Introduction

Topic: Market Reaction to workforce reductions: A comparative analysis of high vs low R&D intensity firms

Corporate layoffs are one of the most consequential decisions a management team could make. Often, it is presented as a necessary step to streamline processes and enhance shareholder value. The firm’s decision to reduce workforce sends a powerful and often ambiguous signal to the stock market. Intuitively, reducing workforce should send a positive signal to the market as it exhibits firms’ commitment to improve productivity, cost cutting measures and automation through AI in the modern context. Nevertheless, the reality is far more nuanced. The market reaction is not uniform and it appears to depend critically on the nature of the firm itself. Therefore, this analysis will examine the key characteristic that shape this investor response: a firm’s commitment to innovation as measured by its Research and Development intensity.

Research and development intensity is defined as the extent to which an organization devotes its resources, both financial and human to research and development activities(Milkovich et al., 1991). This distinction is important as investors tend to view the nature of high and low R&D firms through different lenses, consequently the way they interpret a layoff announcement of one category of these firms will differ from another category. For example, high R&D firm such as tech or pharmaceutical company investors will see its primary asset as its human capital. Such firm do not derive its value from factories, machineries but in the collective knowledge, creativity and collaborative research efforts. A layoff announcement from such a firm is detrimental and signal that the company is sacrificing its key resources, compromising its future ability to innovate. From this perspective, market might penalize the stock of the firms because of the negative effect firm’s decision.

On the other hand, low research and development firms, like traditional manufacturers or retailers might not experience the same effect. When these companies announce layoffs, the market interprets the news not as loss of innovative potential but a deliberate effort to cut costs, improve profitability or process automation. In this context, the investors often reward the company stock, viewing the layoffs as a sign of financial discipline and growth.

The central research question of this study is “How does the stock market’s reaction to layoff announcements differ between firms with high and low R&D intensity?”. This RQ leads to two competing hypotheses as stated below.

**H0:** There is no significant difference in the stock market's reaction to layoff announcements between firms with high and low R&D intensity.

**H1A:** Firms with high R&D intensity experience a significantly *more negative* stock market reaction to layoff announcements compared to firms with low R&D intensity.

**H1B:** Firms with high R&D intensity experience a significantly *less negative* stock market reaction to layoff announcements compared to firms with low R&D intensity.

Below table showcase the theoretical lens of the hypothesis.

|  |  |  |
| --- | --- | --- |
| Theoretical Lens | Core Argument for H1A | Core Argument for H1B |
| Resource-Based / Human Capital View | The high R&D firms are penalized more severely is supported by resource based view. For high R&D firms their value lies in the specialized knowledge, creative culture etc. Thus, a decision to cut highly skilled talent sends a power message of deep financial ddistress suggesting the company is desperate that it must sacrifice its long term innovation for short term survival. | Layoffs can be an attempt to reallocate human resources away from unproductive projects, increasing the overall productivity and value of the remaining talent pool. It can signal to the market that management is proactivel adapting to new technologies such as AI and automation and is making strategic decisions necessary to secure competitive advantage. |
| Signaling Theory | Signaling theory assumes layoffs are a powerful negative signal of deep financial distress forcing the firm to sacrifice future growth. In this narrtive, the market penalizes the firm because the signal is one of crisis . | Conversely, a lay off can be a proactive signal of strategic agility which indicate that management is pivoting away from legacy operaitons and reallocate resources towards more promising technologies. This act as a positive signal to the investors. |

This study will add to our understanding of corporate layoffs and the repercussions. Its evident the way the stock market reacts to layoffs news is not always clear, therefore this research suggests that a firms R&D intensity is a key factor understanding the reaction. Seperation of firms into high and low R&D groups and accessing the stock market reaction for layoffs allow us to understand why investors view these announcements differently. Furthermore, this approach will help to resolve conflicting suggestions by the theories like resource based view and signaling theory. It clarifies when the market sees layoffs as smart strategic shift or a signal of deeper problems.

Methodology

To investigate the research questions, this study employs event study methodology to identify the stock market reaction to corporate layoff announcements. A univariate analysis is conducted to compare the observed market reactions between firms with high and low R&D intensity.

