Essays on the Voluntary Provision of Public Goods

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Abstract

Chapter 1.—Non-governmental organizations (NGOs) compete in mission statements. Opportunities for impact vary across issues—NGOs with broader missions expect to execute higher-impact projects but provide less precision to donors as to the *types* of projects that will be funded. I develop the first model in which competing NGOs strategically design their mission statements. Scope of the mission is a strategic complement. Competition leads NGOs to design inefficiently narrow missions while free entry leads to a socially excessive number of NGOs in operation. With low barriers to entry NGOs' missions overlap, each addressing issues that are not the preferred issue for any of its donors, and leading to greater expected impact at the periphery of its mission.

Chapter 2.—In many settings firms rely on non-governmental organizations (NGOs) to certify pro-social attributes embodied in their products. I develop a model of competition between NGOs in the provision of labeling services. Competition between a fixed number of NGOs features a race-to-the-top in labeling standards, but entry of NGOs offering new labels pushes standards down. Competition between NGOs often results in a socially-excessive number of labels, with each label excessively stringent. Compared to a setting in which firms can credibly communicate the social attributes of their products, labels demand greater pro-social behavior than desired by firms, although with proliferation of the number of labels this discrepancy disappears. In contrast to existing models, firms may engage in excessive corporate social responsibility when they rely on NGOs as certifying intermediaries.

Chapter 3.—The intrinsic motivation of a firm's management for engaging in pro-social

behavior is an important determinant of a firm's social conduct. I provide the first model in which firms run by morally-motivated managers engage in corporate social responsibility (CSR) in a competitive setting. CSR induced by moral management crowds out a competitor's strategic CSR, increasing profitability and leading shareholders to strategically delegate moral managers. Firms run by moral managers can engage in a socially-excessive amount of CSR, and shareholders appoint such managers if and only if moral management is sufficiently effective at crowding out a competitor's strategic CSR.

Declaration

I acknowledge the contribution of Anthony Heyes for the research associated with the first two chapters of this thesis. In both cases, his contribution is equal to my own, although the work in this thesis is in my own words. Journal articles based off of the research for these chapters are published, the first in the *Journal of Economic Behavior and Organization* and the second in *Management Science*. Both of these article are co-authored with Anthony Heyes, with details in the bibliographic entries for Heyes and Martin (2015, 2016).

Acknowledgments

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General Introduction

Public goods are widely recognized as a type of good that markets cannot usually provide efficiently. As a result, a number of different types of institutions have emerged to facilitate the provision of public goods. These institutions act as intermediaries, matching individuals interested in contributing to a public good with suppliers or beneficiaries of a public good. A familiar example is a charity, collecting donations from interested individuals (donors) and channeling these funds towards projects in order to produce some socially-beneficial outcome. How effective these institutions are at providing public goods, however, ultimately depends on the incentives faced by such intermediaries.

In this thesis, I examine three institutions that facilitate the provision of public goods: non-governmental organization (NGOs), such as charities, that collect donation in order to produce some socially-beneficial outcomes; social labels, that attest to the social "quality" of a firm's product and communicate this information to consumers; and corporate social responsibility (CSR), whereby firms voluntarily bundle a public good with their output. In each case, I construct a theoretical model to analyze the "industrial organization" of these intermediaries, and how competitive forces inform provision of public goods. As each of these three institutions often exist within an environment of competition, the implications of competition have important consequences for the effectiveness with which these organizations deliver public goods. In each case, competitive forces are important in understanding the voluntary provision of public goods.

NGOs such as charities and nonprofits often provide public goods by acting as an in-

termediary between donors interested in providing a public good and recipients of a public good. A classic example is wildlife preservation, undertaken by organizations such as the WWF, that uses resources from donors to either provide a public good directly or fund its provision, in this case preservation of a species. In the first chapter of this thesis, I examine a model in which NGOs must establish themselves by defining a *mission statement* that outlines what social issues these organizations can address. Using the example of wildlife preservation again, a mission statement could take the form of which animals the NGO helps preserve; *Save the Elephants* is concerned with preservation of elephants whereas *Save Tigers Now* occupies itself with tigers. The mission statement is a key institution-design variable—something chosen by all NGOs—that allows the NGO to attract funding from donors and execute socially beneficial projects (i.e., provide a public good). Of particular interest is how competition between NGOs for donations and low barriers to entry inform NGOs' missions.

The main insight from the model is that competition leads NGOs to compromise on their mission in order to appeal to donors and collect more donations. By narrowing the scope of its mission, an NGO trades off greater expected social impact for increased donations. The result of this, however, is that NGOs collectively design excessively narrow missions that do not use donors' resources efficiently. This problem is exacerbated with free-entry, whereby entry further narrows the scope of NGOs' missions, resulting in excessive entry of NGOs. From the perspective of a social planner, competition results in too many NGOs, each with too narrow a mission, such that fewer NGOs with broader missions would produce greater expected social impact.

In many circumstances, however, NGOs do not provide a public good directly. Firms often engage in pro-social behavior beyond the requirements of law, in essence bundling a public good with their output, thus displaying so called corporate social responsibility. A common example of this is abatement of harmful emissions beyond what is demanded by regulation, or "greening" the supply chain to source inputs from environmentally responsible suppliers, so called "corporate environmentalism." An issue with bundling public goods

and private goods, however, is that this can be a *credence characteristic* of the private good, producing an asymmetry of information that dampens firms' incentives to conduct themselves in a socially responsible way. NGOs can then facilitate corporate provision of a public good by acting as a certifying intermediary, reducing asymmetric information and encouraging CSR.

In the second chapter I analyze a model of social labeling by NGOs in which firms must affix a label on their product to credibly communicate their socially responsible behavior to consumers. For example, both the Rainforest Alliance label and the Fairtrade label inform consumers of a firm's social performance, the former attesting to the low impact of a product on rain forest ecosystems, and the latter relating to the division of rent in the supply chain. By displaying a label on its product, a firm is able to extract a price premium from socially conscientious consumers, thereby giving firms an incentive to qualify for a label. NGOs then design the stringency of their label, setting how high a hurdle firms must pass for certification, and act competitively to attract firms to their label in order to increase the social impact of their certification. The set of labels that results determines the set of pro-social behaviors that firms find profitable to undertake. The incentives faced by NGOs when designing their labels relates directly to firms' incentives to engage in CSR and bundle a public good with their output. As with the first chapter, of particular interest are the implications of competition between NGOs and low barriers to entry for the stringency of labels, and hence corporate provision of public goods.

The key result from the model is that competition between NGOs and free entry leads to an excessive number of excessively stringent labels, a finding that runs counter to the conventional wisdom that competition should lead to a "race-to-the-bottom" in certification standards. Thus, when firms rely on NGOs as certifying intermediates, there will be over-provision of public goods as NGOs require excessive social performance from firms to qualify for their labels. This contrasts with the case when firms can credibly communicate their social conduct to consumers; requiring a label to communicate pro-social behavior leads

to excessive corporate social responsibility from firms. Entry of certifiers, however, has the effect of reducing labels' standards, as increased competition leads NGOs to design labels with greater appeal to firms. Consequently, "proliferation" of labels leads NGOs to design certification schemes that coincide with what firms would do if they could credibly communicate their social conduct to consumers.

While profit-maximizing firms often have a strategic incentive to bundle a public good with their output, for example, by appealing to socially conscientious consumers, the intrinsic motivation of a firm's management for engaging in CSR is an important determinant of a firm's social conduct. Firms may not simply engage in CSR as a profitable non-market strategy, but rather as a form of corporate, or managerial, philanthropy. In the third chapter of this thesis, I analyze a model of corporate social responsibility in which competing firms can be run by moral managers with preferences for both the profitability of the firm and the firm's social conduct. With moral management, firms not only have a strategic incentive to bundle a public good with their output in order to differentiate their product from a competitor's, so called *strategic* CSR, but also have an intrinsic motivation to provide a public good.

The main insight from this model is that moral management by a firm crowds out strategic CSR by a competitor, in turn leading profit-maximizing shareholders to strategically delegate moral managers. This runs against the usual claim that moral management represents an issue of corporate governance—in a competitive environment there is a strategic reason to delegate a moral manager. While firms do not engage in enough CSR when motivated solely by profit, firms run by moral managers can engage in a socially excessive amount of CSR, thus over-providing a public good. In particular, shareholders will strategically delegate moral managers that engage in an excessive amount of CSR if and only if moral management is sufficiently effective at crowding out a competitor's strategic CSR. In contrast with the usual result that strategic or profit-maximizing considerations lead firms to under-provide a public good, the *presence* of moral managers can overturn this result, even when shareholders are

profit maximizers.

A key theme from each chapter in this thesis is that competitive forces are important when considering intermediaries that facilitate the provision of public goods, as these forces have a direct impact on how effectively these institutions provide public goods. Paralleling the industrial organization of firms, there is a potential role for regulation of public-good intermediaries. Notwithstanding to the generic insight that competition between firms is desirable, however, competitive forces between intermediaries may work against efficient provision of a public good. While I note the importance of regulation in each chapter, I leave the design of regulatory instruments for future research.

Chapter 1

NGO Mission Design

> A refresher: What's the first rule of nonprofits? That's right: MISSION, MISSION, and more MISSION. If you are a donor you are drawn by what? The same thing that attracts the staff and volunteers: The *mission*—what the organization *does*. (Brinckerhoff, 2009, p. 195)

Non-governmental organizations (NGOs) play an important role in society.[1] Yet the "industrial organization" of the sector is the subject of comparatively little formal analysis. In particular, there is no model that examines the decision of an NGO in designing its *mission statement*—a statement about what the NGO does—and the implications of competition between NGOs for the choice of mission statements. Since all NGOs have a mission statement, and the mission is fundamental to the social impact of an NGO, understanding the incentives NGOs face when designing their mission is important for understanding the efficacy of this "third sector."

In this chapter I develop the first model of NGO mission design. In the model, an NGO is defined by its mission statement—its "turf"—a key strategic institution-design decision that affects both the volume of donations *and* the quality of an NGO's projects. This is

[1] There is no universally accepted definition of an NGO. For the purpose of this chapter, an NGO is an entity funded by donations and doing "good deeds" on a not-for-profit basis. For more discussion of definitions, see Salamon and Anheier (1992) and Yaziji and Doh (2009).

consistent with the notion that "if mission is your most important resource (and it is), you need to get the most from this resource in every way, every day" (Brinckerhoff, 2009, p. 39). At the heart of it, the mission design decision involves a trade off between the prospect of higher impact projects and the need to satisfy donor interests.

Specifically, NGOs are set up by social entrepreneurs that are impact-motivated in the spirit of Duncan (2004) and Scharf (2014), while donors have spatially-adjusted, warm-glow preferences—they prefer their dollars be directed to high impact projects, but also have varying preferences *among* issues (Baron, 2010). Initially, an NGO defines itself by choosing a mission statement that specifies the set of issues that it can address *ex-post*. This is the institution-design stage, and on the basis of the mission statement the NGO receives donations. Impact opportunities of varying "quality" then arise as a result of stochastic external events, and the NGO directs funds to opportunities that arise *within the set of issues contained in its mission statement* so as to maximize impact. *Ex-post* the NGO selects the highest impact projects consistent with its mission. In this horizontal setting, an NGO effectively offers prospective donors a *lottery* over how their donations will be used. The mission statement constrains the NGO in the projects it might execute (*Save the Elephants* cannot devote funds to saving dolphins, for example) and so limits the support of the lottery that donors are offered.

I begin by abstracting from competition between NGOs and consider a monopoly NGO, examining the mission design decision of a single social entrepreneur in isolation. The NGO finds it optimal to trade off extra donations for a broader mission, as this allows it to produce greater expected social impact. In this way, an NGO does not choose its mission to maximize donations. However, the analysis reveals that this arrangement is socially optimal and leads an NGO to use donors' resources efficiently.

Moving to the more interesting case in which NGOs compete with each other for donations—something that often characterizes the NGO sector (e.g., Aldashev and Verdier, 2010; Scharf, 2014)—NGOs must now design their missions strategically, taking into account

how other NGOs' missions will impact donations. In equilibrium, competitive forces lead NGOs to narrow the scope of their missions, compromising on the breadth of issues they cover in order to attract donors. Entry of NGOs further exacerbates this narrowing of scope. With free entry, there are an excessive number of NGOs in equilibrium, each with excessively narrow missions. Despite this, when there is little barrier to entry, NGOs design mission statements that overlap and cover a broader range of issues than those of interest to their donor base. As a result, there is greater expected activity at the periphery, rather than the core, of an NGO's mission.

This chapter adds to the small existing literature that features horizontally-differentiated charities or NGOs. The seminal paper by Rose-Ackerman (1982) models nonprofits as varying in a dimension called ideology, each deciding what portion of donor revenues to devote to fund-raising effort. Similar to advertising, fund-raising effort is mutually offsetting so that non-cooperative choices lead to socially excessive fund-raising in the sector. Most of the subsequent literature focuses on this inefficiency in fund-raising/advertising effort. More recently, Aldashev and Verdier (2010) develop a model in which prospective donors care about issues but do not know of the existence of an NGO and so need to be "awakened" (e.g., by a leaflet or television advertising). I consciously exclude fund-raising effort from the model in order to focus on the mission design decision, ensuring that none of the results are driven by the fund-raising externalities that have been the focus of the prior research.

In Pestieau and Sato (2006), charities—all focused on the same issue—attract donations by virtue of ideological proximity to donors, with free entry leading to a socially excessive number of NGOs. This result is also echoed in Rose-Ackerman (1982) and Aldashev and Verdier (2010). In the area of mission design, Morales-Belpaire (2012) considers the design of a mission for a single NGO, without competitors, as coverage of a target population.

In all of these models a charity *de facto* addresses a single issue—there is no concept of mission scope and missions cannot be used to differentiate an NGO. Economides and Rose-Ackerman (1993), Bilodeau and Slivinski (1997), and Sandford (2015, Chapter 3) also

model the decentralized provision of local public goods but in different ways and addressing different questions. These papers complement a much larger literature on charitable giving and public goods games that take place in a single-issue setting (see Bilodeau and Steinberg (2006) or Andreoni and Payne (2013) for a review).

By recognizing that an NGO's mission has scope, the model in this chapter departs from existing contributions in a number of important ways and characterizes a key decision made by NGOs. Further, by recognizing that the impact of issues is likely to vary across the issue-space according to external events, the model makes explicit and endogenous the issues to which NGOs' project apply and the impact per dollar of donations.[2] Mission statement design, donations, and the social output of NGOs are codependent in subtle ways.

The remainder of the chapter proceeds as follows. Section 1.1 presents the core of the model; section 1.2 solves the models and analyzes the positive and normative implications of the equilibrium; section 1.3 concludes. All proofs are in the appendix.

1.1 Model

1.1.1 Social issues

There is a set of social, environmental, or other issues, denoted by I, the solution to which an NGO might contribute. More concretely, assume that the issue space I is the circumference of a circle with diameter $1/\pi$. This issue-space is illustrated in figure 1.1, where issue x_1 is, for example, threat of elephant extinction and issue x_2 is deforestation in the Amazon. To be consistent with a more direct geographic interpretation of the issue space, x_1 and x_2 could be the same social issue (e.g., environmental damage) in different geographic locations.

[2]In their pioneering model, Bilodeau and Slivinski (1997) allow nonprofits to contribute to two different public goods in varying proportions, although there is no distinction between the "doing" stage and the conception/role of mission. Since everything in Bilodeau and Slivinski's model is deterministic, there is no sense in which an NGO can offers donors a lottery over issues, and so no strategic value to a mission. Most importantly, their paper does not touch on mission as a strategic instrument in sourcing both donations and opportunities to produce social impact. Identical comments apply to the paper on NGO fragmentation by Sandford (2015, Chapter 3).

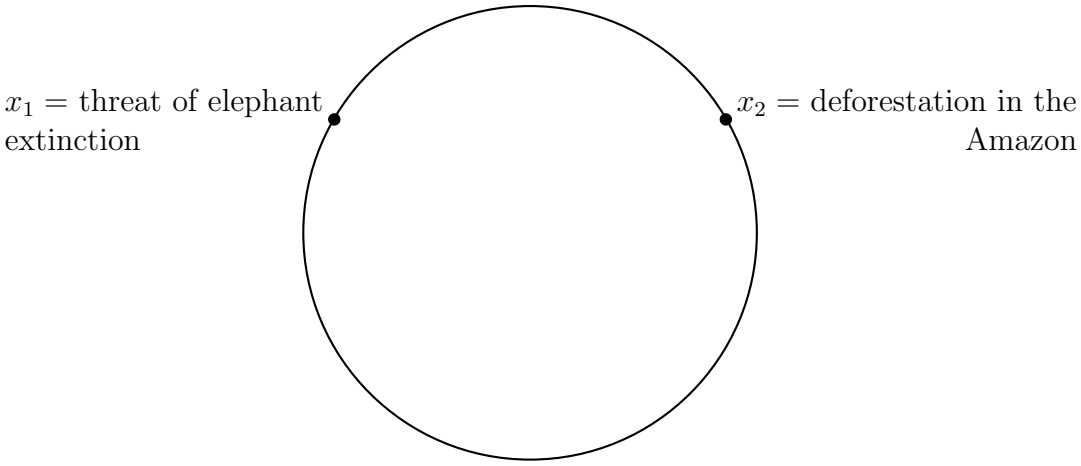

Figure 1.1: Issue space.

This space is often used to model diversity or variety. Salop (1979), for example, uses the circumference of a circle to model product variety and product differentiation in oligopoly. Pestieau and Sato (2006) and Aldashev and Verdier (2010) use this space in the context of charitable giving to model diversity over charities' ideologies. In line with Baron (2010), distance in I can be interpreted as socioeconomic distance.

Opportunities for impact arise according to external events after an NGO is defined. Elephants may be particularly threatened this season because of a weather event or socioeconomic conditions that influence pressure from poachers. More generally, the social impact generated by a dollar of an NGO's effort will vary across issues in a way that is not known at the moment the NGO is constituted. To formalize this notion, let the function b give the constant marginal impact of an NGO's dollar at each location in I as a function of the state of the world. That is, $b(x, s)$ gives the marginal impact associated with devoting a dollar towards issue $x \in I$ when the state is s. It is the *ex-ante* uncertain state of the world that makes the marginal benefit of devoting resources towards an issue unknown. In order to emphasize the horizontal nature of issues, assume that marginal benefit follows an identical, independent process for each issue $x \in I$. In essence, *ex-ante* one issue is not systematically more important than another.

The incentives for an NGO to design its mission are driven by the stochastic nature of b.

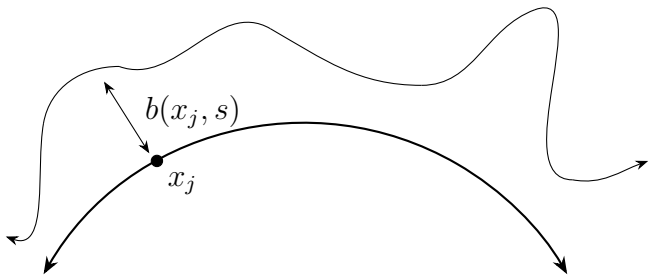

Figure 1.2: Impact opportunities vary across issues.

The NGO will have an incentive to choose a broad mission precisely because this choice will give it greater opportunity to develop high impact opportunities when they arise *ex-post*. Note that marginal impact is constant as a function of total resources devoted to an issue. This simplification helps to focus on the decision of mission design.[3]

The beneficiaries of an NGO's efforts reside outside the circle (they are the elephants saved or environmental damage thwarted) but prospective donors derive warm-glow utility from contributing to them (Andreoni, 1990). Importantly, the NGO knows b at the moment it is deciding how to allocate funds between projects, but this function is not realized at the time the NGO is designed (i.e., when the mission statement is determined). For illustration, one possible function b is sketched in figure 1.2 for a portion of I, given some realized state of the world.

Before moving on and characterizing NGOs, it will be useful to help simplify the analysis by "opening up" the circle I and mapping it onto the unit interval. This can be accomplished with the function $k : [0, 1) \to I$ given by $k(x) = (\cos(2\pi x)/2\pi, \sin(2\pi x)/2\pi)$. It is straightforward to show that k is a continuous bijection such that k^{-1} maps I onto the unit interval while preserving distance.[4] When no confusion is possible, and with some abuse of

[3]Characterizing the technology of producing social benefit as constant returns to scale may be inappropriate if multiple NGOs channel funds towards an issue. Two points recommend making such an assumption however: i) it seems reasonable when funds are small relative to social impact, and ii) it takes no stances on economies of scope with provision by multiple NGOs. In any case, this assumption is without loss of generality given the particular issue space.

It is also worth pointing out that each NGO has the same technology of producing social benefit. Introducing heterogeneity in technology could produce NGOs with differing scopes, although this line of inquiry is not pursued.

[4]To be precise, k^{-1} projects I onto $[0, 1)$. It should be clear that $x \in I$ can always be chosen so that k^{-1}

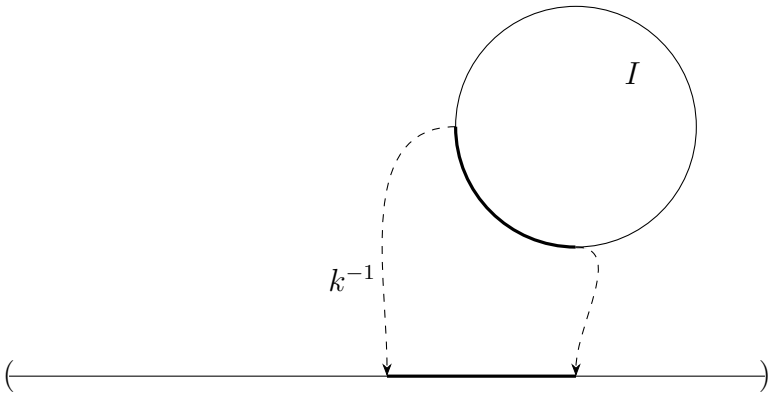

Figure 1.3: Mapping the issue space I into the real line.

notation, the projected issue space will be referred to as I. Figure 1.3 illustrates.

1.1.2 NGOs

An NGO in this model is defined by its mission statement—an institutional design choice to which the NGO commits and that defines what the NGO does. There are number of ways to motivate this assumption (e.g., building of reputation) but it is worth noting the legal significance of mission statements:

> The mission statement is not only the reason you donate to or volunteer for an organization but it also has important legal implications for staff and board. If you do not perform your mission, in the United States, the IRS can take away your tax-exempt status under section 501(c) of the Internal Revenue Code. The same holds true in other countries around the world. (Brinckerhoff, 2009, p. 39)

More precisely, I define an NGO's mission statement as follows.

Definition 1.1 (Mission statement)**.** *A NGO's mission statement M is a subset of the issue space I, such that $M = [\ell - w/2, \ell + w/2]$, where $\ell \in I$ and $w \in [0, 1]$ is the scope of the NGO's mission. An NGO is able to address an issue $x \in I$ if and only if $x \in M$.*

is continuous, hence preserving any topological properties when moving from I to the unit interval.

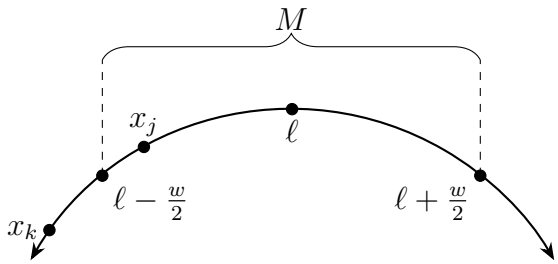

Figure 1.4: Mission statement of an NGO.

Figure 1.4 illustrates the notion of an NGO's mission. The NGO's mission is defined by the subset M—it may devote funds it raises to issue $x_j \in M$, but not to issue x_k which lies outside the scope of its mission. *Save the Elephants*, for example, cannot devote funds to saving dolphins.

Naturally, the formalization of an NGO's mission in the above definition is a simplification. In a repeated setting an NGO may redefine itself by updating its mission. Equally, a new NGO may form specifically as a result of the realized state of the world, such as a particular environmental or humanitarian crisis. Here a mission is treated as an institutional-design characteristic of the organization that is set in advance, abstracting from both of these points. Importantly, the scope of an NGOs missions allows it to be differentiated by the breadth of issues that it can address, a novel and important feature of this operationalization of mission.

Consistent with the notion of impact philanthropy (Duncan, 2004), NGOs (or the social entrepreneurs that run them) are assumed to care only about the social output they produce, with no explicit preference over location.[5] In other words, social entrepreneurs want to "do good," but do not mind to which issues it applies—following, for example, Scharf (2014). While a strong assumption, it is fairly standard in the literature on competing NGOs (e.g., Aldashev and Verdier, 2010) and helps to keep the model focused on competition. Examples of NGO founders consistent with such an assumption can be found in A&S Perspectives (2009). Scharf (2014, p. 50) further motivates this assumption, citing warm-glow altruism on the part of NGO managers.

