Analyzing Stock Buybacks and Their Relationships to Research and Development Expenses and Equity Value among Top Life Science Companies

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SM460: Senior Capstone Project

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25 March 2025

Introduction

The life science industry and its operation in a free market economy presents a complex and often controversial dynamic. On one hand, businesses are driven by the pursuit of profit, seeking to maximize shareholder value through cost-efficiency, competitive strategy, stock performance, and revenue growth. On the other hand, the life science industry holds a unique responsibility to design, develop, and distribute life-saving products that improve public health and well-being. Financial incentives for companies to satisfy immediate goals may overshadow their ethical responsibility to prioritize patient care and affordability in the short term and scientific progress in the long term. As a result, decisions driven by market pressures–such as stock buybacks, worker layoffs, research and development (R&D) cuts for cost-saving purposes, and price increases on existing medicines–can conflict with other goals, like ensuring equitable access for patients and advancing innovation to meet future public health needs. This tension raises critical questions about the role of profit in the life science industry and how to balance the interests of shareholders with society as a whole.

Our research explores the relationship between stock buybacks and investment in innovation through research and development (R&D) within the life science industry. In a stock buyback, a company repurchases its own shares from the market to reduce the number of outstanding shares, often to boost its stock price or earnings per share. Specifically, we hypothesize that among top-performing life science companies operating in the pharmaceutical, medical device, and biotech sectors, stock buybacks are negatively correlated with investment in research and development, intellectual property holdings (IP), the number of clinical trials, and drug pricing trends. In this project, we aim to assess whether buybacks are associated with

innovation, scientific progress, patient access, and stock market performance using empirical data.

What are Stock Buybacks?

To better understand the relationship between buybacks, innovation, and patient access, it is important to first examine what stock buybacks are, how they work, and why companies—particularly in science-based industries—choose to use them. Stock buybacks, or share repurchases, happen when a company purchases its own shares from the open market, effectively reducing the number of outstanding shares. As a result, buybacks can increase earnings per share (EPS = Net Income / Shares Outstanding), which often leads to a higher stock price and pleases investors. Some companies may complete a buyback because they believe their stock is undervalued or because they want control of more shares, both of which are positive signals to the market. The practice has been around for decades but became more prevalent after the 1982 SEC Rule 10b-18, which provided companies with reduced liability against market manipulation claims.[1] Since then, buybacks have grown into a tool used by many corporations for corporate financial management.

However, some critics argue that companies use buybacks to meet short-term financial targets, such as EPS growth, especially when executive compensation is tied to those metrics. Instead, these funds could be directed toward R&D, employee development, or environmental and social impact, all of which could increase future competitiveness. This debate has intensified as corporations prioritize buybacks even in industries where long-term, risky, and costly innovation is fundamental, such as in the life science industry.

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[1] Clark, Ronald O. "Should Congress or the SEC Do Something About Stock Buybacks?" *Business Law Today*, American Bar Association, Apr. 2021, https://www.americanbar.org/groups/business_law/resources/business-law-today/2021-april/should-congress-or-the-sec-do-something/. Accessed 18 Feb. 2025.

Why is Research so Important in the Life Science Industry?

Research is the backbone of the life science industry, driving the discovery and development of new drugs that improve and save lives. It enables companies to innovate, stay competitive, and provide evidence of safety and efficacy for bringing new treatments to market. Over the past decade, the average timeline to bring a compound from candidate nomination to market launch has been approximately 12 years.[2] The cost of developing a single compound on average costs about $2.284 billion from discovery to launch.[3] This process follows a structured pipeline of discovery and development, preclinical research, clinical research, FDA review, and FDA Post-Market Safety Monitoring.[4] Each stage carries increasing costs and risk, with only a small percentage of compounds ultimately reaching the market.

From an accounting standpoint, research and development expenses are generally expensed as incurred, and the costs, reported on the income statement, reduce short-term profitability. However, investors often view high research and development spending in the life science industry as a strategic investment, especially when backed by a strong pipeline or recent drug approvals, signaling long-term growth potential.[5] While costly and time-consuming, sustained investment in research ensures not only a company's competitiveness and future revenue streams but also advances public health and fulfills a broader societal responsibility.

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[2] Agrawal, Gaurav, et al. "Fast to First-in-Human: Getting New Medicines to Patients More Quickly." *McKinsey & Company*, 10 Feb. 2023, www.mckinsey.com/industries/life-sciences/our-insights/fast-to-first-in-human-getting-new-medicines-to-patients-more-quickly.

[3] R&D Funding Could Increase for Life Sciences." *Deloitte Accounting & Finance Blog*, 2 Aug. 2024, https://www2.deloitte.com/us/en/blog/accounting-finance-blog/2024/r-and-d-funding-could-increase-for-life-sciences.html

[4] U.S. Food and Drug Administration. "The Drug Development Process." *FDA*, 4 Jan. 2018, www.fda.gov/patients/learn-about-drug-and-device-approvals/drug-development-process.

[5] Ellis, Jeff, and Dennis Howell. "Will FASB's Proposal Encourage a Flood of R&D Funding in Life Sciences?" *Deloitte Risk & Compliance Journal*, 4 Feb. 2025, https://deloitte.wsj.com/riskandcompliance/will-fasbs-proposal-encourage-a-flood-of-r-d-funding-in-life-sciences-6760c2ae.

How are Stock Buybacks Related to R&D?

Some people assume that firms must choose between spending on R&D or doing share buybacks, as if there is one pot of money and only room for one option. In reality, companies can often finance both, especially if they have access to external funding through debt or equity. The real issue is how firms structure this financing. Buybacks are essentially a way of shifting from using equity financing to relying more on debt. According to financial theory—like the Modigliani-Miller theorem—in perfectly efficient markets, this would not change the value of the firm. However, real markets are not perfect; if the issuance of buybacks leads companies to depend more on debt, it may make future investments harder or more costly to obtain.[6] It is in this sense that buybacks may offer short-term boosts to stock prices while reducing the value of a company over the long term by making innovation more difficult to sustain. High stock buybacks may be an indicator that management is more focused on enriching shareholders rather than R&D, which is essential for the lasting success of a life sciences firm. Our study looks at whether and how that trade-off actually shows up in empirical data on life science companies.

