CORPORATE PHILANTHROPY AND INNOVATION: THE CASE OF THE PHARMACEUTICAL INDUSTRY

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During the past few decades, pharmaceutical companies have launched corporate social responsibility (CSR) initiatives with the aim of strengthening their reputations, brand names, marketing, and public relations.[1] And the corporate "investments" in such initiatives have been substantial. For example, a recent survey of seven big pharma firms reported that their median total giving in 2013 was $938 million.[2] At the same time, competition in the industry has intensified due to accelerated manufacturing processes and increasing research and development (R&D) costs.[3]

A number of business scholars have proposed that such CSR investments, besides burnishing corporate reputations, can be used to make more direct contributions to corporate competitiveness and value. In fact, in the Harvard Business Review, Michael Porter and Mark Kramer have gone so far as to suggest that "If… corporations were to analyze their prospects for social responsibility using the same frameworks that guide their core business choices, they would discover that CSR… can be much more than a cost, a constraint, or a charitable deed—it can be a source of opportunity, innovation, and competitive advantage."

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[*] This article draws on a paper by Frederick L. Bereskin, T.L. Campbell II, and P.H. Hsu, 2016, "Corporate Philanthropy, Research Networks, and Collaborative Innovation," *Financial Management* 45(1), 175-206. Po-Hsuan Hsu acknowledges the grants from the General Research Fund (GRF) sponsored by the Research Grants Council in Hong Kong (HKU 790913 and 17500015). The authors also thank the research assistance of Yen-Yu Lin.

[1] See Hayley Droppert and Sara Bennett, 2015, "Corporate Social Responsibility in Global Health: An Exploratory Study of Multinational Pharmaceutical Firms," *Globalization and Health* 11(15), 1-8.

[2] See Committee Encouraging Corporate Philanthropy, 2014, "Giving in Numbers," *Survey*.

[3] See Victor E. Schwartz and Sanjay Unni, 2015, "A Brief Response to 'Drug Design and Liability: Farewell to Comment k': On the Intersection Between Patent Law and Tort Liability," *Baylor Law Review* 67, 559-566.

Take the case of Merck. In 2012, the company announced its creation of the California Institute for Biomedical Research—or "Calibr"—an independent non-profit organization whose mission is to "accelerate the translation of basic biomedical research into innovative, new medicines to treat disease."[4] Calibr's scientists have been charged with turning basic research into new medicines that can be further developed through commercial partnerships. Merck has committed $90 million of funding to Calibr over a seven-year period, while retaining an exclusive commercial license for certain innovations. At the same time, Calibr—which is structured to run independently of Merck, and with an independent board of directors and scientific advisory board—has the right to seek licensing arrangements or other sources of funding for projects not licensed by Merck.

In addition to its ties to NGOs like Calibr, Merck also has extensive alliances with universities. Greg Wiederrecht, Merck's head of external scientific affairs, noted that 35% of its major licensing deals are with academic institutions, and that the firm executes approximately 50 of those kinds of deals each year. He also noted that in 2011 Merck implemented 277 unannounced research collaborations, and that Merck's annual interactions with academia number in the thousands.[5]

But if many of Merck's R&D collaborations have maintained a deliberately low profile, the company has received extensive *public* recognition of its philanthropic initiatives and investments. For example, in 2014, the Committee Encouraging Corporate Philanthropy (CECP) presented Merck CEO Ken Frazier with its annual Founders Force for Good Award. And in the same year, the Chronicle of Philanthropy ranked Merck third in its ranking of all U.S. corporate

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[4] See Merck & Co., 2012, "Merck Partners with Academic Scientists and Biotechnology Entrepreneurs to Create the California Institute for Biomedical Research (Calibr)," Press Release, March 15.
[5] See Chris Cain, 2012, "Merck's reCalibration," *SciBX* 5(12), 299.

donors—in fact, four of the top eight U.S. corporate givers were pharma companies, with Pfizer second, Johnson & Johnson sixth, and Eli Lilly eighth. In 2015, *Corporate Responsibility Magazine* ranked Merck 27th in its list of the 100 best corporate citizens.