**Data Sources & Sample Construction**

Research was conducted by drawing from three primary data sources: the worker adjustment and retraining notification (WARN), the compustat database for firm financials, the center for research in security in security prices (CRSP) database for stock market data and WRDS event study for abnormal returns.

The database on the layoffs was obtained via the website layoffdata.com which tracks layoffs and cited by numerous researchers and news agencies(Arain, 2025). The federal WARN act requires large employers to give advance notice of layoffs to state governments and workers. Even though, states publish this information, no entity collects these layoffs notices across states. Therefore, the utilized database collects standardize notices across the country into a single, comprehensive dataset.The initial sample of layoff events span over the period from 2015 up to December 2024 in order to capture the contemporary market behavior, especially during the era of AI boom. After the initial cleaning phase for temporary layoffs and company closures, the sample was left with permanent workforce reduction announcements.

A significant challenge in this process was linking the company names form the WARN database with the WRDS databases as the records within the layoff database did not include a unique identifier. To overcome this, a systematic approach was implemented. First, details of all firms from Compustat were extracted for our sample period. Then, cleaned both sets of company names by standardizing them (E.g.: removing suffixes like”inc.” and “LLC”). Thereafter, fuzzy string matching algorithm (Stringdist & fuzzyjoin) was employed to pair the companies from the layoff database with Compustat to obtain the gvkeys(UID). This technique intelligently compares the names from layoff list to the official company names in compustat and find the most like match . With this link established, the researcher managed to gather financial variables, most notably R&D expenditure and sales which were used to calculate R&D intensity measures.

Next, using the CRSP//Compustat merged database, the researcher linked each firms gvkey to its corresponding permanent number (permno) from the center from the CRSP (Center for research in security prices (CRSP) database. A company’s life can be complicated and over the time it can subject acquisitions, mergers etc. These events can change the relationship between the company(gvkey) and its publicly traded stock(permno). The database that connects these two IDs tracks these changes with a start date and end date for every link. The research took measures to ensure the layoff event falls between the official start and end date of the CRSP/Compustat merged database.

Finally, WRDS U.S daily event study tool was used to obtain stock market abnormal returns by taking the cleaned dataset with permno ids. Market model was adopted to access expected returns with specifications estimation window- 100 days, Minimum number of valid returns-70, Gap days- 50. Data were extracted for event windows [-1, +1], [-3, +3], [-5, +5], and [-10, +10] days to ensure wide range of market reaction is captured. The out from this tool was a detailed dataset cvontaining the daily abnormal returns for each firm surrounding its announcement date. To calculate the cumulative abnormal returns for each event a custom script was employed to across the predefined event window files. The script summed the daily abnormal returns across the predefined windows ([-1, +1], [-3, +3], [-5, +5], and [-10, +10] days) to calculate the cumulative abnormal returns for

**Variable Construction**

Dependent Variable – Cumulative Abnormal Returns

CAR was calculated using a two steps process. First, daily abnormal returns were collected across 4 different event windows. Then, these daily returns were summed over several event windows to compute the CAR . Multiple event windows were employed to capture both immediate and long-term market reactions.

* CAR 1 day window- Market Reaction on the event day
* CAR 3 day window – Short term reaction around the announcement
* CAR 5 day window – Medium term market adjustment
* CAR 10 day Window – Extended Market response

Independent Variable – R&D Intensity Classification

R&D intensity was constructed by using annual financial data from the Compustat database. It is calculated by dividing research and development expenses of a firm by its total sales for a given fiscal year. In particular, the financial data from the most recently completed fiscal year prior to the layoff announcement was taken into account.

* 1-year R&D intensity – Current year R&D intensity.
* 3-year R&D intensity – Three-year average R&D intensity.
* 5-Year R&D intensity – Five-year average R&D intensity.

