Effect of Research and Development on Firm Value: Cross-country Evidence from the Technological Sector

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Abstract

The trend of research and development trend has been dramatically upward over the last few decades. Companies, particularly from the technological sectors, invest huge amount of resources on R&D. It is seen as a key competition factor in the sector. In this project it has three big companies which are Apple and Microsoft, Huawei companies. This project's aim is comparison between stock price and research and development costs, the method of this project is secondary data in 2011-2021 years then calculation descriptive statistic and regression analysis and correlation and coefficient among those three companies. The result shows Apple and Microsoft Company is higher in stock price and research & development than Huawei Company and significant, and Huawei Company is less than the Apple and Microsoft and Non-significant.

Key words: Research and development, firm value, stock price and technological sector.

1. Introduction

Companies or organizations should do research before business or operations to know customer needs and get customer satisfaction to their production and research & development directly effectively effect the value of firms, organizations and whatever it be the organization for any type of productions because of every starting business should grow up step by step year by year should be updating and upgrading the business of the company and sustainable product to customers and develop the items and services or products to continue competitive advantage and also technological companies like that to, in technological products is very sensitive because technology is growing more rapidly than other companies than other productions if any company cannot develop or innovate their technological products they will directly destroyed in the market.

Because customers need something new updates every day every year by research and development on the production finding new features new software new skills to their

technological items such as cellphones or laptop or any products of technology for example Apple company and SUMSONG company they are ten years and more in competition with each other they yearly change their design of products and adding more features to their products otherwise they can't continue the competition with each other and they have to make unique production like Apple did because Apple has IOS system on their products, IOS system is easier than Android system and much more suitable for customers because customers satisfied with it 80% or more customers use Apple products because of the IOS system and Apple products it's has more quality than other companies and except Apple products other companies like SAMSUNG and HUAWEI uses Android system for their products it means here Apple did unique products that is why majority use Apple products and this uniqueness for production gains reputation for the company when any company has reputation customers will satisfy with them and as a result they gain value for their firm and these customers satisfaction and reputation in the market came from research and development without it non company can do competition and gain competitive advantage, in this case companies thinking about adding more items like headphones electronics watch and tablets as well to attract all types of customers in every sector like Apple did before and every companies coped like Apple because they realized in this development and innovation could gain high value and high profitability in the market to get higher performance than others this things that I mentioned it's tangible.

And those research and development it's very effect on firm value because without research and development without investigation without innovation the company cannot present or announce their production to their customers because if they release bad quality in the market if consumers non satisfied with the product directly the reputation goes down then it will be difficult to rise or inter the market again like before and the innovation and development it should be based on customers' needs what they really need what is they expectations about the company's production.

The aim of this study is to realize which company has higher stock price and spend research & development more than others, and which company does research & development in order to increases development in technological sector to higher performance to firm value.

2. Literature review

Research indicated that returns on R&D for pharmaceuticals brought into the US market in the 1970s and 1980s were substantially skewed; with the top decide of new drugs accounting for

about half of the overall market value. The rapid growth of managed-care organizations; indications that R&D costs were rising at a rate faster than overall inflation; new market strategies of major firms aimed at simultaneous launches across global markets; and increased attention focused on the pharmaceutical industry in the political arena all changed the R&D environment for new medicines in the 1990s. Henry Grabowski, John Vernon & Joseph A. DiMasi. (2012, September 17). Returns on Research and Development for 1990s New Drug Introductions.

2.1 Research and Development

Research and development have been the key factors of progressing through creativity and inventions, It's finding's and analyzing variety links of literature with economic performance to prove the importance of R&D with economic around technology sectors and other sectors, regards to the previous searches R&D have a positive feedback equally forward through investment and expanding the efficiency of growth and development and its increase organization and firms value, performing possibility of power existing product and new development product, based on study results R&D is one of the phenomena's subjects that assist the firms and organizations system in case of competition of market locally and internationally with improving company performance. (Lin et al., 2006; Griliches, 1986; Jaffe, 1986).

Henderson and Cockburn (1994) and Hagedoon and Cloodt (2003) R&D could impact of the firm's capability and the way of managing production in the market especially in case of producing new product with lower cost, analyzing weakness points doing priorities which is by steps forward and it's another vision for the firms to rich brighten path and bring new product markets area especially in the technological sectors (Budur et al., 2018). Series of related articles by Jaffe (1986), Cohen and Klepper (1996) found. Another study have been done by Japanese through the impact of the Research and Development form data of machines since 1987 to 1988 for first time its demonstrate that he effect of Research and Development illustrate it growth of market and worth very positively and increasing growth TFP is approving and very positive in the half of 1990s, Then in 1998 we feel that market of shareholders directly linked with research and development finally we found the positive roll of R&D impacts on invention and creativity of firms and increasing firms value as well.

