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To what extent does Formula One team performance impact the value of sponsoring firms?

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1. Introduction

Companies have used marketing through professional sports for decades as a primary tool to build brand equity through brand awareness, brand image, and brand engagement, with underlying sales performance, and firm value-enhancing corporate objectives. (Berkes et al., 2007; Cornwell, Roy, et al., 2001; Farrelly et al., 1998; Keller, 1993; Meenaghan, 1991; Mishra et al., 1997; Reiser et al., 2012) Sponsoring individuals and teams has the advantage of disassociating a firm's advertising efforts from the traditional media clutter. (Cornwell, Pruitt, et al., 2001; Kudo et al., 2015; Paula Gardner & Shuman, 1987; Tsiotsou, 2011; Tsordia et al., 2018) This allows firms to form a more direct and personal relationship with their customers, appealing to them through their interests or hobbies, amplifying the effects on brand equity and financial returns. (Aaker, 1996; Keller, 2001; Tsordia et al., 2018) Essentially a competitive advantage is established from the sponsorship/partnership, which stems from its duration, synergy between the entities, and sponsorship type.[1] (Cobbs et al., 2017; Cornwell, Roy, et al., 2001) Research in the field focuses on the intangible benefits like building brand equity, less so on tangible ones like the effects on firm value, a niche which this paper will expand on.

Firms invest enormous sums of money in sponsorship, with sports and motorsports in particular "eating up the lion's share." (Cornwell & Maignan, 1998) In 2022 the global sponsorship spending was estimated at $77.69 billion (Business Wire, 2022). This sum only encompasses the property rights and excludes any additional in-kind, marketing, or financial benefits. (Tsiotsou, 2011) Companies invest two or three times the cost of property rights in sponsored entities, (Cooper, 2011; Walliser, 2003) making the total value of sponsorship in 2022 closer to $190 billion. In 2020 the main industries investing in sponsorship are financial services, technology, and automotive (Statista, 2022), many researchers hypothesized that the industry of a firm significantly influences returns from sponsorship (Clark et al., 2009; Cobbs et al., 2017; Cornwell & Maignan, 1998; Kudo et al., 2015) a theory that is also relevant to this paper.

Large sponsorship and advertising deals often shock the sporting world. To illustrate; a 30-second advertisement at the Super Bowl LVI in 2022 cost the advertiser $ 6.5 million, (Statista,

[1] The type of sponsorship depends on whether the sponsoring firm provides strictly financial or also in-kind benefits to firms. This idea is influenced heavily by the much-researched resource-based view of sponsorship. (Amis et al., 1997; Armstrong et al., 1991; Cornwell, Roy, et al., 2001; van Everdingen et al., 2019)

2022) with the "modest" benefit of having exposure to around 100 million viewers. (NBC, 2022) Regardless of someone's fandom, some sponsorships appeal to almost everyone due to their iconic nature. This signals the success of the campaign. Examples include Tiger Wood's Nike endorsement worth around $ 340 million since 1996, (Roberts, 2022) or Scuderia Ferrari Formula One Team's historic Marlboro sponsorship worth around $500 million between 2013-2015. (Long, 2011) With sponsorship spending only projected to increase in the future (IEG, 2017) there has been a recent push, by shareholders towards accountability from the side of firms, so that they justify this investment apparatus. (Meenaghan, 2013)

Currently, researchers question the adequacy of measures for return on investment (ROI) from sponsorship and fear that decisions could be clouded by agency inefficiencies.[2](Meenaghan, 2013; PWC, 2010) Whatling (2009) considers "media value" as "the worst offender" for validating sponsorship and marketing decisions. He states that "the primary financial and social responsibility of a company is to generate returns and act in the best interest of stakeholders." Therefore, there is a great demand to establish new adequate methods which quantify returns from sponsorship to hold firms accountable and see whether they are acting in their shareholders' best interest. So far this has mainly been attempted through event studies. Researchers obtained contrasting results on how the abnormal stock returns of firms change with the announcement of new sponsorship deals. (Clark et al., 2009; Cornwell, Pruitt, et al., 2001; Drivdal et al., 2018; Kudo et al., 2015; Mishra et al., 1997; Reiser et al., 2012; Tsiotsou, 2011) Furthermore, except for Cornwell, Pruitt, et al., (2001) who explore the value of winning in motorsport, there is little research on how the performance of the sponsored entity impacts the value of firms. This paper uses an alternate method for analyzing the value of sponsorships, in the form of panel fixed and random effect regressions with stock price data, incorporating the impact of performance, in a sport which did not receive much focus so far, Formula One (F1).

The main research question for this paper is therefore:

RQ: To what extent does Formula One team performance, impact the value of a sponsoring firm?

First, this paper will present some context in the theoretical framework required to understand Formula One and the role of sponsorship in the sport. To formulate the hypotheses, a literature

[2] Agency inefficiencies could be things like, a firm only investing in each sport because of the manager's interests, without any real financial/brand equity return justification.

review follows, after which the data collection and method are explained. Lastly, the results are presented followed by a discussion and a conclusion.

2. Theoretical Framework

2.1 Sponsorship

The dictionary definition of sponsorship is "the position or function of a person or a group who vouches for, supports, advises or helps fund another person or an organization or project" (Dictionary.com, 2022*)* It is a concept that has many dimensions as will be explored in depth in the literature review section, for now, this definition is enough to understand the concepts talked about.

2.2 Motorsports and Formula One

Formula One is often referenced as the pinnacle of motorsport, meaning the motorsport racing category with the highest standards, highest performance, best-driving talent, and all aspects of the sport engineered to perfection. It is an international racing class for single-seater, open-wheel formula racing cars, which is sanctioned by the governing body called Fédération Internationale de l'Automobile (FIA). (F1 Chronicle, 2021*)* The first season of the sport debuted in 1950 in the UK, and since then it evolved into a prestigious racing class where drivers of teams compete in races referred to as Grand Prix on pre-built racing circuits or closed street circuits. A season usually starts around March each year and has between 20-23 races in 20 countries on four continents with the final Grand Prix being around November/December. (Formula One, 2023)

An F1 grid has 10 teams with 2 drivers each, totaling 20 cars. The current Formula One teams on the grid are Ferrari, Mercedes, Red Bull Racing, McLaren, Alpine, Aston Martin, Alfa Romeo, Haas, Williams, and Alpha Tauri. (Formula One, 2023) The teams, drivers, and the tracks they race on must adhere to very strict and specific FIA regulations such that the prestige of the series is upheld. (F1 Chronicle, 2021) A standard Grand Prix takes place over a weekend, starting on Friday with the race held on Sunday. On Friday there are two "free practice" sessions (FP1 and FP2) where drivers can test the track and do practice laps without any stakes. On Saturday morning there is another free practice session (FP3), with a qualifying session

later in the day. The qualifying[3] session determines where the drivers start the race on Sunday. Intuitively the driver who is the fastest around, as measured by the time it takes for them to do a lap, will start Sunday's race from first, referred to as the pole position. (Formula One, 2023) Drivers intend to start as far up the grid as possible, which makes it easier for them to climb up the order in the race and score more points. On Sunday the Grand Prix takes place with the cars starting in their established positions, and racing laps around the track until the target lap counter which is determined by a fixed distance they need to travel. The minimum distance they need to travel is 305km or 190 miles, and the position they finish determines how many points each driver and the team score. (F1 Chronicle, 2021)