[5]This assumption is analytically equivalent to that in Rose-Ackerman (1982), where each NGO has a preferred issue and enters only if its preferred issue is addressed in equilibrium.

> To the extent that charities (or the non-profit entrepreneurs who run them) are prosocially motivated, they care about what they provide. However, they also typically favour their own output relative to that of other providers—which is why, for example, they compete with charities similar to themselves for available funds.

Given some donations, that generally depend on an NGO's mission, $d(M)$, an NGO's problem is to pick a mission M to maximize the expected impact of its operations, B. Since uncertainty resolves *ex-post* (i.e., the state of the world is realized), the NGO will devote all of its resources towards the issue which, within the scope of its mission, produces the greatest marginal impact. Note that *ex-ante* there is an equal likelihood of funds going to any particular issue within the NGO's mission, since no issue is systemically more important than any other. The assumption that the NGO allocates money in this way is consistent with the observation that modern NGOs increasingly use cost-benefit analysis to choose between candidate projects—see, for example, Bond (2012) and Copper (2012).

Since issues in I are purely horizontally differentiated *ex-ante*, what matters for the expected impact of an NGO's mission is the scope of the mission, w. Letting β give the *expected maximum marginal impact* of a dollar as a function of the scope of an NGO's mission,[6] an NGO's problem is

$$\max_{w} B(M) = \beta(w)d(M).$$

In order to avoid technical difficulties, assume that $\beta \in C^2$.

As should be obvious, $\beta'(w) > 0$ for all w—an NGO with a broader scope expects to be able to pick a higher impact project because it has a larger set of candidate issues to choose from. It is intuitive to suppose that $\beta''(w) < 0$ and $\lim_{w\to 1} \beta'(w) = 0$—for a broader mission the expected value of the best project is increasing at a decreasing rate.[7]

[6] Formally, $\beta(w) = \mathbb{E}_s \sup_{x\in M} b(x, s)$, where expectation is taken over the state variable s.

[7] To motivate this assumption, consider w as analogous to the sample size (sampling with replacement) N

1.1.3 Donors

There is a set of risk-neutral donors that can make donations to NGOs. Each donor has one unit of an indivisible resource that they can donate (e.g., a dollar) to an NGO of their choosing. The following stylized observations motivate donors in the model (e.g., Aldashev and Verdier, 2010).

1. Donors care about the impact of their donation. All else equal, a donor prefers their donation going to issue x over x' if $b(x, s) > b(x', s)$.

2. Donors have preferences among issues. All else equal, if a donor has a preferred issue θ, they prefer their donation going to issue x over x' if $|x - \theta| < |x' - \theta|$.

In essence, donors prefer donating to NGOs that produce greater social impact but have single-peaked preferences over the issues to which this impact applies. Assume there is a continuum of donors with ideal points distributed uniformly on I, and that donors derive "warm-glow" utility from making a donation, a standard assumption (e.g., Bilodeau and Steinberg, 2006; Andreoni and Payne, 2013).

Given the realized state of the world, s, if an NGO addresses issue x then a donor with the preferred issue θ gets utility

$$u = b(x, s) - (\theta - x)^2$$

from their donation. The expression for utility above makes it clear that donors prefer to donate to projects that produce a larger impact, but perceive that projects further from

from draws of a random variable X distributed uniformly on the support $[0, \alpha]$. Define $\beta(N)$ as the expected maximum value of X for a given sample size N. For any realization x of X, the probability density function of the maximum value is given by Nx^{N-1}/α^N. Integrating over all realizations of X gives

$$\beta(N) = \int_0^\alpha x \frac{Nx^{N-1}}{\alpha^N} dx = \frac{\alpha N}{(N+1)}.$$

Extending β to $\mathbb{R}_+$, it follows that $\beta'(N) > 0$ and $\beta''(N) < 0$, with $\lim_{N\to\infty} \beta'(N) = 0$. The map $l(w) = (1+w)^2/(1-w)^2$ is a strictly increasing surjection from $[0, 1)$ to $[1, \infty)$ that preserves concavity, and so l^{-1} is suitable for interpreting N in terms of w.

their ideal one are less socially valuable. Consumers' warm-glow altruism is thus limited in the sense of Baron (2010).[8]

Donors donate *ex-ante*, before the state of the world is realized, and so their decision to donate is based on the expected utility of donating. Since donors recognize that the NGO to which they donate will direct funds towards the issue with the largest impact *ex-post*, they realize that *ex-ante* there is an equal likelihood that the NGO will address any particular issue that falls within the scope of their mission.[9] Expected utility for a donor of type θ from donating to an NGO with mission $[\ell - w/2, \ell + w/2]$ is thus

$$\begin{aligned}\mathbb{E}u(w;\theta) &= \beta(w) - \frac{1}{w}\int_{\ell-w/2}^{\ell+w/2}(\theta - x)^2 dx \\ &= \beta(w) - w^2/12 - (\theta - \ell)^2.\end{aligned}$$

Donors then choose which NGO to donate to, according to which one gives the largest expected utility, or do not donate at all and receive outside utility of zero.[10] For future use, recall that d is the function that gives donations as a function of NGOs' missions.

1.1.4 Timing

The following summarizes the timing of the game played by donors and NGOs.

1. Each NGO writes down a mission statement (i.e., chooses a set of issues that it can address, M). The set of impact opportunities (i.e., the realized values $b(x, s)$) are not

[8] Following Baron (2010), dis-utility from mismatch can take an exponential form, so that a donor discounts the value of their donation for issues further from their preferred issue, analogous to exponential discounting. While this approach can be taken here, it introduces several technical complications while delivering the same qualitative results. In any case, quadratic loss is fairly standard for modeling dis-utility of mismatch (e.g., Economides and Rose-Ackerman, 1993). Similar remarks apply for using absolute loss to model dis-utility of mismatch.

[9] Alternatively, donors may simply have uninformed priors *ex-ante* about where an NGO will channel donations *ex-post*.

[10] Following Aldashev and Verdier (2010), it is straightforward to let donors have an innate propensity to donate. Analytically, this simply lowers the reservation utility from not donating, and has no impact on the results of the model, other than introducing additional notation.

known at this stage but the process that generates them and therefore β is common knowledge.

2. Observing NGOs' mission statements, donors make donation decisions. Total donations to an NGO is denoted by d.

3. The state of the world s is realized so that values $b(x, s)$ are observed for all $x \in I$. The NGO directs the funds at its disposal to the issue in M that produces the greatest impact (i.e., the issue x' such that $b(x', s) \geq b(x, s)$ for all $x \in M$).

The solution concept is sub-game perfect Nash, and only symmetric equilibria are examined. While symmetry is a strong restriction, ruling out the possibility that NGOs vary in the scope of their missions, it helps to focus the model on developing the implications of competition between NGOs and entry into the sector.

Before analyzing the equilibrium of the model, the assumptions about timing are stark and it is useful to reflect on them. Central is that an NGO fixes its mission before impact opportunities are realized and before donors make donation decisions.

While it is true that in some cases an NGO is set up in response to a specific opportunity to produce social impact, there is good reason for not wanting to sequence the game in this way. Most importantly, this is a model of the strategic use of missions by NGOs. Having an NGO act first and design its mission captures the notion that mission is important in attracting donors. A more demand-driven approach in which donors decide initially to which issue they want to devote their money, with an NGO then emerging to execute this, seems less interesting. If donors care about mission and NGOs want to exploit this strategically, it makes little sense to construct a model in which mission is chosen *after* donors have decided how they want to donate.[11] The analysis here reflects the idea that "[m]ission statements are intentionally vague, as too much specificity risks alienating selected groups of stakeholders" (Powell and Steinberg, 2006, p. 133).

[11] There are instances where an NGO emerges to satisfy demand on the part of donors for social enterprise. The NGO, however, must still design a mission before it can attract funds.

Uncertainty over social outcomes is motivated by the idea that at any moment there is only less-than-perfect knowledge of what the impact of particular projects in the future will be. If there were no uncertainty over the impact of projects, there would be no strategic value to keeping a mission vague. In this way, the timing captures long-run considerations; an NGO must design its mission to give itself sufficient flexibility and develop a donor base. It is reasonable to think there is likely to be substantial "stickiness" in adjusting mission. There could be various reasons for this, from having to go back through the approval process for charitable tax-exempt status, to the need to redevelop "brand" and name awareness.

Implicit in the timing of the model is that an NGO credibly commits to the mission that it announces. While credibility can be motivated by reputational or legal costs—an NGO risks alienating donors or losing tax-exempt status if it deviates from its announced mission—assuming credibility allows the analysis to focus on the implications of competition. By abstracting from issues of commitment, the effects of competition between NGOs on mission statements are transparent—any inefficiency resulting from competition comes about because of the way NGOs interact, not because they are unable to commit to their mission. Credibility is a fairly standard assumption regarding the actions of NGOs (e.g., Bilodeau and Slivinski, 1997; Aldashev and Verdier, 2010)—see Bilodeau and Steinberg (2006) for more on the credibility of nonprofits.

1.2 Equilibrium

To begin, I examine the case in which the space of donors is not "covered," so that not all donors actually donate. In this case, NGOs act as monopolists, insulated from competitive forces. Considering this case first will make the implications of competition clearer.

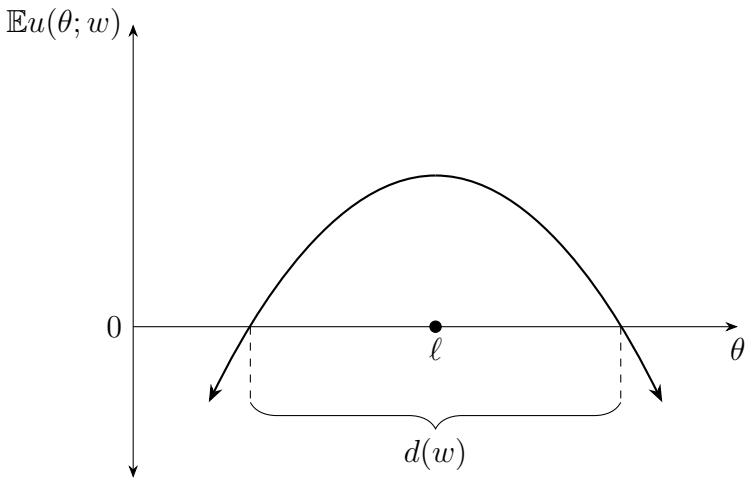

Figure 1.5: Donor base with a single NGO.

1.2.1 Design of a monopoly NGO

Consider the problem of a single social entrepreneur who faces no competition for donations from other NGOs. This occurs when the number of NGOs operating is sufficiently small so that not all donors wish to donate, and thus NGOs do not face meaningful competition with each other over donations. Given a choice of mission (i.e., a choice of w), a donor of type θ will donate if and only if expected utility is positive,

$$\beta(w) - w^2/12 - (\theta - \ell)^2 \geq 0.$$

This condition defines the set of donors that wish to donate—the NGO's *donor base*—as well as total donations, as a function the scope of an NGO's mission. Figure 1.5 illustrates.

Analytically, donations to an NGO as a function of its mission are given by the measure of an NGO's donor base,[12]

$$d(w) = 2\sqrt{\beta(w) - \frac{w^2}{12}}. \tag{1.1}$$

[12]To be precise, (1.1) applies only when $\beta(w) \geq w^2/2$. It is possible that this inequality is reversed once w becomes large enough. In order to simplify the exposition, this is ignored throughout the chapter by assuming that $\beta(1) \geq 1/12$. This assumption has no substantive impact on the analysis, other than avoiding having to constantly quality when donations are non-negative.

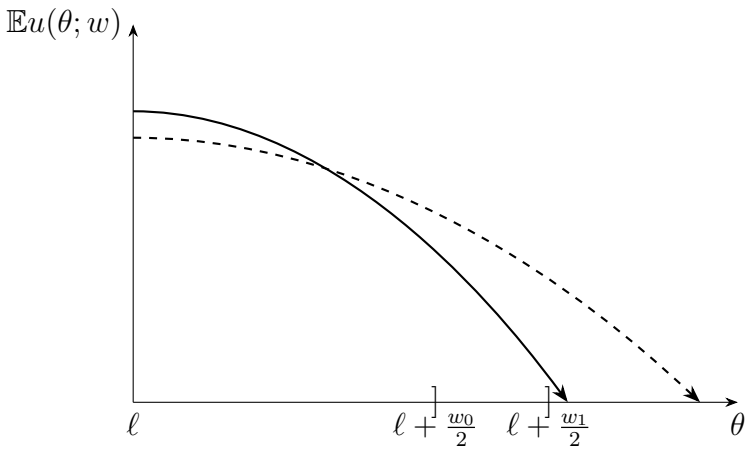

Figure 1.6: Effect on utility for consumer types with $\theta \geq \ell$ from increasing w from w_0 to w_1 while holding domain left of ℓ fixed.

It is worth noting that (1.1) is invariant to ℓ, so that the "center" of an NGO's mission is unimportant. This just reflects the idea that one issue is not systematically more important than another.

Examining (1.1), it is clear that an NGO's mission has two effects on its donor base. For the first effect, increasing w increases the expected impact of the NGO's funds. Donors like this, and so adopting a broader mission has the effect of increasing total donations. For the second effect, increasing w and covering a wider range of issues makes it more likely that the NGO will end up channeling resources to an issue that is further from a donor's ideal issue. Except for those donors with ideal issues sufficiently close to the periphery of the NGO's mission, donors with ideal issues already covered by the NGO's mission unambiguously dislike this extra scope. However, donors with ideal issues outside the NGO's mission, or sufficiently close to the periphery, like the fact that issues closer to their preferred issue are now covered by the NGO, although this must be weighed against the new issues being even further from their ideal issue. Figure 1.6 illustrates this effect. On net, the effect is negative, as the dis-utility from new issues outweighs the utility of issues closer to the donor's preferred issue, and so adopting a broader mission has the effect of decreasing total donations. The following proposition summarizes these two effects.

Proposition 1.1 (Donations non-monotonic in scope)**.** *Total donations to an NGO are increasing in the scope of its mission up to a point and decreasing thereafter (i.e., there is a unique $\hat{w}$ such that d is increasing in w if and only if $w \leq \hat{w}$).*

The non-monotonicity of donations plays an important role in the results in this model as it places limits on an NGO's desire to expand horizontally. While an NGO with a broad scope may be able to find a very high-impact project *ex-post*, prospective donors are dissuaded from contributing by their anticipation that the issue to which their donation ends up being directed to is likely to be far from their preferred issue.

Given total donations as a function of its mission, an NGO wishes to design its mission (i.e., choose w) to maximize its expected social impact. Using the function in (1.1), an NGO's problem can be written as

$$\begin{aligned}\max_{w} B(w) &= \beta(w)d(w) \\ &= 2\beta(w)\sqrt{\beta(w) - \frac{w^2}{12}}.\end{aligned}$$

Denoting by w^* the optimal scope for the NGO's mission, the first-order condition for the NGO's problem,

$$\frac{\beta'(w^*)}{w^*}\left(\frac{3\beta(w^*) - \frac{w^{*2}}{6}}{\beta(w^*)}\right) = \frac{1}{6}, \tag{1.2}$$

completely characterizes the solution to the NGO's problem.[13]

Remark 1.1. *There is a unique point w^* that satisfies* (1.2)*.*

If total donations were fixed, the NGO would want to choose the scope of its mission w to be as large as possible, as this will ensure that the highest impact projects are available *ex-post*. The NGO, however, is restricted by the need to attract donations and thus cater

[13]Necessity follows since $\lim_{w\to 0} B'(w) > 0$ and $\lim_{w\to 1} B'(w) < 0$, assuming of course that $d(1) > 0$. Sufficiency follows since $\log B$ is obviously concave.

to prospective donors. As described in proposition 1.1, some donors are dissuaded from donating to the NGO once the scope of the NGO's mission becomes too broad. These effects then combine to give the following proposition.

Proposition 1.2 (Foregone donations)**.** *An NGO designs a mission statement that is broader in scope than one that maximizes donations.*

1.2.2 Welfare with a monopoly NGO

Before moving on to consider the implications of competition for the scope of NGOs' missions, it is useful to develop a simple normative result and compare the scope of a monopoly NGO, w^*, with the choice that a social planner would make.[14] There is some debate in the literature as to how to treat warm-glow utility in the evaluation of social welfare. Following Andreoni (2006), Diamond (2006), and Bernheim and Rangel (2012), I exclude donors' warm-glow utility from the social welfare function. In essence, welfare derives from consequences over outcomes, not the action that led to those outcomes. With this assumption in hand, social welfare with a monopoly NGO is given by

$$W(w) = \beta(w)d(w).$$

If there is more than one NGO acting in isolation, W would need to aggregate surplus over each NGO, although this has no impact on the socially optimal scope an NGO's mission.

Clearly, the above welfare function corresponds to the objective of an NGO: both a social planner and NGO would like to choose a mission that maximizes expected social impact.[15]

[14]Note that the planner must still design an NGO that can attract donations. The planner cannot force donors to donate. If this were not true, the planner would always want all NGOs to have missions with maximal scope.

[15]It is possible that there is an opportunity cost associated with making a donation, so that a social planner would value social impact less than an NGO, although this is often not considered (e.g., Aldashev and Verdier, 2010). Adding this into the model would drive a wedge between the socially optimal mission statement and that chosen by an NGO, such that an NGO chooses too narrow a mission statement. When considering competition between NGOs—the main focus of the chapter—this has no qualitative impact on the results of the model. Ignoring such an opportunity cost helps to clarify the comparison between a monopoly NGO's mission and that of an NGO facing competition for donations, while reducing notation.

The scope of a monopoly NGO's mission, w^*, is thus socially optimal. Absent competitive forces, an NGO uses donors' resources efficiently.

Proposition 1.3 (Socially optimal NGOs)**.** *When NGOs act in isolation, each chooses a socially optimal mission statement.*

1.2.3 Competing NGOs

The monopoly NGO setting considered in the previous section gives insight into the trade-offs implicit in an NGO's mission design problem. In reality, however, there are many NGOs defined by different missions that coexist but compete with one another for donations. In defining their mission statements, NGOs will use the scope of their mission strategically.

In order for NGOs to face meaningful competition from each other, the donor space must be "covered" so that donors make a decision between which NGO they want to donate to, not whether to donate to a particular NGO or not at all. In this case, a NGO *encroaches* on its neighboring NGO's donor base, luring prospective donors away by addressing issues that appeal to those donors. Since the goal is to characterize symmetric equilibria, assume all NGOs are spaced $1/n$ apart on I, where n is the number of NGOs, and that all NGOs but the ith choose $\bar{w}$ as the scope of their missions. In this case, donors choose between neighboring NGOs. To be precise, if NGO i has a mission centered on issue ℓ and NGO j has a mission centered on $\ell + 1/n$, a donor of type θ, located between ℓ and $\ell + 1/n$, donates to NGO i if and only if

$$\beta(w_i) - \frac{w_i^2}{12} - (\theta - \ell)^2 \geq \beta(\bar{w}) - \frac{\bar{w}^2}{12} - (\theta - \ell - 1/n)^2.$$

From the above inequality, total donations for NGO i are given by

$$d(w_i, \bar{w}) = \frac{1}{n} + n\left[\beta(w_i) - \beta(\bar{w})\right] - \frac{n}{12}\left[w_i^2 - \bar{w}^2\right].$$

In contrast to the previous case where NGOs acted as monopolists, donations now depend on an NGO's mission as well as the missions of all other NGOs. It is in this sense that NGOs are competitors, and the desire to attract donors will give NGOs an incentive to strategically design the scope of their missions.

Given that all others NGOs are choosing $\bar{w}$ as the scope of their missions, an NGO's problem is now

$$\begin{aligned}\max_{w} B(w,\bar{w}) &= \beta(w)d(w,\bar{w}) \\ &= \beta(w)\left(\frac{1}{n} + n\left[\beta(w) - \beta(\bar{w})\right] - \frac{n}{12}\left[w^2 - \bar{w}^2\right]\right).\end{aligned}$$

In a symmetric Nash equilibrium, denoted by w^e, it is both necessary and sufficient that

$$\frac{\beta'(w^e)}{w^e}\left(\frac{1+n^2\beta(w^e)}{n^2\beta(w^e)}\right) = \frac{1}{6}, \tag{1.3}$$

so that (1.3) characterizes the set of Nash equilibria.[16]

Remark 1.2. *There is a unique point w^e that satisfies* (1.3).

The following lemma provides some intuition for analyzing the impact of competition on the scope of NGOs' missions. In essence, if an NGO finds it optimal to reduce the scope of its mission to attract donors, competitors respond by narrowing their missions as well.

Lemma 1.1. *The scope of an NGO's mission is a strategic complement in a neighborhood about the equilibrium.*

Comparing the scope of NGOs' missions when they compete for donors versus when they act in isolation (i.e., comparing w^e with w^*) leads to the following proposition, and illustrates the impact that the presence of competitors has for an NGO's mission-design problem.

[16]To establish necessity, note that, for any $\bar{w}$, $\lim_{w\to 0} B'(w,\bar{w}) > 0$ and $\lim_{w\to 1} B'(w,\bar{w}) < 0$, and thus a Nash equilibrium must be interior. Sufficiency follows since $\log B$ is concave in its first argument.

Proposition 1.4 (Competition reduces scope)**.** *When NGOs compete with each other for donations, each chooses a mission that is narrower in scope than if each acted in isolation (i.e.,* $w^e \leq w^*$*).*

In effect, when NGOs encroach on one another's donor bases and compete for donations, each NGO finds it beneficial to narrow its mission and cover a smaller variety of issues. By reducing its scope below w^* the NGO can, other things being equal, attract more donations—recall that w^* does not maximize donations. Strategic complementarity of scope, however, means that other NGOs have an incentive to reduce the scope of their mission statements as well, so that in equilibrium all NGOs design narrower mission statements. Such a mechanism is seen in the NGO sector, where competition leads NGOs to compromise on or alter their mission to attract donors (e.g., Fruttero and Gauri, 2005; Bose, 2014): "Another way to increase funds from private givers [in the presence of competition], and ensure continued funds from changing governments, is to compromise on policy positions" (Glennie, 2012).

From (1.3), it is straightforward to determine the effect of entry on the scope of NGOs' missions. By increasing the number of NGOs, n, and thus making competition more intense between NGOs, each NGO has an incentive to narrow its missions and solidify its donor base, as detailed in the following proposition.

Proposition 1.5 (Entry reduces scope)**.** *Each NGO chooses a mission with a narrower scope in equilibrium when there are more NGOs (i.e.,* w^e *is a decreasing function of* n*).*

While competition has the effect of reducing the scope of NGOs' missions, it is worthwhile to note that each NGO still chooses a mission that is broader than that which maximizes donations. In this way, proposition 1.1 continues to hold even when NGOs act as competitors. Sargeant and Jay (2002) find evidence to this point; non-profit mergers that increase the scope of an NGO can reduce donations received by the new NGO.

Before moving on and considering entry, it is useful to establish a sufficient condition for the equilibrium to be one in which NGOs are competitors. In essence, if there are "enough"

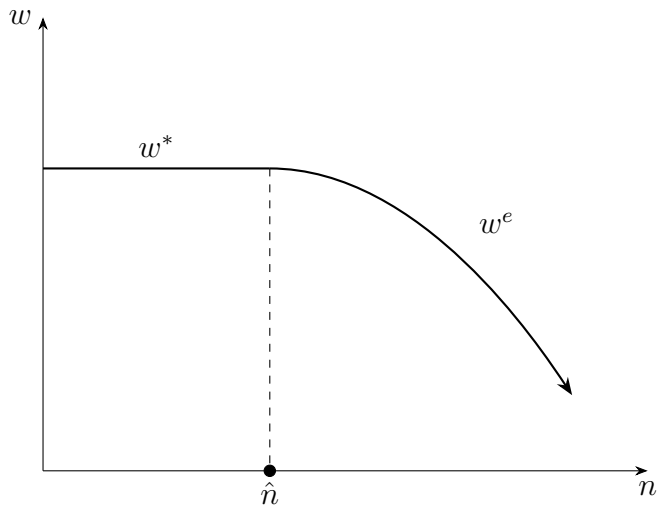

Figure 1.7: Equilibrium scope as a function of the number of NGOs.

NGOs, then they will be competitors. This is relevant for the case of free entry, as such an equilibrium can occur only when NGOs compete with each other for donations. The following lemma restricts the histories of the game to ensure that NGOs' strategies are given by (1.3) in a sub-game perfect equilibrium. Figure 1.7 illustrates this.

Lemma 1.2. *There is a number of NGOs $\hat{n} \geq 2$ such that, if there are at least $\hat{n}$ NGOs, the unique, symmetric Nash equilibrium is given by w^e in* (1.3).