Masaya Tomiyama & Tsutomu Miyagawa. (2003, January 23). Corporate governance and research and development: Evidence from Japan. In business world you need R&D to across

the crisis of invention time is never stop for firms with the changing that happen in business world new investor and new ones come to lead, its need new theory and new science method for achieving new data and analyses generally the research are going forward equally with the technology information that is related the inventions who made. Most people when hear the words of research and development sprightly imagine a laboratory with a white lab coat in or imagine pharmacies famous brands actually it's kindly close form this type of working with these imagine, but truly it's not like this, Research and Development is existed in any successful company in the world without the size and ability of the worth or area and power of the company. It's not very difficult to understanding what is R&D essentially, the firms are doing the best through improving they did and what they do in future this is related to the product that the company is have and exited and maybe it could be new revolution for the company to do invention, with R&D there have a million of invention and new product and millions of people around the world is use it .without research and development there is never science and the technological producers that reflects benefits for a millions of people, apple company is produced iPhone in 2007 after 10 years of invention based of research and development apple company is prefer new technology inventions such as new specification in design and wife charging and recognizing face known as face ID, there we have to thanks R&D fir a new invention in manufacturing non driver cars and charging cars also known as electric cars they have been estimated millions cars in 2020 from street and its imaginations of most of people in the world. Simply there have three types of research and development. The companies. Callum Brodie. (n.d.). These companies invest the most in research. The basic R&D subject is understanding a particular are and give a beneficial result to the firms in a specific problem and the way of fixed this is the first step for developing strategic of firm at the same time give a big result to the firm in market.

Applied research and development is working on achieving new information about market need to create new product and service in the market (Budur, 2018). Relying on previous research and development result or new R&D for reaching the specific target, the latest R&D it's used for analyzing that how to meet costumer requirement and the second step of R&D is the process of is recognizing the result and taking advantage of any decanted industry.

Development research is according on the is using the existing info that is achieved from the expertise way to progressing new product and service which is achieved in the process, these is the of engine of born the ideas before that the product sell and using in the market and its help the company in more effectively and efficiency marketing their products (Abdullah & Aziz, 2017).

2.2 Firm value

Firm value it described as market value, it's amounts of money that required which is purchase or take over a business form (Abdullah and Fatah, 2020; Para et al., 2022). If the price of the stocks is raises it determined the process and its performance highest value for the shareholders if the stock's value is increased the wroth is prove more worth, There's more notion of demonstrating company worth in a certain way (Nurlela and Islahuddin, 2008). According Husnan and Pudjiastuti (2002), it's amount of money that required which is purchase or take over a business form, organizing the value of firms is the most valuable things which is firms are able to do, The firms used plan several way thought this case which is consist of planning and finding benefits of running the worth to rise the power and efficiency of the firm and make it more famous and bigger. Nur Triani, Deden Tarmidi. (2019) have conducted a study to see if there Research and development directly linked to firm value, using a sample of 563 Chinese between 2005 to 2013 the study is suggests that when research and development is increase there's the firm value is rise to the certain points and then rocked down and there have reverses in the U shape link firm value, generally have been confirm our experience and compliable of literature research and development not arranged in a straight line which is not going by steps in progress, The study is evaluate a very important points for the stakeholders, for instance investor, politicians and government in running of long term performance objects. Woo et al. (2018) outline that firms are working hard to always reach the main point of understanding how the brand is are creating strong value this consist of four different types of firs one is brand value, second is sources-value, third is delivery value, fourth is outcomes value.

2.3 R&D in technology sector

Based on the article's and studies research and development in technology sector is consist of that activity which the company achieved such as the technological product and invention with service then demonstrated to market, the technology companies are used R&D for getting new information and ideas for creating new products and service progression existing product, system and service then they used in market for sell, this process is day by day always in growth cause it's the main source of the technological firms always seeking to the best to serve the best technology, for attracting customers in market increasing rate of sell and competing firms between each other in technology markets (Rashid et al., 2020). R&D is important for business because it's suggesting new knowledge and new ideas, the reason of advancing firms around the world another reason is led to rocket up efficiency as well and help the firms to survive in

market competition. The highest level of research and development is supported invention and creating information (Poturak et al. 2020) and new specialist are the most specific points that make a high technology companies (high - tech) from the other companies which is not developed as well, the organization and firm are faced many different pressure and nervous in strategy because this firms are usually select out different strategy's, the qualitative research have been done in Poland is show that form a 61 different countries in the high tech companies that operate which is working in the worldwide market, the result demonstrate that the high tech companies are have a very accurate vision with future targets for progressing R&D as resource the studied firms are try to leading invention and creativity in a technology sector. Bielawska (2012, April). The strategic dilemmas of innovative enterprises: proposals for high-technology sectors.

