Expected Firm Altruism and Brand Extensions

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Abstract

This paper studies quality choice in a model where consumers expect firms to be somewhat altruistic towards those customers to whom they have sold goods in the past. Because some consumers who expect altruism from a supplier react with anger when they can reject the hypothesis that new actions by this supplier are inconsistent with this altruism, existing firms have some advantages over new ones. Consistent with numerous marketing studies, existing firms (or brands) can face a larger demand for new products than new entrants. Moreover, the failure of new products can reduce the demand for a brand's existing products even if the quality of these existing products is well understood by consumers. Moreover, the model can explain why new products can be subject to loyalty switches, where one brand has an advantage in introducing product A and a disadvantage in introducing product B, while the opposite is true for a different brand. Lastly, the model predicts that a firm that is seen as caring for only a subset of quality sensitive customers can have an advantage in introducing a product relative to a firm that is seen as more widely altruistic.

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This paper seeks to present a simple formal model to explain the relative ease with which established brands are sometimes able to introduce a new product in a different product category (a "category extension"). While the model is purposefully kept simple and is thus unrealistic in many respects, it is consistent with several empirical findings from the marketing literature on brand extensions. This literature has repeatedly shown that, at least in the laboratory, two attributes of brand extensions are significant predictors of consumer acceptance. The first is that the original brand be liked (or seen as having high quality) and the second is that the extension "fit" with the original brand (Aaker and Keller (1990), Broniarczyck and Alba (1993)). As Klink and Smith (2001) note, the concept of "fit" is not very precisely defined in this literature.[1] However, the real-world examples of successful extensions described in Keller (1998) suggest at least some meanings of the idea.

In some cases, firms successfully extend brands into new categories by selling new products that have an input in common with the original product. Examples of this from Keller (1998) include Hershey chocolate milk and Honda lawnmowers. In these cases, some of the qualities of the original product are almost by necessity also present in the extension and so the success of these extensions may not be all that surprising. In others, however, there is no input in common and what is common across the product and the extension is the target customer. A good example of this is provided by the successful extension of Aunt Jemima, a brand of dry ingredient mixes for making pancakes, into pancake syrup. Another is the extension of the toothpaste brand Colgate into toothbrushes.

It is less clear, in this case, why consumers should expect a similar level of quality in the extension as in the original product. The possibility that I consider here is that consumers expect firms that provide a valuable product to care about the people who use it. In other words, consumers attribute the (high) quality of existing products to (positive) intentions on the part of its provider towards at least some of its users. This leads them to believe that the development of new products was carried out with the same intentions. The result is that

[1] Klink and Smith (2001, p. 333-34) note, in particular that "This raises a more general and critical point, however, related to construing perceived fit. If knowledge in this area is to progress in a meaningful manner, it would be useful to arrive at some consensus about how to define and measure the perceived fit construct."

they trust new products whose target customers have traditionally purchased the brand's existing products.

The idea that consumers imbue brands with intentions fits with Fournier (1998, p. 345) who says "Another form of animism involves complete anthropomorphization of the brand object itself, with transference of the human qualities of emotionality, thought, and volition." The attribution of intentions to a brand "object" may seem like a particularly extreme form of irrationality. It is important to remember, however, that the behavior of brands is governed by actual people and these people may indeed have intentions vis-a-vis their customers. It may thus not be entirely irrational to suppose that a brand that sells a well-liked product is managed by people with a particularly large degrees of empathy for the customers that most enjoy this product.[2]

An alternative hypothesis is that customers do not regard brands as having intentions but see them as having only capabilities, where these capabilities may include their knowledge of consumer tastes. Consumers might reason, for example, that brands which have demonstrated superior knowledge in the past by providing a high quality good would be particularly adept at producing complementary goods that are valuable to the same consumers. Moreover, the pursuit of profits would provide these firms with an incentive to provide such goods. Consumers would thus be able to count on the attractiveness of "related" category extensions by successful brands.

One way of differentiating between the view that brands are treated as capabilities and the view that they are seen as having intentions is to analyze the purchases of a brand's original products in those cases where category extensions fail. If consumers bought products only on the basis of their beliefs about a firm's capabilities, they would not reduce their purchases of existing products unless the failure of the extension conveyed information about the quality of the existing product. By contrast, if consumers care about firm intentions, their experience with a brand extension can lead them to reevaluate a brand's intentions and reduce their

[2]If people differ in the groups that they most empathize with, this difference in tastes presumably affects the employer that people most wish to work for. Workers should, in particular, flock to those firms whose products are particularly well-liked by the groups that they feel close to.

purchases of existing products when these intentions are found wanting.