Alternatively, if donors have a sufficiently strong innate propensity to donate, as in Economides and Rose-Ackerman (1993) and Aldashev and Verdier (2010), then market coverage is trivial and w^e in (1.3) is always the unique, symmetric equilibrium, regardless of the number of NGOs (i.e., $\hat{n} = 2$).

1.2.4 Equilibrium with free entry

In this section I examine how many NGOs will emerge from a process of free entry, taking into account how scope depends on the competitive landscape. Free entry is an assumption seen in existing models of NGO competition (e.g., Rose-Ackerman, 1982; Aldashev and Verdier, 2010). Thornton (2006) argues that legal and financial barriers for the formation

of a nonprofit are low; Weisbrod (2000) offers local advocacy groups as an example of a type of NGO subject to low barriers to entry stemming from low start-up costs. In sum, "[low barriers to entry are] an incentive for founders to create a new organization rather than examining ways in which their goals might be achieved through existing organizations" Eagan (2011).

Letting F be the opportunity cost associated with setting up an NGO,[17] and assuming that F is not so large as to dissuade NGOs from actually competing with each other, NGOs will enter up to the point where the expected social impact they produce equals the opportunity cost F.

Proposition 1.6 (Free-entry equilibrium)**.** *In the free-entry equilibrium, there is a unique number of NGOs $n^e > 2$, each with a mission of scope w^e, defined by*

$$\frac{\beta'(w^e)}{w^e}\left(\frac{1+n^{e2}\beta(w^e)}{n^{e2}\beta(w^e)}\right)=\frac{1}{6}$$
$$\beta(w^e)=Fn^e.$$

One interesting aspect of NGOs' mission-design strategies is that an NGO may engage in *donor stretching*, covering a range of issues broad enough so that there are issues in the NGO's mission that are not the preferred issue of *any* of its donors (i.e., $d(w^e) \subset M(w^e)$). Put another way, donor stretching occurs when an NGO's mission covers a broader range of issues than its donor base is interested in. While donor stretching need not occur, when there are sufficient number of NGOs competing for donations, NGOs design mission statements that stretch donors, and this occurs precisely when there are small barriers to entry.

Proposition 1.7 (Donor stretching)**.** *When F is sufficiently small so that there is little barrier to entry, an NGO designs a mission that addresses issues that are not the preferred issue for any member of its donor base.*

[17] Aldashev and Verdier (2010) treat the presence of an opportunity cost against which NGO-entrepeneurs weight the "psychological" benefit of their operation as a stylized fact.

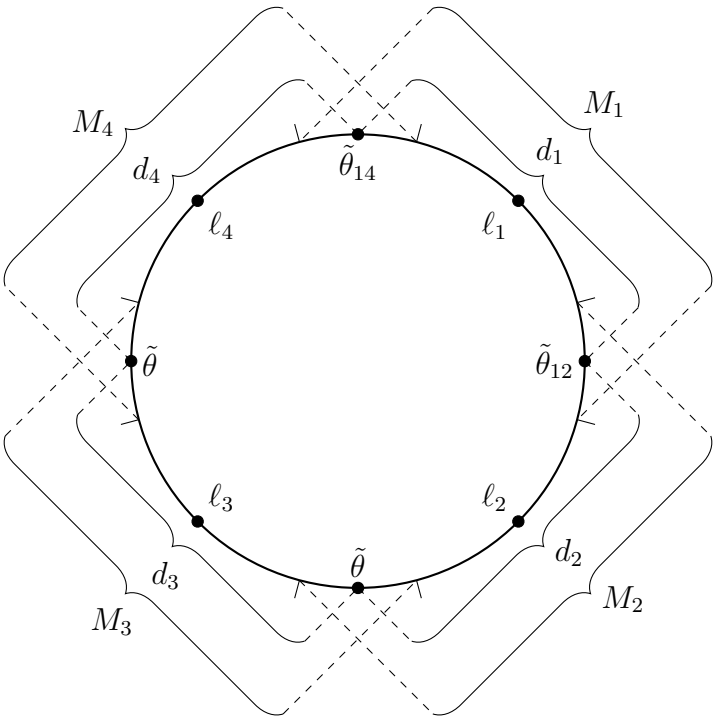

Figure 1.8: Equilibrium under free entry, illustrated for $n^e = 4$.

This is summarized in Figure 1.8, illustrated for a case in which $n^e = 4$. The NGO centered at ℓ_1 (for example) attracts donations from donors with ideal issues between $\tilde{\theta}_{14}$ and $\tilde{\theta}_{12}$ (the length of the arc between these two cut-off types is donations for NGO 1). The following corollary is immediate.

Corollary 1.1 (Overlapping missions)**.** *With little barrier to entry, NGOs design mission statements that overlap. Expected impact is higher at the periphery of an NGO's mission.*

This is an interesting result. Even though all donors donate, competition for turf among NGOs leads to mission statements that *overlap* in equilibrium. This result is consistent with evidence found in Koch et al. (2009). One interesting implication of overlapping missions is that expected impact generated by NGO activities on a subset of issues—in particular, those that lie within the intersection of two NGOs' missions—will be greater (twice as great) than other issues, even though NGOs are symmetric. These "favored" issues will be at the periphery, not the core, of any individual NGO's mission.

1.2.5 Welfare with competing NGOs

With multiple, symmetric NGOs acting competitively, the social welfare function is

$$W(w) = \beta(w) - nF.$$

In order to characterize the socially optimal mission with competing NGOs, however, donors' participation constraint needs to be taken into account. Formally, the socially optimal mission w^{**} and number of NGOs n^{**} solves

$$\max_{w,n} W(w) = \beta(w) - nF \quad \text{s.t. } \beta(w) - \frac{w^2}{12} \geq \frac{1}{4n^2}.$$

Taking into account donor's participation constraint ensures that the socially optimal mission w^{**} is comparable with the competitive mission w^e from the previous section. Solving the above problem leads to the following propositions.

Proposition 1.8 (Excessively narrow missions)**.** *NGOs design missions that are excessively narrow compared to what is socially optimal in a competitive setting (i.e., $w^{**} > w^*$).*

Recall that when NGOs are insulated from competitive pressure, they act in a socially optimal way. Instead, when NGOs choose their missions strategically, they fail to design socially optimal missions. As shown in the previous sections, competition has the effect of narrowing NGOs' mission statements, and this narrowing is inefficient. By strategically narrowing its mission to attract more donors, each NGO designs a mission that is excessively narrow. It follows that, if each NGO increases the scope of its mission, each will receive the same amount of donations but produce greater expected impact.

Proposition 1.9 (Excessive entry)**.** *The free entry equilibrium features more NGOs in operation than is socially optimal ($n^{**} < n^*$).*

The issue with entry relates to NGOs' incentives to enter. Since entry induces other NGOs to reduce the scope of their missions, entry imposes a negative externality on all other

NGOs, giving too much incentive for social entrepreneurs to set up an NGO. The result is an excessively large fixed cost associated with addressing social issues, as fewer NGOs with the same scope could produce the same expected impact at lower cost. Combining the above two propositions, when NGOs compete for donations, this leads to a socially excessive number of NGOs, each with too narrow a mission—fewer NGOs with broader missions would improve social welfare.[18]

Viewing NGO mergers as a way of increasing the scope of missions and reducing the number of NGOs, the following quote effectively captures the normative results of the model.

> The reality is that mergers among nonprofits are necessary. In many parts of the country today, there are simply too many nonprofits. This situation is caused by many factors, including the best of intentions, but the plain fact is that having an excessive number of nonprofit organizations actually weakens the collective power of the entire field. (McLaughlin, 2010, p. xvi)

The idea that there are too many NGOs, each with too narrow a mission, can also be seen in Werker and Ahmed (2008); Nursey-Bray (2012) discusses some criticisms that environmental NGOs have too narrow a focus.

1.3 Conclusions

The model developed in this chapter is the first formal economic analysis of NGO competition in mission statements. The final insight—that NGOs choose mission statements that are too narrow in scope—has a number of implications. Little formal analysis has been directed at trying to understand how policy towards the NGO sector (the "third sector") should be designed, but the biases identified here point to intervention that encourages NGOs to broaden the scope of their missions. This intervention could come in a variety of forms: tax

[18]Comparing with Aldashev and Verdier (2010), mission scope has a similar effect to fundraising, where impact across NGOs is decreasing with entry and free entry delivers too many NGOs. The mechanisms from which these outcomes are realized, however, are distinct.

advantages on the basis of mission, practices aimed at facilitating merger between NGOs, or regulating NGO entry. I leave the design of these policies for future work.

While previous work has pointed to the possible over-supply of NGOs from excessive entry (e.g., Rose-Ackerman, 1982; Pestieau and Sato, 2006; Aldashev and Verdier, 2010), these analyses are driven by concern for diversion of funds from socially beneficial activities to mutually-offsetting, fund-raising activities. Without fund-raising effort or expenditure in the model, the results developed here are driven by a more fundamental consideration of the activities in which NGOs engage. It is the incentives NGOs have to design their mission strategically that facilitate excessive entry.

1.4 Appendix

Proof of proposition 1.1. Define the function $g : (0,1) \to \mathbb{R}$ by $g(w) = \beta'(w)/w$. Note that g is strictly decreasing and maps onto $(0,\infty)$. Setting $\hat{w}$ as the unique point such that $g(\hat{w}) = 1/6$, it is obvious that $d'(w) \geq 0$ if and only if $w \leq \hat{w}$. The mean value theorem completes the proof. □

Proof of remark 1.1. Let the function $h : (0,1) \to \mathbb{R}$ be given by

$$h(w) = \frac{\beta'(w)}{w}\left(\frac{3\beta(w) - \frac{w^2}{6}}{\beta(w)}\right).$$

To begin, note that h is strictly decreasing since β is concave. Now since $\lim_{w\to 0} h(w) = \infty$ and $\lim_{w\to 1} h(w) = 0$, h maps onto $(0,\infty)$ and hence there is a unique point w^* such that $h(w^*) = 1/6$. □

Proof of proposition 1.2. Setting $g(w) = \beta'(w)/w$ and

$$h(w) = \frac{\beta'(w)}{w}\left(\frac{3\beta(w) - \frac{w^2}{6}}{\beta(w)}\right)$$

as before, the goal is to show that $h(w^*) = 1/6$ implies that $g(w^*) < 1/6$. Now $h(w) > g(w)$ for all $w \in (0,1)$ since, by assumption, $\beta(w) > w^2/12$ for all $w \in (0,1)$. It therefore follows that at w^*, $g(w^*) < 1/6$. □

Proof of remark 1.2. Let the function $H : (0,1) \to \mathbb{R}$ be given by

$$H(w) = \frac{\beta'(w)}{w}\left(\frac{1+n^2\beta(w)}{n^2\beta(w)}\right).$$

Note that H is strictly decreasing for $n \geq 1$. Since $\lim_{w\to 0} H(w) = \infty$ and $\lim_{w\to 1} H(w) = 0$, H maps onto $(0,\infty)$ and hence there is a unique point w^e such that $H(w^e) = 1/6$. □

Proof of lemma 1.1. From (1.3), $\beta'(w^e)/w^e < 1/6$ since

$$\frac{1+n^2\beta(w)}{n^2\beta(w)} > 1.$$

Now

$$\frac{\partial^2 B(w,\bar{w})}{\partial w \partial \bar{w}} = -n\beta'(w)\left(\beta'(\bar{w}) - \frac{\bar{w}}{6}\right)$$

is continuous and strictly positive when $\bar{w} = w^e$. Therefore there is a neighborhood N about w^e such that $\partial^2 B(w,\bar{w})/\partial w \partial \bar{w} > 0$ for all $\bar{w} \in N$. □

Proof of proposition 1.4. The goal is to show that

$$\frac{\beta'(w^e)}{w^e}\left(\frac{3\beta(w^e) - \frac{w^{e2}}{6}}{\beta(w^e)}\right) \geq \frac{1}{6},$$

for then it must be that $w^* \geq w^e$. Since

$$\frac{\beta'(w^e)}{w^e}\left(\frac{1+n^2\beta(w^e)}{n^2\beta(w^e)}\right) = \frac{1}{6},$$

the desired inequality will hold if and only if

$$\frac{3\beta(w^e) - \frac{w^{e2}}{6}}{\beta(w^e)} \geq \frac{1 + n^2\beta(w^e)}{n^2\beta(w^e)}$$
$$\beta(w^e) - \frac{w^{e2}}{12} \geq \frac{1}{2n^2}.$$

Since the donor space is covered at w^e, $\beta(w^e) - w^{e2}/12 \geq 1/n^2$ and thus the result is proved. □

Proof of proposition 1.5. Since w^e is unique given n, (1.3) implicitly defines w^e as a function of n. A straightforward application of the implicit function theorem then establishes that w^e is C^1 with $\partial w^e(n)/\partial n < 0$. The mean value theorem establishes the result. □

Proof of lemma 1.2. The goal is to show that there is an $\hat{n}$ such $\beta(w^e) - w^{e2}/12 \geq 1/n^2$ for all $n \geq \hat{n}$. Let $G(n) = (\beta - w^2/12) \circ w^e(n) - 1/n^2$; note that G is strictly increasing in n. Letting $\hat{w}$ be the unique point given by $\beta'(\hat{w})/\hat{w} = 1/6$, from (1.3) it is apparent that $w^e(n) \to \hat{w}$ as $n \to \infty$. Therefore $\lim_{n\to\infty} G(n) > 0$. Now if $G(2) \geq 0$, set $\hat{n} = 2$ and the proof is done. Instead, if $G(2) < 0$, there is a unique point $\hat{n}$ such that $G(\hat{n}) = 0$ and $G(n) \geq 0$ if and only if $n \geq \hat{n}$. □

Proof of proposition 1.6. Letting w^e be the function defined by (1.3), the goal is to show that there is a unique point n^e such that $\beta(w^e(n^e))/n^e = F$. Define the function $K : [\hat{n}, \infty) \to \mathbb{R}$ by $K(n) = \beta(w^e(n^e))/n^e - F$. To begin, K is strictly decreasing since w^e is a decreasing function of n. Since $K(\hat{n}) > 0$ by assumption and $\lim_{n\to\infty} K(n) = -F$, there is a unique $n^e > 2$ such that $K(n^e) = 0$. □

Proof of proposition 1.7. From the equilibrium conditions in proposition 1.6, it is apparent that $n^e \to \infty$ if and only if $F \to 0$. The proposition will thus be proved if $w^e(n) > 1/n$ for all n sufficiently large. From (1.3), $w^e(n) \to \hat{w}$ as $n \to \infty$, proving the result. □

Proof of proposition 1.8. There are two cases to consider, depending on whether the constraint binds or not at the optimum. If the constraint does not bind, then it is obvious that

$w^{**} = 1$. Since $w^e < 1$ the proposition is proved.

Instead, suppose that the constraint binds. Now given any n, $\beta(w^{**}) - w^{**2}/12 = 1/(4n^2)$ implicitly defines w^{**} as a strictly increasing function of n. Since $\beta(w^e) - w^{e2}/12 \geq 1/n^2$ it must be that $w^{**} > w^e$, given n. Since this is true for all n, it is true for $\hat{n}$ from lemma 1.2. Since w^{**} is strictly increasing in n and w^e is strictly decreasing in n, it follows that $w^{**} > w^e$. □

Proof of proposition 1.9. There are two cases to consider, depending on whether the constraint that $n^{**} \geq \hat{n}$ binds or not. If the constraint binds, it is obvious that $n^e > n^{**}$. If instead the constraint does not bind, the Kuhn-Tucker conditions for the planner's problem give that

$$\frac{\beta'(w^{**})}{w^{**}} \left(\frac{1 + 2n^{**2}F}{2n^{**2}F} \right) = \frac{1}{6}.$$

Since $w^{**} > w^*$ from proposition 1.8, combining the above expression with those in proposition 1.6 gives that

$$2n^{*2}F > 2n^{**2}F,$$

proving the result. □

Chapter 2

Social Labeling by Competing NGOs

Non-governmental organization (NGO) labels that attest to the social footprint of a product, or the firm that supplies it, are common or growing in many product markets.[1] To be clear, the term *social labeling* implies communication of an externality: "A social label is best understood as [a symbol]... about the impact of a business process on *another group* of stakeholders" (Zadek et al., 1998, p. 20). Since pro-social behavior on the part of a firm is often a *credence characteristic* of a good—a consumer cannot observe that a firm employs socially responsible practices when producing a good, even after consuming the good—certification by a third party is required to communicate this information to consumers.[2] To the extent that consumers are willing to pay for pro-social behavior by firms, there is

[1]Consider eco-labels that attest to a firm's environmental performance as an example. The website ecolabelindex.com catalogs eco-labels by country and industry: as of writing, there are 465 labels across 199 countries and 25 industries. Sales of certified coffee and tea grew by 433 and 2000 percent respectively from 2005 to 2010 (Steering Committee of the State-of-Knowledge Assessment of Standards and Certification, 2012, p. 9). With respect to organizational structure, NGOs are the largest providers of eco-labels (Vermeer and Michalko, 2010, p. 21).

[2]In some contexts the good behavior of firms is directly observable by consumers, or firms may be able to communicate this information in a credible way. But often this will not be the case: "Conscientious consumers may be interested in supporting responsible companies but find it difficult to assess the accuracy of their self-serving claims. Given this information problem, the market for responsible production is expected to fail unless credible systems of certification can be created" (Bartley, 2011, p. 445). Labels often apply to elements of a firm's supply chain, making observation by individual consumers difficult. A label, however, is able to extract this information by virtue of a monitoring or auditing component; see Bartley (2011) or Auld (2014) for details. This differentiates a label from a code or principle of good conduct as the labeler can monitor performance "on the ground" (Bartley, 2011, p. 443). A labeler may then have a comparative advantage in inferring a product's social footprint compared to consumers so that, even if a consumer can learn the social characteristics of a product, it is less costly for a consumer to simply follow the label.

a potential rent that a firm can extract, and labeling provides the means for a firm to gain access to this rent.[3] The design of labels on offer is then important in understanding voluntary pro-social behavior by firms—the set of labels available details the set of social actions firms find profitable to undertake.

Existing analyses of label design focus exclusively on the stringency of labels, that is, how high a hurdle firms must pass to bear the label on their product, for a fixed social issue. In practice, different labels often apply to *different* behaviors and existing models say nothing about the attributes that become the subject of a label. These models also treat the number of labels as fixed, in contrast with the widespread *proliferation* of social labels (e.g., Bartley, 2011; Auld, 2014; Fischer and Lyon, 2014). While the issue of label proliferation is a key focus of policy discussion in this area, existing models provide no insight into the implications of entry for the types of labels available to firms.

In this chapter, I develop the first model of label design that (i) allows for horizontal variation in social attributes, and (ii) allows for entry of NGOs into the labeling "market." Of particular interest are the normative implications of label proliferation, and how the pro-social behavior induced from adopting a label compares to credible corporate social responsibility (CSR) by firms (e.g., Besley and Ghatak, 2007). This comparison makes clear the role played by NGO certification in determining firms' non-market strategies.

To give a concrete example, consider the market for tea. When purchasing tea, consumers choose between competing (and intrinsically similar) products bearing NGO-run labels that relate to *different* elements of their social conduct; see figure 2.1. PG Tips displays the Rainforest Alliance label (as do other major brands, such as Liptons and Yorkshire) that attests to their environmental impact. Similarly, Cooperative (and Twinings, Taylors, and others) carry the Fairtrade label that focuses on the division of profit in the supply chain. On the other hand, Typhoo displays no label at all. While either the Rainforest Alliance label or Fairtrade label requires firms to engage in pro-social behavior, the type of behavior

[3]See Steering Committee of the State-of-Knowledge Assessment of Standards and Certification (2012, pp. 9, 18, 50) for a discussion and estimates of price premiums for various eco-labeled commodities.

Figure 2.1: Examples of tea with different social labels.

differs *qualitatively*; the labels relate to different social issues. A similar situation applies in the market for coffee, where there are even more labels (Auld, 2014, Chapter 5). Even for labels that relate to a broad topic such as environmental sustainability, "[c]urrent standards often focus on one aspect or dimension of sustainability" (Steering Committee of the State-of-Knowledge Assessment of Standards and Certification, 2012, p. 51).

The main result of the model is that competition between NGOs does not produce an efficient allocation of labels. While NGOs engage in a "race-to-the-top" in designing the stringency of labels, an entering NGO imposes a negative externality on all other NGOs, ultimately reducing the stringency of all labels. These competing effects can produce labels that are either excessively weak or excessively stringent. However, when consumers value pro-social behavior for its social impact, there are an excessive number of inefficiently stringent labels. This runs counter to the contention that entry of labels is undesirable because competition between certifiers produces a "race-to-the-bottom" in terms of label requirements (Bartley, 2011; Auld, 2014).

With respect to firms' CSR activities, labels induce more pro-social behavior from firms than is the case when they can credibly communicate their pro-social efforts to consumers.

With label proliferation, however, the amount of pro-social behavior demanded by NGOs converges to that desired by firms. Questions about the desirability of labels then reduce to questions about the desirability of CSR. In settings where consumers fully internalize the social value of their consumption decisions, firms choose the first-best amount of pro-social behavior and, in this case, label proliferation can be desirable. Compared to the broader CSR literature (e.g., Bagnoli and Watts, 2003; Besley and Ghatak, 2007), when the choice set of firms is given by the set of labels available, the standard result that CSR under-provides pro-social behavior is reversed. Label proliferation is then desirable precisely because it helps to bring down the excessive standards of labels.

While the existing literature on labels and certification is sizable, there is little on the topic of label design. The relevant literature on competition between labelers is: Heyes and Maxwell (2004), Bottega and De Freitas (2009), Fischer and Lyon (2014, 2016), and Li and van't Veld (2015).[4] Heyes and Maxwell (2004) examine competition between a government label and an NGO run label, with a focus on the political economy of public labeling; Bottega and De Freitas (2009) examine competition between government and for-profit, and government and NGO run labels; Fischer and Lyon (2014, 2016) and Li and van't Veld (2015) examine competition between an industry label and an NGO label. Each of these papers builds a model where design of a label entails duopolists choosing the stringency of their labels, with each label applying to the same issue and no scope for entry. In this chapter I allow the number of certifiers to be determined endogenously, and examine the implication that entry has on the stringency of labels.

The remainder of this chapter proceeds as follows: section 2.1 details the basic model; section 2.2 solves the models and characterizes the equilibrium strategies; section 2.3 examines the normative implications of the model; section 2.4 concludes. Proofs are in the appendix.

[4]Existing analyses on labels—whether they be social labels or not—focus mostly on issues associated with communication of label standards (e.g., Lizzeri, 1999; Hamilton and Zilberman, 2006; Lerner and Tirole, 2006; Harbaugh et al., 2011; Mason, 2011). Issues of consumer confusion, label credibility, and strategic provision of information by labelers arise because of the informational asymmetry present with labeled products.

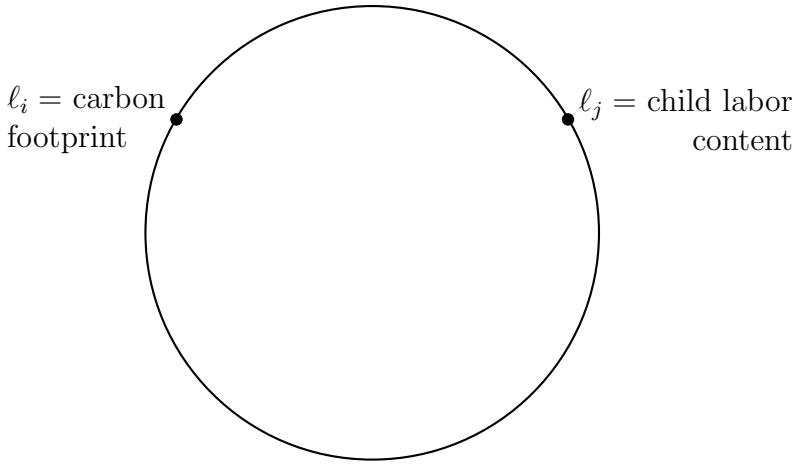

Figure 2.2: Issue space.

2.1 Model

The model is presented in several pieces: first, I describe the basic environment in terms of issues, consumers, firms, and NGOs; then, I outline the game played by consumers, firms, and NGOs.

2.1.1 Consumers and social issues

There is a set of social issues $I \subset \mathbb{R}^2$ generated or impacted by the operations of firms in production of a good. These issues are represented by points on the circumference of a circle with diameter $1/\pi$, similar to Baron (2010) and in the spirit of Salop (1979). See figure 2.2 for an illustration. The principal advantage of this particular characteristic space is the ease of considering entry.

For each issue there is a function b that gives the social benefit generated by applying s units of good behavior to this issue. For example, if the issue is "carbon footprint," b gives the social benefit from reducing s units of emissions. Note that b is the same for all issues, emphasizing the horizontal nature of issues: issue ℓ_i is not objectively better to address than issue ℓ_j. Assume $b \in C^2$, $b(0) = 0$, $b'(s) > 0$ and $b''(s) \leq 0$ for all s.