2.4 R&D and firm value

According to a series of a study which is published by Jaffe (1986) and Cohen and Kleber (1996) they found it that Research and Development types and levels is very closely affect of firm value and there have a link between R&D and firm value cause both are forward equally and this wo subject are complete each other. Griliches (1986) is particularly foxed on the relationship between research and development with firm work as well in the production process and evaluating market and customer form worldwide of business firms and organizations are competing in case of manufacturing new products this is the way of sustain firms to aim the target completely , The study have been regarding to the of a specific sample of production and investment japan in 1982, Goto and Suzuki (1989) its illustrated a positive relationship connection of research and development with enterprise value in the sector of technology especially and activity of firms through the subject, it assets the firm to keeping time and progress quickly, Same for Wakelin (1998) Appears and demonstrated the value of research and development for the firms and firms value very well and increased the power of manufacturing , effecting of employees awareness and activity through the subject Morbey and Reithner (1990) and Del Monte and Papagni (2003) found the improvement of the firm selling with income, in Italy is most of the time it's on pf the hugest factors which is the motion and efficiency of the company is increased levels unbelievable and show the company's specialties.

Based on the annual reports valuable firms are spend such as Amazon, Alphabet, Huawei, Microsoft, Apple, Samsung etc. are the top firms which is spend the most in research and development, this firms are form the top level of global business during these years and they

almost got sustainability evidence in market, research and development is imperative to withstand competition wave of distribution. Regarding to the study Amazon Company is among the highest top of spender through research and development, Amazon Company by the evidence illustrate paying out more than 42.74 billion dollars form the facial of 2020 (11.1% of net sales) on technology detail and content in compare of to 35.93 billion dollar in the facial 2019. In 2017, Security and Exchanging Commission asked amazon to demonstrate and publish the company transparency clearly in any way and direction by activates or projects or any other way which is illustrate the company direction, the cost of research and development is always increased in the company around the technology content in the financial statement, during 2020 was show up 2,244 and the most of it is form the Artificial Intelligence (AI) machine leering, and computer vision as the of its venture the idea of delivery stuff and product with drone and robot for organizing warehouse. Microsoft is another spender of Research and Development and the company is committed on in case of technology in the long terms, with covering three determination of the company, determination of cloud platform, determination of create more personal computer science computation, the company is spend more than 13% of the total income during this years for research and development which is the link or strong relation between the subjects for the company, in the facial of 2020 the company is spend for research and development 19.27 billion dollar, around first nine month its spending more than 15,03 billion in case technology invention of the company, in 2021 Microsoft is reached 2905 invention during research and development this the 4th to level in least of the company R&D research in case of creativity and new ideas for the company in the world, Microsoft is one of that firms that used the ability of student in the different universities around the world yearly, they are believed young generation through the different classes in society that is what Microsoft doing with universities in case technology especially.

Fifth company in the list doing research and development is Apple company, Apple company is takes a different way in case of research and development, the company is have specific way to spending on R&D, in 1998 Steve Jobs said invention is never rely on spending and money it's about the people you have in the company, how you lead that people or employees in the firms and your plan to how long you reach it in the facial year of 2020 apple is spend 18.75 billion dollar in research and development, its directly about %7 of net of the company form the first six month of 2020, and apple company directly show up that they spend 10.42 billion for research and development in case of technology invention and creativity The company always believed that research and development is bass of growth of company and future of the company with competitors in the market, for expanding and cross the boarders with developing

new product and service which is the particular and healthy way for invention and there is apple company in 2020 is reached 2791 research and development The power of progressing is increased through the different types of apple product about speciation which is working with technology and friend of nature, apple company truly work on IOS progressing yearly this system is the basic thing that make Apple different with other company in the wold and support it with new version usually its make customer feel great in case of battery and screen life as well, one of the most thing apple did during this year after that they manufactured iPhone 12 generation they removed the head charger as keeping nature and evaluated all the part of the product that it could doing recycling for the next years later its start from iPhone 12 to 13 and its same for mace and, iPad, apple TV, I watch and other products as well, increasing Apple shares in stock market daily is prove it that Apple strategy is worked successfully and customer can see the result in the market how is research and development are impact the firms and how is relationship is strong among both of the subjects about resin net income and expanding the company in business world (Prableen Bajpai, 2021).

