

Does Innovative Capacity Drive Firm Performance in Excess of Market Norms during Times of Crisis

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Abstract—This paper explores the market performance of the most innovative firms and compares that performance against a market index fund to determine if highly innovative firms outperform the market during times of financial crisis. A quantitative methodology was used, with ANOVA as the selected tool to test for statistically significant differences. The firms were found to not be statistically different in performance from the market index, but did have overall positive stock price performance.

Index Terms—Innovation, management, market performance, strategy

I. INTRODUCTION

The purpose of this study is to determine if there is a relationship between the innovative capacity of a firm and their overall financial performance during a crisis as compared to overall market performance. Innovation has emerged as a modern core competency for firms, one that is linked to overall firm performance [1]. The question is whether or not innovative capacity drives superior financial performance during a global crisis and market shock?

To investigate this, the 2019 and 2020 Boston Consulting Group (BCG) lists of the most innovative companies were used as a guide. Those firms appearing in both lists and publicly traded in the United States were utilized as a study population, using closing stock prices from December 31 of 2019 to December 31 of 2021, dates before and after the global emergence of the SARS-CoV-2, commonly referred to as Coronavirus or COVID-19, pandemic. The collective performance of these firms, 26 in total, is compared to the overall Dow Jones Industrial Average performance over the same time period.

The current business climate provides a need for this study. Aslam *et al.* [2] explains that innovation, based in culture and employee approaches to the work, is required to survive in today's competitive landscape. The employee element is a particularly critical one for organizations pursuing innovation as a strategy as there is a synergy created among innovative employees across an organization [3].

This study is particularly useful in its timing as companies behave differently during and following significant market shocks. Karabag [4] states that studying corporate responses to the COVID-19 pandemic is important as substantial

changes often follow disruption. Market disruptions naturally create uncertainty for firms, and in relation to innovation firms have been found to be more likely to invest in innovative processes during times of uncertainty [5]. Among those firms likely to pursue innovation during time of uncertainty [6] found that firms with more available financial capacity are more likely to engage in major innovation projects.

This combination of the need for innovation in response to disruption and the likelihood of the best prepared firms to engage more robustly in innovative practice provide a foundation for this study. By comparing the most innovative firms against average market returns it will be possible to test the real returns of innovative practice in response to a market shock. First, in order to effectively frame the research, business innovation will be clearly defined.

II. DEFINING BUSINESS INNOVATION

In its most simple form, innovation is doing something new. This was the core of the original definition by Joseph Schumpeter, which defines innovation as doing something new in the realm of industry [2]. Reviewing literature on the topic, Distanont and Khongmalai [3] defined innovation as, “a new thing different from what already exists that has been developed using existing knowledge and that responds to the needs of the market” (p 17). Majid *et al.* [1] further refines the definition for business, stating, “...corporate innovation is defined as the planning and executing of new and unique ideas” (p 2). The definition of innovation alone is enhanced by providing a context for the purpose of the innovation. Essentially, innovation is similar to other business activities in that the goal of innovative practice is to create additional value for stakeholders [7].

In a contextual definition of innovation for industry the overall purpose of innovation as a strategy becomes important. Oliveira *et al.* [8] explains that leading innovation means linking the innovative activities of the firm with organizational strategy, which includes product and process decisions. Different forms of innovation, specifically product, process, and business model innovation, provide a firm with the opportunity to build sustainable competitive advantage [3].

Considering that innovation includes strategy, value creation, and establishing competitive advantage, the practice easily aligns with the overall goals of any business. As with other activities and investments, the purpose for a firm to engage in innovation is to improve their success in the market. That success is measured by performance, which should be an outcome of successful innovation practice.

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III. CONNECTION OF INNOVATION TO PERFORMANCE

Am *et al.* [9] helps to frame the importance of innovation, particularly in response to crisis, with their study which found that innovative firms who continued to invest in innovation through the 2009 financial crisis exceeded market performance by 30% or more. While the Am study was insightful, “little has been done in business and policy communities to draw any systematic analysis to improve the overall innovation climate and made the implement-ability of the concept easier” [2]. Sánchez [10] explains that because innovation inherently requires risk, firms need to establish a firm understanding of how their product and service innovations drive positive performance.

As with any investment decision, risk in innovation carries the potential for reward. Bena and Garlappi [11] explain that the leaders in innovation have distinct advantages over the followers, with the potential rewards for followers declining and their relative risk increasing. Speed is a consistent trend in the study of innovation’s potential contributions to firm performance. Innovative capacity gives firms the ability to quickly respond to change and, by making such changes, establish competitive advantage in the newly developed marketplace [8].

Innovative capacity is important for firms in any business environment, but as a competitive asset innovation becomes more important when facing challenges. [12] identified innovation as being critical in firm responses to economic crises, both in the initial response and during the recovery phase following the disruption. This finding is reflected by [6], who state that, “...firms which are able to sustain their innovation activity will gain a significant advantage in any post-COVID recovery” (p 511).

