Competition and Mergers among Nonprofits

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Abstract

Should mergers among nonprofit organizations be regulated differently than mergers among for-profit firms? The relevant empirical literature is highly controversial. We analyze this question by modeling duopoly competition with quality-differentiated goods. In a governance-based approach we derive benchmark results for merging firms and then characterize welfare effects of mergers between nonprofits dominated by consumers, workers, suppliers, and pure donors. We find that mergers both among firms and among most types of nonprofits decrease welfare. Mergers among consumer-dominated nonprofits, however, *can* improve welfare. Hence "nonprofit" might not equal "nonprofit". Our main policy implication is that mergers among nonprofit organizations should not necessarily be treated in the same way as mergers among for-profit firms – a notion that is absent in current merger guidelines both in the US and the EU.

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1 Introduction

Should mergers among nonprofit organizations be regulated? If so, should they be regulated differently than mergers among for-profit firms? The empirical literature on comparisons of nonprofits (NFPs) and profit-maximizing firms (FPs) is highly controversial,[1] and empirical evidence on mergers between nonprofits is very limited.[2] A recent theoretical paper, by Philipson and Posner (2006), has analyzed the questions raised above and concluded that the fact that antitrust law does not distinguish between the nonprofit and the for-profit sectors, is efficient.

In this paper we challenge the view and main result of Philipson and Posner. We start from the idea that, while it is widely undisputed that owners of FPs maximize profits, it is not clear at all what decision makers in nonprofits optimize.[3] To be as conclusive as possible we propose a governance-based approach and model de facto control over nonprofits by four generic stakeholder groups: consumers, workers, suppliers, and pure donors. Whatever governance mechanism is in place, the owner being pivotal for a certain decision must be a member of one of these groups. We then assume rational objective functions characterizing each group and investigate the introductory questions by modeling duopoly competition with quality-differentiated goods.

The health care market serves as a suitable application: we assume that consumers (patients) have inelastic demand for a basic service and heterogeneous preferences for additional quality. Each of the two competing organizations we model could either be a profit-maximizing firm or a nonprofit organization being dominated by one of the four stakeholder groups. After characterizing equilibria under duopoly competition we impose a merger onto the two organizations and compare relative results for each merger type.

We confirm the standard result that, abstracting from synergies or trans-

[1] Chou (2002, p.297) lists several empirical studies that compare quality levels produced by nonprofit and for-profit nursing homes and reports diverging results (some find that NFPs produce higher quality, others are ambiguous). Malani et al. (2003) survey the literature on nonprofits in the US health care sector and conclude that existing data are mostly inconclusive.

[2] A notable exemption is the case study by Vita and Sacher (2001). By definition of a case study, however, conclusions cannot by generalized.

[3] Deneffe and Masson (2002) study this question empirically by using a data-set on hospitals in Virginia. Horwitz (2007) studies the effect of nonprofit ownership on the provision of medical services for the poor by using survey data from on US hospitals and demographic data from the US Census.

action cost reductions, mergers between firms almost always decrease and never increase welfare. The same is true for mergers between nonprofits which are dominated by owners with mainly financial interests (application: a bank taking over control over a NFP after it failed to repay debt). Mergers between nonprofits dominated by consumers, however, *can* improve welfare as long as the owners do not have too exclusive preferences concerning quality (application: extramural care providers controlled by their patients). Mergers between worker-dominated nonprofits, in contrast, do not improve welfare (application: nonprofit hospitals with weak board such that senior physicians de facto have control over quality). Mergers between nonprofits dominated by donors without any further interest in the organization are even welfare decreasing (application: purely altruistic owners). So are mergers between supplier-dominated NFPs (application: foundations being governed by input suppliers as a means of showing corporate social responsibility).

These results imply for competition law and regulation that, depending on the governance structure, "nonprofit" might be too crude a label for organizations with varying goals and, therefore, varying expected behavior after mergers. Consequently, mergers among nonprofit organizations should not necessarily be treated in the same way as mergers among for-profit firms. This notion is absent in current merger guidelines both in the US and the EU.

Our work mainly relates to two strands of the economic literature. First, it shares a common topic, horizontal mergers, with the classical studies of Salant et al. (1983), Davidson and Deneckere (1985), Perry and Porter (1985) and Farrell and Shapiro (1990) and more recent work such as Bian and McFetridge (2000) and Davidson and Mukherjee (2006), to name just a few. In this literature, the main questions studied are on the impact of mergers on competition and, finally, on firms' profits, consumer surplus and total welfare. Conclusions are mainly drawn for regulators and competition authorities. With the exception of Philipson and Posner (2006), however, the impact of the organizational form of the merging parties on those variables of interest is largely ignored.

The second strand of related literature, which is notably less developed, is on organizational choice between the for-profit and the nonprofit form: Glaeser and Shleifer (2001), Kuan (2001), Francois (2003), and Herbst and Prüfer (2007) provide formal studies contrasting nonprofits and firms. The work of Hansmann (1996) offers a very valuable descriptive approach. In this literature the main questions studied are on the factors which make the nonprofit organizational form more attractive than profit-maximizing alternatives (apart from tax exemption). These questions are approached from the perspective of either the owners of the nonprofit, i.e. its final decision makers, or from an efficiency perspective.

Moreover, we profited from the ideas of Glaeser (2003), who sketches a governance-based model of nonprofits and shows that an improved outside option of one stakeholder group leads the nonprofit manager to specify product characteristics which are more in line with that group's preferences. Glaeser does neither consider competition nor mergers among nonprofits though.

The paper most closely related to our topic is Philipson and Posner (2006), which builds on Lakdawalla and Philipson (2006). In that model, the owners of nonprofit organizations prefer increased output. The authors interpret such preferences as altruism and analyze nonprofits as for-profit firms with lower perceived costs. Their main result is that, after a merger, nonprofit organizations have the same incentives to reduce output and, hence, to decrease social welfare as for-profit firms. This result is based on the assumption that nonprofit owners can exchange profits into own consumption—consequently, they could be expected to maximize profits, too. This assumption, however, hurts the nondistribution constraint (NDC), i.e. the rule that any surplus of a nonprofit may not be distributed to its owners. While it is arguable that, in practice, due to imperfect monitoring of decision makers the NDC is not strictly binding, we can expect an upper threshold for rent extraction because of external monitoring via tax offices, auditors or even journalists. Hence, the model of Philipson and Posner could be interpreted as not modeling nonprofits but for-profit producers who may or may not have a preference for increased output. While we replicate their adverse welfare effect when nonprofits dominated by altruists merge, we show that there are alternative governance structures of NFPs that make mergers efficient.

The paper is organized as follows. In the next session we describe a model of duopoly competition with quality-differentiated goods. In section 3 we establish benchmark-results for the first-best case and competition and mergers between two FPs. In section 4 we characterize subgame-perfect equilibria for duopoly competition and mergers among consumer-dominated and worker-dominated NFPs, and relate those findings to cases where they are dominated by suppliers and donors. In section 5 we discuss central assumptions, while in section 6 we state testable hypotheses and policy implications.

2 The Model

2.1 Demand

There is a mass of 1 consumers. Each consumer i obtains utility from consumption

$$u^i = b + \theta^i q - p \tag{1}$$

where $b \geq 0$ is the exogenous basic utility that providers must produce in order to get a license to offer their services.[4] This reflects inelastic unit demand for a service of basic quality and the existence of a regulator ensuring a minimum quality standard in the industry.[5] θ^i is the individual preference for additional quality, which is drawn from a uniform distribution over the interval $[0, 1]$. The uniform price charged for a unit of the product/service is p.

2.2 Supply

There are two organizations $j \in \{A, B\}$ competing for the consumers; market entry costs of third parties are prohibitive.[6] The generic value function that organizations maximize is

$$V_j = \omega_j \pi_j + (1 - \omega_j)\psi_j \tag{2}$$

where π_j denotes monetary profits, ψ_j denotes some non-monetary utility, and $\omega_j \in \{0, 1\}$ is the organizational form variable: each organization for which $\omega_j = 0$ is a nonprofit, while each organization for which $\omega_j = 1$ is a (purely) profit maximizing firm.[7] Owners of the organizations are risk-neutral and have outside options which yield them a value of zero if they do not participate in the market.

Monetary profits are defined as:

$$\pi_j = p_j s_j - C(q)$$

[4] b could be interpreted as the utility from the contractible part of a products's quality, e.g. the number of doctors or the value of medical equipment in a hospital or the ratio of professors to students in a university. q could then be interpreted as the non-contractible part of quality, e.g. the effort of doctors or professors invested in their work.

[5] Health care or education are suitable examples.

[6] Shaked and Sutton (1982) show that, in a market with quality differentiated goods, at most two goods can have a positive market share.

[7] All organizations for which $\omega_j \in (0, 1)$ could be classified as cooperatives. Those are not the focus of this paper though. See Herbst and Prüfer (2007) for more information and a model comparing firms, nonprofits and cooperatives.

where s_j denotes organization j's market share, $C(q) = skq_j^2$ are total costs and $k \geq 1$ is a measure of the marginal costs to produce additional quality. We normalize all other costs to zero.[8]

In firms, monetary profits may be legally distributed to owners, e.g. via dividend payments. Hence firms simply maximize profits independent of the individual preferences of owners.[9] It is not clear in general, however, what kind of non-monetary utility owners of nonprofits, i.e. the persons holding residual control in the organization, maximize.

We assume that there is some governance mechanism—or decision-making rule—in each nonprofit by which a pivotal owner τ is determined among all owners.[10] The pivotal owner's relative preferences for quality of the product versus monetary income are captured by his type $\tau \in [0, 1]$.[11] Assume τ is drawn from a uniform distribution with an atom at $\tau = 0$, so the density of types at $\tau = 0$ can be higher than above that value. Next, we assume the pivotal owner to be part of one of four generic patron groups in touch with the nonprofit: he is either a consumer or a supplier or a worker or a pure donor.[12]

First, if the pivotal owner is recruited from the set of *consumers*, following Herbst and Prüfer (2007), we assume that the non-monetary variable which nonprofits maximize is the utility consumers derive from additional quality (henceforth: quality). If the pivotal owner is a consumer, he will have preferences $\tau = \theta$. As a first side-constraint, when determining product characteristics (i.e. quality,

[8]This specification of costs captures that production of higher quality gets more and more expensive and that higher quality also increases marginal costs of output. It rules out economies or diseconomies of scale, which are discussed in some empirical papers on health care markets, e.g. by Bilodeaux et al. (2000) or O'Neill and Largey (1997). However, the results are not clear-cut. Moreover, it is obvious that the introduction of economies (diseconomies) of scale would benefit (penalize) a single entity over two competitors. Therefore, assuming economies (diseconomies) of scale would make the case for (against) mergers independent of the type of merger even stronger. Because we want to focus on the *relative* welfare effects of mergers among nonprofits compared to mergers among firms, we assume the most simple case of constant returns to scale where marginal and average costs of production are constant.