Other pharma companies have also developed collaborative relationships with academic and nonprofit institutions involving a variety of control or licensing rights. Collaborations with research organizations such as universities and hospitals are likely to be particularly important for pharmaceutical firms. According to a recent study in the *New England Journal of Medicine*, during the period from 1990 to 2007, public-sector research institutions played some role in the discovery of as much as 20% of new-drug applications. What's more, the drugs in which these institutions have played a role have tended to have greater efficacy.[6]

There are a number of different ways in which pharma companies have collaborated with academia.[7] One common model is the establishment of large research institutions or commitment to fund current institutions. For example, in 2012, Novartis and University of Pennsylvania announced a collaborative venture—the Center for Advanced Cellular Therapeutics (CACT)—funded in part by a $20 million grant from Novartis, and where Novartis will be granted exclusive licensing rights and University of Pennsylvania will receive royalty payments.[8] Similarly, in 2011 Gilead Sciences pledged $100 million over the next ten years to the Yale School of Medicine, thereby making the "largest corporate commitment to Yale in the

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[6] See A.J. Stevens, J.J. Jensen, K. Wyller, P.C. Kilgore, S. Chatterjee, and M.L. Rohrbaugh, 2011, "The Role of Public-Sector Research in the Discovery of Drugs and Vaccines," *New England Journal of Medicine* 364(6), 535-541.

[7] See Christopher-Paul Milne and Ashley Malins, 2012, "Academic-Industry Partnerships for Biopharmaceutical Research & Development: Advancing Medical Science in the U.S.," Working paper, Tufts University School of Medicine, for a discussion of different models between academic medical colleges and industry.

[8] See University of Pennsylvania, 2016, "Novartis-Penn Center for Advanced Cellular Therapeutics Unveiled at Penn Medicine," Press release, February 16.

university's history."[9] Gilead will have the first right to license the collaboration's intellectual property, and academics will be allowed to publish the research done as part of the collaboration. In 2008, GlaxoSmithKline (GSK) and the Harvard Stem Cell Institute (HSCI) announced a five-year, $25 million agreement. As part of this agreement, GSK has been funding research at HSCI and other hospitals affiliated with Harvard Medical School, while also supporting research grants and staff exchange programs. This joint venture is expected to create property rights that will be shared by the two parties.[10]

A somewhat different way of collaborating with outside talent is a so-called "contest" model, as exemplified by GlaxoSmithKline's "Discovery Fast Track" competition. In this program, which was started in 2013, the firm selects proposals from academic researchers, in which the winning proposals receive funding and GSK receives licensing rights. The 2015 competition resulted in six winning proposals from 378 entries.[11] Eli Lilly's Open Innovation Drug Discovery program is another example. That program allows scientists at different research institutions to develop and evaluate drug candidates with resources provided by Lilly. In exchange, the company has first rights to a licensing or collaboration agreement.

In other cases, the relationship with academic scientists is more explicit in its aim of providing commercially successful products for the supporting pharmaceutical firm. In one such example, Sanofi and the University of California at San Francisco (UCSF) are collaborating on diabetes research and other areas.[12] Similarly, Pfizer's Centers for Therapeutic Innovation (CTI) have been established in a number of locations (known as "bioclusters") to capitalize on

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[9] See Yale School of Medicine, 2011, "A Major Boost for Cancer Drug Discovery," Press Release, May 13.
[10] See Victor Alamo-Bethencourt, 2008, "GSK's Harvard Cash Injection," *Nature Biotechnology* 26(9), 956.
[11] See GlaxoSmithKline, 2016, "GSK Names Winners of 2015 Discovery Fast Track Challenge," Press release, March 4.
[12] See University of California San Francisco, 2012, "UCSF, Sanofi Collaborate to Find New Diabetes Cures," Press Release, January 10.

collaborations between Pfizer scientists, academic institutions, and disease foundations. Through its CTIs, Pfizer provides its expertise to validate potential drug candidates.[13]

The arrangements described above are presented as examples of how pharmaceutical companies' CSR initiatives can become important aspects of their strategies for innovation. Industry contributions to academic institutions and other research partners range from unrestricted gifts to fee-for-service, while including joint ventures and other types of collaborations. But for all their differences, each of these forms of philanthropy can be seen as investments in the corporate future, part of the quest for competitive advantage in innovation.

