Can Socially Responsible Firms Survive Competition? An Analysis of Corporate Employee Matching Grants

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Abstract

Fifty-five percent of S&P 500 firms have employee matching grant schemes. Matching grants act as a coordination mechanism which reduces free-riding by socially conscious employee-donors who value a public good but prefer someone else to pay for it. The popularity of matching schemes demonstrates that socially responsible firms can survive market competition. Our model shows that such schemes can enhance the welfare of socially conscious employees and raise more for charities without reducing profits for investors in firms operating in competitive labor and capital markets. This will be so provided socially conscious employees are either more productive or value working together. We document that labor productivity is higher at firms with matching schemes and that these firms are also more likely to be ranked as one of the “100 Best Companies to Work for.”

Keywords: Employee matching grants, corporate social responsibility, stakeholder society

JEL codes: D03, D21, H41, L31

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Can Socially Responsible Firms Survive Market Competition?
An Analysis of Corporate Employee Matching Grants

“The Social Responsibility of Business Is to Increase Its Profits.”
Milton Friedman (1970)

Two hundred and seventy-six firms currently included in the S&P 500 index have employee matching grant schemes which support charitable organizations. As one example, Microsoft matches employee donations of up to $12,000 per employee per year and in 2010 the program raised $96 million with over 62 percent of employees participating.¹ We show that corporate donations and in particular, employee matching grants, can act as coordination mechanisms to mitigate free-riding by employee-donors (who value a public good but still prefer others to pay for it) and enhance the welfare of socially conscious employees and the communities the charitable organizations serve without reducing the profits available for investors. Investor profits are not reduced since the cost of the match is borne by the employees in the form of reduced wages. Because employees bear the cost in terms of reduced wages, firms without donation programs are able to offer higher wages and workers will defect unless teams of socially responsible employees are either more productive or value working with like-minded colleagues. We find that labor productivity is higher at firms that do have matching schemes, and that those firms are also more likely to appear on the list of “100 Best Companies to Work for” published by Fortune Magazine. Thus, socially responsible firms can indeed survive market competition.

Corporate donations to charitable organizations can take two different forms: direct lump-sum donations and employee matching grants. Corporate matching grant schemes typically match individual employee donations to an approved list of nonprofit organizations up to some dollar limit. For some companies the matching scheme also applies to donations by the directors and retirees. Based on the data compiled by HEP Development Services, there are over 1,800

organizations in the U.S. which have matching grants schemes. Descriptive properties of these schemes are listed in Table 1.

[Please Insert Table 1 Here]

For convenience, employees who value public goods are termed “socially conscious,” and those who do not are described as “regular” employees. Similarly, firms which donate to charities are termed “socially responsible,” and those who do not are described as “regular” firms. Our analysis starts with a setting where all employees are socially conscious and wish to donate to a charity which provides a public good. We first establish an equivalence result: both corporate employee matching grants and lump-sum donations can act as coordination mechanisms that mitigate free-riding, increase the total charitable donation, and achieve the first-best solution.

However, regular companies may be able to attract these socially conscious employees away from socially responsible firms by offering higher wages. We show that socially conscious employees are less vulnerable to “poaching” by regular firms when a corporate donation takes the form of a matching grant rather than a lump-sum donation. We determine two alternate conditions for the existence of a separating equilibrium where socially conscious employees work for socially responsible firms which have matching grant schemes and regular employees work for regular companies. One such condition is that labor productivity is higher when teams of socially conscious employees work together. The other is that socially conscious employees simply enjoy working with like-minded colleagues. Based on an empirical analysis of approximately 1700 publicly traded companies, we find supportive evidence that labor productivity at firms offering matching grants is significantly higher and that employee satisfaction is also more likely to be higher as the firms offering matching grants appear more frequently on Fortune Magazine’s list of the “100 Best Places to Work for”.

Our paper contributes to the literature on corporate social responsibility which lies at the heart of corporate governance; see Friedman (1970), Porter (1992), Freeman (2001), Benabou and Tirole (2010) among others. Tirole (2006, pp. 56-64) summarizes the debate concisely: All participants agree with the goals of a stakeholder society but differ in how best to implement them. Shareholder-value proponents argue it is best to use contractual protection and regulation
to control externalities associated with a shareholder focus, while the stakeholder-value proponents favor board representation for varying groups of stakeholders. Our contribution to the debate is to show that it is possible for corporations to improve the welfare of employees and communities without reducing profits for investors.

Many papers have examined corporate philanthropy. Heinkel, Kraus and Zechner (2001) and Barnea, Heinkel and Kraus (2005, 2009) model a setting in which corporate spending on public goods reflects shareholder preferences. This analysis focuses on investor welfare and analyzes the equilibrium effect on stock prices when investor portfolio choice is influenced by corporate donations. Another view of corporate giving is that it is a perk enjoyed by managers. When corporate governance is weak and free cash flows are plentiful, corporate giving to managers’ favorite charities is potentially a manifestation of the agency issues recognized in Jensen (1986). Brown, Helland and Smith (2006) empirically link corporate charitable giving with measures of potential agency problems: firms with larger boards and lower debt ratios tend to give more. Our paper’s focus is not on investor welfare or managerial perks.

Corporate donations or spending on social and environmental projects are not necessarily different from ordinary business expenditures incurred to increase shareholder wealth. For example, corporate donations may simply be a marketing strategy to improve the public image of the corporation (see Mescon and Tilson (1987) and Galaskiewicz (1997)). Navarro (1988) recognizes that donations to local environmental protection and local educational institutions may reduce the costs of production and thereby maximize shareholder wealth. Elfenbein, Fisman and McManus (forthcoming) show that charitable contributions can be used as a signaling mechanism for quality assurance in a marketplace and Lev, Petrovits and Radhakrishnan (2010) document a positive relation between corporate charitable contributions and customer satisfaction. Chava (2011) and Cheng, Ioannou and Serafeim (2011) find that better corporate social and environmental performance improves access to capital markets and Gillan et al. (2011) find that operating performance, efficiency, and firm value tend to increase with firms’ performance on environmental, social and governance criteria. This paper differs in that we do not examine spending on social and environmental projects by firms directly. Instead, we

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2 Yermack (2009) provides evidence that managers time their share donations to their own family foundations, sidetracking the insider trading regulations to obtain tax benefits.
examine decentralized employee donations that do not affect production processes, product market competition, or access to the financial markets.

Focusing on employee utility in competitive capital and labor markets reflects the recent emphasis on human capital as a key asset in firm production (as in Zingales (2000) and Akerlof (2007)). Dignity in the work place has been investigated by the sociologist Randy Hodson who finds that employees want to view what they do as useful: Workers who are unable to obtain such satisfaction are likely to take actions that reflect their displeasure (Hodson 2001). Carlin and Gervais (2009) study how a manager’s work ethic can affect the optimal employment contract and firm value. Berk, Stanton and Zechner (2010) develop a model in which human capital is a determinant of firm capital structure. Filbeck and Preece (2003), Goenner (2008), Edmans (2011), and Ahmed, Nanda and Schnusenberg (2010) have used Fortune Magazine’s annual list of “100 Best Places to Work For in America” to conclude that there is a positive relation between improved employee satisfaction and favorable stock market reactions in both the short- and long-run. We are not aware of either analytical or empirical work which addresses corporate employee matching grant schemes, which makes this the first study of the theoretical existence conditions and welfare effects of corporate matching grants and ties this analysis to an empirical investigation of the matching schemes observed in practice.

The next section shows that if all employees are socially conscious, then both corporate lump-sum donations and employee matching grants can achieve the first-best solution and thereby dominate a system of decentralized employee giving. Section 2 analyzes competition in the labor market because, all else being equal, regular firms can afford to offer higher wages that could induce socially conscious employees to “defect” so that corporate donation programs would not survive. We show that socially responsible firms with direct lump-sum donation programs will find it even more difficult to survive than firms with matching grant schemes. Provided socially conscious employees working in teams produce either more output or more employee utility and the match ratio is not too high, matching schemes can survive and lead to a Pareto improvement for all parties. Section 3 uses a numerical example involving Cobb-Douglas utility to illustrate the main points of Section 2. Section 4 contains an empirical analysis providing evidence that labor productivity is higher at firms which offer employee matching grants. In Section 5 we examine the alternative assumption that socially conscious employees working together at socially responsible firms enjoy non-pecuniary benefits and find firms with
matching grants appear more frequently on *Fortune’s* annual list of “100 Best Companies to Work for”. Section 6 concludes. The appendix shows that recognizing the personal and corporate tax deductibility of charitable donations does not affect the conclusions of our theoretical analysis.

1: Corporate Donations as a Coordination Mechanism

In this section, we consider the ability of a firm to act as a coordination mechanism for donations when all employees are socially conscious. We abstract from agency costs, advertising effects, and investor preferences and we assume that the markets for products, labor, and capital are competitive.

1.1: Corporate Lump-sum Donations

The recipient of a corporate donation is assumed to be a nonprofit organization which produces $G$ units of a public good. We adopt the public good model of Warr (1982, 1983) and Bergstrom et al. (1986).\(^3\) The utility $U^i$ of employee $i$, $i = 1, \ldots, N$, is a function of her private consumption $x_i$ and the total amount of the public good $G$. $U^i = U^i(x_i, G)$ is continuous and strictly quasi-concave, and the first and second-order derivatives satisfy

$$U_1 > 0, \quad U_2 > 0, \quad U_{11} < 0, \quad U_{22} < 0, \quad U_{12} \geq 0.$$  

(1)

Thus, individuals have diminishing marginal utility with respect to both the public and private good and find that increased consumption of the public good does not reduce the marginal utility of the private good.

Suppose that there are $N$ socially conscious *homogeneous* employees. In order to guarantee interior solutions, we assume that an employee’s utility function satisfies the Inada conditions \(\lim_{x \to 0} U_1(x, G) = +\infty\), and \(\lim_{x \to \infty} U_1(x, G) = 0\). The employee allocates her wage $W_i$ between private consumption $x_i$ and a donation $g_i$ with $x_i + g_i = W_i$.

