spenders' portfolio

The top 30 R&D spenders portfolio consist of 4 companies from the software and services industry, 9 companies from the pharmaceuticals industry, 8 companies form the automobiles industry, 4 companies form the Technology hardware equipment industry and ultimately 5 companies from other industries. All the top 30 spenders maintain competitive R&D positions throughout the period, with none of them ever dropping below top 150.

In figure 1 we see that from the year 2012 to 2018 the top R&D spenders portfolio experienced a market capitalization growth of 240 per cent. To put this number in perspective the S&P 500 Index grew by 122 per cent during the same time period. Hence, it is evident that the top R&D spending companies have performed very well compared to the rest of the stock market. Furthermore, the Global Innovation 1000 list in total experienced a 155 per cent growth during this time period.

From this data we can confidently say that when it comes to the 1000 most innovative companies in the world, R&D spending seem to have a positive impact on market value in the short-term. This would help us answer our first research questions whether innovative companies with higher R&D expenditures will outperform other innovative companies. But, because of the uncertainty of the origin of the valuation increases, one can not be positive it is due to R&D expenditure. However, if this result is in line with that of the majority of other studies, then that conclusion would become more likely and according to the theoretical framework, that indeed seem to be the case. This result strengthens the theory that R&D expenditure in innovative companies are strongly correlated with future market valuations.

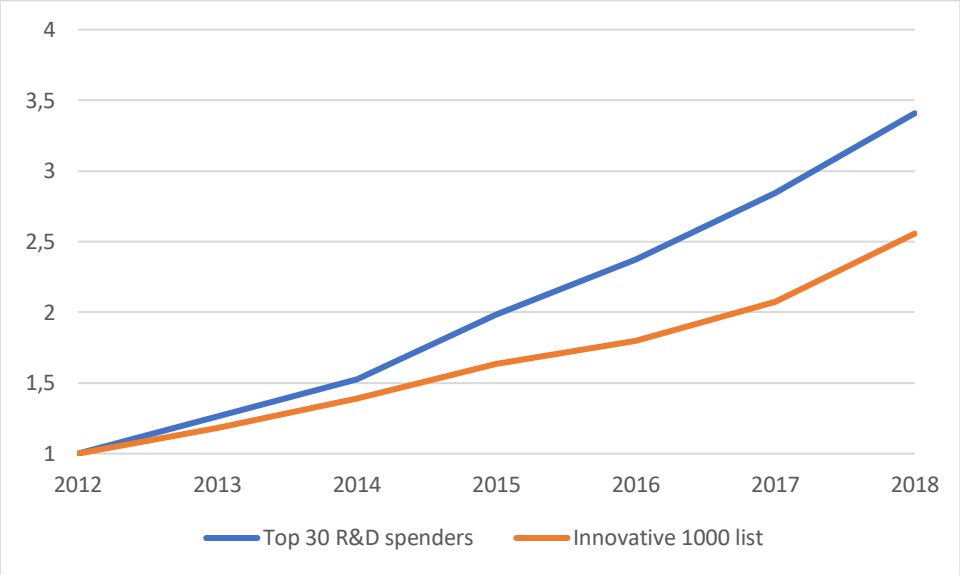

Figure 1

5.2 Top R&D spenders in the pharmaceutical industry

From the top 30 R&D spenders portfolio, a new portfolio consisting of nine pharmaceutical companies were created. The pharmaceutical sector as a whole grew by 96 per cent from 2012 to 2018 (figure 2). In relation to S&P 500 as well as the global innovation 1000 list as a whole, this must be considered a weak performance. The Industry is considered one of the most R&D intensive (Strategy&, 2018), so it is interesting that it has not performed better during this time.

The pharmaceutical companies with the most R&D expenditures performed even worse. The market capitalization of the 9 companies only grew by 59 per cent. This result suggest that the answer to our second research question is no, the top R&D spenders does not necessarily outperform their industries. But, Since the pharmaceutical industry is very R&D intensive, and the top R&D spenders in the sector performs worse than the sector as a whole, it is likely the case that the sector have other more significant key value drivers that are not covered in this study (Koller et al. 2005). Again, this is under the assumption that R&D is a key value driver for all innovative companies. It could also be the case that the top R&D spenders in this industry is large already established companies, and would therefore according to Duqi & Torluccio (2010) not benefit as much from R&D expenditure as their competitors.