Background on Corporate Philanthropy

As practiced by U.S. companies, corporate philanthropy is generally done in one of two main ways: (1) direct contributions to NGOs for activities or purposes that are typically specified by the corporate donors; or (2) donations to corporate-sponsored foundations, which then oversee the funds. And corporate philanthropy in the U.S. involves significant amounts. In 2014, for example, the median Fortune 100 company made $54 million in charitable donations, representing 0.8% of pre-tax profit—and charitable giving by Fortune 100 health care companies was even higher, at 1.2% of pre-tax profit.[14]

But despite the prominence of corporate charitable foundations, most charitable giving in fact occurs through direct contributions.[15] And as discussed in the pages that follow, the findings of our recent study of donations by 18 U.S. pharma companies show clear differences in the

[13] See http://www.pfizer.com/research/rd_partnering/centers_for_therapeutic_innovation.
[14] See Committee Encouraging Corporate Philanthropy, 2015, "Giving in Numbers," *Survey*.
[15] See GivingUSA Foundation, 2015, "The Annual Report on Philanthropy for the Year 2014," *Annual Report*.

payoffs to companies that choose direct contributions rather than "delegated giving" through sponsored foundations.[16]

Charitable giving through corporate-sponsored foundations requires public disclosure of the recipients and the dollar amounts donated to each—amounts that are also reported on IRS form PPF 990. Disclosure of direct contributions, however, is completely voluntary.[17] What's more, companies have tended to resist mandatory disclosure of their direct giving activities, which may seem surprising given the positive news associated with most charitable giving.[18] But given our finding that much of pharma companies' direct charitable contributions are driven by their innovation strategies, the companies' reluctance to disclose can be attributed to their desire to protect competitive secrets.[19]

Conducting and funding research-related activities in the form of philanthropic programs has a number of advantages over conventional in-house R&D. First, from the perspective of an NGO that may otherwise be reluctant to develop a collaborative relationship with a for-profit firm, the partnership can be more readily justified under the auspices of philanthropic support.[20]

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[16] In a related paper that we wrote with another coauthor, we examine the effects of corporate philanthropy on innovation, and show that the effect holds among a broader collection of U.S. firms (see Fred L. Bereskin, T.L. Campbell II, and P.H. Hsu, 2016, "Corporate Philanthropy, Research Networks, and Collaborative Innovation," *Financial Management* 45(1), 175-206.

[17] See GivingUSA Foundation, 2015, "The Annual Report on Philanthropy for the Year 2014," *Annual Report*.

[18] For example, when Senator Mike Oxley and Representative Paul Gillmor attempted to require mandatory disclosure of firms' charitable giving in 1997, firms' comment letters were generally against the proposed legislation, often referring to the joint role of philanthropy and corporate strategy. Adolph Coors Company's comment letter, for example, suggested that the mandatory disclosure, "would have a devastating impact on these marketing and sales strategies, and the very worthy charitable endeavors they fund" (see http://www.sec.gov/rules/other/s72697/smith1.htm).

[19] For additional discussions of how philanthropic programs could be used to outsource R&D, see Usha Haley, 1991, "Corporate Contributions as Managerial Masques: Reframing Corporate Contributions as Strategies to Influence Society," *Journal of Management Studies* 28(5), 485-509; N.C. Smith, 1994, "The New Corporate Philanthropy," *Harvard Business Review* 72, 105-116; F. Kahn, 1997, "Pandora's Box: Managerial Discretion and the Problem of Corporate Philanthropy," *UCLA Law Review* 44, 579-676; Baruch Lev, C. Petrovits, and S. Radhakrishnan, 2010, "Is Doing Good Good for You? How Corporate Charitable Contributions Enhance Revenue Growth," *Strategic Management Journal* 31, 182-200.

[20] See Michael Porter and M. Kramer, 2002, "The Competitive Advantage of Corporate Philanthropy. The Link Between Competitive Advantage and Corporate Social Responsibility," Harvard Business Review December, 5-16.

Second, the research orientation of the NGO, and the nature of its partnership with the pharma firm, provides stronger assurance that such projects won't be shortchanged or shut down as a result of myopic cutbacks to corporate R&D by the firm—a possibility that seems especially large for low-return or "non-core" projects because they are outside of the typical scope of conventional R&D-related activities. Finally, since the expenditure is partly justified as being associated with developing a relationship with a research organization—and given the possibly longer-term research focus of the research organization—projects are likely to experience fewer organizational hurdles.