Innovation and firm performance as a topic are thus applicable in any economic environment, but crisis highlights the importance of innovation as a core driver of success in the modern firm. This study’s focus on the most innovative firms is, in part, due to the fact that innovative capacity in a firm has been seen to be a self-reinforcing aspect of firm performance, with organizational knowledge growing through innovation, and greater organizational knowledge enhancing innovative efforts [7]. Innovation is also linked with a firm’s capacity to be strategically flexible [13], with strategic flexibility a necessary element in response to market shocks and the type of crisis seen in the COVID-19 pandemic.

Performance at any point clearly has value to a firm, but a firm’s innovative capacity should be focused on more than just short-term returns. The self-sustaining nature of an innovative culture lends itself to long-term returns. Those long-term returns are what establish and maintain competitive advantage for the innovative firm.

IV. INNOVATION AND COMPETITIVE ADVANTAGE

As discussed in the previous section, a firm’s innovative capacity provides the opportunity to have greater strategic flexibility. Kong and Suntrayuth [13] expand their connection of innovation to firm performance, establishing that innovative capacity is more than just a short-term benefit to a firm, but it can help to establish a sustainable competitive

advantage. Obeidat *et al.* [7] reinforces this connection between innovation, strategy, and competitive advantage, explaining that competitive advantage, “involves designing and implementing a value adding strategy that can’t be implemented by competitors” (p 1333).

Competitive advantage can lead to larger financial returns. Successful innovative efforts are linked to both competitive advantage development and higher profits [14]. Sustained performance provides firms with many advantages, among which are resources with which to pursue further innovative projects. This flexibility can allow for a better capacity to both withstand and respond to economic crises.

V. INNOVATION AND MARKET SHOCKS

The ability for any firm to remain successful ultimately relies on their ability to create value for the customer. Value propositions for customers can change during financial crises, with companies being forced to move away from what was historically successful in order to meet customers where they are in the new environment [9]. Companies’ opportunity to address this shift in value proposition, ultimately to deal with the impacts of the crisis, is an innovative action [12].

Distanont and Khongmalai [3] specifically address company responses to crisis, explaining that the challenges need to be faced and that the way to successfully face the challenges is through innovation, but paradoxically innovation activity falls during times of crisis. This conflict of need versus action indicates that firms who continue to invest in innovation throughout the current crisis should see superior returns. Innovation is recognized as a key element to survival and recovery in response to the COVID-19 pandemic [6].

This linkage of innovation to firm performance and recovery in response to market shocks is the central theory informing the study. If past findings are correct, then more innovative firms should achieve superior returns to the overall market through a crisis period. The study design is constructed to address this question.

VI. STUDY DESIGN

There are several factors at play in the design of this study. The primary factors are identifying a firm’s innovative capacity, measuring the firm’s specific financial performance in parallel with the emergence of a major crisis, and comparing the performance of a group of such firms against the market as a whole. These factors are addressed through the selection of appropriate subjects across the proper period of time to provide meaningful data for testing.

Based on expectations from past studies, the most innovative firms should produce superior performance. This expectation for performance informs the study’s Hypothesis:

HO1: There is not a statistically significant difference among the mean stock price changes over time for the most innovative firms compared to the Dow Jones Industrial Average.

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VII. DATA COLLECTION

In order to identify distinctly innovative firms, the Boston Consulting Group’s (BCG) list of the 50 most innovative companies was used. From that list, only firms appearing in both the 2019 and 2020 lists were selected. This provides a group of 26 firms that showed consistent innovative success across multiple years, most importantly before and during the COVID-19 pandemic. The full list of firms is provided in Table I.

TABLE I: BCG MOST INNOVATIVE FIRMS, 2019-2020

Apple	Tesla	SAP
Alphabet/Google	WalMart	Adidas
Amazon	Johnson & Johnson	Royal Dutch Shell
Microsoft	Siemens	Unilever
Samsung	LG Electronics	Volkswagen
Netflix	JP Morgan Chase	Salesforce
IBM	Dell	Toyota
Alibaba	McDonald’s	3M
Facebook	Bayer	

For the financial performance of the firms, the adjusted close prices for the firms were collected from archival data hosted at finance.yahoo.com. The starting date was December 31, 2019 to take a performance measure prior to the onset of the COVID-19 pandemic. Data was collected through December 31, 2021 to provide data on performance through the continuing COVID-19 pandemic impacts. Data were not included from 2022 in order to avoid the influence of market fluctuations caused by the instability in Eastern Europe centered on the conflict between Russia and Ukraine.

Data was collected for all 26 firms, although there were missing days of reporting for LG Electronics so it was removed from the data set to avoid inconsistency in the data analysis. The following section will cover the analysis and results.

VIII. DATA ANALYSIS AND RESULTS

Price data for the 25 firms included in the study, along with the Dow Jones Industrial Average, were imported into Excel. In order to focus on performance over time and remove issues of scale and currency conversions the daily percentage changes in price were calculated and used as the source of the analysis. This yielded a count of 504 measures for each of the 26 groups.