A subset of consumers care about the social impact of their consumption decisions and

derive "warm-glow" utility from purchasing a good that embodies positive social attributes. Both Zadek et al. (1998) and the Steering Committee of the State-of-Knowledge Assessment of Standards and Certification (2012) identify warm-glow as an important motivation for consumers to buy labeled products. This warm-glow underpins a willingness on the part of consumers to pay a premium for labeled products. There are numerous empirical studies that provide evidence of the willingness of (some) consumers to pay a premium for labeled products—see the studies cited in Steering Committee of the State-of-Knowledge Assessment of Standards and Certification (2012, p. 9), as well Elfenbein and McManus (2010).

Consumers have preferences over social issues—some may care more about environmental issues, whereas other may care more about the welfare of workers in the firm's supply chain. Assume consumers have single-peaked preferences, with ideal issues distribute uniformly on I. A consumer with ideal type θ has a preferred issue $\theta \in I$, with the value of a good embodying positive social behavior diminished for issues further from θ. Distance in I can be seen as a form of social distance (e.g., Baron, 2010), where a consumer can identify with issues closer to their socioeconomic type.

There is a set of firms, each of which produces a homogeneous good in terms of its use value. Assume there is free entry of firms into this market. Embodiment of positive social attributes then differentiates a good both horizontally and vertically. Assume that it is within the power of a firm to address only one issue so that goods are only differentiated along a single horizontal dimension. (Recall that an issue is an element of $I \subset \mathbb{R}^2$, not an element of $\mathbb{R}$.) Consumers buy at most one good, but must choose what social attributes, if any, are "bundled" with this good.

Consumers have quasi-linear utility functions. Provided that the embodiment of pro-social behavior is known, a consumer of type θ gets utility

$$u(s_i, \ell_i, p_i; \theta) = \bar{u} + v(s_i) - |\theta - \ell_i| \mathbb{I}[s_i > 0] - p_i + B, \tag{2.1}$$

from purchasing a good from firm i at price p_i. Here s_i is the amount of positive social behavior embodied in firm i's product, $\bar{u}$ is the use-value of the good, ℓ_i is the issue that firm i helps ameliorate, $\mathbb{I}$ is the indicator function, and B is the total value of public goods bundled with the sale of private goods.[5]

The function v in (2.1) gives the warm-glow utility associated with s_i units of pro-social behavior by firm i. Assume $v \in C^2$, $v(0) = 0$, $v'(s) > 0$ and $v''(s) \leq 0$ for all s. The term $|\theta - \ell|$ measures how this warm-glow utility is eroded by distance between a consumer's preferred issue and the issue addressed by a firm. In other words, the utility function (2.1) says that a consumer prefers greater pro-social behavior embodied in their purchase, although at a diminishing marginal rate, and prefers the positive social behavior to be applied to issues closer to their preferred issue. Importantly, embodiment of positive social behavior is a *credence characteristic* of a good; a consumer cannot determine if a good is provided in a socially responsible way, even after consuming the good.

In practice, enhanced social characteristics can be positively correlated with higher private benefits from consumption. For example, organic food products may deliver environmental or animal welfare benefits that are public in nature, but may also be healthier to consumers than industrially-farmed alternatives. To allow for this extra dimensionality in some of the results, let $\alpha \in [0, 1)$ be a parameter that measures the fraction of $v(s)$ that is associated with private gains, the remaining $(1 - \alpha)v(s)$ being warm-glow benefits to the consumer associated with the public good contribution.

In general there is no reason to suppose a particular relationship between consumers' valuation of a good embodying pro-social behavior, v, and the social value of this pro-social behavior, b. This will inevitably lead to ambiguity in any welfare analysis. To focus on the implications of NGOs' label design decisions and isolate the implications that this has for

[5]Consumers that have no preference for pro-social behavior have utility $u(p) = \bar{u} - p + B$. This is similar to Besley and Ghatak (2007), where there are two types of consumers with preferences for pro-social behavior by firms. Consumers with no preferences for pro-social behavior are unimportant in the model and will be ignored. Following Economides (1993), it is simple to have consumers vary in their preference for pro-social behavior. In this case, $v(s)$ should be interpreted as the average value when it appears in demand functions.

firms' social conduct, the special case of *socially consistent* preferences—where a consumer's warm-glow valuation of a firm's pro-social behavior equals its social value—will be carried throughout. To be precise, a consumer is said to have socially consistent preferences if $v(s) = b(s)/(1-\alpha)$ for all s. By endowing consumers with socially consistent preferences, there is no possibility that results are driven by consumers under- or over-valuing firms' social conduct; rather, any distortions due to labeling must come from the behavior of NGOs. It is worth noting that many related papers (e.g., Besley and Ghatak, 2007; Aldashev and Verdier, 2010; Deltas et al., 2013) consider only these types of preferences.

Pro-social behavior on the part of a firm is costly. Firms are homogeneous with respect to the constant returns technology of producing output.[6] Without loss of generality, assume the marginal cost of production, without engaging in any positive social behavior, is zero. Engaging in pro-social behavior then increases the marginal cost of production; there is a function c that gives the marginal cost of producing a good embodying s units of pro-social behavior. Assume $c \in C^2$, $c(0) = 0$, $c'(s) > 0$ and $c''(s) > 0$ for all s, $\lim_{s\to 0} c'(s) = 0$, and $\lim_{s\to\infty} c'(s) = \infty$. The function c can include a certification/monitoring fee.[7]

2.1.2 NGOs and labels

The quasi-linear form of utility makes explicit consumers' willingness to pay for a good that embodies pro-social behavior. It is this willingness to pay that gives rise to a rent that a firm can capture and hence provides an incentive for firms to engage in costly pro-social behavior. The role for certification then comes from the credence nature of positive social behavior: a firm requires third-party certification in order to extract a rent from consumers.

Third-party certification of a product comes in the form of a label. To focus on compe-

[6] Issues associated with adoption of technology and labeling can be found in Amacher et al. (2004).

[7] It is standard to have certifiers offer labels freely to firms (e.g., Heyes and Maxwell, 2004; Fischer and Lyon, 2014). A fixed certification fee per unit of output can be included in the model, but doing so complicates the analysis (slightly) without generating any insights.

Alternatively, when the cost of running a label is incident upon the firms whose products display the label, certification can act like a club good. See Kotchen and van't Veld (2011) for a model of "green clubs" and the implications this has for the stringency of a label.

tition between NGOs, assume that only NGOs can offer a label. As is usually the case in practice, assume an NGO can offer only one label (e.g., Fischer and Lyon, 2014). A label run by NGO j is then an ordered pair

$$L_j = (\ell_j, s_j) \in I \times \mathbb{R}_+.$$

A label stipulates what issue must be addressed and the stringency with which this issue must be addressed. A firm that engages in s_j units of pro-social behavior with respect to issue ℓ_j is then entitled to carry the label L_j.[8]

Assume that firms can freely adopt a label so that there is no rationing of labels: any firms that satisfies the criteria of a label can place that label on its product. Assume also that an NGO can perfectly monitor a firm's behavior, and consumers understand all labels. Issues of imperfect monitoring and consumer confusion are treated elsewhere (e.g., Harbaugh et al., 2011; Mason, 2011) and are not of interest here. Importantly, a label is assumed credible so that consumers believe the label.[9] While these are strong assumptions about NGOs, they represent the ideal and allow the analysis to focus on competition. The assumption that a firm can address only one issue amounts to assuming that a firm can adopt only one label, a standard assumption (Fischer and Lyon, 2014).

Letting $q(L_j, L_{-j})$ be the demand a good when it bears label L_j, an NGO's problem is

$$\max_{s_j} b(s_j)q(L_j, L_{-j}) - F,$$

where F is a fixed cost to setting up a label.[10] An NGO cares about the amount of social

[8]Certification here is binary: a firm either meets the requirements for a label or does not. In some settings labels have multiple tiers (e.g., silver, gold, platinum)—see Farhi et al. (2013), Li and van't Veld (2015), and Fischer and Lyon (2016) for models of multi-tier certification.

[9]Credibility of labels is an important issue; Bartley (2011, p. 441), Steering Committee of the State-of-Knowledge Assessment of Standards and Certification (2012, p. 22), and Auld (2014, p. 99) provide some discussion. Credibility is a standard assumption in models of label design (e.g., Heyes and Maxwell, 2004; Bottega and De Freitas, 2009; Fischer and Lyon, 2014; Li and van't Veld, 2015). Complications from lack of credibility are studied in Hamilton and Zilberman (2006) and Mahenc (2008).

[10]F need not represent a financial outlay associated with certification/monitoring, but can represent an

benefit produced by its label—the product of the number of units sold bearing the label and the social impact per unit bearing the label. The function b can be net of any certification costs imposed on the NGO, or the entire incident of certification costs not related to production can be borne by firms through c; funding for NGOs is not explicitly modeled.[11]

Before moving on, it is worth discussing the objective of an NGO. Counter to standard producer theory, there is no easy counterpart to profit as an objective for an NGO. The treatment of an NGO's preferences here is fairly standard, but is not universal. Having an NGO care about only the social impact of its labels is analogous to the impact philanthropists in Duncan (2004), the development NGOs is Aldashev and Verdier (2010), and the warm-glow charities in Scharf (2014). In each case, the NGO cares about its contribution to social betterment. Scharf (2014, p. 50) further explains this point.

> To the extent that charities (or the non-profit entrepreneurs who run them) are prosocially motivated, they care about what they provide. However, they also typically favour their own output relative to that of other providers—which is why, for example, they compete with charities similar to themselves for available funds.

Agents with such motivations working in the nonprofit sector can be seen in Besley and Ghatak (2005) and Francois (2007). With respect to labeling, having the NGO care only about the impact of its label is standard (e.g., Heyes and Maxwell, 2004; Bottega and De Freitas, 2009; Fischer and Lyon, 2014; Li and van't Veld, 2015). Compared to the case when NGOs internalize a fraction of their impact on other NGOs, self-interested NGOs give a lower bound for equilibrium stringency of labels.

Note that NGOs do not have preferences with respect to issues. However, the model could be recast with NGOs having such preference, with only those NGOs with preferences

opportunity cost for the social entrepreneur(s) setting up a label.

[11] If NGOs are funded by donors then the self-interested objective of an NGO may be inappropriate: donors may care about a wider range of issues. While important, stakeholders to an NGO are not modeled and a discussion of stakeholder preferences and their influence would take the analysis far afield.

for a particular issues entering in equilibrium (e.g., Rose-Ackerman, 1982). In the context of the model these two interpretations are equivalent. With respect to previous literature, Aldashev and Verdier (2010), for example, do not view NGOs as having inherent preferences regarding ideology (the relevant spatial dimension in their model). In this case, an NGO values only the results of its own activities. Since the goal of the model is to examine a symmetric equilibrium, each NGO is assumed to be spaced at equal intervals in the issue space (i.e., each of n NGOs is a distance of $1/n$ apart on I).

2.1.3 Timing

The following sequence of events characterize the game played by consumers, firms, and NGOs. The solution concept is sub-game perfect Nash, and so the game is solved backwards. Only symmetric equilibria are examined.[12]

1. NGOs choose to set up a label or not.

2. NGOs that establish a labeling scheme choose the stringency of their label (i.e., choose s_j).

3. Firms choose whether to adjust their operations to comply with an offered label or not and set prices.

4. Consumers choose which goods to purchase.

[12]The analyses of Heyes and Maxwell (2004), Bottega and De Freitas (2009), and Fischer and Lyon (2014) consider asymmetric equilibria and develop some interesting results from this. However these analyses deal with heterogeneous labelers. In the case of homogeneous labelers, restricting attention to symmetric equilibria does not seem too onerous an assumption, and is standard for models with homogeneous agents.

2.2 Equilibrium

2.2.1 Stage 4: Demand for products by consumers

The first order of business is to characterize demand for labeled products by consumers. If p_0 is the price of a good that embodies no pro-social behavior, a consumer purchases a labeled good if and only if utility in (2.1) is greater than $\max\{\bar{u} - p_0, 0\}$.[13] Assume that $\bar{u} \geq p_0$ so that a consumer will always purchase the good, at least in its unlabeled form.

To fix ideas, consider first the case of a single label. While this case will not be useful later, it is helpful to illustrate the mechanics of the model. A consumer of type θ will purchase the labeled good if and only if

$$v(s) - |\theta - \ell| \geq p - p_0.$$

Assuming $v(s) \geq p - p_0 \geq 0$, there are two types of consumers, θ'' and θ', such that

$$v(s) - (\theta'' - \ell) = v(s) - (\ell - \theta') = p - p_0,$$

with the convention that $\theta'' \geq \theta'$. For a given price premium $p - p_0$, only consumers in the interval $[\ell - \theta', \ell + \theta'']$ will purchase the labeled version of the good. It follows that demand for the labeled product is

$$q(p, p_0, s) = 2 \min \left\{ v(s) - p + p_0, \frac{1}{2} \right\}.$$

As should be expected, demand is decreasing in own price, increasing the price of the unlabeled version, and increasing in the stringency of the label. See figure 2.3 for an example.

[13] This point differs from other analyses using a similar horizontal framework, where it is assumed that consumers always purchase a differentiated good because of the high use value associated with the good, irrespective of its variety (e.g., Economides, 1993). Since labels are voluntary, it is important to keep stock of an unlabeled variant.

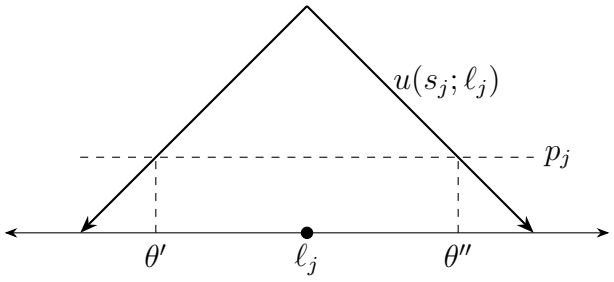

Figure 2.3: The interval of consumers that buy a labeled good for a given s_j and $p_0 = 0$.

Consider now $n \geq 2$ labels. In this case, a consumer must choose the good with label L_j to maximize utility in (2.1) subject to the constraint that

$$v(s_j) - |\theta - \ell_j| \geq p_j - p_0.$$

If this constraint is violated, a consumer will simply choose the unlabeled variant. Demand for a labeled good L_j is then just the measure of consumers that get the largest utility from consuming the good with label L_j, subject to satisfying the above constraint.

Since the purpose of the model is to analyze the decision for NGOs to enter into the activity of labeling and the implications this has for the stringency of labels, the goal will be to look for an equilibrium that covers the market, so that all consumer types purchase a unit of a labeled good. As only symmetric equilibria are considered, let $\bar{p}$ and $\bar{s}$ denote the price of all labeled goods other than j and the stringency of all labels other than j. Recalling that each label is spaced $1/n$ apart on the issue space I, demand for a good carrying L_j is

$$q(\mathbf{p}, \mathbf{s}) = \begin{cases} 0 & \text{if } p_j > v(s_j) - \max\left\{v(\bar{s}) - \bar{p} - \frac{1}{n}, -p_0\right\}, \\ 2[v(s_j) - p_j] & \text{if } p_j \geq v(s_j) - \left[\frac{1}{n} - v(\bar{s}) + \bar{p}\right], \\ v(s_j) - p_j - v(\bar{s}) + \bar{p} + \frac{1}{n} & \text{if } p_j \leq v(s_j) - \left[\frac{1}{n} - v(\bar{s}) + \bar{p}\right], \\ \frac{2}{n} & \text{if } p_j < v(s_j) - \left[v(\bar{s}) - \bar{p} + \frac{1}{n}\right], \end{cases} \tag{2.2}$$

on the equilibrium path, where $\mathbf{p} = (p_j, \bar{p}, p_0)$ and $\mathbf{s} = (s_j, \bar{s})$. See figure 2.4 for an example.

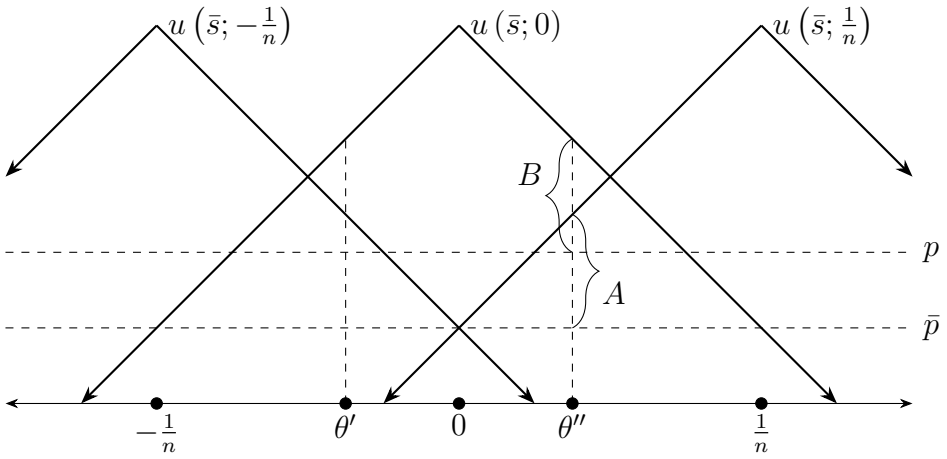

Figure 2.4: Demand for a label with stringency $\bar{s}$ and price p. Section $A = u\left(\bar{s}, \frac{1}{n}; \theta''\right) - \bar{p}$ and section $B = u\left(\bar{s}, 0; \theta''\right) - p$ are equal.

Note that as written, the demand function in (2.2) does not allow for "undercutting strategies" that result in a labeled product being purchased by consumers will ideal points beyond the location of another label. This is analogous to the usual assumption in the product differentiation literature (e.g., Economides, 1993).

2.2.2 Stage 3: Label adoption and pricing by firms

There is free entry of firms into the product market and free entry of firms into labels, with the result that as many firms as so desire can adopt a label provided that they meet the requirements of the label; NGOs do not ration labels. A firm will adjust its practices and adopt a label if and only if it earns positive profit from doing so, and firms that do not adopt a label simply produce output without a label. Having a label allows the firm to charge a price premium for its product by credibly communicating its social conduct to consumers, but the size of this premium will depend on the number of other labeled products in the marketplace. Since the cost of complying with the requirements of a label, $c(s)$, is strictly increasing with the stringency of the label, a firm will never over-comply with the requirements of a label.

Given that each firm with the same label sells a homogeneous product, firms act as

Bertrand competitors in a label. This assumption on firm behavior is similar to that in the model of CSR by Besley and Ghatak (2007). Free entry into labels then ensures that there are at least two firms per label, with the price of each good bearing label j set equal to marginal cost: $p_j = c(s_j)$.

Proposition 2.1. *Given the set of labels available, any Nash equilibrium in the price setting sub-game has at least two firms adopting each label and price equal to marginal cost, so that* $p_j = c(s_j)$ *for each label* j *and* $p_0 = 0$.

Having price equal marginal cost is a desirable outcome for this stage of the game. No distortion in the product market keeps the analysis focused on NGOs: any inefficiency that arises is because of competition between labels, not because of an inefficiency in product markets.

2.2.3 Stages 1 and 2: NGO competition and entry

In stages 1 and 2 of the game, NGOs decide whether to setup a label or not, and those NGOs that do establish a label choose the stringency of their label. It is these stages that constitute the real interest of this chapter, characterizing the implications of competition for the stringency of labels and the resulting incentives for NGOs to enter and set up a label.

Consider first stage 2 of the game, where NGOs choose the stringencies of their labels. From the previous section, it is observed that firms that adopt label j set $p_j = c(s_j)$ in equilibrium and firms that do not adopt a label set $p_0 = 0$. It follows that (2.2), demand for

the good with label j, is

$$q(s_j, \bar{s}) = \begin{cases} 0 & \text{if } v(s_j) - c(s_j) < \\ & \qquad \max\left\{v(\bar{s}) - c(\bar{s}) - \frac{1}{n}, 0\right\}, \\ 2[v(s_j) - c(s_j)] & \text{if } v(s_j) - c(s_j) \leq \frac{1}{n} - v(\bar{s}) + c(\bar{s}), \\ v(s_j) - c(s_j) - v(\bar{s}) + c(\bar{s}) + \frac{1}{n} & \text{if } v(s_j) - c(s_j) > \frac{1}{n} - v(\bar{s}) + c(\bar{s}), \\ \frac{2}{n} & \text{if } v(s_j) - c(s_j) > v(\bar{s}) - c(\bar{s}) + \frac{1}{n}. \end{cases}$$

Recall that this demand function does not allow for "undercutting strategies" (Economides, 1993). In order to simplify notation, assume that for all n, there is at least some s such that $v(s) - c(s) \geq 1/n$. This assumption simply saves on notation by normalizing the minimum number of labels needed to cover the market to $n = 2$; relaxing this assumption has no impact on the model.

An NGO's problem is now to choose the stringency of its label to maximize its social impact, taking into account consumers' demand for the labeled good given firms' pricing strategies and incentives to adopt a label:

$$\max_{s_j} w(s_j, \bar{s}) = b(s_j)q(s_j, \bar{s}) - F.$$

Note that for any solution s_j^* to the above problem, it is necessarily the case that $v'(s_j^*) < c'(s_j^*)$. This means that an NGO designs a label that is more stringent than that which maximizes demand for the good to which its label applies. In other words, an NGO is willing to give up some units bearing its label that are sold in exchange for increased stringency, and the increased impact generated, on the infra-marginal units. Interpreted another way, the "price" an NGO charges firms for its label is the stringency above that which maximizes demand. Firms then pass this on to consumers in the form of a higher price for a labeled good.

Given any number of NGOs, n, that have entered and set up a label, it follows that in a symmetric Nash equilibrium in the choice of stringencies that covers the market (should one exist), given by s^*, it must be the case that

$$\frac{b'(s^*)}{n} = -b(s^*)[v'(s^*) - c'(s^*)]. \tag{2.3}$$

Remark 2.1. *There is a unique point s^* that satisfies* (2.3)*, so that if a symmetric Nash equilibrium that covers the market exists, it is necessarily unique.*

Ignoring for the moment the question of whether a symmetric Nash equilibrium exists that can cover the market, the following proposition characterizes the strategic nature of labels' stringency.

Proposition 2.2 (Strategic Complements)**.** *Labeling stringencies are strategic complements in a neighborhood of the Nash equilibrium s^*.*

If a competing NGO increases the stringency of its label, it causes firms to increase the price of their product. In a neighborhood of the Nash equilibrium, however, labels are sufficiently stringent that this increase in price outstrips the increase in willingness to pay by consumers, decreasing demand for firms carrying the label as consumers flock to firms carrying similar labels. A neighboring NGO now faces increased demand for its label by consumers and is able to increase the stringency of its label. The increased demand gives the NGO more cushion to design a stringent label. Strategic complementarity in stringency between labelers is also found in Fischer and Lyon (2014), suggesting that this may be an important facet of competition between labels.

The way in which NGOs design the stringency of their labels to appeal to consumers and generate social impact depends on the number of labels in existence that certify firms' social conduct. Analogous to product market competition, with more labels operating, there comes a need for NGOs to set the stringency of their labels more aggressively to secure demand for the products bearing those labels.

Proposition 2.3 (Entry reduces stringency)**.** *The equilibrium stringency of labels is decreasing with the number of NGOs (i.e., s^* is a decreasing function of n).*

Intuitively, as more labels emerge, competition between labels becomes more intense, causing a reduction in stringency to attract consumers based on the price of the good. Competition *per se* does not lead to a race-to-the-bottom, rather entry gives the driving mechanism that can lead to weak labels, an important distinction from existing literature (e.g., Bartley, 2011; Auld, 2014). It is the prospect of generating social impact that puts downward pressure on standards as entry imposes a negative externality on all other NGOs, leading them to reduce the requirements for award of their labels.

Before moving on to the first stage of the game and considering entry, the question of whether there is a symmetric Nash equilibrium that covers the market can be addressed. The following lemma establishes when a point satisfying equation (2.3) is *sufficient* to be an equilibrium.

Lemma 2.1. *If $v(s^*) - c(s^*) \geq 1/n$, where s^* is defined as in* (2.3)*, then the point s^* is a Nash equilibrium.*

Intuitively, the lemma simply says that sufficient for s^* to be Nash equilibrium is that NGOs face meaningful competition from other NGOs, so that an NGO is not guaranteed some demand for its label. It is at least *possible* for neighboring NGOs to attract all of the demand for a labeled good so that NGOs are in fact competing on stringency. The following proposition relates existence of a symmetric, covered equilibrium to the number of NGOs offering labels, in essence restricting the histories of the game to ensure that s^* as given by (2.3) is an equilibrium strategy.