In addition to the benefits of direct giving compared to conventional in-house R&D, it is important to consider the benefits of giving directly as opposed to through corporate-sponsored foundations. First, as already noted, outlays from foundations are publicly disclosed. Second, the fiduciary duty of the foundations' directors' are to the foundation, even though they are appointed by the sponsoring company. Third, foundations have restrictions on the kinds of investments they can pursue, including restrictions on venture capital.

As discussed below, our findings provide a new perspective on the private value of philanthropy—one that provides more support for the proposition that companies can "do good" by and while "doing well" for their shareholders. Indeed, our findings can be seen as persuasive evidence that many activities that take the form of philanthropic giving are also designed to increase corporate sustainability and long-run values through effective collaboration with outside research organizations.

Our Study

Previous researchers have recognized that corporate giving provides benefits for the firm's investors, as well as its other important stakeholders. For example, studies have provided evidence that CSR increases the attractiveness of the firm to current and prospective employees, which in turn is associated with more innovative companies.[21] Corporate philanthropy also serves as a type of insurance against certain kinds of shareholder activists—though typically those intent not on maximizing overall value, but in strengthening the claims of non-investor stakeholders.[22] Finally, philanthropy has also been shown to function as a kind of advertising and brand building, one that is associated with higher product prices, both of which are relevant to new innovations.[23]

For the purpose of our study, however, the limitation of the existing research and explanations is that they *all* predict uniformly positive effects on corporate innovation and values by charitable contributions, regardless of whether they are made directly to NGOs that conduct research or administered through corporate-sponsored foundations. But, as previously noted and discussed in more detail below, the main finding of our recent study is the notable *contrast* between pharma companies' two different choices of funding (direct charitable contributions versus their charitable foundations), and the resulting quantity and quality of associated innovations.

[21] See Daniel Turban and Daniel Greening, 1997, "Corporate Social Performance and Organizational Attractiveness to Prospective Employees," *Academy of Management Journal* 40(3), 658-67; James Werbel and Max Wortman Jr., 2000, "Strategic Philanthropy: Responding to Negative Portrayals of Corporate Social Responsibility," *Corporate Reputation Review* 3(2), 124-136; and Dane Peterson, 2004, "The Relationship Between Perceptions of Corporate Citizenship and Organizational Commitment," *Business & Society* 43(3), 296-319.
[22] See David Baron, 2001, "Private Politics, Corporate Social Responsibility, and Integrated Strategy," *Journal of Economics & Management Strategy* 10(1), 7-45; and Giavanni Cespa and Giacinta Cestone, 2007, "Corporate Social Responsibility and Managerial Entrenchment," *Journal of Economics and Management Strategy* 16(3), 741-771.
[23] See Robert Schwartz, 1968, "Corporate Philanthropic Contributions," *Journal of Finance* 23(3), 479-4976) for the advertising effects of philanthropy and Piet Eichholtz, Nils Kok, and John Quigley, 2013, "The Economics of Green Building," *Review of Economics and Statistics*, 95(1), 50-63, for studies linking CSR to higher product prices.

Data

In conducting our study, we began by gathering data on corporate philanthropy, patents, and drug approvals for a large sample of U.S. pharma companies during the period 1989 through 2004. [24]

The two main measures we used for corporate innovative output are patent counts and patent citations. Patent count is the number of successful patent applications filed by a company in a sample year. Patent citation is the number of forward citations received by the firm in the sample year from all successful patent applications that occur in that year. Our measure of patent citations excludes self-citations and also controls for the "vintage bias" that results from older patents tending to receive more citations than newer patents.