Firms are of two types: type $S$ (socially responsible) and type $R$ (regular). Type $S$ firms donate to the charity while type $R$ firms do not. Throughout this section, labor productivity is

\(^3\) For a detailed account of the development of the public goods model and its application in philanthropy, see the survey by Andreoni (2006).
assumed to be the same at both types of firm. If firm $S$ decides to donate an amount of $g_l$ per employee, then in order to be able to compete in the product and capital markets its wage rate must satisfy the following condition

$$W_S + g_l = W_R,$$  \hspace{1cm} (2)

where $W_S$ and $W_R$ are the wage rates paid by firms $S$ and $R$ respectively. A firm’s total labor costs per employee are then unaffected by its donations, thereby keeping shareholder profits unchanged. The firm acts as a social planner by choosing the optimal lump-sum contribution to the charity expressed as $G_l = Ng_l$, where $g_l$ is the per employee optimal lump-sum corporate donation and $\bar{g}_l$ solves

$$\max_{g_l} U\left(W_R - g_l, Ng_l\right),$$

with the first-order condition

$$U_1\left(W_R - \bar{g}_l, Ng_l\right) = NU_2\left(W_R - \bar{g}_l, Ng_l\right).$$ \hspace{1cm} (3)

Alternatively, suppose the firm decides not to donate to the charity; i.e., the firm chooses to be of type $R$. An employee will then contribute $g_i$ which solves

$$\max_{g_i} U\left(W_R - g_i, g_i + (N-1)\bar{g}\right),$$ \hspace{1cm} (4)

where $\bar{g}$ is the equilibrium donation from each of the other employees. In a Nash equilibrium, every employee contributes $\bar{g}$ which satisfies

$$U_1\left(W_R - \bar{g}, Ng\right) = U_2\left(W_R - \bar{g}, Ng\right),$$ \hspace{1cm} (5)

and the total amount raised by the charity is $\bar{G} = Ng\bar{g}$. For future reference, the definitions of commonly used variables are listed in Table 2.

[Please Insert Table 2 Here]

Comparing the optimality equation (3) given a lump-sum corporate donation with the optimality equation (5) given decentralized employee giving, we see that coordination at the firm level reduces free-riding. This result is well-known in the public-good literature – see Samuelson
(1954) and Chapter 2 of Laffont (1989). Given corporate lump-sum donations, the employee receives a reduced wage of $W_R - \bar{g}_i$. Since $\bar{g}_i$ is the first-best per employee donation, employees have no desire to make additional private contributions.

**Proposition 1:** Assume all employees are socially conscious. The total donation raised for the public good when employees give privately is less than that given a corporate lump-sum donation when the total cost to the firm of wages plus corporate donations is held constant.

It is interesting to consider the substitutability of private and corporate giving. If the corporate donation per employee is above $\bar{g}$, then employees will not make any additional private contributions. But if the corporate donation per employee is between zero and $\bar{g}$, then employees will always donate enough to make up the difference. This is analogous to the Roberts (1984) result that government spending on public goods crowds out private donations.

We next consider employee matching grant schemes as an alternative to a lump sum corporate donation strategy and show that matching schemes can also mitigate the free-riding problem.

1.2: Employee Matching Grants

A firm of type $S$ may institute a matching policy: for each dollar contributed by the employees, $S$ will match it with $h$ dollars.\(^5\) Here we use a single asterisk to denote variables (such as donations, wages, etc.) under the matching scheme. Thus $g^*$ denotes each employee’s contribution to the public good. A firm of type $S$ reduces wages by $h g^*$ per employee relative to a firm of type $R$.

We solve for the first-best optimal match ratio and then compare and contrast a corporate lump-sum donation scheme with an employee matching grant scheme.

\(^4\) Also see Andreoni and Payne (2003) for experimental results on the “crowding-out” effect of government spending on private donations. Note that Proposition 1 is different from the Modigliani-Miller style irrelevance proposition in relation to corporate charitable donations derived by Zivin and Small (2005). Zivin and Small model employee donations as a private good, not as a public good and hence their model does not address the issue of free-riding by donors.

\(^5\) Previous studies on matching behaviour and private donations can be found in Guttman (1978, 1985), Danziger and Schnytzer (1997), and Gong and Grundy (2010). These studies do not consider corporate matching grant schemes.
Under a matching scheme, the employee’s utility function takes the form
\[ U(W_S^*-g^*, G^*) \] where \( W_S^* \) is the wage rate given the matching scheme. Assuming all other employees choose to donate \( g^* \), employee \( i \)’s maximization problem is:
\[
\max_{g_i} U\left(W_S^*-g_i,(1+h)g_i + (N-1)(1+h)g^*\right).
\]
The Inada condition \( \lim_{x \to 0} U(x,G) = +\infty \) guarantees an interior solution and in a Nash equilibrium the first order condition is
\[
-U_1\left(W_S^*-g^*,(1+h)Ng^*\right) + (1+h)U_2\left(W_S^*-g^*, (1+h)Ng^*\right) = 0. \tag{6}
\]
Based on condition (6), the employee’s optimal contribution to the public good is an implicit function of the match ratio \( h \) with a unique solution. We first note that each employee’s donation is uniquely determined under a match ratio in Lemma 1. Proofs of all lemmas are contained in Appendix 1.

**Lemma 1:** For each match ratio there is a unique optimal employee donation \( g^* \).

We now compare the total contribution to the public good under a matching scheme with that under decentralized employee giving.

**Proposition 2:** For any positive match ratio \( h \), the total contribution to the public good under a matching scheme is greater than under a decentralized scheme.

**Proof:** Suppose Proposition 2 were false and that for some \( h \) and associated \( g^*(h) \), the level of decentralized giving \( g \) was greater than or equal to \( (1+h)g^*(h) \). Optimality condition (6) can be rewritten as
\[
U_1\left(W_R^*-(1+h)g^*, (1+h)Ng^*\right) = (1+h)U_2\left(W_R^*-(1+h)g^*, (1+h)Ng^*\right). \tag{7}
\]
Since \( U_1 > 0, U_{11} < 0, \) and \( U_{12} \geq 0, \) \( \bar{g} \geq (1 + h)g^* \) implies that the left-hand-side of (5) is at least as large as the left-hand-side of (7). This implies that the right-hand-side of (5) must be at least as large as the right-hand-side of (7) and since \( h > 0, \)
\[
U_2 \left( W_R - \bar{g}, N\bar{g} \right) \geq (1 + h)U_2 \left( W_R - (1 + h)g^*, (1 + h)Ng^* \right) > U_2 \left( W_R - (1 + h)g^*, (1 + h)Ng^* \right).
\]
On the other hand, \( \bar{g} \geq (1 + h)g^*, \) \( U_2 > 0, \) \( U_{22} < 0, \) and \( U_{12} \geq 0 \) together imply
\[
U_2 \left( W_R - \bar{g}, N\bar{g} \right) < U_2 \left( W_R - (1 + h)g^*, (1 + h)Ng^* \right)
\]
and we have a contradiction. \[\text{QED}\]

Proposition 2 has established that the charity is strictly better-off under a matching scheme than with decentralized giving. Recall that profits to the firm’s investors are not affected. Recognition of the free-riding problem in decentralized giving is not new. But are employees better-off with a matching scheme? To answer this question, we need to find the match ratio \( h \) that maximizes employee utility and then compare the utility of the employees with and without such a matching scheme. In order to find the (employee) utility-maximizing \( h, \) we now establish that the total donation (employee plus firm) is increasing in the match ratio in Lemma 2.

**Lemma 2:** \((1 + h)g^*(h)\) is increasing in \( h.\)

Assume that the socially responsible employer \( S, \) acting as a social planner on behalf of the employees, chooses the match ratio \( h \) so as to maximize employee utility given that the employees react according to equation (6). The firm chooses \( h \) by solving
\[
\max_h U \left( W_R - (1 + h)g^*(h), (1 + h)Ng^*(h) \right), \quad (8)
\]
with the first-order condition
\[
\frac{dU}{dh} = \left( g^*(h) + (1 + h)\frac{dg^*(h)}{dh} \right)(-U_1 + NU_2) = 0. \quad (9)
\]
From Lemma 2 we have \( \frac{\partial (1+h)g^*(h)}{\partial h} = \left( g^*(h) + (1+h) \frac{dg^*(h)}{dh} \right) > 0 \), and therefore the first-order condition can be simplified as \(-U_1 + NU_2 = 0\).

It is straight-forward to verify that the second-order condition is satisfied:

\[
\frac{d(-U_1 + NU_2)}{dh} = \left( g^*(h) + (1+h) \frac{dg^*(h)}{dh} \right) \left( U_{11} - (N+1)U_{12} + NU_{22} \right) < 0. \tag{10}
\]

**Proposition 3:** The match ratio that maximizes employee utility is \( h^* = N-1 \).

**Proof:** For any given match ratio \( h \), the optimality condition for the employee-donor has been derived in Equation (7). Equation (9) gives the optimality condition if the socially responsible firm acts as a social planner to coordinate employee donations by choosing \( h \). Comparing (7) with (9), it is apparent that \( h^* = N-1 \) is the optimal match ratio. \( \text{QED} \)

Applying Proposition 3, Equation (9) can be rewritten as

\[-U_1 \left( W_R - Ng^*(h), N^2 g^*(h) \right) + NU_2 \left( W_R - Ng^*(h), N^2 g^*(h) \right) = 0. \tag{11}\]

One corollary from Proposition 3 is that the employee’s utility is an increasing function of the match ratio \( h \) for \( h \) in the interval \([0, N-1]\). Setting \( h = 0 \) corresponds to the case of no matching and this is always an option for firm \( S \). Since the utility maximizing match ratio exceeds 0, employees can be strictly better off when firms offer matching grants. Similar reasoning applies when we consider corporate lump-sum donations. As discussed in Section 2.1, a zero lump-sum donation is always an option for firm \( S \), but by acting as a social planner and coordinating employee donations the firm can maximize employee utility. The following proposition summarizes these findings.

**Proposition 4:** When all employees are socially conscious, they are strictly better off working at socially responsible firms that offer either a match ratio of \( h = N-1 \) or a lump-sum donation at \( \overline{g}_l \) per employee than working at firms that are not socially responsible.
1.3: Equivalence between Employee Matching Grant Schemes and Lump-sum Donations When Employees are Homogeneous

It is straightforward to see that, when \( \bar{g}_i = N g^* (h) \), (3) and (11) are identical. This indicates that both corporate lump-sum donations and employee matching grants can achieve the same first-best optimal solution. We have established the equivalence between corporate direct lump-sum donations and matching grants when all employees are socially conscious.

**Proposition 5:** At an optimal match ratio \( h = N - 1 \), a matching grant scheme is equivalent to optimal corporate direct lump-sum giving.

Propositions 4 and 5 imply that when all employees are socially conscious, every firm should coordinate employee donations, either through lump-sum donations or employee matching grant schemes. While an employee’s consumption of private and public goods remains the same under both forms of corporate donation strategy, one crucial difference is in the employee’s take-home wage. Under the optimal corporate lump-sum donation approach, each employee’s take-home wage is \( W_R - \bar{g}_i = W_R - Ng^* (h) \) with \( g^* (h) \) evaluated at \( h = N - 1 \), and private donation to the public good is zero. Under the optimal matching grant scheme, each employee’s take-home pay is \( W_S^* = W_R - h g^* (h) = W_R - (N - 1) g^* (h) \) and the employee contributes \( g^* (h) \), evaluated at \( h = N - 1 \). Therefore, an employee’s take-home pay is higher under a matching grant scheme, and each employee contributes the additional sum of \( g^* (h) \) to the charity.\(^6\)

The optimal match ratio of \( N - 1 \) is much higher than that observed in practice, as seen in Table 1. We now show that the level of match ratios observed in practice may be the result of competition for labor when competing regular firms are willing to offer higher wages. Further, employee matching schemes are better able to survive in competitive labor markets than corporate lump-sum giving.

