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Andrew A. Samwick
Sophie Wang

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ABSTRACT

This paper analyzes the impact of corporate social responsibility (CSR) on the total provision of public goods in a framework in which consumers who may make such voluntary contributions to public goods via CSR are also voters who decide on the level of taxes to finance publicly provided public goods. The main result indicates that, relative to an economy in which all public goods are publicly financed, the introduction of CSR lowers the total amount of public goods, as voters rationally anticipate that higher CSR will partially offset the consequences of lower public funding. The results offer a cautionary tale about the promotion of CSR in an economy with heterogeneous preferences for the public good.

Andrew A. Samwick
6106 Rockefeller Hall
Department of Economics
Dartmouth College
Hanover, NH 03755-3514
and NBER
andrew.samwick@dartmouth.edu

Sophie Wang
Dartmouth College
sophie.wang32@gmail.com

1 Introduction

The Business Roundtable made headlines in 2019 when, for the first time in over two decades, it issued a Statement on the Purpose of a Corporation that acknowledged specific responsibilities to stakeholders beyond shareholders, including customers, employees, suppliers, and communities. Such Corporate Social Responsibility (CSR) has been growing markedly in recent years. Dattani et al. (2015) establish a baseline of $20 billion spent on CSR in 2013 by Global Fortune 500 companies. Stobierski (2021) reports that between 2011 and 2019, the share of S&P 500 companies publishing a CSR Report rose from 20 to 90 percent.

In a review of the early economics literature on CSR, Kitzmueller and Shimshack (2012) define CSR as "the corporate provision of public goods or reduction of negative externalities beyond what is required by law." Much of the scholarly discussion of CSR has focused on the motives that shareholders would have for CSR, starting with and often responding to Friedman (1970)'s seminal essay. His conclusion that the only social responsibility of business is to increase profits is facilitated by assumptions that shareholders can achieve their philanthropic objectives equally well outside the firm and would prefer to do so.

For example, underlying Friedman's contention is the assumption that there are no advantages to contributions by shareholders acting in concert via the corporation relative to contributing as individuals on their own. Contrary to this assumption, Bénabou and Tirole (2010) posit that the firm may face lower transactions costs in making donations or mitigating externalities as a rationale for shareholders delegating philanthropy through CSR.[1] In a brief essay commemorating the 50th anniversary of Friedman (1970), Hart (2020) expands this argument by noting that giving through the corporation may help overcome free-rider problems in individual giving to public goods, as each shareholder's "donation" is conditional on the donations of all the other shareholders. Additionally, as several authors, most notably Baron (2001), have noted, CSR may be "strategic" in the sense that it responds to stakeholder preferences for this voluntary overcompliance and, in doing so, may enhance profitability.[2]

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[1] El Ghoul et al. (2017) show that CSR is more positively associated with firm value (as measured by Tobin's q) in countries with weaker market institutions, suggesting that CSR is helping to counteract greater transaction costs and limited access to resources.

[2] That companies are responding to stakeholder preferences is suggested by Rubin (2008)'s findings that companies with high CSR ratings are typically in "blue" states or counties whereas companies with low CSR ratings are typically in "red" states or counties. Similarly, Di Giuli and Kostovetsky

Friedman acknowledged this possibility in his essay and focused instead on value-reducing CSR that responds to managerial preferences that differ from those of the shareholders.

However, CSR can also emerge as the expressed desire of shareholders rather than as an agency conflict between shareholders and managers. As Hart and Zingales (2017) argue, shareholders often act in prosocial ways, at their own expense, in their isolated decisions as individuals. It is natural that they would also seek to do so in their roles as shareholders, when they can share the costs of their philanthropic behavior with others. In light of this, maximizing shareholder welfare need not be the same as maximizing market value. Further, Baron (2007) develops a theory of CSR in an analytical model that reflects the economic environment envisioned by Friedman (1970) and shows that prosocial entrepreneurs will form firms, even at a financial loss, to open up new opportunities for others to engage in CSR.[3]

Less well developed in the existing literature are the downstream consequences of the availability of CSR on the behavior of the stakeholders other than shareholders. To analyze such consequences, we abstract from the shareholder considerations noted above, assume identical costs for the public good across private CSR and tax-financed public provision, and posit free entry by firms that drives economic profits to zero for any degree of CSR.[4] Our model takes as its starting point that of Besley and Ghatak (2007), who show that a stylized version of CSR can be modeled in the framework of voluntary, private contributions to public goods introduced by Bergstrom et al. (1986). In a model of pure public goods with two types of consumers – those who care about the public good and those who do not – they demonstrate that CSR generates a Pareto improvement, as caring consumers will engage in CSR and neutral consumers will not change their behavior. They further show that an exogenous

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(2014) find that firms with Democratic founders or CEOs spend more on CSR. While they also find that increases in firm CSR ratings are associated with negative future stock returns and declines in the firm's return on assets, Friede et al. (2015) find, in aggregating data from over 2,000 studies, that there is generally a nonnegative (though not necessarily causal) relationship between environmental, social, and governance criteria and corporate financial performance.

[3]See Schmitz and Schrader (2015) for a more extensive discussion of the motives corporations might have for CSR. In a recent survey of the literature, Hong and Shore (2022) conclude that shareholder interest in CSR is driven primarily by non-pecuniary motives – a willingness to sacrifice returns to address various firm externalities – rather than by pecuniary motives like the pursuit of abnormal rates of return.

[4]We thus also abstract from the interaction of CSR with oligopolistic competition. See Bagnoli and Watts (2003) for such a model.

increase in the public provision of the public good will crowd out voluntary provision by CSR.

Our investigation of CSR is motivated by the observation that the consumers who decide whether to engage in CSR via their purchases are also the voters who decide whether to tax themselves to provide the public good through the public sector. To consider the implications of this duality, we augment the model of Besley and Ghatak (2007) in two ways. First, we allow for multiple caring types of consumers, who engage in CSR to varying degrees according to their preferences. This change to the model necessitates using the version of their model with an impure public good, incorporating the "warm glow" of giving described by Andreoni (1989, 1990).[5] In our model, individuals differ only in the intensity of their preference for the public good, with separate parameters indexing the direct utility from the total stock of public goods and the warm glow of giving through CSR. Second, we introduce a first-stage of voting on the amount of tax-financed public good to be provided. The "warm glow" is assumed to be generated by the voluntary contributions to public goods provided through CSR but not by taxes.

Endogenizing the amount of the public good provided through taxes allows us to consider the extent to which the prospect of subsequent CSR *by consumers* crowds out public provision *by voters*. We compare the level of public goods under three regimes distinguished by how they can be funded: Public Only through taxes, Voluntary Only through CSR, and Public and Voluntary through both. We derive the equilibrium under each regime and show that the total provision of public goods is lower when CSR and public provision are both possible compared to when all public goods are provided publicly through taxes. Voters rationally anticipate that lower CSR will partially offset the consequences of higher public funding, and this offset lowers the marginal benefit of supporting higher taxes to finance public provision. For a given marginal cost of providing the public good, this reduction in the marginal benefit reduces the equilibrium amount of the public good. In general, the addition of CSR opportunities does not generate a Pareto improvement. We show conditions under which a majority coalition prefers the hybrid regime, despite its lower level of public goods.

Our results are most similar to the prior work of Calveras et al. (2011) and Epple

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[5]See Cornes and Sandler (1994) for an early analysis of the comparative static properties of such a model.

and Romano (2003), who explore private contributions to public goods in frameworks without explicit CSR. Calveras et al. (2011) define a more "altruistic" society as one in which warm glow preferences for private contributions are stronger. They show that majority voting in a more altruistic society leads to a lower tax rate and may also lead to lower equilibrium provision of the public good. Epple and Romano (2003) use a framework in which households have the same preferences but differ in their endowments of income. Households vote over an income tax but do not face a labor-leisure tradeoff. They show that while permitting private contributions may lead to a reduction in total provision of the public good, a majority always favors permitting private contributions.

