

**Do Socially Responsible Firms Add Value for Their Employees?**  
**-- A Theoretical Examination of Corporate Employee Matching Grant Programs**

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Abstract

Many companies donate money for social causes, either directly at the firm level or indirectly by offering employee matching grants. Built upon a standard public good model, we show that (1) lump-sum corporate donation is equivalent to individual employees' personal donations; (2) employee matching grant programs, although could potentially act as a coordination mechanism to mitigate free-riding behavior and achieve Pareto improvement, cannot sustain because the employees have incentive to switch to work for regular firms paying a higher salary; (3) If there is an improvement in labor productivity in companies offering matching grant, then there exists a separating equilibrium in which socially conscious employees choose to work and stay with firms offering such a matching grant, while regular employees choose to work for firms without such a plan. Judging from the prevalence of employee matching grant programs in the real world, we conclude that socially responsible firms may add either pecuniary benefits of increased labor productivity or non-pecuniary benefits of collective "warm-glow" to their employees.

**Key Words:** corporate social responsibility, employee matching grants, public goods, corporate philanthropy, stakeholder society

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## 1: Introduction

In a famous essay, Milton Friedman (1970) argued that a corporation's sole purpose is to maximize shareholders' value. Under this doctrine, there seems no role for corporate charitable giving, because doing so will reduce the dividends available to shareholders. If shareholders wish to donate their dividends to charity, they are free to do so. Accordingly, corporate charitable giving is permissible if and only if it will be in the shareholders' long-term interest. A good example is corporate image enhancing charitable activities which are essentially advertising campaigns. Friedman's argument is welcomed by business community. For example, the former CEO of Coca Cola, Mr. Roberto Goizeta, made an equally passionate and persuasive argument about the objective of a modern corporation: to create value for shareholders.<sup>1</sup>

Despite insisting on creating shareholders value as the goal of modern businesses, thousands of corporations in the U.S. and other countries as well continue to either directly donate money to charities or indirectly establish matching grants programs for their employees. The firms with matching grants scheme will match with a certain ratio and up to a limit for every one dollar donated to an approved list of nonprofit organizations by an employee. In some companies, the matching grants have been extended to the retirees as well.<sup>2</sup> Why does the business community, on the one hand, generally favor Friedman's argument, but on the other hand, also set up charitable foundations and employees matching grants programs? This is the focus of the paper.

We consider socially conscious employees who derive utility from both private consumption and the provision of public goods. While many essential public services are provided by governments, nevertheless, nonprofit service providers have achieved great

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<sup>1</sup> See the webpage: <http://www.goizuetafoundation.org/essence.htm>.

<sup>2</sup> Organizations such as HEP Development Services provide data and matching services for nonprofits. On its website, HEP claims to have over 12,000 U.S. companies which have matching grants scheme on file. See the webpage: <http://www.hepdevelopment.com/products.cfm>.

results for many worthy causes which governments do not adequately fund. The budgets of those nonprofit organizations depend heavily on individual and corporate donations.<sup>3</sup> It is well known that voluntary contribution to the public good suffers from the free-riding problem. The equilibrium donations by individuals are short of Pareto efficient amount. Can corporate donation programs reduce the free-riding behavior and make employees and communities better off without reducing the profits for investors?

To study corporate charitable giving, we consider two alternative methods: lump-sum donations vs. employee matching grants. It is shown that companies make lump-sum donations, while cutting wages to their employees in order to keep the profits to investors constant, will crowd out employees' private donations and not achieve the efficient level in providing the public good. By contrast, corporate employee matching grants could potentially act as a coordination mechanism to mitigate the free-riding behavior and increase the total charitable donations, provided that either everyone in the economy is socially conscious or the employees can be forced to stay in the company. In the absence of severe penalty for these leaving the company, employees have incentive to defect to regular competing companies which offer higher salaries with no matching grants, therefore, rendering the match grant schemes unsustainable if there is no improvement in labor productivity in such firms. Tax deduction of charitable giving at both corporate and personal levels will not alter the conclusions.

Judging from the existence of numerous corporate donation programs in the real world, the above analytical results based on the standard model of charitable giving are at odds with the prevalence of such programs. We reach the conclusion that socially responsible firms with employee matching grants must add either pecuniary benefits of increased labor productivity or non-pecuniary benefits of collective "warm-glow" to their employees, or both. Otherwise, they will not be able to compete with regular companies. Increased labor productivity can lead to the equilibrium achieved by employee matching grant scheme sustainable, although at a much lower match ratio than the first-best one. Paradoxically, other things being equal, the higher weight the employees attached to the

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<sup>3</sup> See Andreoni (2006) for an excellent survey on the topic of philanthropy.

public good may make the equilibrium under the matching grant scheme the more difficult to sustain. This is due to the higher employees' voluntary contribution under the matching scheme, the greater temptation to defect when regular firms poach those employees with higher salaries. Therefore, the sustainable matching ratio is actually lower.

## 1.1 Related Literature

Our paper is related to two branches of literature in finance and economics: the objective of corporations and the voluntary provision of public goods.

The objective of corporation lies in the heart of corporate governance, investing, and business ethics. As the business sector takes on more prominent roles on the global stage, governments and non-profit advocacy groups increasingly demand corporations to be more concerned about the environmental and social impact of their activities.