\(^6\) In the current setting, the employee’s utility remains the same under either direct giving or employee matching grant schemes. However the situation may be different in an impure public goods setting where employees also enjoy private benefit of giving, termed ‘warm-glow’ by Andreoni (1989). The difference caused by this non-pecuniary benefit for employees is explored in Section 5.
2: Corporate Donations and Labor Market Competition

Firms can choose to be socially responsible with either employee matching grant schemes or lump-sum donations, or regular with no corporate contributions to the charity. In this section we assume that firms are otherwise identical in that the productivity of their employees is unaffected by the firm’s choice of type. All firms offer the same total pay package determined in a competitive labor market.

Will a socially conscious employee earning $W_S$ at a socially responsible firm have an incentive to switch to a higher-paying position offering $W_R$ at a regular firm? Our next proposition highlights the difficulty of retaining employees in the face of competition from firms without corporate giving programs.

**Proposition 6:** (a) If a firm offers an employee matching grant scheme, employees are better off by defecting to a regular firm. (b) Similarly, if a firm donates a fixed amount to charity, employees are better off by defecting to a regular firm.

**Proof:** (a) For this proof only, we introduce some additional notation, $\hat{g}$ and $g'$. A socially conscious employee who does defect could still choose to give a non-matched donation of $\hat{g}$, where $\hat{g}$ may be zero. Those employees remaining with firm $S$ will make a donation of $g'$ after the defection. Note that $g' = g'(\hat{g}, h)$ is a function of both $\hat{g}$ and $h$. It is straightforward to show that $g'(\hat{g}, h) = \frac{\partial g'(\hat{g}, h)}{\partial \hat{g}} < 0$.

We first wish to show that defection will always occur unless $h$ is specified as a function of the number of employees remaining at firm $S$. To establish this result we assume that $h$ is fixed. The defector will then need to solve

$$\max_g U(W_R - g, (N-1)g'(g,h)(1+h)+g).$$

One feasible strategy for the defector is to donate an amount equal to $g^*(h)(1+h)$; i.e., to give what she would have given at her previous employment and to make up for the lack of a match personally. She uses the increase in her wages as a result of the defection to cover exactly what
would have been the match at her old firm. In this event \( g'\left(g^*(h)(1+h), h\right) = g^*(h) \) and the defector achieves the same level of utility that she achieved before defecting.

But this will not be the optimal donation for a defector to choose. The partial derivative of the defector’s maximization problem evaluated at \( \hat{g} = g^*(h)(1+h) \) is

\[
-U_1\left(W_r - g^*(h)(1+h), Ng^*(h)(1+h)\right) + U_2\left(W_r - g^*(h)(1+h), Ng^*(h)(1+h)\right)\left[1+(N-1)(1+h)g'_1\left(g^*(h), h\right)\right]
\]

\[
< -U_1\left(W_r - g^*(h)(1+h), Ng^*(h)(1+h)\right) + U_2\left(W_r - g^*(h)(1+h), Ng^*(h)(1+h)\right)\left(1+h\right)U_2\left(W_r - g^*(h)(1+h), Ng^*(h)(1+h)\right)
\]

\[
= 0.
\]

She could achieve a higher level of utility by giving a lesser amount instead. Thus if all firms were socially responsible there would be an incentive for a new firm of type \( R \) to enter and offer a wage marginally less than \( W_R \). By doing so, it could attract socially conscious employees away from type \( S \) firms and earn a higher profit than competing firms.

(b) Now consider a corporation which donates a fixed amount to charity. An employee will defect since her wage will be increased while the amount contributed by the firm to the charity will be unchanged: She can then donate privately to the charity and/or increase her private consumption.  

QED

With competition, Proposition 6 states that if there is an equilibrium without defection, any match ratio must be of the form \( h = h\left(N\right) \). One simple solution that will prevent defection is

\[
h\left(N\right)=\begin{cases} N-1; & \text{if no one defects} \\ 0; & \text{if one or more defect.} \end{cases}
\]

We now consider less extreme conditions under which employee matching schemes can survive because there is a benefit that will be lost if a socially conscious employee defects from a socially responsible firm.

2.1: Surviving Labor Market Competition: Increased productivity of socially conscious teams

In this subsection, we discuss a necessary condition for the survival of employee matching grant schemes. If socially conscious employees are more productive when they work together in a
team, either because they produce more of the firm’s product or their interaction produces a
direct utility benefit to them, then socially conscious employees will be reluctant to defect to a
regular firm. Further, we will show that employee matching grant schemes are better able to
retain socially conscious employees than lump-sum donation programs.

Previous research has suggested that there can be a difference in labor productivity when
social interaction matters for employees. Firms with charitable foundations may attract
employees who are passionate about particular social or environmental concerns and are linked
through this common interest. Sociologists have coined the phrase ‘social capital’ to describe
“features of social life-networks, norms, and trust that enable participants to act together more
effectively to pursue shared objectives” (see Putnam (1993)).⁷ Corporate donations can act as
linking social capital. Hamilton, Nickerson and Owan (2003) conclude that more productive
workers tend to join teams first, even despite a loss in earnings, and conclude that this is
evidence that some workers derive non-pecuniary benefits from teamwork. Sabatini (2008)
concludes that the linking social capital of voluntary organizations improves labor productivity
in a set of small-to-medium sized Italian enterprises. Further evidence comes from Brekke and
Nyborg (2008) who show that employers may be able to use the firm’s corporate social
responsibility profile as a screening device to attract more productive workers. Section 4 of this
paper provides empirical evidence of higher labor productivity for firms which have employee
matching grant schemes.

2.2: Retaining Employees: matching grants vs. lump-sum donations

Assume that the labor productivity of teams of socially conscious employees is \( W_R (1 + \Delta) \) with
\( \Delta \geq 0 \). Given higher labor productivity, socially responsible firms can afford to pay higher
salaries, thereby reducing the incentive for its employees to defect. The following proposition
establishes the superiority of employee matching grants over lump-sum schemes in retaining
employees.

**Proposition 7:** Assume that socially conscious employees are more productive in
socially responsible firms. Comparing a lump-sum donation scheme to a matching

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⁷ There are a number of books and surveys on this topic; see Dasgupta and Serageldin (2000), Sobel (2002) and
grant scheme that raises the same total amount, the productivity gain \( \Delta \) necessary to preclude switching is smaller when the firm has a matching scheme than when it makes a fixed lump-sum donation.

**Proof:** Assuming that all other employees remain with firm \( S \), an employee currently working for firm \( S \) with a matching grant scheme will defect if and only if

\[
\max_{g_i} U(W_R - g_i, (N-1)(1+h)g^* + g_i) > U((1+\Delta)W_R - (1+h)g^*, N(1+h)g^*). \tag{12}
\]

If a firm is committed to donating a fixed lump-sum \( N\bar{g}_i \), and this amount will not be reduced if one of its employee defects, then the employee will defect if and only when

\[
\max_{g_i} U(W_R - g_i, N\bar{g}_i + g_i) > U((1+\Delta)W_R - \bar{g}_i, N\bar{g}_i). \tag{13}
\]

Recall that \( \bar{g}_i \) is the optimal donation per employee under the lump-sum approach. As \( \bar{g}_i = (1+h)g^* \), comparing inequalities (12) with (13), we see that the productivity gain \( \Delta \) necessary to preclude switching is smaller when the firm has a matching scheme than when it makes a fixed lump-sum donation. \( \text{QED} \)

### 2.3: Existence of a Separating Equilibrium with a Matching Grant Scheme

The attractive feature of employee matching grant schemes in retaining socially conscious employees has been demonstrated in the preceding subsection. But the question remains whether there exists a separating equilibrium in which socially conscious employees choose to remain with socially responsible firms. Relying on Lemmas 3 and 4, we are able to show that this is the case.

**Lemma 3:** \( \lim_{h \to \infty} (1+h)g^*(h) = (1+\Delta)W_R. \)

Lemma 3 states that as the match ratio becomes infinite, the private good consumption of socially conscious employees approaches zero.

**Lemma 4:** There exists a match ratio \( \bar{h} \) such that \( \bar{h}g^*(\bar{h}) = \Delta W_R. \)
Lemma 4 states that there exists a critical match ratio at which the firm’s matching donation per employee is exactly equal to the additional productivity of socially conscious employees working in a team relative to the productivity of regular employees.

**Proposition 8:** There exists a separating equilibrium in which teams of socially conscious employees choose to work together in socially responsible firms offering matching grant schemes and regular employees choose to work for regular firms.

**Proof:** First, to ensure that regular employees working for type $R$ firms do not switch to type $S$ firms, we require that $\Delta W_R < h^*(h)$, i.e., that the nominal pay at firm $S$ is lower than that at firm $R$. Now, consider the condition for socially conscious employees to stay with firm $S$. If a potential defector conjectures that all other socially conscious employees will stay with firm $S$ and continue to give $g^*(h)$, she will not defect as long as

$$U(W_R(1+\Delta)-(1+h)g^*(h), N(1+h)g^*(h)) > \max_{\hat{g}} U(W_R - \hat{g}, (N-1)(1+h)g^*(h) + \hat{g}).$$  \hspace{1cm} (14)

From Lemma 4, there exists an $h$ which satisfies $hg^*(h) = \Delta W_R$. Let $\bar{h}$ denote this particular match ratio. Given this match ratio, we have

$$U(W_R(1+\Delta)-(1+h)g^*(h), N(1+h)g^*(h))_{|h=\bar{h}} = U(W_R - \hat{g}, (N-1)(1+h)g^*(h) + \hat{g})$$

and inequality (14) is satisfied. Thus socially conscious employees will not defect at the match ratio $\bar{h}$ since for any given level of private good consumption, type $S$ employees will enjoy a higher level of public good consumption if they stay at firm $S$. By continuity, there exists some $h > \bar{h}$ in the neighborhood of $\bar{h}$, such that $\Delta W_R < h^*(h)$ and type $S$ employees will not defect.

QED

Proposition 3 has established that when all firms and all employees are socially conscious, the match ratio that maximizes employee utility is $h^* = N-1$. This far exceeds the match ratios observed in practice and set out in Table 1B. A natural explanation is that very high match ratios
imply such low wages at socially responsible firms that competition from regular firms (offering higher wages and no match) would tempt even the most magnanimous of socially conscious employees.