[9]Individual owner preferences are unimportant in firms because money/dividends can be exchanged into any type of goods the owner prefers to consume.

[10]Possible decision-making rules comprise majority voting, veto rights for each owner, or dictatorship, amongst others.

[11]Here we assume τ to be exogenous. See Herbst and Prüfer (2007) for endogenization of a pivotal owner's preferences in a slightly different setting.

[12]Note that the pivotal owner does not have to be an official owner serving on the NFP board. We interpret ownership as having *de facto*, not *de jure* residual control. See also footnote 15.

in the context of our model) we assume that the pivotal owner will make sure that he is willing to buy the product himself. As a second constraint, nonprofits by definition are required to meet a *non-distribution constraint*, which de facto means their profits have to be zero. If profits are positive in equilibrium, they have to be donated to a charity not modeled explicitly.[13] Therefore, consumer-dominated nonprofits maximize:

$$\begin{aligned} & \psi_j && = q_j \\ \text{s.t.} \quad & u^\tau && \geq 0 \\ \text{and} \quad & \pi_j && = 0 \end{aligned}$$

Second, if the pivotal owner is a *supplier* of capital, i.e. a lender, his only rational interest can be in getting back his monetary investment plus a premium. Such a lender would not act differently than the investor of a firm—while additionally being constrained by the NDC. Therefore, if a lender has a say in a nonprofit, he will act as a profit maximizer, which is captured by our analysis of the firm. If the pivotal owner is a supplier of input goods or services, his interest is either in maximizing the price he can sell his goods for to the nonprofit, which gives him the same objectives as a lender, or he is interested in maximizing the service quality of the nonprofit w.r.t. suppliers when selling his inputs. The latter situation can be captured by reinterpreting our model of a consumer-run nonprofit, where the supplier-owner is seen as consumer-owner of the nonprofit.[14]

Third, if the pivotal owner is a *worker*—or an "elite worker" in the sense of Glaeser (2003), e.g. a physician in a hospital or a professor in a university—we assume that he is paid a competitive, exogenous market wage, which we will not consider further on.[15] Therefore, he suffers from the production of additional

[13]This assumption reflects the legal situation in many countries. We assume the charity to be part of the economy, hence donations are not lost when calculating welfare.

[14]In practice, there could be a foundation set up by a firm to distribute its products to a market segment not in reach of the firm's own quality-price offering. Besides, for instance, selling the product for a very low price to the poor in a third-world country, the foundation's task is to serve its owner/the firm well by creating a brand name. This strategy sometimes comes under the headline of *corporate social responsibility*.

[15]A worker could either become the pivotal owner by serving on the board of the nonprofit or because monitoring of the official owners is too weak. The latter could be the case, for instance, if the NFP's founders are not active anymore and the difference of specialized knowledge of elite workers and outsiders is substantial. Then elite workers could "consult" the official owners what would be "best". See Glaeser (2003) for a related approach.

quality as he is not compensated for it in monetary terms and has to bear $C(q)$.[16] However, there is an expected payoff for quality production via increased reputation of the nonprofit the pivotal owner is affiliated with. Whether an elite worker's preferences of quality production w.r.t. saved effort are positive or negative, depends on $\tau \geq 0$.[17] Summarizing, worker-dominated nonprofits maximize:

$$\begin{aligned} \psi_j &= \tau q - skq^2 \\ \text{s.t.} \quad \pi_j &= 0 \end{aligned}$$

Finally, the pivotal owner can be a *pure donor*, i.e. a person who does not have an interest in consuming the NFP's services themselves or in supplying it with inputs or in working there but still donates money.[18] Those persons must be interested in maximizing the quality of the nonprofit's service, hence they can be captured by our model of a consumer-dominated nonprofit where the pivotal owner has a type $\tau = 1$.[19]

To reproduce the stylized fact that in many organizations ownership and control are separated and that the interest of the persons with day-to-day control are not necessarily aligned with the persons holding residual control, we introduce a *manager* in each organization. While the owners can determine the long-term variable, quality, and set up the manager's employment contract, the manager is in charge for the short-term variable, price.[20] As the focus of this paper is less on organizational and contract design but more on organizational choice we assume

[16]Assume that non-elite workers can be perfectly monitored by the elite workers and have no discretion on q.

[17]Workers with $\tau > 0$ individually value the reputation of their employer generated by high quality. Workers with $\tau = 0$ have no idiosyncratic valuation of quality.

[18]Examples for such pure donors are persons who donate to aid organizations being active in foreign countries or research institutes that produce services the donor himself will never be directly affected by. Pure donors could become pivotal owners by serving on the board of the nonprofit, for instance.

[19]Hansmann's (1996) concept of *third-party purchases* or, alternatively, the *pure altruism* in Francois and Vlassopoulus (2007) capture the spirit of pure donors. They do not consume the nonprofit's services themselves but a derivative of it, e.g. a clear conscience when giving to an organization bringing relief to children in poor countries. Pure donors cannot have an interest in profit-maximizing of nonprofits because profits do not increase the well-being of the consumers. Instead, they will support if every cent of income is used to increase the quality of services.

[20]Since we only use a one-shot game, "long-term" and "short-term" are translated into the model by letting owners choose quality before the manager determines a price.

that there exists a monitoring technology by which the owners can perfectly check whether the manager produced the level of quality they told him, or not. They will only pay his wage if he produces the quality they demanded. Nevertheless, we assume that the manager in any organization can appropriate some perks $\delta \in (0, 1)$ without being detected by the owners. Perks, as reasoned above, can only be financed by monetary surplus. Hence, the manager maximizes $\delta\pi$.[21]

Without loss of generality we assume that organization A is the quality leader and organization B is the quality follower, i.e. the ex ante beliefs of all players are such that $q_A > q_B$.[22]

2.3 Timing

We want to compare welfare effects of competition among firms and nonprofits. Therefore, in a preliminary stage of the game nature chooses whether competition is between two firms or between two nonprofits. We assume that the competing organizations are symmetric with respect to their ownership structure, i.e. the pivotal owners' preferences are $\tau_A = \tau_B$. This is to avoid comparing too many cases and to study "pure" merger cases first, where governance structures of the merging parties are similar ex ante and not a convex combination of different structures.[23]

We assume complete and symmetric information w.r.t. the endogenous variables throughout the game and solve it for subgame-perfect equilibria. The exact timing is as follows:[24]

- t=1: **Quality:** The pivotal owner of each organization j chooses a level of quality $q_j \in [0, 1]$.

[21]This assumption fits both to the idea that managers are interested in empire building as well as in "enjoying a quiet life". See Bertrand and Mullainathan (2003) for a discussion of managerial preferences in FPs.

[22]Shaked and Sutton (1982, Lemma 4) show that it is not in the interest of profit-maximizing sellers to offer the same level of quality as subsequent Bertrand competition on the pricing stage would erode all profits. Instead both players' equilibrium prices increase in the quality of the quality leader.

[23]Competition among nonprofits (and firms) with differing governance schemes and asymmetric location of pivotal owners (including mergers of nonprofits with heterogenous governance schemes) is a fruitful area of future research that could make the preliminary analysis of this paper more relevant for practice.

[24]See section 5.1 for a discussion of the timing of the game.

- t=2: **Price:** In each organization a manager picks a price p_j for the product, thereby incurring costs $C(q_j)$.
- t=3: **Buying:** Consumers learn the ω_j's and the governance structures of the two organizations in the market, q_j, p_j and their own θ^i and buy exactly one product.

3 Benchmark analysis

Before we characterize equilibria of competition and mergers among nonprofits, we characterize the first-best solution and competition and mergers among firms as benchmark cases.

3.1 First-best

A social planner maximizing the sum of consumer surplus and producer surplus solves:

$$\max_{q,p} W = \int_{\underline{\theta}}^{1} (b + \frac{1+\underline{\theta}}{2} q - p) d\theta - (1-\underline{\theta}) kq^2 + \int_{\underline{\theta}}^{1} p d\theta \tag{3}$$

where $\underline{\theta} = \frac{p-b}{q}$ defines the marginal consumer for $q > 0$ who is indifferent between buying the product and not buying.[25]

The social planner sets the price equal to marginal costs of production: $p = kq^2$. Hence, output is $s = (1-\underline{\theta}) = 1 + \frac{b}{q} - kq$, which means that demand is quality sensitive as long as $b < kq^2$. Substituting this into Equation (3) reduces the social planner's maximization problem to:

$$\max_{q} W = \begin{cases} \frac{(b+q-kq^2)^2}{2q} & \text{if} \quad b < kq^2 \\ b + \frac{q}{2} - kq^2 & \text{if} \quad b \geq kq^2 \end{cases} \tag{4}$$

This expression captures the trade-off of the welfare maximizer: only a high quality level will let quality loving consumers (high θ^i-types) enjoy a high utility. On the other hand, producing a low quality level allows to sell the good for a low

[25] This formulation of welfare uses the fact that the average θ^i of buying consumers is $\frac{1+\underline{\theta}}{2}$. It underlines that $p > 0$ may be used to avoid inefficient consumption but that the social planner's revenues generated by that are no welfare loss.

price and therefore increases demand, which is especially good for welfare if the basic utility b is large. However, if $b \geq kq^2$, there is no trade-off anymore because further quality reduction (and subsequent price reduction) does not increase demand further on.

Lemma 1 (First-best quality, price, and welfare) *(i): Consider* $b \geq \frac{1}{16k}$*: a welfare-maximizing social planner chooses a quality level of* $q_{FB} = \frac{1}{4k}$ *and sells for* $p_{FB} = \frac{1}{16k}$ *to* $s = 1$ *consumers. This generates total welfare of* $W_{FB} = b + \frac{1}{16k}$*.*
(ii): Consider $b < \frac{1}{16k}$*: a welfare-maximizing social planner produces a quality level of* $q_{FB} = \frac{1+\sqrt{1-12bk}}{6k}$ *and asks for* $p_{FB} = \frac{(1+\sqrt{1-12bk})^2}{36k}$*. A share* $s = \frac{2}{3}(2 - \sqrt{1-12bk})$ *buy the product, i.e.* $s \in [\frac{2}{3}, 1]$ *for* $b \in [0, \frac{1}{16k}]$*. Welfare is* $W_{FB} = \frac{(1+12bk+\sqrt{1-12bk})^2}{27k(1+\sqrt{1-12bk})}$*.*

Proof: see appendix.

The main intuition of Lemma 1 is that the level of the basic utility b equally enjoyed by all consumers when they get hold of the product matters a lot. If b is sufficiently high, the social planner will ask for a price that makes sure all consumers can afford the product and thereby enjoy the high basic utility. This avoids inefficient exclusion at the lower end of the preference-for-quality spectrum. All revenues are then used to produce additional quality thereby paying some tribute to quality loving consumers. In contrast, if b is sufficiently low, it does not pay for the social planner to sell to all consumers. Consequently, the lower the basic utility the higher the social planner pushes additional quality (and price), which drives out more and more consumers.