The remainder of the paper is organized as follows. In Section 2, we expand the framework of Besley and Ghatak (2007) to incorporate multiple caring types with a warm glow of CSR. We start with the social optimum and then derive the equilibrium levels of public goods when there is a first stage of majority voting before CSR decisions take place. We compare public good provision under the three regimes in Section 3, deriving the main result that CSR reduces the total amount of public goods. We provide conditions for a majority to prefer the hybrid regime in Section 4 and consider the impact of changes in preferences toward more caring for public goods in Section 5. Section 6 discusses the implications of our findings and concludes. The results offer a cautionary tale about allowing and promoting CSR if the objective is to increase the total amount of the public good.

2 Model

Our model builds on that of Besley and Ghatak (2007), who analyze CSR in the context of a model with two types of consumers, caring and neutral toward CSR. We adopt their notation where possible. Because we seek to study the interplay between voting for publicly provided public goods and CSR, we expand their framework to have multiple types that might care, to different extents, about the public good, through both the total amount of the public good and the "warm glow" that consumers get through their individual amounts of CSR. Individuals decide, as voters, on an amount of the public good provided by the public sector while the same individuals, as consumers, decide on how much CSR to engage in via their consumption. In both cases, our assumptions are meant to be less restrictive and more realistic,

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acknowledging that voters are ultimately responsible for setting the level of taxes and thus publicly provided public goods and that preferences for public goods are more varied than a population that either cares or not about the level of public goods.

The model of Besley and Ghatak (2007) is set in an environment where there is one type of public good and two types of private goods. The public good must be produced while one private good is produced and the other is endowed to all producers and consumers in the amount b. Consumers can make voluntary contributions to the public good through CSR by buying from a producer that bundles the private good with an amount θ of the public good. Each unit of the public good costs α, whether produced by the public sector in amount G or contributed via CSR. They also assume there is free entry from producers who compete in Bertrand fashion and thus earn zero profits. They produce the private good at cost c plus $\alpha\theta$, for the amount of the CSR associated with the purchase. With zero profits, the price for the private good bundled with an amount θ of the public good is $p = c + \alpha\theta$. The model thus abstracts from both entrepreneurs' motivations for CSR and any interaction of CSR with strategic competition in product markets.

We assume a population of individuals of size N who are distinguished by their preference parameters for the public good, γ_i and η_i. We specify a utility function for individual i of the form:

$$U_i = b - (c + \alpha\theta_i) - \frac{\alpha G}{N} + \gamma_i f(G + \Theta) + \eta_i v(\theta_i) \qquad (1)$$

Public goods provided by the public sector are financed by a lump sum tax, in the amount of $\frac{\alpha G}{N}$. Individuals derive utility from the public good in two ways. The first is through the total amount of the public good, $G + \Theta$, where $\Theta = \sum_{i=1}^{N} \theta_i$. The function $f(G + \Theta)$ is assumed to be increasing and strictly concave, with $f' > 0$ and $f'' < 0$. The second is through the warm glow of the CSR, $v(\theta_i)$, similarly with $v' > 0$ and $v'' < 0$.[6] Our approach is to impose minimal assumptions on the joint distribution of the preference parameters, $\{\gamma_i, \eta_i\}$, beyond their non-negativity and a technical assumption that if γ_i is non-zero, then η_i is also non-zero. Thus, our model differs from Besley and Ghatak (2007) in three main ways. First, we allow for a non-exogenous level of G which is financed by a lump sum tax. Second, we allow

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[6]These assumptions are consistent with the findings of Carpenter (2021), who uses a field experiment to show that for donors motivated by the warm glow of giving, its shape is increasing and concave.

for multiple types beyond $\gamma = 0$ or $\gamma = 1$. Third, the existence of multiple types engaging in CSR requires the assumption of "warm glow" utility, which, as Besley and Ghatak (2007) note, leaves their main results essentially unchanged. In so doing, we introduce a separate preference parameter to index the strength of the warm glow, as distinct from the strength of the preference for the total amount of the public good.

2.1 A Social Planner's Problem

Before deriving equilibria in decentralized models, we consider a social planner who maximizes aggregate welfare, based on Equation (1):

$$W = \sum_i \left[b - (c + \alpha\theta_i) - \frac{\alpha G}{N} + \gamma_i f(G + \Theta) + \eta_i v(\theta_i) \right] \tag{2}$$

We note that individuals differ only with respect to the parameters, γ_i and η_i, and not with respect to their endowment, b. Thus, there is no redistributive motive for the tax based on unequal endowments and no particular reason to weight different individuals' utilities differently. The lump sum tax is akin to a membership fee in a group of individuals who differ only in their preference parameters.

Summing over the N consumers, we can write:

$$W = N(b - c) - \alpha(G + \Theta) + \left(\sum_i \gamma_i \right) f(G + \Theta) + \left(\sum_i \eta_i v(\theta_i) \right) \tag{3}$$

The social planner would choose G and $\{\theta_1, ..., \theta_N\}$ to maximize this expression, subject to the constraints that $G \geq 0$ and $\theta_i \geq 0, \forall i$. In the absence of CSR, the social planner would choose G according to the first-order condition:

$$\alpha = \left(\sum_i \gamma_i \right) f'(\tilde{G}^{FB}) \tag{4}$$

Equation (4) is the familiar optimality condition that the marginal cost of the public good should equal the sum of the marginal utilities of the good across all consumers.[7] Here we make the implicit assumption that the marginal utility at zero public goods is sufficiently high, $f'(0) > \frac{\alpha}{\sum_i \gamma_i}$, so that $\tilde{G}^{FB} > 0$. With CSR available at the same resource cost as public provision, however, it is clear from Equation (3)

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[7] We denote this choice of G as $\tilde{G}^{FB}$, with the tilde indicating that this is not a value chosen simultaneously with the values of $\{\theta_1, ..., \theta_N\}$ when CSR is available.

that a social planner would set $G = 0$ given the assumption that $v' > 0$. Any positive amount of G could be reallocated to some individual's θ_i, generating a warm glow and thus an increase in aggregate welfare, while keeping the total cost of the public good, $-\alpha(G + \Theta)$, and the direct utility from the total amount of the public good, $f(G + \Theta)$, unchanged.

With $G^{FB} = 0$, the social planner would choose each value of θ_j according to the first-order condition:

$$\alpha = \left(\sum_i \gamma_i\right) f'(\Theta^{FB}) + \eta_j v'(\theta_j^{FB}) \tag{5}$$

In this case, the marginal cost of producing the public good must be equal to the sum of the marginal utilities of the public good across all consumers *plus* the marginal utility of the warm glow for individual j. The assumption that $v'' < 0$ ensures that θ_j^{FB} is increasing in η_j among those engaging in CSR. Comparing the two first-order conditions, we can see that because $v' > 0$, $f'(\Theta^{FB}) < f'(\tilde{G}^{FB})$, and that because $f'' < 0$, it must be that $\Theta^{FB} > \tilde{G}^{FB}$. Thus, under these conditions, the presence of CSR with a warm glow increases the socially optimal amount of the public good provided.