The patent data also enabled us to study the effectiveness of what might be viewed as corporate investments in innovation. More specifically, we estimated variables intended to reflect "patent influence" and "patent productivity." Patent influence was measured by the "log-linearized" citations per patent, and patent productivity by the log-linearized patent count in the

[24] The Taft Group's Corporate Giving Directory includes firms giving at least $200,000 annually, either through direct charitable contributions or through charitable foundations. The Foundation Center provided us with a list of corporate foundations that were created in 1999 and later that were not in the sample from the Taft Group. The National Center for Charitable Statistics (NCCS) provided us with an updated sample of firms' foundation outlays (collected from foundations' 990-PF filings with the IRS). The direct giving data is supplemented and updated with a sample from The Chronicle of Philanthropy. Their data comes from annual surveys completed by the 300 largest firms in the Fortune 500. In the Chronicle's most recent survey provided to us, one hundred seventeen of their sample firms' completed their survey. We thank Christine Petrovits for providing us with her sample, which she used in "Corporate-Sponsored Foundations and Earnings Management," *Journal of Accounting and Economics* 41, 335-362, 2006. Our patent data came from the NBER patent database that consists of detailed information such as data on patent inventors, assignees (such as firms), technological categories, citations received by each patent from other filings, filing dates, and issue dates. The original data set is discussed in Hall et al. (2005a) and is posted at http://www.nber.org/patents/. Updated versions of the data set are provided at https://sites.google.com/site/patentdataproject/Home/downloads.

following year divided by R&D spending. (Both measures have been widely used in the innovation literature for evaluating corporate R&D activities.[25])

We used four variables to try to capture the scope of companies' innovations. The first was "patent originality," which reflects the breadth of knowledge used for firms' patents. Patents that have cited a broad range of previous patents are regarded as more "original" since they rely on relatively broad research.[26] Our second variable was "patent generality," which is a measure of the diversity of the technologies that cite that patent.[27] Our third and fourth variables were "explorative patent counts" and the "exploration ratio." Corporate patenting activity can provide a measure of the breadth of a company's knowledge base. Specifically, we defined a patent as "explorative" if more than 60% of its citations are based on "new knowledge"—that is, on the set of patents cited by the firm over the previous five years or patents owned by the firm. The explorative patent ratio is the count of explorative patents divided by the total patent count in the focal year.[28]

To control for corporate size, our patent measures were scaled by the firm's sales.[29] Additionally, our patent measures were constructed by application year for all patents that are applied for that are subsequently approved. [30]

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[25] See Jean Lanjouw and Mark Schankerman , 2004, "Patent Quality and Research Productivity: Measuring Innovation with Multiple Indicators," *Economic Journal* 114, 441-465.

[26] Using the technology class of all patents cited by the focal patent, patent originality is calculated as one minus the Herfindahl index of those patents' technology class.

[27] Specifically, the measure is calculated as one minus the Herfindahl index based on the technology class distribution of the patents that cite the focal patent.

[28] For a more thorough discussion of originality and generality, see Manuel Trajtenberg, Rebecca Henderson, and Adam Jaffe, 1997, "University versus Corporate Patents: A Window on the Basicness of Invention," *Economics of Innovation and New Technology* 5(1), 19-50.

[29] See Frederic M. Scherer, 1965, "Firm Size, Market Structure, Opportunity, and the Output of Patented Inventions," *American Economic Review* 55(5), 1097-1125; and Baruch Lev and Theodore Sougiannis, 1996, "The Capitalization, Amortization, and Value-Relevance of R&D," *Journal of Accounting and Economics* 21, 107-138.

[30] We drop the final two years of patent data from our sample (2005 and 2006) since it typically takes an average of two to three years for a patent application to be subsequently approved. See Bronwyn Hall, Adam B. Jaffe, and Manuel Trajtenberg, 2005b, "Market Value and Patent Citations," *RAND Journal of Economics* 36(1), 16-38.

Our fifth and final measure of innovation was the number of drug approvals a company received from the FDA. We retrieve all drug approval records from FDA online database (Drugs@fda) for our sample period. We then manually match the drug manufacturers to public firms listed in the U.S. through their names, locations, and other web sources.