There is a long debate of the corporate objective function in modern corporate governance and business practice: i.e., shareholders' value vs. stakeholders' value. While most academic economists and business leaders agree with Friedman's argument for shareholders' value, others argue that corporations should serve larger social purposes and be responsible not only to shareholders, but also to other stakeholders such as employees, creditors, customers, suppliers and communities; see Porter (1992), Freeman (2001), among others. That is, a firm has a Corporate Social Responsibility (CSR) beyond maximizing shareholders' value. Tirole (2006, pp. 56 – 64) offers a concise survey of the debate on this issue. In summary, both sides of the debate agree with the goals of stakeholder society. They differ in how to achieve them. The shareholder-value proponents argue that it is best to create contractual protection and regulations for negative externalities caused by shareholders' actions, while the stakeholder-value proponents are in favor of board representation by all stakeholders. For the latter approach, managers would serve multiple principals simultaneously. In such a stakeholder society, Tirole (2001) and Jensen (2001) outline several major obstacles: the

sharing of corporate control among stakeholders lead to insufficient outside financing and deadlocks in project selections; performance measures for the managers are not precise and easily quantifiable, resulting in managers' lack of accountability. Thus, Tirole (2001, Page 4) claims that "the proponents of the stakeholder society have not made a convincing case that efficient institutions can be designed that promote the underlying concept."

Embracing CSR does not necessarily require companies to undertake direct production of public goods or active involvement in social movements. Doing so could detract companies from their core business activities. Instead, companies, with shareholders' consent, could make an impact on society by donating money to non-profit charitable organizations which specialize in providing public goods.

Previous literature on corporate philanthropy has dealt with a number of issues. Earlier literature rationalizes that corporate donations, to a certain degree, are not different from other ordinary business expenditures to increase shareholders' gains. In this line of research, corporate donations are just a marketing strategy and used to improve the public image of the corporation (Mescon and Tilson 1987, Galaskiewicz 1997). Navarro (1988) goes beyond the advertising effect of corporate philanthropy. He considers the public good nature of corporate giving through the reduced production costs. Corporate contributions to the environment protection and education are good examples. Others consider corporate giving as a perk enjoyed by the managers. When the corporate governance is not strong and the free cash flow is plentiful, corporate giving to the managers' favorite charities is just another manifestation of the agency issues addressed by Jensen (1986). Indeed, Brown et al. (2006) link corporate charitable giving with agency costs: firms with larger boards and lower debt ratios tend to give more.

In our paper, we will assume that there are no agency costs and advertising effects associated with corporate donations. The markets for products, labor, and capital are competitive. Our investigation focuses on whether corporate donation programs, in

particular, the employee matching grant schemes, can act as a coordination mechanism to mitigate the free-riding behavior and achieve Pareto improvement for all parties involved.

## 1.2: Organization of the Paper

In Section 2, we will prove the equivalence between employees' private giving and corporate lump-sum donation to the charity when employees are socially conscious. Both approaches will lead to the under-provision of the public good. Our focus of the paper, however, is the employee matching grant scheme, which has not been caught attention by the researchers in the area. In Section 3, we will first show the Pareto efficiency of the corporate employee match grants scheme when everyone is socially conscious. Then we will tackle the issue that employees are not homogeneous. A competing business with no matching grants can attract not only regular employees with higher salaries, but also those socially conscious employees. A socially responsible firm has to consider the possibility that its own employees may "defect" to its competitors. Our results show that it is impossible to have employees matching grant scheme under the standard public good model. To explain this puzzle, in Section 4 we argue that there exists a separating equilibrium with a sustainable employee matching grant scheme, if there is an improvement in labor productivity. A numerical example with a Cobb-Douglas utility function is worked out to illustrate the optimal match ratio when there is an improvement in the labor productivity in socially responsible firm. Some discussions related to taxes or non-pecuniary benefits of collective "warm-glow" to their employees are included in Section 5. Section 6 concludes the paper.

## 2: Private Donations by Employees vs. Lump-sum Donation by the Firm

We adapt a model of voluntary contributions (See Warr 1982, 1983, Bergstrom et al. 1986, and Andreoni 2006) to public goods to study the individual and corporate donations. Suppose that there are  $N$  socially responsible *homogeneous* employees. For easy illustration, we assume that the employees' preference can be represented by a

continuous, twice differentiable utility function. Denote  $x_i$  the employee's private consumption,  $G$  the public good, the utility function for an employee is

$$U(x_i, G), \quad U_1 > 0, U_2 > 0, U_{11} < 0, U_{22} < 0, U_{12} \geq 0.$$

The requirement for the cross partial derivative,  $U_{12} \geq 0$ , simply means that an increased supply of the public good will not decrease the marginal utility of the private consumption. Furthermore, we assume that the utility function satisfies the Inada conditions:

$$\lim_{x \rightarrow 0} U_1(x, G) = +\infty, \quad \lim_{x \rightarrow +\infty} U_1(x, G) = 0.$$

The employee's budget constraint is

$$x_i + g_i = W_i,$$

where  $g_i$  is her private donation to a charity which provides the public good  $G$ ,  $W_i$  is her wage. The charity operates efficiently. There are no agency problems, so all of the money collected goes directly to the production of the public good. There are no taxes. Denote the (possible) donation by the firm to the charity as  $g_0$ ,

$$G = \sum_{i=1}^N g_i + g_0.$$

Let us first assume that everyone works for the same firm, which can choose to be one of the two types: type S (socially responsible) or type R (regular). Type S firm donates to the charity, while type R firm does not. The labor productivity is the same for both S and R. Therefore, if firm S decides to donate  $g$  per employee to the charity, the wage rate should satisfy the following condition:

$$W_S + g = W_R. \quad (1)$$

$W_S, W_R$  are the wage rate for firm S and R, respectively. That is, the total pay package to the employees remains constant, keeping the profit for the investors unchanged.