**Proposition 9:** Defection will always occur at high enough match ratios if
\[ U(W_R, (N-1)(1+\Delta)W_R) > U(0, N(1+\Delta)W_R). \]

**Proof:** The utility of a socially conscious employee who remains with firm S is
\[ \max_{g} U\left(W_R (1+\Delta) - hg^*(h) - \tilde{g}, (N-1)(1+h)g^*(h) + (1+h)\tilde{g}\right). \]
She will conjecture that if she moves to work for firm R, she will enjoy a utility level of
\[ \max_{g} U\left(W_R - \tilde{g}, (N-1)(1+h)g^*(h) + \tilde{g}\right). \]

From Lemma 3, \( \lim_{h \to \infty} (1+h)g^*(h) = (1+\Delta)W_R \): As the match ratio approaches infinity, her private good consumption will fall to zero if she stays with firm S and her utility at that level is \( U\left(0, N(1+\Delta)W_R\right) \). If she does move from firm S to firm R, she will enjoy a higher wage of \( W_R \) and can choose to make no donation at all, i.e., she can achieve a utility level of at least \( U\left(W_R, (N-1)(1+\Delta)W_R\right) \). Therefore a type S employee will always defect when the match ratio gets high enough. \( \text{QED} \)

Expressed in words, the inequality condition in Proposition 9 simply states that zero consumption of private good will give an extremely low level of utility even for socially conscious employees who value the public good. Mere survival requires some private consumption and this naturally leads to defection when the match ratio becomes high enough.

**3: A Numerical Example**

Assume that employee-donors have Cobb-Douglas utility: \( U(x, G) = x^\alpha G^\beta \). It can be shown that the Nash equilibrium donation is \( g^*(h) = \frac{\beta (1+\Delta)W_R}{\alpha N + \beta (1+h)} \). Guided by the insight obtained from
Lemma 4 and Proposition 8, we determine the match ratios for which a separating equilibrium can exist. The critical value of the match ratio $\tilde{h}$ at which $\tilde{h}g(\tilde{h}) = \Delta W_r$ (and hence wages at the type $S$ firm are identical to those at a type $R$ firm) is $\frac{(\alpha N + \beta)\Delta}{\beta}$.

For $\alpha = \beta = 0.5$, $N=100$, $\Delta=2\%$ and $W_R=$$10,000$, the critical value of $\tilde{h}=2.020$. A separating equilibrium exists for match ratios slightly higher than 2.020. For instance, it is easy to verify that, when $h=2.030$, nominal pay at firm $S$ is $W_S=$$9,999.03$, which is lower than $W_R$ and thus there is no incentive for regular workers to move from firm $R$ to firm $S$. When $h=2.030$ the utility of a socially conscious employee who remains at firm $S$ is 17,232.88, which is higher than the maximum level of the utility she will conjecture that she can achieve by moving to firm $R$, this maximum being 17,232.85. This maximum level is associated with a conjecture that all the other employees will stay at firm $S$ and that those who stay will continue to make the same donation as they made before the defection. Given such a conjecture, the parameter values are such that a switcher would then optimally cease all donations post the switch.

For a slightly higher value of $h$ of 2.031, socially conscious employees will find switching to type $R$ firms attractive. Since $U\left(W_R - (1+h)g^*(h), (1+h)Ng^*(h)\right)$ is increasing in $h$ for all $h < N-1$, the separating equilibrium with the highest level of employee utility is achieved at a match ratio at 2.030.

Further calculations show the comparative static relations between the optimal match ratio consistent with a separating equilibrium and each of (i) the per employee productivity gain of $\Delta$, (ii) the number of employees in firm $S$, and (iii) the employees’ preference parameter $\alpha$. The higher the per employee productivity gain of $\Delta$ for teams at socially responsible firms, the higher the optimal match ratio that can be offered. This is demonstrated in Panel A of Table 3. It is intuitive since the incentive to switch to a higher-paying regular firm is reduced if greater productivity at firm $S$ allows a higher match without a reduction in the wage.

[Please Insert Table 3 Here]

The relation between the optimal match ratio and the number of socially conscious employees is positive, as illustrated in Panel B of Table 3. With the ability to free-ride on the
generosity of a greater number of employee donors, each employee will reduce her gift. In turn the firm’s match per employee is reduced and the wage offered by firm $S$ rises. The incentive to defect is then reduced and a separating equilibrium can be maintained at a higher match ratio. Finally, the higher the preference parameter associated with the private good, the higher the optimal match ratio. This can be seen from panel C of Table 3. The higher the value of $\alpha$, the smaller the amount that the employees will donate for any given match ratio and the firm’s match per employee will be reduced. At an unchanged match ratio the wage offered by firm $S$ will rise. The incentive to defect will be reduced and again a separating equilibrium can be maintained at a higher match ratio. Somewhat ironically, the end result is that when the utility function of socially conscious employees places less weight on the public good, socially responsible firms can offer higher matches.

In order to investigate one explanation of how socially responsible firms can survive competition from regular firms that can offer higher wages, namely that socially conscious employees working in teams can be more productive than regular workers, we turn to an empirical examination of labor productivity and matching schemes.

4: Empirical Findings on Matching Grants and Labor Productivity

We examine the set of firms included in Standard and Poor’s ExecuComp data base in the year 2009. ExecuComp includes both active and inactive firms in the S&P 1500 index, plus a handful of other firms. Financial information was obtained from Compustat for the years 2005 through 2009. To be included in the sample, information must be available on the firm’s Book Value of Assets, Number of Employees and pre-tax Operating Income before Depreciation and the firm must have a non-negative book value of equity. This screening procedure yields 7,872 firm-year observations; 27.6% of which come from firms with matching grants.8

Labor productivity is defined as pre-tax Operating Income before Depreciation divided by the number of Employees. To mitigate the impact of inflation, asset values and profits are deflated to year 2005 dollars with GDP deflators obtained from the website of the Federal Reserve Bank of St. Louis. Detailed data definitions are contained in Appendix 2.

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Summary statistics for the complete set of firms are reported in Panel A of Table 4. Summary statistics for firms with matching grants are reported in Panel B, and in Panel C for firms without matching grants.

Firms offering matching grants are typically larger in terms of their book value of assets (median values of $5.21 billion vs. $1.25 billion) and number of employees (median values of 11,250 vs. 3,590). Firms with matching grants also perform better. The average return on assets (ROA) is 14%, as compared with 12% for firms without matching grants. The t-statistic for the difference in return on assets between the two groups is 4.8997 (with a p-value of 0.0000). They have higher average Tobin’s Q at 1.49. By contrast, the average Tobin’s Q for non-matching firms is 1.58 and the t-statistic for the difference in Tobin’s Q is 2.9794 (with a p-value of 0.0014). It also appears that firms offering matching grants have higher labor productivity as the median (mean) is $56,230 per year ($137,440 per year); while firms without such programs have a median productivity of $35,750 per year ($77,140 per year). The two-sample t-statistic for a test of the difference in labor productivity between firms with matching grants and firms without matching grants is 6.4852 with a one-sided p-value of 0.0000.

[Please Insert Table 4 Here]

For our main test of differences in labor productivity, we consider a simple Cobb-Douglas production function with inputs of labor $L$ and capital $K$,

$$Q = \xi K^\alpha L^{\beta_1} + \beta_2 M$$

where

$$M = \begin{cases} 
1, & \text{if the firm has a matching scheme;} \\
0, & \text{otherwise.}
\end{cases}$$

(15)

$Q$ is the operating income before depreciation of the firm. $\xi$ is a scalar interpreted as a productivity factor. Our hypothesis is that one way to ensure that socially responsible firms can survive market competition and hence that a separating equilibrium can exist, is that firms with employee matching grants enjoy higher productivity; i.e., that $\beta_2 > 0$.

Dividing both sides of the production function (15) by $L$ and then taking the logarithm, we have

$$\ln(Q / L) = \ln(\xi) + \alpha \ln(K / L) + [\beta_1 - (1 - \alpha)]\ln(L) + \beta_2 M \cdot \ln(L).$$

Thus, we test whether the estimated $\beta_2$ parameter is positive in the following relation:
\[
\ln(Q_{it} / L_{it}) = \lambda_0 + \alpha \ln(K_{it} / L_{it}) + \beta_1^* \ln(L_{it}) + \beta_2 M_i \ln(L_{it}) + \sum_{j=1}^{J} \gamma_j X_{j, it} + \epsilon_{it},
\]
where \(X_j\)'s are a set of control variables. The estimated value of \(\lambda_0\) is an estimate of \(\ln(\xi)\), and the estimated value of \(\beta_1^*\) is an estimate of \(\beta_1 - (1 - \alpha)\).

We include three control variables. Recent studies have suggested that firms’ financial performance is influenced by both corporate governance (Gompers, Ishii and Metrick 2003) and competitiveness in product markets (Giroud and Mueller 2011). Therefore, we add the G-index to measure the strength of corporate governance and a Herfindahl index to measure a firm’s market power. Values of the G-index were obtained from Andrew Metrick’s website. Since the G-index has been compiled infrequently, we use a firm’s year 2004 G-index value for the year 2005 sample, and its year 2006 G-index value for observations from years 2006 to 2009. Annual values of a Herfindahl index (\(H\)-index) are calculated for each of the 38 Fama-French industry classifications based on 4-digit SIC codes. The 38 industry definitions are found on Ken French’s website. The calculation of the annual value of the \(H\)-index for each such industry is based on sales data for the set of firms in the sample that year. The third control variable is the one-year lagged investment in Research and Development (R&D). Productivity may depend not only on a firm’s capital and labor, but also on how much of the capital represents recent investment in R&D.

Pooled OLS results are reported in Panel A of Table 5 where the \(t\)-statistics are robust to heteroscedasticity and clustering of residuals at the firm level.\(^9\) As suggested by Petersen (2009), clustered standard error estimates are used to adjust for the correlation of residuals within a firm. The regressions are estimated both with and without a sector effect. We attempt a control for any sector effects on the total productivity factor \(\xi\) that are distinct from the degree of industry concentration. We do so by using a set of sector dummies created by classifying firms into ten sectors based on their Global Industry Classification Standard (GICS) codes. In all six variants of the regression (i.e., with and without sector effects and including various number of the control variables), firms with matching grants have significantly higher productivity at the 1% level. The

\(^9\) All the regressions reported in Table 5 have been repeated on a sub-sample in which we delete both the top and bottom 0.5% of observations based on inflation-adjusted profit levels. The sign and significance of the estimates are unchanged. These results are available upon request.
estimated coefficient on the matching dummy, $\beta_i$, varies across the regressions and ranges between 0.0308 and 0.0640.