3.2 Duopoly competition among firms

We solve the game described in section 2.3 by backward-induction searching for subgame-perfect equilibria. In $t = 3$ consumers have to choose which organization to buy from. Consumer i prefers to buy from organization A if he cannot increase his net consumption utility by buying from B, i.e. if $b + \theta^i q_A - p_A \geq b + \theta^i q_B - p_B$. Solving this expression for the consumer located at $\hat{\theta}$, who is indifferent between buying from A and B and determines the organizations' market shares, s_A and s_B, yields:

$$\hat{\theta} = s_B = \frac{p_A - p_B}{q_A - q_B}; s_A = 1 - s_B = 1 - \frac{p_A - p_B}{q_A - q_B} \tag{5}$$

All consumers with preferences $\theta^i < \hat{\theta}$ will buy from organization B, and from organization A otherwise.

In $t = 2$ managers determine the prices p_A and p_B. The manager of organization j, who is interested in the appropriation of perks, chooses p_j to solve:

$$\max_{p_j} \delta[p_j s_j(p_j) - s_j(p_j) k q_j^2] \tag{6}$$

This leads to reaction functions of:

$$R_A : p_A(p_B) = \frac{q_A - q_B + p_B + kq_A^2}{2}; R_B : p_B(p_A) = \frac{p_A + kq_B^2}{2} \tag{7}$$

and to Nash equilibrium prices of:

$$p_A^* = \frac{2q_A - 2q_B + 2kq_A^2 + kq_B^2}{3}; p_B^* = \frac{q_A - q_B + kq_A^2 + 2kq_B^2}{3} \tag{8}$$

Substituting these prices into (5) produces equilibrium market shares of:

$$s_A^* = \frac{2}{3} - \frac{k(q_A + q_B)}{3}; s_B^* = \frac{1}{3} + \frac{k(q_A + q_B)}{3} \tag{9}$$

Prices of quality differentiating firms are strategic complements. The total price level positively depends on both firms owners' quality decision, while the market share of the quality leader (follower) decreases (increases) in the quality produced by *both* firms and the marginal costs of quality production, k. Note that the decisions of the manager do not depend on δ. Hence, the slightest expectation of being able to appropriate some perks lets the manager maximize total profits, which is wanted by the firms' owners but not by nonprofit owners.

We substitute equilibrium prices and market shares in the profit functions and can rewrite the maximization problem of the firms' owners in $t = 1$ as:

$$\max_{q_A} \quad \pi_A = \frac{1}{9}(q_A - q_B)(k(q_A + q_B) - 2)^2 \tag{10}$$

$$\max_{q_B} \quad \pi_B = \frac{1}{9}(q_A - q_B)(k(q_A + q_B) + 1)^2 \tag{11}$$

Before stating our results, let us define producer surplus as $PS = \pi_A + \pi_B$, whereas consumer surplus is $CS = \int_0^{s_B}(b + \frac{s_B}{2} q_B - p_B) d\theta + \int_{s_B}^1 (b + \frac{1+s_B}{2} q_A - p_A) d\theta$ as long as the market is covered, and welfare is $W = PS + CS$.[26]

[26] This formulation of consumer surplus already uses the fact that the average θ^i of B's clients is $\frac{s_B}{2}$ and the average θ^i of A's clients is $\frac{1+s_B}{2}$.

Lemma 2 (Competing firms) *(i): Assume* $b \geq \frac{10}{27k}$*. In a unique subgame-perfect equilibrium the quality leader, firm A, produces* $q_A^* = \frac{2}{3k}$*, sells for* $p_A^* = \frac{20}{27k}$ *to* $s_A^* = \frac{4}{9}$ *consumers and makes profits of* $\pi_A^* = \frac{32}{243k}$*. The quality following firm B sets* $q_B^* = 0$*, sells for* $p_A^* = \frac{10}{27k}$ *to* $s_A^* = \frac{5}{9}$ *consumers and makes profits of* $\pi_A^* = \frac{50}{243k}$*. Producer surplus is* $PS_{FF} = \frac{82}{243k}$ *and consumer surplus is* $CS_{FF} = b - \frac{74}{243k}$*, which adds to welfare of* $W_{FF} = b + \frac{8}{243k}$*.*
(ii): Assume $b < \frac{10}{27k}$*. In a unique subgame-perfect equilibrium firm B produces* $q_B^* = 0$ *and sells for* $p_B^* = \frac{b}{2}$*. There is no closed-form solution for* q_A^**. Consumer surplus, producer surplus and welfare, depending on* q_A^**, are given by Equations (31) to (33).*

Proof: see appendix.

Lemma 2.(i) shows that, if the basic consumption utility b is sufficiently high such that competitive forces make sure the market is always covered, firm A produces a very high quality (compared to q_{FB}) while firm B maximizes product differentiation by producing no additional quality at all. Because of the high fixed consumption utility b all consumers buy a product, despite the fact that prices are very high relative to p_{FB}. As equilibrium values do not depend on b, it is competitive forces that contain the firms from exploiting consumers when the basic utility increases. Interestingly, $\pi_B^* > \pi_A^*$: B sells to more consumers and bears no cost of quality production.

If b is sufficiently low, firm B has to react to avoid losing customers. Lemma 2.(ii) indicates that B does that by radically cutting prices to $\frac{b}{2}$, which makes sure the market is completely covered in this case too. Firm A reacts by cutting its own quality q_A and its price p_A accordingly.

3.3 Mergers between two firms

Now let the firms merge and form a monopoly in the market. We do not assume that there is a special reason, such as expected synergies, for a merger because our focus is on the *relative* welfare effects of mergers among nonprofits compared to mergers among firms. Therefore, the subsequent analysis could come on top of a traditional merger analysis that focuses on other merger aspects than the organizational form of the parties involved.[27]

[27] See the literature review in the introduction section for some references on mergers among profit-maximizing firms.

Just as a social planner a monopolistic firm faces consumer demand of $s = (1 - \underline{\theta}) = \frac{q+b-p}{q}$, for $q > 0$. In contrast to a social planner, the firm's manager chooses p to maximize $\delta\pi$, which results in a monopoly price and output of:

$$p^* = \frac{1}{2}(b + q + kq^2); \quad s^* = \frac{b + q - kq^2}{2q} \tag{12}$$

Substituting (12) in the objective function of the firm's owners and incurring that demand is quality sensitive as long as $b < kq^2 + q$ reduces the maximization problem in $t = 1$ to:

$$\max_q \pi = \begin{cases} \frac{(b+q-kq^2)^2}{4q} & \text{if} \quad b < kq^2 + q \\ b & \text{if} \quad b \geq kq^2 + q \end{cases} \tag{13}$$

Before we state Lemma 3, note that Equation (13) shares some commonalities with (4), the maximization problem of the social planner: both are monopolists, but monopolistic pricing of the firm, compared to marginal cost pricing of the social planner, increases the boundary of b above which sales are not price sensitive, anymore. This is reflected in the second line of (13): if $s = 1$, the manager will ask for the maximum price that all consumers are willing to pay: $p^* = b$. Consequently, in this case there is no reason for profit maximizing owners to increase additional quality above zero. As long as owners expect $s < 1$—cf. the first lines of (13) and (4)—the profit the firm maximizes is exactly half of the welfare a social planner maximizes.

Lemma 3 (Monopolistic firm) *(i): Consider* $b \geq \frac{1}{16k}$*: a monopolistic firm will choose a quality level of* $q_F^* = 0$*, ask for* $p_F^* = b$*, sell to* $s = 1$ *consumers and yield producer surplus of* $PS_F = b$*, consumer surplus of* $CS_F = 0$*, and welfare of* $W_F = b$*.*
(ii): Consider $b < \frac{1}{16k}$*: a monopolistic firm will produce a quality level of* $q_F^* = \frac{1+\sqrt{1-12bk}}{6k}$*, sell for* $p_F^* = \frac{1+3bk+\sqrt{1-12bk}}{9k}$ *to* $s = \frac{2-\sqrt{1-12bk}}{3}$ *consumers; i.e.* $s \in [\frac{1}{3}, \frac{1}{2}]$ *for* $b \in [0, \frac{1}{16k}]$*. Producer surplus, consumer surplus and welfare are given by:*

$$PS_F = \frac{(1 + 12bk + \sqrt{1 - 12bk})^2}{54k(1 + \sqrt{1 - 12bk})} \tag{14}$$

$$CS_F = \frac{1 + \sqrt{1 - 12bk} - 12bk(-3 + \sqrt{1 - 12bk})}{108k} \tag{15}$$

$$W_F = \frac{1 + \sqrt{1 - 12bk} - 12bk(-3 + \sqrt{1 - 12bk})}{36k} \tag{16}$$

Proof: see appendix.

Without a quantity effect of further quality growth, i.e. where $b \geq \frac{1}{16k}$, the monopolistic firm will completely exploit consumers by not providing additional quality at all and charging the homogenous basic willingness-to-pay to consumers. This results in a welfare loss compared both to the first-best and competition among firms. For low levels of basic quality and low costs of additional quality ($b < \frac{1}{16k}$), the monopolistic firm even produces $q_F = q_{FB}$. Because of its high pricing, however, it sells only to half of the consumers a social planner sells to and generates a welfare of $W_F = \frac{3}{4}W_{FB}$.

Proposition 1 (Merging Firms) *(i): Consider $b = 0$: In competition, one firm produces no additional quality ($q_B^* = 0$), the other firm produces $q_A^* = \frac{1}{3k} = q_F$, the quality of the monopolistic firm. Under both regimes consumer surplus ($CS = \frac{1}{54k}$) and total welfare ($W = \frac{1}{18k}$) are equal.*
(ii): Consider $b > 0$: competing firms generate total welfare that is larger than welfare generated by a monopolistic firm.

Proof: see appendix.

This Proposition, implying that mergers among profit-maximizing firms that compete in a duopoly never increase welfare, is a standard result in the mergers literature. The obvious mechanism is that competition contains firms from exploiting consumers. If they merge, their market power increases—here the monopolist seizes to produce additional quality as soon as the basic utility is sufficiently large—and consumers suffer more than the merged firm wins.

4 Nonprofits

We now analyze our core subject of interest, competition and mergers among nonprofits. As described in section 2.2 we distinguish among nonprofits dominated by consumers, workers, suppliers, and pure donors. For reasons outlined above we only have to characterize equilibria explicitly for consumer-run and worker-run nonprofits.