Suppose that the firm's managers decide not to donate to the charity. An employee will contribute the optimal amount of  $g_i$ , which can be found by maximizing the following utility function, given all other employees' giving at  $\bar{g}$

$$\max_{g_i} U(W_R - g_i, g_i + (N-1)\bar{g}).$$

The first-order condition for optimal donation is

$$-U_1(W_R - g_i, g_i + (N-1)\bar{g}) + U_2(W_R - g_i, g_i + (N-1)\bar{g}) = 0,$$

where  $U_1$  and  $U_2$  are the partial derivative of the utility with respect to the private good and the public good, respectively. The second-order condition for the maximum is satisfied.

At the Nash equilibrium, every employee contributes at the same level  $\bar{g}$ ,

$$-U_1(W_R - \bar{g}, N\bar{g}) + U_2(W_R - \bar{g}, N\bar{g}) = 0. \quad (2)$$

For simplicity, we will omit the subscript  $i$  from now on whenever doing so will not confuse the readers.

Alternatively, the firm can choose to be Type S: reduce the wage paid to its employees and donate the amount of  $\bar{g}$  to the charity. When a firm chooses this option, the total amount of public good is  $N\bar{g}$ , and the equilibrium condition (2) is satisfied. The employee therefore will be indifferent in working for R or S if and only if firm S offers the wage at

$$W_R = W_S - \bar{g}. \quad (3)$$

**Proposition 1:** *Assume all employees have the same preference. There exists equivalence between employees' private giving and corporate lump-sum donation to the charity when the total wage is kept constant.*

In Proposition 1, we have conducted a thought experiment that a firm can contemplate two alternatives: either provides the public good for all of its employees and therefore considered "socially responsible" (type S), or contributes nothing and the public

good is provided purely by private contributions of its employees (type R). Of course, there is a continuum of intermediate cases where a firm can partially contribute to the public good by the amount between zero and  $\bar{g}$ , and adjust its wage rate subject to the wage differential according to Equation (1). The main message is this: because of the nature of the public good, the amount contributed by the firm will crowd out individual employee's voluntary donation. The net result is that lump-sum donation by the firm leaves employees' welfare unchanged. This proposition is similar to that obtained in Roberts (1984), which claims that the spending by the government on public goods crowds out private donations.

Proposition 1 also extends the Modigliani-Miller type irrelevant proposition in corporate charitable giving derived by Zivin and Small (2005). In their study, employees' donation is treated as a private good, not as a public good. Therefore, Zivin and Small does not address the issue of free-riding behavior among givers to charities.

### **3: Corporate Employee Matching Grant Scheme**

In this section, we consider an alternative corporate philanthropic strategy. A firm of type S now considers adopting a matching policy: for each dollar contributed by the employees, S will match with  $h$  dollars. Suppose that the match ratio  $h$  is given. Under the scheme, let's denote each employee's donation as  $g^*$ . Correspondingly, firm S cuts the wage by  $hg^*$  per employee.

#### **3.1: Homogenous Socially Conscious Employees**

Let us assume that all employees are socially conscious. Under the matching scheme, the employee's utility function takes the form  $U(W_S^* - g^*, G^*)$ .  $W_S^*$  is the wage rate under the matching scheme. Throughout the paper, we use the asterisk (\*) to denote the

variables (such as donations, wages, etc.) under the matching scheme. Assuming an interior solution, the optimal donation satisfies the following first-order condition:

$$-U_1 + (1+h)U_2 = 0.$$

And in the Nash equilibrium,

$$-U_1(W_S^* - g^*, (1+h)Ng^*) + (1+h)U_2(W_S^* - g^*, (1+h)Ng^*) = 0. \quad (4)$$

To maintain the same level profit to the investors as required by competitive capital markets condition,

$$W_R = W_S^* + hg^*.$$

Now, we would like to compare the total amount of contributions to the public good under the two schemes. The proof of the following proposition is similar to the approach in the proof of Proposition 1 in Gong and Grundy (2007), where a large wealthy benefactor considers whether to use matching grant or seed money to lead a fund-raising campaign.

**Proposition 2:** *The total amount of contributions to the public good under the matching scheme is larger than under the alternatives.*

**Proof:** Based on Proposition 1, there is equivalence between the decentralized individual employee's donation and the firm's donation. Therefore, we will only need to compare the total amount of donation to the public good  $\bar{G}$  under the decentralized scheme for firm R, and the matching grant scheme offered by firm S.