We also undertake a GLS random effect panel data analysis and these results are reported in Panel B. The estimated relation between matching grants and productivity is quite similar to that estimated using pooled OLS. Each of the six regressions reported in Panel B imply that matching grants are associated with significantly greater productivity, at least at the 5% level.

[Please Insert Table 5 Here]

The negative estimate of the coefficient on the $H$-index suggest that companies in more concentrated industries have lower productivity, consistent with increasing managerial agency problems and/or growing union power in less competitive industries. Firms with low values of the $G$-index are viewed as firms with strong shareholder rights and hence the significant negative coefficient on the $G$-index in columns (5) & (6) of both Panels A and B is consistent with effective corporate governance having a positive impact on firm performance.

This section has investigated whether socially conscious employees working together in teams are more productive than regular workers. An alternate explanation for how socially responsible firms can survive competition from regular firms is that socially conscious employees enjoy a direct utility benefit from team membership at socially responsible firms. They would lose this benefit if they were to defect to a higher-paying regular firm. In the next section, we investigate empirically this additional possibility.

5: Employee Satisfactions and Matching Grants

As pointed out by Andreoni (1989), many donors enjoy a private psychological benefit from the act of giving, termed “warm glow.” In Andreoni’s analysis, an individual’s donation to the public good enters into his utility function at two levels, once as part of the public good, $G$, and a second time based on the size of his own donation $g_i$: $U_i = U_i(x_i, g_i, G)$. Proposition 5 established that when $U_i \equiv U_i(x_i, G)$, employee matching grant schemes can be equivalent to a corporate lump-sum donation scheme. But, if the act of giving does not have as large an impact on the employee’s utility when a donation is effectively made via reduced wages, employee contributions to the charity directly may dominate corporate giving on behalf of employees.
Employee satisfaction can go beyond the individual “warm glow” induced by the employee’s personal contributions to the charity. People can enjoy working with like-minded individuals and this may lead to higher labor productivity as investigated in Section 4. But even without such a benefit, as long as employees value working with those who support the same causes, a matching scheme can act not only as a coordination mechanism to mitigate free-riding in the provision of public goods, but also as a bonding mechanism for team members.

For employees who enjoy a warm glow from team membership, a move to a regular company will reduce their utility, other things being equal. Such non-pecuniary benefits may make socially conscious employees at socially responsible firms reluctant to move to a regular company even though it may offer a higher nominal salary.

We use the list of *Fortune Magazine*’s “100 Best Companies to Work For in America” to test whether there is a positive relation between employee matching grant schemes and employee satisfaction. Since 1998, *Fortune Magazine* has published an annual list of the 100 firms judged to be the best places to work based on their employer-employee relations. The list is determined by the *Great Place to Work Institute* and the decision to include a firm on the list is based on employee surveys. Thus inclusion on the list can be treated as a direct measure of employee satisfaction\(^{10}\). Previous studies (for example, Ahmed et al. 2010 and Edmans 2011) report a link between corporate financial performance and membership of the list.

We investigate the following hypothesis: If employees enjoy a non-pecuniary benefit from working in firms with matching grant schemes (a variant of a “warm glow” effect), then the matching grant firms will be more likely to appear in *Fortune*’s “100 Best Companies to Work for in America”. Based on the lists from 2006 to 2010, Panel A of Table 6 reports that 4.79% of the firms in our sample of firms from *ExecuComp* with matching grants also appeared on the “100 Best” list. Only 1.35% of firms without matching grants did. More tellingly, Panel B of Table 6 reports that a firm with a matching grants scheme and not on the list seems to find it easier to "break" into the ranking in the subsequent year: the chance of inclusion in the following

\(^{10}\) The survey includes two parts. Two-third of a company’s score is based on 57 questions. One of the questions is whether the company has employee matching grants. However, in an e-mail communicated to the authors, one of the institute’s founders, Milton Moskowitz stated that “This is NOT a major criterion in selection of the list. It is just one of many attributes checked off. A company would not be severely handicapped by not having this program. The methodology of the list rests largely on the opinions of employees who take our survey. Their answers to 57 questions account for two-thirds of the final score. The remaining one-third comes from our evaluation of the programs and benefits offered by applicants, and matching grants do not have any strong weight by themselves.” For a more detailed description of how the list is compiled, see [www.greatplacetowork.com](http://www.greatplacetowork.com).
year is 1.36%. By contrast a firm without matching grants has only a 0.18% probability of being ranked in the subsequent year. The Chi square test statistic is 33.14, with a p-value of 0.0000. Panel C of Table 6 indicates that a firm with matching grants and membership of the list has a 77.5% chance of continuing to be ranked in the following year, compared with a 76.92% for those members without matching grants. This difference is not statistically significant.

[Please Insert Table 6 Here]

To test further whether matching grants may be positively associated with inclusion in the “100 Best” list, a Probit regression analysis is employed and reported in Table 7. In this regression, the dependant variable is a dummy which takes a value of one if the firm appears on the list, and zero otherwise. The independent variables are a dummy variable for matching grant schemes and control variables are lagged labor productivity, log of book assets, log of the number of employees, $H$-index, $G$-index and lagged R&D. Standard errors are adjusted for clustering at the firm level, as we have a repeated sampling of the firms’ appearance on the “100 Best” list in each year between 2006 and 2010. Using five years of financial data from 2005 to 2009\textsuperscript{11}, we find that firms with matching grants are more likely to appear on the “100 Best” list. This relation is significant at the 1% level in the absence of controls and when only the lagged labor productivity is included as a control variable. The relation remains significant to at least at the 5% level when more control variables are considered. It is not surprising that the lagged labor productivity may be positively associated with the likelihood of inclusion on the list, as shown in Columns (3) and (4) of Table 7. More profitable firms may be able to make employees happier. More tellingly, firms offering matching grants are more likely to be included in the “100 Best” list even after controlling this factor. Finally, more R&D oriented firms have a better chance of appearing on the list, which suggests that more innovative firms have higher employee satisfaction.

[Please Insert Table 7 Here]

\textsuperscript{11} Due to the time delay in releasing the survey results, we match year the 2010 “100 Best Companies to Work for in America” list with financial data from year 2009, and so on.
The empirical analyses in this and the previous section suggest that the conditions for the existence of a separating equilibrium may well be satisfied in practice: socially conscious employees may choose to work for socially responsible firms which offer matching grants and have higher labor productivity and perhaps higher employee satisfaction.

To complete our analysis of the optimality of employee matching grant schemes, Appendix 3 re-examines the Propositions developed above in the light of the tax deductibility of individual and corporate donations. The Propositions are shown to be unaffected by the tax deductibility of donations.

6: Conclusion

We have addressed the relation between corporate philanthropy and firms’ human capital. When socially conscious employees value both their private consumption and the provision of public goods, corporate donations, either a direct donation to a charity or an indirect employee matching grant, can act as a coordination mechanism to mitigate the free-rider problem among employee donors. In these circumstances corporate philanthropy is superior to individual employee personal donations. But corporate philanthropy is challenged when employees have an incentive to switch to regular firms paying higher wages. However, a separating equilibrium in which socially conscious employees work for socially responsible firms offering employee matching programs and regular employees work for regular firms can exist if teams of socially conscious employees are in fact more productive. The tax deductibility of corporate and individual donations does not alter this conclusion.

Judging from the real world prevalence of corporate employee matching grant programs, we conclude that teams of socially conscious employees produce either a pecuniary benefit of increased labor productivity or a collective “warm-glow”. Our empirical investigation supports the view that firms with matching grant schemes enjoy higher labor productivity and that their employees are more satisfied.

In summary, when employees are socially conscious, companies can fund employee matching grants or lump-sum donations through a reduction in the wages paid to their philanthropic employees. Provided there is a benefit to being in the team, socially conscious
employees will not be lured away by the higher wages of regular firms. The company’s shareholders need bear none of the cost of corporate giving. Why then is the company’s board feted for its “generosity”? The answer is because corporate donations can serve as a coordination mechanism that allows the employees to achieve their preferred combination of private and public good consumption. The employees prefer that combination to what they would have achieved if they were paid more at regular firms and had to make their donations individually. And the charities are able to raise more money than in the equilibrium of individual donations from better-paid employees. The corporation’s Board should be applauded for its “social responsibility” in implementing a Pareto improving outcome for employees, charities and shareholders.
References


Appendix 1: Proof of Lemmas

**Lemma 1:** For each match ratio there is a unique optimal employee donation $g^\ast$.

**Proof:** The proof proceeds by contradiction. Suppose the lemma were not true. Then for some $h$ there would exist two different levels of employee contribution, $g^{*\ast\upsilon}$ and $g^{*\ast\upsilon'}$ satisfying (6), with $g^{*\ast\upsilon} > g^{*\ast\upsilon'}$.

Since $g^{*\ast\upsilon}$ satisfies (6),

$$U_1\left(W_R - (1 + h) g^{*\ast\upsilon}, N g^{*\ast\upsilon}\right) = (1 + h) U_2\left(W_R - g^{*\ast\upsilon}, N g^{*\ast\upsilon}\right).$$  \hfill (A1)

Suppose the employee increases her contribution from $g^{*\ast\upsilon}$ to $g^{*\ast\upsilon'}$. The left-hand-side of equation (A1) increases because $U_{11} < 0$ and $U_{12} \geq 0$. But the right-hand-side of equation (A1) decreases, since $U_{22} < 0$. This means that $g^{*\ast\upsilon'}$ cannot satisfy equation (6) and thus $g^{*\ast\upsilon'}$ cannot be an optimal donation.

**QED**

**Lemma 2:** $(1 + h)g^\ast(h)$ is increasing in $h$.

**Proof:** For a given match ratio $h$, each employee takes as given that each other employee will donate $g^\ast$ and solves

$$\max_g U\left[\left(W_R - g^\ast h\right) - g, (N - 1)(1 + h)g^\ast + (1 + h)g\right],$$

with the first order condition

$$U_1\left(W_R - (1 + h)g^\ast(h), N(1 + h)g^\ast(h)\right) = (1 + h) U_2\left(W_R - (1 + h)g^\ast(h), N(1 + h)g^\ast(h)\right).$$

For notational ease, we define $\bar{g}(h) \equiv (1 + h)g^\ast(h)$. Consider two match ratios, $h^A$ and $h^B$, with $h^A > h^B$. Suppose in fact that

$$\left(1 + h^A\right)g^\ast(h^A) \leq \left(1 + h^B\right)g^\ast(h^B).$$

The first order conditions corresponding to match ratios of $h^A$ and $h^B$ are

$$U_1\left(W_R - \bar{g}(h^A), N \bar{g}(h^A)\right) = (1 + h^A) U_2\left(W_R - \bar{g}(h^A), N \bar{g}(h^A)\right) \quad \text{and} \quad \text{(A2)}$$

and
The assumptions that $U_1 > 0$, $U_2 > 0$, $U_{11} < 0$, $U_{22} < 0$, $U_{12} \geq 0$ and the supposition that 
\[
(1 + h^A) g(h^A) \leq (1 + h^B) g(h^B) \quad \text{when} \quad h^A > h^B,
\]
have the following contradictory implication:
The left-hand-side of equality (A2) is smaller than the left-hand-side of equality (A3), yet the right-hand-side of equality (A2) is greater than the right-hand-side of equality (A3). Thus 
\[(1 + h) g^*(h) \] is strictly increasing in $h$.