In this first-best allocation, we can define the set of contributors, C^{FB}, as the pairs of $\{(\gamma_i, \eta_i)\}$ such that the right-hand side of the first-order condition in Equation (5) with $\theta = 0$ exceeds the left-hand side:

$$C^{FB} = \{(\gamma_i, \eta_i) \,|\, \alpha < \gamma_i f'(\Theta^{FB}) + \eta_i v'(0)\} \tag{6}$$

The first-best will be such that all individuals with $(\gamma_i, \eta_i) \in C^{FB}$ will engage in CSR as given by Equation (5) and those with $(\gamma_i, \eta_i) \notin C^{FB}$ will not engage in CSR.[8]

2.2 Voting as a First Stage

We next consider how equilibrium amounts of the public good are determined in a decentralized model with two stages. In the first stage, individuals vote on the amount

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[8]In his analysis of the optimal tax treatment of private contributions for public goods, Diamond (2006) discusses circumstances under which it would not be appropriate to include the warm glow in the social planner's objective function. In this case, the total amount of $G + \Theta$ is given by Equation (4), but the distribution of that amount across public and private contributions is not determined.

of the public good, G, that will be provided through the lump sum tax, $\frac{\alpha G}{N}$.[9] In the second stage, individuals make their consumption decisions over how much CSR to engage with their private good purchase, θ_i, at an additional cost of $\alpha\theta_i$. When individuals vote in the first stage, they anticipate how the amount of the public good provided through taxes will affect the CSR choices of all potential consumers in the second stage.

Returning to the individual utility function in Equation (1), and temporarily suppressing the i subscripts for readability, we can consider the consumer's choice in the second stage by holding G fixed in:

$$b - (c + \alpha\theta) - \frac{\alpha G}{N} + \gamma f(G + \Theta) + \eta v(\theta) \tag{7}$$

For a given amount of G, each individual (in the second stage) will maximize this utility with respect to θ, yielding the first-order condition:

$$\gamma f'(G + \Theta) + \eta v'(\theta) = \alpha \tag{8}$$

This equation implicitly defines a relationship between the choices of θ and the value of G.[10] As above, the set of contributors, C, includes all combinations of $\{\gamma, \eta\}$ such that:

$$C = \{(\gamma, \eta) \mid \alpha < \gamma f'(G + \Theta) + \eta v'(0)\} \tag{9}$$

For such consumers, the marginal benefit of the additional CSR, through both the direct utility of the public good and the warm glow, is greater than the resource cost of producing it. For these consumers with $(\gamma, \eta) \in C$, the first-order condition in Equation (8) determines their choice of θ.

Moving back to the first stage, taking the derivative of Equation (7) with respect to G yields the first-order condition for a voter contemplating whether to support an increase in G:

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[9]Individuals in the model are not making a labor-leisure tradeoff, and income is equal across individuals, so an income tax is identical to a uniform lump sum tax as modeled here.

[10]Equation (8) shows why the warm glow assumption is necessary in this model in which more than one caring consumer engages in CSR. With $f()$ the same across consumers, absent the $v'(\theta)$ term, there would be no way for this first-order condition to hold simultaneously for two different values of γ. Similarly, this is the reason for the technical assumption that η must be positive for any consumer with positive γ.

$$-\alpha\frac{d\theta}{dG} - \frac{\alpha}{N} + \gamma f'(G+\Theta)\left(1 + \frac{d\Theta}{dG}\right) + \eta v'(\theta)\frac{d\theta}{dG} = 0 \tag{10}$$

which can be rewritten as:

$$\frac{\alpha}{N} = \gamma f'(G+\Theta)\left(1 + \frac{d\Theta}{dG}\right) + (\eta v'(\theta) - \alpha)\frac{d\theta}{dG} \tag{11}$$

If this voter engages in CSR, with $\theta > 0$, then substituting in the first-order condition for θ from Equation (8) into the last term in Equation (11) yields:

$$\frac{\alpha}{N} = \gamma f'(G+\Theta)\left(1 + \frac{d\Theta}{dG} - \frac{d\theta}{dG}\right) \tag{12}$$

If instead the voter does not engage in CSR, with $\theta = 0$, then $\frac{d\theta}{dG} = 0$, and Equation (11) reduces to:

$$\frac{\alpha}{N} = \gamma f'(G+\Theta)\left(1 + \frac{d\Theta}{dG}\right) \tag{13}$$

In both equations, the left-hand side is the individual voter's marginal cost of an additional unit of G, and the right-hand side is the voter's marginal benefit of that additional unit. The first-order condition incorporates the possible dependence of each θ, and therefore Θ, on G. In both equations, the marginal benefit of the public good financed through the lump sum tax is equal to the relative weight on the public good in the utility function, γ, multiplied by the marginal utility of an additional unit of the public good, $f'(G+\Theta)$, multiplied by the net effect of the increase in G on the total stock of the public good, $\left(1 + \frac{d\Theta}{dG} - \frac{d\theta}{dG}\right)$. As we will discuss below, because $f'' < 0$, the total amount of the public good, $G + \Theta$, is positively related to this net effect.

To obtain an analytical expression for this net effect, we take the total derivative of the first-order condition for θ in Equation (8):

$$\gamma f''(G+\Theta) \cdot dG + \gamma f''(G+\Theta) \cdot d\Theta + \eta v''(\theta) \cdot d\theta = 0 \tag{14}$$

Dividing through by $\gamma f''(G+\Theta) \cdot dG$ yields:

$$1 + \frac{d\Theta}{dG} + \frac{\eta}{\gamma} \cdot \frac{v''(\theta)}{f''(G+\Theta)} \cdot \frac{d\theta}{dG} = 0 \tag{15}$$

Equation (15) shows that with $v()$ and $f()$ strictly concave, crowding out will be imperfect, $1 + \frac{d\Theta}{dG} > 0$, as long as crowd out exists for some individual, $\frac{d\theta}{dG} < 0$. (Note that crowding out would be perfect for $v'' = 0$.) This expression for $1 + \frac{d\Theta}{dG}$ can be substituted into Equation (12) to obtain:

$$\frac{\alpha}{N} = -\gamma f'(G + \Theta)\left(1 + \frac{\eta}{\gamma} \cdot \frac{v''(\theta)}{f''(G + \Theta)}\right)\frac{d\theta}{dG} \tag{16}$$

The last step is to find an analytical expression for $\frac{d\theta}{dG}$. Reintroducing subscripts i and j to distinguish different individuals, Equation (15) implies that:

$$\frac{\eta_j}{\gamma_j} \cdot \frac{v''(\theta_j)}{f''(G + \Theta)} \cdot \frac{d\theta_j}{dG} = \frac{\eta_i}{\gamma_i} \cdot \frac{v''(\theta_i)}{f''(G + \Theta)} \cdot \frac{d\theta_i}{dG} \tag{17}$$

for any $i \neq j$ such that $\theta_i, \theta_j > 0$. Thus,

$$\frac{d\theta_i}{dG} = \frac{v''(\theta_j)}{v''(\theta_i)} \cdot \frac{\eta_j}{\gamma_j} \cdot \frac{\gamma_i}{\eta_i} \cdot \frac{d\theta_j}{dG} \tag{18}$$

By definition, $\frac{d\Theta}{dG} = \sum_{i \in C} \frac{d\theta_i}{dG}$ where the summation only applies to the subset of consumers who engage in CSR. Now that we have an expression for $\frac{d\theta_i}{dG}$ in terms of $\frac{d\theta_j}{dG}$, we can substitute this into Equation (15) and rearrange to get

$$1 + \left(\sum_{i \in C} \frac{\eta_j}{\gamma_j} \cdot \frac{\gamma_i}{\eta_i} \cdot \frac{v''(\theta_j)}{v''(\theta_i)} + \frac{\eta_j}{\gamma_j} \cdot \frac{v''(\theta_j)}{f''(G + \Theta)}\right)\frac{d\theta_j}{dG} = 0 \tag{19}$$

and substituting back into Equation (16) gives:

$$\frac{\alpha}{N} = \gamma_j f'(G + \Theta)\frac{\left(1 + \frac{\eta_j}{\gamma_j} \cdot \frac{v''(\theta_j)}{f''(G+\Theta)}\right)}{\left(\sum_{i \in C} \frac{\eta_j}{\gamma_j} \cdot \frac{\gamma_i}{\eta_i} \cdot \frac{v''(\theta_j)}{v''(\theta_i)} + \frac{\eta_j}{\gamma_j}\frac{v''(\theta_j)}{f''(G+\Theta)}\right)} \tag{20}$$