Research and development is positively affect companies performance most of the studies showing that research and development is more effective and impact the firms value positively than service, because of that inventions that become true through research and development the companies are able to increase price of the product and give the product more value there they can guaranteed there future with this vision, research and development leads to increase production and reduce cost of production (Hadžiahmetović et al. 2022). Research and development is allow the company stay ahead, the firms plan is effect the value of research and value of the products its asset the company's to survive in the different situation, research and development in the progressive countries different with a retarded countries the development countries are more beneficial on R&D because they truly used and it going to be survive the firms and countries in a difficulties which is a basic source helping to increase net income and level of progressing to lead world through this development countries are control the world in case of technology especially and they will sell it to other countries as product and survive and the retarded company are forces to buy and use it because the different sectors, They are spending more and support the studies in a different sector especially the sector of education to grow up new and smart generation, supporting public sector and private sector and increase level of understanding invidious ability as well, retarded countries are spending for R&D is lower than expectations and there not supporting in both of public and private sectors that's what yearly and annual income of the retarded country's low and never become progress spending for service, never working on individual abilities, studied and educational sources a

big part of the process in R&D this is effect the enterprise value of the firms in the both different countries. Kartick Gupta. (2017, September). The effects of R&D and competition on firm value in international evidence.

Leonidas et al. (1996) examines the most important models on the subject, defines their structural characteristics, assesses the procedures used to validate them, and examines the fundamental conceptual concerns that arise from their evaluation. While significant progress has been made studying the mechanics and constituent pieces of the export development process, this line of empirical investigation has been criticized on structural, methodological, and conceptual grounds. Future study in the topic should take use of existing theory's diverse contribution while also elevating its prominence with contributions from marketing, business, and other disciplines.

3. Methodology

In the analysis, data on the stock return of businesses listed on the ISE throughout the 2011-2021 period, as well as data on R&D spending and market capitalization/book value, were employed. Data were gathered from their respective websites as well as other scholarly papers. The availability of full data from the 2011 - 2021 eras was the primary criterion for choosing the businesses whose data was used. This constraint developed as a result of the lack of a trustworthy database and the inability to obtain all data pertaining to the companies. Furthermore, due to their differing financial structures, financial organizations such as banking and other financial firms were excluded from the research.

4.1 Variable Measurement

The purpose of this study is to see where extra return rates on R&D spending may be shown. First and first, among all factors, R&D expenses must be defined. R&D expenses are classified into two types based on company accounting criteria: regular R&D expenditures and nonrecurring R&D expenditures (Choi & Kim, 2017).

Total R&D Expenditure = Ordinary R&D Expenditure + Nonrecurring R&D Expenditure

In a nutshell, total R&D expenditures (TRD) are the sum of conventional R&D spending and nonrecurring R&D expense. Ordinary R&D expenses are determined as the total of research expenses in the income statement and research expenses in the factory cost report. Nonrecurring R&D expenses are computed by subtracting basic development expenditures

from term-end development expenditures and adding development expenditure repayments from the revenue statement and factory cost report. This is explained in the Formula below. Assuming an equitable percentage of the portfolio's investment in individual stocks, the standardized residual return rate, which is the average monthly rate of return minus the risk-free rate (monthly change rate of 3 treasury bond), is utilized as the dependent variable. As independent variables, RMRF (market premium), firm size, and BM ratio are employed. The following are the calculations for each variable. First, for RMRF, the value of the market rate of return after deducting the risk-free rate was employed. KOSPI was utilized as the market rate of return, while the three-year government bond return rate was used as the risk-free rate. The combined market value is used to compute the second factor, which is company size. It is determined by multiplying the variety of similar stocks by the stock price in the year t-1. Third, BM is the market to book ratio, and book value is entire ownership interest after deducting preferred capital stock. The term "market value" refers to the whole market worth (Abdullah & Tursoy, 2021).

Firm value is measure in the literature using different types of accounting and market data. Abdullah et al. (2021) uses accounting data to measure firm value. Rasul (2018) uses Tobins' Q index. Akalpler and Abdullah (2020) use stock price per share.

4.2 Conceptual framework

We view the drivers of strategy as consisting of three alternative perspectives: industry-based (i.e., competitive forces), resource-based (e.g., firm-specific resources and capabilities), and institution n-based (e.g., policies, regulations). Accordingly, we develop a framework that depicts alternative drivers of. So, the processes by which SO affect performance, and the moderators of these relationships (see Figure 1).