QED

**Lemma 3:** \[ \lim_{h \to \infty} [1 + h] g^*(h) = [1 + \Delta] W_R. \]

**Proof:** Lemma 1 has established that \([1 + h] g^*(h)\) is increasing in $h$. Suppose \([1 + h] g^*(h)\) reaches \([1 + \Delta] W_R\) at a finite value of $h$. The employee is consuming zero of the private good and her entire marginal product is donated to the charity. At higher values of $h$ the lower bound of zero on consumption of the private good remains binding. Now suppose \([1 + h] g^*(h)\) does not reach \([1 + \Delta] W_R\) at a finite value of $h$ and that \(\lim_{h \to \infty} [1 + h] g^*(h) = B < [1 + \Delta] W_R\). The first-order condition requires 
\[
\frac{U_1 \left(W_R (1 + \Delta) - (1 + h) g^*(h), N (1 + h) g^*(h)\right)}{U_2 \left(W_R (1 + \Delta) - (1 + h) g^*(h), N (1 + h) g^*(h)\right)} = (1 + h) .
\]

Take the limit of both sides of (A4) as $h$ approaches infinity. The limit of the left-hand side is a finite number, 
\[
\frac{U_1 (W_R (1 + \Delta) - B, NB)}{U_2 (W_R (1 + \Delta) - B, NB)},
\]
while the limit of the right-hand side is infinite. QED

**Lemma 4:** There exists a match ratio $\bar{h}$ such that $\bar{h} g^*(\bar{h}) = \Delta W_R$.

**Proof:** We first prove that $h g^*(h)$ is an increasing function of $h$. We prove this statement by contradiction. Suppose that $h g^*(h)$ were non-increasing in $h$ over some range. Then $g^*(h)$ would have to be decreasing in $h$ over that same range and this would imply that $g^*(h) + h g^*(h) = (1 + h) g^*(h)$ was decreasing in $h$ over that range. But this is impossible since $(1 + h) g^*(h)$ is increasing in $h$ from Lemma 2. Thus, $h g^*(h)$ must be everywhere increasing in
$h$. Now, it is known that $\lim_{h \to 0} h g^*(h) = 0$, $\lim_{h \to \infty} h g^*(h) = [1 + \Delta] W_R$ and $h g^*(h)$ is increasing in $h$. Continuity ensures there exists a match ratio $\bar{h}$ such that $\bar{h} g^*(\bar{h}) = \Delta W_R$. QED

Appendix 2: Notes on the Empirical Analysis

1: Data
The employee matching grants data come from HEP Development Services: [http://hepdata.com](http://hepdata.com) collected on May 18, 2010. The database includes corporations, professional service firms, and non-profit organizations which offer employee matching grants. Our empirical analysis assumes that these firms also had matching grants back to year 2005, as HEP Development Services does not indicate when the matching programs started. We merge this database with financial information collected from the Fundamentals Annual data files on Compustat for firms included in the ExecuComp database in 2009. Financial data are collected for fiscal years between year 2005 and 2009. To be included in the sample, firms must have a set of relevant financial information available, in particular, the number of employees, book value of assets, and the operating income before taxes and depreciation. We delete observations for a given firm in a given year if the firm’s book value of equity is negative that year. After the screening procedure, we have 7,872 valid firm-year observations.


2: Variable Definitions and Compustat Codes
A firm’s capital stock is measured by the book value of assets (Compustat code AT). Labor productivity is measured by pre-tax Operating Income before Depreciation (Compustat Code: OIBDP) divided by the reported number of the employees of a firm (Compustat Code: EMP). According to the Compustat manual, “the number of employees represents the number of company workers as reported to shareholders. This is reported by some firms as an average number of employees and by others as the number of employees at year-end. No attempt has been made to differentiate between these bases of reporting. If both are given, the year-end
figure is used. This item includes: all part-time and seasonal employees and all employees of consolidated subsidiaries, both domestic and foreign, but it excludes consultants, contract workers and employees of unconsolidated subsidiaries.” To achieve consistency in the treatment of data, we assume that the number of employees is reported as the number at year-end. Thus, the number of employees and the reported book value of assets are considered to be stock variables and we use the average of the beginning and end-of-year values of capital and labor to explain that year’s production.

Appendix 3: The Impact of Taxes on Donations

We reconsider employee matching grant schemes when corporate and individual donations are deductible at the respective corporate and personal rates. We first show that the Proposition 1 result that lump-sum corporate donations crowd-out individual employee donations continues to apply in the presence of corporate and personal taxation. To see this, denote the corporate and personal tax rates by \( \tau_c \) and \( \tau_p \) respectively. When the firm donates \( g \) per employee to the charity the total amount of the public good is \( Ng \) and employees are paid at a reduced rate of \( W_S \). Because both salaries and donations are tax deductible at the corporate level, there is no difference in shareholders’ after-tax profits provided \( W_S = W_R - \bar{g} \). The utility of socially conscious employees is

\[
U \left( W_S (1 - \tau_p), N \bar{g} \right).
\]  

(A5)

If the firm chooses not to donate, the utility of socially conscious employees each donating \( g \) is

\[
U \left( (W_R - g)(1 - \tau_p), Ng \right).
\]  

(A6)

Inspecting expressions (A5) and (A6), we see that for \( g = \bar{g} \), socially conscious employees are indifferent to the source of a given per employee donation. Either way, they bear the same cost in terms of reduced private consumption.
The total tax burden remains the same whether the company or its employees donate a given total amount. For a regular firm whose employees donate, total per employee wage and donation-related taxes are
\[ \tau_p (W_R - g) - \tau_c W_R. \]
For a socially responsible firm making a per employee donation of \( \bar{g} \), total per employee wage and donation-related taxes are
\[ \tau_p W_S - \tau_c (W_S + \bar{g}). \]
For \( g = \bar{g} \) and \( W_S = W_R - \bar{g} \), total wage and donation-related taxes are identical.

Finally we consider the impact of taxes on employee matching grant schemes. Because employees bear the cost of the corporate match in the form of lowered wages, socially conscious employees will defect to regular firms unless teams of socially conscious employees are more productive either in pecuniary terms or in producing a collective warm glow. A socially conscious employee at a type \( S \) firm who receives a wage of \( W_S = W_R - h g^*(h) \) will solve
\[ \max_g U \left( (W_S - \bar{g})(1 - \tau), (N - 1)(1 + h)g^*(h) + (1 + h)\bar{g} \right) \]
with an equilibrium first order condition of
\[ -(1 - \tau)U_1 \left( \left[ W_R - (1 + h)g^*(h) \right](1 - \tau), N(1 + h)g^*(h) \right) + (1 + h)U_2 \left( \left[ W_R - (1 + h)g^*(h) \right](1 - \tau), N(1 + h)g^*(h) \right) = 0. \]
(A7)
If she defects she will solve
\[ \max_g U \left( (W_R - \hat{g})(1 - \tau), (N - 1)(1 + h)g^*(h) + \hat{g} \right). \]

Our defector could achieve her pre-defection utility level simply by making a post-defection donation of \( (1 + h)g^*(h) \); i.e. by donating both \( g^*(h) \) and enough to cover the lost employer match of \( h g^*(h) \). The partial of the defector’s utility with respect to her post-defection donation evaluated at \( \hat{g} = (1 + h)g^*(h) \) is
\[-(1-\tau)U_1\left([W_R-(1+h)g^*(h)](1-\tau), N(1+h)g^*(h)\right)\]
\[\quad + U_2\left([W_R-(1+h)g^*(h)](1-\tau), N(1+h)g^*(h)\right) < 0.\] (A8)

The inequality follows from a comparison of the left-hand sides of expressions (A7) and (A8).
Thus a socially conscious employee can always increase her utility by defecting and choosing to
donate an amount less than $(1+h)g^*(h)$. Thus the Proposition 6 result that, all else equal,
socially conscious employees will switch to regular firms offering higher wages will continue to
apply in the presence of both corporate and personal taxes.
Table 1: Summary of U.S. Employee Matching Grant Programs

Panel A: Distribution of the maximum amount matched
The number of organizations reported in the data source http://hepdata.com on May 18, 2010 as willing to match to a specific level when organizations are counted at the parent company level.

<table>
<thead>
<tr>
<th>Maximum Amount Matched</th>
<th>Number of Firms</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>50,000-200,000</td>
<td>8</td>
<td>0.44%</td>
</tr>
<tr>
<td>25,000-49,999</td>
<td>26</td>
<td>1.43%</td>
</tr>
<tr>
<td>10,000-24,999</td>
<td>174</td>
<td>9.54%</td>
</tr>
<tr>
<td>5,000-9,999</td>
<td>232</td>
<td>12.73%</td>
</tr>
<tr>
<td>1,000-4,999</td>
<td>653</td>
<td>35.82%</td>
</tr>
<tr>
<td>100-999</td>
<td>468</td>
<td>25.67%</td>
</tr>
<tr>
<td>20-99</td>
<td>14</td>
<td>0.77%</td>
</tr>
<tr>
<td>Unspecified</td>
<td>248</td>
<td>13.60%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1823</strong></td>
<td><strong>100.00%</strong></td>
</tr>
</tbody>
</table>

Panel B: The distribution of the match ratio
The maximum for each parent company organization reported in the data source http://hepdata.com on May 18, 2010 of that organization’s regular and qualified match ratios:

<table>
<thead>
<tr>
<th>Match Ratio</th>
<th>$h = 9$</th>
<th>$h = 5$</th>
<th>$h = 4$</th>
<th>$h = 3$</th>
<th>$h = 2$</th>
<th>$h = 1$</th>
<th>$h &lt; 1$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Firms</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>22</td>
<td>106</td>
<td>1607</td>
<td>85</td>
</tr>
<tr>
<td>%</td>
<td>0.05%</td>
<td>0.05%</td>
<td>0.05%</td>
<td>1.21%</td>
<td>5.81%</td>
<td>88.15%</td>
<td>4.66%</td>
</tr>
</tbody>
</table>

