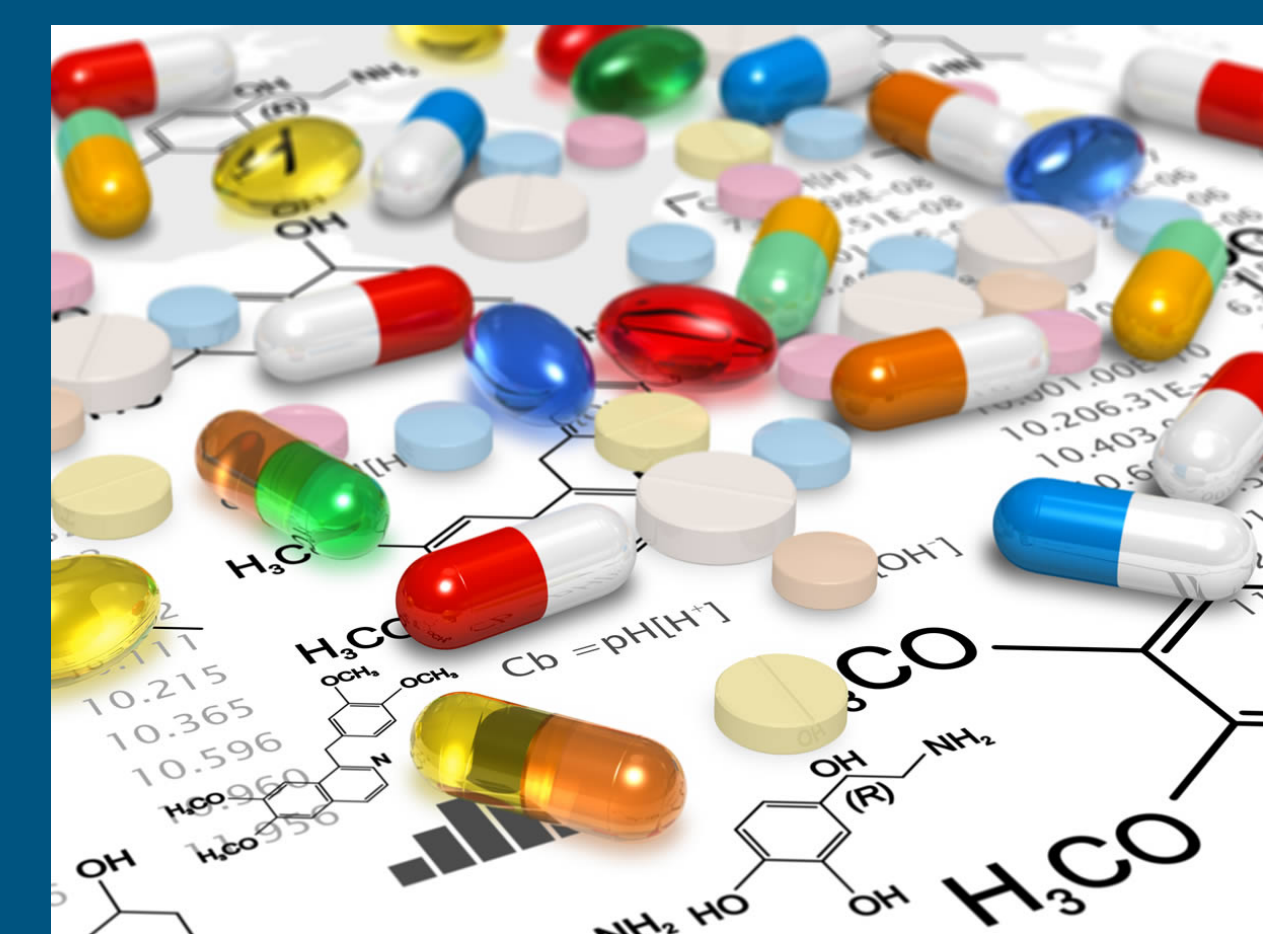


Increased Internal Risk-Taking and Competitiveness in Biotechnology Organizations

Hannah Baxter
Organizational Sciences



HYPOTHESIS

H₁: Risk taking and competitiveness measures are higher in that of a biotechnology company verses that of a traditional pharmaceutical company.

ABSTRACT

This paper examines differences in risk-taking and competitiveness among biotechnology and pharmaceutical firms. It has been argued that biotechnology firms, in contrast to pharmaceutical firms, face higher levels of competitiveness and must pursue higher levels of risk-taking as a result. Using a sample of 40 biotechnology firms and 40 pharmaceutical firms, we analyze financial data, particularly research and development (R&D) expenditures, to assess the impact of levels of competitiveness and risk-taking. We discuss our results and implications for the literature on the management of R&D.