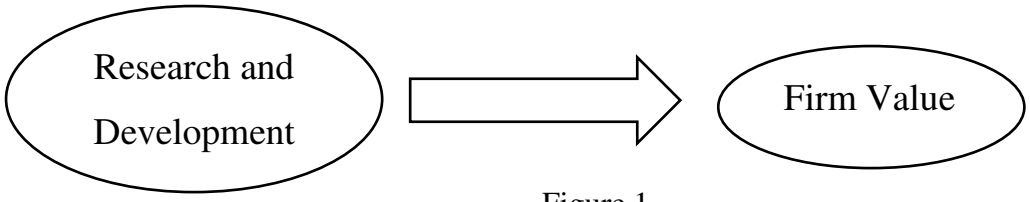

Figure 1

Conceptual framework

4.3 Model

To investigate the non-linearity of the link between R&D spending and business value, we estimate Equation using Arellano and Bond's dynamic panel modified method of moments (GMM) estimator. The dynamic GMM estimate simply distinguishes the model by removing strong effects or any equivalent linear firm-specific variable. This estimate also alleviates worries about endogeneity due to the probable link between these firm-specific effects and explanatory factors (Abdullah, 2021). We also conduct pooled least squares method (OLS) and fixed-effects panel regressions as alternative estimate specifications. The linear regression model looks like this:

4.4 Firm Value

$$FV_{it} = \beta_0 + \beta_1 R\&D_{it} + E_{it}$$

Stock price per share is used as a surrogate for firm value as a dependent variable. Tobin's Q is calculated by dividing the book value of total assets by the book value of equity + the market value of equity by the value of total assets. We also utilize the industry-adjusted Tobin's Q as an alternate proxy, as Rasul et al. (2022) does. The difference between a firm's Q and the average Q in the firm's industry within observation year is the industry-adjusted Tobin's Q (Abdullah and Tursoy, 2021a; Gallié & Legros, 2012)

Lerner index and the square of R&D intensity are our primary independent variables of interest. We utilize R&D intensity as a measure for the degree of R&D spending, which is calculated by dividing R&D expenditures by total assets. Furthermore, we employ R&D intensity squared to discover the likelihood of a non-linear connection between R&D spending and business value. In particular, if the sign of the coefficient on the square of R&D intensity is positive (negative), the link between company value is likely to be straight. A similar technique is used for estimating the model with numerous leaps each period. However, it is no more possible to directly solve for the optimal R&D stock.

4.5 Method

In this research, we investigate if there is a direct relationship between R&D initiatives and business value. Using a Technology documented business as an example; we provide

experimental confirmation that the R&D ventures firm worth connection, which is consistent with our central hypothesis.

We look for the presence of a modified relationship between R&D initiatives and firm worth in enterprises with a high learning experience. We also find a link among enterprises with little learning experience. These findings imply that there is an additional direct link between R&D initiatives and company worth in terms of the degree of businesses' learning experiences.

However, the relationship between R&D activities and company exposition is still not adequate. As a result, in order to cover these identified research gaps and contribute to the present literature, this study explored the potential impact of R&D activity on business progress and financial performance in Ethiopian enterprises. Using imbalanced board data from 476 exclusive enterprises recorded in Ethiopia and a combination of the fixed-impact, PSM, and ETE assessment approaches, our analysis found substantial evidence that R&D movement has a robust, significant, and critical influence on firms' display. The obvious insights demonstrate that in the scenario analysed, around 28% of enterprises invested resources into R&D.

The findings also show that there is a significant difference in all results between the two subsamples, implying that firms with R&D activities have a higher value in all result components. The experimental results involving the FE technique also suggest that interest in R&D has a positive and truly massive impact on development execution, demonstrating that current year's R&D speculation and prevailing year's advancement execution have a warm relation, while current year's R&D venture has a negative impact on current year's associations' presentation due to more limited term monetary execution.

Furthermore, this year's extended monetary presentation is significantly influenced by last year's R&D effort, which strongly supports the estimations offered in the study. Similarly, the evaluation employs PSM and ETE to analyse the strength of the models, and essentially comparable results were obtained from the two procedures using various assessment options; also, there are a few contradictory outcomes over the long-haul monetary execution employing ETE methodology. Similarly, results demonstrate the effects of major control elements, and discoveries reveal that those factors are typically actually vital in the normal bearings. In two respects, this study broadens and enhances the R&D speculations firm worth writing. We provide fresh evidence for the prevalence of linearity in the relationship between R&D ventures and business value in a cross-country context. This research has substantial implications for academics and specialists. Our findings, in particular, can be useful to strategy creators who take out R&D venture techniques.

In two respects, this study broadens and enhances the R&D speculations firm worth writing. We provide fresh evidence for the relationship between R&D ventures and firm value in cross-country sample. This research has substantial implications for academics and specialists. Our findings, in particular, can be useful to strategy creators who take out R&D venture techniques.