Factoring out $\frac{\eta_j}{\gamma_j} \cdot \frac{v''(\theta_j)}{f''(G+\Theta)}$, gives a final expression:

$$\frac{\alpha}{N} = \gamma_j f'(G + \Theta)\frac{\left(1 + \frac{\gamma_j}{\eta_j} \cdot \frac{f''(G+\Theta)}{v''(\theta_j)}\right)}{\left(1 + \sum_{i \in C} \frac{\gamma_i}{\eta_i} \cdot \frac{f''(G+\Theta)}{v''(\theta_i)}\right)} \tag{21}$$

When this voter does not engage it can be shown that the new expression for this voter's choice of G is:[11]

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[11]The steps in the derivation are the same, recognizing that the 1 in the numerator in Equation (20) is not present because the voter is not engaging in CSR.

$$\frac{\alpha}{N} = \gamma_j f'(G + \Theta) \frac{1}{\left(1 + \sum_{i \in C} \frac{\gamma_i}{\eta_i} \cdot \frac{f''(G+\Theta)}{v''(\theta_i)}\right)} \tag{22}$$

If voter preferences for G are single-peaked, then the median voter theorem will apply, and we can express Equations (21) and (22) as:

$$\frac{\alpha}{N} = \gamma_{med} f'(G + \Theta) K_{med} \tag{23}$$

Here, K_{med} is the final term in either of the two prior equations with j chosen to be the voter with the median value of γ_j. As in Equations (12) and (13), it corresponds to the net effect of an increase in G on the amount of CSR contributed by consumers other than the median voter. K_{med} is positive because $f()$ and $v()$ are strictly increasing and concave. It is less than one because the denominator is larger than the numerator as long as at least one consumer engages in CSR.[12]

Thus, public provision of the public good imperfectly crowds out voluntary provision through CSR. The degree of crowding out depends on the relative magnitudes of $|f''|$ and $|v''|$. K_{med} is lower, and thus crowding out is higher, when $|f''|$ is high relative to $|v''|$. In such cases, a given change in G generates a large offsetting change in θ_i through each consumer's first-order condition.

Equation (23), combined with the first-order condition in Equation (8) for each consumer who engages in CSR or $\theta = 0$ for each consumer who does not, constitutes the equilibrium. Due to the concavity of $f()$, the total amount of the public good, $G + \Theta$, is higher when the cost of the public good, α, is lower; the population size, N, is higher; the median voter's preference for the public good, γ_{med}, is higher; and K_{med}, moving inversely with the crowding out of CSR by G, is higher. When a given reduction in G ultimately results in a smaller net reduction in $G + \Theta$, the median voter pursues that reduction, to shrink the lump-sum tax amount without sacrificing too much of the public good.[13]

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[12]Preferences will be single-peaked wherever the second-order condition is negative. The key term in that condition is $f''(G + \Theta) \cdot (1 + \frac{\partial \Theta}{\partial G}) \cdot K_{med} + f'(G + \Theta) \cdot \frac{\partial K_{med}}{\partial G}$. The first of these addends is negative, since $f'' < 0$ and the other two factors have been shown to be positive. The second of these addends will be negative if $\frac{\partial K_{med}}{\partial G} < 0$, since $f' > 0$. Inspecting the formulas for K_{med}, we can see that the sign of $\frac{\partial K_{med}}{\partial G} < 0$ will depend on the signs of v''' and f''' and will be zero if those derivatives are zero. Thus, asserting single-peakedness of preferences for G requires bounds on v''' and f''' that their absolute values are not too far from zero.

[13]See Becker and Lindsay (1994) for an early discussion of the intuition for this point, leading them to ask, "Does the Government Free Ride?"

3 Public Good Provision under Three Regimes

In this section, we compare the total amount of the public good across three regimes. The outcome derived Section 2 has public goods from both public and voluntary sources. Following the terminology in Epple and Romano (2003), we refer to this regime as "Public and Voluntary" (PV) and contrast it with regimes in which the public good comes from the "Public Only" (PO) in the form of the lump sum tax or from "Voluntary Only" (VO) in the form of CSR. The main result is that $G^{PO} > G^{PV} + \Theta^{PV} > \Theta^{VO}$. In other words, starting with an economy that has only CSR (VO), adding a public good financed by a lump sum tax increases the total amount of the public good (PV). *Removing* the CSR and leaving only the tax financed public good raises the amount of the public good further (PO).

3.1 Comparing the PO and PV regimes

To fix ideas, note that in the "Public Only" economy with no CSR opportunities, voter j most prefers the value of G that maximizes $b - c - \frac{\alpha G}{N} + \gamma_j f(G)$, which will solve:

$$\frac{\alpha}{N} = \gamma_j f'(G) \tag{24}$$

The concavity of $f()$ ensures that preferences for G are single-peaked and thus the median voter theorem holds. The amount of the public good under this regime is:

$$\frac{\alpha}{N} = \gamma_{med} f'(G^{PO}) \tag{25}$$

Recall that the total amount of the public good in the PV regime is given by Equation (23).

Proposition 1: Public Goods Are Higher Under PO than PV

$$G^{PO} > G^{PV} + \Theta^{PV} \tag{26}$$

Assume that if there is an opportunity for CSR, then at least one consumer will contribute. Even if G were so large that $f'(G)$ were near zero, a consumer with suffi-

ciently high η would receive enough warm glow on the first dollar of CSR contributed that the first order condition would not hold at $\theta = 0$.

As a result, the total level of public good provision is lower when there is public and voluntary provision versus when there is just public provision and no opportunity for CSR. While it is to be expected that the level of G is lower in the PV regime due to the presence of CSR, it also holds that the sum of G and all the individual contributions to the public good, Θ, is lower than the amount of G under the PO regime.

The proof of this result is straightforward. The left sides of Equations (23) and (25) are both equal to $\frac{\alpha}{N}$. We can therefore set the right sides of the two equations equal to each other and factor out γ_{med} to get the following condition:

$$f'(G^{PO}) = f'(G^{PV} + \Theta^{PV})K_{med} \tag{27}$$

Since we have shown above that $0 < K_{med} < 1$, in order for the equation to hold, it must be that:

$$f'(G^{PO}) < f'(G^{PV} + \Theta^{PV}) \tag{28}$$

which, since $f()$ is increasing and concave means that

$$G^{PO} > G^{PV} + \Theta^{PV} \tag{29}$$

The intuition for the result is, as above, that as the median voter in the PV regime contemplates the benefits of increasing G, the crowding out of incremental CSR by an increase in G lowers the marginal benefit of that increase. Thus, equality of that marginal benefit is achieved at a lower total amount of the public good than under the PO regime, where there is no possibility of crowding out. This relationship is illustrated in Figure 1.

The result of Proposition 1 is robust to some of the simplifying assumptions made in the derivation. For example, the assumption that the cost of the public good, α, is the same for CSR and public provision is not essential. The α that appears in both Equations (23) and (25) pertains to the cost to the public sector. Since this is true in both regimes, differential costs between sectors in the PV regime do not affect the comparison *across* regimes. K_{med} will still be less than 1 with a different cost of CSR, so it will still be the case that $f'(G^{PV} + \Theta^{PV}) > f'(G^{PO})$.

However, the value of K_{med}, and thus $G^{PV} + \Theta^{PV}$, may be different due to the change in the cost of CSR. Consider a value of the cost of CSR, $\hat{\alpha}$, such that $\hat{\alpha} > \alpha$ if the public sector has a cost advantage, perhaps through economies of scale in public provision, and $\hat{\alpha} < \alpha$ if there are lower costs in the private sector, whether through innovation or government subsides (through a funding source exogenous to the model above). The impact of $\hat{\alpha}$ on $G^{PV} + \Theta^{PV}$ is determined by the sign of $\frac{\partial K_{med}}{\partial \hat{\alpha}}$.