Two studies suggest that consumers do reduce their purchases of existing products when new product carrying the same brand fail. Sullivan (1990) shows that after the Audi 5000 was accused of having a problem with sudden acceleration, the demand for Audi cars fell. This was true even of the Audi Quattro, which used a different technology that was not associated with any acceleration problem. It could be argued, however, that consumers did not know enough about automobile technology to be certain of these differences across Audi cars. The second study involves a product that customers knew better. Using scanner data, Swaminathan *et al* (2001) examined the demand for a food product that had had a 53% market share in its category before it introduced an unrelated extension that was withdrawn after 18 months. Swaminathan *et al* (2001) show that individuals who had bought the extension were significantly less likely to buy the original product afterwards. Since the extension was unsuccessful, this study suggest that a failed extension can hurt sales of flagship products even in situations where the attributes of these products are well-established in consumer's minds.

If the failure of an extension changes the perceived quality of the original product, this reduction in demand can be rationalized with the formal models of Wernerfelt (1988) and Cabral (2000). In these models, consumers are uncertain about the quality of a brand's initial (or flagship) product. When the brand introduces an extension, consumers obtain a signal of the new product's quality. If this signal is adverse, so that consumers judge the extension to be of low quality, they reduce their demand for the flagship product because they reduce their estimate's of this product's quality.

One difficulty with this mechanism is that Roedder-John, Loken and Joiner (1998) show that the perceived quality of flagship products is fairly resilient in consumers' minds.[3] They

[3] They build on an extensive earlier literature (see for example, Keller and Aaker (1992) and Loken and Roedder-John (1993), Pina *et al.* (2006)) that focused on subjects' overall ratings of brands after these are described to them as having introduced either successful or failed extensions. This literature did not always find statistically significant effects. Loken and Roedder-John (1993) showed that subjects who are told that a brand has introduced an ungentle or low-quality product do sometimes reduce the degree to which they subsequently associate a brand with "gentleness" or "high quality." But this says little about the attitudes of subjects towards the original product, since their overall brand evaluation is presumably a mixture of their

show that the attributes that subjects attribute to a flagship brand (Johnson & Johnson Baby Shampoo) are essentially impervious to the introduction of dissonant extensions carrying the same brand name. It is also possible to be somewhat skeptical *a priori* of the idea that consumers change their mind about a product that they have consumed repeatedly (which is their typical experience with well-known branded goods) after a short experience with a new product from the same brand. This is particularly true when the extension does not share any inputs with the original good.

As demonstrated in Choi (1998), if one modifies the Wernerfelt (1988) and Cabral (2000) models so that quality judgments of the original product are unaffected by failed extensions, the demand for the existing product is unaffected as well. The result is that the use of an existing brand in a new product loses some of its signaling value.[4] In the model proposed here, the success of an extension can affect the demand for existing products even when the quality of these goods is known. The reason is that this demand depends not only on the attributes of the product but also on the attitudes of consumers towards the firm selling this product.

The setting is one where consumers ascribe altruism to firms. In particular, consumers that buy a product from which they derive a particularly large degree of surplus expect the brand that stands behind this good to be particularly altruistic towards them. I suppose that, as in Choi (1998), consumers are initially uncertain about the attributes of new products (though they do learn about these when they experience the good). Coupled with the expectation of altruism, this uncertainty leads to high initial demand for product extensions that are plausibly targeted at people who derived a lot of surplus from the brands existing product. This fits with the observations that several successful brand extensions are targeted at the same customers as the brand's original product.

In several cases (Aunt Jemima's extension into pancake syrup) the extension is meant to

evaluation of the original product and their judgment regarding the extension.

[4]In Choi's (1998) model, branding can still signal high quality because firms have a repeated choice between high and low quality extensions. There is then a reputational equilibrium where brands introduce only high quality extensions. While this is an attractive model, it should be noted that it would need to be modified to be consistent with the common failure of newly introduced products.

be used at the same time as the original product. Target customers seem to be similar also in less straightforward cases. Using surveys of undergraduates, Broniarczyk and Alba (1993) show that these regard a potential extension of the Close-Up brand of toothpaste into breath mints as more attractive than a similar extension by Crest.[5] By contrast, an extension by Crest into toothbrushes was regarded more favorably than a similar extension by Close Up.[6] Broniarczyk and Alba (1993) also observed statistically significant differences between the attractiveness of category extensions by the cereals brands Cheerios and Froot Loops. While consumers said their would be more attracted by an oatmeal offering from the former, they were more likely to be favorably impressed by a lollipop offering from Froot Loops.