Project Inspiration

Our project is inspired by two studies. In July 2021, the U.S. House of Representatives Committee on Oversight and Reform released a report investigating stock buybacks, R&D, and executive compensation among a sample of 14 pharmaceutical companies. Earlier, in February 2019, former SEC Commissioner Robert J. Jackson Jr. examined the relationship between stock buybacks and corporate cashouts within the biopharmaceutical sector.

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[6] Freshfields Bruckhaus Deringer LLP. "The Dangers of Buybacks: Mitigating Common Pitfalls." *Harvard Law School Forum on Corporate Governance*, 23 Oct. 2020, https://corpgov.law.harvard.edu/2020/10/23/the-dangers-of-buybacks-mitigating-common-pitfalls/.

The House report revealed how, "overall, the 14 companies spent an average of 10% more on buybacks and dividends than on R&D from 2016 to 2020, but the eight U.S.-based companies spent on average over 24% more on buybacks and dividends than on R&D."[7] This evidence suggests that by reducing spending on buybacks and dividends, companies could maintain or exceed their current level of R&D investment.

In the second study, Jackson sought to identify potential explanations for large corporate buybacks and to investigate whether senior company executives were profiting from these decisions. He found that there was a measurable increase in stock performance post buyback announcement compared to the performance of similar companies and that company insiders were selling their stocks at materially higher levels during these periods.[8] Therefore, executives benefitted from the buyback announcement that they authorized, and he postulated that buyouts are used to cash out executive stock.

Our research intends to expand upon these two studies by further investigating the impacts of stock buybacks on the life sciences industry. Similarly to the House Report, we focused on R&D spending in relation to stock buybacks. The project aims to provide a more holistic view of this relationship on an industry level through our larger sample size. The House report's sample was limited to pharmaceutical companies and did not include firms that had not pursued buybacks as a point of comparison–two changes we made in our research design. In contrast to Jackon's work, our analysis does not include dividends, focuses on a much larger set of companies, and does not investigate executive trading information. Instead, the project

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[7] U.S. House of Representatives Committee on Oversight and Reform, *Drug Pricing Investigation: Pharmaceutical Industry Business Practices—Buybacks, Dividends, and Executive Compensation Compared to Research and Development Spending*, staff report, July 2021, https://oversightdemocrats.house.gov/sites/evo-subsites/democrats-oversight.house.gov/files/COR%20Staff%20Report%20-%20Pharmaceutical%20Industry%20Buybacks%20Dividends%20Compared%20to%20Research.pdf.

[8] Robert J. Jackson Jr., "Stock Buybacks and Corporate Cashouts," U.S. Securities and Exchange Commission, February 4, 2019, https://www.sec.gov/news/speech/speech-jackson-020419.

expands upon his look into changes in equity value, examining the long-term effects of stock buybacks on stock price.

Methodology

Companies based in the United States or listed on American stock exchanges were considered in this project. Initially, our group wanted to capture companies that undertook large share repurchase programs in our sample. We decided to select 100 companies from target industries so that our data analysis could be performed on a broad selection of companies. To achieve this, companies were chosen on the basis of revenue, using 2016 as the base year. If a company fell into the top 100 when sorted by revenue, it was selected for our sample. Since companies that pursued significant stock buyback programs also had high revenues, this method of selection self-sorted companies of interest into our sample.

The company sample included companies from the following GIC Sub-Industry codes: 35201010, 35202010, 35203010, and select companies from 35101010 and 35102015. The first two codes refer to the pharmaceutical and biotechnology industries, respectively, while the latter three codes refer to different subcategories within the medical device industry. All of the data utilized was pulled from Compustat, while ChatGPT, Perplexity.ai, and supplemental reading sources (See Appendix D) were used miscellaneously.

Selected companies were split into one of two groups: treated and controlled. The treated group consisted of companies that pursued stock buybacks in a given fiscal year. The project measured the value of stock buybacks on an annual level. The control group included firms that did not meet this criterion. In practice, companies may have been “control” for 2016 if they did not pursue buybacks in that year, and “treated” for 2017 if they did repurchase shares. The

designation of "treated" or "control" only applied to a company for a specific fiscal year and could change over time.

The project assumed that R&D is necessary for the long-term success of companies in these industries. The project measured average R&D as a percentage of revenue for the entire sample on an annual basis. Companies were also segmented by industry for further analysis. These results were used to establish evidence for a relationship between group designation and spending on R&D and to establish differences across industries.

Furthermore, stock prices at market close were collected and compared to the average returns of the market. The S&P 500 was used as a measure of the market. Performance was examined on a quarterly basis in an attempt to find more deviation than would have been apparent in an annual analysis.

Results

First, we observed stock buybacks, R&D expenses, and revenue for the full sample. On average, 41% of companies conducted buybacks in a given year, with the greatest amount of buybacks (59%) occurring in 2016. For comparison, about 47% of S&P Composite 1500 companies pursued buybacks in 2016.[9] Overall, our data suggest that larger companies are more likely to engage in stock buybacks. Table 1 reveals that in 2016 and 2017, the average total revenue for treated firms was more than twice that of control firms. In every year except for 2020, treated firm buyback purchases exceeded R&D expenditures. There was also a spike in buybacks in 2018, possibly related to the corporate tax cut from 31% to 25%.[10]

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[9] Liyu Zeng and Priscilla Luk, *Examining Share Repurchases and the S&P Buyback Indices* (New York: S&P Dow Jones Indices, March 2020), https://www.spglobal.com/spdji/en/documents/research/research-examining-share-repurchases-and-the-sp-buyback-indices.pdf.

[10] Emily Stewart, "Tax Cuts and Stock Buybacks, Explained," *Vox*, August 2, 2018, https://www.vox.com/2018/8/2/17639762/stock-buybacks-tax-cuts-trump-republicans.