Data Analysis & Results

**Descriptive Statistics**

This section provides a summary of the final sample used for the analysis.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Table 1: Summary Statistics by R&D Classification | | | | |
| Classification | R&D Group | Layoff Announcements | Unique Firms | Total Workers |
| 1-Year R&D | | | | |
|  | High R&D | 773 | 442 | 84,978 |
|  | Low R&D | 776 | 335 | 93,711 |
| 3-Year R&D | | | | |
|  | High R&D | 772 | 439 | 84,332 |
|  | Low R&D | 777 | 339 | 94,357 |
| 5-Year R&D | | | | |
|  | High R&D | 772 | 438 | 84,426 |
|  | Low R&D | 777 | 333 | 94,263 |
| *Note: Data sourced from final\_dataset\_cleaned data frame.* | | | |  |

Table 1 provides a detailed breakdown of the final sample segmented by R&D intensity measured over one-, three- and five-year periods. The table reveals key characteristics of the final dataset. As detailed in table 1, across all classification periods, the number of layoff announcements are almost perfectly split between R&D groups which was split using the median of RD intensity scores. If particular firm R&D intensity is above the median those fall within the High R&D category and the rest within low R&D intensity. A key observation is for 1 year classification, the high R&D group consists of 773 announcements from 442 unique firms while low R&D groups has 776 announcements from only 335 unique firms. This observation is consistent across all other groups. This suggest that low R&D firms are likely to announce layoffs multiple times during the sample period ( an average of 2.3 announcements per firm) compared to high R&D groups( an average of approximately 1.75 announcements per firm).

The next key observation related scale of layoffs. Across all the measurement windows, low R&D groups laid off a greater total number of workers than the high R&D group. For instance, in year 1 classification, the low R&D firms laid off around 280 employees on average compared to 192 employees of high R&D firms.In summary, the data pattern suggest that low R&D group announced lay off frequently and on a larger scale than high R&D group firms.