In my interpretation, there is more overlap between the target market for lollipops (parents who enjoy buying sweets for their children) and the target market for Froot Loops than there is between the target market for Cheerios and that of lollipops. Similarly, the target market for Cheerios appears relatively similar to the target market for oatmeal. In the case of toothpastes, Close Up seems directed at people who are particularly concerned with the smell of their breath (who should be the target market for breath mints) while the target market for Crest seems more concerned with hygiene.

Broniarczyk and Alba (1993) do not stress the similarities in the target market and emphasize brand associations instead. The idea is that consumers associate brands with certain attributes (clean teeth, colorful sweets, fresh breath) and that they are attracted to brand extensions that share these attributes with the brand's original products. Because products with different attributes often have different target markets, it does not seem easy to distinguish empirically between the idea that brand associations drive the success of extensions from the idea that this depends on commonalities in the target market.[7]

As in Rotemberg (2007), I suppose that some individuals expect a minimal level of

[5]Interestingly, these survey respondents regarded Close-Up as being less attractive than Crest as a toothpaste, suggesting that the attractiveness of extensions does not depend on a unidimensional indicator of "quality."

[6]Crest did enter the toothbrush market around 1992.

[7]Indeed, Keller (1998, p. 96) shows that images of typical users are an important aspect of brand associations.

altruism from the firms that they buy from and that they react with anger (*i.e.,* negative altruism) when they find evidence that proves that the firm is not sufficiently altruistic. Under some conditions, the introduction of failed extensions will be seen as providing such evidence and thus lead to a fall in the demand for a brand's core products.

The formal analysis involves the introduction of a new product whose quality becomes known only over time. When the product is first introduced and consumers are uncertain about its quality, an altruistic firm has a bigger incentive to provide a high quality good. This means that the introduction of a low quality good can be seen by consumers as showing insufficient altruism.[8] This leads to anger at the brand, though this anger is of no consequence when the new good is introduced by a "fly-by-night" brand that stops being in business after the product fails.

I then consider the possibility that the product is introduced with the same brand as an existing product. Consumer anger at an unsuccessful extension then leads customers to curtail their purchases of the existing product. This means that firms become less tempted to introduce low quality goods. This mechanism can lead even customers who do not react to a firm's altruism to be particularly willing to buy the new product if it is a brand extension.

A second issue considered by the paper is whether altruism is an all-purpose attribute, like "quality" in the models of Wernerfelt (1988) and Cabral (2000). That is, does the perception of altruism for more customers always promote additional demand for a product's extension. Or, alternatively, can it be better for a firm to be expected to be altruistic only for a smaller group of more discriminating customers? Note that the question being asked is not whether it is better for a company attempting to sell skiing equipment to be seen as caring for skiers rather than for stamp collectors. It is whether caring for a limited coterie of skiers induces more demand than caring equally for this coterie and also caring for other individuals. I show that the later can be true. The reason is that, faced with a firm that cares only about

[8]For simplicity the model is one where extensions only fail if they are of low quality, which denotes insufficient altruism. The model can presumably be extended to cover the case where consumers forgive those product failures that they regard as "mistakes" while punishing firms only for failures that consumers regard as foreseeable.

them, quality-sensitive consumers have less reason to fear that the firm might have shaved quality to ultimately increase the appeal of the product to more price-sensitive consumers.

The paper is organized as follows. Section 1 shows that altruistic firms are more likely to introduce high quality products. As result, incumbent firms that can be punished for showing insufficient altruism have an advantage over new entrants in the provision of certain new products. Section 2 shows that the product introductions that customers expect from broadly and narrowly altruistic firms differ while Section 3 concludes.

1 A Two-Good Model

The temporal structure of the model is close to Wernerfelt (1988) and Cabral (2000). There are three periods 0, 1 and 2. In period 0, an incumbent firm is the monopoly provider of an "old" good with known quality. In period 1, either the incumbent or another firm can enter production in a new market. Before this production takes place, entrants must determine the quality of their good. Consumers, on the other hand, do not know this quality until period 2. In period 2, both the old good (the one available in period 0) and the "new good" (the one introduced in period 1) are available for sale once again. This timing is illustrated in Table 1.