4.1 Competition among consumer-dominated nonprofits

Since managers, by assumption, behave similarly irrespective of the organization they work for, Equations (8) and (9) show Nash equilibrium prices in $t = 2$ and market shares in $t = 3$ when two nonprofits compete with each other. (10) and (11) depict corresponding profit functions. As argued above, the programme that the pivotal owner of a consumer-dominated nonprofit maximizes is:

$$\max_{q} \quad q_j \tag{17}$$

$$\text{s.t.} \quad u^{\tau} \geq 0 \tag{18}$$

$$\text{and} \quad \pi_j = 0 \tag{19}$$

This programme implies that pivotal owners with preferences $\tau_A = \tau_B = \theta$ will choose the maximum quality level which leads to zero profits and makes sure that they are willing to buy the product themselves.

Lemma 4 (Competing consumer-dominated nonprofits) *(i): There is no subgame-perfect equilibrium with differentiated qualities, in which the non-distribution constraint is binding. In equilibrium both nonprofits produce the same levels of quality.*

(ii): Depending on the preferences of the pivotal owners, symmetric consumer-dominated nonprofits produce $q_A = q_B = \frac{\tau+\sqrt{4bk+\tau^2}}{2k} \equiv q_{CNN}$. *Each manager asks for* $p_A = p_B = kq_{CNN}^2 = \frac{(\tau+\sqrt{4bk+\tau^2})^2}{4k} \equiv p_{CNN}$ *and sells to* $s_A = s_B = \frac{1-\tau}{2}$ *consumers, thereby making profits and producer surplus of* $\pi_A = \pi_B = 0 = PS_{CNN}$. *This behavior generates consumer surplus and welfare of* $CS_{CNN} = W_{CNN} = \frac{(\tau-1)^2(\tau+\sqrt{4bk+\tau^2})}{4k}$.

Proof: see appendix.

Lemma 4.(i) shows that the only way for consumer-owners to produce zero profits and to contain their perk-seeking managers from asking monopoly prices is to tell them to produce the same quality level and, consequently, let them face Bertrand price competition. This result extends Shaked and Sutton (1982, p.7), who argue in their seminal paper on monopolistic competition with quality differentiated products that in Nash equilibrium profit-maximizing firms never produce the same level of quality—for the very reason to avoid Bertrand price competition.

Lemma 4.(ii) builds on the fact that this strategy of the pivotal owners leads to efficient marginal cost pricing. The "participation constraints" of the pivotal owners (18) make sure that quality is not excessively increased and all consumers with preferences of $\theta^i \geq \tau$ buy the product.[28] As τ is not only the pivotal owner but also the marginal buyer, this model could be interpreted as either using the unanimity decision-rule in a consumer-dominated nonprofit if the preferences of the lowest-ranking member are at $\underline{\tau} = \tau$. Alternatively, the model captures the majority voting rule (median owner decides), if the preferences of the lowest ranking member are at $\underline{\tau} = 2\tau - 1$. Finally, recall that the preferences of the pivotal owner in for-profit firms, in contrast to nonprofits, have no influence on firms' behavior.

4.2 Mergers between two consumer-dominated nonprofits

If two nonprofits merge and the market structure changes from duopoly competition to monopoly, due to a perk-seeking manager the situation in $t = 2$ and $t = 3$ resembles the one under a for-profit monopoly, which is captured in (12). The consumer-dominated nonprofit monopolist's pivotal owner, however, solves the same optimization programme as given in Equations (17) to (19).

Lemma 5 (Monopolistic consumer-dominated nonprofit) *(i): Any quality level that leads to positive sales also leads to positive profits. The non-distribution requires that those profits are donated to a charity.*
(ii): Consider $b > 0$: depending on his own preferences the pivotal owner sets $q_{CN} = \frac{2\tau-1+\sqrt{1+4bk-4\tau+4\tau^2}}{2k}$. The manager asks for $p_{CN} = \frac{2bk+\tau(\sqrt{4bk+(1-2\tau)^2}+2\tau-1)}{2k}$ and sells to $s = 1-\tau$ consumers. Producer surplus, consumer surplus and welfare are given by Equations (41) to (43).
(iii): Consider $b = 0$: if $\tau > \frac{1}{2}$, then $q_{CN} = \frac{2\tau-1}{k}$, $p_{CN} = \frac{4\tau^2-2\tau}{2k}$, which leads to $s = 1 - \tau, PS_{CN} = \frac{(6\tau-4\tau^2-2)^2}{4k(2\tau-1)}, CS_{CN} = \frac{(2\tau-1)(\tau-1)^2}{2k}, W_{CN} = 3\frac{(2\tau-1)(\tau-1)^2}{2k}$. If $\tau \leq \frac{1}{2}$, then $q_{CN} = 0$, $p_{CN} = b$, $s = 1$, $PS_{CN} = b$, $CS_{CN} = 0$, $W_{CN} = b$.

Proof: see appendix.

Due to the absence of a competitor, monopoly pricing of the nonprofit's manager cannot be avoided by its owners. Therefore, as long as the pivotal owner does not increase quality to a level which no consumer can afford anymore, the manager is always able to generate positive profits, as long as $b > 0$. Lemma 5.(i)

[28] Without the second constraint, Equation (18), owners would then drive up quality (and prices) more and more, until no consumer could afford to buy the product anymore. If $s = 0$, then $PS = CS = W = 0$.

establishes that our previous interpretation of the non-distribution constraint, as a zero-profit condition, cannot be upheld; this is no problem because the owners cannot extract monetary profits if those are donated to a charity.

Lemma 5.(ii) characterizes the result if consumers attach some positive basic utility to the product, where, intuitively, the quality produced increases in the preference for quality of the pivotal owner. Lemma 5.(iii) shows the interesting insight that, given there is no basic utility and the pivotal owner's preferences for quality are low, a monopolistic consumer-dominated nonprofit would produce no additional quality at all—and thereby generate a welfare of zero. This is due to the manager's monopoly pricing, which avoids that such a low-quality preferring owner could afford any product with $q > 0$. Only if his preferences for quality are sufficiently large ($\tau > \frac{1}{2}$) positive quality is produced (and positive welfare generated). Finally note that in this case, just as under a monopolistic firm, producer surplus doubles the size of consumer surplus.

Proposition 2 (Merging consumer-dominated nonprofits) *(i): Consider* $b = 0 \wedge \tau \leq .6$*: in this range we have* $q_{CN} < q_{CNN}$ *and* $W_{CN} < W_{CNN}$*.*
(ii): Consider $b = 0 \wedge \tau \geq .6$*: in this range* $q_{CN} < q_{CNN}$ *but* $W_{CN} \geq W_{CNN}$*.*
(iii): Consider $b > 0$*: in this range we also have* $q_{CN} < q_{CNN}$*. For some* τ *we find* $W_{CN} - W_{CNN} > 0$*, for some* τ *otherwise.*

This Proposition is fundamental for our entire study. It shows that, for some parameter values of the pivotal owners' preferences, a merger between two competing consumer-dominated nonprofits can increase welfare. To better understand this result we plotted equilibrium quality levels in Figure 1.

Independent of b or τ, competing consumer-run nonprofits produce higher quality than a monopolist: $q_{CN} < q_{CNN}$. This is intuitive as the monopolistic manager maximizes his perks, and hence profits, which means that he will produce less quality for a given market price. Competitive nonprofits, in contrast, face Bertrand competition and sell for marginal costs. Therefore, they can afford to produce higher quality for a given price.

Now it is enlightening to compare quality levels produced in the market with the first-best level, which is shown in Figure 1. If b is low (left panel) and τ is not too large, the competitive quality q_{CNN} is closer to q_{FB} than the monopolistic quality q_{CN}. As τ is of intermediate size, however, q_{CN} even intersects q_{FB}, which makes the monopolist more welfare enhancing than the competitors, who

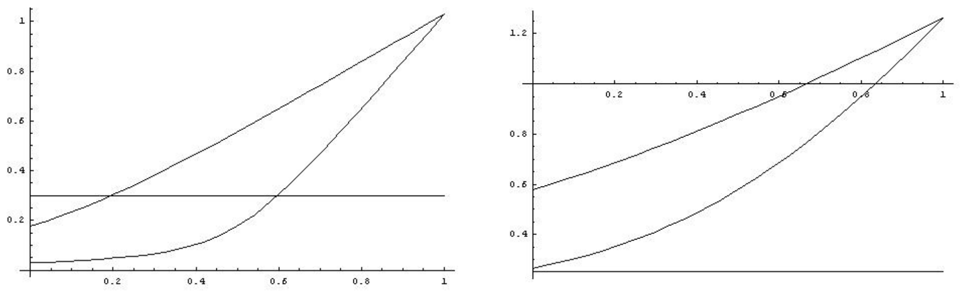

Figure 1: Equilibrium quality levels of consumer-dominated nonprofits depending on the pivotal owner's preference for quality $\tau \in [0,1]$. [LEFT]: $k = 1$, $b = \frac{1}{32} < \frac{1}{16}$: the horizontal line at .3 depicts the first-best quality, the lower curve the monopolist's quality q_{CN}, the higher curve the competitive quality q_{CNN}. [RIGHT]: $k = 1$, $b = \frac{1}{3} > \frac{1}{16}$; the horizontal line at .25 depicts the first-best quality, the lower curve the monopolist's quality q_{CN}, the higher curve the competitive quality q_{CNN}.

overinvest in quality. Only as τ gets very large, q_{CN} still is closer to q_{FB} than q_{CNN}, but monopolistic pricing of the manager makes the monopolistic case less efficient.

Moreover, if b is large (right panel of Figure 1), q_{CN} is closer to q_{FB} for all τ, which results in higher welfare if duopolists merge as competing nonprofits heavily overinvest in quality. Only if τ is very high—and q_{CN} gets close to q_{CNN}—monopolistic pricing of the manager ruins the relative efficiency of monopolistic consumer-run nonprofits.

4.3 Competition among worker-dominated nonprofits

In accordance with section 2.2, if a nonprofit's de facto control rests with an elite worker who has to exert effort to produce quality, that pivotal owner will choose q to maximize his net utility from quality production, which depends on his reputation gains and the costs to produce the quality:[29]

$$\psi_j = \tau q_j - s_j k q_j^2 \tag{20}$$

$$\text{s.t.} \quad \pi_j = 0 \tag{21}$$

[29] Without loss of generality we assume that the pivotal owner has to bear all costs of quality production and cannot share them with his fellow elite workers.

The managers of A and B face the same situation as in competition among consumer-dominated nonprofits (see section 4.1). Hence, Lemma 4.(i) holds. Resulting Bertrand price competition leads to marginal cost pricing, i.e. $p_A = p_B = kq^2$ and $\pi_A = \pi_B = 0$. This simplifies the decision-problem of the pivotal owners in A and B to:

$$\max_{q} \quad \tau q_j - s_j k q_j^2 \tag{22}$$

Given our assumption, that $\tau_A = \tau_B = \tau$, there is a unique solution.