2.3 Performance and scoring points in Formula One

To score points drivers need to finish in the top 10, the points based on positions are 25, 18, 12, 10, 8, 6, 4, 2, and 1 respectively (Sporting News, 2022) The championship is split into a drivers' championship and a constructors' (team) championship. In the drivers' championship, the individual driver's points accumulated through the season are totaled giving an order of the 20 drivers; the one with the most points becomes World Champion. Each team has two drivers, and the total of their points forms the constructor standings, where the one with the most points becomes the winning constructor. (Formula One, 2023) The total prize pot for a season given out amongst the constructors is around $900 million, and the difference between positions at times could be tens of millions. The strategic and political environment[4] of F1 makes the competition in technological development, and driver skill even more intense. F1 represents a technological wonder, and a competition of synergies between man and machine, in an extremely competitive environment. The sport's survival depends almost solely on sponsorship (Cobbs et al., 2017) hence why it is so relevant to explore for this research on the firm value benefits of sponsorship.

[3] The qualifying session is split into 3 parts Q1, Q2, and Q3. Q1 (Qualifying 1) has a time period of 18minutes with all 20 cars lapping the track with their fastest time recorded, only the 15 fastest cars can advance into Q2 (Qualifying 2) with the 5 slowest cars starting position being finalized with the time they put in during the session. Q2 has a time limit of 15minutes, with the 15 cars lapping the track, only the fastest 10 will advance into Q3 (Qualifying 3). Q3 usually has a time limit of 12minutes, and it determines where the fastest 10 cars will start Sunday's race. (Formula One, 2023)

[4] The term F1 politics encompasses how F1 teams interact with each other and with the governing body the FIA, in the public eye and in the background. It is not uncommon to see teams trying to gain an advantage off the track, through statements in the media, trying to slander other teams, or reporting each other to the FIA for rule breaks etc.. The teams try to hinder each other's progress and development for their personal gain. (Kaiser, 2021)

2.4 Sponsorship in Motorsport and Formula One

Motorsport is a prime theatre for advertising with the two largest categories being Formula One and NASCAR. Viewership's for these two categories were on average 70.3 million and 3 million people per race in 2021 respectively. (Statista, 2021*)* While the NASCAR viewer count and popularity does not come close to that of F1, it is important to mention since it is the closest motorsport category and is used for analysis in many research papers examined in Section 3. Cars in a racing series are a blank canvas where advertisers pay to put branding. A car's livery in most cases is a base color and all the branding put on it by sponsors. (Tsiotsou, 2011) The clear visibility, large media coverage, and the enticing nature of extreme sports make motor racing an ideal advertising hub. (van Everdingen et al., 2019) Fans of any sport can be very loyal to their teams, keeping up to date with all the news, pledging their pure support, and purchasing their associated products. (Dalakas & Melancon, 2012) Fans often downplay the negatives and exaggerate the positives of their favorite teams. These qualities make them an ideal target for marketing campaigns from whom amplified ROIs could be achieved, (Tsordia et al., 2018) making sponsorships important to explore, specifically for motorsport and F1.

2.5 The Competitive Environment

Due to the intense competition and the very costly nature of the sport, smaller less successful teams can find themselves in a loop of bad performances, because they can spend less money on development. As a benchmark, a single formula one car costs around 15 million euros, with individual parts costing millions or hundreds of thousands. (Jessner, 2022) Cobbs et al., (2017), explain that some teams require sponsors to even get a seat at the table, a highly relevant issue in F1. It is a common phrase in F1 to say after a race that a team was "best of the rest". The grid is split between the top three teams which for the past decade has been Mercedes, Red Bull, and Ferrari, and the rest of the teams on the grid. These top three teams won most of the races in the near past of F1, Mercedes even becoming the greatest F1 team ever based on the number of constructor championships won. (Saunders and Edmondson, 2019) The team which performs the best out of the other teams on the grid is referred to as the best of the rest. There is a midfield behind the top three, where teams (usually three or four of them) are close to each other, and they have good performances on occasion. Behind the midfield are the even slower teams called backmarkers, who trail behind in nearly all races and barely have good performances in a season. Top teams get the highest prize money, have the highest earnings,

and have the top sponsorship deals. They afford the best talent and uphold their performances while the smaller teams will struggle in this biased environment (Sealy, 2022)

Before cost cap regulations[5] the top teams spent around $500 million whilst back marker and midfield teams were spending between $100-200 million. (Dhruv, 2019) Top teams tend to reign superior as smaller teams experience this very significant resource inequality. A good performance by a small team in a season can lead to a domino effect of more prize money, more media coverage and so more sponsors, which leads to them climbing the order. (Saunders and Edmondson, 2019) Sponsorship deals come in many different forms, there are distinctions, like whether a firm is a title sponsor, do they give in-kind benefits or strictly financial support, and whether the sponsor is an engine manufacturer. All these can influence the value of sponsorship and team performance, a topic discussed in the following literature review where the hypotheses are also derived.

3. Literature Review

Firstly, many papers discuss the value of sponsorship from a brand value-enhancing perspective which is intangible by nature. Hoek et al., (2012), state that "image goodwill and improving community relations" dominate the reasons for sponsorship, with research on the topic being more descriptive than empirical. The historical view of sponsorship is that it is done as charitable activities in a more local context where SMEs could be viewed as more favorable by their local communities. Cornwell & Maignan, (1998) refer to sponsorship as "a provision of assistance through financial or in-kind benefits." They find a shift from the traditional view where sponsorship is used as a corporate strategy tool because of new increased spread of information, and technological advancements which allow firms to reach a greater volume of audiences worldwide. They also explain that studies regarding the value of sponsorships have given very mixed or no effects, this being due to the lack of sophisticated methods available and there being too many exogenous variables. However, they hypothesize that congruence and association of sponsors with the sponsored entity, media coverage, and the sponsorship-associated marketing strategy could have influential effects on the value of sponsorship deals.

Cornwell, et al. (2001) explore the value of sponsorship through brand equity and managers' perspectives. They expand on a brand equity model (Aaker, 1996) and find brand awareness,

[5] Cost cap regulations in 2022 require that all the expenses of an F1 team be under the $145.6 million mark, with inflation adjustment, drivers' salaries not included and some other exceptions. (Jessner, 2022)

loyalty, quality, engagement, and associated marketing initiatives, influence the brand image. They conclude that the duration of the sponsorship, the firm size, and an active marketing strategy that facilitates the sponsorship all can have a positive impact on the returns from the deal. However, it is theorized that sponsorship is good for generating awareness and enhances brand equity but requires additional effective management to generate significant returns. (Abratt et al., 1987; Hoek et al., 2012; Kuzma et al., 1993; Marshall & Cook, 1992) As an addition they reference Amis et al., (1997) proposing the resource-based view of sponsorship which could provide more insight for assessing sponsorship value.