Results

Our main finding is that direct giving is positively associated with patent output. More specifically, as reported in Panel A of Table 1, for our sample of companies, each one standard deviation increase in direct giving is associated with a 28% increase in the number of patents and a 46% increase in patent citations. We also find that the patent influence (as measured by citations per patent) increases by 18% for a one standard deviation increase in direct giving, and patent productivity (patent count divided by R&D expenditure) is 9% higher. Moreover, the other explanatory variables also have the expected effects; for example, R&D spending is positively associated with subsequent counts and citations, while advertising expense is positively, but insignificantly, associated with these values.[31]

In contrast to these findings, we also find, as reported in Panel B, that corporate donations to (and giving by) their own foundations are not significantly associated with either their patent output (as measured, again, by Counts and Cites) or the performance of their patent investments (as measured by Influence and Productivity). Our evidence in Panel B is particularly interesting when considering the previous research that points to positive effects associated with charitable giving generally—that is, from direct contributions as well as corporate-sponsored foundations.

[31] We control for advertising due to firms' philanthropy partially being driven by reputation and advertising motives.

Specifically, as we note earlier in our paper, foundation giving provides benefits to the firm in more easily attracting and retaining highly qualified employees and being more protected from being targeted by outside (albeit not generally value-maximizing) activists. Additionally, the results in Panel B are consistent with our results from Panel A in not being driven by an omitted variable, since if both innovation and corporate philanthropy are associated with a factor such as better business opportunities or financial resources, we would expect to see the relation for contributions regardless of whether they are made directly by the firm or by its foundation.

(Insert Table 1 around here)

In the second stage of our study, we examined the "mechanism" by which corporate philanthropic contributions are associated with their innovative output. Specifically, when we looked more carefully at measures of patent breadth, we found that direct giving is associated with obtaining patents that have the potential to expand the companies' expertise and range of investment opportunities. What's more, when we examined the increases in patent breadth measures over two different time horizons—in the following year's breadth-increasing activities (as reported in Panel A), and in the following three-year period (Panel B)—the longer-term measures tended to have even greater statistical significance, consistent with the benefits of a broader base of knowledge manifesting over a somewhat longer time-period.

As reflected in the estimates reported in Panel B, we find that patent originality and generality increases by 34% and 20%, respectively, for each one standard deviation increase in direct giving, demonstrating the considerable breadth and broad application of these firms' patents. Moreover, using our two measures for explorative innovations (which reflect the changes in the firms' areas of expertise) we provide additional evidence that direct giving is associated with an expanded knowledge base. In particular, we show that the number of explorative patents (that is, patents outside of the firm's existing knowledge base) increases by 46.0%, and that the proportion of explorative patents increases by 38.5%.

(Insert Table 2 around here)

Finally, we show that direct giving is positively associated with the number of FDA drug approvals. As reported in Table 3, when we performed a Poisson regression of the number of FDA drug approvals on the amount of direct giving, we found that each one standard deviation increase in direct giving was associated with a 19.6% increase in the number of drug approvals in the following five-year period. At the same time, we find that giving by the companies' charitable foundations does not have a significant effect on FDA drug approvals.

This difference further confirms our earlier findings based on patent-based measures, and suggests that direct giving leads to more new drugs that are critical performance indicators for pharma firms. At the same time, we find no evidence that the foundation-funded philanthropy that is said to improve corporate reputation has any effect on the regulatory process and the likelihood of FDA approval.

(Insert Table 3 around here)

Conclusion

Our study shows that direct contributions by large pharmaceutical companies have been used with considerable success to facilitate relationships with academia and thereby increase their innovative capabilities and output. By contrast, philanthropic donations by big pharma to the companies' sponsored foundations have had relatively little to show for them.

More specifically, our findings show that direct giving is associated with a greater quantity and quality of innovations, patents that are more influential, and R&D spending that is more productive. What's more, when we use the patent data to show possible changes in the breadth of corporate R&D, we provide evidence that direct giving is associated with patents with potential to broaden the scope of the firm beyond its traditional expertise and technological class. And as one final, and commercially important, manifestation of this effect, we show that companies with more direct giving have greater success in obtaining FDA drug approvals.

All in all, then, our findings show that corporate giving decisions by big pharma have played a significant role in their strategy for innovation, and in the success of that strategy. Our study also suggests that the effect is driven by direct giving to institutions, and not by funding through corporate-sponsored foundations.