Suppose otherwise and  $\bar{g} \geq (1+h)g^*$ . Recall the assumption that  $U$  is such that an interior solution is always attained under a matching system. The optimal conditions (2) and (4) can be rewritten as relations (5) and (6) respectively.

$$U_1(W_R - \bar{g}, N\bar{g}) = U_2(W_R - \bar{g}, N\bar{g}), \quad (5)$$

$$U_1(W_R - (1+h)g^*, (1+h)Ng^*) = [1+h]U_2(W_R - (1+h)g^*, (1+h)Ng^*). \quad (6)$$

Since  $U_1 > 0$ ,  $U_{11} < 0$ , and  $U_{12} \geq 0$ ,  $\bar{g} \geq (1+h)g^*$  implies the left-hand-side of (5) is greater than the left-hand-side of (6). But this implies that the right-hand-side of (5) must then be greater than the right-hand-side of (6). Since  $h > 0$ , we have

$$U_2(W_R - \bar{g}, N\bar{g}) \geq [1+h]U_2(W_R - (1+h)g^*, (1+h)Ng^*) > U_2(W_R - (1+h)g^*, (1+h)Ng^*)$$

But  $\bar{g} \geq (1+h)g^*$ ,  $U_2 > 0$ ,  $U_{22} < 0$ , and  $U_{12} \geq 0$  imply

$$U_2(W_R - \bar{g}, N\bar{g}) < U_2(W_R - (1+h)g^*, (1+h)Ng^*)$$

and we have a contradiction. **QED**

Therefore, the charity is strictly better-off, while the profits go to the investors are not reduced under such a matching scheme. But are employees better-off? To answer this question, we need to first find the optimal match ratio  $h$  by firm S, and then compare the utility of the employees with and without the matching scheme.

Let us assume that the socially responsible employer S, acting as a social planner, chooses the match ration  $h$  to maximize the employee's utility in stage one. In the second stage, the employees react according to Equation (4). For the two-stage game between the employer and the employees, we use the backward induction method to solve, which yields the subgame perfect equilibrium. The firm chooses  $h$  optimally,

$$\max U(W_R - (1+h)g^*, (1+h)Ng^*) \tag{7}$$

The first-order condition for the optimization (7) yields

$$\left( g^* + (1+h) \frac{dg^*}{dh} \right) (U_1 - NU_2) = 0 \tag{8}$$

Assuming that

$$\left( g^* + (1+h) \frac{dg^*}{dh} \right) \neq 0,^4$$

comparing equation (8) with equation (6) yields the optimal match ratio at

$$h^* = N - 1. \tag{9}$$

It is straight-forward to verify that the second-order condition is met. That means, the utility of the employees as a function of h in firm S has a single peak. Thus, we have proved the following proposition.

**Proposition 3:** *Under the current model set-up, the optimal match ratio under the matching scheme is  $h^* = N - 1$ .*

We are now able to prove that employees are better off working for firm S with a matching grant scheme than working for firm R. Combining with the previously established equivalence result between firm R and firm S with a lump-sum donation, the welfare implications of the employee matching grant scheme can be summarized in the following proposition.

**Proposition 4:**  *$U^*(x^*, G^*) > U(\bar{x}, \bar{G})$ . That is, employees at the socially responsible firms with the matching scheme are strictly better off than working for regular firms or firms offering lump-sum donations.*

**Proof:** Let  $U^*$  be the employee's utility for working at firm S with a matching grant scheme,  $U$  be her utility for working at firm R, respectively. Since  $h = 0$ , which corresponds to the case of no matching, is always an option for firm S. From

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<sup>4</sup> Suppose this is not the case, then  $g^*$  should satisfy the differential equation  $\left( g^* + (1+h) \frac{dg^*}{dh} \right) = 0$ . The

general solution is  $g^* = C/(1+h)$ , where C is an arbitrary positive constant. If the firm can co-ordinate and force each employee to donate a fixed amount to the charity, C may be found in some special cases by solving the following optimization program:  $\max_C U(W_R - C, NC)$ . For example,  $C = \beta W_R / (\alpha + \beta)$  in the

Cobb-Douglas utility function,  $U = x^\alpha G^\beta$ . However, we will ignore such these kind of centralized decision in the following analysis.

Proposition 3, an optimal match ratio, chosen by a benevolent firm, is found to be  $N-1$  which is greater than zero. Therefore, it must be the case that employees are better off with such an optimal match grant scheme than without such a scheme. **Q.E.D.**

In summary, if all employees are socially conscious, then a socially responsible company can fund an employee matching grant scheme through a reduction in the wages paid to its philanthropic employees. The company's shareholders bear no cost. Why then is the company's board feted for its "generosity"? Because their adoption of a corporate matching grants scheme allows the employees to co-ordinate and achieve an equilibrium combination of private and public good consumption that they prefer to that attained when they are paid more but make their donations without a match. The charity is able to raise more than it could in the equilibrium of individual donations from better-paid employees. In doing so, the board of directors has implemented a Pareto efficient allocation and demonstrated that it is "socially responsible" without reducing investors' profits.

### 3.2: Heterogeneous Employees

We retain all of the assumptions made in subsection 3.1, except that now there are two classes of employees: socially conscious employees who derive utility from the consumption of the public good and regular employees who do not enjoy the public good provided by the charity.