Proposition 2.4 (Existence of an equilibrium)**.** *There is a number $\hat{n} \geq 2$ such that $s^*(n)$, as given by* (2.3)*, is the symmetric Nash equilibrium in the choice of stringencies that covers the market whenever the number of NGOs offering labels, n, is greater than $\hat{n}$.*

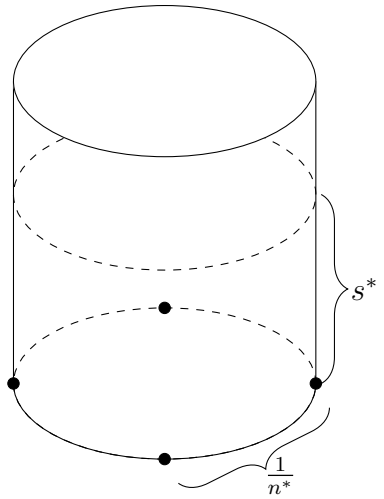

Figure 2.5: Example of an equilibrium with $n^* = 4$ labels, each of stringency s^*.

Finally, consider stage 1 of the game where NGOs decide whether to enter and set up a label or not. Assuming that the fixed cost of entry F is not so large as to preclude entry, free entry leads NGOs to enter up until the point where there is no more payoff to be had from labeling, and this must occur at a point where the market is covered.

Proposition 2.5 (Free-entry equilibrium)**.** *In a symmetric, subgame perfect Nash equilibrium there is a unique number of NGOs $n^* > 2$ offering labels of stringency s^* such that*

$$\frac{b(s^*)}{n^*} = F \tag{2.4}$$

$$\frac{b'(s^*)}{n^*} = -b(s^*)[v'(s^*) - c'(s^*)]. \tag{2.5}$$

Together, (2.4) and (2.5) completely characterize the symmetric Nash equilibrium actions for NGOs in the game.[14] See figure 2.5 for an example.

Before concluding this section, it is worth emphasizing the importance of the strategies for stages 1 and 2 of the game. The allocation of labels that results determines the choice set for firms with respect to voluntary social behavior. To the extent that competition produces a desirable allocation of labels, voluntary pro-social behavior by firms is desirable.

[14]Since each NGO is assumed to maintain one label, n^* also gives the number of distinct social issues that get addressed by social labels.

2.3 Welfare

The analysis of the previous section provides a framework within which to think about competition between labeling schemes when entry of NGOs is endogenous. Solving the model and analyzing NGOs' strategies highlights the key role of entry in determining the stringency of labels. Existing analyses of labeling and certification (e.g., Harbaugh et al., 2011; Fischer and Lyon, 2014), abstracting as they do from the possibility of entry, necessarily miss this mechanism.

It is interesting from a policy perspective to examine the normative implications of entry by competing NGOs. Since the set of labels available for firms to adopt defines the menu of pro-social attributes that a firm can embody in its product and have acknowledged by consumers, the process of competition between labelers has substantial ramifications for the desirability of corporate social responsibility. If the set of labels available differs from that desired by a social planner, firms' CSR strategies will not deliver socially optimal outcomes.

To begin, I define the first-best set of labels. The appropriate conduct of welfare analysis in settings in which consumers have warm-glow preferences is not without controversy. Following Andreoni (2006), Diamond (2006), and Bernheim and Rangel (2012), I take the most common approach and exclude consumers' and NGOs' warm-glow valuation from the welfare function. A planner simply wishes to balance the real costs and benefits as a *consequence* of NGOs' labeling schemes, ignoring agents' preferences over the *actions* that led to these consequences. Given this, the social welfare function (net of the constant $\bar{u}$) is

$$W(s,n) = b(s) + \alpha v(s) - c(s) - nF. \tag{2.6}$$

The first-best set of labels is then defined as the values s^{**} and n^{**} that maximize (2.6) subject to the constraints that $v(s) - c(s) \geq 1/(2n)$ and $n \geq 2$. (To maintain comparability with earlier results, the constraints ensure that the market is covered.)

In general, NGOs' labeling schemes will not be efficient. The exact reason for this di-

vergence, however, is usually not straightforward: NGOs may design labels that are more or less stringent than what a planner would like, and there may be more or fewer labels than what is efficient. The reason for this ambiguity is that there are two ways in which NGOs' label-design decisions differ from that of a social planner. The first reason relates to competition between NGOs and how this affects the set of labels offered by NGOs, whereas the second reason relates to how consumers value firms' social conduct in relation to the social value of firms' conduct (i.e., the relationship between v and b).

Proposition 2.6 (Inefficient labels)**.** *Competition and entry of NGOs does not produce the first-best set of labels (i.e.,* $W(s^*, n^*) < W(s^{**}, n^{**})$*).*

While the above result is interesting, establishing that NGO labeling schemes are inefficient, further observations can be drawn if additional structure is placed on consumers' valuation of firms' social conduct, v. Since the goal of the model is to understand the implications of competition and entry on the set of labels offered by NGOs, assume that $v = b/(1-\alpha)$ so that consumers value firms' social conduct for its social impact. That is, in order to isolate the normative implications of competition between NGOs, assume consumers have socially consistent preferences. By endowing consumers with socially consistent preferences, any divergence from first-best must be caused by NGOs' incentives to offer labels in a competitive setting.

When consumers have socially consistent preferences, the planner will want as few labels as possible operating since there is no need to cater to consumers' preferences in order to induce their participation to purchase a labeled good. The stringency of each label is then free to be set so as to maximize the social impact of that label. This means that first-best is given by $n^{**} = 2$, with s^{**} implicitly defined by

$$b'(s^{**}) + \alpha v'(s^{**}) = c'(s^{**}). \tag{2.7}$$

In essence, efficiency requires that labels induce firms to engage in an amount of pro-social

behavior to equate the marginal benefit of this behavior with the marginal cost, and that the fixed cost of running a certification system be kept to a minimum. The divergence between the labeling equilibrium and first-best can be seen by comparing (2.4) and (2.5) with (2.7).

Proposition 2.7 (Excessive entry and stringency of labels)**.** *When consumers have socially consistent preferences, competition and entry of NGOs produces a socially excessive number of labels, each excessively stringent (i.e.,* $s^* > s^{**}$ *and* $n^* > n^{**}$*).*

The above proposition, combined with the strategic complementarity of stringency, implies that competition between NGOs produces a race-to-the-top in labeling standards: NGOs have too much incentive to create stringent labels. The source of this problem is the decentralized nature of a label. Even though product markets are efficient and consumers face the marginal cost of stringency, the fact that NGOs do not embody directly the cost of their labels leads to excessively stringent labels. This is in contrast to the concern sometimes expressed that "given the existence of competing programs, it would appear that certification would be plagued by a 'race to the bottom,' leading to an overall decline in the stringency of [labeling] standards" (Bartley, 2011, pp. 446–447).[15]

There are two policy implications that come from the above proposition. The first is that a minimum quality standard on firms' social conduct need not be a useful policy tool when firms certify their pro-social behavior with voluntary labels. Such minimum quality standard are often discussed in the context of firms' environmental conduct and can act to increase welfare (e.g., Arora and Gangopadhyay, 1995; Heyes and Maxwell, 2004). In particular, when consumers have socially consistent preferences, a minimum quality standard has no role to play, counter to standard models of product differentiation where quality is always under-provided.

The second policy implication of the proposition is that policies to enact barriers to entry, effectively increasing the fixed-cost of entry F, can have an ambiguous impact on welfare.

[15]This insight is consistent with the familiar "too many varieties, too little quality" result in the product differentiation literature (e.g., Economides, 1993). When NGOs issue labels, however, there is too much "quality," rather than too little.

While limiting entry has the effect of reducing the cost associated with running certification schemes—increasing welfare—reducing the number of certifiers further increases labels' stringency above the efficient level—reducing welfare. Whether restricting entry improves welfare depends on whether the increase in welfare from reducing the cost of certification outweighs the loss in welfare from increasing the stringency of labels or not.

As a final consideration, the degree to which a labeled good confers private value to consumers by virtue of being labeled provides an interesting comparative static to help understand when the competitive equilibrium is likely to be closer to first-best.

Proposition 2.8. *The socially optimal stringency increases as the private value of the good increases, so that* s^{**} *is strictly increasing in* α*.*

Since the choice of stringency by NGOs is invariant to consumers' private valuation of firms' social conduct, the divergence between s^* and s^{**} *decreases* as α increases. For goods that confer a relatively larger private value to consumers from firms' pro-social conduct (e.g., organic food), the stringency of NGOs' labels is closer to first-best than for goods that confer little private value (e.g., dolphin friendly).

2.3.1 CSR with perfect information

The need for labeling in this model is driven by the assumption that the social attributes embodied in products are credence characteristics of the product. Consumers cannot directly discern these attributes, even after consuming the good. However, there is a wider game-theoretic literature on how firms make social behavior decisions when those behaviors are directly observed by consumers (e.g., Besley and Ghatak, 2007). In what follows, I refer to this as the "CSR game." The purpose of this section is to evaluate the outcome of the CSR game in the context of the model of section 2.1 (i.e., examine the equilibrium of the game where firms can credibly communicate their social conduct to consumers) and compare this outcome with the labeling equilibrium of section 2.2.

If there is perfect information, so that firms do not need a label to credibly communicate CSR to consumers, then the model of section 2.1 is simply that of Salop (1979) with the addition of a quality component. Each firm acts with a certain degree of market power and chooses the price of its good and its social conduct (equivalent to quality) to maximize profit. Following Brekke et al. (2010), the symmetric, free-entry Nash equilibrium for this game, denoted (p^e, s^e, n^e), is given by

$$\begin{aligned} p^e &= c(s^e) + \frac{1}{n^e} \\ c'(s^e) &= v'(s^e) \\ n^e &= \max\left\{\sqrt{\frac{1}{F}}, 2\right\}. \end{aligned} \tag{2.8}$$

Except for determination of pro-social behavior, this equilibrium is the same found in Salop (1979). The choice of s, however, is simple: choose s to maximize demand. In contrast to the case when firms require a label to communicate pro-social behavior, entry has no effect on firms' choice of pro-social behavior. Comparing (2.8) with the equilibrium condition in propositions 2.5 leads to the following proposition.

Proposition 2.9 (Label proliferation and CSR)**.** *Firms engage in less pro-social behavior when labels are not required to communicate pro-social behavior (i.e., $s^* > s^e$). As the fixed costs of launching a labeling scheme tends to zero (or equivalently as the number of labels tends to infinity), pro-social behavior in the labeling equilibrium converges to that in the equilibrium of the CSR game (i.e., if $F \to 0$ then $s^* \to s^e$).*

Emphasizing again that NGOs have a tendency to inflate the stringency of their labels, firms would like to engage in less pro-social behavior if they could communicate this to consumers compared to what NGOs prescribe with their labels. In the presence of label proliferation, however, questions about the stringency of labels reduce to questions about the amount of CSR done by firms if there were perfect information.

Not surprisingly, in the most general case, welfare comparisons between the CSR game and first-best remain ambiguous. However, when consumer have socially consistent preferences, condition (2.7) is the pertinent one for determining the socially optimal amount of firms' pro-social behavior. The following corollary is immediate.

Corollary 2.1. *If consumers have socially consistent preferences, the equilibrium amount of pro-social behavior in the CSR game is first-best. If NGOs are required to certify those actions, then NGOs design labels that are too stringent. As the number of labeling schemes proliferates, stringency tends to the first-best level.*

Thus, in contrast to existing literature on CSR, when firms rely on NGOs to certify their CSR activities they can engage in a socially excessive amount of CSR. In this sense, proliferation of labels can be desirable when consumers have socially consistent preferences as increased competition between NGOs decreases the stringency of labels, improving welfare by reducing the amount of CSR firms undertake.

2.4 Conclusions

In this chapter I develop the first model of label design by competing NGOs that allows for entry of new labels. Understanding the implications of entry for labels' standards is important given the widespread proliferation of social labels. Counter to conventional wisdom, competition leads NGOs to design excessively stringent labels even if entry of new certification schemes has the effect of reducing stringency. The first key insight of the model—that there is an excessive number of excessively stringency labels—has a number of policy implications that relate to restricting entry of certifiers and encouraging certifiers to design less stringent standards. While I leave development of policy rules for future work, it is worth noting that any policy that restricts entry of new labels will drive up the stringency of existing labels. In fact, when there is little barrier to entry, proliferation of certification schemes may not be so bad, as this drives down the stringency of labels towards the efficient

level.

One interesting implication of the excessive stringency result is that certification schemes run by industry groups, interested in designing a label to maximizing industry profit, may be beneficial since they can reduce the overall stringency of labels (Fischer and Lyon, 2014). By offering a less stringent label that matches with firms' interest to engage in pro-social behavior, the presence of industry-run labels can improve corporate provision of public goods.

The second key insight of the model relates to firms' conduct of CSR. Counter to existing literature on the topic (e.g., Bagnoli and Watts, 2003; Besley and Ghatak, 2007; Deltas et al., 2013), when firms rely on NGOs to certify their social performance, this can lead firms to engage in a socially excessive amount of CSR. In fact, with proliferation of labels, the stringency of labels coincides with the amount of pro-social behavior firms would like to conduct if they could credibly communicate their behavior to consumers. In this way, discussions about the stringency of labels when there is proliferation of labels is equivalent to a discussion of voluntary CSR by firms when there is no informational asymmetry.

2.5 Appendix

Proof of proposition 2.1. It is straightforward to verify that at least two firms per label with price equal to marginal cost is a Nash equilibrium: all firms earn zero profit and no firm can deviate to earn positive profit. Now suppose there were another equilibrium. If this equilibrium had a label adopted by only one firm, that firm must be charging price above marginal cost. However, another firm could enter and undercut this price, thereby increasing its payoff. Hence, no equilibrium can have a label adopted by only one firm. Similarly, if the price of a good were above marginal cost, one firm offering the good could undercut all of its competitors, thereby increasing its payoff. □

Proof of the remark 2.1. Denote by $\hat{s}$ the unique point such that $v'(\hat{s}) = c'(\hat{s})$. Define the function $g : [\hat{s}, \infty) \to \mathbb{R}$ by $g(s) = -b(s)[v'(s) - c'(s)]/b'(s)$. It follows that g is strictly

increasing and maps onto $[0, \infty)$. Therefore there is a unique point s^* such that $g(s^*) = 1/n$. □

Proof of proposition 2.2. Noting that

$$\frac{\partial^2 w(s_j, \bar{s})}{\partial s_j \partial \bar{s}} = -b'(s_j)[v'(\bar{s}) - c'(\bar{s})]$$

is continuous and equal to $b'(s^*)/n > 0$ when $(s_j, \bar{s}) = (s^*, s^*)$, it follows that there is a neighborhood N about (s^*, s^*) such that $\partial^2 w(s_j, \bar{s})/\partial s_j \partial \bar{s} > 0$ for all $(s_j, \bar{s}) \in N$. □

Proof of proposition 2.3. Since g as defined in remark 2.1 is strictly increasing, the function $\sigma : (0, \infty) \to \mathbb{R}$ defined by $\sigma(n) = g^{-1}(1/n)$ is strictly decreasing in n. Since σ is the extension of s^* to $(0, \infty)$, it follows that s^* is a decreasing function of n. □

Proof of lemma 2.1. In order to prove the lemma, the following result is needed.

Lemma. *Given any $\bar{s}$, there are unique points s_0 and s_1, with $s_0 < s_1$, such that*

1. $v(s) - c(s) \geq \max\left\{v(\bar{s}) - c(\bar{s}) - \frac{1}{n}, 0\right\}$
2. $v(s) - c(s) \leq v(\bar{s}) - c(\bar{s}) + \frac{1}{n}$
3. $v'(s) \leq c'(s)$

if and only if $s \in [s_0, s_1]$.

Proof. To simplify the notation, let $f(s) = v(s) - c(s)$. It follows from the properties of v and c that $f(0) = 0$, $f''(s) < 0$ for all $s \in \mathbb{R}_{++}$, f' is onto $(-\infty, \beta)$, with $\beta > 0$, and $\lim_{s\to\infty} f(s) = -\infty$. This last property comes from the concavity of f. To see this, denote by $\hat{s}$ the unique point given by $f'(\hat{s}) = 0$. This point exists and is unique since f' is one-to-one and onto $(-\infty, \beta)$. Since f' is strictly decreasing, $f'(\hat{s} + \varepsilon) < 0$ for any $\varepsilon > 0$. It also follows from concavity of f that $f(\hat{s} + \delta) < f(\hat{s} + \varepsilon) + f'(\hat{s} + \varepsilon)(\delta - \varepsilon)$ for any $\delta > 0$. Taking $\delta \to \infty$ gives that $\lim_{s\to\infty} f(s) = -\infty$.

Now consider each of the conditions 1, 2, and 3 in turn. 1) Since f is strictly decreasing on $[\hat{s}, \infty)$ and maps onto $(-\infty, f(\hat{s})]$, there is a unique point $s_1 \in (\hat{s}, \infty)$ such that $f(s_1) = \max\left\{f(\bar{s}) - \frac{1}{n}, 0\right\}$. For all $s \in [\hat{s}, \infty)$, $f(s) > \max\left\{f(\bar{s}) - \frac{1}{n}, 0\right\}$ if and only if $s \in [\hat{s}, s_1)$. 2) Clearly $f(\bar{s}) + \frac{1}{n} > \max\left\{f(\bar{s}) - \frac{1}{n}, 0\right\}$ so that $f(s_1) < f(\bar{s}) + \frac{1}{n}$. If $f(\hat{s}) \leq f(\bar{s}) + \frac{1}{n}$, set $s_0 = \hat{s}$. Otherwise the same reasoning as before gives a unique $s_0 \in (\hat{s}, s_1)$ such that $f(s_0) = f(\bar{s}) + \frac{1}{n}$, with $f(s) < f(\bar{s}) + \frac{1}{n}$ if and only if $s > s_0$. 3) Lastly, $v'(s) \leq c'(s)$ if and only if $s \geq \hat{s}$.

Taking the above points together, conditions 1–3 hold for some s if and only if $s \in [s_0, s_1]$. □

From the lemma, it is clear that an NGO j will always choose some $s \in [s_0, s_1]$ and so, from the assumption that $v(s^*) - c(s^*) \geq 1/n$, an NGO's problem can be written as

$$\max_{s_j \in [s_0, s_1]} w(s_j, s^*) = b(s_j)\left[v(s_j) - v(s^*) - c(s_j) + c(s^*) + \frac{1}{n}\right] - F.$$

Clearly this problem admits a solution, and this solution must be interior. Since the point s^* that satisfies (2.3) is unique, s^* is a global maximum. Since this is true for all NGOs, the point s^* in (2.3) is a Nash equilibrium. □

Proof of proposition 2.4. From the lemma, the goal is to find a point $\hat{n}$ such that $(v - c) \circ s^*(n) \geq 1/n$ for all $n \geq \hat{n}$. Defining the function g as in remark 2.1, $s^*(n) = g^{-1}(1/n)$; since g is a homeomorphism, s^* is continuous. From the properties of g, s^* is strictly decreasing in n and maps onto $(\hat{s}, \infty)$.

Now let $h(n) = (v - c) \circ s^*(n) - 1/n$. It is apparent that h is strictly increasing in n, since $v'(s^*) < c'(s^*)$. Now if $h(2) \geq 0$, set $\hat{n} = 2$ and the proof is complete. Otherwise $h(2) < 0$, and, since $\lim_{n\to\infty} h(n) = v(\hat{s}) - c(\hat{s}) > 0$, there is some $\hat{n} > 2$ such that $h(n) \geq 0$ if and only if $n \geq \hat{n}$. □

Proof of proposition 2.5. Define the function $k : [\hat{n}, \infty) \to \mathbb{R}$ by $k(n) = b(s^*(n))/n - F$. It is obvious that k is continuous and strictly decreasing in n. Since $k(\hat{n}) > 0$ by assumption and

$\lim_{n\to\infty} k(n) = -F$, there is a unique $n^* > 2$ such that $k(n^*) = F$. The proposition follows by noting that $s^*(n^*)$ is implicitly defined by (2.4). □

Proof of proposition 2.6. To begin, note that (s^{**}, n^{**}) is unique since W is strictly concave and the constraint set is convex. There are now two cases to consider, depending on whether the participation constraint $v(s) - c(s) \geq 1/(2n)$ binds or not.

If the participation constraint does not bind, then it must be that $n^{**} = 2$. Since $n^* > 2$, this establishes that $(s^{**}, n^{**}) \neq (s^*, n^*)$.

If the participation constraint does bind, then $v(s^{**}) - c(s^{**}) = 1/(2n^{**})$. Assuming $n^* = n^{**}$, this implies that $v(s^{**}) - c(s^{**}) < v(s^*) - c(s^*)$, so that $(s^{**}, n^{**}) \neq (s^*, n^*)$. □

Proof of proposition 2.7. That $n^* > n^{**}$ is obvious. To show that $s^* > s^{**}$, note that $v(s) = b(s)/(1-\alpha)$ implies that $b(s) + \alpha v(s) - c(s) = v(s) - c(s)$. Now $v'(s^*) < c'(s^*)$ implies that $b'(s^*) + \alpha v'(s^*) < c'(s^*)$. Since $b''(s) + \alpha v''(s) < c''(s)$ for all s, it follows that $s^* > s^{**}$. □

Proof of proposition 2.8. Since s^{**} is unique, (2.7) implicitly defines s^{**} as a function of α. From the implicit function theorem, this function is differentiable, and $\partial s^{**}(\alpha)/\partial\alpha > 0$. From the mean value theorem, s^{**} is strictly increasing in α. □

Proof of proposition 2.9. To show that $s^* > s^e$, note that any Nash equilibrium s^* for stage 2 of the labeling game has $v'(s^*) < c'(s^*)$. Since $v' - c'$ is strictly decreasing, it follows that $s^* > s^e$.

Now, defining the function $g : [\hat{s}, \infty) \to \mathbb{R}$ by $g(s) = -b(s)[v'(s) - c'(s)]/b'(s)$ as before, $s^*(n) = g^{-1}(1/n)$, given any n. Since g is strictly increasing and maps onto $(0, \infty)$, g is a homeomorphism. Since $g(\hat{s}) = 0$, it follows that $\lim_{n\to\infty} s^*(n) = \hat{s} = s^e$. From (2.4), it is apparent that $n^* \to \infty$ if and only if $F \to 0$, completing the proof. □

Chapter 3

Moral Management in Competitive Markets

It is widely observed that firms engage in socially responsible behavior beyond the requirements of law, so much so that this behavior even has its own name—corporate social responsibility (CSR). Why then do firms voluntarily engage in socially responsible behavior? While *strategic* CSR may be profitable for firms—differentiating their products to extract a price premium from socially responsible consumers or forestalling regulation or activism—and hence aligned with the goal of profit maximization (e.g., Maxwell et al., 2000; Besley and Ghatak, 2007), one motivation that is becoming increasingly important is the intrinsic motivation of a firm's management for addressing social issues.[1] *Morally-motivated managers*—that is, managers interested in both the firm's economic performance *and* social performance—are often seen as necessary for firms to deliver needed social outcomes: "[corporate] [s]ocial responsibility can only become reality if more managers become moral instead

[1]For example, in response to shareholder concerns about Apple's environmental initiatives, CEO Tim Cook recently remarked: "If you only want me to make decisions that have a clear [return on investment], then you should get out of the stock" (Winston, 2014, p. 1). This is consistent with the recent trend among large tech companies to voluntarily reduce their carbon footprint, like Microsoft, Amazon, and Google, with the latter claiming to become carbon neutral by 2017 (Hardy, 2016). In a similar vein, UN secretary-general Ban Ki-moon commented: "We need corporate sustainability to be in the DNA of business culture and operations" (UN News Centre, 2012).

of amoral or immoral" (Carroll, 1991, p. 39). This is especially true in the context of environmental concerns.

> The science is clear: We have overshot the carrying capacity of the planet, and serious repercussions are now inevitable... We are in urgent need of companies that have a greater purpose than making money. (Ratan et al., 2013)

It is important to stress that moral management does not imply a lack of interest towards profit; rather, a moral manager wants to be profitable while operating in a socially responsible way (Carroll, 1991).[2] Movements such as *Capitalism 24902* further the idea that addressing social issues should be a core concern of business; creating stakeholder value, not just shareholder value, should be a firm's objective (Branson, 2011). This normative view is also reflected in the economics literature, where profit-maximizing firms often do not have enough incentive to engage in CSR (e.g., Kitzmueller and Shimshack, 2012). At the same time, managers not solely motivated by profit bring up issues of corporate governance—moral management is seen as necessarily involving some cost to shareholders, undermining shareholder primacy (Bénabou and Tirole, 2010).