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Table 1: Corporate Philanthropy and Innovation

This table examines the effects of corporate philanthropy (direct giving and foundation giving) on innovation. The dependent variables are: Counts (the number of patent applications in the subsequent year that are eventually approved, scaled by sales), Cites (the number of non-self forward patent citations in the following year for patents that are subsequently approved, scaled by sales), Influence (the logged ratio of Cites to Counts), and Productivity (the logged ration of Counts to R&D expense). The independent variables are: DirectGiving (the disclosed level of direct giving by the firm scaled by sales and multiplied by 1,000), FoundationGiving (the level of giving by corporate sponsored foundations scaled by sales and multiplied by 1,000), RD (Research & Development expenditure scaled by sales), Advertising (advertising expenditure scaled by sales), MarketToBook (the market value of assets divided by the book value of assets), Leverage (using the market value of the firm), LogRevenue (the log of sales), and InstiOwn (the percentage of institutional ownership). We include year fixed-effects. Panel A presents the results with direct giving, and Panel B presents the results with corporate-sponsored foundations. T-statistics based on robust firm-clustered standard errors are provided in parentheses below the coefficient value. *, **, and *** denote significant differences from zero at the 10%, 5%, and 1% levels respectively.

	Panel A: Direct giving				**Panel B: Foundation giving**			
	Counts	Cites	Influence	Productivity	Counts	Cites	Influence	Productivity
DirectGiving	0.002***	0.031***	0.483***	0.079***				
	(3.168)	(5.542)	(3.663)	(3.999)				
FoundationGiving					-0.004	-0.010	0.007	-0.232
					(-0.761)	(-0.149)	(0.031)	(-0.656)
RD	0.129*	1.052*	-5.385	-1.477	0.142**	1.218*	0.484	-0.891
	(2.010)	(1.751)	(-1.312)	(-0.978)	(2.357)	(2.026)	(0.543)	(-0.692)
Advertising	0.025	-0.639	-15.024	1.965	0.011	-0.835	-1.149	1.386
	(0.530)	(-1.527)	(-1.357)	(0.630)	(0.224)	(-1.490)	(-0.541)	(0.413)
MarketToBook	0.000	-0.001	-0.327	0.144	0.001	0.002	-0.028	0.149
	(0.323)	(-0.077)	(-0.862)	(1.071)	(0.385)	(0.167)	(-0.338)	(1.041)
Leverage	0.047	0.652*	1.100	6.426***	0.061	0.889**	1.374	7.016***
	(0.946)	(1.752)	(0.131)	(3.234)	(1.527)	(2.601)	(1.041)	(4.145)
LogRevenue	-0.004	-0.002	0.087	-0.143	-0.002	0.030	0.216**	-0.062
	(-1.587)	(-0.075)	(0.133)	(-1.214)	(-1.012)	(1.295)	(2.349)	(-0.524)
InstiOwn	-0.019*	-0.041	4.048	-0.495	-0.015	0.003	0.869**	-0.288
	(-1.821)	(-0.365)	(1.675)	(-0.900)	(-1.406)	(0.028)	(2.300)	(-0.538)
Constant	0.037	0.016	7.097	-2.028	0.021	-0.266	-0.818	-2.644*
	(1.135)	(0.064)	(1.240)	(-1.553)	(0.847)	(-1.085)	(-0.967)	(-2.081)
Observations	163	163	163	163	163	163	163	163
R-squared	48.8%	55.4%	58.1%	37.0%	46.7%	47.6%	68.0%	35.9%

Table 2: Exploration-related Measures of Innovation

This table examines the effects of corporate philanthropy (direct giving) on innovation. The dependent variables are: Originality, Generality, Exploration, and Exploration Rate. Originality is defined as one minus the Herfindahl index based on the technology class of all patents that have been cited by the firm's patents, Generality is defined as one minus the Herfindahl index based on the technology class of all patents that cite the firm's patents, Exploration is our measure of explorative innovations based on the number of patents for which at least 60% of the citations are outside of the firm's existing knowledge base as defined in Benner and Tushman (2002), and Exploration Rate is the corresponding value based on the ratio of explorative patents filed during the year. The independent variables are: DirectGiving (the disclosed level of direct giving by the firm scaled by sales and multiplied by 1,000), RD (Research & Development expenditure scaled by sales), Advertising (advertising expenditure scaled by sales), MarketToBook (the market value of assets divided by the book value of assets), Leverage (using the market value of the firm), LogRevenue (the log of sales), and InstiOwn (the percentage of institutional ownership). We include year fixed-effects. Panel A presents the results over a one-year period, and Panel B presents the results over the cumulative three-year period. T-statistics based on robust firm-clustered standard errors are provided in parentheses below the coefficient value. *, **, and *** denote significant differences from zero at the 10%, 5%, and 1% levels respectively.