To attract regular employees, competing firms will be established to offer their workers higher salaries without matching grants. For modeling purposes, let us assume that there are two firms now in the economy. Firms are identical except one of them, called S, has an employee matching grant scheme, and the other, R, does not have such a plan and will not contribute to the charity. Further assume that the labor productivity is the same for both firms. Consequently, they offer the same total pay package as required by competitive labor market conditions. If one employee moves to another firm, the labor

productivity will remain the same for both firms as well. As S will have to offer lower nominal wage to its workers, regular type will not choose to work for S. The interesting issue is that, under what conditions, there is no incentive for the socially conscious employees to work for firm R. Intuitively, socially conscious workers could work for R with a higher pay, while still enjoy the benefits of the public good provided contributed by those who remain working for S. This reflects the nature of the public good: it is available to everyone and non-excludable.

The purpose of this further analysis is to see whether the optimal matching scheme is sustainable when the socially conscious employees have the opportunity to switch. It would be interesting to see under what conditions there will be co-existence of different type of firms for different types of employees – a separating equilibrium. We start with the assumption that a socially conscious worker initially chooses to work and stay at firm S. When a competing regular firm appears, if she decides to defect to firm R, while holding other people’s employment unchanged, then she cannot be excluded from enjoying the benefits of the public good provided by those remaining in firm S. The following proposition illustrates the difficulty in a frictionless economy to establish the corporate employee matching grant by employers due to the “free-riding” behavior.

**Proposition 5:** *If a socially responsible firm S offers an employee matching grant scheme with a fixed match ratio  $h > 0$ , then in a frictionless economy, employees at firm S are always better off by “defecting” to firm R which does not offer such a matching program.*

**Proof:** A socially conscious employee who does defect will 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  $\bar{g}$  after the defection. Note that  $\bar{g} = \bar{g}[\hat{g}, h]$ , a function of both  $\hat{g}$  and  $h$ .

We first wish to show that defection will always occur unless  $h$  is chosen as a function of the number of employees at firm S. Let  $N$  denote the number of employees at firm S.

To establish the conjectured result we assume that it is not true and that  $h$  is not a function of the number of employees remaining with firm  $S$ . The defector will then solve

$$\max_g U(W_R - g, (N-1)g[g, h](1+h) + g) . \quad (10)$$

One feasible strategy for the defector is to donate an amount equal to  $g^*(1+h)$ . In this event  $\bar{g} = \bar{g}[g^*(1+h), h] = g^*$  and the defector achieves a level of utility identical to that which she would have achieved by remaining with firm  $S$ . But this will not be the optimal donation for her to choose. She could achieve a higher level of utility by instead choosing to donate some amount less than  $g^*(1+h)$  post her defection. **Q.E.D.**

Proposition 5 states that if there is to be an equilibrium without defection, it will require that  $h = h[N]$ . One obvious solution is that  $h = N-1$  if no one defects, and  $h = 0$  if one or more employees defect. Unless this severe penalty in existence, employees will always be attracted to higher salaries offered by competing regular firms. The next section is devoted to the possible solutions which address how to overcome the switching issue.

#### **4: Impact of Increased Labor Productivity**

In this section, we will discuss a potential benefit of the employee matching grants which may be able to explain the popularity of such programs. We point out that incorporating possible increased labor productivity in firm  $S$  and sharing of common interests will potentially make socially conscious employees reluctant to leave firm  $S$  in pursuit of higher nominal salaries in the competing firm  $R$ .

##### 4.1: Differential Labor Productivity

Some recent researches suggest that there may be a difference in labor productivity when firms care about the social interactions of their employees. To elaborate on this point,

note that firms offering employee matching grants attract a certain type of employees who are passionate about social or environmental concerns and linked through this common interest. Regular employees choose to work for regular firms without such matching grants. Sociologists have long articulated that “features of social life-networks, norms, and trust, that enable participants to act together more effectively to pursue shared objectives” as social capital (see Putnam 1993). The concept of social capital, i.e., how relationship affects individual decision making has also been studied by economists at many different levels.<sup>5</sup> Employee matching grants, made to a list of approved non-profit charitable organizations, can act as the linking social capital. Sabatini (2006a) finds the evidence that the linking social capital of voluntary organizations improves labor productivity in small-to-middle sized Italian enterprises.

Now suppose that there is such a difference. Assume that the capital market is competitive. The labor productivity at firms offering matching grants is higher than that at firms without it. With higher labor productivity, firm S could pay higher salaries than otherwise, thereby reducing the incentives for its employees to switch. Under this condition, a separating equilibrium exists. That is, regular employees work for regular companies without matching grants, while socially conscious employees work for socially responsible firms.

We proceed to prove the existence of the separating equilibrium by establishing three lemmas. The first one states that a firm’s matched contribution to the public good is always positively related to the match ratio.

***Lemma 1:***  $hg^*(h)$  must always be increasing in  $h$ .

**Proof:** Suppose that there exists an employee matching grant scheme. For a given match ratio  $h$ , each employee solves

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<sup>5</sup> There are a number of excellent books and surveys on this topic; see Dasgupta and Serageldin (2000), Sobel (2002), Sabatini (2006b) among others. More information on social capital can be found on the website: [http:// www.socialcapitalgateway.org/](http://www.socialcapitalgateway.org/).

$$\max_g U\left(W_R(1+\Delta) - g^*h - g, (N-1)(1+h)g^* + (1+h)g\right)$$

The first order condition thus can be written as

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

For notational ease, we define  $\tilde{g} \equiv (1+h)g(h)$ .