Researchers explore the resource-based view of sponsorship (Amis et al., 1997; Cobbs et al., 2017; van Everdingen et al., 2019) According to Wright et al., (1994) it is the contribution of corporate resources to a sustainable competitive advantage, which arises from the partnership. Cobbs et al., (2017) researched the effectiveness of sponsorship resources in F1 and found that there is a resource exchange between the F1 team and the sponsor which is mutually beneficial. The sponsorship gives teams funds to continue operations, and the sponsors receive brand equity-enhancing effects from the exposure and association with the team. Sponsors giving teams gear and products can test their gear in the extreme conditions of F1, e.g Shell testing oil products with Ferrari. The authors bring up the idea of performance-based sponsorship, which is when firms provide performance-enhancing products to teams. Like Cornwell, Pruitt, et al., (2001) they conclude that the congruence/link between the sponsor and the team would influence the returns from the deal, and that performance also affects returns.

Similarly, van Everdingen et al., (2019) follow a resource-based perspective to explain positive effects arising from F1 sponsorship. Their main premise is that a gear[6] manufacturer who compete in sports experience higher returns to the sponsorship, than if non-gear manufacturers compete[7]. They explore both the branding effect of sponsorship and a concept of breeding effect, which is an innovation effect and how the deal fosters R&D. They find that competing as a gear manufacturer results in positive breeding effects, which is positively moderated by R&D spending. They also find that branding returns are higher for firms with lower advertising spending. Findings show that gear manufacturers experience higher returns overall than non-gear manufacturers, and this due to the sponsor's closer link to the team, which brings performance enhancing benefits and so better returns. They also highlight that branding returns are increased with media coverage and viewership of an event (Aaker, 1996) and that this is

[6] Gear as in any physical product used by the team, like clothes, parts, equipment etc…
[7] Like a firm which has nothing to do with the sport, e.g crypto sponsor for a team.

also linked to performance, since top performers get more exposure. (Cobbs et al., 2017) Similar to other papers, there was only vague attempt to measure tangible benefits, through sales performance, which was done at local scale.

To explore tangible returns to sponsorship, researchers mostly use event study methodology which shows highly contrasting results among studies. Reiser et al., (2012) use an event study to see how sponsorship announcement in multiple sports impacts the share price of a firm through cumulative abnormal returns. They find a positive share price reaction to the announcement in NASCAR but not in F1, and other sports. They hypothesized that high tech sponsors benefit more since sponsorship announcement is a positive signalling tool, but investigation did not yield significant effects. Contrasting to their hypothesis they found that larger more established firms get higher returns. Furthermore, they found that returns from international events were higher. Miyazaki & Morgan, (2001) use similar methodology and found positive share price effect of sponsorship announcement for the 1996 Olympics, however Farrel & Frame, (1997) analysing the same Olympics obtained negative share price reaction. Clark et al., (2009) analysing the stock price impact of sponsorship announcement in different sports found no reaction, other than a small positive one for NASCAR. Similarly, Pruitt et al., (2004) only find positive stock price reaction of sponsorship announcement from NASCAR. Filbecka et al., (2009) analysing stock price reaction to advertisements in the super bowl, award shows and sitcoms, find no share price reaction through their event study. All these papers explain the presence of too many exogenous variables to isolate the effect of the sponsorship announcement. They highlight the need for alternative methodology to measure firm value benefits of sponsorship deals, due to the mixed findings.

To further illustrate, Kudo et al., (2015) make a distinction if a sponsor is a title sponsor to see whether that make a difference for the cumulative abnormal returns after announcement date. They find significant abnormal returns title sponsors in NASCAR and the LPGA, but negative effects for the PGA tour. They also find that congruence between sponsor and the sport, yields significant returns, as well as the sponsor being in the high-tech sector. Mishra et al., (1997) used the same event study for stock returns and sponsorship announcement in the Olympics and the football world cup. They find small significant effects on the announcement date and stress the importance of firm-specific characteristics. They find that return on assets of a firm can influence the results, meaning that more profitable firms get higher returns. Clark et al., (2009) investigate title event sponsorship in golf, tennis, NASCAR, and college bowl like Kudo et al., (2015), and they find a neutral effect for the returns to title sponsorship, in all sports

except for NASCAR. They highlight that sponsor congruence was significant like other researchers also found, and hint to consider audience-specific characteristics for explaining results. Similarly, Tsiotsou (2011) does not find significant stock price reaction to sponsorship announcement in the 2004 Olympic games and debate whether the spending on sponsorship is justified.

Very few researchers have attempted to include a performance variable into the model, to see how performance of the sponsored entity impacts the value of the sponsorship and firms. Cornwell, Pruitt, et al., (2001) studied the value of winning in motorsport, they were one of the first papers trying to implement the performance variable and analyse its effect on stock market reaction of sponsors, through an event study. They explore how endorsements of top players in sport resulted in positive stock market reactions, like Nike's signing of Michael Jordan (Mathur et al., 1997) and cite that Arthur et al. (1998) also found firm value-enhancing effects for sponsoring top finishers in motorcycle racing. They find that first-time winners lead to significantly more value effects and that direct auto sponsors experience higher returns. Drivdal et al., (2018) uses the same methodology but in professional cycling, trying to see the impact of winning and losing. He finds no significant stock price reaction to sponsor announcements, and very little reaction for winners, however, finds large negative stock market reactions to doping scandals, which can be used as a proxy here for a bad performance.

The literature review gives a good overview that there is no clear stock market impact of sponsorships, at least for sponsorship announcement. In most sports and events there were mixed results, however in each analysis NASCAR usually had positive stock market reactions. Since not many studies explored F1, and NASCAR is the second largest motorsport in the world, it can be used as a proxy that F1 will experience similar effects. A unique addition of this research is seeing how performance influences the firm value through sponsorship. In the little research that was done with a performance variable, positive effects were noticed for good results. Intuitively thinking, sponsoring a top performer should yield higher returns, since their association effects, media exposure, and image are much stronger and better so based on brand equity theory they should bring higher value to the company. The introduction of positive new information like a team winning another race could confirm that the sponsor's investment is paying off, hence would prompt more stock market reaction. Worse-performing teams don't have stable results so even if they perform well in a race or a couple of races, their unreliability makes their associated sponsors a less favorable investment prospect, justifying the lack of stock market reaction. Building on this, hypotheses one and two are:

H1: Formula one team performance has a positive effect on stock returns of the team's sponsors.

H2: The stock market reaction to performance will be higher for top teams.

Another recurring variable that most researchers deemed as having a significant impact on the value of a sponsorship deal was the congruence between the sponsor and the given person or team they are sponsoring. The theory states that if there is a close link between the sponsor and the team, this will result in a competitive advantage which yields higher value. Based on this hypothesis three is:

H3: Sponsors will experience higher stock returns to performance if the given sponsor is in the auto industry.