An organization with a matching scheme may specify different match ratios for donations made to different causes. For example, Murphy Oil Corporation has a matching policy which specifies that donations for Education & Hospitals will be matched as 2:1; other donations are matched 1:1. In this case, the regular match ratio is 1 and the qualified match ratio is 2. We report that such a company has a match ratio $h = 2$ in Panel B.
Table 2: Notation

Variables with a single asterisk (*) denote a setting with matching scheme rather than a lump sum scheme. Variables with the subscript \( l \) denote a setting with a lump-sum scheme.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>( W_R )</td>
<td>Wage paid at a regular firm</td>
</tr>
<tr>
<td>( W_S )</td>
<td>Wage paid at a socially responsible firm</td>
</tr>
<tr>
<td>( g_i )</td>
<td>Employee-donor ( i )'s contribution to the public good</td>
</tr>
<tr>
<td>( N )</td>
<td>The number of employees in a firm</td>
</tr>
<tr>
<td>( h )</td>
<td>Match ratio</td>
</tr>
<tr>
<td>( x )</td>
<td>Employee-donor’s private consumption</td>
</tr>
<tr>
<td>( G )</td>
<td>Total donations to the public good</td>
</tr>
<tr>
<td>( U(x, G) )</td>
<td>Employee-donor’s utility function</td>
</tr>
<tr>
<td>( \tau )</td>
<td>Tax rate</td>
</tr>
<tr>
<td>( \Delta )</td>
<td>The incremental labor productivity of socially conscious employees in team relative to the productivity of regular employees</td>
</tr>
</tbody>
</table>
Table 3: The relation between the optimal match ratio consistent with a separating equilibrium percentage and various model inputs

\( W_R = 1000 \) and \( U(x, G) = x^\alpha G^\beta \) in all the panels.

Panel A: The relation between the optimal match ratio consistent with a separating equilibrium and the labor productivity increment of a team of socially conscious employees assuming that \( \alpha = \beta = 0.5 \) and \( N = 100 \)

<table>
<thead>
<tr>
<th>( \Delta )</th>
<th>0%</th>
<th>0.5%</th>
<th>1%</th>
<th>1.5%</th>
<th>2%</th>
<th>2.5%</th>
<th>3%</th>
<th>3.5%</th>
<th>4%</th>
</tr>
</thead>
<tbody>
<tr>
<td>( h )</td>
<td>0</td>
<td>0.515</td>
<td>1.020</td>
<td>1.525</td>
<td>2.030</td>
<td>2.535</td>
<td>3.040</td>
<td>3.545</td>
<td>4.050</td>
</tr>
</tbody>
</table>

If there is a 2% productivity gain associated with a team of socially conscious employees, the match ratio that maximizes employee utility and maintains a separating equilibrium is 2.03.

Panel B: The relation between the optimal match ratio consistent with a separating equilibrium and the number of employees of a socially responsible firm assuming that \( \alpha = \beta = 0.5 \) and \( \Delta = 2\% \)

<table>
<thead>
<tr>
<th>( N )</th>
<th>25</th>
<th>50</th>
<th>75</th>
<th>100</th>
<th>125</th>
<th>150</th>
<th>175</th>
<th>200</th>
<th>225</th>
</tr>
</thead>
<tbody>
<tr>
<td>( h )</td>
<td>0.562</td>
<td>1.04</td>
<td>1.533</td>
<td>2.030</td>
<td>2.528</td>
<td>3.026</td>
<td>3.523</td>
<td>4.025</td>
<td>4.524</td>
</tr>
</tbody>
</table>

Panel C: The relation between the optimal match ratio consistent with a separating equilibrium and the preference parameter \( \alpha \) of socially conscious employees assuming that \( \beta = 1 - \alpha \), \( \Delta = 2\% \) and \( N = 100 \)

<table>
<thead>
<tr>
<th>( \alpha )</th>
<th>0.3</th>
<th>0.35</th>
<th>0.4</th>
<th>0.45</th>
<th>0.5</th>
<th>0.55</th>
<th>0.6</th>
<th>0.65</th>
<th>0.7</th>
</tr>
</thead>
<tbody>
<tr>
<td>( h )</td>
<td>0.894</td>
<td>1.111</td>
<td>1.365</td>
<td>1.667</td>
<td>2.030</td>
<td>2.473</td>
<td>3.028</td>
<td>3.741</td>
<td>4.694</td>
</tr>
</tbody>
</table>
Table 4: Summary Statistics
Matching Grants vs. Non-matching Grants

The sample consists of firms included in ExecuComp database in 2009. Matching grant information is obtained from [www.hepdata.com](http://www.hepdata.com) for May 18, 2010. Financial information comes from Compustat and covers the years 2005 through 2009. Dollar values are deflated to 2005 dollars. The GDP deflator information comes from the website of the Federal Reserve Bank in St. Louis. Firm-year observations with incomplete financial information on Labor Productivity, Book Asset Value and Number of Employees or with negative book value of equity in a given year are dropped from the sample. \( N \) is the number of the firm-year observations. Panel A includes all firms. Missing values of R&D are assumed to have zero value. Panel B reports summary statistics for the subsample of firms with matching grants. Panel C reports summary statistics for firms without matching grants.

### Panel A: All Firms

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Mean</th>
<th>S.D.</th>
<th>25%</th>
<th>Median</th>
<th>75%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Labor Productivity (thousands per employee)</td>
<td>7,872</td>
<td>93.76</td>
<td>369.53</td>
<td>17.62</td>
<td>40.74</td>
<td>97.46</td>
</tr>
<tr>
<td>Book Assets (millions)</td>
<td>7,872</td>
<td>15,055</td>
<td>89,561</td>
<td>602</td>
<td>1,856</td>
<td>6,391</td>
</tr>
<tr>
<td>No. of Employees (thousands)</td>
<td>7,872</td>
<td>19.78</td>
<td>66.70</td>
<td>1.50</td>
<td>4.79</td>
<td>14.60</td>
</tr>
<tr>
<td>Book Assets per Employee (thousands)</td>
<td>7,872</td>
<td>1,429</td>
<td>5,252</td>
<td>169</td>
<td>355</td>
<td>971</td>
</tr>
<tr>
<td>Tobin’s Q</td>
<td>6,808</td>
<td>1.56</td>
<td>1.19</td>
<td>0.83</td>
<td>1.22</td>
<td>1.89</td>
</tr>
<tr>
<td>ROA</td>
<td>7,872</td>
<td>0.13</td>
<td>0.11</td>
<td>0.07</td>
<td>0.12</td>
<td>0.18</td>
</tr>
<tr>
<td>Book Leverage</td>
<td>7,872</td>
<td>0.20</td>
<td>0.17</td>
<td>0.05</td>
<td>0.18</td>
<td>0.31</td>
</tr>
<tr>
<td>R&amp;D</td>
<td>7,872</td>
<td>0.06</td>
<td>0.70</td>
<td>0.00</td>
<td>0.00</td>
<td>0.03</td>
</tr>
<tr>
<td>Matching Dummy</td>
<td>7,872</td>
<td>0.28</td>
<td>0.45</td>
<td>0.00</td>
<td>0.00</td>
<td>1.00</td>
</tr>
</tbody>
</table>
### Panel B: Firms with Matching Grants

<table>
<thead>
<tr>
<th>Metric</th>
<th>N</th>
<th>Mean</th>
<th>S.D.</th>
<th>25%</th>
<th>Median</th>
<th>75%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Labor Productivity (thousands per employee)</td>
<td>2,169</td>
<td>137.44</td>
<td>482.48</td>
<td>28.04</td>
<td>56.23</td>
<td>125.59</td>
</tr>
<tr>
<td>Book Assets (millions)</td>
<td>2,169</td>
<td>31,092</td>
<td>120,000</td>
<td>1,734</td>
<td>5,211</td>
<td>18,439</td>
</tr>
<tr>
<td>No. of Employees (thousands)</td>
<td>2,169</td>
<td>34.71</td>
<td>106.41</td>
<td>3.75</td>
<td>11.25</td>
<td>31.50</td>
</tr>
<tr>
<td>Book Assets per Employee (thousands)</td>
<td>2,169</td>
<td>1,628</td>
<td>6,387</td>
<td>219</td>
<td>451</td>
<td>1,220</td>
</tr>
<tr>
<td>Tobin’s Q</td>
<td>1,909</td>
<td>1.49</td>
<td>1.13</td>
<td>0.80</td>
<td>1.20</td>
<td>1.86</td>
</tr>
<tr>
<td>ROA</td>
<td>2,169</td>
<td>0.14</td>
<td>0.08</td>
<td>0.09</td>
<td>0.13</td>
<td>0.19</td>
</tr>
<tr>
<td>Book Leverage</td>
<td>2,169</td>
<td>0.22</td>
<td>0.15</td>
<td>0.11</td>
<td>0.22</td>
<td>0.32</td>
</tr>
<tr>
<td>R&amp;D</td>
<td>2,169</td>
<td>0.03</td>
<td>0.07</td>
<td>0.00</td>
<td>0.00</td>
<td>0.03</td>
</tr>
</tbody>
</table>

### Panel C: Firms without Matching Grants

<table>
<thead>
<tr>
<th>Metric</th>
<th>N</th>
<th>Mean</th>
<th>S.D.</th>
<th>25%</th>
<th>Median</th>
<th>75%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Labor Productivity (thousands per employee)</td>
<td>5,703</td>
<td>77.14</td>
<td>314.62</td>
<td>14.22</td>
<td>35.75</td>
<td>87.57</td>
</tr>
<tr>
<td>Book Assets (millions)</td>
<td>5,703</td>
<td>8,956</td>
<td>75,698</td>
<td>460</td>
<td>1,247</td>
<td>3,859</td>
</tr>
<tr>
<td>No. of Employees (thousands)</td>
<td>5,703</td>
<td>14.10</td>
<td>41.46</td>
<td>1.13</td>
<td>3.59</td>
<td>10.00</td>
</tr>
<tr>
<td>Book Assets per Employee (thousands)</td>
<td>5,703</td>
<td>1,353</td>
<td>4,749</td>
<td>152</td>
<td>330</td>
<td>846</td>
</tr>
<tr>
<td>Tobin’s Q</td>
<td>4,899</td>
<td>1.58</td>
<td>1.22</td>
<td>0.83</td>
<td>1.22</td>
<td>1.90</td>
</tr>
<tr>
<td>ROA</td>
<td>5,703</td>
<td>0.12</td>
<td>0.12</td>
<td>0.06</td>
<td>0.12</td>
<td>0.18</td>
</tr>
<tr>
<td>Book Leverage</td>
<td>5,703</td>
<td>0.19</td>
<td>0.17</td>
<td>0.03</td>
<td>0.17</td>
<td>0.30</td>
</tr>
<tr>
<td>R&amp;D</td>
<td>5,703</td>
<td>0.07</td>
<td>0.82</td>
<td>0.00</td>
<td>0.00</td>
<td>0.03</td>
</tr>
</tbody>
</table>
Labor productivity is defined as pre-tax operating income before depreciation per employee. The dependent variable is the log of labor productivity. The independent variable of interest is a matching grant dummy variable (equal to one when the firm has a matching grant and zero otherwise) multiplied by the log of the number of employees. The other independent variables are the log of the number of employees and the log of the book value of assets per employee. The regression results of the pooled ordinary least squares (OLS) are in Panel A, which includes a sector dummy variable based on GICS industry classification of each firm. The GLS estimates of Random Effects Panel Data Regressions are reported in Panel B. Dollar values of assets and profits are deflated to 2005 dollars. The t-statistics (in parentheses) are computed using standard errors robust to heteroskedasticity and clustering at the firm level. Significance is noted by *** at the 1% level, by ** at the 5% level and * at the 10% level.