Consider two match ratios,  $h^A$  and  $h^B$ , with  $h^A > h^B$ . Suppose that in fact  $\tilde{g}^A < \tilde{g}^B$ .

That is,  $(1+h^A)g(h^A) < (1+h^A)g(h^B)$ .

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

$$U_1\left(W_R(1+\Delta) - \tilde{g}^A, N\tilde{g}^A\right) = (1+h)U_2\left(W_R(1+\Delta) - \tilde{g}^A, N\tilde{g}^A\right) \quad (11)$$

and

$$U_1\left(W_R(1+\Delta) - \tilde{g}^A, N\tilde{g}^A\right) = (1+h)U_2\left(W_R(1+\Delta) - \tilde{g}^A, N\tilde{g}^A\right) \quad (12)$$

The assumptions that  $U_1 > 0$ ,  $U_2 > 0$ ,  $U_{11} < 0$ ,  $U_{22} < 0$ ,  $U_{12} \geq 0$  and the supposition that  $\tilde{g}^A < \tilde{g}^B$  when  $h^A > h^B$  has the following contradictory implications: The left-hand-side of equality (11) is smaller than the left-hand-side of equality (12), but the right-hand-side of equality (11) is greater than the right-hand-side of equality (12).

Now consider the effect of  $h$  on  $hg^*(h)$ . We know that  $(1+h)g^*(h)$  is always increasing in  $h$ . Suppose that  $hg^*(h)$  were decreasing in  $h$  over some range. Then  $g^*(h)$  would have to be decreasing in  $h$  over that range. This implies that  $hg^*(h) + g^*(h)$  is decreasing in  $h$  over the same range. But this is impossible. Thus,  $hg^*(h)$  must always be increasing in  $h$ .

**QED.**

We will later show that if there exists an  $h$  such that  $hg^*(h)=W_R\Delta$ , then there exists a separating equilibrium. For this purpose, given that  $\frac{\delta hg^*(h)}{\delta h}>0$ , we would like to obtain  $\lim_{h \rightarrow \infty} hg^*(h)=(1+\Delta)W_R$ . Since  $\lim_{h \rightarrow \infty} g^*(h)=0$ , equivalently, we would like to prove the following lemma.

**Lemma 2:**  $\lim_{h \rightarrow \infty} (1+h)g^*(h)=(1+\Delta)W_R$ .

**Proof:** Suppose otherwise and there exists a positive value  $B$ ,  $B<(1+\Delta)W_R$ , such that

$\lim_{h \rightarrow \infty} (1+h)g^*(h)=B$ . Again, the first-order condition requires

$$\frac{U_1\left(W_R(1+\Delta)-g^*(h)(1+h), N(1+h)g^*(h)\right)}{U_2\left(W_R(1+\Delta)-g^*(h)(1+h), N(1+h)g^*(h)\right)}=1+h \quad (13)$$

Take the limit on both sides of (3) as  $h$  approaches to the 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 an infinity. Therefore, this is a contradiction. **QED.**

**Lemma 3:** There exists a match ratio  $\bar{h}$  such that  $\bar{h}g^*(\bar{h})=\Delta W_R$ .

**Proof:** As  $\lim_{h \rightarrow 0} hg^*(h)=0$  and  $\lim_{h \rightarrow \infty} hg^*(h)=(1+\Delta)W_R$ , and  $hg^*(h)$  is increasing in  $h$ , the property of continuous function ensures that there exists a solution such that  $\bar{h}g^*(\bar{h})=\Delta W_R$ . **QED.**

Finally, we are ready to prove the existence of separating equilibrium.

**Proposition 6:** *There exists separating equilibrium that socially conscious employees will stay in Firm S that offers a matching grant scheme and*

*regular employees will choose to work for Firm R, which does not offer such a matching scheme nor make any donations to charity.*

**Proof:** To ensure that regular type of employees working for Firm R do not switch to work for Firm S, we require that  $\Delta W_R < hg^*(h)$ . That is, the nominal pay at Firm S is not higher than that at Firm R. Now, we focus on the condition for socially conscious employees to stay in Firm S. To do so, it is necessary that

$$\begin{aligned} & \max_g U(W_R(1+\Delta) - g^*h - \bar{g}, (N-1)g^*(1+h) + \bar{g}(1+h)) \\ & > \max_g U(W_R - \bar{g}, (N-1)g^*(1+h) + \bar{g}) \end{aligned} \quad (14)$$

From Lemma 3, there exists an  $h$  which satisfies  $hg^*(h) = \Delta W_R$ . Let  $\bar{h}$  denote this match ratio. Given this match ratio, socially conscious employees will not defect: Although the private good consumptions can be the same in at both firms, type-S employees will enjoy a higher level of public goods consumption at Firm S for any given level of private good consumption. By the property of continuous functions, there exists some  $h > \bar{h}$  in the neighborhood of  $\bar{h}$ , such that  $\Delta W_R < hg^*(h)$  (and hence type R employees will not defect) and such that type-S employees will not defect. Thus, we have proved the existence of a separating equilibrium. **QED.**

Furthermore, the match ratio  $h$  can not be too large, because socially conscious employees will be better off by seeking employment in regular firms, as the nominal pay from Firm S can be too low.