4. Data

4.1 Dependent Variable

The focus of this research is to evaluate how performance of formula one teams impacts the value of the sponsoring firm. Therefore, the dependent variable is the stock price change of a team's sponsors (*stock growth*) between the trading day before a race and the next trading day after a race. Stock price data for the top four publicly traded sponsors of each team (Appendix 1) were gathered using the Excel *stockhistory* function for the 2019, 2020 and 2021 season. All sponsors with some exceptions, were unique to each team, so the performance of a team only impacts their own sponsors. To calculate the stock growth, the percentage change between the stock price before and the stock price after the race was taken, giving us the final dependent variable. Measuring the variable like this helps isolate the effect of the race on the stock growth due to the short time frame.[8] The stock price data seems to be the most viable way to measure the value of sponsorships for firms, as seen from previous research. The benefit is that it's widely available, and since F1 is such a global sport, most sponsors were even listed on the

[8] The shorter time frame helps with isolating the effect because we assume that the grand prix is a major event happening over the weekend, which is relevant to the given companies, therefore would influence the stock price.

main exchanges which were all accessible through Excel. Importantly, stock prices respond to new information so would potentially capture the effect of team performance.

Regarding transformations, it's important to note that the Haas F1 team didn't have any public sponsors hence they weren't included in the analysis. Moreover, Honda is the main sponsor of both Red Bull and their sister team Torro Rosso/Alpha Tauri. Since Red Bull is a top team, they are more relevant to explore for this analysis, so to keep sponsors unique the observations for Honda were dropped for the sister team. A similar case was with Alfa Romeo and Williams, where PKN Orlen sponsors both, so observations were dropped for Williams since they are the worse-performing team in aggregate. Additionally, sponsors enter and leave F1 every season, therefore overall, there are a different number of observations for each sponsor since they might have only been present in one of the explored seasons.

4.2 Independent Variable

The independent variable is the total of points (*points*) each team obtained for a given race. For this a Kaggle database was used which contains data on every Formula One season since 1950. A unique data set needed to be composed of the original database, which contains the races relevant to this research which is all the races for 2019, 2020, and 2021 seasons. Next, the race results were matched with the teams, giving the points per race per team, yielding the final dependent variable. This variable is an exact measure of team performance, and allows for the ranking of teams by performance, therefore being perfect for exploring hypotheses one and two. The accuracy of the data is also easily verifiable through internet search which makes it ideal. Its important to note that teams often enter, exit or change names, which could impact the validity of the research. The 2019, 2020, and 2021 seasons were chosen specifically because there were little changes of teams merely some name changes. To overcome this issue teams that changed names were still classified under the old name to increase the reliability of results.[9]

4.3 Other Variables

The main control variable used in this research, which hasn't been done before in relevant literature is adding the change in S&P 500 (*spstockgrowth*) price over the race weekend to control for general market trends influencing the stock growth of a team's sponsors. This was

[9] The teams that changed names were Renault to Alpine, Torro Rosso to Alpha Tauri, Racing Point to Aston Martin. These don't change the entire team, and at the core its still the same team with same personnel and same drivers, it's like rebranding/restructuring.

again done using the excel *stockhistory* function. Most research papers refer to there being too many exogenous variables which influence stock price of firms, the general direction of the market being a major one. Therefore, it is an important control variable which eliminates some of this exogenous effect on the stock growth of sponsors.

To help explore hypothesis three, categorical variables for the industry a sponsor is in were created splitting them up into the categories of Auto, High-Tech and Other. The industry of each firm was obtained using the Excel stock function, after which the firms were split into the three categories manually. The High-Tech category contains firms in industries like technology, computing, telecommunications, aerospace, and electronics. The Auto category is the one most related to Formula One, it consists of car manufacturers, machinery and equipment manufacturing, and energy companies like oil and gas. Lastly, the Other category has firms outside of the mentioned, with the main ones being financial services, tobacco, food, beverage, healthcare etc… In previous literature there was lot of mention that the congruence between firm and team influences the stock market reaction which is why this variable is relevant to explore.

4.4 Descriptive Statistics

The constructed dataset contains 2,125 observations composed of three F1 seasons worth of data. It contains the points given to each team per race, the stock growth over the race weekend for four sponsors per team, the S&P 500 stock growth over the weekend and the industry of the given sponsors. To get an overview of the data and to set the scene for the regression analysis, Table 1, 2, and 3 compare the average and the total stock growth of team's sponsors through the season to the position they finished in that year's championship. [10] [11] The average stock growth is the average growth of the teams sponsors over a race weekend during a season. For example, from Table 1, Mercedes sponsors stock price grew on average by 0.01% over every race weekend. The total stock growth is the sum of all the stock price changes for each team's 4 sponsors over the season.

[11] The average stock price change over a race weekend can be thought of like and ETF, e.g Ferrari sponsors used for the analysis is PM, UPS, SHEL, RACE, the average stock growth is the average of these 4 stock growths over the weekend.

Table 1: 2019 F1 season results with the average and the total stock growth per team

2019 Season			
Team	**Points**	**Average Stockgrowth**	**Total Stockgrowth**
Mercedes	739	0.01%	0.94%
Ferrari	504	-0.12%	-10.40%
RedBull	417	-0.44%	-37.31%
Mclaren	145	0.13%	10.58%
Renault/Alpine	91	-0.48%	-40.24%
TorroRosso/AlphaTauri	85	-0.31%	-25.66%
RacingPoint/AstonMartin	73	0.44%	37.09%
AlfaRomeo	57	0.26%	21.72%
Williams	1	0.00%	-0.03%

Based on the developed theory and given our hypotheses, we would except that the teams sponsor of teams who perform better in the championship would also have the higher average and total stock growth. From Table 1 the relationship between the points and the average stock growth in the 2019 F1 season seems to be somewhat random. Mercedes only has an average stock growth of 0.01% and a total stock growth of 0.94% over the season and they were the champions. RacingPoint/AstonMartin who are in 7th position had both the highest average and total stock growth over the season, 0.44% and 37.09% respectively. The other teams seem to have randomly distributed values with many even having negative average stock growth over the season. Also interesting is that Alfa Romeo in 8th position has a higher average stock growth and total stock growth than any of the top or midfield teams. No clear relationship between the team performance and the stock growth is attainable from Table 1.

Table 2: 2020 F1 season results with the average and the total stock growth per team.