Consider a reduction in $\hat{\alpha}$ so that $\hat{\alpha} < \alpha$. From the consumer's first-order condition in Equation (8), a reduction in $\hat{\alpha}$ increases the number of contributors, the contribution of each contributor, and thus Θ^{PV}. As in the earlier discussion of the derivative of K_{med} (see footnote 12), assume that the absolute values of v''' and f''' are not too far from zero, so that the increase in contributors leads to an increase in the sum in the denominator of K_{med} and thus a lower value of K_{med}. Via the concavity of $f()$ and the voter's first-order condition in Equation (23), this leads to a decrease in $(G^{PV} + \Theta^{PV})$ despite the increase in Θ^{PV}. A lower cost of CSR raises total CSR but also exacerbates the implicit tax that CSR imposes on voters and thus (with α fixed) lowers the total amount of public goods.

Similarly, the appeal to the median voter theorem is not essential. Comparing Equations (21) and (22) to Equation (24) indicates that the result in Proposition 1 would obtain for the choice of G by *every* voter j under the two regimes, not just the median voter. Thus, the results would hold under any social weighting of individual preferences (with non-negative weights on each individual) that is applied consistently across the two regimes.

The result of Proposition 1 is partially robust to the sequencing of voting and CSR decisions. While it is natural to model consumption decisions as happening more frequently than, and thus conditional on, public provision, if instead CSR happens in the first stage and voting occurs in the second, then the median voter's first-order condition is:

$$\frac{\alpha}{N} = \gamma_{med} f'(G + \Theta) \tag{30}$$

Comparing this equation to Equation (25), we see that $G^{PV} + \Theta^{PV} = G^{PO}$ under this alternative assumption. Thus, any CSR done in the first stage is fully offset by the median voter in the second stage. Thus, as in the main result above, adding CSR

to the PO regime would not increase the total amount of the public good.[14]

3.2   Comparing the PV and VO regimes

We next compare the PV and VO regimes, which differ in that CSR is the only means to finance the public good in the latter. In the VO regime, the optimal level of θ_i for each individual is given by the first-order condition in Equation (8), which when $G = 0$ becomes the condition:

$$\gamma f'(\Theta^{VO}) + \eta v'(\theta_j^{VO}) = \alpha \tag{31}$$

We can also define C^{VO} as the set of pairs of (γ, η) who engage in CSR in this regime:

$$C^{VO} = \{(\gamma, \eta) \,|\, \alpha < \gamma f'(\Theta^{VO}) + \eta v'(0)\} \tag{32}$$

Proposition 2: Public Goods Are Higher Under PV than VO

$$G^{PV} + \Theta^{PV} > \Theta^{VO} \tag{33}$$

The total level of public good provision is lower when there is only voluntary provision versus when there is public and voluntary provision. The proof of this result is as follows. For a given (γ_j, η_j) pair, for an individual who engages in CSR in both regimes, we can set the marginal utilities in the two first-order conditions, Equations (31) and (8), equal to each other since they are both equal to the same marginal cost:

$$\gamma_j f'(\Theta^{VO}) + \eta_j v'(\theta_j^{VO}) = \gamma_j f'(G^{PV} + \Theta^{PV}) + \eta_j v'(\theta_j^{PV}) \tag{34}$$

We begin our proof by contradiction by supposing that $\theta_j^{VO} < \theta_j^{PV}$. Then $v'(\theta_j^{VO}) > v'(\theta_j^{PV})$ by the concavity of $v()$ and $f'(G^{PV} + \Theta^{PV}) > f'(\Theta^{VO})$ to maintain the equality. By the concavity of $f()$, this implies that $\Theta^{VO} > G^{PV} + \Theta^{PV}$ and thus $\Theta^{VO} > \Theta^{PV}$. By the initial supposition, each $\theta_j^{VO} < \theta_j^{PV}$, so the only way that

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[14]Under this alternative, the first-order condition for the consumer in the first stage is $\alpha = \gamma_{med} f'(G + \Theta) + \eta_i v'(\theta_i)$. Comparing this to Equation (8), we can see that for $\gamma_i \geq \gamma_{med}$, θ_i is lower under the alternative. There may be a value of $\gamma_i < \gamma_{med}$ such that θ_i is higher under the alternative for this value of γ_i and lower.

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$\Theta^{VO} > \Theta^{PV}$ is if more consumers engage in CSR in the VO regime than the PV regime.

The set of contributors, C^{PV}, in the PV regime is given by pairs of (γ, η) that satisfy:

$$C^{PV} = \{(\gamma, \eta) \mid \alpha < \gamma f'(G^{PV} + \Theta^{PV}) + \eta v'(0)\} \tag{35}$$

Comparing this to the expression for C^{VO} in Equation (32), we see that $C^{PV} \subset C^{VO}$ is equivalent to $f'(\Theta^{VO}) > f'(G^{PV} + \Theta^{PV})$. However, it followed from our supposition of $\theta_j^{VO} < \theta_j^{PV}$ that $f'(\Theta^{VO}) < f'(G^{PV} + \Theta^{PV})$. Thus by contradiction, we demonstrate that $\theta_j^{VO} > \theta_j^{PV}$ and $v'(\theta_j^{PV}) > v'(\theta_j^{VO})$. Equation (34) would then imply that $f'(\Theta^{VO}) > f'(G^{PV} + \Theta^{PV})$ and by the concavity of $f()$ that $G^{PV} + \Theta^{PV} > \Theta^{VO}$.

3.3 Comparing Decentralized Regimes to the First Best

We can also compare the level of public good provision chosen by the social planner with the level that obtains in the regimes in which consumers make their choices in a decentralized manner.

We first show that there is underprovision in the Voluntary Only (VO) regime relative to the first best chosen by a social planner.

Proposition 3: There Is Underprovision of the Public Good Under VO

$$\Theta^{FB} > \Theta^{VO} \tag{36}$$

Because the first-order conditions in both the FB (Equation (5)) and VO (Equation (31)) regimes equate the marginal benefits of incremental CSR to its cost, and the latter is equal to α in both cases, the marginal benefits must be equal as well:

$$\gamma_j f'(\Theta^{VO}) + \eta_j v'(\theta_j^{VO}) = \gamma_j f'(\Theta^{FB}) + \eta_j v'(\theta_j^{FB}) + \left(\sum_{i \neq j} \gamma_i\right) f'(\Theta^{FB}) \tag{37}$$

As long as there is at least one $\gamma_i > 0$, then the final term on the right-hand side of this equation is positive, and thus:

$$\gamma_j f'(\Theta^{VO}) + \eta_j v'(\theta_j^{VO}) > \gamma_j f'(\Theta^{FB}) + \eta_j v'(\theta_j^{FB}) \tag{38}$$

Because both $f()$ and $v()$ are increasing and concave, this inequality requires that at least one of $\Theta^{FB} > \Theta^{VO}$ or $\theta_j^{FB} > \theta_j^{VO}$. Suppose that $\Theta^{FB} < \Theta^{VO}$, and thus it must be that $\theta_j^{FB} > \theta_j^{VO}$. If each consumer who engages in CSR engages in more CSR under FB, then the only way for $\Theta^{FB} < \Theta^{VO}$ is for there to be more consumers engaged in CSR under VO. This would in turn require that $C^{FB} \subset C^{VO}$.