**Proposition 7:** *As the match ratio is far greater than  $\bar{h}$  and approaches to the infinity, the defection of Type S employees will always occur.*

**Proof:** To stay in Firm S, the utility of a Type-S employee can be represented as

$$\max_g U(W_R(1+\Delta) - g^*h - \bar{g}, (N-1)g^*(1+h) + \bar{g}(1+h)). \quad (15)$$

If the employee moves to work for Firm R, then her utility could be achieved as the result of the following optimization

$$\max_g U(W_R - g, (N-1)g^*(1+h) + g). \quad (16)$$

From Lemma 2,  $\lim_{h \rightarrow \infty} (1+h)g^*(h) = (1+\Delta)W_R$ . This points out that as the match ratio approaches to the infinity, the private good consumption drops to zero, if she stays in Firm S, although her consumption of the public good would be at a higher level. The Inada conditions for the utility function require that  $\lim_{x \rightarrow 0} U_1(x, G) = +\infty$ . As she moved from Firm S to Firm R, the marginal utility of her private consumption will be far higher than the marginal utility lost due to the reduced level of public good consumption. Therefore, a Type S employee will always defect when the match ratio is too high.

**Q.E.D.**

In the following subsection, we will work out a detailed numerical example to illustrate how the corporate employee matching grant could survive the free-rider problem and why in practice, the observed match ratio is much lower than the first-best solution  $h = N-1$ .

#### 4.2: A Numerical Example

In this part, we will use a Cobb-Douglas utility function to illustrate the separating equilibrium when there is increased labor productivity for socially responsible corporations.

Suppose a socially conscious employee has the following utility function:

$$U = x^\alpha G^\beta, \quad 0 < \alpha, \beta < 1, \quad \alpha + \beta = 1.$$

Suppose Firm S offers a match ratio  $h$  and there are  $N$  employees. It can be shown that the Nash equilibrium amount of an employee's contribution is:

$$g^* = \frac{\beta(1+\Delta)W_R}{\alpha N + \beta(1+h)}.$$

The critical value of the match ratio  $\bar{h}$ , as derived in Lemma 3, is

$$\bar{h} = \frac{(\alpha N + \beta)\Delta}{\beta}.$$

For a more concrete example, assume that  $\alpha = \beta = 0.5$ ,  $N=100$ ,  $\Delta=2\%$ ,  $W_R = 10,000$ .

Then  $\bar{h}=2.02$ . In this case, a separating equilibrium exists when the match ratio is slightly higher than 2.02. For instance, it is easy to verify that, when  $h = 2.030$ , the nominal pay at Firm S is  $W_S = 9,999.03$ , which is lower than  $W_R$ , thus there is no incentive for regular workers to move from Firm R to Firm S. At the mean time, the utility of a socially conscious employee staying at firm S is 17232.88, which is higher than the level of the utility at 17232.85, when the same employee moves to work for firm R and the other employees remain. However, when  $h$  increases, Type S employees will find switching to work for regular firm R is more attractive. In this example, as long as  $h$  is higher than 2.031, the defection will occur. As the employees' utility is an increased function of match ratio  $h$ , other things being equal, the separating equilibrium can be achieved at the match ratio at 2.030 (to the precision of three digits). Please note that the socially conscious employee's contribution to the public good will be bounded below at zero when he moves to Firm R.<sup>6</sup>

Further calculations show the comparative static relation between the optimal match ratio  $h$  and the productivity gain  $\Delta$ , the number of employees in firm S, and the employee's preference  $\alpha$ , respectively. In summary,

- a. Other things being equal, the higher the productivity gain  $\Delta$  for the socially responsible firm S, the higher the optimal match ratio can be offered by firm S;
- b. The higher the number of employees in firm S, the higher the optimal match ratio;
- c. The higher the preference parameter for the private good  $\alpha$ , the higher the optimal match ratio.

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<sup>6</sup> That is, a negative contribution to the public good is prohibited.

The last point needs some explanation. Intuitively, when  $\alpha$  is relative low and  $\beta$  is relatively high, employees in firm S will contribute more to charity because they put less weight on their enjoyment of the public good, absence of the competing regular companies. When a competing firm promises to offer a higher pay but without matching grants, employees at firm S will have stronger incentive to switch, because the benefit of getting a free-ride from those staying at firm S will be higher. Similarly, if employees at firm S have a lower preference with regard to the public good, they are less likely to consider switching, and consequently, the optimal match ratio can be set higher without worrying about the defection of those employees. Ironically, the end result is that the employees with lower marginal utility of the public good will stay with the company S, and have a higher utility as the result! This can be seen from two cases: one is  $\alpha=0.5, \bar{h} = 2.02$ . By contrast, the other case is  $\alpha=0.6, \bar{h} = 3.02$ .

## 5: Other Considerations

In this section, we will consider other factors which may or may not make the coordination mechanism of employee matching grant schemes to work.

### 5.1: Collective “Warm-Glow”

As pointed out by Andreoni (1988, 1989), many donors enjoy private psychological benefit from the act of giving, termed as “warm glow.” The employees’ utility takes the form  $U(x, g, G)$ . Such a warm glow effect will be reduced and even disappear completely when the corporations make lump-sum donations on the behalf of their employees. By contrast, under the employee matching grants program, individual employees still contribute a non-negative amount from their own pockets. As the employees’ utility is an increasing function of the match ratio  $h, h \in [0, N - 1)$ , employees are better off when the matching grants scheme is adopted, even without the consideration of the “warm glow” effect. With the additional element of the “warm glow,” the matching grants scheme will

further increase each employee's utility than the lump-sum donation by the corporation on the behalf of its employees.