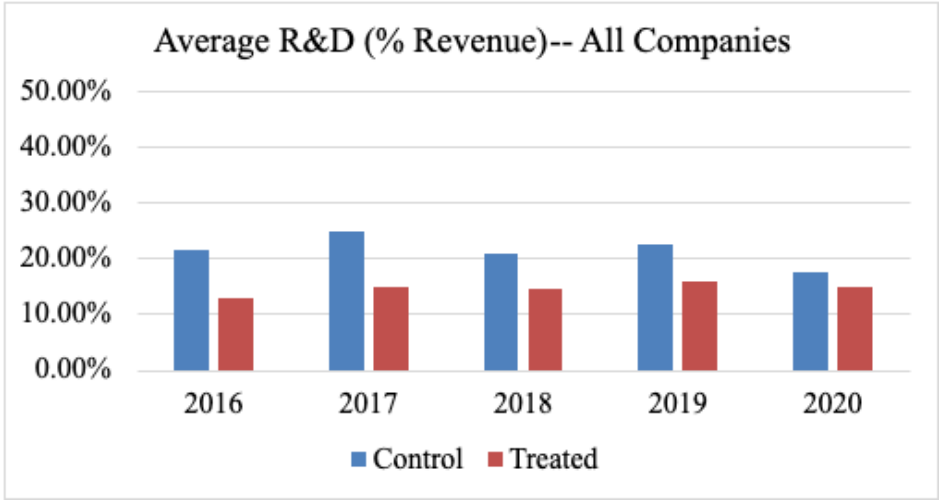
*Figure 1: Companies that engage in buybacks are significantly larger in revenue**

	Average Buybacks		Average R&D Expense		Average Total Revenue		Count of Group	
Fiscal Year	**Control**	**Treated**	**Control**	**Treated**	**Control**	**Treated**	**Control**	**Treated**
2016	-	$2,764	$646	$1,842	$4,058	$11,174	37	63
2017	-	$1,977	$822	$1,880	$5,055	$11,126	31	69
2018	-	$3,565	$982	$2,052	$6,546	$11,258	27	67
2019	-	$2,639	$1,309	$1,913	$8,542	$11,001	22	70
2020	-	$1,703	$1,913	$2,235	$10,577	$11,120	21	67
Grand Total	-	**$2,524**	**$1,054**	**$1,984**	**$6,492**	**$11,134**	**138**	**336**

*All amounts in millions

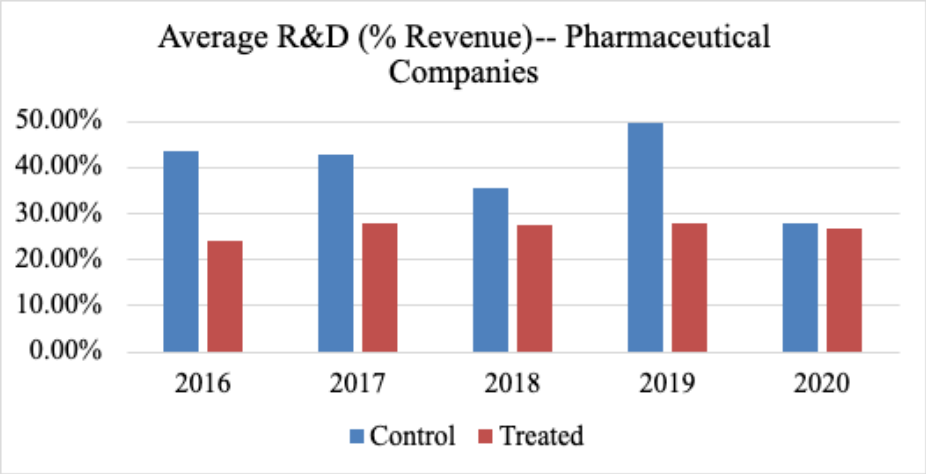
While treated firms spent more on R&D than control firms in absolute terms, Figure 1 displays that, relative to revenue, treated firms consistently dedicated a smaller share to R&D each year. On average, firms pursuing buybacks had R&D expenditures equal to 14.59% of revenue, compared to 21.67% for control firms. This gap shrank to just 2.39 percentage points in 2020, potentially reflecting a shift in investment priorities due to the COVID-19 pandemic.

Figure 2: Firms with buybacks invested less in R&D relative to revenue



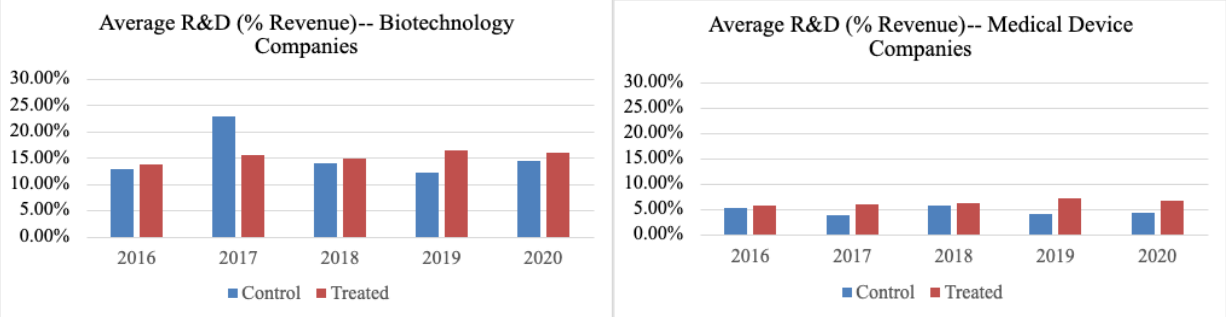
Among pharmaceutical companies, where the level of R&D investment is higher overall, the disparity is more pronounced (Figure 2). Treated companies in this sector allocated an amount equal to 26.77% of revenue to R&D, while control firms allocated 39.98%–a difference nearly double that observed in our sample as a whole.

Figure 3: Pharmaceutical industry exhibits wider R&D gap between treated and control firms