However, under the conjecture that $\Theta^{FB} < \Theta^{VO}$:

$$\gamma_j f'(\Theta^{VO}) + \eta_j v'(0) < \gamma_j f'(\Theta^{FB}) + \eta_j v'(0) \tag{39}$$

Since the expressions on both sides of the inequality are the quantities that must exceed α for a consumer to engage in CSR, the conjecture that $\Theta^{FB} < \Theta^{VO}$ results in a contradiction, and the total quantity of the public good in the VO regime is lower than the social optimum.

We demonstrate above that $G^{PO} > G^{PV} + \Theta^{PV} > \Theta^{VO}$. We now consider whether the PV regime also suffers from underprovision of the public good relative to the social optimum. The method of proof by contradiction employed in Proposition 3 does not work in this case, as it is theoretically possible for G^{PV} to be sufficiently large that $\Theta^{FB} < G^{PV} + \Theta^{PV}$ and yet have $\theta^{FB} > \theta^{PV}$ for all consumers engaged in CSR. As a weaker alternative, we can consider sufficient conditions for underprovision.

Proposition 4: There Is Underprovision of the Public Good Under PV when Preferences Are Skewed Right

If $\gamma_{mean} > \gamma_{med}$, then $\Theta^{FB} > G^{PO} > G^{PV} + \Theta^{PV} > \Theta^{VO}$.

To prove this proposition, we can rewrite Equation (4) as:

$$\alpha = N\left(\gamma_{mean}\right) f'(\tilde{G}^{FB}) \tag{40}$$

and note from Equation (25) that

$$\alpha = N\left(\gamma_{med}\right) f'(G^{PO}) \tag{41}$$

By the concavity of $f()$, we will have $\tilde{G}^{FB} > G^{PO}$ whenever $\gamma_{mean} > \gamma_{med}$. Under

this assumption, and recalling the result from Section 2 that $\Theta^{FB} > \tilde{G}^{FB}$, we have thus shown that:

$$\Theta^{FB} > \tilde{G}^{FB} > G^{PO} > G^{PV} + \Theta^{PV} > \Theta^{VO} \qquad (42)$$

Thus, when the distribution of γ_i is asymmetric with a mean greater than the median, there is underprovision in both the PO and PV regimes. The first-best requires higher public goods in response to the high mean, but regimes in which the median voter is decisive are insufficiently responsive to the high values of γ_i that elevate the mean above the median.[15]

4 How Welfare Varies with Regime

In the prior section, we considered how the total amount of the public good varies across the three regimes. In this section, we consider how individual welfare changes across regimes and, in particular, sufficient conditions for a majority of individuals to prefer one regime to another. In other words, if voters could decide both the regime and the tax rate, what would they choose?

Of particular interest is the comparison between the PV and PO regimes, as Epple and Romano (2003) showed in their framework that a majority always prefers PV to PO. The natural starting point in our model for a coalition of people who prefer the PV to PO regime is among individuals who do not engage in CSR. For such voters, we have:

$$U_j^{PV} - U_j^{PO} = \frac{\alpha}{N}(G^{PO} - G^{PV}) - \gamma_j \left[f(G^{PO}) - f(G^{PV} + \Theta^{PV}) \right] \qquad (43)$$

From the median voter's first-order condition in the PO regime, we know that $\frac{\alpha}{N} = \gamma_{med} f'(G^{PO})$. Substituting in yields:

$$U_j^{PV} - U_j^{PO} = \gamma_{med} f'(G^{PO})(G^{PO} - G^{PV}) - \gamma_j \left[f(G^{PO}) - f(G^{PV} + \Theta^{PV}) \right] \qquad (44)$$

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[15]Besley and Ghatak (2007) briefly consider voting over public goods in their model with only two groups of consumers, those with $\gamma = 0$ and those with $\gamma = 1$. In their Proposition 5, they show that if the latter are in the majority, they will vote for an amount of the public good exceeds the first-best level. In the context of our Proposition 4 above, this occurs because $\gamma_{med} > \gamma_{mean}$, contrary to our proposition's assumption.

We can see from Equation (44) that for $\gamma_j = 0$, $U_j^{PV} - U_j^{PO}$ is positive and that it is declining with γ_j. This observation leads to the following sufficient conditions.

Proposition 5: A majority of individuals will prefer the PV regime to the PO regime if the median voter does not engage in CSR and the following condition holds:

$$f(G^{PV} + \Theta^{PV}) > f(G^{PO}) - f'(G^{PO})(G^{PO} - G^{PV}) \tag{45}$$

The proof of this result is as follows. The expression in Equation (44) will remain positive for all values of γ_j such that:

$$\gamma_j < \gamma_{med}\frac{f'(G^{PO})(G^{PO} - G^{PV})}{f(G^{PO}) - f(G^{PV} + \Theta^{PV})} \tag{46}$$

If the median voter does not engage in CSR, and if Equation (46) holds for $\gamma_j = \gamma_{med}$, then a majority of individuals will prefer the PV regime to the PO regime. The inequality in Equation (45) follows from setting $\gamma_j = \gamma_{med}$ and rearranging terms.

This relationship is illustrated graphically in Figure 2. By visual inspection, the condition is more likely to hold when Θ^{PV} is large, so that $f(G^{PV} + \Theta^{PV})$ is high, and when the slope of the function $f()$ does not decline rapidly, i.e. when $|f''|$ is small.

As a special case, suppose that $f''' = 0$ and define $\Delta = G^{PO} - (G^{PV} + \Theta^{PV})$. Then:

$$f(G^{PV} + \Theta^{PV}) = f(G^{PO} - \Delta) = f(G^{PO}) - \Delta f'(G^{PO}) + \frac{1}{2}\Delta^2 f''(G^{PO}) \tag{47}$$

This second-order Taylor expansion is exact due to the assumption that $f''' = 0$. Substituting this expression into Equation (45) yields:

$$f(G^{PO}) - \Delta f'(G^{PO}) + \frac{1}{2}\Delta^2 f''(G^{PO}) > f(G^{PO}) - f'(G^{PO})(G^{PO} - G^{PV}) \tag{48}$$

Simplifying, we obtain:

$$f'(G^{PO})\Theta^{PV} + \frac{1}{2}\Delta^2 f''(G^{PO}) > 0 \tag{49}$$

or:

$$\frac{\Theta^{PV}}{\Delta^2} > \frac{-f''(G^{PO})}{2 \cdot f'(G^{PO})} \qquad (50)$$

Note that an increase in Θ^{PV} increases the numerator and decreases the denominator of the fraction on the left, so the interpretation is that Θ^{PV} is large in the PV case relative to the curvature of the $f()$ function at the PO optimum. Intuitively, when the fraction of consumers who engage in CSR is less than half, and yet Θ^{PV} is high, there is a minority of the population with high values of γ. Their contributions through CSR, in turn, are sufficiently large such that those who do not engage in CSR prefer PV, with its lower taxes, high CSR by others, and lower total public good provision, to PO, with its higher taxes, zero CSR by others, and higher total public good provision.

We can also consider the scope for coalitions to form starting with the highest values of γ, among individuals who in the PV regime are engaging in CSR. Augmenting Equation (44) for the warm glow and cost increment of CSR, we have:

$$
\begin{aligned}
U_j^{PV} - U_j^{PO} =& \gamma_{med} f'(G^{PO})(G^{PO} - G^{PV}) \\
& - \gamma_j \left[f(G^{PO}) - f(G^{PV} + \Theta^{PV}) \right] + \eta_j v(\theta_j) - \alpha \theta_j
\end{aligned}
\qquad (51)
$$

The added term includes $v(\theta_j)$, the value of which is not restricted beyond the assumptions that $v(0) = 0$, $v' > 0$, $v'' < 0$, and the first-order condition for θ_j. This lack of restrictions leaves the sign of the expression ambiguous. Those with the highest γ values would prefer the higher total public good levels in the PO regime, while those with the highest η values would prefer the opportunity for CSR in the PV regime. Intuitively, they will prefer the PV regime whenever the *level* of the warm glow, $\eta_j v(\theta_j)$, is large relative to the *derivative* of the non-warm-glow portion of utility, $\gamma_j f'(G^{PV} + \Theta^{PV})$. The former measures what they gain in the PV regime, while the latter captures what they lose by forsaking the incrementally higher value of the public good in the PO regime.