Lemma 6 (Competing worker-dominated nonprofits) *(i): Consider* $\tau = 0$*: both nonprofits in equilibrium produce:* $q_A = q_B = 0 \equiv q_{WNN} = p_{WNN}$, $s_A = s_B = \frac{1}{2}$, $PS_{WNN} = 0$, $CS_{WNN} = b = W_{WNN}$.
(ii): Consider $\tau > 0 \quad \wedge \quad b \geq \frac{\tau^2}{4k}$*: the subgame-perfect equilibrium is characterized by* $q_A = q_B = \frac{\tau}{2k} = q_{WNN}$, $p_A = p_B = p_{WNN} = \frac{\tau^2}{4k}$ *and* $s_A = s_B = \frac{1}{2}$*. Hence* $PS_{WNN} = 0$, $CS_{WNN} = \frac{4bk+\tau-\tau^2}{4k} = W_{WNN}$.
(iii): Consider $\tau > 0 \quad \wedge \quad b < \frac{\tau^2}{4k}$*: the subgame-perfect equilibrium is characterized by the maximum quality feasible,* $q_A = q_B = q_{WNN} = \frac{1+\sqrt{1+4bk}}{2k}$, $p_A = p_B = p_{WNN} = \frac{(1+\sqrt{1+4bk})^2}{4k}$ *and* $s_A = s_B = 0$*. Consequently,* $PS_{WNN} = 0 = CS_{WNN} = W_{WNN}$.

Proof: see appendix.

Lemma 6 underlines that the pivotal owner's preferences for quality and the intensity of competition mainly determine the market outcome. As competition is most intense, due to the lack of product differentiation in equilibrium, prices equal marginal costs and profits are zero. Lemma 6.(i) captures the situation when the pivotal elite worker is unwilling to invest in quality without getting monetary remuneration for it, e.g. because he is lazy or reputational concerns do not play a role in his perspective. He would exert no effort to produce additional quality.

Lemma 6.(ii) captures the situation when the pivotal elite worker is motivated to produce additional quality but knows, due to the high basic utility of the product and the marginal cost pricing, that all consumers will buy anyway. He will then increase additional quality in line with his own preferences. If his preferences are the average of the entire population, $\tau = \frac{1}{2}$, this case can even reach first-best welfare.

Lemma 6.(iii) captures another extreme case. If the basic utility is low, consumers are sensitive to changes in quality and, subsequently, price levels. The optimal response of a quality-loving elite worker—independent of his exact level of preferences τ—is then to produce the maximum quality level feasible, at which no consumer can afford the product. He would get all the reputation/utility of the high quality but he would not have to bear the costs of production.[30] Unfortunately, this comes at the expense of welfare, de facto creating the worst welfare outcome of zero.[31]

4.4 Mergers between two worker-dominated nonprofits

In a monopolistic worker-dominated nonprofit the manager will set the monopoly price and consumers will react accordingly as captured in Equation (12). Substituting this in the objective function of the pivotal owner and incurring that demand is elastic as long as $b < kq^2 + q$ reduces the maximization problem in $t = 1$ to:

$$\max_q \begin{cases} \tau q - \frac{b+q-kq^2}{2q} kq^2 & \text{if} \quad b < kq^2 + q \\ \tau q - kq^2 & \text{if} \quad b \geq kq^2 + q \end{cases} \tag{23}$$

$$\text{s.t.} \quad \pi_j = 0 \tag{24}$$

Lemma 7 (Monopolistic worker-dominated nonprofit) *(i): Consider* $\tau = 0$*: the nonprofit produces* $q_{WN} = 0$ *and asks for* $p_{WN} = b$*. It sells to* $s_{WN} = 1$ *consumers, creating* $PS_{WN} = b$*,* $CS_{WN} = 0$*, and* $W_{WN} = b$*.*
(ii): Consider $\tau > 0 \quad \wedge \quad b \geq \frac{\tau(2+\tau)}{4k}$*: the subgame-perfect equilibrium is characterized by* $q_{WN} = \frac{\tau}{2k}$*,* $p_{WN} = b$ *and* $s_{WN} = 1$*, leading to* $PS_{WN} = b - \frac{\tau^2}{4k}$*, which is donated to a charity.* $CS_{WN} = \frac{\tau}{4k}$ *and* $W_{WN} = b + \frac{\tau - \tau^2}{4k}$*.*

[30] In practice, this scenario captures a situation where, for instance, physicians in a nonprofit hospital invest a lot in their own education and training and hence are able to perform very complicated surgeries. This brings them reputation and respect from their colleagues in other hospitals but patients cannot afford to pay for such high-skilled labor anymore.

[31] These results could be made more realistic by assuming that the nonprofits have to sell to one consumer at least to prove their high quality to the rest of the world. The pivotal owners would then marginally reduce quality (and hence price) such that a marginal consumer would buy. Consumer surplus and welfare would turn slightly positive.

(iii): Consider $\tau > 0 \wedge b < \frac{\tau(2+\tau)}{4k}$*: the subgame-perfect equilibrium is characterized by the maximum quality feasible,* $q_{WN} = \frac{1+\sqrt{1+4bk}}{2k}$, $p_{WN} = \frac{(1+\sqrt{1+4bk})^2}{4k}$ *and* $s_{WN} = 0$*. Consequently,* $PS_{WN} = 0 = CS_{WN} = W_{WN}$.

Proof: see appendix.

Due to the formal similarity of Lemmas 6 and 7 we directly proceed to:

Proposition 3 (Merging worker-dominated nonprofits) *(i): Consider* $b < \frac{\tau^2}{4k} \quad \vee \quad b \geq \frac{\tau(2+\tau)}{4k} \quad \vee \quad \tau = 0$*: quality levels and welfare generated by worker-dominated duopolists and a worker-dominated monopolist are equal:* $q_{WNN} = q_{WN}$, $W_{WNN} = W_{WN}$.
(ii): Consider $b \in [\frac{\tau^2}{4k}, \frac{\tau(2+\tau)}{4k}) \quad \wedge \quad \tau > 0$*: competitive worker-run nonprofits produce lower quality and generate higher welfare than such monopolists:* $q_{WNN} < q_{WN}$, $W_{WNN} > W_{WN}$.

This Proposition requires no formal proof but easily follows from the two previous Lemmas on worker-dominated nonprofits. Lemma 7.(i) follows from the same logic as Lemma 6.(i): if the pivotal elite worker has no preference for additional quality, he will not produce it. The difference between the two results is that, in case of a monopolistic worker-dominated nonprofit, the manager's power to set the price to the monopoly level is not constrained by competition. Consequently, consumer surplus of the competition case is shifted to the producer in the monopoly case—who then due to the non-distribution constraint has to donate the profits to a charity. This shift, however, does not affect the welfare result.

Parts (ii) and (iii) of Lemma 7 compare well to parts (ii) and (iii) of Lemma 6: if the pivotal elite worker has a preference for quality and complete market coverage, due to high basic utility b, is secured, he picks a quality level which is rising in line with his quality preference. If demand is elastic w.r.t. quality changes, however, the pivotal owner chooses the maximum quality level feasible such that his utility from quality production is maximized but costs, due to the inability of consumers to afford the high-quality product, are minimized.

There are two significant differences between Lemmas 6 and 7: first, in parts (ii), as in parts (i), by asking for a higher price the monopolistic manager shifts surplus from consumers to the producer. As demand is inelastic in these ranges the shift does not affect welfare though. Second, more importantly the boundary between parts (ii) and (iii) is different—which is the origin of Proposition 3.(ii).

While in the competition case demand is quality inelastic if $b \geq \frac{\tau^2}{4k}$, the same is true in the monopolistic case only for $b \geq \frac{\tau(2+\tau)}{4k} > \frac{\tau^2}{4k}$. This means that, for intermediate levels of b, the overinvestment in quality of competing worker-dominated nonprofits is lower than by monopolists, leading to higher welfare of the competitive case.

4.5 Nonprofits dominated by suppliers and pure donors

Before we state our main result, let us briefly discuss the cases of nonprofits dominated by suppliers and by pure donors.

We argued in section 2.2 that the only rational interest of a supplier of capital (a lender) to a nonprofit due to the non-distribution constraint can be in maximizing the secure repayment of the loan. This security would be maximized if, given the absence of market risk in our model, the nonprofit's monetary income was maximized. Then the lender could be sure to get back loan and interest. Consequently, such a supplier would lead a nonprofit just as a profit maximizing firm. In equilibrium, Lemmas 2 and 3 and Proposition 1 apply, subject to the constraint that profits have to be donated to a charity. This means that mergers between two nonprofits dominated by lenders with pure financial interest nearly always decrease and never increase welfare.

We also argued in section 2.2 that a supplier of input goods or services could either be regarded as maximizing the price he can sell his goods for to the nonprofit, which gives him the same objectives as a lender. Alternatively, he could be interested in maximizing the service quality of the nonprofit w.r.t. suppliers when selling his inputs. Our model of consumer-dominated nonprofits would capture this case, where the supplier-owner is seen as consumer-owner of the nonprofit. Consequently, Lemmas 4 and 5 and Proposition 2 would apply. Such a merger, depending on the preferences of the pivotal owners τ and the basic utility b, could be welfare enhancing.

If the pivotal owner is a pure donor, we argued that he must be interested in maximizing the quality of the nonprofit's services. Our model of a consumer-dominated nonprofit captures this set-up. Subgame-perfect equilibria are characterized by Lemmas 4 and 5, where $\tau = 1$. With reference to Proposition 2 we conclude that mergers between two nonprofits dominated by pure donors always decrease welfare (irrespective of b).

We summarize our insights in the main result:

Proposition 4 (Comparing merger cases) *(i): Mergers between two competitors whose pivotal owners have purely financial interests, independently whether ex ante they are incorporated as firms or nonprofits, never increase but mostly decrease welfare.*
(ii): Mergers between nonprofits whose pivotal owners have an interest in the consumption of the organizations' goods or services, independently whether they are consumers of the NFP's product or obtain non-monetary utility from its services as suppliers, can increase welfare.
(iii): Mergers between nonprofits whose pivotal owners are elite workers and therefore could have a non-monetary interest in producing quality, are never welfare enhancing but can decrease welfare.
(iv): Mergers between two nonprofits whose pivotal owners are pure donors striving to maximize product quality always decrease welfare.

It is crucial to understand the different sources of merger inefficiency captured in Proposition 4. Part (i) is comparatively obvious as merging profit-maximizers use their increased market-power to exploit consumers and fail to offer high quality for the high price they charge.

In part (iii) the source of inefficiency is completely different: nonprofits dominated by workers who suffer from the production of additional quality if they sell a lot, on the one hand, but benefit from high quality independently of output, on the other hand, have a tendency to overinvest heavily in quality. Then their services are priced prohibitively for (nearly) all consumers, thereby reducing the disutility attached to output, but they can still collect high utility, e.g. from reputation among colleagues. Mergers among such organizations, by reducing competition, allow the pivotal workers in more states of the world to live out their private obsessions. This behavior has detrimental effects on welfare.