In this simple setting, the question of whether branding is useful reduces to the question of whether a firm producing the incumbent good has an advantage in introducing the new good. I will show that this is indeed the case if consumers require a small degree of altruism on the part of firms.

Let π^i_j and B^i_j denote, respectively, the profits and consumer surplus from the sale of the good of type i in period j while λ is a parameter giving a firm's true altruism towards its consumers. The distribution of firms' actual altruism parameters is given by the pdf G_λ. For simplicity, discounting is ignored in this section and the three periods are assumed to be of equal length. A firm that produces only the old good then has a level of welfare given by

$$W^o = W^o_0 + W^o_2 \qquad \text{where} \qquad W^0_i = \pi^o_i + \lambda B^o_i \qquad \text{and} \quad i = 0, 2$$

while a new entrant that produces only the new good has a welfare level equal to

$$W^n = W_1^n + W_2^n \qquad \text{where} \qquad W_i^n = \pi_i^n + \lambda B_i^n \qquad \text{and} \;\; i = 1, 2$$

In both these formulas, an altruistic firm values a unit of consumer surplus by λ times the amount it values a unit of profits. Finally, an incumbent firm that produces both the old and the new good, has a welfare level W, which equals $W^0 + W^n$.

1.1 The Old Good

Consider first the demand and cost structures for the "old" good that an incumbent firm sells in both period 0 and period 2. There are K^o potential consumers for this product and each of them can buy either 0 or 1 unit in either period. The good is non-storable and each consumer has the same valuation for this good in both periods. An individual's valuation, ψ, is drawn from a distribution with pdf F_ψ.

It is convenient to begin the analysis with period 2. If the seller charges p_2^o and consumers base their purchases solely on their own material payoffs, the lowest valuation consumer who buys has a valuation $\psi = p_2^o$. Total sales then equal $K^o(1 - F_\psi(p_2^o))$. I simplify the analysis by supposing that F_ψ is uniform between 0 and Y so sales would equal $K^o(1 - (p_2^o/Y))$.

Total consumer surplus is then

$$K^o \int_{p_2^o}^{Y} (\psi - p_2^o) dF_\psi(\psi) = \frac{K^o(Y - p_2^o)^2}{2Y} \tag{1}$$

Let the altruism of a firm producing this good in period 2 be given by λ_2^o. If a firm with altruism λ_2^o had a constant per unit cost of production of c_o and believed its demand were equal to $K(1 - (p_2^o/Y))$, it would set the price p_2^o to maximize

$$W_2^o(\lambda_2^o, c_o, p_2^o) = K^o \left\{ \left(1 - \frac{p_2^o}{Y}\right)(p_2^o - c_o) + \frac{\lambda_2^o(Y - p_2^o)^2}{2Y} \right\} \tag{2}$$

After multiplying through by Y, the first order condition for this problem is

$$2p_2^o - Y + \lambda_2^o(Y - p_2^o) = c_o \tag{3}$$

So that its price would equal

$$p_2^{o*}(\lambda_2^o, c_o) = \frac{c_o + (1-\lambda_2^o)Y}{2-\lambda_2^o} \tag{4}$$

The derivative of this price with respect to λ_2^o equals $(c_o - Y)/(2-\lambda_2^o)^2$. Since c_o must be smaller than the maximum willingness to pay Y for production to be positive, the price $p_2^{o*}(\lambda_2^o, c_o)$ declines with the level of altruism. A selfish firm with $\lambda_2^o = 0$ would charge the usual monopoly price $(c_o+Y)/2$ while a firm that cared equally for consumers as for its own profits ($\lambda_2^o = 1$) would charge the efficient price c_o. This argument establishes that the price that satisfies (4) always exceeds marginal cost.

Equation (3) allows for a simple interpretation of the outcome with altruism. With demand given by $K^o(1 - p_2^n/Y)$, marginal revenue is equal to $2p_2^o - Y$. At the same time, $(Y - p_2^o)$ equals the quantity demanded times Y/K^o, which is the derivative of price with respect to quantity. This means that (3) equates marginal cost to marginal revenue plus the marginal vicarious benefit from selling an additional unit. This marginal vicarious benefit equals the altruism parameter times the price reduction received by all existing customers when one more unit is sold.