This focus also has speculative and administrative implications by demonstrating a non-linearity in the R&D speculations company worth relationship. To begin with, our findings support the speculative prognosis. According to the real choice theory, the future volatility of R&D earnings effects market esteem. According to the real choice hypothesis, a higher risk leads to a higher payoff. Our evidence from Chinese enterprises suggests that increased market vulnerability raises the market value of R&D speculations to a certain point, beyond which it decreases market worth.

Second, our findings support the prediction of data unevenness conjecture. Firms with larger R&D investments may face bigger data disparity and, as a result, more significant hostile choice expenditures, which has a negative impact on company worth. Third, our findings support the S-bend theory by demonstrating the reduction of minor re-visitation of R&D hypotheses. Our evidence based on Chinese enterprises suggests that an increase in R&D investment increases the minor rate of return to a certain point, at which time it appears to diminish the minor rate of return past that point. Speculations about research and development are inextricably linked to vulnerability. As a result, while deciding to invest in R&D, administrators must consider market and mechanical vulnerabilities. According to partners (for example, financial supporters and lenders), Chinese capital business sectors are less skilled when compared to developed nations such as the United States. As a result, enterprises must eliminate data disparities across firms and partners in order to have simple access to capital for R&D endeavors. This implies that firms should increase market transparency and risk management.

We don't focus on state-started channels associated to the age of information and the assistance of mechanical advancements in more depth in the R&D guesses company worth relationship. As a result, additional investigation should consider these divergences in the connection. Fourth, a few studies provide strategy recommendations to such firms, one of the productivity-driven economies. Specifically, Samsung and Huawei are concerned with the relative ranking of China and Korea in the system of competitive economic conditions. As a result, future research should consider the relationship between R&D speculations and business value in

terms of upper hands from a cross-country perspective. 6th, subsequent research should broaden the example time frame in studying the R&D guesses firm worth association.

5.Research Finding

In research finding the descriptive statistic has been done, correlation and coefficient and the last is regression analysis the project describes three massive company in the technological industry and have best value than other companies in technology, three major tables about all companies that the analysis done its descriptive statistics for all. First table describes Apple Company which is the best company in performance and firm value.

Descriptive Statistics			
STP		*R&D*	
Mean	45.72556	Mean	10648.91
Standard Error	11.80319	Standard Error	1963.467
Median	30.0096	Median	10045
Standard Deviation	39.14674	Standard Deviation	6512.084
Sample Variance	1532.467	Sample Variance	42407235
Kurtosis	2.948103	Kurtosis	-1.02202
Skewness	1.810109	Skewness	0.394473
Range	127.9891	Range	19485
Minimum	13.0002	Minimum	2429
Maximum	140.9893	Maximum	21914
Sum	502.9812	Sum	117138
Count	11	Count	11

Table 1 Apple Company descriptive statistics

There is some factors in the table but most important is Mean which is 45.72556 in stock price but in research and development is 10648.91 which is more than the stock price it means Apple Company spent large amount money in research and development, then standard deviation in stock price is 39.14674 and opposite of it is research and development which is 6512.084 it means again Apple Company the R&D is better than the stock price and the third one is the Range from minimum to maximum in stock price starts from 13.0002 to 140.9893 and the Range between them is 127.9891 it means the Range is too long in stock price, but in research and development starts from 2429 to 21914 and the Range between them is 19485 which means R&D in Range less than stock price, and the last one is summation between 2011-2021 years it means 11 years, in stock price Sum is 502.9812 but in research and development is Summation is equal to 117138

Table 2 Microsoft Company descriptive statistics

Mean	105.2572	Mean	13602.09
Standard Error	29.40397	Standard Error	1158.04
Median	62.14	Median	12046
Standard Deviation	97.52194	Standard Deviation	3840.785
Sample Variance	9510.53	Sample Variance	14751630
Kurtosis	2.251978	Kurtosis	-0.47702
Skewness	1.631581	Skewness	0.854668
Range	310.23	Range	11354
Minimum	26.09	Minimum	9362
Maximum	336.32	Maximum	20716
Sum	1157.83	Sum	149623
Count	11	Count	11

In this table of Microsoft Company the important factors is Mean and standard deviation, Range and Summation but first starts with Mean in stock price is 105.2572 but in research and development is 13602.09 it means Microsoft spent higher cost in research and development, then the standard deviation in stock price is 97.52194 opposite of it in research and development is 3840.785 again in research and development is better than stock price, and about Range from minimum to maximum in stock price starts from 26.09 to 336.32 and the

Range between them is 336.32, and the other on is research and development again starts from minimum to maximum, minimum is 9362 and maximum is 20716 and the Range between them is 11354, it means the Microsoft Company focused on Mean and Standard Deviation more than Range, and the last factor is Summation, in stock price is 1157.83, but in the research and development Summation is 149623 Microsoft company higher than the stock price and the calculation years is 2011-2021.