The mechanism behind Proposition 4.(ii) is that consumer-dominated nonprofits, just as worker-dominated nonprofits, focus on the production of quality. While the latter try to avoid selling to many consumers, in contrast, consumer-dominated NFPs make sure they can afford to buy the product produced and, therefore, invest less in quality than worker-dominated NFPs. Tough competition between two consumer-run nonprofits erodes this quality containment. This is why, as long as the quality preference of the pivotal owner is not too high, mergers relaxing tough competition and decreasing quality produced can be welfare enhancing.

The latter effect is not applicable to mergers among NFPs dominated by pure donors because those persons tend to invest so heavily in quality that mergers virtually do not decrease overinvestment but only have the negative effect of increased prices.

5 Discussion

5.1 Timing of the game

There are three obvious questions concerning the timing specification of our game: First, why are q and p set at different stages? The reason is that we assume $C(q)$ to be a per-period fixed cost for personnel and special technical equipment, both with a certain education or quality. Hence q cannot be adjusted at short notice. Contrarily, prices can be adjusted very easily. Thus they should be chosen at an *own* stage and *after* quality determination.

Second, why should it be the manager who determines p, not the owners? We assume separation of ownership and control because cost components in an organization are numerous, fluctuating, and consequently hard to evaluate for an outsider. This is one reason why tasks are delegated to a professional manager. Owners might only observe and evaluate the organization's budget after production and sales. With some discretion on costs, a manager could then always justify a monopolistic price level via budget break-even.

Third, if the manager can determine p, why should he choose to maximize revenues, even in a nonprofit? Because we assume that owners can observe the level of quality before they pay the manager—potentially by spending on an external auditor or some other monitoring mechanism specified outside of the game—the manager cannot shirk on q. The only way to create some rents for himself is then to maximize the sum of profits and to spend some income on his perks. Alternatively, following Bertrand and Mullainathan (2003) who suggest that managers prefer to spend less effort on hard work instead of building empires, we could assume that the signal owners obtain on the quality level actually produced by the manager is stochastic. Owners' uncertainty then would be similar across organizations though. Hence after reducing quality a bit, managers in all organizations would have to maximize their own utility similarly, by maximizing perks, the scope for which increases with profits.

6 Conclusion

In this paper we have investigated the relative welfare effects of mergers among nonprofits compared to mergers among for-profit firms. We have approached our main question, whether mergers among nonprofits should be regulated differently than mergers among firms, by constructing a model of duopoly competition which accounts for the different governance structures of nonprofits dominated by consumers, workers, suppliers, and pure donors.

We have shown the standard result that, abstracting from synergies or transaction cost reductions, mergers between firms almost always decrease and never increase welfare. The same is true for mergers between nonprofits which are dominated by owners with mainly financial interests. Mergers between nonprofits dominated by consumers, however, *can* improve welfare as long as the owners do not have preferences for too exclusive/high quality. This is the main result of our paper standing in sharp contrast to Philipson and Posner (2006). Our main policy implication follows, that such mergers should be treated more benevolent than mergers among other organizations, in particular profit-maximizing firms–a notion that is absent in current merger guidelines both in the US and the EU.

Although related to consumer-run nonprofits, mergers between two NFPs dominated by elite workers or by pure donors do not improve welfare and, hence, should not get special legal status.

The results of our analysis can be transformed into the following hypotheses:

- Mergers between two for-profit firms should lead to a *decrease* in the average quality produced in the industry. The average price should rise (fall) if the basic utility of the product is sufficiently high (low).
- Mergers between two consumer-dominated NFPs should lead to a *decrease* in the average quality produced in the industry (reduction of overinvestment in quality) and a corresponding *decrease* in the average price.
- Mergers between two worker-dominated NFPs should lead to *constant* average quality produced in the industry if the basic utility is sufficiently large or sufficiently small; for intermediate levels of basic quality quality should *increase*. As long as average quality is not too low, prices should *increase*.

The potential applicability of our framework, e.g. for competition authorities, is twofold: if the motivation of two nonprofits' owners wanting to merge is known or can be estimated rather precisely, our model generates predictions on the merged party's behavior and the welfare effects of the merger. This method can also be used with existing data to test the validity of our model.

Contrarily, if owners' preferences could not be revealed, a merger was already settled and some data—namely on quality, prices and output—could be obtained, the de facto governance structure could be concluded by using our framework. Vita and Sacher (2001), to pick one example, analyze the case study of a merger between two nonprofit hospitals. They find, on the one hand, that the transaction was followed by significant price increases. However, those authors reject the hypothesis that the price increases completely reflect higher post-merger quality. The changes induced by the merger—increasing prices but constant quality—fit well to the move from Lemma 6.(ii) to Lemma 7.(ii). Consequently, our model suggests that the case studied by Vita and Sacher concerned two worker-dominated nonprofits.

With this study we want to raise awareness for the conjecture that nonprofit might not equal nonprofit. Maybe the empirical literature on nonprofits is only inconclusive and controversial because the label "nonprofit" serves as a melting pot of various organizational forms whose owners in fact have very different objectives and, consequently, can be expected to behave differently in several situations, for instance in mergers.

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A Appendix

A.1 Remarks for subsequent proofs

Within the subsequent proofs, when searching for the equilibrium quality level produced by the pivotal owner in $t = 1$, we have to distinguish between two competitive settings in $t = 2$: if a manager prices according to marginal cost, $p = kq^2$, the quality decision in $t = 1$ finally affects consumer demand—there is a quantity effect—iff $q \in (\sqrt{\frac{b}{k}}, \frac{\sqrt{1+4bk}+1}{2k})$. Below that range, i.e. where $b \geq kq^2$, all consumers buy: $s = 1$. Above that range, i.e. where $b \leq kq^2 - q$, no consumer buys: $s = 0$.

If a manager sets the monopoly price, $p = \frac{1}{2}(b + q + kq^2)$, the quality decision in $t = 1$ finally affects consumer demand iff $q \in (\frac{\sqrt{1+4bk}-1}{2k}, \frac{\sqrt{1+4bk}+1}{2k})$.[32] Below that range, i.e. where $b \geq kq^2 + q$, all consumers buy: $s = 1$. Above that range, i.e. where $b \leq kq^2 - q$, no consumer buys: $s = 0$.

A.2 Proof of Lemma 1

(i): The second line of (4) has a straightforward solution, $q_{FB} = \frac{1}{4k}$, which is valid if $b \geq kq^2 = \frac{1}{16k}$ and leads to $p_{FB} = \frac{1}{16k}$, $s = 1$ and a welfare of $W = b + \frac{1}{16k}$.

[32] Note that $\frac{\sqrt{1+4bk}-1}{2k} < \sqrt{\frac{b}{k}}$ for $b > 0$.

(ii): There are four FOCs of $\frac{(b+q-kq^2)^2}{2q}$ which define candidates for q_{FB}:

1. $q = \frac{1-\sqrt{1+4bk}}{2k} < 0$: this hurts the assumption $q \geq 0$.

2. $q = \frac{1-\sqrt{1-12bk}}{6k}$: the second-order condition (SOC) is positive. Hence, here we have a welfare minimum.

3. $q = \frac{1+\sqrt{1+4bk}}{2k}$: here total output is $s = 0$, hence $W = 0$.

4. $q = \frac{1+\sqrt{1-12bk}}{6k}$: SOC is negative; hence we have a welfare maximum, which exists $\forall\ b \leq \frac{1}{12k}$. As the case in (4) requires a stronger condition, $b < \frac{1}{16k}$ (see above), this is always fulfilled.

Hence, $q_{FB} = \frac{1+\sqrt{1-12bk}}{6k}$ generates $p_{FB} = kq^2 = \frac{(1+\sqrt{1-12bk})^2}{36k}$ and output of $s = \frac{2}{3}(2 - \sqrt{1-12bk})$. Welfare is $W_{FB} = \frac{(1+12bk+\sqrt{1-12bk})^2}{27k(1+\sqrt{1-12bk})}$. □

Note that both cases converge at $b = \frac{1}{16k}$, where both functions produce $q = \frac{1}{4k}$, sell for $p = \frac{1}{16k}$ to $s = 1$ consumers and generate welfare of $W = \frac{1}{8k}$.

A.3 Proof of Lemma 2

(i): If $b \geq \frac{10}{27k}$, the budget constraint of all consumers holds, i.e. the market is always covered for competitive prices. In this case, the FOCs of Equations (10) and (11) result in the following reaction functions:

$$q_A(q_B) = \frac{2 - kq_B}{k}; \quad q_A(q_B) = \frac{2 + kq_B}{3k}; \quad q_B(q_A) = \frac{-1 - kq_A}{k}; \quad q_B(q_A) = \frac{-1 + kq_A}{3k}$$

The optimal quality for B is $q_B^* = 0$, a corner solution. Because consumers could not afford to buy $q_A = \frac{2}{k}$, A's best response to this is $q_A^* = \frac{2}{3k}$. Both strategies form a Nash equilibrium. The remaining results in Lemma 2.(i) follow by substitution of q_A^* and q_B^*. Note that the cheapest version of the product available to the consumer at $\theta^i = 0$ is B's product, the consumption of which gives him a utility of $b - \frac{10}{27k} \geq 0 \quad \forall \quad b \geq \frac{10}{27k}$.

(ii): If $b < \frac{10}{27k}$, the market is not necessarily covered. $s_A = 1 - \frac{p_A - p_B}{q_A - q_B}$ remains constant but B's market share generalizes to $s_B = \frac{p_A - p_B}{q_A - q_B} - \frac{p_B - b}{q_B}$. This is

reflected in equilibrium prices, market shares, and profits of

$$p_A^* = \frac{2q_Aq_B - b(q_A - q_B) - kq_B^2q_A - 2q_A^2 - 2kq_A^3}{q_B - 4q_A} \tag{25}$$

$$p_B^* = \frac{-2b(q_A - q_B) - q_B(q_A - q_B + 2kq_Aq_B + kq_A^2)}{q_B - 4q_A} \tag{26}$$

$$s_A^* = \frac{-2b + q_A(-2 + k(q_B + 2q_A))}{q_B - 4q_A} \tag{27}$$

$$s_B^* = -\frac{q_A(2b + q_B(1 + k(q_A - q_B)))}{q_B(q_B - 4q_A)} \tag{28}$$

$$\pi_A^* = \frac{(q_A - q_B)(b - q_A(-2 + k(q_B + 2q_A)))(2b - q_A(-2 + k(q_B + 2q_A)))}{(q_B - 4q_A)^2} \tag{29}$$

$$\pi_B^* = \frac{(q_A - q_B)q_A(2b + q_B(1 + k(-q_B + q_A)))^2}{q_B(q_B - 4q_A)^2} \tag{30}$$

In $t = 1$ there is no closed-form solution for q_A^* and q_B^*. However, all derivatives of Equations (25) to (30) w.r.t. b are positive. Therefore, when starting at $b = \frac{10}{27k}$ and decreasing b, all values will shrink. Moreover, since $\frac{\partial \pi_B^*}{\partial q_B} < 0$ for all supported q_B, $q_B^* = 0$. This simplifies all Equations (25) to (30). The only closed-form solution for optimal q_A, however, is $q_A^*(b = 0) = \frac{1}{3k}$.