Instead of supposing that consumers all base their purchases exclusively on their valuation for the good and the price, I suppose that a fraction γ bases its purchases also on their perceptions regarding their suppliers' altruism. To simplify, this fraction is randomly selected among the K^o potential buyers so that the demand by the remaining fraction equals $(1-\gamma)K^o(1-(p_2^o/Y))$. The fraction γ cares about the firm's altruism in a manner similar to that in Rotemberg (2007). In particular, the altruism of these consumers for a firm selling good j in period t is given by

$$\nu_t^j = -\xi(\bar{\lambda}, \hat{\lambda}_t^j, H_t^j) \tag{5}$$

The function ξ takes a value of zero if the indicator function $H_t^j = 0$ and if, given their information set $\hat{\lambda}_t^j$, consumers cannot reject the hypothesis that the firm took its current period actions by maximizing $W(\lambda)$ for $\lambda \geq \bar{\lambda}$. This information set includes any current available information about the firm selling good j at time t, including its price. If the data in $\hat{\lambda}_t^j$ allows consumer i to reject this hypothesis with a test of size (or significance level) α, the function ξ takes on the value $\bar{\xi} > 0$. The function ξ also equals $\bar{\xi}$ if the indicator function H_t^j is equal to 1. The indicator equals 1 if consumers were ever able to reject the hypothesis that the firm maximized $W(\lambda)$ for $\lambda \geq \bar{\lambda}$ in the past.

The basic idea behind (5), which neglects any baseline altruism from consumers to firms for simplicity, is that consumers tend to give firms the benefit of the doubt. They react negatively only when the odds are high that the firm is acting in a truly non-altruistic fashion. Rotemberg (2007) argues that this forbearance coupled with a severe reaction when a person's expectation regarding altruism is violated can explain experimental outcomes in ultimatum and dictator games. More closely related to the application at hand, it explains why most price changes go unchallenged while some price increases are accompanied by vociferous complaints against "price gouging" (see Rotemberg (2004), for illustrations of this phenomenon).

One simplification that is incorporated in (5) is that consumers do not remember all the details concerning a firm's behavior. They recall only whether the firm has "crossed the line" in the past. If it has not, consumers subject it to a new test of the null hypothesis that the firm is sufficiently altruistic. It it has, consumers treat it as being excessively selfish. This simplification of the memory process has some intuitive appeal and also considerably simplifies the analysis.[9] The analysis is also simplified by the assumption that every consumer who cares about the firm's attitude has the same altruism threshold, the same information about firms, the same significance level for its test and the same $\bar{\xi}$. In a more general model, these could differ across consumers, though it is worth noting that the model incorporates some heterogeneity because only a fraction γ of consumers cares about the firm's attitude.

Start with the case where, in period 2, H_2^o is zero so the firm has not been declared to be insufficiently altruistic in the past. Consumers in period 2 then test whether the price in period 2 maximizes $W_2^o(\lambda_2^o, c_o, p_2^o)$ for $\lambda_2^o \geq \bar{\lambda}$. Consumers use a statistical test because

[9] It bears some similarity to standard supergame strategies where players of repeated games "punish" defectors for a finite number of periods without using the behavior of the defector during the punishment interval as a gauge of the extent to which he deserves a shortening of his sentence.

they are uncertain of a firm's cost. All they know about this cost is that the firm's marginal cost c_o is drawn from the pdf G_c. Let c_o^α be defined as the smallest value of c_o such that $G_c(c_o) \geq 1-\alpha$. This means that a fraction smaller than α of firms have lower costs while no more than $1-\alpha$ have higher costs. A direct observation of the cost realization c_o^α would thus be the largest possible realization that would lead someone to fail to reject the hypothesis that the cost c_o is drawn from the distribution G_c

Consumers do not observe actual costs, but they do observe the price charged by the firm. They are thus able to test the joint null hypothesis that the firm's costs are drawn from this distribution and that the firm maximizes $W_2^o(\bar{\lambda}, c_o, p_2^o)$ so that its price is $p_2^o(\bar{\lambda}, c_o)$. They reject this hypothesis if and only if the price they observe exceeds $p_2^{o*}(\bar{\lambda}, c_o^\alpha)$. Therefore, ξ equals $\bar{\xi}$ for prices strictly above $p_2^{o*}(\bar{\lambda}, c_o^\alpha)$ and equals zero otherwise.

The net benefit that a consumer with $\xi = \bar{\xi}$ derives from buying a unit of the good is

$$\psi - p_2^o - \bar{\xi}E(p_2^o - c_o)$$

where E takes expectations conditional on information available to the consumer. As shown more explicitly below, the monopoly firm in this model has no incentive to charge a price below c_o and, indeed, can always assure itself some positive profits by setting $p_2^o > c_o$. Since the consumer knows this, $E(p_2^o - c_o) > 0$. This means that, for $\bar{\xi}$ large enough, $\bar{\xi}E(p_2^o - c_o) > Y - p_2^o$. A consumer who cares about the firm's altruism and for whom $\xi = \bar{\xi}$ then refrains from purchasing the good even if his valuation ψ is equal to the largest possible value, namely Y.