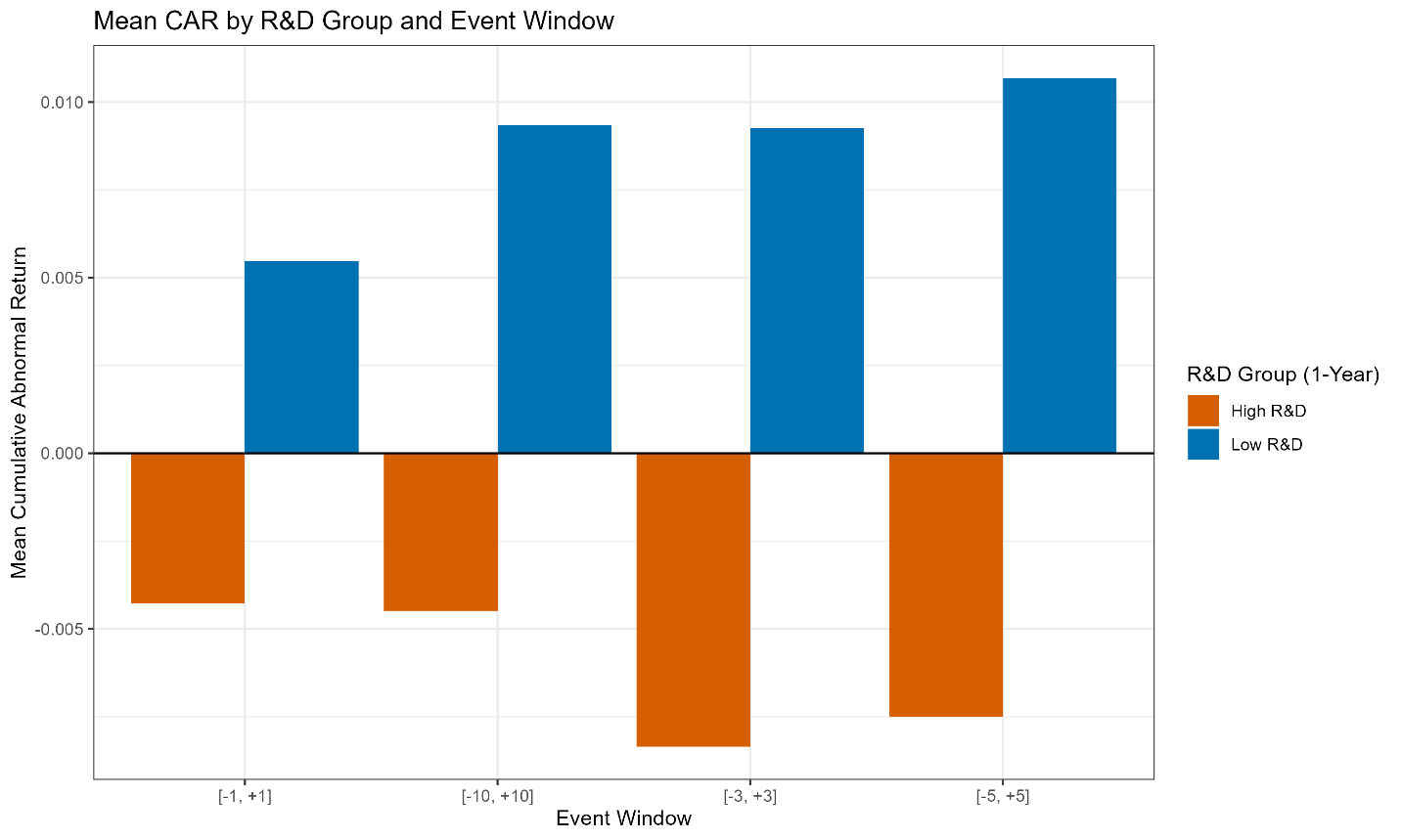


Figure 1 clearly depict the pattern of mean market reaction to layoff annoucements, compairing the high and low R&D groups. The most important finding of this chart is the consistent, but opposing reaction between the high and low R&D intensive firms. For every window of CAR analyzed, the bar representing high R&D group(orange) remans negative, while the bar for the low R&D group remains positive. This bar chat visually support the idea that investors penalize innovative firms for layoffs while rewarding less R&D intensive firms.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Table 2: Summary Statistics for CARs by R&D Group | | | | | | | |
| CAR\_Window | RD\_Group | N | Mean | Mode | Std\_Dev | Min | Max |
| 1-Day CAR [-1, +1] | | | | | | | |
| 1-Day CAR [-1, +1] | High R&D | 755 | -0.0043 | 0.0186 | 0.1159 | -1.8085 | 0.8438 |
| 1-Day CAR [-1, +1] | Low R&D | 762 | 0.0055 | 0.0511 | 0.071 | -0.83 | 0.7509 |
| 3-Day CAR [-3, +3] | | | | | | | |
| 3-Day CAR [-3, +3] | High R&D | 757 | -0.0083 | -0.0236 | 0.1568 | -2.5578 | 0.6756 |
| 3-Day CAR [-3, +3] | Low R&D | 762 | 0.0093 | 0.0945 | 0.0942 | -0.7013 | 0.7127 |
| 5-Day CAR [-5, +5] | | | | | | | |
| 5-Day CAR [-5, +5] | High R&D | 758 | -0.0075 | -0.0447 | 0.1864 | -2.6114 | 0.8169 |
| 5-Day CAR [-5, +5] | Low R&D | 762 | 0.0107 | 0.0809 | 0.1099 | -0.6921 | 0.6081 |
| 10-Day CAR [-10, +10] | | | | | | | |
| 10-Day CAR [-10, +10] | High R&D | 758 | -0.0045 | -0.1003 | 0.2639 | -2.5651 | 2.9439 |
| 10-Day CAR [-10, +10] | Low R&D | 762 | 0.0093 | 0.0622 | 0.1957 | -1.9354 | 0.9538 |

The descriptive statistics table reveal a consistent divergence in the market reaction to lay off announcements based on firm’s R&D intensity. It is observed that for the high R &D intensity firms, the mean cumulative abnormal returns is negative across all four event windows. The most significant impact is noticeable in the [\_3 ,+3] day window. In contrast, the low R&D firms exhibits consistent positive mean CARs, with the highest value reported at 1.07% in [-5,+5] window. This opposing reactions suggest that investors penalize R&D intensive firms while rewarding low R&D firms for similar actions.