Table 3 Huawei Company descriptive statistics

Mean	6.149545	Mean	79024.18
Standard Error	1.219357	Standard Error	13809.13
Median	4.18	Median	76391
Standard Deviation	4.044148	Standard Deviation	45799.72
Sample Variance	16.35513	Sample Variance	2.1E+09
Kurtosis	-0.11195	Kurtosis	-1.5592
Skewness	1.091756	Skewness	0.261732
Range	11.79	Range	118970
Minimum	2.01	Minimum	23696
Maximum	13.8	Maximum	142666
Sum	67.645	Sum	869266
Count	11	Count	11

The final company in descriptive statistic calculation is Huawei Company. Like other companies before Apple and Microsoft three important factors include Mean, Standard Deviation and Range, at the last Summation.

First of all starts with Mean in stock price is 6.149545, but in research and development Mean equal to 79024.18 its higher than the stock price, and the standard deviation in stock price is equal to 4.044148, but standard deviation in research and development is equal to 45799.72 which is very higher than the stock price, and the Range starts from minimum to maximum in stock price the minimum is 2.01 and the maximum is 13.8 and the Range between them is equal to 11.79, and about the research and development again starts from minimum to maximum and the Range between them, the minimum is equal to 23696, and the maximum is equal to 142666 and the Range between them is equal to 118970 again Huawei company in research and

development is spent more than the stock price, and the last factor is Summation in stock price is equal to 67.645, but Summation in the research and development is equal to 869266, again in Summation Huawei Company is better than the stock price.

Then another method is correlation and coefficient between the three companies shows the results shows the positivity between stock price and research & development how it's positive with each other includes three tables of correlation and coefficient

Table 4 Correlation Coefficients

The first table is Apple company correlation and coefficients between stock price and research and development which is positive in both sides.

	STP	R&D
STP	1	
R&D	0.900344	1

And the second on is Microsoft company correlation and coefficients between stock price and research and development which is positive in both sides.

	STP	R&D
STP	1	
R&D	0.964872	1

The third one and the last is Huawei Company correlation and coefficients between stock price and research and development which is negative.

	STP	R&D
STP	1	
R&D	-0.11943	1

As the results that shows between the three companies is nearby each other specially between Apple Company and Microsoft Company in research and development because both of them spent large amount of money in that factor and both of them in stock price is high but Apple Company is higher than the Microsoft Company, but Huawei Company is so much less than the Apple and Microsoft because of the market share the two American companies both have large amount market share than the Huawei Company and it has some reasons because Huawei Company faced political issue with USA government because Huawei company announced 5G network of internet then USA government abounded Huawei Company from Android systems in their cellphones that is why the stock prices of Huawei Company decreased since 5 years till now they haven't any alternative to provide in their productions

In another calculation in the project is regression analysis the result which is shows the project is successfully affect or not, or the result in this project is correct or not and first of all it has Apple Company regression analysis results.

Table 5 Apple Company regression analysis

Regression Analysis								
Multiple R	0.900							
R Square	0.811							
Adj. R^2	0.790							
SE	17.957							
ANOVA								
	df	*SS*	*MS*	*F*	*Sig. F*			
Regression	1	12422.5	12422.5	38.52	0.000			
Residual	9	2902.208	322.468					
Total	10	15324.674						
	Coefficients	*SE*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	-11.910	10.749	-1.108	0.297	-36.226	12.407	-36.226	12.407
R&D	0.005	0.001	6.207	0.000	0.003	0.007	0.003	0.007

In this case the most important result includes R square and adjusts R square is 0.811 and 0.790 which is significant both of them, and the other one is regression is 0.000 is also significant, and another result is T statistic is 6.207 is positive and P value is 0.000 it means the results shows positively significant in Apple company the value is high and the firm performance is also high.

Table 5 Microsoft Company regression analysis

Regression Statistics	
Multiple R	0.965
R Square	0.931
Adj. R^2	0.923
SE	27.007

ANOVA								
	df	*SS*	*MS*	*F*	*Sig. F*			
Regression	1	88541.01	88541.01	121.395	0.000			
Residual	9	6564.285	729.365					
Total	10	95105.30						
	Coeff.	*SE*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	-227.98	31.32	-7.279	0.000	-298.84	-157.13	-298.84	-157.13
R&D	0.024	0.002	11.018	0.000	0.019	0.030	0.019	0.030

These some factor which is important in this calculation R square is 0.931 and adjusted R square is 0.923 both of them is significant and about the regression is 0.000 is high significant And the last one is T statistic is 11.018 and P value is 0.000 is high significant to.