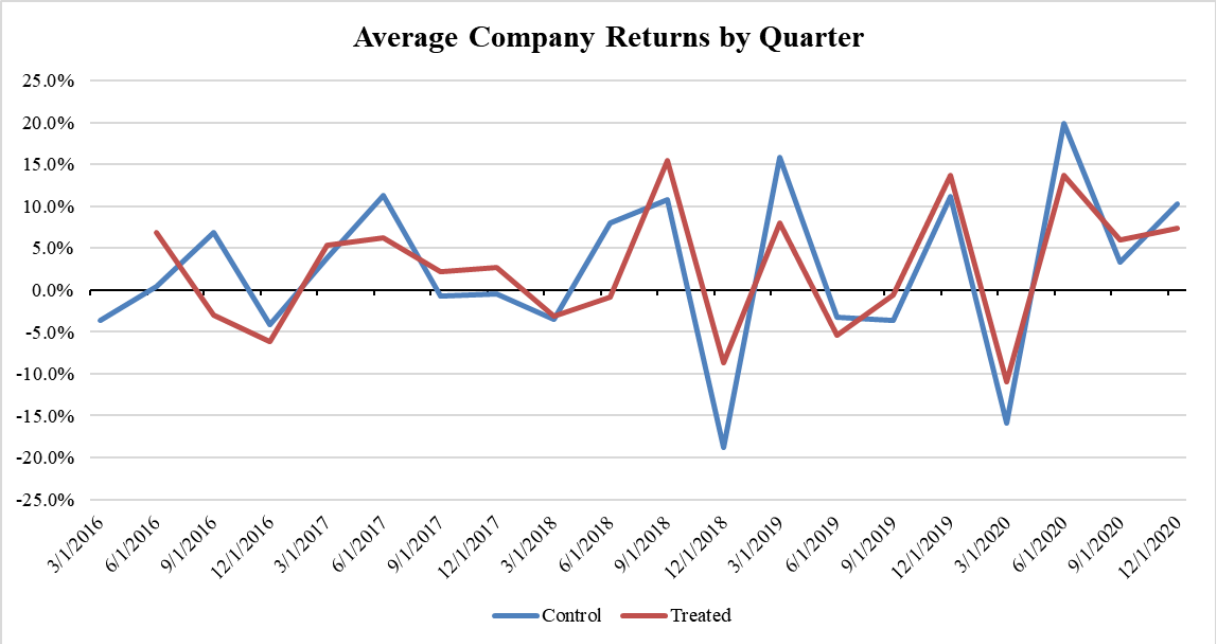
This finding sharply contrasts with results from the other two industries in our sample. Among biotechnology companies (Figure 3), treated firms reported higher R&D expenses relative to revenue than control firms in every year except 2017. In the medical devices industry (Figure 4), treated firms spent a greater portion of revenue on R&D in all five years. These patterns indicate that the correlation between stock buybacks and R&D investment is industry-specific, with the pharmaceutical industry driving much of the effect observed in our full sample.

Figures 4 and 5: Treated firm R&D spending matches or surpasses control firms in the biotechnology and medical device sectors



Finally, we examine quarterly stock returns for the companies in our sample (Figure 6). There were marginal benefits for treated firms, which experienced average stock price growth of 2.6% per quarter compared to 2.4% for control firms. However, the frequent crossover between the groups' return lines implies that buybacks may not guarantee long-term stock performance.

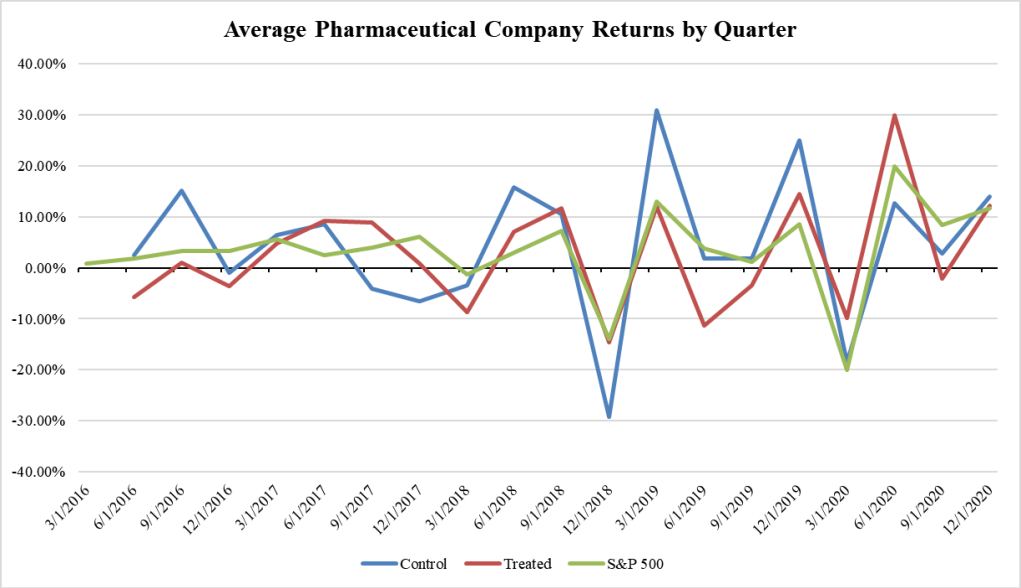
Figure 6: Quarterly stock returns show a minimal advantage for buyback firm



When we segmented our stock analysis, we found that companies within the pharmaceutical industry had the highest deviation from one another. The control and treated

groups have a correlation coefficient of R^2=0.492, which is relatively high for a large sample. We can conclude that both the treated and control groups move both similarly to the market and to each other across all industries we studied. Additional quarterly equity performance segmented by industry can be found in Appendix E, and correlation tables can be found in Appendix F.

Figure 7: Quarterly stock returns deviate most within the pharmaceutical industry, still relatively high correlation



Taken together, our findings support the narrative that buybacks inherently detract from R&D investments in only the pharmaceutical industry. There was a significant gap in R&D spending between treated and control firms in the pharmaceutical industry, supporting findings from the earlier House report and our hypothesis that pharmaceutical companies pursuing stock buybacks invest proportionally less in R&D. However, industry dynamics appear to be a key factor, since biotechnology and medical device companies did not display this pattern. Existing research from Jackson and the House Report suggests that buybacks increase share prices in the

short term. Our research was unable to conclude that there was a positive or negative correlation between stock buybacks and long-term equity performance.

Our study has several limitations: it relies on correlational data, and given our sampling of the top 100 companies by 2016 revenue, it is unclear whether our findings would generalize to the broader industries. Further research could be done to investigate the impacts of stock buybacks on other innovation-related factors, such as intellectual property holdings (IP), the number of clinical trials, and drug pricing trends. Nevertheless, these results provide nuance to the debate over whether stricter regulations on stock buybacks are necessary to protect continued innovation and scientific progress.