2020 Season			
Team	**Points**	**Average Stockgrowth**	**Total Stockgrowth**
Mercedes	573	0.92%	62.30%
RedBull	319	0.45%	30.70%
Mclaren	202	-0.21%	-14.17%
RacingPoint/AstonMartin	195	0.26%	17.64%
Renault/Alpine	181	0.04%	3.01%
Ferrari	131	0.15%	9.89%
TorroRosso/AlphaTauri	107	0.53%	36.04%
AlfaRomeo	8	0.69%	46.67%
Williams	0	0.39%	26.81%

For the 2020 season in Table 2, the top team, Mercedes ended up having both the highest average and total stock growth over the season, 0.92% and 62.30% respectively. Red Bull who are second in the Championship have relatively high stock growths as well with an average of 0.45% and a total of 30.70%. The midfield teams all have moderate average stock growths over the race weekends ranging from 0.04% to 0.26% and total stock growth over the season ranging from 3.01% to 17.64%. Interestingly, the back of the grid like in the 2019 season seem to have the high average and total stock growths overall, which is the opposite of what was theorized. The bottom three teams have an average stock growth range of 0.39% to 0.69%, with total stock growths of 26.81%, 36.04% and 46.67%.

Table 3: 2021 F1 season results with the average and the total stock growth per team.

2021 Season			
Team	**Points**	**Average Stockgrowth**	**Total Stockgrowth**
Mercedes	613.5	-0.14%	-12.07%
RedBull	585.5	0.10%	8.49%
Ferrari	323.5	0.11%	9.22%
Mclaren	275	-0.24%	-20.12%
Renault/Alpine	155	-0.32%	-26.64%
TorroRosso/AlphaTauri	142	-0.16%	-13.60%
RacingPoint/AstonMartin	77	0.03%	2.16%
Williams	23	-0.23%	-18.91%
AlfaRomeo	13	0.08%	6.95%

Results for 2021 are also quite random with most of the grid experiencing negative average and total stock growths over the race weekends and through the season. It is interesting to note that RedBull and Ferrari in positions 2nd and 3rd have the two highest average and total stock growths which is somewhat in line with the theory. From Tables 1, 2, and 3 there is no clear relationship between a team's performance and the stock growth of the teams' sponsors, hence the regression analysis is required to go more in-depth.

Table 4: Distribution of sponsor industry and their average stock growth.

	Auto	**High Tech**	**Other**
Weighted Average Stockgrowth	0.05%	0.01%	-0.01%
# Sponsors	21	15	19

Table 4 illustrates the distribution of sponsors analyzed by their given industry category and their average stock growths weighted by the number of sponsors over the three F1 seasons. As observable, most of the sponsors, 21 are categorized in Auto, second most in the Other category with 19 and 15 in the High Tech category. The auto industry experienced the highest average stock growth over the three seasons, with 0.05%, the High tech category only having an average

stock growth of 0.01% and the Other category having negative stock growth, -0.01%. In section 3.1 it was hypothesized that the stock returns from sponsorship are dependent on the synergy between the sponsor and the team. In this analysis (See section 5 and 6) the synergy will be measured using the industry categories presented, to see if it influences the stock returns for sponsors.

5. Method

From the literature review, there is a gap in the literature for analysis that considers how the sponsorship impacts firm value over time, like through an F1 season. To do this we need to consider multiple events which potentially impact the value of a firm. Here this is done by having the number of points obtained each race as the performance measure. A fixed effect and a random effect regression is used to investigate the hypotheses. It is important to note that all the key assumptions[12] for these models are assumed to be true regarding data and variables.

5.1 Fixed Effect Model

The panel data used for this analysis allows for a fixed effect regression model to be constructed. For each race we have the number of points a team obtained (independent variable), and the stock price growth of that teams sponsor over the race weekend (dependent variable). Therefore, the time variable in the regression model is a unique ID *(raceId)* given to each race and the group variable is a unique ID given to each sponsor *(stockid)*.

It is assumed that there are unobserved fixed effects that impact the stock price of a firm, these effects would be the idiosyncratic firm factors that influence stock price.[13] Fixed effects control for some unobserved time-invariant market factors which can influence how the sponsors' stock is traded. Since each sponsor is unique to a team, the fixed effect also captures the time-invariant team-specific factors which influence the stock price of the sponsor.[14] To control further for general market-specific factors, the S&P 500 stock growth over each race weekend

[12] Independence of errors(iid), no perfect multicollinearity, exogeneity (we include the S&P 500 stock growth which is potentially influenced by a lot of factors impossible to control for all hence this might not be fully acceptable), no OMV (fixed effects handle OMV), no autocorrelation, and constant variance of error term.
[13] This could be things like strategy, investments, financial position, public perception of them.
[14] Like the general perception of how a team and how they perform, or prediction of how they will perform.

is included in the model, making the model somewhat robust to time-variant market factors as well.

The equation for this model is:

$$stockgrowth = \beta 0 + \beta i1 * points + \beta 2 * spstockgrowth + \alpha i + \varepsilon$$

Where **β0** is the constant, **β1** is the coefficient for the main treatment variable points and **β2** is the coefficient for the S&P 500 stock growth. **α** is the fixed effect for each sponsor (**i**). To reiterate, these are effects of omitted firm, team and market-specific time-invariant variables which influence the stock growth. **ε** is the error term which presents any residual variation in the dependent variable that is not explained by the independent variable or the fixed effects. The **i** parameter in the regression represents the sponsor or set of sponsors the regression is being done for, which here is the set of all sponsors.

Hypothesis 2 states that the effect of performance on the stock price is stronger for top teams. To investigate this, fixed effect regression will be conducted, where teams are clustered by top and bottom performers. Since each sponsor is unique to a team, the **i** parameter captures this clustering.

$$stockgrowth = \beta 0 + \beta i1 * points + \beta 2 * spstockgrowth + \alpha i + \varepsilon$$

The difference between the two models is that here, parameter **i** is the set of sponsors belonging to top-performing teams. A third model is done where the **i** is a set of sponsors of the worst-performing teams.

The top teams are the top five performing teams which also happen to have the most F1 legacy, having a stable spot in the recent F1 grid. These are Mercedes, Ferrari, Red Bull, Mclaren and Renault. The bottom teams are the rest of the teams on the grid who perform worse through the seasons or haven't been a stable part of the grid in recent years. These are Aston Martin, Alpha Tauri, Williams, and Alfa Romeo.

Hypothesis 3 states that the firm value-enhancing effect of performance will be stronger for sponsors who are in the auto industry. To investigate this, three separate regressions will be conducted where sponsors are clustered by industry category Auto, High Tech and Other.

$$stockgrowth = \beta 0 + \beta i1 * points + \beta 2 * spstockgrowth + \alpha i + \varepsilon$$

The clustering is captured by **i** which here will be the set of all sponsors in the given industry.

5.2 Random Effect Model

A random effects model would capture any random effect that a sponsor or a team might experience. The teams we are comparing are heterogenous in several different ways and so are the sponsors included in this experiment. The data is clustered into subpopulations by the specific sponsor *(stockid)* with the time variable being the unique race ID *(raceId).* These groups also don't have the same population parameters. Sponsors are different in size, industries, functions, and budgets; the same could be said about the teams. They also spent a different amount of time in the sport, e.g for some sponsors there are only one season worth of observations for others there are three. Moreover, some observations have been dropped (Section 4) to avoid repeated time values in the panel.