In this chapter I develop the first model of CSR in which competing firms can be morally-managed in order to understand how strategic *and* non-strategic motivations inform firms' social conduct—how do morally-motivated managers affect firms' and shareholders' strategies and can these managers engage in a socially optimal amount of CSR? Given the various motivations for firms to engage in CSR (Bansal and Roth, 2000; Hahn et al., 2016), the interaction between morally-motivated CSR and strategic CSR is of interest not only from a business strategy point of view, but also from a normative perspective with regard to firms' social conduct. As will be seen, there is tension between these motivations for CSR in a competitive setting, and this tension encourages shareholders to strategically delegate moral managers.

[2] A synonym for "moral manager" often found in the literature is "altruistic manager" (e.g., Baron, 2001; Fernández-Kranz and Santaló, 2010), in that managers' motivation to engage in CSR stems from altruism.

While there is a growing literature that looks at the incentives for firms to engage in CSR activities, there is little formal modeling of moral management and the decision behind firms' CSR. Most models take CSR as bundling a private good with a public good (Kotchen, 2006) and focus on CSR as a form of product differentiation (e.g., Bagnoli and Watts, 2003; Besley and Ghatak, 2007) or as a means to influence regulation or activism (e.g., Maxwell et al., 2000; Innes, 2006; de Bettignies and Robinson, 2015); in all cases firms are profit maximizers and CSR is of the strategic variety. Lyon and Maxwell (2008), Kitzmueller and Shimshack (2012), and Schmitz and Schrader (2015) provide reviews. A general theme from this literature is that firms do not have enough incentive to provide a public good, so that strategic CSR alone is unlikely to provide the socially optimal amount of public good.

In terms of considering moral management, Baron (2001, 2009) examines the incentives for a morally-motivated firm to engage in CSR in the presence of an activist. In both cases the focus lies on activism and the decisions of an activist, with minimal attention paid to the competitive implications of CSR, and no attention paid to normative outcomes. In a different vein, Baron (2008) considers a model of managerial contracting when both shareholders and managers can have preferences over the provision of social goods, focusing on the reasons why managerial pay may depend on social performance. By contrast, the model I develop in this chapter has neither activism nor an agency problem; instead, I look at the implications of moral management for firms' strategies and the resulting impact on welfare.

Outside of the economics literature there is a considerable management literature on CSR, often defining CSR as coming from a morally-managed firm; socially responsible behavior by a firm is not CSR unless it is induced by moral management. (This is in contrast to the economics literature, where CSR bundles a public good with a private good beyond what is demanded by law—the motivation for the firm is not important.) Many of the classic criticisms against CSR—particularly that firms should be profit maximizers and that CSR destroys the value of a firm—take this definition (e.g., Davis, 1973) and the model here can be used to speak to these criticisms. The strong presumption is that CSR induced by

managerial philanthropy necessarily forgoes profit. In this literature, McWilliams and Siegel (2001) is probably the closest to the present chapter, discussing the implications of CSR induced by concerns beyond profit in a competitive setting. Their discussion, however, lacks any formal modeling and fails to outline any strategic or normative implications from this type of CSR.

Beyond the literature on CSR, this paper also contributes to the literature on strategic delegation, with profit-maximizing shareholders using moral managers as a commitment device to affect product market competition. The nature of commitment here relates to the manager's preferences for bundling a public good with their firm's output, rather than an organization form, such as vertical separation, debt financing, or exclusive territories (e.g., Bonanno and Vickers, 1988; Showalter, 1995; Rey and Stiglitz, 1995), or an incentive contract (e.g., Sklivas, 1987).

The model I develop in this chapter is a simple differentiated duopoly that treats CSR as a form of product differentiation—bundling a public good with a private good appeals to socially responsible consumers and a firm can use this as a profitable non-market strategy, a common reason why firms engage in strategic CSR (e.g., McWilliams and Siegel, 2001; Besley and Ghatak, 2007; Bénabou and Tirole, 2010; Kitzmueller and Shimshack, 2012). Moral management then augments a firm's objective from one of pure profit maximization to a hybrid that incorporates both profitability and social conduct directly. Analytically, the model I develop is similar to models of mixed oligopolies, especially those with partially privatized firms that have a hybrid objective for profit and consumer surplus (e.g., Matsumura, 1998; Kopel et al., 2014). However, by focusing on the *endogenous* provision of a *public good* and the *endogenous* preferences a manager has for providing a public good, the insights of the model are distinct and unique from those in the literature on mixed oligopolies.

In terms of results, by engaging in CSR beyond what makes "business sense" in a competitive market, a morally-managed firm influences both the market and non-market strategies of a competitor. Given firms' pricing strategies, CSR is a strategic substitute and moral

management on the part of a firm crowds out strategic CSR by a competing firm. Strategic substitutability causes moral management by one firm to generate a negative externality for a competitor. Increased social conduct stemming from a manager's intrinsic motivation then comes at the cost of a competitor's strategic CSR—the relationship between the total CSR among firms and moral management is not one-to-one.

To the extent that managers are agents of shareholders, moral management may simply reflect moral shareholders, with shareholders delegating moral managers to satisfy their own philanthropic interests. However, by influencing the strategies of its competitor, a morally-managed firm can be more profitable in equilibrium than if it were solely profit-motivated. This leads shareholders interested only in profit to strategically delegate a moral manager in a competitive equilibrium, and the incentives to appoint a moral manager are intimately related to the effectiveness with which moral management crowds out a competitor's strategic CSR. The presence of moral managers, even if shareholders are only interested in profit, leads to increased conduct of pro-social behavior in a competitive setting. This is in contrast to a monopolistic market, where moral management increases total CSR at the expense of profit so that shareholders would never appoint a moral manager. The strategic delegation result helps to explain the empirical finding that competitive forces lead firms to engage in more pro-social behavior (e.g., Fernández-Kranz and Santaló, 2010; Flammer, 2015).

In terms of normative results, strategic CSR alone leads to under-provision of the public good that is bundled with a firm's output, even when consumers value the public good for its social value—firms do not engage in enough CSR, the standard result for models of strategic CSR. Introducing moral management, however, can lead to efficient provision of the public good, although managers must value the public good *below* its social value for this to be the case. Moral management then introduces the possibility that firms *over-provide* the public good, counter to the case when firms only engage in strategic CSR. In particular, if managers fully embody the impact of their firm's activities on *stakeholders*, then firms will engage in too much CSR. The issue here is again a tension between strategic and morally-motivated

CSR, and morally-motivated CSR does not crowd out strategic CSR *enough* for firms to implement first-best when maximizing stakeholder value.

When profit-motivated shareholders appoint managers, strategic delegation of moral managers leads to increased provision of the public good. How firms' social conduct then relates to the efficient amount of CSR depends on the incentives shareholders have for appointing moral managers, and hence the extent to which morally motivated CSR by a firm crowds out a competitor's strategic CSR. With little crowding out, shareholders appoint managers that conduct less CSR than is socially desirable. Even if managers are morally motivated, their appointment by profit-motivated shareholders just passes the problem of efficient provision of a public good up a level. With greater crowding out, however, comes the possibility that shareholders appoint managers that *over-provide* the public good. While profit maximization does not gives firms enough incentive to engage in CSR, the same motivation for shareholders can result in too much CSR in the presence of moral managers.

As an extension, moral management can influence an incumbent firm's use of CSR as an entry deterring strategy; shareholders may wish to appoint a morally-motivated manager as a credible means to deter entry. In the presence of a morally-motivated entrant, the incumbent must further over-invest in order to deter entry since it is more difficult to deter entry of a morally-managed firm. Compared to actual competition, moral management by an entrant encourages CSR from an incumbent when there is only the threat of competition. When adopting an entry deterring strategy, the incumbent always does too much CSR and a morally managed entrant exacerbates this problem.

The remainder of the chapter proceeds as follows: section 3.1 sets up the basics of the model; section 3.2 describes the equilibrium along with its positive implications; section 3.3 considers shareholders' decision to appoint a manager; section 3.4 examines the normative implications of the model; section 3.5 considers the interaction between moral management and entry deterring strategies; section 3.6 concludes. Proofs are in the appendix.

3.1 Model

3.1.1 Firms and consumers

Consider the market for a good with two competing firms, labeled 1 and 2, both of which can engage in pro-social behavior and sell to socially responsible consumers. CSR here bundles provision of a public good with a private good, and socially responsible consumers—consumers who value contributing to the public good—will wish to purchase the pro-social product. To abstract from issues associated with communication of CSR, assume firms credibly communicate their pro-social actions so that consumers know if a firm has engaged in pro-social behavior.[3]

By appealing to socially responsible consumers, CSR differentiates a firm's product and firms can use CSR as a profitable non-market strategy, a common reason why firms engage in strategic CSR (e.g., McWilliams and Siegel, 2001; Besley and Ghatak, 2007; Bénabou and Tirole, 2010; Kitzmueller and Shimshack, 2012). Specifically, suppose the market is a differentiated duopoly à la Hotelling where CSR acts as a form of vertical differentiation, as in Conrad (2005) and Deltas et al. (2013), and similar to Bagnoli and Watts (2003) and Heyes and Martin (2016).[4] If a firm conducts s units of CSR, it bundles s units of a public good with its output. It is this provision of a public good that increases consumers' willingness-to-pay for a firm's output, effectively increasing the "quality" of the good.[5] For example, a firm can voluntarily abate s units of its emissions to reduce an environmental externality associated with the production of its output, with environmentally conscientious consumers willing to pay a "green" premium for the good (e.g., Arora and Gangopadhyay,

[3]A firm's social conduct may be a credence characteristic of a good, such that consumers cannot verify the social impact of their consumption even after consuming the good. A third party can then certify a firm's pro-social actions, such as a non-governmental organization, and this makes a firm's claim credible; see Harbaugh et al. (2011) and Heyes and Martin (2016) for models of certification. As will be discussed later in this section, the model developed here can be embedded in a model of certification so that credible communication by firms is not a strong assumption.

[4]Horizontal differentiation can come about for the usual reasons (e.g., brand competition) or can be due to firms' social conduct. That is, CSR may differentiate a good both horizontally and vertically.

[5]See Elfenbein and McManus (2010) for an estimate of consumer willingness to pay for CSR. Elfenbein et al. (2012) find consumers respond favorably to products that are tied to charity.

1995).

There is a continuum of consumers with single-peaked, quasi-linear utility functions, with ideal varieties distributed uniformly on the varietal segment $[0, 1]$. Firm 1 is located at zero and firm 2 is located at one, and each consumer can purchase at most one good from either firm 1 or firm 2. A consumer with preferred variety θ gets utility

$$u(s_i, p_i; \theta) = \bar{u} + v(s_i) - |\mathbb{I}[i = 2] - \theta| - p_i + B$$

from purchasing from firm $i \in \{1, 2\}$, where s_i is CSR conducted by firm i, $\bar{u}$ is a consumer's reservation value, and p_i is the price of the good. The value $v(s)$ is interpreted as the value to a consumer from purchasing a good embodying s units of CSR, with $v \in C^2$, $v(0) = 0$, $v'(s) > 0$ and $v''(s) \leq 0$ for all s.[6] This value is "warm-glow" utility associated with making a purchase from a firm that provides a public good (Bagnoli and Watts, 2003; Deltas et al., 2013; Heyes and Martin, 2016), similar to a charitable donation.[7] Assume that $v(s) \leq 3$ so that vertical differentiation is not that much more important than horizontal differentiation to consumers, ensuring that consumer demand is well defined in equilibrium. The term B is the total value of public goods bundled with firms' outputs.

Assuming that consumers' reservation value $\bar{u}$ is sufficiently large so that the market is

[6] It is straightforward to allow consumers to vary in their valuation of CSR, although most models do not allow for this (e.g., Besley and Ghatak, 2007). In doing so, the function v should be interpreted as the average value of CSR over all consumers when it appears in the demand function.

[7] Consumers must value purchasing a good from a socially responsible firm beyond the private value of the public good, for otherwise each consumer would entirely free-ride on the contributions of others and no public good would be provided. Consumers may get some private value from purchasing from a socially responsible firm, say, because the good is of higher quality. While this makes no difference for the positive analysis, it makes the normative analysis more complicated while delivering all the same results (and no new ones). Hence assuming only warm-glow is for simplicity, and is with little loss of generality.

covered, demand for firm $i \in \{1, 2\}$ is given by

$$q_i(p_i, s_i; p_j, s_j) = \begin{cases} 1 & \text{if } p_i < v(s_i) - v(s_j) + p_j - 1, \\ 0 & \text{if } p_i > v(s_i) - v(s_j) + p_j + 1, \\ \frac{1+v(s_i)-v(s_j)-p_i+p_j}{2} & \text{otherwise,} \end{cases}$$

where s_i is CSR conducted by firm i and s_j is CSR conducted by firm j. Assuming that v is bounded above ensures that both firms face positive demand in equilibrium.

Since CSR produces a public good, let the social benefit from CSR be given by the function b; assume $b \in C^2$, $b(0) = 0$, $b'(s) > 0$, and $b''(s) \leq 0$ for all s.[8] If a firm bundles s units of public good with its output and sells q units of output, this produces social value $b(s)q$. For example, if a firm improves its environmental conduct by voluntarily abating emissions, and so reduces emissions on each unit of output, $b(s)q$ is the reduction in environmental damage caused by the firm. By conducting itself in a socially responsible way, if a firm makes profit $\Pi(s)$ when doing CSR s, $\Pi(s)$ is the value of the firm to shareholders and $\Pi(s) + b(s)q$ is the value of the firm to *stakeholders*.

3.1.2 Managers

A manager can be motivated by both the profit that accrues from sales and the social contribution of the firm (Schmitz and Schrader, 2015); that is, a manager can be *morally-motivated*. This is in contrast to an *amoral* manager with preferences for only profit (Carroll, 1991). Put another way, a moral manager is interested in *stakeholder* value whereas an amoral manager is interested in *shareholder* value. Despite the name, moral management

[8] As noted by Bagnoli and Watts (2003), CSR can explicitly link a public good with a private good, as is the case here, or there can be no explicit linkage with output. The case of no explicit linkage is ignored in the interest of simplicity and since the explicit linkage case is more common in the literature. Allowing for no explicit linkage has no effect on the positive results of the model and pushes the normative results towards an inefficient outcome.

need not arise from a sense of moral duty on the part of managers.[9]

There are a variety of reasons why a manager may have preferences for pro-social behavior; see Aguilera et al. (2007) or Bénabou and Tirole (2010) for a discussion of the motivations for firms to engage in CSR. Importantly, moral management does not imply a lack of interest towards profit, rather "[m]oral managers want to be profitable, but only within the confines of sound legal and ethical precepts, such as fairness, justice, and due process" (Carroll, 1991, p. 45). In the language of Kitzmueller and Shimshack (2012), this amounts to "not for profit CSR."

The presence of a morally-motivated manager can bring about concerns of corporate governance if shareholders are solely concerned with the generation of profit. If shareholders have preferences for pro-social behavior then the manager appointed may simply reflect these preferences and hence moral management is a reflection of moral shareholders (Morgan and Tumlinson, 2016). There are a variety of ways in which a moral manager can become entrenched and persist despite concern from shareholders (e.g., Cespa and Cestone, 2007). Alternatively, influence from stakeholders can lead a firm's management to incorporate concern over social issues into their objective as a form of delegated philanthropy (Bénabou and Tirole, 2010; Schmitz and Schrader, 2015). The issue of corporate governance will receive more attention in section 3.3; for the moment it is taken as given that a firm can be run by a moral manager.

Conducting itself in a socially responsible manner is costly for a firm, and CSR can affect

[9]Care, however, must be taken when discussing CSR in the context of morally-motivated managers. The concept of CSR is often ill-defined and has different meanings in different literatures (or the same literature). One popular definition, adopted in Baron (2001) and McWilliams and Siegel (2001), defines CSR not only by performance, but also by motivation; CSR requires *corporate social performance* (CSP) beyond what is demanded by markets or laws. Thus a profit-motivated firm can engage in CSP, but this is not CSR since the motivation is not present. In this way CSR is a stronger concept than CSP. Baron (2001) even goes as far to define CSR as coming from a firm with altruistic motivation. When a profit-motivated firm engages in CSP as a non-market strategy, it is often called strategic CSR.

By contrast, the economics literature tends to take a broader view of CSR, defining it as CSP that goes beyond legal or regulatory requirements only (Kitzmueller and Shimshack, 2012). Hence CSP induced by strategic considerations and moral considerations are both CSR, provided it goes beyond what is demanded by law. In this chapter, the latter definition of CSR is taken; CSR is then qualified with its motivation when necessary (e.g., CSR induced by moral management versus strategic CSR). It should be noted that most criticisms against CSR apply to the first definition (Davis, 1973; Bénabou and Tirole, 2010).

both the marginal cost of producing a good as well as entail a fixed cost (fixed with respect to output). To keep the analysis simple and highlight the main points, CSR is assumed to entail only a fixed cost, given by the function F; the marginal cost of production is constant with s, and normalized to zero without loss of generality. The cost F is interpreted as the cost of adjusting the firm's practices to be more socially responsible, say, by using ethically sourced inputs or installing pollution abatement technology. Assume $F \in C^2$, $F(0) = 0$, $F'(s) > 0$ and $F''(s) > 0$ for all s, with $\lim_{s\to 0} F'(s) = 0$ and $\lim_{s\to\infty} F'(s) = \infty$. All the results of the model are maintained with marginal cost increasing and convex in s when output is produced with a constant returns to scale technology.

Allowing for managers to have preferences over both the profitability of their firm—given by Π—and social conduct, the payoff for firm i's manager is given by

$$\pi_i(p_i, s_i; p_j, s_j) = \Pi_i(p_i, s_i; p_j, s_j) + \mu_i s_i,$$

which is equivalent to

$$\pi_i(p_i, s_i; p_j, s_j) = p_i q_i(p_i, s_i; p_j, s_j) - F(s_i) + \mu_i s_i,$$

where $\mu_i \in [0, \infty)$ is the manager's degree of moral management.[10] A moral manager corresponds to $\mu > 0$ and an amoral manager corresponds to $\mu = 0$—the parameter μ is simply

[10]This is not the only way to model a morally-motivated firm; see Besley and Ghatak (2005) or Baron (2010) for a discussion of morally-motivated agents. An alternate approach specifies weights for profit and CSR so that moral management corresponds to a greater weight put on pro-social behavior. For instance, a manager may receive payment as a fraction of the profit of the firm and derive some reputational benefit from CSR. This approach, however, is equivalent to that taken here. If ω is the weight put on profit and θ is the weight put on CSR, then $\mu = \theta/\omega$. In this way, π is similar to a (scaled) quasi-linear utility function, and can be interpreted as the manager's utility function (Baron, 2001).

The function π can also have a behavioral interpretation. For example, a manager may be motivated by guilt so that manager experiences guilt for not behaving in a socially responsible way. This in turn determines how a manager perceives profitability, such that guilt diminishes the perceived value of generating profit (Gneezy et al., 2014). Let $g = \mu(\bar{s} - s)$ be guilt; the more CSR a manager conducts up to a maximum $\bar{s}$, the less guilt they incur. The parameter μ now captures the strength of a manager's guilt from behaving badly. Since guilt now diminishes the perceived value of profit (Π), let $u = \Pi \exp(-g/\Pi)$ be a manager's (scaled) utility function. It follows that $u \approx \Pi + \mu s - \mu\bar{s}$, and this represents the same preferences as π.

the value of CSR to the manager beyond what accrues through profit.[11] Importantly, weight is put on pro-social behavior both for its strategic payoff (i.e., increased profit) and its broader meaning to the manager as a corporate citizen (Carroll, 1991, p. 47). For instance, in the presence of multiple stakeholders, μ can be thought of as the implication of CSR on all stakeholders or a representative stakeholder.[12] A useful interpretation of μ that will be adopted when discussing normative results is that μ is *warm-glow* utility—a manager has warm-glow altruism for providing the public good (Baron, 2001)—consistent with the idea that CSR induced by non-strategic considerations is a form of corporate philanthropy (Carroll, 1991).[13]

Moral management can be seen as a form of social entrepreneurship in that part of the firm's objective involves addressing a social issue, but the notion of a morally-motivated firm should be kept distinct from a social enterprise. Social enterprise is characterized by a zero-profit constraint as revenue generated is re-invested into the firm or directed towards addressing a social cause—a social enterprise is more like a charity that can generate its own revenue (outside of fund-raising). In the context of the model, a morally-managed firm is a more general concept as a social enterprise is simply a morally-managed firm with no weight put on profit.

3.1.3 Timing

To begin, managers' μs are held fixed in order to examine the choice of CSR and pricing strategies; the issue of what type of manager shareholders would like to appoint is dealt with later. The basic game played by firms consists of two stages: in the first stage, firms choose

[11] $\mu < 0$ might correspond to an *immoral* manager with preferences for reducing provision of a public good. As will be seen, such managers cannot come about in equilibrium when shareholders appoint managers; restricting $\mu \geq 0$ is without loss of generality.

[12] If CSR entails a vector of activities $(s^1, s^2, \ldots, s^n)$, where s^i impacts stakeholder i, then $\mu^1 s^1 + \mu^2 s^2 + \ldots + \mu^n s^n$ is the impact on stakeholders, at least from the perspective of the manager. Keeping CSR one-dimensional seeks to simplify the analysis.

[13] A manager may also value CSR done by another firm. If the manager of firm i values the CSR done by firm j, s_j, then their payoff is $\pi_i(p_i, s_i; p_j, s_j) = p_i q_i(p_i, s_i; p_j, s_j) - F(s_i) + \mu_i s_i + \lambda_i s_j$, where λ_i is the value that the manager of firm i places on CSR done by firm j. It is clear that this represents the same preferences as if the manager cared only about their CSR.

their CSR simultaneously,[14] and in the second stage firms compete in prices. The solution concept is sub-game perfect Nash.

The motivation for this timing is threefold. First, this is a standard setup for models of CSR (e.g., Baron, 2001; Deltas et al., 2013); keeping the model similar to those of existing papers makes the implications of moral management transparent. Second, this timing reflects the idea that CSR is an investment decision. Lastly, moral management influences a firm's mission or "core competencies" which then influence how it competes with other firms; having CSR chosen before prices reflects this.

In section 3.3 the basic game is extended by considering an additional stage at the beginning where shareholders can appoint a manager. Discussion of shareholders is deferred until section 3.3. In section 3.5, firms are allowed to move sequentially and entry deterring strategies can be adopted.

3.2 Equilibrium

3.2.1 Price competition

In the second stage of the game, given levels of CSR (s_1, s_2) from the previous period, firms simultaneously choose the price of their products. The result of CSR in the first period is that firms face different demand schedules for their products due to product differentiation and have different cost structures so that CSR affects a firm's market strategies. Moral management has no direct effect on price competition and in the second stage of the game

[14] If a third party certifies a firm's pro-social behavior in the form of a label, then firms do not choose their CSR directly but instead select the label that gives the highest profit. If there is a continuum of labelers, one for each stringency $s \in [0, \infty)$, as in Lerner and Tirole (2006), then choice of a label amounts to choice of CSR. Having a continuum of labelers reflects the idea that the market for social labels is crowded due to the recent proliferation of social labels. See Heyes and Martin (2016) for a discussion of label proliferation; the authors find that with free entry of labelers, equilibrium stringency of labels corresponds with the level of CSR firms would do if they credibly communicate their social conduct. Alternatively, if the market for labels is contestable such that a prospective certifier could enter after the incumbents design their labels, then a Nash equilibrium stringency for certification must coincide with a Nash equilibrium in the game where firms choose their CSR directly.

a firm's objective is to maximize profit. Formally, a firm i's problem is

$$\max_{p_i} \pi_i(p_i, s_i; p_j, s_j) = p_i q_i(p_i, s_i; p_j, s_j) - F(s_i) + \mu_i s_i, \tag{3.1}$$

which is equivalent to

$$\max_{p_i} p_i q_i(p_i, s_i; p_j, s_j).$$

Given the structure of firms' payoffs, prices are strategic complements. The following lemma gives firms' equilibrium pricing strategies (p_1^*, p_2^*).

Lemma 3.1. *The unique, interior Nash equilibrium (p_1^*, p_2^*) has firms choosing*

$$\begin{pmatrix} p_1^*(s_1, s_2) \\ p_2^*(s_2, s_1) \end{pmatrix} = \frac{1}{3} \begin{pmatrix} 3 + v(s_1) - v(s_2) \\ 3 + v(s_2) - v(s_1) \end{pmatrix}. \tag{3.2}$$

3.2.2 Choice of CSR

Moving to the first period, firms must now choose their level of CSR taking into account the price equilibrium in the second stage. Inserting firms' pricing strategies in (3.2) into the expression for π_i in (3.1), the payoff for firm i's manager is given by

$$\pi_i(s_i, s_j) = \frac{1}{2} \left(\frac{3 + v(s_i) - v(s_j)}{3} \right)^2 - F(s_i) + \mu_i s_i.$$

Remark 3.1 (Strategic substitutes)**.** *CSR is a strategic substitute (i.e., $\partial \pi_i(s_i, s_j)/\partial s_i \partial s_j < 0$).*

Examining (3.2) gives the intuition for the strategic nature of CSR. When a firm engages in more CSR, this increases the price which that firm charges for its product because consumers are now willing to pay more for the good. CSR by a firm's competitor, however, decreases that firm's price; there is a demand effect from product differentiation, leading the

firm to reduce price and attract customers. The importance of these price effects is how they combine with the direct effect CSR has on demand to influence the strategic nature of CSR. While CSR increases profitability at the margin, allowing a firm to charge a higher price and attract more customers, when a rival firm does more CSR this has the effect of reducing the marginal profitability of CSR by both reducing demand for the firm's product and forcing the firm to compete more aggressively on price.