Policy Implications

Several proposals have been put forward to enhance oversight in buyback practices. The Reward Work Act (proposed by Sen. Tammy Baldwin) would ban open-market buybacks; instead, companies would have to conduct buybacks through tender offers, which require more disclosure.[11]A tender offer is a more transparent method where firms publicly offer to buy a set number of shares at a specified price within a limited time. Shareholders can then choose whether or not to sell their shares back to the company under these terms. This process ensures equal treatment of shareholders and reduces the potential for insider advantage. Companies forced to justify repurchase plans might dedicate more funds toward innovation, wage compensation, and business expansion. However, this could result in stock stagnation, and companies would lose a key tool for managing their capital.[12] Limiting buybacks might reduce firms' flexibility in managing their capital structure, especially when they have excess cash and

[11] Baldwin, T. (2018, March 22). *S.915 - Reward Work Act of 2018*. Congress.gov. https://www.congress.gov/bill/116th-congress/senate-bill/915

[12] CFI, *Dividend vs Share Buyback/Repurchase Enhance yield or boost EPS?*

lack better immediate investment opportunities.[13] Buybacks are considered a way to efficiently allocate capital when they have excess cash. Warren Buffet, for example, has defended buybacks, arguing they benefit shareholders when done responsibly (ensuring retained earnings are not used purely for buybacks)[14]. Ultimately, while regulating buybacks may promote greater transparency and fairness, it also requires careful consideration of the trade-offs in terms of corporate flexibility and long-term shareholder value.

The Worker Dividend Act (proposed by Sen. Cory Booker) would mandate that companies that conduct buybacks give employees a proportional financial benefit, such as cash bonuses or stock grants.[15] This law would apply to large corporations and significant stock repurchase programs. The goal is to ensure that workers, like shareholders, share in the financial gains from buybacks, potentially helping to reduce income inequality. As a result, this policy could make buybacks less attractive, as firms would face higher associated costs when pursuing them. Critics of this approach argue that firms might compensate by cutting other employee benefits or slowing hiring.[16]

Additional policy tools could align corporate behavior with innovation-focused growth. One option is mandatory R&D minimums for firms conducting buybacks: to ensure that stock buybacks do not come at the expense of innovation, regulations could prohibit buybacks if companies' R&D spending falls below a set percentage of revenue. Our findings indicated that R&D intensity was highest among firms that did not engage in buybacks. On the positive side, it might lead the firm to increase R&D investments to meet the threshold, potentially boosting

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[13] Almeida, Heitor, Vyacheslav Fos, and Mathias Kronlund. 2016. *The Real Effects of Share Repurchases*. NBER Working Paper No. 19406. National Bureau of Economic Research. https://www.nber.org/papers/w19406

[14] Buffet, *Letter to Berkshire Hathaway Shareholders for 2020*, Feb. 27, 2021.

[15] Booker, C. (2018, March 6). *S.2514 - Worker Dividend Act of 2018*. Congress.gov. https://www.congress.gov/bill/116th-congress/senate-bill/2514

[16] Visram, Tax Cut Fuels Record $200 Billion Stock Buyback Bonanza, CNN.com (June 5, 2018).

innovation. However, it may lead to superficial or inefficient spending if firms treat the requirement as a check box rather than a strategic priority. Its effectiveness would depend heavily on careful design. Setting an industry-wide benchmark could also be challenging due to the diverse functions within life science companies, such as biotechnology, pharmaceuticals, and medical devices.

Another approach is a progressive tax penalty for excessive buybacks. The 2018 corporate tax cuts led to a surge in buybacks, raising concerns that tax savings were being directed to shareholders instead of reinvested in innovation.[17] A progressive tax could be applied to buybacks exceeding a certain threshold, encouraging companies to prioritize long-term R&D over short-term stock price boosts. Defining an appropriate threshold, though, remains a challenge.

Beyond U.S. legislative efforts, other countries impose more restrictive buyback regulations. Switzerland, Japan, the UK, and the Netherlands enforce stricter controls on repurchases, offering potential models for balancing corporate financial strategies with sustained investment in research and development. In Switzerland, the Swiss Takeover Board oversees share repurchases, and any buyback activity exceeding a certain threshold must be approved by shareholders. Moreover, companies are restricted from repurchasing shares during certain periods, such as around earnings announcements, to prevent market manipulation and ensure that share repurchases do not impair other investments, including R&D.[18] The UK's Financial Conduct Authority (FCA) imposes similarly strict rules on buybacks: share repurchases in the UK must be approved by shareholders and cannot exceed certain amounts without justification. Companies must disclose the purpose of their buybacks in annual reports, explaining whether the

[17] Visram, *Tax Cut Fuels Record $200 Billion Stock Buyback Bonanza*, CNN.com (June 5, 2018).
[18] Swiss Takeover Board. (2020). *Stock buybacks and regulations*. https://www.takeover.ch

funds used for repurchases could have been better spent on strategic activities, such as R&D or employee compensation.[19]

While many policy proposals surrounding stock buybacks focus on their societal consequences—such as rising inequality or declining investment in innovation—an equally important dimension is the possibility that firms may be acting against their own long-term interests.[20] Currently, there is a structural incentive to prioritize immediate stock performance over sustained investment in R&D, talent, and growth capabilities.[21] Therefore, policies should also aim to correct internal incentive misalignments that lead to suboptimal corporate behavior. For example, companies' compensation structures could be linked to long-term goals—such as innovation outcomes, return on invested capital (ROIC) over five years, or new product development.[22]

Conclusion

Stock buybacks are strategic financial tools with the potential to bring temporary benefits to organizations. However, controversy remains over whether such benefits come at the expense of long-term growth and, in the case of science-based companies, at the cost of capital investments that could lead to transformative treatments and innovations. While prior research emphasizes the fact that big pharmaceutical companies have spent more on buybacks than on R&D in recent years, our results reveal significant industry-level differences. Among biotechnology and medical device companies, buyback firms often invest at similar or higher

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[19] Financial Conduct Authority. (2020). *Share repurchase regulations in the UK.* Retrieved from https://www.fca.org.uk

[20] Asker, J., Farre-Mensa, J., & Ljungqvist, A. (2015). Corporate investment and stock market listing: A puzzle? *Review of Financial Studies*, *28*(2), 342–390. https://doi.org/10.1093/rfs/hhu077

[21] Bebchuk, L. A., & Fried, J. M. (2004). *Pay without performance: The unfulfilled promise of executive compensation*. Harvard University Press.

[22] OECD. (2019). *The role of institutional investors in promoting good corporate governance*. OECD Publishing. https://doi.org/10.1787/33986073-en

levels (relative to revenue) than non-buyback firms. Stock price analysis also demonstrates that buybacks generally result in temporary gains rather than lasting returns. These findings provide helpful insights for the discussion surrounding buyback regulation.

The use of stock buybacks has greatly increased over time, especially following the 2018 corporate tax cuts under the Trump Administration. Yet, SEC rules governing the tactic have not been changed since 2003, sparking debate over whether increased disclosures or outright restrictions are necessary to discourage short-term decision-making.[23] Should further proposed tax reductions take effect, they could expand firms' capacity to pursue buybacks, making these questions more important than ever.