	Panel A: Innovation in following year				**Panel B: Cumulative innovation in following three-year period**			
	Originality	Generality	Exploration	Exploration Rate	Originality	Generality	Exploration	Exploration Rate
DirectGiving	**0.005*** **	**0.002**	**0.001** **	**0.037**	**0.016*** **	**0.006* **	**0.003** **	**0.134* **
	(4.485)	(1.726)	(2.802)	(1.723)	(4.042)	(1.747)	(2.696)	(2.031)
RD	0.184*	0.281*	0.036**	0.551	0.675*	0.837*	0.114*	1.679
	(1.989)	(1.816)	(2.122)	(0.958)	(2.045)	(1.809)	(2.102)	(0.964)
Advertising	0.033	0.038	0.002	-0.037	0.083	0.073	-0.002	-1.364
	(0.390)	(0.571)	(0.121)	(-0.029)	(0.291)	(0.344)	(-0.042)	(-0.396)
MarketToBook	-0.001	-0.001	-0.000	-0.014	-0.003	-0.000	-0.001	-0.106
	(-0.372)	(-0.309)	(-0.532)	(-0.499)	(-0.374)	(-0.010)	(-0.629)	(-1.440)
Leverage	0.156	0.115	0.001	0.187	0.402	0.279	0.005	-0.786
	(1.557)	(1.435)	(0.043)	(0.245)	(1.197)	(1.053)	(0.108)	(-0.319)
LogRevenue	-0.012*	-0.003	-0.003**	-0.115**	-0.038**	-0.006	-0.007**	-0.288*
	(-2.097)	(-0.596)	(-2.360)	(-2.244)	(-2.114)	(-0.443)	(-2.305)	(-1.792)
InstiOwn	-0.029	-0.030	-0.005	-0.368*	-0.080	-0.075	-0.010	-1.115**
	(-1.115)	(-1.441)	(-1.007)	(-1.972)	(-1.038)	(-1.228)	(-0.749)	(-2.172)
Constant	0.122*	0.018	0.026*	0.925*	0.366*	0.024	0.062*	2.830
	(1.802)	(0.301)	(1.869)	(1.746)	(1.750)	(0.126)	(1.779)	(1.650)
Observations	163	163	163	163	163	163	163	163
R-squared	39.9%	50.0%	54.5%	40.0%	49.9%	55.4%	57.6%	51.7%

Table 3: Effect on Drug Approvals

This table provides Poisson results of the effects of corporate philanthropy on drug approvals. The dependent variable is the number of drug approvals in the following five years. The independent variables are: DirectGiving (the disclosed level of direct giving by the firm scaled by sales and multiplied by 1,000), FoundationGiving (the level of giving by corporate sponsored foundations scaled by sales and multiplied by 1,000), RD (Research & Development expenditure scaled by sales), Advertising (advertising expenditure scaled by sales), MarketToBook (the market value of assets divided by the book value of assets), Leverage (using the market value of the firm), LogRevenue (the log of sales), and InstiOwn (the percentage of institutional ownership). We include year fixed-effects. T-statistics based on robust firm-clustered standard errors are provided in parentheses below the coefficient value. *, **, and *** denote significant differences from zero at the 10%, 5%, and 1% levels respectively.

DirectGiving	0.062**	
	(2.064)	
FoundationGiving		0.245
		(1.100)
RD	-0.054	0.281
	(-0.025)	(0.112)
Advertising	-2.962	-3.134
	(-0.671)	(-0.799)
MarketToBook	0.056	0.066
	(0.630)	(0.761)
Leverage	6.229*	7.065*
	(1.688)	(1.793)
LogRevenue	0.438	0.543*
	(1.637)	(1.806)
InstiOwn	0.329	0.384
	(0.374)	(0.434)
Constant	-0.022	-1.337
	(-0.008)	(-0.400)
Observations	163	163
Pseudo R-squared	27.0%	25.9%