5 Changing the Distribution of Preferences

In Section 3, we determined the level of public good provision under each regime. We now evaluate how this level, $G + \Theta$, changes in each regime when the population

becomes more caring. We model this change as having the γ_j of a single contributor increase by a small amount while holding η_j fixed. This question was a main focus of Calveras et al. (2011), who showed that it is possible in the PV regime for a more altruistic society to have lower amounts of the public good.

In the Public Only regime, the only preference parameter that the first order condition for the median voter's choice of G in Equation (25) depends on is γ_{med}. Increasing γ_j of any consumer who is not the median voter will not change the level G_{PO}. Unless the median voter's preferences change, the level of the public good is invariant to changes in the preferences of the consumers. If γ_{med} increases, so too will G^{PO} due to the concavity of $f()$.

When G is exogenous (including the Voluntary Only regime in which it is exogenously zero), the response to an increase in γ_j is given by the first order condition in Equation (8). Equations (52) and (53) restate this relationship separately for γ_j, which changes, and for γ_k, which does not:

$$\gamma_j f'(G + \Theta) + \eta_j v'(\theta_j) = \alpha \tag{52}$$

$$\gamma_k f'(G + \Theta) + \eta_k v'(\theta_k) = \alpha \tag{53}$$

The increase in γ_j must increase θ_j and thus Θ by some amount.[16] With Θ higher (and G fixed exogenously at zero), Equation (53) shows that θ_k must fall to preserve the equality. Overall, θ_j increases, each θ_k decreases, and the net effect on Θ is an increase that is smaller than the increase in θ_j. In the Voluntary Only regime, then, an increase in the caringness of any consumer who is already contributing increases the amount of the public good, Θ^{VO}.

In the Public and Voluntary regime, the response for $G + \Theta$ to an increase in the γ_j of a contributor is not uniquely determined. The outcome from the VO regime is possible – θ_j increases, $G + \Theta$ increases, and each θ_k falls, consistent with Equations (52) and (53). Recall that the level of G is determined endogenously through voting, as given (for a non-contributing median voter) by Equation (22):

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[16]If θ_j did not increase, then Equation (52) shows that Θ would have to increase. With this coming from only increases in θ_k, both terms on the left-hand side of Equation (53) would decrease while the the right side would not. Thus, θ_j must increase.

$$\frac{\alpha}{N} = \gamma_j f'(G + \Theta) \frac{1}{\left(1 + \sum_{i \in C} \frac{\gamma_i}{\eta_i} \cdot \frac{f''(G+\Theta)}{v''(\theta_i)}\right)} \tag{54}$$

With $G + \Theta$ higher, the final fraction must also increase, due to the concavity of $f()$. With the signs of f''' and v''' unconstrained by any prior step, they can be chosen such that the change in the final fraction is positive. Having $f''' > 0$ and $v''' = 0$, for example, is consistent with the increase in $G + \Theta$ leading to an increase in this fraction. Thus, as would be expected, it is possible for the total amount of the public good to increase in response to an increase in the caringness of any individual already engaging in CSR.

Another possible outcome is that $G+\Theta$ does not change at all. Note that if the γ_j that increases is not that of the median voter, and if $f''' = v''' = 0$, then the last term in the first-order condition for G is a constant and $G+\Theta$ will not change. In this case, Equation (53) shows that θ_k also does not change, and Equation (52) shows that θ_j must increase, to decrease $v'(\theta_j)$ and restore equality. This increase is fully offset by the median voter in the lower choice of G.[17] Thus, it is possible that an increase in caringness of a contributor who is not the median voter results in no increase in the total amount of the public good, matching the outcome in the PO regime. As in that regime, if it is the median voter's preference that changes, this will tend to increase the total amount of the public good.

A final possibility is one in which, counterintuitively, $G + \Theta$ is lower. Equation (53) then requires that θ_k increases to restore equality and that θ_j increases even more to satisfy Equation (52), as $\frac{\alpha}{\gamma_j}$ is lower. With $G + \Theta$ lower, the final fraction in the median voter's first-order condition must also fall, and this can be supported by making assumptions on f''' and v'''. As above, having $f''' > 0$ and $v''' = 0$ is consistent with the decrease in $G + \Theta$ leading to a decrease in this fraction.[18] This possibility of a declining $G + \Theta$ when a single contributor becomes more caring echoes the findings in Calveras et al. (2011) derived using a different modeling framework.

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[17]Note that under these assumptions about preferences, the only aspects of the distribution of γ that affect the total amount of the public good are the median and the number who engage in CSR.

[18]That the assumptions about preferences that lead to $G+\Theta$ increasing or decreasing are the same indicates that more specific functional form assumptions would be required to determine which result obtains. Here, we contend only that the two outcomes for $G + \Theta$ are possible.

6 Conclusion

The growth of CSR has the potential to reshape the way individuals contribute voluntarily to public goods. It provides a convenient mechanism for private contributions to scale, as consumers can make their contributions as a by-product of their other economic choices. Around the world, CSR can also be expected to grow as a consequence of the privatization of state-owned enterprises, as Boubakri et al. (2019) show that privatized firms have higher CSR intensity than other publicly listed firms. In the United States, the tax landscape for charitable giving has changed for moderate donors, as the Tax Cuts and Jobs Act of 2017 raised the standard deduction and thus reduced the number of taxpayers who face a marginal tax reduction for their charitable donations.[19] Though not modeled here, CSR in a competitive product market enables donations to occur with deductibility at the corporate tax rate. Enriching the tax environment in the model to include distortionary rather than lump sum taxes is an important area for continued research.[20] Similarly, the integration of a first stage of voting with richer characterizations of market structure and conduct than we have modeled here as an interesting area for future research.

With expectations of greater CSR in the future, it is tempting to presume that the total stock of public goods will increase. The key contribution of this paper is to demonstrate that this presumption will not necessarily hold up when the population of consumers who decide whether to engage in CSR is the same population of voters who decide whether to tax themselves to provide some amount of public goods through public finance. The result is not due to the "warm glow" of CSR per se. In the model, a stronger warm glow increases the socially optimal amount of the public good.

Instead, the result that the total stock of public goods in a model with public and voluntary provision is lower than when public goods are provided only through taxes is due to the first stage of voting. Voters with weak preferences for the public good recognize that reductions in public financing will crowd *in* greater CSR by those with stronger preferences. This crowding in does not occur in the absence of voluntary contributions, and thus the foregone benefits of marginal reductions in taxes are lower in the regime with CSR. This change in incentives drives the main result. If those with sufficiently weaker preferences for the public good constitute a majority, then

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[19] See Meer and Priday (2020) for projections of the impact based on recent estimates of the tax price elasticity of charitable giving and the various provisions of the TCJA.

[20] See, for example, Itaya et al. (2002), Saez (2004), Diamond (2006), and Zhang (2018).

this regime will be expected to prevail despite the lower stock of public goods.

Our findings echo those of Epple and Romano (2003) and Calveras et al. (2011), who derived similar results in different frameworks that did not explicitly consider CSR. In our work, we have built on the insight of Besley and Ghatak (2007) that CSR that caters to the preferences of consumers can be modeled in the general framework of voluntary contributions to public goods in Bergstrom et al. (1986). With CSR modeled simply as a deduction from the consumer's resources, all of our results would also apply if the private contributions to public goods were made directly rather than through CSR. Our results are derived with minimal assumptions on the distribution of preferences, relying primarily on the median of this distribution (and occasionally the number of contributors). The results are also not driven by any desire to redistribute resources across income groups.