A single factor ANOVA test was run on the data set with an alpha set at 0.05. Results from the ANOVA are provided in Table II.

TABLE II: ANOVA TEST RESULTS

Source of Variation	SS	df	MS	F	P-value	F-crit
Between Groups	0.0203	25	0.0008	1.4113	0.0835	1.5069
Within Groups	7.5089	13078	0.0006			
Total	7.529	13103				

Because the P-value result of the single factor ANOVA test is greater than alpha ($0.084 > 0.05$), the null hypothesis is

accepted and there is not a statistically significant difference among the means of the samples. While this indicates that the innovative firms as a whole did not outperform the market index, neither did they significantly underperform the market index. Keeping pace with an index that improved by over 27% across the time period studied is arguably strong performance for the firms.

While the firms as a whole performed well, there were exceptions to the positive returns. Two firms, Alibaba and Bayer, returned negative sum and average changes in price over the time period studied. While positive performance was not universal across the group, 92% of firms had positive sum and average changes. The summary results from the ANOVA are provided in Table III.

TABLE III: ANOVA SUMMARY RESULTS

Groups	Count	Sum	Average	Variance
Apple	505	59152.43	117.13	875.88
Alphabet/Google	505	1005913.25	1991.71	347260.71
Amazon	505	1519424.32	3008.76	274269.70
Microsoft	505	117055.37	231.79	2733.32
Samsung	505	726903.72	1439.41	104897.14
Netflix	505	253439.28	501.86	6865.82
IBM	505	58944.76	116.72	134.07
Alibaba	505	110728.01	219.26	1949.64
Facebook (Meta)	505	140144.16	277.51	3231.48
Tesla	505	268954.75	532.58	87225.39
WalMart	505	67399.33	133.46	139.22
Johnson & Johnson	505	76137.89	150.77	168.00
Siemens	505	34448.19	68.21	181.14
JP Morgan Chase	505	64373.03	127.47	826.92
Dell	505	19458.02	38.53	147.67
McDonald’s	505	106867.62	211.62	655.96
Bayer	505	26633.56	52.74	50.19
SAP	505	67823.35	134.30	222.18
Adidas	505	135265.81	267.85	1025.63
Royal Dutch Shell	505	18686.66	37.00	51.77
Unilever	505	27405.69	54.27	11.89
Volkswagen	505	11871.40	23.51	64.91
Salesforce	505	113063.49	223.89	1613.35
Toyota	505	75816.08	150.13	470.39
3M	505	84216.89	166.77	394.78
^DJI	505	15377473.58	30450.44	17279191.03

IX. INTERPRETATIONS

The 2020-2021 calendar years were marked with substantial market disruptions for many industries. One measure of success for a firm could be keeping pace with a growing market, which this group of innovative firms as a whole did by not showing a statistically significant difference in mean price changes from the Dow Jones Industrial Average. It is possible that this outcome validates the competitive advantage that comes from being a highly innovative firm.

There are multiple factors that contribute to firm success, so the current study cannot definitively say that the success of these firms is due to their talent for innovation, but it is a first step in linking innovation to market performance during an economic crisis. It is also possible that there are industry effects being seen here. While multiple industries are included in this list of the most innovative firms for 2020 and 2021, the list as a whole is heavy with technology sector firms,

which could serve to skew the data, particularly during a crisis where solutions were found by shifting to technological solutions offered by some of these firms.

At the same time, the ability of these technological sector firms to address rapidly developing demands in the shifting pandemic marketplace may be evidence of the value of innovation. Innovation is a hallmark of technology-focused firms, but the efforts made during the pandemic were, in many cases, extraordinary. The ability to leverage organizational knowledge to quickly adapt could be strong evidence for the value of innovation as it relates to surviving financial crises.

X. FUTURE RESEARCH OPPORTUNITIES

The current study is a first step in assessing innovation as a tool for performing well through a market shock. Because both equity markets and firm performance are such complex environments, additional research will be helpful to better understand if innovation truly aids firms during crisis. Expanded studies by industry, comparing identified less innovative firms with more innovative firms, and utilizing data across multiple market shock periods will all add to the overall understanding of the relationship.

XI. CONCLUSION

Sustainable competitive advantage is a constant goal for the modern firm. While helpful in any market conditions, it can be critical during crisis periods where the possibility of substantial losses is magnified. Innovation is growing in importance as a driving force behind sustainable competitive advantage, which raises questions about the ability of innovation to help a firm survive a market shock. By reviewing the market performance of the identified most innovative firms against a market index during the COVID-19 pandemic it was possible to begin to understand the influence of innovation on firm performance during crisis. Based on this initial assessment, the most innovative firms are able to maintain their performance at the level of the market as a whole through a crisis period, although they do not outperform the market.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

AUTHOR CONTRIBUTIONS

Dr. Caudill completed this work independently, without assistance from any other authors.

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