**Panel A. OLS Regression**

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
<th>(6)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Matching*ln(emp)</td>
<td>0.0640</td>
<td>0.0554</td>
<td>0.0543</td>
<td>0.0452</td>
<td>0.0308</td>
<td>0.0313</td>
</tr>
<tr>
<td></td>
<td>(5.357)***</td>
<td>(4.246)***</td>
<td>(4.158)***</td>
<td>(4.356)***</td>
<td>(2.787)***</td>
<td>(2.833)***</td>
</tr>
<tr>
<td>Ln(book assets/emp)</td>
<td>0.725</td>
<td>0.720</td>
<td>0.720</td>
<td>0.815</td>
<td>0.830</td>
<td>0.831</td>
</tr>
<tr>
<td></td>
<td>(49.02)***</td>
<td>(39.60)***</td>
<td>(40.02)***</td>
<td>(45.50)***</td>
<td>(36.75)***</td>
<td>(35.51)***</td>
</tr>
<tr>
<td>Ln(book assets)</td>
<td>-0.0589</td>
<td>-0.0304</td>
<td>-0.0281</td>
<td>-0.0480</td>
<td>-0.00619</td>
<td>-0.00711</td>
</tr>
<tr>
<td></td>
<td>(-4.635)***</td>
<td>(-1.923)*</td>
<td>(-1.759)*</td>
<td>(-3.945)***</td>
<td>(-0.413)</td>
<td>(-0.481)</td>
</tr>
<tr>
<td>H-index</td>
<td>0.607</td>
<td>0.624</td>
<td></td>
<td>-0.506</td>
<td>-0.510</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(1.770)*</td>
<td>(1.811)*</td>
<td></td>
<td>(-1.524)</td>
<td>(-1.532)</td>
<td></td>
</tr>
<tr>
<td>G-index</td>
<td>-0.00534</td>
<td>-0.00501</td>
<td></td>
<td>-0.0116</td>
<td>-0.0116</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(-0.788)</td>
<td>(-0.734)</td>
<td></td>
<td>(-1.984)**</td>
<td>(-1.990)**</td>
<td></td>
</tr>
<tr>
<td>lagged R &amp; D</td>
<td>0.129</td>
<td></td>
<td></td>
<td>-0.111</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.456)</td>
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<tr>
<td>Sector Effect</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Observations</td>
<td>7,413</td>
<td>5,421</td>
<td>5,421</td>
<td>7,413</td>
<td>5,421</td>
<td>5,421</td>
</tr>
<tr>
<td>Adjusted R-squared</td>
<td>0.677</td>
<td>0.660</td>
<td>0.660</td>
<td>0.730</td>
<td>0.725</td>
<td>0.725</td>
</tr>
</tbody>
</table>
### Panel B. GLS Random Effect Panel Regression

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
<th>(6)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Matching Dummy</td>
<td>0.0558</td>
<td>0.0437</td>
<td>0.0466</td>
<td>0.0413</td>
<td>0.0236</td>
<td>0.0258</td>
</tr>
<tr>
<td></td>
<td>(4.388)***</td>
<td>(3.158)***</td>
<td>(3.332)***</td>
<td>(3.698)***</td>
<td>(2.003)**</td>
<td>(2.178)**</td>
</tr>
<tr>
<td>Ln(emp)</td>
<td>0.722</td>
<td>0.718</td>
<td>0.716</td>
<td>0.795</td>
<td>0.816</td>
<td>0.820</td>
</tr>
<tr>
<td></td>
<td>(47.03)***</td>
<td>(36.87)***</td>
<td>(36.71)***</td>
<td>(41.16)***</td>
<td>(33.98)***</td>
<td>(33.81)***</td>
</tr>
<tr>
<td>Ln(book assets)</td>
<td>-0.0463</td>
<td>-0.00151</td>
<td>-0.00737</td>
<td>-0.0413</td>
<td>0.0132</td>
<td>0.00971</td>
</tr>
<tr>
<td></td>
<td>(-3.274)***</td>
<td>(-0.0860)</td>
<td>(-0.417)</td>
<td>(-3.050)***</td>
<td>(0.798)</td>
<td>(0.590)</td>
</tr>
<tr>
<td>H-index</td>
<td>-0.768</td>
<td>-0.803</td>
<td>-1.390</td>
<td>-1.400</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(-1.792)*</td>
<td>(-1.867)*</td>
<td>(-3.309)***</td>
<td>(-3.327)***</td>
<td></td>
<td></td>
</tr>
<tr>
<td>G-index</td>
<td>-0.00587</td>
<td>-0.00666</td>
<td>-0.0124</td>
<td>-0.0125</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(-0.880)</td>
<td>(-0.997)</td>
<td>(-2.115)**</td>
<td>(-2.138)**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>lagged R &amp; D</td>
<td>-0.370</td>
<td></td>
<td></td>
<td>-0.436</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(-1.647)*</td>
<td></td>
<td></td>
<td>(-1.857)*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Industry Effect</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Observations</td>
<td>7,413</td>
<td>5,421</td>
<td>5,421</td>
<td>7,413</td>
<td>5,421</td>
<td>5,421</td>
</tr>
<tr>
<td>Overall R-squared</td>
<td>0.678</td>
<td>0.657</td>
<td>0.656</td>
<td>0.730</td>
<td>0.724</td>
<td>0.724</td>
</tr>
</tbody>
</table>
### Table 6
Matching Grants and “100 Best Companies to Work for” List

**Panel A:** The following table summarizes the frequency of appearance of firms with and without matching grant schemes in *Fortune Magazine*’s “100 Best Places to Work for in America” lists between 2006 and 2010 inclusive. There are 7,872 firm-year observations.

<table>
<thead>
<tr>
<th></th>
<th>Matching Grants</th>
<th>No Matching Grants</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>On “100 Best” List</td>
<td>104 (4.79%)</td>
<td>77 (1.35%)</td>
<td>181</td>
</tr>
<tr>
<td>Not on “100 Best” List</td>
<td>2,065 (95.21%)</td>
<td>5,626 (98.65%)</td>
<td>7,691</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>2,169</td>
<td>5,703</td>
<td>7,872</td>
</tr>
</tbody>
</table>

**Panel B:** The following table summarizes the frequency of appearance of firms with and without matching grant schemes in *Fortune Magazine*’s “100 Best Places to Work for in America” lists between 2007 and 2010 inclusive, if the firm was not on the list in the previous year. There are 6,023 firm-year observations.

<table>
<thead>
<tr>
<th></th>
<th>Matching Grants</th>
<th>No Matching Grants</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>On “100 Best” List</td>
<td>22 (1.36%)</td>
<td>8 (0.18%)</td>
<td>30</td>
</tr>
<tr>
<td>Not on “100 Best” List</td>
<td>1,596 (98.64%)</td>
<td>4,397 (99.82%)</td>
<td>5,993</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>1,618</td>
<td>4,405</td>
<td>6,023</td>
</tr>
</tbody>
</table>

**Panel C:** The following table summarizes the frequency of appearance of firms with and without matching grant schemes in *Fortune Magazine*’s “100 Best Places to Work for in America” lists between 2007 and 2010 inclusive, if the firm was in the list in the previous year. There are 150 firm-year observations.

<table>
<thead>
<tr>
<th></th>
<th>Matching Grants</th>
<th>No Matching Grants</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>On “100 Best” List</td>
<td>62 (77.50%)</td>
<td>50 (76.92%)</td>
<td>118</td>
</tr>
<tr>
<td>Not on “100 Best” List</td>
<td>18 (22.50%)</td>
<td>15 (23.08%)</td>
<td>32</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>80</td>
<td>65</td>
<td>150</td>
</tr>
</tbody>
</table>
Table 7
Probit Regressions

The dependent variable takes the value of one if the firm appears in the “100 Best Places to Work for” list and zero otherwise. The independent variable is a dummy variable for matching grants, plus control variables for lagged labor productivity, log of book assets, log of the number of employees, $H$-index, $G$-index and lagged R&D. Book value of assets and profits are deflated with the year 2005 GDP deflator. $z$-statistics are reported in brackets and standard errors are adjusted for clustering at the firm level.

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Matching Dummy</td>
<td>0.5464</td>
<td>0.5723</td>
<td>0.3348</td>
<td>0.3057</td>
</tr>
<tr>
<td></td>
<td>(4.47)***</td>
<td>(4.54)***</td>
<td>(2.42)**</td>
<td>(2.01)**</td>
</tr>
<tr>
<td>Lagged labor Prod.</td>
<td>3.56e-5</td>
<td>4.76e-5</td>
<td>8.87e-5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(1.50)</td>
<td>(2.04)**</td>
<td>(1.83)*</td>
<td></td>
</tr>
<tr>
<td>Ln(EMP)</td>
<td></td>
<td>0.1109</td>
<td>0.1077</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(1.97)**</td>
<td>(1.62)</td>
<td></td>
</tr>
<tr>
<td>Ln(Book Assets)</td>
<td>0.0967</td>
<td>0.0970</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(1.92)*</td>
<td>(1.65)*</td>
<td></td>
</tr>
<tr>
<td>$H$-index</td>
<td></td>
<td></td>
<td></td>
<td>-2.1011</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(-1.08)</td>
</tr>
<tr>
<td>$G$-index</td>
<td></td>
<td></td>
<td></td>
<td>-0.0225</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(-0.92)</td>
</tr>
<tr>
<td>lagged R&amp;D</td>
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<td></td>
<td>0.3052</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(2.24)**</td>
</tr>
<tr>
<td># of observations</td>
<td>7,872</td>
<td>6,168</td>
<td>6,168</td>
<td>4,565</td>
</tr>
<tr>
<td>Pseudo R²</td>
<td>0.0422</td>
<td>0.0486</td>
<td>0.0958</td>
<td>0.0896</td>
</tr>
</tbody>
</table>