[23] Emily Stewart, "Tax Cuts and Stock Buybacks, Explained," *Vox*.

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Appendix A

Sample List

Below is a table that encompasses the list of companies that we utilized in our sample, accompanied by their revenue in 2016.

Global Company Key	Ticker Symbol	Company Name	Revenue - Total
6266	JNJ	JOHNSON & JOHNSON	71890
8530	PFE	PFIZER INC	52824
25648	RHHBY	ROCHE HOLDING AG	51807.09
100080	BAYRY	BAYER AG	49350.65
101310	NVS	NOVARTIS AG	48518
7257	MRK	MERCK & CO	39807
101204	SNY	SANOFI	36623.88
5180	GSK	GSK PLC	34897.67
24856	GILD	GILEAD SCIENCES INC	30390
7228	MDT	MEDTRONIC PLC	28833
16101	ABBV	ABBVIE INC	25638
28272	AZN	ASTRAZENECA PLC	23408
1602	AMGN	AMGEN INC	22991
14538	TEVA	TEVA PHARMACEUTICALS	21903
6730	LLY	LILLY (ELI) & CO	21222.1
1078	ABT	ABBOTT LABORATORIES	20853
2403	BMY	BRISTOL-MYERS SQUIBB CO	19427
10530	TMO	THERMO FISHER SCIENTIFIC INC	18274.1
212782	FMS	FRESENIUS MEDICAL CARE AG	17910.79
3735	DHR	DANAHER CORP	16882.4
8020	NVO	NOVO NORDISK A/S	15863.87
27845	AGN	ALLERGAN PLC	14570.6
24468	BIIB	BIOGEN INC	11448.8
212340	SHPG	SHIRE PLC	11396.6
10115	SYK	STRYKER CORP	11325

13599	CELG	CELGENE CORP	11229.2
7637	VTRS	VIATRIS INC	11076.9
29955	BHC	BAUSCH HEALTH COMPANIES INC	9674
144559	ZBH	ZIMMER BIOMET HOLDINGS INC	7683.9
17928	IQV	IQVIA HOLDINGS INC	6878
24782	PRGO	PERRIGO CO PLC	5280.6
13721	ZTS	ZOETIS INC	4918
100418	ESAIY	EISAI CO LTD	4873.884
23812	REGN	REGENERON PHARMACEUTICALS	4860.427
21801	VWR	VWR CORP	4514.2
277812	GRFS	GRIFOLS S A	4273.381
126554	A	AGILENT TECHNOLOGIES INC	4202
63645	ENDPQ	ENDO INTERNATIONAL PLC	4010.274
18086	MNKTQ	MALLINCKRODT PLC	3380.8
11115	VAR	VARIAN MEDICAL SYSTEMS INC	3217.8
62263	ALXN	ALEXION PHARMACEUTICALS INC	3084
33955	ELAN	ELANCO ANIMAL HLTH INC	2913.5
136725	ISRG	INTUITIVE SURGICAL INC	2704.4
65772	MTD	METTLER-TOLEDO INTL INC	2508.257
61600	PRXL	PAREXEL INTERNATIONAL CORP	2426.3
138205	ILMN	ILLUMINA INC	2398.373
223098	RDY	DR REDDY'S LABORATORIES LTD	2322.506
61574	WAT	WATERS CORP	2167.423
4145	RVTY	REVVITY INC	2115.517
2220	BIO	BIO-RAD LABORATORIES INC	2068.172
19985	PTHN	PATHEON NV	1866.7
20228	CTLT	CATALENT INC	1848.1
21739	PRAH	PRA HEALTH SCIENCES INC	1811.711
24344	VRTX	VERTEX PHARMACEUTICALS INC	1702.177
137131	CRL	CHARLES RIVER LABS INTL INC	1681.432

110620	ICLR	ICON PUBLIC LIMITED COMPANY	1666.487
138483	BRKR	BRUKER CORP	1611.3
22039	SYNH	SYNEOS HEALTH INC	1610.596
121440	UTHR	UNITED THERAPEUTICS CORP	1598.8
11376	WST	WEST PHARMACEUTICAL SVSC INC	1509.1
177287	JAZZ	JAZZ PHARMACEUTICALS PLC	1487.973
63186	QGEN	QIAGEN NV	1337.991
27810	LIVN	LIVANOVA PLC	1213.925
122257	BMRN	BIOMARIN PHARMACEUTICAL INC	1116.854
14304	AKRXQ	AKORN OPERATING COMPANY LLC	1116.843
29127	INCY	INCYTE CORP	1105.719
185355	HZNP	HORIZON THERAPEUTICS PUB LTD	1046.12
30554	TARO	TARO PHARMACEUTICL INDS LTD	950.751
29819	BIVV	BIOVERATIV INC	887.4
61745	IPXL	IMPAX LABORATORIES INC	824.429
19417	CXRXF	ADVANZ PHARMA CORP LTD	816.159
162335	PBH	PRESTIGE CONSUMER HEALTHCARE	806.247
61399	MYGN	MYRIAD GENETICS INC	753.8
20115	PAHC	PHIBRO ANIMAL HEALTH CORP	751.526
24302	ALKS	ALKERMES PLC	745.694
118081	AMRI	ALBANY MOLECULAR RESH INC	570.45
22632	LCINQ	LANNETT CO INC	566.091
31477	AZTA	AZENTA INC	560.323
62169	LFCR	LIFECORE BIOMEDL INC	541.099
12250	AMAG	AMAG PHARMACEUTICALS INC	532.091
156617	ACORQ	ACORDA THERAPEUTICS INC	519.601
15414	TECH	BIO-TECHNE CORP	499.023
13839	CBM	CAMBREX CORP	490.338
176022	EBS	EMERGENT BIOSOLUTIONS INC	488.782
65944	ASRT	ASSERTIO HOLDINGS INC	455.897

19998	MEDP	MEDPACE HOLDINGS INC	421.582
141460	SGEN	SEAGEN INC	418.147
24040	IONS	IONIS PHARMACEUTICALS INC	346.62
175079	CBPO	CHINA BIOLOGIC PRODUCTS HLDG	341.169
164609	GHDX	GENOMIC HEALTH INC	327.868
185836	PCRX	PACIRA BIOSCIENCES INC	276.371
184256	IRWD	IRONWOOD PHARMACEUTICALS INC	273.957
133504	LMNX	LUMINEX CORP	270.639
20659	AMPH	AMPHASTAR PHARMACEUTICLS INC	255.165
178157	MDXG	MIMEDX GROUP INC	245.015
179731	INSYQ	INSYS THERAPEUTICS INC	242.275
175308	SCMP	SUCAMPO PHARMACEUTICALS INC	230.056
24176	NTRA	NATERA INC	217.074
278153	HCM	HUTCHMED (CHINA) LTD	216.08
186159	SUPN	SUPERNUS PHARMACEUTICALS INC	215.003

Appendix B

Below is the color code key that our team utilized throughout our project along with the associated GIC sub-industry codes and associated industries. Please note that the following codes 35203010, 35101010, and 35102015, all refer to companies within the medical devices industry.