The table also present notable difference in the volatility of the market reaction. The standard deviation of CARs is consistently higher for high R&D group across all event windows. For instance, in the [-3,+3] window, the standard deviation for the high R&D group is 66% larger than the lower R&D group(0.1568 vs 0.0942). This dispersion is also supported by the higher gap in min and max values for high R&D groups. The data patterns suggest that investors face higher degree of uncertainty in the assessment of layoffs at innovative firms.

In summary, the statistics provide strong support for H1A. The negative market reaction for high R&D firms aligns with the resource based view where layoffs are perceived as destruction of valueable human capital.

**Univariate Analysis Results**

The results presented in the table 3 detail the mean CAR breakdown for firms segmented by R&D classification.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Table 3: Mean CARs by R&D Classification and Event Window | | | | | |
| Classification | R&D Group | Mean CAR [-1, +1] | Mean CAR [-3, +3] | Mean CAR [-5, +5] | Mean CAR [-10, +10] |
| **1-Year R&D** | | | | | |
| 1-Year R&D | High R&D | -0.0043 | -0.0083 | -0.0075 | -0.0045 |
| 1-Year R&D | Low R&D | 0.0055 | 0.0093 | 0.0107 | 0.0093 |
| **3-Year R&D** | | | | | |
| 3-Year R&D | High R&D | -0.0043 | -0.0079 | -0.007 | -0.0034 |
| 3-Year R&D | Low R&D | 0.0055 | 0.0088 | 0.0101 | 0.0082 |
| **5-Year R&D** | | | | | |
| 5-Year R&D | High R&D | -0.0039 | -0.0076 | -0.0072 | -0.0034 |
| 5-Year R&D | Low R&D | 0.0051 | 0.0085 | 0.0103 | 0.0082 |

The primary finding is that all firms classified as high R&D consistently experience negative mean CARs across all four event windows regardless whether R&D intensity is calculated over 1 year, 3 years or 5 years. On the other hand, the low R&D firms reflect consistent positive mean CARs across all observation windows. It evident that investors on average penalize layoffs at R&D intensive firms while rewarding the low R&D firms for similar actions.

The stability and consistency of this finding across the different R&D classification periods is a key result. Furthermore, the magnitude of the mean CARs for both high and low R&D groups remain consistent across all R&D intensity measures. For example,the mean CAR for the [-5,5+] window is 1.07%,1.01% and 1.03% respectively. This observed robustness strongly suggest that observed phenomenon is not a short-term fluctuation instead it is linked to the firm’s more stable, long-term commitment to R&D investment. This result provides strong foundation for hypothesis testing to follow.

**Hypothesis testing outcomes**

The T test results are presented in the table 4. It provides sotrng statistical support for the primary alterantive hypothesis H1A –“Firms with high R&D intensity experience a significantly *more negative* stock market reaction to layoff announcements compared to firms with low R&D intensity” and allow for the rejection of null hypothesis of no observed difference between low and high R&D firms. The analysis provide evidence that stock market’s reaction to layoff announcement differ between high and low R&D firms and the difference is statistically significant.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Table 4: T-Test for Difference in Mean CARs by R&D Classification | | | | | | |
| Classification | Event\_Window | Mean CAR (High R&D) | Mean CAR (Low R&D) | Difference | t-statistic | p-value |
| **1-Year R&D** | | | | | | |
| 1-Year R&D | [-1, +1] | -0.0043 | 0.0055 | -0.0097 | -1.9727 | 0.0487\* |
| 1-Year R&D | [-3, +3] | -0.0083 | 0.0093 | -0.0176 | -2.6506 | 0.0081\*\* |
| 1-Year R&D | [-5, +5] | -0.0075 | 0.0107 | -0.0182 | -2.3141 | 0.0208\* |
| 1-Year R&D | [-10, +10] | -0.0045 | 0.0093 | -0.0138 | -1.1596 | 0.2464 |
| **3-Year R&D** | | | | | | |
| 3-Year R&D | [-1, +1] | -0.0043 | 0.0055 | -0.0098 | -1.9902 | 0.0468\* |
| 3-Year R&D | [-3, +3] | -0.0079 | 0.0088 | -0.0168 | -2.5203 | 0.0119\* |
| 3-Year R&D | [-5, +5] | -0.007 | 0.0101 | -0.0171 | -2.1722 | 0.0300\* |
| 3-Year R&D | [-10, +10] | -0.0034 | 0.0082 | -0.0116 | -0.9696 | 0.3324 |
| **5-Year R&D** | | | | | | |
| 5-Year R&D | [-1, +1] | -0.0039 | 0.0051 | -0.0091 | -1.833 | 0.067 |
| 5-Year R&D | [-3, +3] | -0.0076 | 0.0085 | -0.0161 | -2.426 | 0.0154\* |
| 5-Year R&D | [-5, +5] | -0.0072 | 0.0103 | -0.0175 | -2.2309 | 0.0259\* |
| 5-Year R&D | [-10, +10] | -0.0034 | 0.0082 | -0.0116 | -0.9725 | 0.331 |
| *Note: Significance levels: \* p < 0.05, \*\* p < 0.01* | | | | | | |