Following Viechtbauer (2007), the observations in our data "differ more than expected from sampling variability alone" and the random effects model accounts for this by assuming the distribution of heterogeneity to be random. Tsionas & Kumbhakar (2014) find that the introduction of random effects can capture time-varying inefficiency, especially for data with "a wide array of parameter values and sample sizes" which also is coherent with the characteristics of our analysis. Hernandez et al., (2014) confirm that random effects studies are better in the presence of high heterogeneity studies where observations at different levels hold observed or unobserved heterogeneities, thus making this method tailormade for this analysis.

Therefore, the same regressions will be conducted to test the hypotheses as in the fixed effect regression, but the random effect model gives more efficient estimation procedures since it handles population/group heterogeneity better. To reiterate, hypotheses one and two will be tested by running a random effect regression first including all sponsors, and then a separate one for the top and bottom teams. For hypothesis three, the sponsors will be clustered by industry, which as seen in Table 4, also have different group parameters.

6. Results

6.1 Fixed Effect Regressions

Table 5: Results of fixed effect regressions of stock growth and points, and sponsors grouped by team performance.

	(Panel A) Full Grid Stock Growth	**(Panel B) Front of the Grid Stock Growth**	**(Panel C) Back of the Grid Stock Growth**
points	0.0000420	0.0000219	0.000149
	(0.0000633)	(0.0000685)	(0.000160)
spstockgrowth	0.734***	0.755***	0.703***
	(0.0623)	(0.0808)	(0.0982)
_cons	-0.00146	-0.00210	-0.000368
	(0.000912)	(0.00139)	(0.000991)
N	1997	1180	817
R^2	0.066	0.070	0.062

Standard errors in parentheses
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

From Table 5, in Panel A we see a very small positive effect of points on the stock growth, where if points increase by one, it results in a 0.000042% increase in stock growth which is effectively zero. This finding is not statistically significant even at 10%. Similar could be said about models in Panel B and C where the effect is tested for top-performing teams and backmarker teams through the three seasons. The effect of points on the stock growth is effectively zero and statistically insignificant at all levels. The zero effect was to be expected due to too many exogenous variables to consider as the theory suggests in Section 3. Even though the fixed effects handle some of the time-invariant heterogeneity, several time-variant variables could influence the stock growth other than the points scored by the F1 team they sponsor. Some of these are controlled for by the S&P 500 variable, whose coefficients are intuitively all significant at 1%. The average effect of a 1% change in the S&P 500 stock growth through the three models is around a 0.7% increase in the stock growth of sponsors. Moreover, the standard errors are also quite large relative to the coefficients, suggesting some imprecision and uncertainty in the results. These findings do not provide evidence to support hypotheses one and two, most likely due to the limitations of the data which will be expanded on in Section 7. Regarding the R^2 values, the independent variable only explains 6.6%, 7%, and 6.2% of the variation in stock growth respectively.

Table 6: Results of fixed effect regressions of stock growth and points, sponsors grouped by industry.

	(Panel A) Auto Stock Growth	**(Panel B) High Tech Stock Growth**	**(Panel C) Other Stock Growth**
points	-0.0000377	0.000103	0.0000876
	(0.000100)	(0.000129)	(0.000103)
spstockgrowth	0.681***	0.770***	0.761***
	(0.104)	(0.136)	(0.0908)
_cons	0.000564	-0.00266	-0.00256*
	(0.00159)	(0.00203)	(0.00124)
N	729	550	718
R^2	0.057	0.057	0.092

Standard errors in parentheses
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

In Table 6 we see fixed effects regressions results clustering sponsors by industry, which seem to yield little sufficient evidence for hypothesis three, with an effectively zero effect found. From Panel A we see that the stock growth of firms in the Auto industry experiences a negative effect of -0.0000377% to a one-unit increase in points. The high-tech industry category in Panel B experiences a positive effect of 0.000103% and the sponsors in the other industry (Panel C) category a 0.0000876%. The coefficients for the S&P 500 stock growth are all significant at 1%, with coefficient values around 0.7. The significance of the S&P 500 stock growth to the stock growth of sponsoring firms, suggests that the model isn't fundamentally flawed, but the lack of significance could more be attributed to the characteristics of the data set. For all three industry models the standard errors are large relative to the size of the coefficients, hinting at uncertainty in the data. Moreover, the points variable explains only 5.7% of variation in stock growth for the auto industry, 5.7% for the high tech and 9.2% for the other industry category, as seen from the R^2 measurement.

6.2 Random Effect Regressions

Table 7: Results of random effect regressions of stock growth and points, sponsors grouped by team performance.

	(Panel A) Full Grid Stock Growth	(Panel B) Front of the Grid Stock Growth	(Panel C) Back of the Grid Stock Growth
points	0.0000287	0.0000854*	0.000129
	(0.0000413)	(0.0000502)	(0.000146)
spstockgrowth	0.733***	0.752***	0.705***
	(0.0623)	(0.0805)	(0.0980)
_cons	-0.00131	-0.00320**	-0.000467
	(0.000737)	(0.00112)	(0.00110)
N	1997	1180	817

Standard errors in parentheses
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Panel A, in Table 7 shows a result like those in Table 5 with a zero effect of team performance on the stock growth of sponsoring firms. In Panel B we see a larger effect of team performance on the stock growth of sponsors for top teams compared to the effect when considering all teams (Panel A) and backmarker teams (Panel C). The effect for top teams is statistically significant at 10% which seems to be in line with the theory that top performers experience a stronger effect of performance on stock growth, but this is also effectively zero, so there is no evidence to support the hypothesis. If we compare it to previous models in Tables 5 and 6 we can see that this is the first model with standard errors lower than the coefficient, hinting at the increased precision of the random effect model. Lastly, this model's p-value is also the lowest at 0.089 (Appendix 2) suggesting that the model if expanded could yield some evidence. In Table 7 the S&P 500 coefficients are once again all significant at 1%, with similar coefficients to those in previous models, showing the validity of the method.

Table 8: Results of random effect regressions of stock growth and points, sponsors grouped by industry.

	(Panel A) Auto	**(Panel B) High Tech**	**(Panel C) Other**
points	-0.0000663	0.0000760	0.0000751
	(0.0000686)	(0.0000909)	(0.0000635)
spstockgrowth	0.681***	0.768***	0.763***
	(0.104)	(0.136)	(0.0903)
_cons	0.000939	-0.00231	-0.00245*
	(0.00126)	(0.00183)	(0.000984)
N	729	550	718

Standard errors in parentheses
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

In Table 8 we realize similar effects to those seen in Table 6 with the fixed effects regressions, a zero effect. The coefficient for Panel A shows a larger negative effect than in the fixed effect regression for the Auto industry category at -0.0000663 compared to -0.0000337 which is almost twice as large, suggesting there is less variability considered in the fixed effect models between groups which is in line with key assumptions of the method. The coefficients in Panel B and Panel C are very similar suggesting that there is no real difference amongst the industry categories when considering the performance effects on stock growth. The standard errors are again relatively large compared to the coefficient sizes suggesting the lack of precision and increased uncertainty in the data. The coefficients for each industry are not statistically significant suggesting that the random effects model also could not completely control for the variability amongst the sponsors and clusters of sponsors analyzed. The S&P 500 coefficients are all positive and significant with similar values to all the models explored so far, which is to be expected.