Promotion of CSR, as part of a more general movement to change the expectations on corporations to act on behalf of the social good, could mean adding opportunities for voluntary contributions to public goods in markets where public provision already exists. That this can lower the total amount of public goods offers a cautionary tale about promotion of CSR in an economy with heterogeneous preferences for the public good and the opportunity for those preferences to be revealed not just through consumption but through voting as well.

Figure 1: Comparing Total Public Good Provision Across Regimes

Marginal Utility

$$G^{PV} + \Theta^{PV} \qquad G^{PO} \qquad \text{Public Good}$$
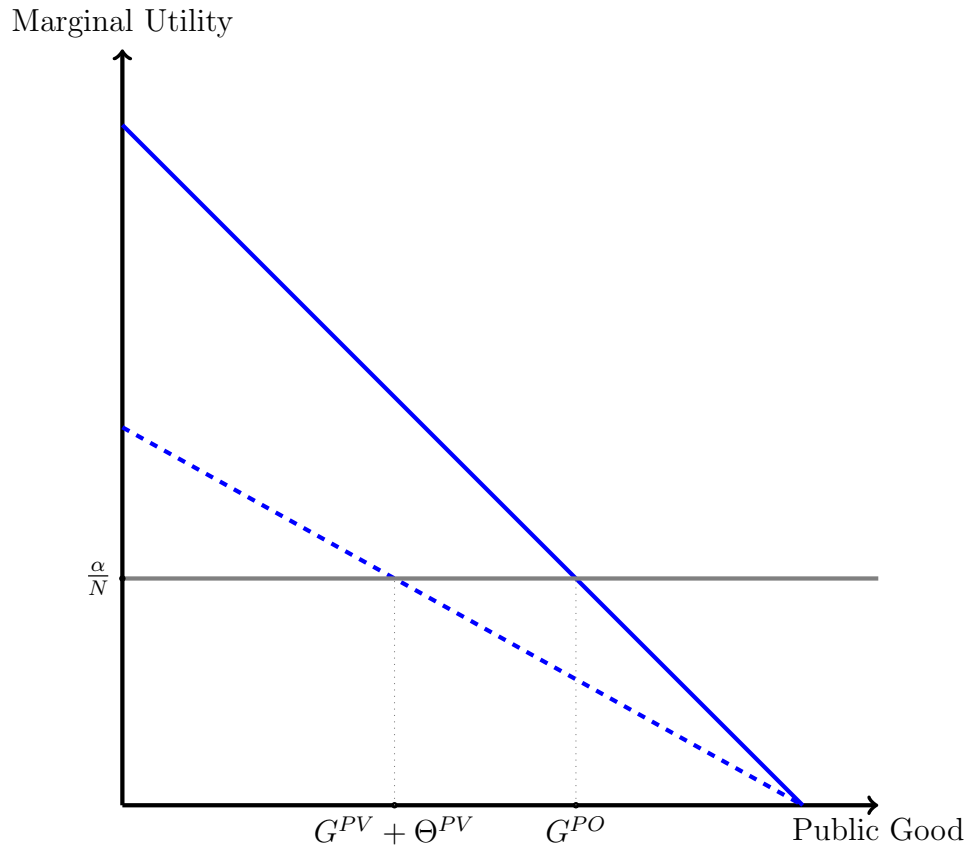
Note: The gray horizontal line is the median voter's (constant) marginal cost of an additional unit of the public good financed through taxes. The blue diagonal line is the the (declining) marginal benefit of that additional unit when all public goods are financed through taxes. The dashed blue diagonal line is the (declining) marginal benefit of that additional unit when public goods are financed through CSR in addition to taxes. The figure is drawn for quadratic utility.

Figure 2: Sufficient Condition for a Majority to Prefer PV to PO
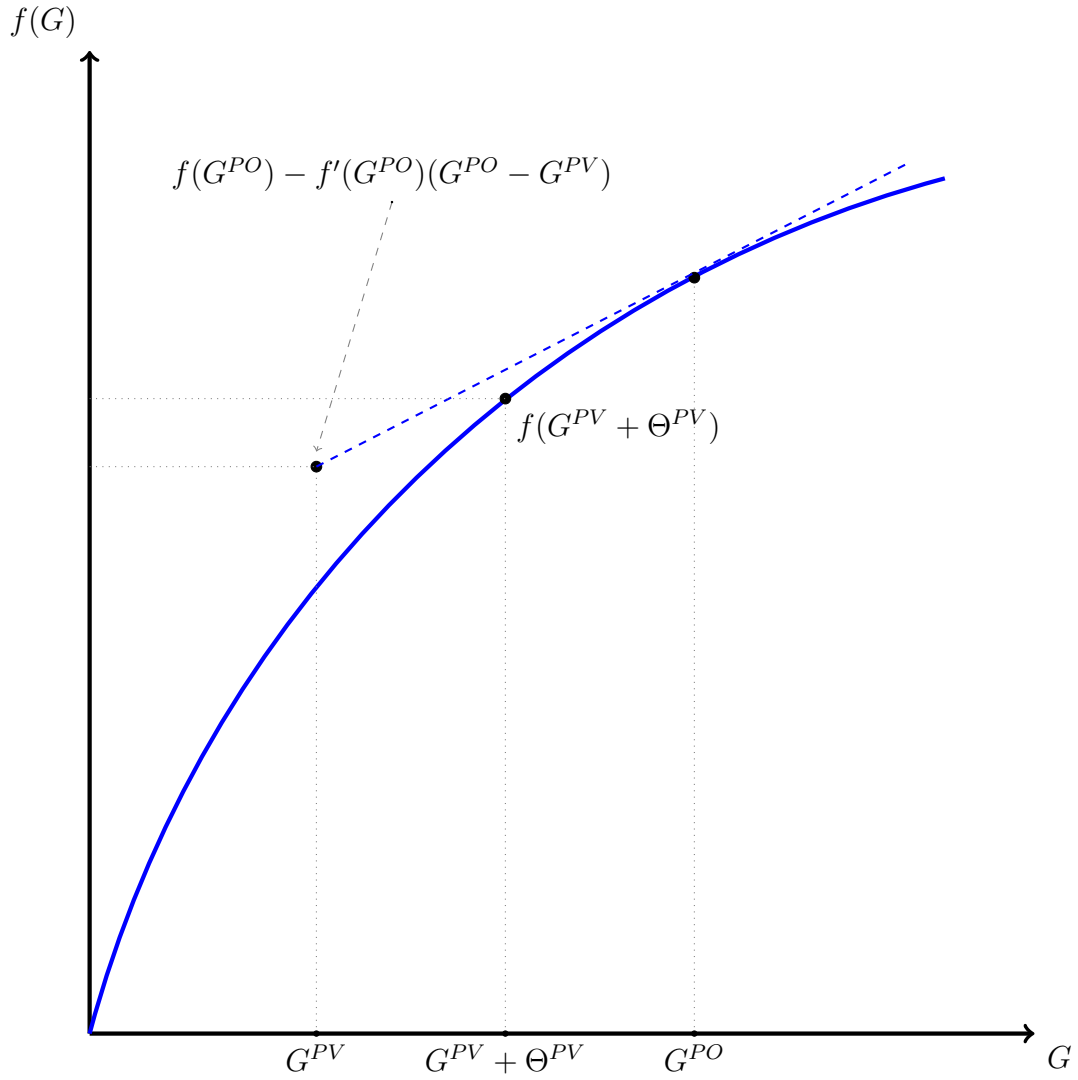
Note: As in Equation (45), the sufficient condition for a median voter who does not engage in CSR to prefer the Public and Voluntary regime to the Public Only regime is:
$f(G^{PV} + \Theta^{PV}) > f(G^{PO}) - f'(G^{PO})(G^{PO} - G^{PV})$.

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