Table 5 Huawei Company regression analysis

Regression Statistics								
Multiple R	0.119							
R Square	0.014							
Adj. R^2	-0.095							
SE	4.232							
ANOVA								
	df	*SS*	*MS*	*F*	*Sig. F*			
Regression	1	2.333	2.333	0.130	0.727			
Residual	9	161.219	17.913					
Total	10	163.551						
	Coeff.	*SE*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	6.983	2.638	2.647	0.027	1.014	12.951	1.014	12.951
R&D	0.000	0.000	-0.361	0.727	0.000	0.000	0.000	0.000

In Huawei Company is so much different than Apple and Microsoft Companies R square is equal to 0.014 and adjusted R square is -0.095 which is negative and T statistic is equal to -0.361 and P value equal to 0.727 which means non-significant.

5.1 Discussion

In this project that we have three majors company which is have most market share in the technological industry that we got positively results in both Apple and Microsoft Companies they spent large amount money in research and development more than stock price because research and development is independent and stock price is dependent because when the companies got higher value in research and development it means their stock price will increases in the same time because the research and development is the most important factor in firm value in technological sector and the Huawei Company has less stock price value it means they spent less than the Apple and Microsoft Companies amount of money and definitely the research and development it's also less than the Apple and Microsoft companies because that it mentioned before Huawei company faced political issue with USA government that is why they lost so much market share and stock prices, as a result it means the Apple and Microsoft Company is so much better than the Huawei company in firm value and firm performance.

5.2 Conclusion

R&D is the most important investigation in business specially in massive companies like Apple and Microsoft as we got both of them positively significant in the result, and firm performance is the performance in the market and also in the market share. This study broadens and supplements the R&D speculations firm worth writing in two ways. We give new proof on the presence of a non-linearity in the connection between R&D speculations and firm worth. This study gives significant ramifications to scholastics and professionals. Specifically, our discoveries can be valuable to strategy producers who carry out R&D speculation arrangements.

This concentrate additionally gives hypothetical and administrative ramifications by giving proof of a non-linearity in the R&D speculations firm worth relationship. In the first place, our discoveries affirm the hypothetical expectation. As indicated by the genuine choice hypothesis, the future unpredictability of the profit from R&D speculations influences market esteem. The genuine choice hypothesis recommends that a higher gamble prompts a better yield. Our proof

from Chinese firms recommends that expanded market vulnerability increases the market worth of R&D speculations until a specific level; then, at that point, past a specific level, it diminishes the market esteem. Second, our discoveries affirm the expectation of data lop-sidedness speculation. Firms with more R&D speculations might confront higher data lop-sidedness and along these lines more noteworthy antagonistic determination costs, which contrarily influences firm worth. Third, our discoveries affirm the expectation of the S-bend hypothesis by showing the decreasing negligible re-visitation of R&D speculations. Our proof recommends that an expansion in R&D speculations increases the negligible pace of return until a specific point; then, at that point, it seems to decrease the peripheral pace of return past a specific point. Research and development speculations are firmly connected to vulnerability. Along these lines, administrators need to perceive market and mechanical vulnerability when they choose to put resources into R&D. According to the point of view of partners (e.g., financial backers and loan bosses), Chinese capital business sectors are less productive contrasted with created nations, like the U.S. Along these lines, for their simple admittance to supporting for R&D speculations, firms need to alleviate data lop-sidedness among firms and partners. This suggests that organizations ought to upgrade market straightforwardness and oversee risk productively.

5.3. Limitation

This concentrate likewise has the accompanying restrictions. To start with, we exactly test the direct connection between R&D ventures and firm worth. In our investigation, we think about precluded variable issues. We rehash the investigation by controlling for firm age, send out power, and overall revenue that can influence firm worth. In any case, we can't handle for potential factors, for example, publicizing power and innovative force of imports because of the trouble of acquiring information from firms. In this way, further exploration ought to consider these factors in analysing the R&D ventures firm worth relationship. Second, in light of the jumping hypothesis, which is developed around Schumpeter's idea of imaginative obliteration, it is urgent to examine the kind of advancements firms seek after, e.g., steady or revolutionary advancements. Subsequently, further exploration ought to investigate the connection between R&D ventures and firm worth in the structure of sorts of advancements.

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