Strategic substitutability is important moving forward and governs the effect of moral management on firms' social conduct—see Deltas et al. (2013) for a discussion of the strategic nature of CSR. If CSR entails some convex marginal cost, CSR need not be a strategic substitute globally as increasing marginal costs associated with CSR can render it a strategic complement when one firm engages in sufficiently more CSR than the other. It turns out, however, that little is lost by ignoring strategic complementarity as only strategic substitutability affects equilibrium outcomes when shareholders are involved.

A managers's problem is now to choose s_i to maximize π_i. It is reasonable to assume that a morally-motivated firm must still produce positive profit in equilibrium, putting an upper bound on the amount of CSR a firm can undertake. To avoid getting sidetracked, the upper bound is assumed sufficiently large so as not to bind, or equivalently the μs are not so large as to lead a manager to jeopardize profitability for social conduct.[15] This assumption is innocuous if shareholders appoint managers.

In a sub-game perfect Nash equilibrium, the equilibrium strategies (s_1^*, s_2^*) are given by the first-order condition

$$\begin{pmatrix} F'(s_1^*) - \mu_1 \\ F'(s_2^*) - \mu_2 \end{pmatrix} = \frac{1}{9} \begin{pmatrix} v'(s_1^*)(3 + v(s_1^*) - v(s_2^*)) \\ v'(s_2^*)(3 + v(s_2^*) - v(s_1^*)) \end{pmatrix}. \tag{3.3}$$

To facilitate comparative statics and ensure that firms' strategies are well defined, assume

[15] Fixing s_j and noting that v is bounded above, the point $\bar{s}_i$ such that $q_i(\bar{s}_i)^2 = F(\bar{s}_i)$ is a suitable upper bound for firm i. Assuming the upper bound does not bind in equilibrium does not affect any results from the model; relaxing this assumption simply makes stating results more difficult by having to qualify when the upper bound may bind. (It is obvious that the lower bound $s = 0$ never binds.)

the equilibrium is globally stable.[16]

Remark 3.2. *There is a unique equilibrium* (s_1^*, s_2^*) *given by* (3.3).

From (3.3), the effect of moral management on equilibrium CSR is easily derived, as noted in the following lemma.

Lemma 3.2. *Equilibrium CSR by a firm is increasing in its own moral management and decreasing in moral management by its competitor. The firm with greater moral management engages in more CSR in equilibrium.*

While it is intuitive that moral management encourages a firm to conduct more CSR and a firm with greater moral management should engage in more CSR, the effect of moral management on a competitor's CSR is less obvious. In essence, CSR by a morally-managed firm—or CSR induced by moral management—crowds out CSR by a competing firm. Intuitively, moral management by a firm induces that firm to engage in CSR beyond what is prescribed by profit maximization and, since CSR is a strategic substitute, this "exogenous" shift in CSR encourages a firm's competitor to reduce its CSR.

Decomposing CSR by a firm into its component parts—strategic CSR and morally-motivated CSR—leads to the following expression for equilibrium CSR: $s_i^*(\mu_i, \mu_j) = s_i^*(s_j^*(\mu_i, \mu_j), \mu_i)$. The comparative statics from lemma 3.2 can then be decomposed into the effect of moral management on strategic CSR and the effect on morally-motivated CSR. Differentiating s_i^*,

$$\frac{\partial s_i^*(s_j^*(\mu_i,\mu_j),\mu_i)}{\partial \mu_i} = \underbrace{\frac{\partial s_i^*(s_j^*(\mu_i,\mu_j),\mu_i)}{\partial s_j}\frac{\partial s_j^*(\mu_j,\mu_i)}{\partial \mu_i}}_{\substack{\text{strategic CSR}\\(>0)}} + \underbrace{\frac{\partial s_i^*(s_j^*(\mu_i,\mu_j),\mu_i)}{\partial \mu_i}}_{\substack{\text{morally-motivated CSR}\\(>0)}}$$

[16]This will be true if, for instance, π_i is "sufficiently concave" so that $\partial^2\pi_i(s_i,s_j)/\partial s_i^2 < -1/9v'(s_i)^2$, or equivalently $1/9v''(s_i)(3+v(s_i)-v(s_j))+2/9v'(s_i)^2-F''(s_i) < 0$, for all (s_i, s_j). It is straightforward to find functional forms for v and F that satisfy this condition (i.e., $v(s) = vs$ and $F(s) = Fs^2/2$ with $F > 2/9v^2$).

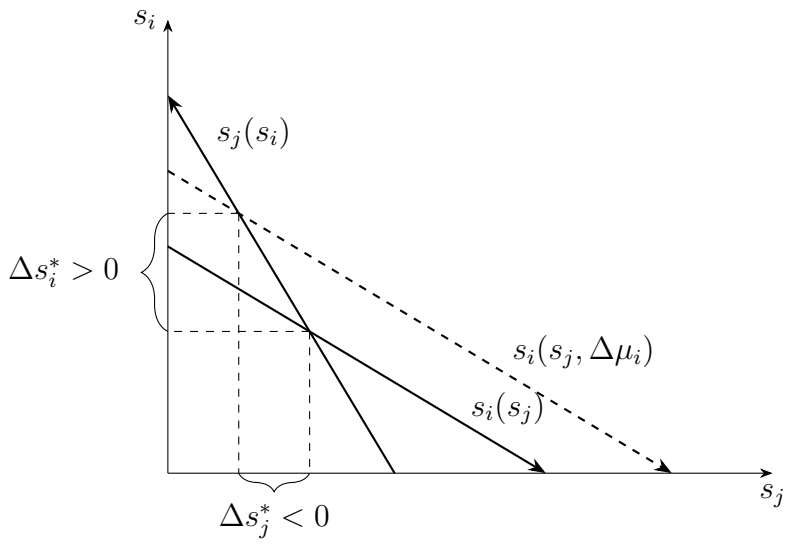

Figure 3.1: Effect on equilibrium CSR from an increase in μ_i of $\Delta\mu_i$.

and

$$\frac{\partial_i^*(s_j^*(\mu_i,\mu_j),\mu_i)}{\partial\mu_j} = \underbrace{\frac{\partial s_i^*(s_j^*(\mu_i,\mu_j),\mu_i)}{\partial s_j}\frac{\partial s_j^*(\mu_j,\mu_i)}{\partial\mu_j}}_{\substack{\text{strategic CSR}\\(<0)}} + \underbrace{\frac{\partial s_i^*(s_j^*(\mu_i,\mu_j),\mu_i)}{\partial\mu_j}}_{\substack{\text{morally-motivated CSR}\\(=0)}}.$$

Lemma 3.2 then leads to the following (see also figure 3.1).

Proposition 3.1 (Moral management crowds out strategic CSR)**.** *Moral management promotes strategic CSR from a firm while a competitor's moral management crowds out the strategic CSR of a firm.*

When a firm is morally-managed, there are two channels through which moral management increases its equilibrium CSR: a direct channel and an indirect channel. The direct channel holds market conditions fixed and, since the firm is morally-motivated to engage in CSR, this channel increases CSR. For the indirect channel, by altering market conditions—charging a higher price and crowding out a competitor's CSR—the firm finds strategic CSR more profitable and hence engages in more strategic CSR. In this way there need not be tension between a moral rationale for CSR and an instrumental rationale, as is often claimed (Margolis and Walsh, 2003).

Instead, when a competing firm is morally-managed, this impacts only the incentive for a firm to engage in strategic CSR; the direct effect of moral management on CSR remains unchanged in the face of a morally-managed competitor. Since moral management encourages a competitor to do more CSR, the firm faces reduced demand, competes more aggressively on price, and thus finds strategic CSR less profitable. Put another way, moral management by a firm exerts a negative externality on a competing firm because CSR is a strategic substitute, with extra CSR induced by moral management coming at the cost of strategic CSR by a competitor.

A term that will be useful in subsequent sections is the degree to which moral management by firm i crowds out strategic CSR by firm j, $\left|\frac{\partial s_j^*/\partial \mu_i}{\partial s_i^*/\partial \mu_i}\right|$. For instance, if there is no crowding-out effect (i.e., $\partial s_j^*/\partial \mu_i = 0$) then $\left|\frac{\partial s_j^*/\partial \mu_i}{\partial s_i^*/\partial \mu_i}\right| = 0$, whereas if crowding out is one-to-one then $\left|\frac{\partial s_j^*/\partial \mu_i}{\partial s_i^*/\partial \mu_i}\right| = 1$. Note that if firms are equally morally-managed, the direct effect of moral management on a firm's own CSR outweighs the crowding-out effect. Aggregate CSR increases with moral management when both firms are equally morally-managed so that crowding out is less than one-to-one and therefore $\left|\frac{\partial s_j^*/\partial \mu_i}{\partial s_i^*/\partial \mu_i}\right| \in (0, 1)$.

Before moving to the next section and adding shareholders to the model, the above proposition has a direct implication for minimum quality standards (MQS) that apply to firms' social conduct. Such a standard may prescribe, say, a minimum amount of recycled material that must be present in a product. If firms are differentially morally-managed, then the less morally-managed firm engages in less CSR and hence a MQS would target the less morally-managed firm. Implementing a MQS makes the less morally-managed firm act "as if" it were more morally-managed. A minimum quality standard then seeks to increase the social conduct of the less morally-managed firm at the expense of CSR from the more morally-managed firm. This is counter to the result in Arora and Gangopadhyay (1995), where a greener firm responds to an environmental MQS by increasing CSR.

Corollary 3.1. *When firms are differentially morally-managed, a minimum quality standard for firms' social conduct increases the social conduct of the less morally-motivated firm at*

the expense of strategic CSR from the more morally-motivated firm.

3.3 Strategic delegation by shareholders

In this section, the basic game of the previous section is modified by adding shareholders that own firms and appoint managers. At first blush, it would seem that moral management would reduce the profitability of a firm; after all, moral management induces a firm to engage in CSR beyond what makes business sense (Baron, 2009). If shareholders are concerned only with profit, this informs the type of manager shareholders would like to appoint. If moral management leads a firm to be less profitable, shareholders would not appoint a moral manager in the first place. In general, however, the effect of moral management on profitability is ambiguous and in certain cases can be positive. Unless otherwise stated, it is assumed from now on that shareholders are interested only in profit.

Proposition 3.2. *Moral management increases equilibrium profit of a firm up to a point. A firm is more profitable with small degree of moral management than with amoral management.*

While this result is counter-intuitive, it follows from the nature of price competition between firms and the resulting strategic substitutability of CSR. The ambiguity of moral management on a firm's profit comes about from two effects. While the direct effect of moral management seeks to reduce profit, as expected, by deviating from profit maximizing behavior, the indirect effect that emerges from the presence of a competitor allows for an increase in profitability. For a small degree of moral management, this indirect effects outweighs the direct effect, making moral management profitable. This runs counter to the analysis in McWilliams and Siegel (2001) where CSR beyond what is profit-maximizing has no equilibrium impact on profit.

As an example, consider the case when both firms are amorally managed. In this case, if firm 2 becomes slightly morally-managed, firm 1 reacts by reducing its CSR—firm 1 competes more aggressively on price, making its CSR less valuable—since CSR is a strategic substitute.

This reduction in CSR by firm 1, in conjunction with the increase in CSR by firm 2, then increases demand for firm 2, in turn increasing revenue since firm 2's price also increases from the additional CSR. When there is little moral management, the cost of deviating from profit-maximizing behavior induced by the manager's concern for social conduct is less than the boost in revenue, increasing the firm's profit. In fact, in this case, firm 2 is *more* profitable than firm 1—a concern for social conduct beyond what is profitable leads the firm to become more profitable because of competition.

It is worth noting that a profit-maximizing firm *cannot* mimic the actions of a morally-motivated firm to increase profit. Given pricing strategies and a competitor's social conduct, a profit-maximizing firm cannot increase profit by deviating from its optimal amount of CSR. If a profit-maximizing firm were to act *as if* it were morally-managed and have a competitor respond accordingly, the profit-maximizing firm would like to reduce its CSR—it is the presence of a moral manager that makes a firm's increased social conduct credible. It is also worth noting that since there is full information, moral management does not increase profit by resolving uncertainty about a firm or its social conduct (e.g., Elfenbein et al., 2012).

Proposition 3.2 suggests that shareholders would like to appoint a manager with some type $\mu > 0$—shareholders wish to appoint a moral manager as a form of strategic delegation.[17] In this way moral management need not bring about an issue of corporate governance, as is often claimed (Bénabou and Tirole, 2010). Augmenting the timing in section 3.1.3, suppose two groups of shareholders, each of which owns a firm and chooses a manager before firms choose to engage in CSR. Having shareholders choose managers' types directly rather then designing an incentive contract abstracts from issues associated with the design of such a contract and instead focuses on the type of manager shareholders would like to appoint.[18]

[17]For example, Google notes that it is the "largest corporate purchaser of renewable energy in the world" and that this is "good for the economy, good for business and good for our shareholders" (Hardy, 2016).

[18]As a micro foundation, suppose there is a continuum of managers, each with a type $\theta \in [0, \infty)$, where θ gives the manager's interest towards pro-social behavior. For simplicity, suppose payment for a manager comes in the form of a fraction of profit $\omega > 0$ and this fraction is set exogenously in a competitive market for managerial remuneration. Since output is deterministic, there is no moral hazard problem. (There is a large literature on wage contracting for managers in a setting of moral hazard; see Baron (2008) for a model when a manager can be morally-motivated.) A manager's objective is thus unchanged from that in

Formally, the problem for the shareholders that own firm i is

$$\max_{\mu_i} \Pi_i(\mu_i, \mu_j) = \frac{1}{2}\left(\frac{3 + v(s_i^*) - v(s_j^*)}{3}\right)^2 - F(s_i^*),$$

where (s_i^*, s_j^*) are firms' equilibrium strategies from (3.3).

From proposition 3.2, in a sub-game perfect Nash equilibrium the equilibrium actions of shareholders (μ_1^*, μ_2^*) are such that the shareholders that own firm i choose some $\mu_i^* > 0$. The equilibrium strategy for shareholders, whose only concern is profit, is to strategically appoint a morally-motivated manager.

Looking at the first-order condition for a shareholder's problem,[19]

$$\frac{\partial \Pi_i(\mu_i, \mu_j)}{\partial \mu_i} = -\frac{\partial s_i^*(\mu_i^*, \mu_j^*)}{\partial \mu_i}\mu_i^* - \frac{1}{9}(3 + v(s_i^*) - v(s_j^*))v'(s_j^*)\frac{\partial s_j^*(\mu_i^*, \mu_j^*)}{\partial \mu_i} = 0,$$

it is the crowding out of strategic CSR by moral management that gives shareholders an incentive to appoint a moral manager—the above first-order condition can be written as

$$\mu_i^* = \underbrace{\frac{1}{9}(3 + v(s_i^*) - v(s_j^*))v'(s_j^*)}_{\text{marginal revenue}} \cdot \underbrace{\left|\frac{\partial s_j^*(\mu_i^*, \mu_j^*)/\partial \mu_i}{\partial s_i^*(\mu_i^*, \mu_j^*)/\partial \mu_i}\right|}_{\text{crowding out}}.$$

Shareholders choose μ_i^* to balance the cost of deviating from profit-maximizing behavior, embodied in μ_i^*, with the benefit of extra revenue that comes from attracting custom from firm j. If there were no crowding out, so that $\left|\frac{\partial s_j^*/\partial \mu_i}{\partial s_i^*/\partial \mu_i}\right| = 0$, shareholders would appoint an

the previous section, setting $\mu = \theta/\omega$. Inverting this expression gives $\theta(\mu)$ and so shareholders can be seen as choosing μ directly. The goal of shareholders is then to choose a manager—choose a μ—to maximize the residual profit of the firm, $(1 - \omega)\Pi(\mu)$.

It is straightforward to allow ω to be decreasing in θ, capturing the idea that shareholders may not need to rely as heavily on high-powered incentives when managers are morally-motivated (Besley and Ghatak, 2005). Restricting attention to the special case in which ω is constant gives a lower bound for the type of manager shareholders would like to appoint. Abstracting from the effect of a manager's type on compensation highlights the role of competitive markets in influencing shareholders' decision to appoint a manager. A manager is assumed to have a reservation utility sufficiently low that he will accept the shareholders' contract.

[19]The function Π_i may not be concave in μ_i, so that the first-order condition is not sufficient to characterize the equilibrium actions of shareholders, although it is still necessary. If, for instance, $v(s) = vs$ and $F(s) = Fs^2/2$ with $F > (3 + \sqrt{5})/18v^2$, Π_i is strictly concave in μ_i and there will be a unique, symmetric interior equilibrium.

amoral manager with $\mu_i^* = 0$—it is because there is crowding out that appointing a moral manager is unilaterally profitable. In a symmetric equilibrium, however, aggregate profit is lower than if shareholders had appointed profit-motivated managers.[20] The proposition summarizes.

Proposition 3.3 (Strategic delegation of moral managers)**.** *Given two groups of profit-motivated shareholders, each of which owns a firm in the same market, both groups choose to strategically delegate morally-motivated managers. In a symmetric equilibrium, aggregate profit is lower than if all shareholders appointed profit-maximizing managers.*

It is worth noting that *necessary* for shareholders to appoint a moral manager is that moral management crowds out a competitor's strategic CSR, for otherwise appointing a moral manager is not profitable. Hence CSR must be a strategic substitute for moral managers to emerge in equilibrium—if CSR were a strategic complement, say, because firms produced complementary products, moral management would represent an issue of corporate governance and profit-motivated shareholders would appoint managers with $\mu = 0$.

It is also worth remarking that, since both groups of shareholders appointing amoral managers is never a Nash equilibrium (i.e., $(\mu_1^*, \mu_2^*) \neq (0, 0)$), having moral managers in equilibrium is "coalition-proof" in that both groups of shareholders cannot credibly commit to appointing amoral managers, even if this represents a Pareto improvement for shareholders (e.g., in the case of a symmetric equilibrium).

3.3.1 Morally managed monopolist

It is useful to compare the results of the previous section with the actions of a monopolist to make the role of moral management and competition clear. To be precise, assume both firms act as local monopolists so that the market is not covered (i.e., consumers' reservation

[20]Note that in a symmetric equilibrium, $\partial \Pi_i(\mu_i^*, \mu_j^*)/\partial \mu_j < 0$ (since $\left|\frac{\partial s_j^*/\partial \mu_i}{\partial s_i^*/\partial \mu_i}\right| < 1$). Hence a morally managed competitor is bad for business in equilibrium. This is consistent with the empirical evidence in Cao et al. (2016); the authors find that an exogenous increase in CSR reduces profitability of competitors.

value $\bar{u}$ is not so large as to preclude the market from being uncovered).

Keeping the timing of the game, given some choice of CSR s a monopolist sets a price of

$$p_m = \frac{\bar{u} + v(s)}{2}. \tag{3.4}$$

The structure of demand then implies that the payoff for a manager is

$$\pi_m(s) = \left(\frac{\bar{u} + v(s)}{2}\right)^2 - F(s) + \mu s.$$

Maximizing π_m, a monopolist chooses s_m such that

$$F'(s_m) - \mu = \left(\frac{\bar{u} + v(s_m)}{2}\right) v'(s_m). \tag{3.5}$$

The following proposition follows immediately from (3.5).

Proposition 3.4. *CSR for a monopolist increases with moral management; profit decreases with moral management.*

This proposition can be seen as the conventional wisdom: moral management produces an unambiguous increase in CSR but at the expense of profit (Baron, 2009) and, following the reasoning of proposition 3.3, shareholders would not appoint a moral manager.[21] If the extra CSR induced by moral management were profitable, the firm would have already undertaken such an action. This is the classic criticism against CSR and moral management; excessive interest in addressing social causes distracts from profit and dilutes the firm's primary purpose (Davis, 1973; Bowie, 1991), ultimately destroying value created by the firm (Jensen, 2002).

Such a criticism, however, neglects the interaction between CSR induced by moral management and strategic CSR with competing firms. In a competitive market, moral man-

[21] If instead the share of profit ω paid to managers is decreasing in θ, shareholders may wish to appoint a moral manager simply to reduce managerial pay, even if this reduces profit from the firm.

agement and shareholder value need not be mutually exclusive, and CSR serving a moral rationale can also serve an instrumental rationale (Margolis and Walsh, 2003). Even though profit across firms decreases from the presence of moral managers, it is shareholders' choice of manager and their desire to strategically delegate moral managers that creates this loss.

Before concluding this section, an immediate implication of propositions 3.3 and 3.4 is that competition results in firms being run by moral managers, in turn leading firms to engage in more CSR. This helps to explain the empirical finding that competitive forces cause firms to conduct more CSR (Fernández-Kranz and Santaló, 2010; Flammer, 2015). While there is a strategic motivation to increase CSR in a competitive market, competition also gives shareholders an incentive to strategically delegate moral managers, thus resulting in more CSR.

3.4 Welfare

As noted in the introduction, discussions of moral management are often normative—firms *ought* to be run by moral managers or moral management is necessary for firms to provide a public good efficiently. The purpose of this section is to explore the normative implications of moral management: under what conditions can firms run by moral managers provide the first-best amount of public good? To keep the analysis simple, only symmetric equilibria are considered (i.e., equilibria with $\mu_1 = \mu_2$). Since firms and shareholders are symmetric, this does not seem a strong restriction.

In conducting normative analysis in models of CSR, the form of the welfare function depends critically on how consumers value CSR. If consumers' valuation from contributing to the public good is derived from warm-glow preferences (e.g., Bagnoli and Watts, 2003; Deltas et al., 2013), there is good reason to exclude this valuation from the welfare function (Andreoni, 2006; Bernheim and Rangel, 2012). This also applies to a morally-motivated manager's non-monetary payoff μ; a manager is thus assumed to have warm-glow preferences

for providing a public good (e.g., Baron, 2001).

In order to isolate firms' incentives to provide CSR, set $v = b$ so that consumers' average valuation of CSR equals the social impact of CSR, as in Besley and Ghatak (2007), Deltas et al. (2013), and Heyes and Martin (2016). If consumers view purchasing a good embodying CSR as analogous to making a donation, setting $v = b$ means that consumers are impact philanthropists (Duncan, 2004). While these are strong assumptions, they give the best chance for firms to provide a public good efficiently and allow the analysis to focus on firms' incentives to provide public goods.[22]

With the above assumptions, the social welfare function is

$$w(s_1, s_2) = \int_0^{q_1} (\bar{u} + b(s_1) - \theta - p_1)d\theta + \int_{q_1}^1 (\bar{u} + b(s_2) - (1-\theta) - p_2)d\theta$$
$$+ p_1 q_1 - F(s_1) + p_2 q_2 - F(s_2),$$

which simplifies to

$$w(s) = b(s) - 2F(s).$$

Alternatively, w can be seen as the social benefit of the public good less the cost of provision, a reasonable objective for an organization interested solely in providing a public good, such as an environmental protection agency. In this case the normative criterion is provision of public good, abstracting from provision of the private good to which it is bundled. In either

[22]It is worth discussing the implications of relaxing these assumptions. If consumers' or managers' warm-glow valuation of CSR is included in welfare, then CSR can never be done efficiently by firms. If instead a fraction of consumers' valuation is economic value, say, because there is increased quality with CSR, then a fraction of consumers' valuation α would appear in welfare; v can be set equal to $\alpha v + b$ and a slightly more complicated argument delivers all the same results. Setting $v = b$ prevents consumers from (under-) over-valuing CSR and removes the possibility that firms provide an (in)efficient amount of CSR *because* consumers (under-) over-value the public good provided by CSR. All subsequent results can be generalized by setting $v = \gamma b$, for some number $\gamma > 0$. Focusing on the case of $\gamma = 1$ reduces notation and simplifies the exposition.

case, the surplus maximizing amount of CSR s^{**} is given by

$$F'(s^{**}) = \frac{1}{2}b'(s^{**}). \tag{3.6}$$

Before moving on, the following remark establishes the benchmark for amoral firms and can be seen as the standard result in the literature (e.g., Kitzmueller and Shimshack, 2012). Comparing (3.6) with (3.3) leads to the following.