7. Discussion

7.1 Hypothesis One

In Hypothesis One it was stated that the value of sponsors will be positively impacted by the performance of teams. This hypothesis was primarily tested in Panel A of Table 5 with a fixed effect regression and in Table 7 with a random effect regression. Both coefficients for the points variable show an effectively zero effect, with very large standard errors relative to the size of

the coefficients, and the P values suggest that the result is statistically insignificant. The small effect size can be explained by the many omitted macroeconomic and firm-specific variables which ultimately would affect the stock growth of firms more than the event of the performance of an F1 team it sponsors. This can also be seen by the S&P 500 stock growth variable in the model which is statistically significant at 1% in all regressions. Based on this the hypothesis can be deemed inconclusive.

In the fixed effect regression, some of the time-invariant sponsor-specific effects are controlled for, as well as some team-fixed effects due to the sponsors' unique nature. Each of these firms was invested in F1 to different degrees as well, the only common point being their participation in F1. Some of them were engine manufacturers, others title sponsors, gear sponsors or strictly monetary sponsors. Including a variable which describes the nature of the sponsorship could improve the analysis, however, this is not completely viable in the case of our model. The relationships between teams and sponsors are often ambiguous, and sometimes classified with little information regarding their monetary value. To gather all the company and deal specific data required is simply not viable and is beyond the scope of this paper. Many papers in the literature review also found that the sponsorship-associated marketing strategy could influence its firm value effects. (Cornwell, Pruitt, et al., 2001; Cornwell & Maignan, 1998; Jensen & Turner, 2017; Tsordia et al., 2018) Data on the marketing expenses of each company or teams were considered as control variables. This proved to be a difficult challenge due to the number of sponsors that would be analysed individually, and the ambiguity surrounding the marketing expenses of firms and teams, making it not viable for this research.

Most of the research on the topic, used event studies which are geographically localized events, contrasting to F1 which hosts events internationally, this could be the source for the lack of an effect in this investigation. (Clark et al., 2009; Cornwell, Pruitt, et al., 2001; Drivdal et al., 2018; Filbecka et al., 2009; Miyazaki & Morgan, 2001) Sponsors have different brand equity between countries, and F1 teams do not change sponsors based on where they will race, hence the impact of performance on firm value will be biased based on where the race is and how much brand equity a sponsor has in that specific country. Many of the referred papers obtained significant abnormal returns to sponsorship announcements, which can be a result of the specificity of the sponsor to the geographic location and demographics of the attendees. If a sponsor does not have truly global reach in all countries with F1 races, the firm value effects will be understandably less, since people maybe don't even know the company. Since many different sponsors were explored here with differing brand equities in different countries, the

effect is diluted, and no effect is realizable. To improve the model, country demographic effects or fan demographic effects could be added. An attempt was made in the data collection process to include fan attendance as a race-specific variable that could impact the stock growth of sponsors due to exposure. However, the seasons analysed in this paper, except for 2019 were affected by the Covid 19 pandemic which makes attendance data redundant. Some races allowed an in-person audience, some restricted attendance heavily and others didn't allow attendance at all. Thus, the attendance data would be biased, and unfair. Therefore, while the data set allows for a fixed and random effect regression to be conducted, the lack of effect and significance in the results can be attributed to the nature of the sport and sponsorships in general, calling for a different method of analysis.

7.2 Hypothesis Two

Hypothesis Two was investigated by seeing the difference in effects of team performance on sponsor value, between top and bottom-performing teams through a fixed and random effect regression. (See Panels B and C of Tables 5 and 7) The fixed effect regression in Table 5 shows an effectively zero effect with large standard errors for both top and bottom-performing teams. Even though the effect is larger for the top teams, the result is statistically insignificant, and the effect is effectively zero. It is also important to note that the sample of top performers is higher than the bottom performers since only nine teams were analyzed and observations dropped due to overlapping sponsors for some teams as explained in section 4, which could have influenced the effect. The fixed effect model likely could not handle the heterogeneity of the sponsors and clustering the data into groups with such different parameters and characteristics. The random effect model in Table 7 also gives no real evidence for H2, there is no difference between top and bottom teams and the coefficients are insignificant.

The lack of an effect for hypothesis two can be explained by the expensive but effective pricing of sponsorship deals. As discussed in Section 2.5, top teams were selected based on their recent performance in F1 and their legacy in the sport. Teams who are constantly winning races, performing well in general or who have a history in F1 get the most exposure, have the highest association value and marketability which is important for sponsors. (Aaker, 1996; Cornwell, Roy, et al., 2001; Keller, 2001; Tsordia et al., 2018) However, these teams are also the most expensive in terms of sponsorship hence most of their sponsors are large multinationals that can afford the sponsorship. Investors might see less added value from a good race performance because it is already priced into the stock price and the price of the sponsorship. Moreover,

companies already spend a lot of money on the sport with sponsorship valuations which they already find hard to justify. The positive news of a race performance would not necessarily prompt even further investment and support of the sponsorship from investors. Shareholder interest would be to spend less on the sponsorship because it essentially comes at their own expense. The size of these companies would also dilute the effect, since so many different variables in many different industries and countries could impact the value of these large firms other than the success of an F1 team.

7.3 Hypothesis Three

In Tables 6 and 8, we see the results which test for Hypothesis Three where the difference of the performance effect based on the industry of a sponsor was investigated. The Auto industry was predicted to have the highest stock growth effect but no evidence to support the hypothesis was found. Although neither the fixed effect nor the random effects models found significant results, and the effect is effectively zero, the direction in the Auto industry sponsors seems to be a negative shock to the performance of teams. In the literature review, it was explained that researchers found stronger sponsorship effects on firm value when there was a synergy between the firms and the sponsored entity. As mentioned in Section 7.2, the nature of the sponsorships is very ambiguous where some sponsors provide gear, others just monetary resources, or both. The synergy benefits were explored in the resource-based view of sponsorship (Amis et al., 1997; Cobbs et al., 2017; van Everdingen et al., 2019), materialize most in F1 if sponsors provide parts, systems, fuel, adhesives, or any physical resource other than money which the teams could use to increase performance. The categorization of sponsors could have been biased because of the ambiguity surrounding sponsorship deals, therefore leading to the results in this analysis. To improve the categorization, data could be collected on the nature of each sponsorship deal, which would potentially lead to results that are in line with the theory.