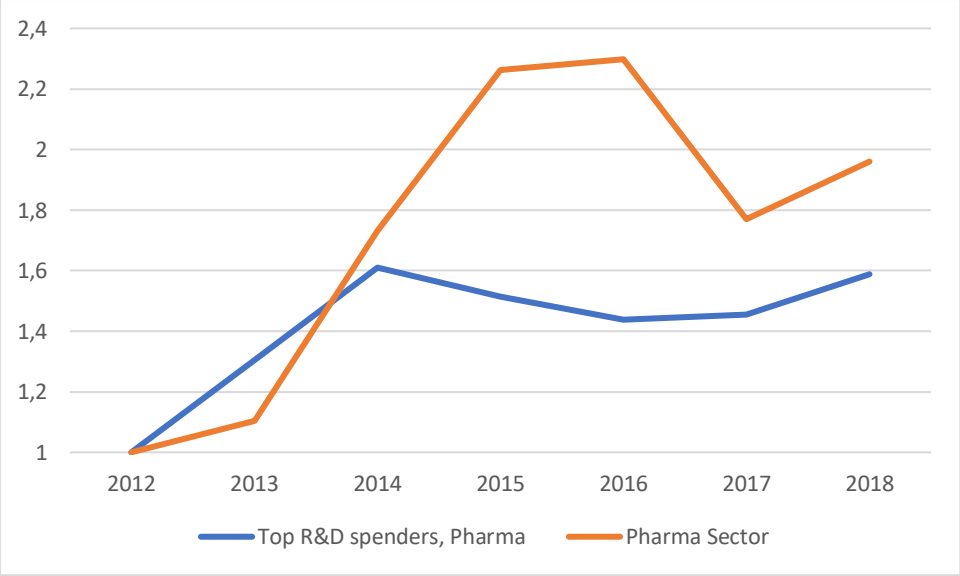

Figure 2

5.3 Top R&D spenders in the automobile Industry

Moving on to the automobile companies in the top R&D spending portfolio, they outperformed the sector as a whole. In our time period, the 8 companies experienced a market cap growth of 70 per cent. Again, this pales in comparison to both the market and the rest of the 1000 innovative companies. In line with the findings in the pharmaceutical industry, this result suggest that the top R&D spenders will outperform their competitors.

What is interesting is that although Tesla Inc. was not one of the 8 automobile companies with the highest R&D activities in 2012, they went on to outgrow their market during this time period. At the beginning of 2012, the Tesla stock was valued at 5.79 USD according to Capital IQ, and in 2018 it has reached 70USD. Although Tesla Inc. was only the 113th highest R&D spending company in 2018 and placed 451 in 2012, it outgrew its competitors easily. Today it is the ninth-highest valued company in the world according to Capital IQ, and the fifth-highest valued company on Wall Street. This strengthens the theory of the innovation value chain and tells us that there is more to innovation than just R&D investments.

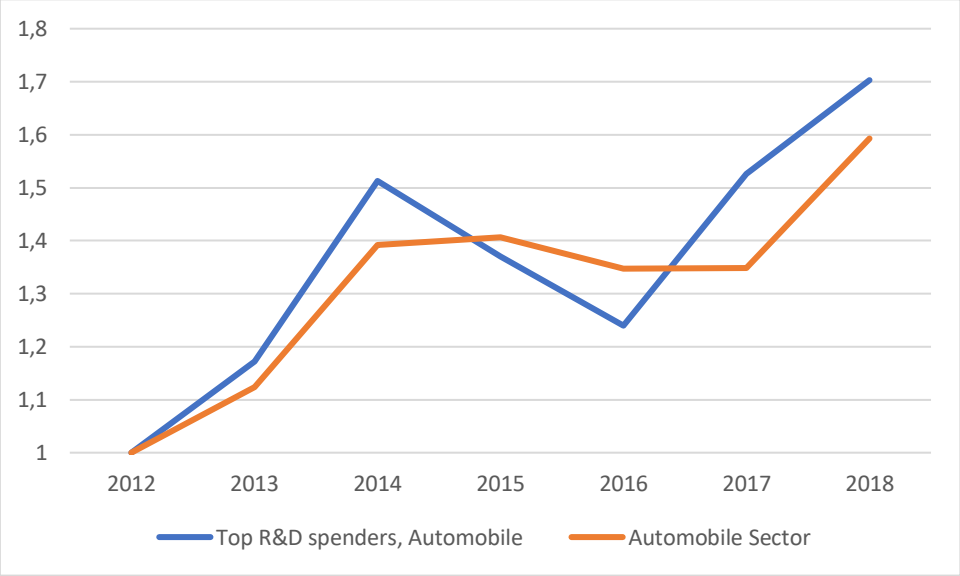

Figure 3

5.4 Top R&D spenders in the Software & Services Industry

Ultimately, we compare the 4 top R&D spending companies in the S&S sector to the sector to its competitors. The four research and development intensive companies in this sector were not competitive in terms of economic growth during this period. They only experienced a total market cap growth of 84 per cent, half that of the sector as a whole. Contrary to the top R&D spenders in the automobile and pharmaceutical industries, this result can not confirm that the top R&D spenders in innovative companies will outperform their industries.