Remark 3.3. *If firms are amorally managed then CSR is under-provided in equilibrium (i.e., $s^* < s^{**}$ when $\mu = 0$).*

3.4.1 Welfare with unrestricted moral management

Before considering the normative implications associated with the type of managers appointed by profit-motivated shareholders, it is useful to consider whether moral management can implement first-best. In other words, is there a degree of moral management μ^w such that $s^*(\mu^w) = s^{**}$? As the next proposition shows, the answer is yes: moral management offers the possibility that first-best provision of the public good is achieved in a competitive market.

Proposition 3.5. *There is a unique μ^w, with $0 < \mu^w < b'(s^{**})/2$, such that if competitive firms are run by managers with a degree of moral management μ^w, then firms engage in the efficient amount of CSR.*

Even if consumers completely internalize the social impact of CSR, there is scope for moral management to provide an efficient amount of CSR in a competitive market. Since an instrumental motive for CSR does not give firms enough incentive to provide a public good, a motivation beyond profit maximization is necessary to implement first-best provision of the public good; sufficient for this to be the case is that managers are morally-motivated. Figure 3.2 illustrates.

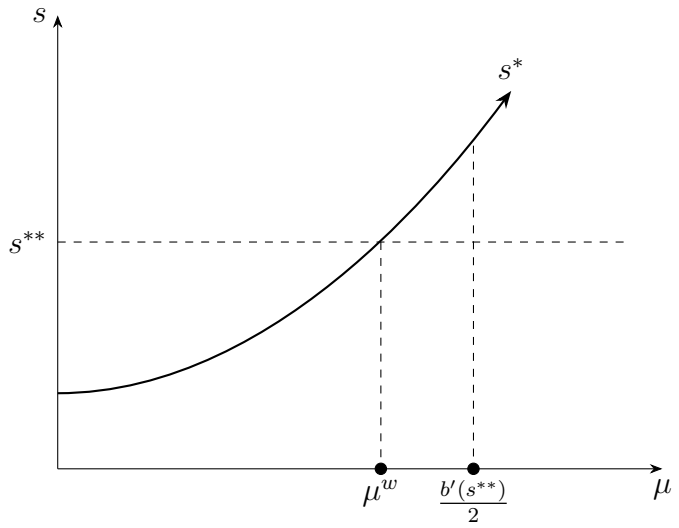

Figure 3.2: The degree of moral management required to implement the first-best amount of CSR.

There are two interesting implications of proposition 3.5, each related to the fact that a morally-managed firm may *over-provide* a public good, counter to existing literature where firms generally do not have enough incentive to engage in CSR (Kitzmueller and Shimshack, 2012). The first implication relates to when firms conduct too much CSR: if managers embody the social value of their pro-social actions, $\mu = b'(s^{**})/2$, and act as maximizers of stakeholder value then firms do too much CSR.

Corollary 3.2. *If managers embody the socially optimal benefit of pro-social behavior,* $\mu = b'(s^{**})/2$*, and thus completely internalize stakeholder value, then firms do too much CSR.*

This is a striking result that calls into question the wisdom of having managers as maximizers of stakeholder value rather than shareholder value, as noted in the introduction. While concern for profit alone is insufficient to induce the efficient provision of a public good, embodying stakeholder value goes in the opposite direction and leads to an over-provision of a public good. The culprit here is again strategic CSR, and this leads to the second interesting implication of proposition 3.5: absent a strategic motivation for CSR, a manager embodying stakeholder value would implement first-best. Thus while morally-motivated CSR crowds out strategic CSR, because it does not crowd it out completely, it does not crowd it out

enough. Paradoxically, it is consumers' willingness to pay for firms' socially responsible behavior that prevents managers embodying stakeholder value from implementing first-best.

Corollary 3.3. *Firms engage in first-best CSR when managers are motivated by stakeholder value (i.e., $\mu = b'(s^{**})/2$) if and only if strategic CSR is completely crowded out.*

3.4.2 Welfare with strategic delegation

The purpose of this section is to consider the normative outcome when profit-motivated shareholders appoint a manager—how does the type of manager μ^* appointed by shareholders compare with the efficient type μ^w? Recall that it is the crowding out of a competitor's strategic CSR by moral management that gives shareholders an incentive to strategically delegate a moral manager, and so the incentive to appoint a moral manager depends on the effectiveness with which moral management crowds out strategic CSR. While it would seem that shareholders would appoint a manager with less concern for social conduct than is efficient, $\mu^* < \mu^w$, since they are motivated by just profit—so that firms engage in too little CSR—if moral management is effective at crowding out a competitor's strategic CSR then this inequality can be reversed.

The following lemma provides a useful characterization of the shareholder equilibrium (note the similarity between equations (3.6) and (3.7)).

Lemma 3.3. *In a symmetric equilibrium, shareholders choose μ^* so that*

$$F'(s^*) = \phi b'(s^*), \tag{3.7}$$

where $\phi = \frac{1}{3}\left(1 + \left|\frac{\partial s_j^*/\partial \mu_i}{\partial s_i^*/\partial \mu_i}\right|\right)$ and $\phi \in (1/3, 2/3)$.

The term ϕ in the above lemma is a function of the effectiveness with which moral management by firm i crowds out strategic CSR by firm j, $\left|\frac{\partial s_j^*/\partial \mu_i}{\partial s_i^*/\partial \mu_i}\right|$. If moral management has no effect on strategic CSR (i.e., $\partial s_j^*/\partial \mu_i = 0$), then $\phi = 1/3$ and (3.7) reduces to (3.3),

so that shareholders appoint amoral managers and CSR is determined entirely by strategic considerations. Comparing s^* in (3.7) with the socially optimal amount of CSR s^{**} in (3.6), it is clear that shareholders appoint managers that implement first-best if and only if $\phi = 1/2$ (i.e., $\mu^* = \mu^w$ if and only if $\phi = 1/2$).

Proposition 3.6 (Socially excessive CSR)**.** *In a symmetric equilibrium, profit-motivated shareholders appoint a manager with $\mu^* < \mu^w$ if $\left|\frac{\partial s_j^*/\partial \mu_i}{\partial s_i^*/\partial \mu_i}\right| < \frac{1}{2}$ and appoint a manager with $\mu^* > \mu^w$ if $\left|\frac{\partial s_j^*/\partial \mu_i}{\partial s_i^*/\partial \mu_i}\right| > \frac{1}{2}$. That is, shareholders appoint managers that engage in too much CSR if and only if CSR induced by moral management is sufficiently effective at crowding out strategic CSR by a competitor.*

Even if shareholders are interested only in profit, the presence of moral managers can lead to an over-provision of the public good if (and only if) moral management is sufficiently effective at crowding out strategic CSR.[23] The intuition for this point is simple: the marginal benefit to shareholders of appointing a moral manager, from the extra CSR induced by moral management, is proportional to the degree of crowding out. When the degree of crowding out is sufficiently large, the marginal benefit to shareholders exceeds the marginal cost from the social planner's point of view. By trying to disadvantage the competing firm through strategically delegating a moral manager, shareholders collectively appoint managers that have too great an incentive to engage in CSR.

3.5 Moral management and entry

To the extent that CSR acts as a form of vertical product differentiation, CSR can be used by an incumbent firm to deter entry. This is relevant in the context of moral management for two reasons. First, since "the next generation of leaders will be more socially concerned and committed as employers, consumers and investors" (Guthrie, 2014) it is important to

[23]Whether crowding out is sufficiently large or not depends on the curvature of π_i. Returning to the parameterization where $v(s) = vs$ and $F(s) = Fs^2/2$, $\left|\frac{\partial s_j^*/\partial \mu_i}{\partial s_i^*/\partial \mu_i}\right| > \frac{1}{2}$ is equivalent to $F < 1/3b^2$, making over-provision likely in cases where the cost of providing the public good is small relative to the benefit.

understand the implications of a morally-managed entrant on the incentives of an incumbent. Second, appointing a morally-motivated manager can act as a credible commitment to engage in CSR and shareholders can use this strategy to improve profitability.

Allowing for entry, the timing of the game (section 3.1.3) is then modified to one of a standard entry game, so that 1) the incumbent chooses its level of CSR, 2) the entrant decides to enter or not, 3) the entrant chooses its level of CSR, 4) both firms compete in prices. Let firm 1 be the incumbent and firm 2 be the entrant.

Begin with stage 4, price competition. In any history for which firm 2 enters and engages in CSR, firms simply compete in price, and Nash equilibrium prices are given by (3.2). If instead firm 2 stays out, firm 1 acts as a monopolist and sets a price according to (3.4). Given these pricing strategies, in stage 3, if firm 2 enters, it chooses s_2^e according to the second expression in (3.3). This defines the CSR of firm 2 as a function of firm 1's CSR in the first stage. Moving to stage 2, firm 2 will enter if and only if doing so generates positive a payoff for the manager. Assume that there is a fixed-cost K that the entrant must pay to enter.

Consider now the first stage, in which firm 1 decides its social conduct. If firm 1 wishes to deter entry, it chooses s_1^d to solve

$$\begin{aligned} \max_{s_1} \pi_1(s_1) = & \left(\frac{\bar{u} + v(s_1)}{2}\right)^2 - F(s_1) + \mu_1 s_1 \\ & \text{s.t. } \frac{1}{2}\left(\frac{3 + v(s_2^e) - v(s_1)}{3}\right)^2 - F(s_2^e) + \mu_2 s_2^e \leq K. \end{aligned} \tag{3.8}$$

The strategic substitutability of CSR then leads to the following.

Remark 3.4. *CSR makes the incumbent firm tough.*

Intuitively, if the incumbent engages in CSR this seeks to steal custom from the entrant, reducing the amount of the market the latter can serve upon entry. Since moral management encourages the incumbent to conduct more CSR, moral management has the effect of deterring entry. To focus on entry deterrence, assume that K is such that entry can be

deterred for s_1 sufficiently large.

Lemma 3.4. *Assuming K is such that entry can be deterred given moral management of the entrant, there is a $\bar{\mu}$ such that for all $\mu_1 < \bar{\mu}$ entry is deterred and for all $\mu_1 \geq \bar{\mu}$ entry is blockaded.*

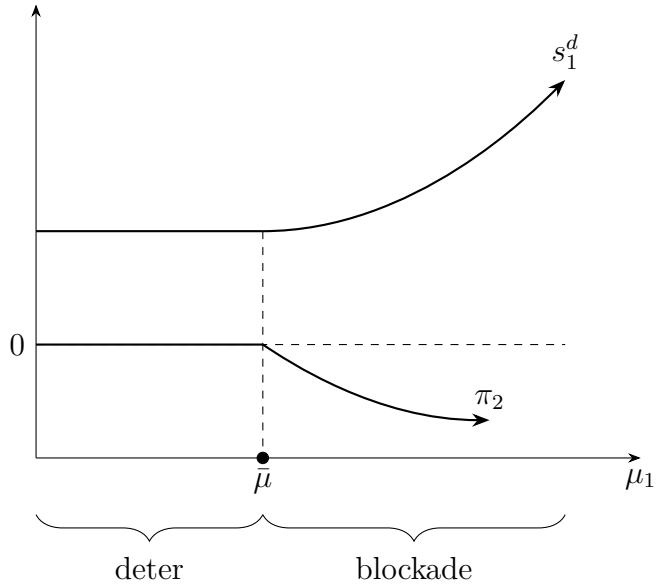

Figure 3.3: The incumbent firm's strategy to prevent entry as a function of moral management.

Figure 3.3 illustrates the lemma. In order for an incumbent that has little moral management to deter entry, more CSR must be done than if the firm were a monopolist, as CSR makes the incumbent tough in the sense of Fudenberg and Tirole (1984) and this deters entry. For a sufficient degree of moral management, however, this firm conducts enough CSR so that entry is blockaded.

Shifting focus to the entrant, the degree of moral management for the entrant affects the ability of the incumbent to prevent entry. In particular, moral management on the part of the entrant forces the incumbent to further over-invest in CSR to deter entry. In this sense, it is more difficult to prevent entry of a morally-motivated firm.

Lemma 3.5. *The incumbent firm must over-invest even further to deter entry of a more morally-motivated firm.*

The threat of a morally-managed competitor has a very different effect from the presence of a morally-managed competitor. Rather than crowding out CSR from firm 1, moral management by firm 2 now induces more CSR from firm 1 when there is only the threat of competition.

Assuming it is profitable to deter entry, shareholders would like to appoint a morally-motivated manager to credibly commit to the firm's social conduct, thereby deterring entry. That is, shareholders would like to appoint a manager with type $\bar{\mu}$—so that entry is just blockaded—as this credibly commits the incumbent to a CSR strategy that deters entry. The above lemmas then combine to produce the following.

Proposition 3.7 (Moral manager deters entry)**.** *Shareholders appoint a manager of type $\bar{\mu} > 0$ to deter entry of a competitor, such that $\bar{\mu}$ is increasing in the entrant's degree of moral management. This leads to an over-provision of the public good that worsens with a more morally-motivated entrant.*

3.6 Conclusion

In this chapter I provide the first formal model of moral management and CSR in competitive markets, generating insight into the interaction between CSR induced by morally-motivated management and strategic CSR. Compared to existing literature where firms only have a strategic (i.e., profit maximizing) incentive to bundle a public good with their output (e.g., Bagnoli and Watts, 2003; Besley and Ghatak, 2007; Deltas et al., 2013), moral management has important implications for firms' social conduct in a competitive setting.

The first key insight from the model is that CSR induced by moral management crowds out strategic CSR from a competitor. While this is an interesting interaction stemming from two distinct motivations to provide a public good, it is this crowding out that gives shareholders an incentive to strategically delegate moral managers. In this regard, moral management need not bring up issues of corporate governance as shareholders can strategically use these

mangers to increase the profitability of their firms.

The second key insight of the model relates to efficient corporate provision of public goods. While the standard result is that strategic CSR does not give firms enough incentive to provide public goods efficiently (Kitzmueller and Shimshack, 2012), moral management introduces the possibility that this result is overturned. In particular, shareholders appoint managers that engage in a socially excessive amount of CSR if and only if moral management is sufficiently effective at crowding out a competitor's strategic CSR. Counter to conventional wisdom, moral management can replace an inefficiency stemming from under-provision of a public good with another inefficiency from over-provision of a public good.

3.7 Appendix

Proof of lemma 3.1. If there is an interior equilibrium, it must be given by (p_1^*, p_2^*) in (3.2) and therefore must be unique. All that remains is to show that (p_1^*, p_2^*) is in fact an equilibrium.

Without loss of generality, set $s_1 \geq s_2$. Given p_j^*, demand facing firm i is

$$q_i(p_i, s_i; p_j, s_j) = \begin{cases} 1 & \text{if } p_i < \max\left\{\frac{2}{3}\left[v(s_i) - v(s_j)\right], 0\right\}, \\ 0 & \text{if } p_i > \frac{2}{3}\left[v(s_i) - v(s_j) + 3\right], \\ \frac{3+v(s_i)-v(s_j)}{3} - \frac{p_i}{2} & \text{otherwise.} \end{cases}$$

Letting $\underline{p}_1 = 2\left[v(s_1) - v(s_2)\right]/3$ and $\overline{p}_1 = 2\left[v(s_1) - v(s_2) + 3\right]/3$, firm 1's problem is to choose $p_1 \in [\underline{p}_1, \overline{p}_1]$ to maximize $p_1 q_1(p_1, s_1; p_2, s_2)$. Clearly p_1^* solves this problem. Letting $\overline{p}_2 = 2\left[v(s_2) - v(s_1) + 3\right]/3$, firm 2's problem is to choose $p_2 \in [0, \overline{p}_2]$ to maximize $p_2 q_2$. Clearly p_2^* solves this problem. Therefore (p_1^*, p_2^*) is an interior Nash equilibrium. □

Proof of remark 3.2. There are two parts to the proof: to show that there is an equilibrium and to show that it is unique.

Begin with uniqueness. Let f be the function that maps $\mathbb{R}^2_{++}$ to $(1/9v'(s_1)(3+v(s_1)-v(s_2))-F'(s_1)+\mu_1, 1/9v'(s_2)(3+v(s_2)-v(s_1))-F'(s_2)+\mu_2)$; the goal is to show that f is globally univalent and hence any point (s_1,s_2) such that $f(s_1,s_2)=(0,0)$ is unique. Let $J(s_1,s_2)$ be the Jacobian of f at (s_1,s_2); note that $J(s_1,s_2)$ is symmetric. Stability then implies that $J(s_1,s_2)$ is negative definite for all (s_1,s_2). Therefore f is globally univalent and so the point (s_1^*,s_2^*) in (3.3) is unique.

Move now to existence. Note that $J(s_1,s_2)$ negative definite implies that π_i is strictly concave. Since F is strictly increasing and strictly convex, with $\lim_{s\to\infty}F'(s)=\infty$, $F(s)-\mu s$ is unbounded above; together with the boundedness of v, this implies that π_i is unbounded below. Since $\lim_{s\to 0}F'(s)=0$, π_i has a unique stationary point, and since $F(0)=0$ this implies that there is a unique point $\bar{s}_i>0$ such that $\pi_i(\bar{s}_i)=0$, given s_j. The implicit function theorem then gives that $\bar{s}_i$ is a continuous, decreasing function of s_j.

Let $\bar{s}=\bar{s}_i(0)$. Define by S_i the correspondence that associates with each $s_j\in[0,\bar{s}]$ the set $[0,\bar{s}_i(s_j)]\subseteq[0,\bar{s}]$. Since $\bar{s}_i$ is continuous, S_i is continuous. It is clearly non-empty, and compact and convex valued.

Firm i's problem is then to choose $s_i\in S_i$ to maximize π_i. From the continuous maximum theorem, the solution σ_i is a continuous function of s_j. Defining σ_j analogously, let $g=\sigma_i\circ\sigma_j$; a Nash equilibrium exists if there is an s_i^* such that $s_i^*=g(s_i^*)$. Since g is a continuous function mapping $[0,\bar{s}]$ into itself, there is such a point s_i^*. Since s_i^* must be a stationary point for π_i, the proof is complete. □

Proof of lemma 3.2. i) Let J denote the Jacobian of (3.3) at (s_1^*,s_2^*); recall that $|J|>0$ and $\partial^2\pi_i(s_i,s_j)/\partial s_i^2<0$ for all (s_i,s_j) from the stability condition (i.e., $J(s_1,s_2)$ is negative definite). Since the equilibrium is unique, s_i^*, $i\in\{1,2\}$, is a function of (μ_i,μ_j). It follows

from the implicit function theorem that $s_i^* \in C^1$ with

$$\frac{\partial s_i^*(\mu_i,\mu_j)}{\partial \mu_j} = -\frac{\frac{1}{9}v'(s_j^*)v'(s_i^*)}{|J|} < 0$$
$$\frac{\partial s_i^*(\mu_i,\mu_j)}{\partial \mu_i} = -\frac{\frac{1}{9}v''(s_j^*)(3+v(s_i^*)-v(s_j^*))+\frac{1}{9}v'(s_j^*)^2 - F''(s_j^*)}{|J|} > 0.$$

Since the extension of s_i^* to $(-\epsilon,\infty)\times(-\epsilon,\infty)$ as defined by (3.3) is C^1 for some $\epsilon > 0$, it is continuous on $\mathbb{R}_+$. The result follows from the mean value theorem. ii) Suppose this were not the case; suppose that $\mu_1 > \mu_2$ and $s_1^* \leq s_2^*$. From (3.3), $\mu_1 > \mu_2$ implies that $1/9v'(s_1^*)(3+v(s_1^*)-v(s_2^*)) - F'(s_1^*) < 1/9v'(s_2^*)(3+v(s_2^*)-v(s_1^*)) - F'(s_2^*)$. Since π_i is strictly concave, this implies that $s_2^* < s_1^*$, a contradiction. □

Proof of proposition 3.2. Letting Π_i give the profitability of firm i in equilibrium,

$$\frac{\partial \Pi_i(\mu_i,\mu_j)}{\partial \mu_i} = -\frac{\partial s_i^*(\mu_i,\mu_j)}{\partial \mu_i}\mu_i - \frac{1}{9}v'(s_j^*)(3+v(s_i^*)-v(s_j^*))\frac{\partial s_j^*(\mu_i,\mu_j)}{\partial \mu_i}.$$

Now $\lim_{\mu_i\to 0}\partial\Pi_i(\mu_i,\mu_j)/\partial\mu_i > 0$, since $v, F \in C^2$ and s_i^* and s_j^* are continuous, and so there is a neighborhood N about $\mu_i = 0$ such that Π_i is strictly increasing in μ_i. It follows that $\Pi_i(\mu_i,\mu_j) > \Pi_i(0,\mu_j) > 0$ for all $\mu_i \in N$.

To show that Π_i is non-monotonic, note that for μ_i sufficiently large it must be that $\Pi_i(\mu_i,\mu_j) < 0$. Hence Π_i cannot be monotonic. □

Proof of proposition 3.3. i) From proposition 3.2 if $\mu_i = 0$ then the shareholders to firm i can deviate to some $\mu_i > 0$ for a strictly larger payoff. ii) From (3.3), s^* is strictly increasing in μ in a symmetric equilibrium; it is obvious that Π is strictly decreasing in s^*. Therefore $\Pi(0) > \Pi(\mu^*)$. □

Proof of proposition 3.4. A straightforward application of the implicit function theorem to (3.5) gives that $ds_m(\mu)/d\mu > 0$. Letting Π_m be profit, $d\Pi_m(\mu)/d\mu < 0$. The result follows from the mean value theorem. □

Proof of remark 3.3. Suppose this were not the case so that $s^* \geq s^{**}$ for $\mu = 0$. From (3.3) and (3.6), this implies that $1/3b'(s^*) \geq 1/2b'(s^{**})$, a contradiction since b is concave. □

Proof of lemma 3.3. Set $\phi = 1/3\left(1 - \frac{\partial s_j^*/\partial \mu_i}{\partial s_i^*/\partial \mu_i}\right)$; using (3.3) it is straightforward to show that the first-order condition for the shareholder's problem can be written as $F'(s^*) = \phi v'(s^*)$. Clearly $\phi > 1/3$ since $\frac{\partial s_j^*/\partial \mu_i}{\partial s_i^*/\partial \mu_i} < 0$. Now the stability condition implies $|J(s^*, s^*)| > 0$ so that $-\frac{\partial s_j^*/\partial \mu_i}{\partial s_i^*/\partial \mu_i} < 1$ and $\phi < 2/3$. The assumption that $b = v$ completes the proof. □

Proof of proposition 3.5. Set $\mu^w = 1/6b'(s^{**})$. From (3.3), $s^*(\mu^w)$ is given by $F'(s^*) = 1/3b'(s^*) + 1/6b'(s^{**})$. Since s^{**} is the unique point such that $F'(s^{**}) = 1/2b'(s^{**})$, it must be that $s^*(\mu^w) = s^{**}$. Since s^* is strictly increasing in μ, μ^w is unique. □

Proof of corollary 3.2. Since s^* is strictly increasing in μ, $s^* > s^{**}$ for all $\mu > \mu^w$. □

Proof of corollary 3.3. From (3.3), $s^*(\mu) = s^{**}$ when $\mu = b'(s^{**})/2$ if and only if v is the zero function. □

Proof of proposition 3.6. It is clear from comparing (3.7) with (3.6) that $s^*(\mu^*) < s^{**}$ if and only if $-\frac{\partial s_j^*/\partial \mu_i}{\partial s_i^*/\partial \mu_i} < \frac{1}{2}$. The result follows from the fact that s^* is strictly increasing in μ. □

Proof of remark 3.4. From the envelope theorem, $d\pi_2(s_1)/ds_1 = -1/9(3 + v(s_2^e) - v(s_1))v'(s_1) < 0$. □

Proof of lemma 3.4. To begin, $\pi_2(s_2^e(0)) \geq K$ and $\pi_2(s_2^e(\bar{s})) < K$ for some $\bar{s}$ since entry deterrence is possible (by assumption). Since π_2 is strictly decreasing in s_1, there is a unique point σ such that $\pi_2(\sigma) = 0$ and $\pi_2(s_1) \leq 0$ if and only if $s_1 \geq \sigma$. Ignoring the constraint in (3.8), the solution s_1^u is strictly increasing in μ_1. Set $\bar{\mu} = s_1^{u-1}(\sigma)$. It follows that $s_1^d = \sigma$ if $\mu_1 \leq \bar{\mu}$, otherwise $s_1^d = s_1^u$. □

Proof of lemma 3.5. With entry deterrence, the constraint in (3.8) binds. From the implicit

function theorem

$$\frac{ds_1^d(\mu_2)}{d\mu_2} = \frac{9s_2^e}{(3 + v(s_2^e) - v(s_1^d))v'(s_1^d)} > 0.$$

From the mean value theorem s_1^d is strictly increasing in μ_2. □

Proof of proposition 3.7. From lemma 3.4, shareholders choose $\mu = \bar{\mu}$. From lemma 3.5, $\bar{\mu}$ is strictly increasing in μ_2. Clearly $s_1^d > s^{**}$, since $\bar{u} + v(s_1^d) \geq 1$ (by assumption). □

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