The absence of a stock market reaction could be explained by the very high heterogeneity of sponsors and the selected industries which neither the fixed effect models or the random effect models could account for. The seasons analysed were nearly all under the Covid-19 pandemic, which resulted in significant volatility in the markets in all industries, or time-variant variables between races which the models are not suited to handle. Such volatility in markets would outweigh the effect of a race performance by an F1 team as many sponsors were struggling

with issues like revenue deficiencies, employee layoffs and business closures. Industries were affected to different degrees which would also have an impact on the analysis (Appendix 3), but especially when clustering by industry where the results would have been heavily biased by the macro-economic conditions of their given industry. To improve on this, the industry-specific market conditions could have been added in as a variable next to the general market conditions control of the S&P 500 stock growth variable.

8. Conclusion

In conclusion, the analysis in this paper could not find a definitive answer to the research question and only found very limited evidence for the existence of a positive effect of performance for top F1 teams on the value of sponsors. The data set had some limitations in the form of severe heterogeneity amongst the sponsors and clusters of sponsors analyzed which the fixed and random effect models couldn't handle. To improve the method the sponsors should have been chosen based on more strict criteria, however, this would have been difficult since many of the team's sponsors are not listed on the stock market, and even those who are, are significantly different in terms of firm characteristics. In addition, F1's global nature makes it difficult to analyze as race-specific, country-specific, and audience-specific effects would influence the effect of performance on the stock growth of sponsors. The macroeconomic conditions are also expected to outweigh the intended effect, especially during such a significant recession like the one in our analysis window. The lack of an effect is also attributable to the effective pricing of sponsorships and their expensive nature. Future research should also consider stock market effects like the weekend effect which states that stock returns on Monday are significantly lower than those on the immediately preceding Friday, which is also a major source of bias in the method. (Kenton, 2021) Lastly, as the underlying research suggests, the primary aim of sponsorship is to enhance the brand equity of firms with tangible monetary benefits only in the form of longer-term sales growth and brand awareness, not the enhancement of the short-term valuation.

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10. Appendix

Appendix 1: List of all sponsors for the different f1 teams for the 2019, 2020 and 2021 season.

2019:

Ferrari: Ferrari, Philip Morris International, Shell, UPS

McLaren: British American Tobacco, Dell, Petrobras, Logitech

Mercedes: Mercedes, Petronas, UBS, Hewlett Packard

Red bull: Aston Martin. Honda, Mobil1, Tag Heuer,

Renault: Renault, Castrol, Infiniti, Mapfre

Force India: Bombardier, Canada Life, NEC, Telcel

Torro Rosso: Honda, Siemens, Randstad, Pirelli

Haas: x

Williams: Williams, Rexona, Orlen, Sofina, NetJets,

Alfa Romeo: Alfa Romeo, Orlen, Carrera, Singha,

2020:

Ferrari: Ferrari, Philip Morris International, Shell, UPS

McLaren: British American Tobacco, Dell, Splunk, Coca Cola

Mercedes: Mercedes, Petronas, UBS, Hewlett Packard

Red bull: Aston Martin, Honda, Mobil1, Tag Heuer

Renault: Renault, Castrol, Dupont, Mapfre

Racing Point: Bombardier, Canada Life, NEC, Telcel

Alpha Tauri: Honda, Siemens, Randstad, Pirelli

Haas: x

Williams: Sofina, NetJets, RBC, Symantec

Alfa Romeo: Alfa Romeo, Orlen, Carrera, Acer

2021:

Ferrari: Ferrari, Philip Morris International, Shell, UPS

McLaren: British American Tobacco, Dell, Splunk, Coca Cola

Mercedes: Mercedes, Petronas, UBS, Hewlett Packard

Red bull: Honda, Mobil1, Tag Heuer, Oracle

Alpine: Renault, Castrol, Dupont, Mapfre

Aston Martin: Aston Martin, Cognizant, Bombardier, Peroni (Ashai)

Alpha Tauri: Honda, Siemens, Randstad, Pirelli

Haas: x

Williams: Sofina, Symantec, Zeiss, PPG

Alfa Romeo: Alfa Romeo, Orlen, Carrera, Acer

Appendix 2: Random effect regression results of top performing teams, showing p values.

	(1) **stock growth**
points	0.0000854 (0.089)*
spstockgrowth	0.752*** (0.000)
_cons	-0.00320** (0.004)
N	1180

R^2	

p-values in parentheses
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Appendix 3: Research on the effect of the Covid 19 pandemic on different industries, analysis 2019, 2020, and 2021 through average shareholder returns- by Balint Jaszberenyi 2023

Table 2 Presents the weighted average shareholder returns, for different industries in the given years.

	2019	2020	2021
Technology	9.89%	10.90%	8.13%
Financials	7.73%	-0.54%	6.11%
Healthcare	4.05%	2.10%	6.20%
Consumer discretionary	5.88%	4.72%	3.36%
Energy	1.51%	-6.46%	9.26%

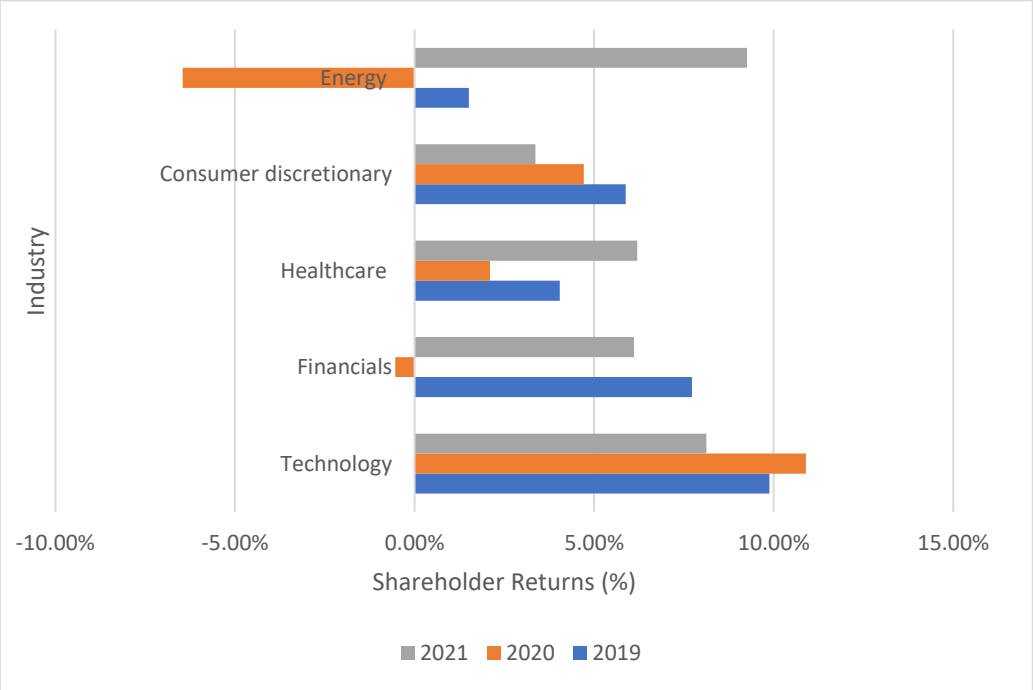

Figure 1 Shows the weighted average shareholder returns for the different industries.