We can go beyond the individual “warm glow” induced by the employee's personal contributions to the charity. People enjoy more working with like-minded peers. This may lead to higher labor productivity, the consequence of which has already been addressed. In this section, we argue that even without such a pecuniary benefit of increased labor productivity, as long as employees enjoying working with like-minded peers, then matching grants scheme can act not only as a *coordination* mechanism to mitigate the free-riding behavior in the provision of public goods, but also a *bonding* mechanism for team members. Such a bonding mechanism works better for smaller teams/firms. Therefore, while the previous example illustrates that larger firms are easier to implement the employee matching grant schemes from the coordination mechanism point of view, smaller firms can also implement the matching grant scheme if the bonding effect is strong.

For employees, a move to a regular company which does not offer a matching scheme will reduce their utility, other things being equal. To characterize this preference, the employee's utility function is dichotomous:

$$U = (1 + \lambda I_e)U(x_i, g_i, G),$$

where  $I_e$  is an indicator function,

$$I_e = \begin{cases} 1, & \text{if the employee stays with firm } S; \\ 0, & \text{if the employee works for firm } R. \end{cases}$$

$\lambda$  measures the positive effect of collective “warm glow.”

It is easy to show that with this specification, bonding mechanism will make the employees reluctant to move to regular companies which offer a higher nominal salary, therefore, smaller firms could also implement employee matching grants, provided such a bonding effect is strong.

## 5.2: Impact of Corporate and Personal Taxes

Some may wonder whether tax deductibility for donations will alter our conclusions so far. We will first show that there is still a crowding-out effect for lump-sum corporate contribution on individual employees' giving, and in a frictionless economy, tax deductibility will not affect the sustainability of the matching grant scheme.

To see this, denote  $\tau_c, \tau_p$  as the tax rate for corporate income and personal income, respectively. Let us consider the corporate lump-sum donation first. When the firm donate  $\bar{G} = N D^{corp}$  per employee to charity, employees will be paid at a reduced rate of  $W_S$ . The indirect utility function for the workers at the socially responsible firm is:

$$V(W_S (1 - \tau_p); \bar{G}). \quad (17)$$

That is, each employee will have  $W_S (1 - \tau_p)$  amount in after-tax salary, while the company donates  $D^{corp}$  per employee to charity. Similarly, the indirect utility function for an employee if the firm chooses not to donate is:

$$V(W_R (1 - \tau_p) - g (1 - \tau_p); Ng). \quad (18)$$

This means that each employee will have  $W_R (1 - \tau_p)$  amount of after-tax income and voluntarily donate  $g$  to charity. This reflects the fact that individual donations are tax deductible.

Because both salaries and donations are tax deductible at the corporate level, there is no difference from the point of after-tax profits to investors:  $W_R = W_S + D^{corp}$ . Inspecting Expressions (17) and (18), we see that if  $D^{corp} = g$  then socially conscious employees are indifferent whether the company contributes to the charity or not.

To see this problem more clearly, from the employee's perspective, the total tax burden remains the same whether the company donates money on its employees or not. For a regular company, the tax collected is:

$$\tau_p W_R - \tau_c W_R - g \tau_p;$$

For a socially conscious company with a lump-sum donation, the tax collected is:

$$\tau_p W_S - \tau_c W_S - D^{corp} \tau_c.$$

Because  $W_R = W_S + D^{corp}$ , and  $D = D^{corp}$ , simply algebra shows that the tax burden for the employees are the same. This extends Proposition 1 in the context of taxation.

Now, let us pay the attention whether the matching grants scheme could survive switching problem under taxes. If the socially responsible firm decides to offer its employees a match ratio  $h$  for their donations, then the individual's contribution to the public good could increase or decrease. The calculation is similar to Proposition 11 in Gong and Grundy (2007). However, the free-rider problem will prevail. Socially conscious employees will have the incentive to switch to work for regular companies with a higher pay and no matching grants. The reasoning process of Proposition 5 will prevail with or without taxes.

## 6: Conclusion

In this article, we have addressed the role of corporate donation programs for charitable giving in promoting employees' and communities' welfare. Assuming that the utility functions of socially conscious employees depend on not only the private consumption, but also the provision of public goods, we show that lump-sum corporate donation will crowd out private donations, and therefore it is equivalent to individual employees' personal donations. That is, the best the corporate lump-sum donation can achieve is what decentralized individual employees' donation can do.

We then focused on employee matching grant programs. Other than either all employees are socially responsible or a severe penalty is imposed if any employee moves to work for a regular company, the employee matching grant schemes cannot sustain because the employees have incentive to switch to work for regular firms paying a higher

salary for any given match ratio. Tax deductions of corporate and individual donations will not alter the conclusions. However, a separating equilibrium has been proved to exist when there is an improvement in labor productivity in firms offering matching grants. Judging from the prevalence of corporate employee matching grant programs in the real world, we conclude that socially responsible firms must add either pecuniary benefits of increased labor productivity or non-pecuniary benefits of collective “warm-glow” to their employees.

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