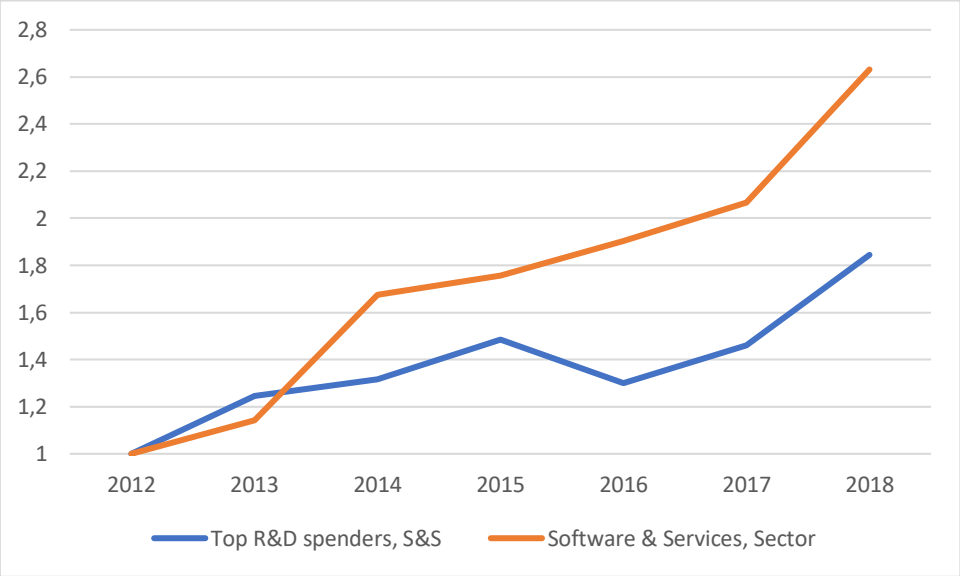

Figure 4

6 Conclusion

This study is based on innovative companies presented by PwC's strategy consulting business, Strategy&'s Global Innovation 1000 study from 2012 and the data is directly taken from their 2012-2018 reports. Hence companies that have not made it to Strategy&'s Global Innovation 1000 study is not included. Since R&D expenditure in the 1000 companies listed have increased in recent years (Strategy&,2018), the results will most likely be positively skewed for R&D in general. This, since we already know that every business on the list is considered innovative. Furthermore, we know that the valuation problem surrounding high-growth businesses is not necessarily apparent in lesser innovative companies, hence the findings in this study may not be applicable to any other data.

Since the data collected only covers the years 2012-2018, R&D expenditure before this period will most likely have impacted earnings during this period, and contrary, R&D expenses during this period will most likely result in future cash flows not officially reported during this period but rather assumed to be partly estimated in analysts DCF valuations. With the assumption that R&D expenditure is a key value driver for all innovative companies, prior R&D expenditure should already to some extent be covered in the stock prices.

Because of how fast-paced the technology industries are, research and development expenditure today is likely not met by the public the same as it did in 2012. Since the R&D activities have grown exponentially year by year, it is likely that managers have realised that shareholders value such investments higher than in the past. This could mean that conclusions made of data from 2012 is likely to be misleading today.

From the theoretical framework, I believe that the assumption that R&D activities are key value drivers in all innovative companies is correct. However, how much of an impact it has on market value, and especially in a short time span like the one studied, is impossible to say. The findings are supposed to be complementary to already existing research presented in this paper. Furthermore, because of how vague the understanding of R&D's real effects on a company is, and because of the fact that it varies from business to business, a regression analysis built upon estimated variables was not included in this paper.

Furthermore, the sample size used in this study may not be adequate, especially so in each industry since those portfolios only consisted of less than 8 companies. Even though there is clear evidence presented in the theoretical framework in this paper that R&D expenditures tend to be strongly connected to future market values. We cannot with the research at hand today, reject the hypothesis that innovative companies with higher research and development expenditures will outperform other innovative companies or their industries. Instead, almost all the resources in this thesis seem to agree with Jaruzelski et al. (2018) and Jaruzelski (2014), that there is more to innovation than R&D expenditure, and that when it comes to R&D, more is not always better.

The findings in this paper can contribute to the research subject in that, it finds similar links between R&D expenditure and market capitalizations. It is also one of the few studies that have not relied on other key value drivers in a multi-linear regression analysis to explain the true effects of R&D on market value, hence the findings in this paper can be of a more supplementary nature to other researchers. This study also contributes to society since it helps clarify the valuation problems surrounding innovative companies and can thus help both retail and institutional investors to allocate their resources in a more effective way and ultimately can explain that there is more to market valuation than the earnings multiples in the financial reports.

6.1 Suggested further studies

I believe the time span of 6 years in this paper is too short. For a deeper understanding of R&D's true effect on future market value, one would have to consider all future earnings-multiples and other variables that could affect the market valuation. One would also have to include all other key value drivers that could impact the market value. This would require not only more time and resources, but also changes to accounting practices to prevent financial variables from being as bland as they often appear today. This would allow for more predictable DCF-models, and consequently, more reliable research. With the ability to derive clear key value drivers, researchers would be able to find more clear cut correlations with the help of regression analysis.

In hindsight, I also believe that the sample size in this paper may not be adequate. For a better understanding of how the top R&D spenders' in innovative companies may outperform their industries I think portfolios with a higher number of competitors should be constructed. For example, in this paper, only four S&S companies made it into the top R&D spending portfolio.

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