The findings are consistent over multilple event windows. Focusing on the 1 year R&D classification, its evident that negative difference in mean CARs for high R&D firms is statistically significant for [-1, +1] (p < 0.05), [-3, +3] (p < 0.01), and [-5, +5] (p < 0.05) windows. The magnitude of this effect is well evident in the -3,+3 window where mean CAR for high R&D firms was 1.76 % lower than for low R&D firms, indicating market significantly punish the R&D intensive firms for cutting down staff.

Other alternative measures of R&D intensity are in line with the core findings. A similar of pattern of statistically significant differences is observed for 3 year and 5 year classifications. This further confirms that core findings are highly robust. Moreover, the effect appears to be applicable only medium term as the pattern loses the statisticall significance in the longest window of -10,+10 across all classifications.

In conclusion, the hypothesis tests confirms that stock market penalisez high R&D firms in R&D intensive firms for layoff annoucements compared to less R&D intensive firms. This effect is mostly observed in the weeks immediately following the announcement and hold hold true across varios measure of R&D intensity. Furthermore, the finding support resource based view where layoffs are considered to be a value destroying activity for innovative firms. On the other hand, findings are also consistent with the signaling theory that state layoff as a powerful signal of negative private information, that suggests the company is under financial distress.

Conclusion

This study is conducted determine how stock market react to layoffs annoucements differs between firms with high and low R&D intensity. The results and data of the descriptive statistics, univariate analysis and analysis for the hypothesis testing provide clear and robust answer to the research question. The findings exhibit a statistically significant and different market reaction for high and low R&D firms. Inestors penalize R&D intensive firms for announcing workfoce reductions resulting in negative abnormal returns. In constrat, firms with low R&D intensity experience positive abnormal return for the same action. Findings are consistent across multiple event windows and R&D intensity measures.

Findings also support the resource based view where layoffs are perceived as a destructive act oct that affect innovative human capital and signagling theory where layoff is interpreted as as a response for financial distress experienced by the &D intensive firms.

Several limitations of this study present future research opportunities. Due to the lack of the computing power, the researcher had settle for less efficient fuzzyjoin parameters which resulted in only 14.06% match rate between compustat database and the layoff database to obtain the gvkey. With appropriate computing power the researcher could have improved the fuzzyjoin algorithm follow additional parameters for matching. Future researches could employ multivariate regression to control for firm specific variables and isolate the R&D effect more precisely. Sample is based on U.S firms and publicly announced layoffs that meet WARN act criteria, therefore findings may not be generalizable for small firms or to different international contexts.

References

Arain, O. (2025). *WARN Database*. WARN Database. https://layoffdata.com/cited/

Milkovich, G. T., Gerhart, B., & Hannon, J. (1991). The effects of research and development intensity on managerial compensation in large organizations. *The Journal of High Technology Management Research*, *2*(1), 133–150. https://doi.org/10.1016/1047-8310(91)90018-J