	GIC Sub-Industry Code: 35201010
	Company Count in Sample: 27
	Pharmaceuticals
	GIC Sub-Industry Code: 35202010
	Company Count in Sample: 39
	Biotechnology
	GIC Sub-Industry Code: 35203010
	Company Count in Sample: 27
	Medical Devices
	GIC Sub-Industry Code: 35101010 & 35102015
	Company Count in Sample: 7
	Misc - Medical Devices

Appendix C

Analysis of average company stock change compared to the S&P 500.

Average of Company Returns by Quarter					
Row Labels	Control	Treated	S&P 500	Control - Excess of MKT	Treated - Excess of MKT
3/31/2016	-3.6%		0.8%	-4.3%	
6/30/2016	0.4%	6.9%	1.9%	-1.5%	5.0%
9/30/2016	6.8%	-3.0%	3.3%	3.5%	-6.4%
12/31/2016	-4.2%	-6.1%	3.2%	-7.4%	-9.4%
3/31/2017	3.8%	5.4%	5.6%	-1.8%	-0.1%
6/30/2017	11.3%	6.2%	2.6%	8.7%	3.7%
9/30/2017	-0.7%	2.2%	4.0%	-4.7%	-1.8%
12/31/2017	-0.4%	2.7%	6.1%	-6.6%	-3.4%
3/31/2018	-3.4%	-3.1%	-1.2%	-2.2%	-1.9%
6/30/2018	8.1%	-0.8%	2.9%	5.1%	-3.8%
9/30/2018	10.8%	15.4%	7.2%	3.6%	8.2%
12/31/2018	-18.8%	-8.7%	-14.0%	-4.8%	5.3%
3/31/2019	15.8%	8.0%	13.1%	2.8%	-5.1%
6/30/2019	-3.2%	-5.4%	3.8%	-7.0%	-9.1%
9/30/2019	-3.6%	-0.6%	1.2%	-4.8%	-1.8%
12/31/2019	11.1%	13.7%	8.5%	2.6%	5.2%
3/31/2020	-15.9%	-11.0%	-20.0%	4.1%	9.0%
6/30/2020	19.9%	13.7%	20.0%	-0.1%	-6.2%
9/30/2020	3.4%	6.0%	8.5%	-5.1%	-2.5%
12/31/2020	10.3%	7.3%	11.7%	-1.4%	-4.3%
Average	2.4%	2.6%	3.5%	-1.1%	-1.0%

Appendix D

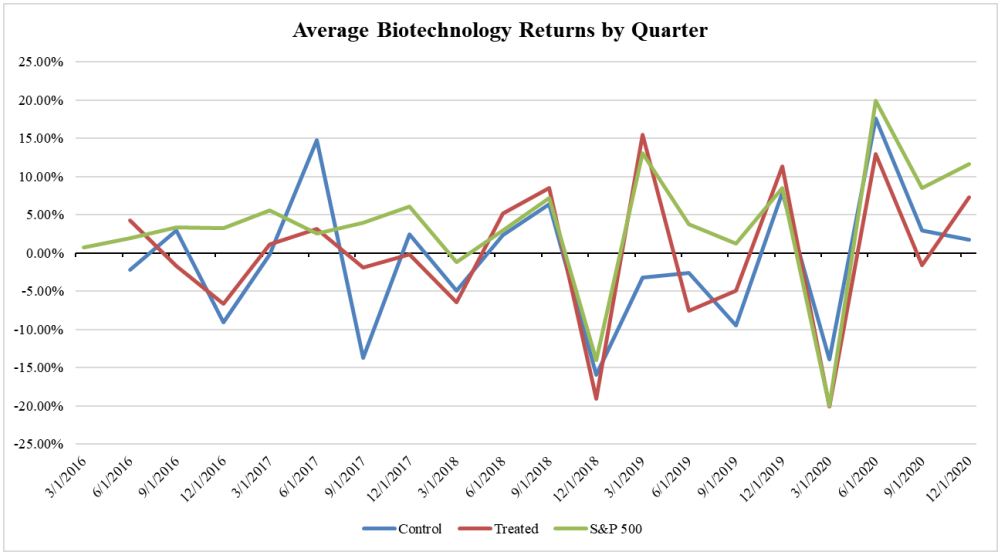
Supplemental Reading List

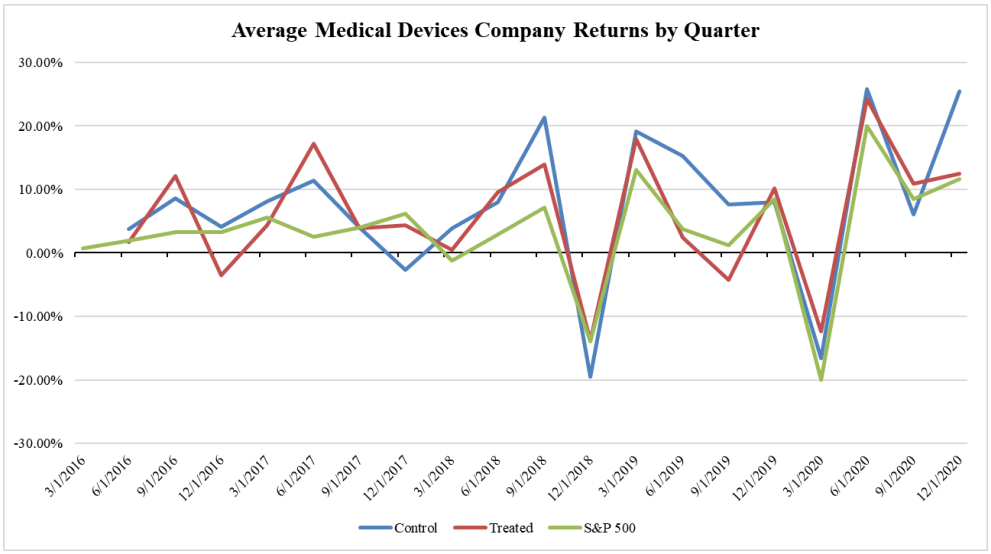
The following articles have been reviewed and will be used in the final paper. They may be recommended for review by panelists to enrich the summit discussion.