At $q_B = 0$, producer surplus is the sum of (29) and (30):

$$PS_{FF}(q_B = 0) = \frac{-b^2 + bq_A^*(5 - kq_A^*) + 2q_A^{*2}(kq_A^* - 1)^2)}{8q_A^*} \tag{31}$$

Consumer surplus is:

$$CS_{FF}(q_B = 0) = \frac{1}{8}(b(5 - kq_A^*) + q_A^*(kq_A^* - 1)^2) \tag{32}$$

Hence total welfare is:

$$W_{FF}(q_B = 0) = -\frac{b^2 + 2bq_A^*(kq_A^* - 5) - 3q_A^{*2}(kq_A^* - 1)^2)}{8q_A^*} \tag{33}$$

The only fixed value we can give is by substituting $q_A^*(b = 0) = \frac{1}{3k}$ into (33):

$$W_{FF}(q_B = 0, b = 0) = \frac{1}{18k} \quad \square \tag{34}$$

A.4 Proof of Lemma 3

(i): The second line of (13) has a unique solution, $q_F = 0$, which leads to $p_F = b$, $s = 1$ and, subsequently, to producer surplus of $PS = \pi = b - 0 = b$, consumer surplus of $CS = 1(b + 0 - b) = 0$, and welfare of $W = b + 0 = b$. This strategy is an option for the monopolistic firm in the range $b \geq kq_F^2 + q_F = 0$. As we will see below, it is optimal for the firm's owners if $b \geq \frac{1}{16k}$.

(ii): The profit function on the first line of (13) is exactly half of the welfare function on the first line of (4), the social planner's maximization problem. Consequently, the same four candidates for equilibrium quality exist and, for the same reasons as in the proof of Lemma 1.(ii), the profit-maximizing quality in the defined range is $q_F^* = \frac{1+\sqrt{1-12bk}}{6k}$. Substituting q_F^* in (13) yields profits of:

$$\pi_F^* = \frac{(1 + 12bk + \sqrt{1 - 12bk})^2}{54k(1 + \sqrt{1 - 12bk})} \tag{35}$$

The profits in (35) are strictly larger than the alternative from Lemma 3.(i) ($\pi_F = b$) iff $b < \frac{1}{16k}$. Substituting the threshold level $b = \frac{1}{16k}$ and $q_F^* = \frac{1+\sqrt{1-12bk}}{6k}$ into the boundary condition in (13), which requires that $b < kq^2 + q$, reveals that output is price sensitive (and hence $q_F^* = \frac{1+\sqrt{1-12bk}}{6k}$ is supported) as long as $b < \frac{5}{16k}$, which is larger than $\frac{1}{16k}$.

Consequently, the monopolistic firm's owners choose $q_F^* = \frac{1+\sqrt{1-12bk}}{6k}$ if $b < \frac{1}{16k}$. The manager then asks for $p_F^* = \frac{1+3bk+\sqrt{1-12bk}}{9k}$ and sells to $s = \frac{2-\sqrt{1-12bk}}{3}$ consumers; i.e. $s \in [\frac{1}{3}, \frac{1}{2}]$ for $b \in [0, \frac{1}{16k}]$. Producer surplus is as in (35), while consumer surplus and welfare are given by:

$$CS_F = \frac{1 + \sqrt{1 - 12bk} - 12bk(-3 + \sqrt{1 - 12bk})}{108k} \tag{36}$$

$$W_F = \frac{1 + \sqrt{1 - 12bk} - 12bk(-3 + \sqrt{1 - 12bk})}{36k} \tag{37}$$

If $b \geq \frac{1}{16k}$, a monopolistic firm will act as given in part (i) of this proof. $\square$

A.5 Proof of Proposition 1

(i): Consider $b = 0$: this comparison is a mere corollary to Lemmas 2.(ii) and 3.(ii).

(ii): For $b > 0$ we have to distinguish among three ranges:

1. Consider $0 < b < \frac{1}{16k}$: in this range we suffer from the fact that we cannot characterize analytical solutions for $q_A^*(b > 0)$ in the competitive case. Therefore, we use a graphical approach. In Figure 2 we plot $\pi_A(q_A, b)$ for $k = 1$. It is easy to observe that, for $b = 0$, $q_A^* = \frac{1}{3}$ is profit-maximizing. The

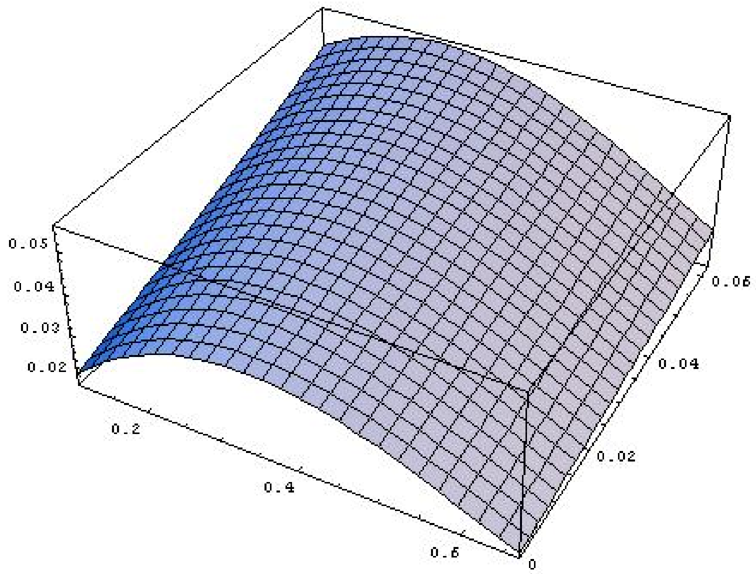

Figure 2: Firm A's profits (z-axis) depending on its own quality (drawn for $q_A \in [0.1, \frac{2}{3}]$ on the x-axis) and the basic utility (drawn for $b \in [0, \frac{1}{16}]$ on the y-axis); all assuming $k = 1$.

grid lines suggest that the profit-maximizing value of q_A, i.e. q_A^*, slightly decreases with increasing b. In Figure 3 we plot the excess welfare of the competitive firm case over the monopolistic firm case, $W_{FF} - W_F$ (with the same parameter assumptions as in Figure 2). If we copy the profit-maximizing q_A^*-values from Figure 2 to Figure 3, we notice that the $(W_{FF} - W_F)$-surface shows *positive* values. Consequently, for $q_A^*(b > 0)$, $W_{FF} - W_F$.

2. Consider $\frac{1}{16k} \leq b < \frac{10}{27k}$: in this range we have $q_F = 0$ and $W_F = b$. In the competitive case, $q_A > 0$ and $W_{FF} > b$ (see (33)).

3. Consider $b \geq \frac{10}{27k}$: Here, we have $W_F = b < W_{FF} = b + \frac{8}{243k}$ (see Lemmas 2.(i) and 3.(i)).

Summarizing, $W_{FF} > W_F \quad \forall \quad b > 0$. $\square$

A.6 Proof of Lemma 4

(i): The non-distribution constraints of both nonprofits (19) can only be satisfied by pure or mixed strategies in $t = 1$ if the respective action combination is

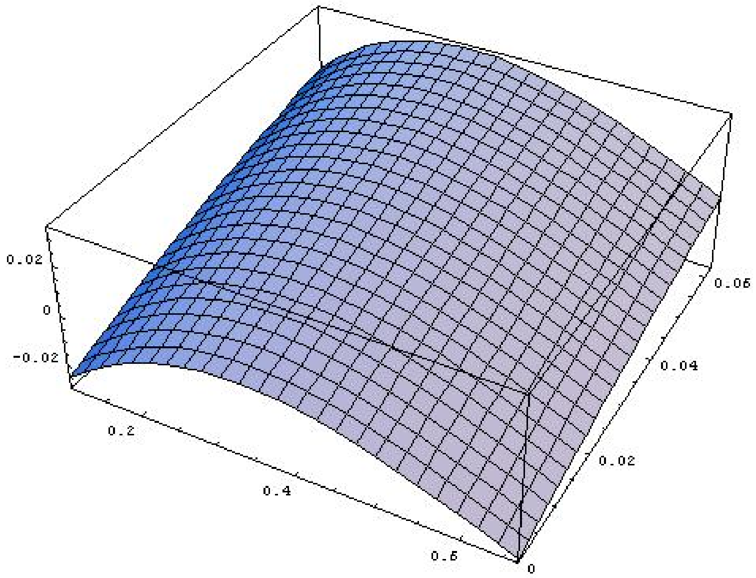

Figure 3: The welfare difference of competing firms vs. a monopolistic firm: $W_{FF} - W_F$ (on z-axis), depending on quality $q_A \in [0.1, \frac{2}{3}]$ (x-axis) and the basic utility $b \in [0, \frac{1}{16}]$ (y-axis); assuming $k = 1$ (same parameters as in Figure 2).

$q_A = q_B$.[33] Any other action combination leads to positive profits for at least one nonprofit. This insight produces two instant corollaries:

1. If $q_A = q_B = q$, there is no product differentiation and managers face Bertrand price competition in $t = 2$. Hence, both of them will choose a price that equals marginal costs, i.e. $p_A = p_B = kq^2$.

2. There are infinitely many supported solutions for $q_A = q_B$.

(ii): Now Equation (18) becomes important: pivotal owner τ's net consumption utility is non-negative if $b + \tau q - kq^2 \geq 0$. Optimizing this function for q and considering the quality maximization goal (17) yields:

$$q_A = q_B = \frac{\tau + \sqrt{4bk + \tau^2}}{2k} \equiv q_{CNN} \tag{38}$$

[33]Recall our assumption that managers in $t = 2$ have perfect information about both organizations' quality levels before they produce and choose prices. Hence only the outcome of $t = 1$ is important, not the mixed strategies resulting in it. Because of this we confine ourselves to pure strategies.

Consequently, both managers ask for $p_{CNN} = \frac{(\tau+\sqrt{4bk+\tau^2})^2}{4k}$ and generate profits of $\pi_{CNN} = 0 = PS_{CNN}$. By construction, total output is $s_A + s_B = 1 - \tau$, which results in consumer surplus and welfare of:

$$CS_{CNN} = W_{CNN} = \frac{(\tau - 1)^2(\tau + \sqrt{4bk + \tau^2})}{4k} \quad \square \tag{39}$$

A.7 Proof of Lemma 5

(i): Building on (12) the profits of the monopolist are given by $\pi = \frac{(b+q-kq^2)^2}{4q}$. The only quality level at which profits equal zero is $q = \frac{1+\sqrt{1+4bk}}{2k}$. This would lead to $s = 0 = \pi = PS = CS = W$. We conclude that any quality level that leads to positive sales also leads to positive profits. To avoid violating the non-distribution constraint these have to be donated to a charity, i.e. the nonprofit's owners cannot enjoy the fruits of profits but profits are not lost from a welfare perspective.