BACKGROUND

- Biotech differs from traditional pharma organizations by working specifically with a biological basis, live enzymes, or small inert molecules to manufacture drugs.
- Biotechs are smaller and more concentrated in terms of human and financial resources, which results in a narrower therapeutic focus in R&D pipeline. Inherently increasing risk and need for competitiveness.
- Biotech requires high investment, often seen as a high-risk decision for investors, as it requires high return. To generate these investment returns, a biotech has to drive risk and competitiveness in order to differentiate next generation unmet medical needs.
- The lenses of analysis are outdated when applied to biotechnology's strategy for internal risk-taking:
 - Burns and Stalker (1961) contingency theory
 - Lawrence and Lorsch (1967) certainty – uncertainty environment
 - Kahnemad and Tversky (1979) prospect theory

METHODS

- This study utilizes a dataset consisting of archival financial information drawn from 40 biotechnology companies and 40 pharmaceutical companies' annual 10K SEC reports on years 2011, 2014, and 2015.
- Each organization was chosen and categorized as either biotechnology or pharmaceutical based off of the functional definition of their products.
- Gentry and Shen (2013) standardized the norm definition for calculating R&D intensity; R&D expenditure divided by revenue.
- Chen and Muller (2010) claim a company's pipeline is representative of competitiveness, as it is a valuable and rare distinction from other companies for generating profitable growth opportunities.

Descriptive Statistics for Pharmaceutical Organizations

	N	Minimum	Maximum	Mean	Std. Deviation
Products	40	0	430	60	95
Products in Pipeline	40	0	343	33	58
Age	40	2	236	52	56
R & D '15 (in mil)	40	3	334.000	10.228	52.579
Total Revenue '15 (in mil)	40	0	70.074	12.227	17.523
R&D intensity '15	40	0.0	464.5	22.2	75.64
Net income '15 (in mil)	40	-1.326	20.026	2.716	5.197
Net Margins'15 (in mil)	40	-8140.8%	80.0%	-234.9%	12.92
Valid N (listwise)	40				

Descriptive Statistics for Biotechnology Organizations

	N	Minimum	Maximum	Mean	Std. Deviation
Products	40	0	149	11	27
Products in Pipeline	40	0	47	11	10
Age	40	7	94	25	14
R & D '15 (in mil)	40	0.008	4.070	51	1.012
Total Revenue '15 (in mil)	40	0	32.639	2.328	6.338
R&D intensity '15	40	0	135	5	21
Net income '15 (in mil)	40	-556	18.108	806	3.07
Net Margins'15	40	-15519%	3318%	-340%	25
Valid N (listwise)	40				

One-way ANOVA Test Products and Products in Pipeline

Attributes	Bio	Pharma	Sig. between means P<0.001
Products	11.4	59.55	0.003*
Products in Pipeline	11.25	32.92	0.022*

N=80

Sig **<0.001 *<.05

RESULTS

- Mean numbers in the descriptive statistics support claims made in the literature review
- Biotech averages;
 - Younger in age
 - Less products and products in pipeline
 - Half the amount of R&D expenditure spending
 - Lower revenue
 - Lower net income

ANOVA

- The means differ more than would be expected by chance alone
- On average pharma has more products marketed and more products within their pipelines

DISCUSSION

- Can make the assumption from the descriptive statistics that pharma is situated in the industry with more years of experience, higher opportunity for revenue, higher potential for R&D projects, and higher net income.
- Based on the literature review and statistical significance, one could argue pharma organizations will often manufacture products and develop pipeline products at a higher capacity than biotech organizations.
- From the 40 pharma organizations examined the average R&D expenditure and revenues was considerably higher than biotech, creating less risky decisions for pharma to invest and produce new products.

CONCLUSION

- Some of the statistical ANOVA tests were found to not be statistically significant, and other data is still being processed.
- This research adds to gap analysis within the field of examining the biotech industry to the traditional pharma.

Application

- Applicable to investors and venture capitalists for future investments in biotech verses pharma at a corporate level.
- Understanding how biotech organizations are situated in the market and recognizing the differences in risk and competitiveness.
- At the therapeutic level, understanding the opportunity for therapeutic risk taking, competitiveness, and the opportunity for deployment of financial and human resources within biotechs and the investment community.
- Managerial application for how to improve organizational capability, develop strategies, and determine where the internal strengths and weakness lie.