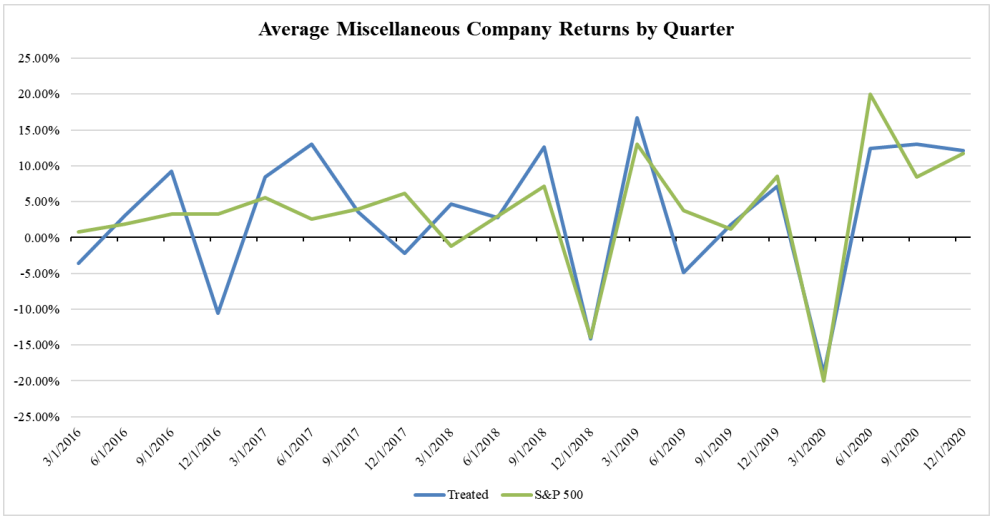
- Stewart, Stock buybacks, explained, Vox, Aug. 5, 2018.
- Very entertaining video on Henry Singleton, the Teledyne corporation and the use of buybacks as part of his capital allocation strategy. https://moiglobal.com/henry-singleton-lessons/
- Visram, *Tax Cut Fuels Record $200 Billion Stock Buyback Bonanza*, CNN.com (June 5, 2018).
- Senator Elizabeth Warren's statements on stock buybacks: https://www.youtube.com/watch?v=zsOZeJYDgPo
- Buffet, *Letter to Berkshire Hathaway Shareholders for 2020*, Feb. 27, 2021.
- CFI, *Dividend vs Share Buyback/Repurchase Enhance yield or boost EPS?*
- Lazonick, Sakinç, and Hopkins, W*hy Stock Buybacks are Dangerous for the Economy*, Harvard Business Review, Jan. 7, 2020.
- SEC Commissioner Jackson analysis of stock buybacks released in 2019, see here: SEC.gov | Stock Buybacks and Corporate Cashouts and its follow-up on insider trading: Letter from SEC Commissioner Robert J. Jackson, Jr. to U.S. Senator Van Hollen
- National Academy of Science. *Making Medicines Affordable*, Chapter 1. https://nap.nationalacademies.org/catalog/24946/making-medicines-affordable-a-national-imperative
- *S*ertkaya A, Beleche T, Jessup A, Sommers BD. *Costs of Drug Development and Research and Development Intensity in the US, 2000-2018.* JAMA Netw Open. 2024;7(6):e2415445. https://jamanetwork.com/journals/jamanetworkopen/fullarticle/2820562
- Protect our care. In 2023, Big Drug Companies Raked in $684 Billion and Spent $106 Billion Rewarding Shareholders. https://www.protectourcare.org/wp-content/uploads/2024/02/greedwatch2023.pdf
- US House of Representatives. *Drug Pricing Investigation Industry Spending on Buybacks, Dividends, and Executive Compensation.* https://oversightdemocrats.house.gov/sites/evo-subsites/democrats-oversight.house.gov/files/COR%20Staff%20Report%20-%20Pharmaceutical%20Industry%20Buybacks%20Dividends%20Compared%20to%20Research.pdf

Appendix E

Average Biotechnology, Medical Devices, and Miscellaneous Quarterly Stock Performance Graphs:







Appendix F

Array of Correlation Coefficient Tables:

All Companies		
Array	R	R^2
Control and S&P	0.880257	0.774852
Treated and S&P	0.778827	0.606572
Control and Treated	0.833162	0.69416
Pharmaceutical		
Arrays	R	R^2
Control and S&P	0.773524669	0.59834
Treated and S&P	0.771976015	0.595947
Control and Treated	0.701182512	0.491657
Biotechnology		
Arrays	R	R^2
Control and S&P	0.685672391	0.4701
Treated and S&P	0.879096106	0.7728
Control and Treated	0.722272776	0.5217
Medical Devices		
Arrays	R	R^2
Control and S&P	0.873841534	0.763599
Treated and S&P	0.857209318	0.734808
Control and Treated	0.838253797	0.702669
Misc - Medical Devices		
Arrays	R	R^2
Treated and S&P	0.801196	0.641915

Appendix G

Below is a table that includes the items pulled from Compustat for all sample companies.

Item	Code
Company Name	Conm
Ticker Symbol	Tic
Stock Exchange Code	exchg
GIC Sub-Industries	gsubind
Common Shares Issued	cshiq
Total Shares Repurchased	cshopq
Common Shares Outstanding	cshoq
LTD due in one year	dd1q
LTD total	dlttq
EPS Excluding Extraodinary	epsfxq
Net Income	niq
Operating Income before dep	oibdpq
Repurchase price	prcraq
Revenue	revtq
Stock Compensation Expense	stkcoq
R&D	xrdq
Cash Div on common stock	cdvcy
Cash dividend	dvy
Cash Div on preferred	pdvcy
Purchase of common stock	prstkccy
Purchase of common and preferred Stock	prstkcy
Purchase of preferred	prstkpcy
Price close	prccq