(ii): The pivotal owner τ expects the manager to price monopolistically. Hence his net consumption utility is non-negative if $b + \tau q - \frac{1}{2}(b + q + kq^2) \geq 0$. His quality maximization goal (17) makes sure he chooses:

$$q_{CN} = \frac{2\tau - 1 + \sqrt{1 + 4bk - 4\tau + 4\tau^2}}{2k} \quad \text{if} \quad b > 0 \tag{40}$$

The manager asks for $p_{CN} = \frac{2bk+\tau(\sqrt{4bk+(1-2\tau)^2}+2\tau-1)}{2k}$ and sells to $s = 1 - \tau$ consumers. Profits (donated to a charity), consumer surplus and welfare are:

$$PS_{CN} = -\frac{1}{4k^2}[\Big(2bk + \tau(\sqrt{4bk + (1 - 2\tau)^2} + 2\tau - 1)\Big) \Big(2k(b + \tau - 1) + (2\tau - 1)(\sqrt{4bk + (1 - 2\tau)^2} + 2\tau - 1\Big)] \tag{41}$$

$$CS_{CN} = \frac{(\tau - 1)^2(\sqrt{4bk + (1 - 2\tau)^2} + 2\tau - 1)}{4k} \tag{42}$$

$$W_{CN} = \frac{(\tau - 1)^2(\sqrt{4bk + (1 - 2\tau)^2} + 2\tau - 1)}{4k} - \frac{1}{4k^2}[\Big(2bk + \tau(\sqrt{4bk + (1 - 2\tau)^2} + 2\tau - 1)\Big) \Big(2k(b + \tau - 1) + (2\tau - 1)(\sqrt{4bk + (1 - 2\tau)^2} + 2\tau - 1\Big)] \tag{43}$$

(iii): If $b = 0$, the pivotal owner's utility function is non-negative for $\tau q - \frac{1}{2}(q + kq^2) \geq 0$. This yields:

$$q_{CN} = \begin{cases} \frac{2\tau-1}{k} & \text{if} \quad b = 0 \wedge \tau > \frac{1}{2} \\ 0 & \text{if} \quad b = 0 \wedge \tau \leq \frac{1}{2} \end{cases} \tag{44}$$

The second line leads to $p_{CN} = b = 0, s = 1, PS_{CN} = b = 0, CS_{CN} = 0, W_{CN} = b = 0$. The conditions in the first line let the manager ask for $p_{CN} = \frac{4\tau^2-2\tau}{2k}$, which leads to $s = 1-\tau, PS_{CN} = \frac{(6\tau-4\tau^2-2)^2}{4k(2\tau-1)}, CS_{CN} = \frac{(2\tau-1)(\tau-1)^2}{2k}, W_{CN} = 3\frac{(2\tau-1)(\tau-1)^2}{2k}$. □

A.8 Proof of Proposition 2

(i): Consider $b = 0 \wedge \tau \leq \frac{1}{2}$: a comparison of Lemmas 4.(ii) and the second part of 5.(iii) reveals that $q_{CN} < q_{CNN}$ and $W_{CN} < W_{CNN}$.
(ii): Consider $b = 0 \wedge \tau > \frac{1}{2}$: comparing Lemma 4.(ii) with the first part of 5.(iii) shows that $q_{CN} < q_{CNN}$. However, $W_{CN} < W_{CNN}$ only if $\tau < .6$. In contrast, if $b = 0 \wedge \tau \geq .6$, $W_{CN} \geq W_{CNN}$.
(iii): Consider $b > 0$: drawing on Lemmas 4.(ii) and 5.(ii) shows that $W_{CN} \geq W_{CNN}$ if

$$\frac{(\tau-1)^2(\sqrt{4bk+(1-2\tau)^2}+2\tau-1)}{4k} - \frac{1}{4k^2}\Big[\Big(2bk+\tau(\sqrt{4bk+(1-2\tau)^2}+2\tau-1)\Big)\Big(2k(b+\tau-1)+(2\tau-1)(\sqrt{4bk+(1-2\tau)^2}+2\tau-1\Big)\Big] - \frac{(\tau-1)^2(\tau+\sqrt{4bk+\tau^2})}{4k} \geq 0 \tag{45}$$

In Figure 4 we plot this welfare difference ($W_{CN} - W_{CNN}$) depending on b and τ, the quality preference of the pivotal owner. It is obvious that for some parameter-combinations, e.g. for low τ and high b, this difference is positive.

To support this statement we plotted the same welfare difference ($W_{CN} - W_{CNN}$) for one low and one high specific value of b in Figure 5. It is obvious that in both graphs, for some τ, $W_{CN} - W_{CNN} > 0$. □

A.9 Proof of Lemma 6

(i): Consider $\tau = 0$: Equation (22) easily shows that such a worker only suffers from producing quality. Hence $q_{WNN} = 0$, which leads to $p_{WNN} = 0$, $s_A = s_B =$

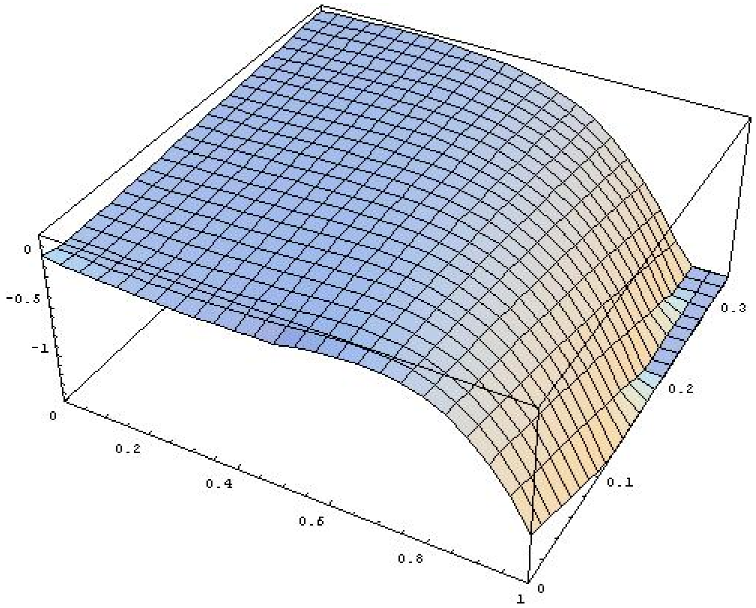

Figure 4: The welfare difference of a monopolistic consumer-dominated nonprofit vs. competing consumer-dominated nonprofits: $W_{CN} - W_{CNN}$ (on z-axis), depending on the pivotal owner's preference for quality $\tau \in [0, 1]$ (x-axis) and the basic utility $b \in [0, \frac{1}{3}]$ (y-axis); assuming $k = 1$.

$\frac{1}{2}$, $PS_{WNN} = 0$, $CS_{WNN} = b = W_{WNN}$.
(ii): Consider $\tau > 0$: as long as $b \geq kq^2$ all consumers will buy the product because of marginal cost pricing of the managers, i.e. $s_A = s_B = \frac{1}{2}$. In this case, the pivotal owner sets $q_{WNN} = \frac{\tau}{2k}$. Hence $p_{WNN} = \frac{\tau^2}{4k}$, $PS_{WNN} = 0$, $CS_{WNN} = \frac{4bk+\tau-\tau^2}{4k} = W_{WNN}$. This case is valid for $b \geq \frac{\tau^2}{4k}$.
(iii): Consider $\tau > 0 \wedge b < \frac{\tau^2}{4k}$: in this range there is a quantity effect on demand if q is changed. Hence each manager sells to $s_j = \frac{(1-\theta)}{2}$ consumers. The owner's objective function has only a minimum and a turning point on its support, but no interior maximum. Therefore, the owners prefer to produce the maximum quality feasible, $q_{WNN} = \frac{1+\sqrt{1+4bk}}{2k}$, where $s_A = s_B = 0$. Then $PS_{WNN} = 0 = CS_{WNN} = W_{WNN}$. $\square$

A.10 Proof of Lemma 7

(i): Consider $\tau = 0$: Equation (23) shows that the pivotal owner only suffers from producing additional quality. Hence $q_{WN} = 0$. The manager asks for $p_{WN} = b$,

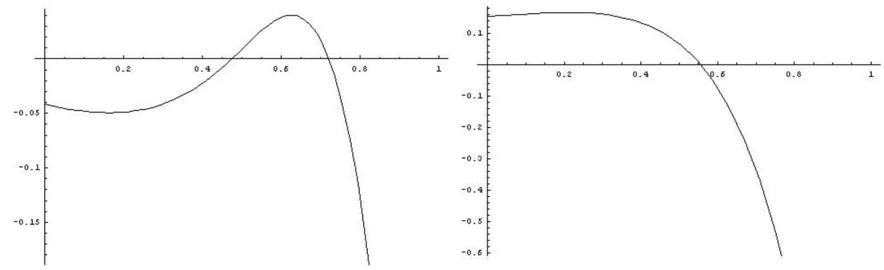

Figure 5: The welfare difference of a monopolistic consumer-dominated nonprofit vs. competing consumer-dominated nonprofits: $W_{CN} - W_{CNN}$, depending on the pivotal owner's preference for quality $\tau \in [0,1]$; assuming $k = 1$ and $b = \frac{1}{32} < \frac{1}{16}$ [LEFT] and $b = \frac{1}{3} > \frac{1}{16}$ [RIGHT].

$s_{WN} = 1$, $PS_{WN} = b$, $CS_{WN} = 0$, and $W_{WN} = b$.
(ii): Consider $\tau > 0$: as long as $b \geq kq^2 + q$ all consumers buy the product, i.e. $s_{WN} = 1$. In this case, the pivotal owner sets $q_{WN} = \frac{\tau}{2k}$. The manager asks for the maximum price $p_{WN} = b$ (not according to (12)), leading to $PS_{WN} = b - \frac{\tau^2}{4k}$, $CS_{WN} = \frac{\tau}{4k}$ and $W_{WN} = b + \frac{\tau - \tau^2}{4k}$. This case is valid for $b \geq \frac{\tau(2+\tau)}{4k}$.
(iii): Consider $\tau > 0 \wedge b < \frac{\tau(2+\tau)}{4k}$: in this range there is a quantity effect on demand if q is changed. Hence the manager sells to consumers for a price and a quantity as stated in (12). The objective function of the pivotal monopolistic owner, subject to managerial monopoly pricing, is the same as for a pivotal owner in a competing worker-dominated nonprofit who can only sell to half of buying consumers and faces marginal cost pricing; see (23). Consequently, Lemma 6.(iii) and its proof apply; only $s = 0$ instead of $s_A = s_B = 0$. $\square$