The result is that demand for the product is

$$K^o(1 - \frac{p_2^o}{Y}) \qquad \text{if} \qquad p_2^o < p_2^{o*}(\lambda_2^o, c_o^\alpha) = \frac{c_o^\alpha + (1-\bar{\lambda})Y}{2-\bar{\lambda}} \tag{6}$$

$$(1-\gamma)K^o(1 - \frac{p_2^o}{Y}) \qquad \text{otherwise} \tag{7}$$

Consider a firm that faces the demand (7) because it has already decided to charge a price above $p_2^{o*}(\bar{\lambda}, c_o^\alpha)$. Since this firm has lost a randomly selected fraction $(1-\gamma)$ of its potential customers, the total surplus of its consumers equals $(1-\gamma)$ times the expression in (1). This implies that this firm's objective is $(1-\gamma)W_2^o(\lambda_2^o, c_o, p_2^o)$. Thus, its welfare maximizing price is $p_2^{o*}(\lambda_2^o, c_o)$, just as if its demand were given by (6).[10]

A firm for whom $p_2^{o*}(\lambda_2^o, c_o)$ exceeds the threshold price $p_2^{o*}(\bar{\lambda}_2^o, c_o^\alpha)$ thus faces a tradeoff. If it charges $p_2^{o*}(\lambda_2^o, c_o)$, its price is "optimal" but it loses the fraction γ of its customers. Charging the threshold price is more attractive if

$$W_2^o(\lambda_2^o, c_o, p_2^{o*}(\bar{\lambda}, c_o^\alpha)) - (1-\gamma)W_2^o(\lambda_2^o, c_o, p_2^{o*}(\lambda_2^o, c_o)) > 0 \tag{8}$$

As shown in the Appendix, this is equivalent to

$$A(\lambda^o, c_o) \equiv \frac{(Y-c_o^\alpha)^2}{Y(2-\bar{\lambda})^2}(1-\bar{\lambda}+\frac{\lambda_2^o}{2}) + (Y-c_o^\alpha)\frac{c_o^\alpha - c_o}{Y(2-\bar{\lambda})} - \frac{(1-\gamma)(Y-c_o)^2}{Y(2-\lambda_2^o)}(1-\frac{\lambda_2^o}{2}) > 0$$

For c_o sufficiently close to Y (so that costs are high relative to the consumers' willingness to pay), the last term is relatively unimportant. The expression above then declines when c_o rises further so that firms with sufficiently high costs do have a tendency to exceed the cutoff price. Similarly, for c_o sufficiently close to Y, this expression is increasing in λ_2^o. Thus, when costs are high, more selfish firms are more likely to charge a price that exceeds the cutoff price.

This signaling game has the following equilibrium:

$$p_2^o(\lambda_2^o, c_o) = \begin{cases} p_2^{o*}(\lambda_2^o, c_o) & \text{if} \quad p_2^{o*}(\lambda_2^o, c_o) \le p_2^{o*}(\bar{\lambda}, c_o^\alpha) \\ & \text{or if} \quad p_2^{o*}(\lambda_2^o, c_o) > p_2^{o*}(\bar{\lambda}, c_o^\alpha) \text{ and } A(\lambda^o, c_o) < 0 \\ p_2^{o*}(\bar{\lambda}, c_o^\alpha) & \text{if} \quad p_2^{o*}(\lambda_2^o, c_o) > p_2^{o*}(\bar{\lambda}, c_o^\alpha) \text{ and } A(\lambda^o, c_o) > 0 \end{cases} \tag{9}$$

To see that this is an equilibrium, note that altruism-aware consumers do not wish to punish firms that charge the cutoff price $p_2^{o*}(\bar{\lambda}, c_o^\alpha)$ even if no firm charges a higher price. The reason is that they cannot reject the hypothesis that these firms are acceptable. Note also that this equilibrium is unique. No matter what other firms do, consumers cannot reject the hypothesis that a firm is good if it charges less than this cutoff price. By the same token, they can never accept this hypothesis if a firm charges more.

[10]The result that the optimal price is independent of whether he firm has lost customers obviously hinges on the assumption that consumers of all types are lost in the same proportion.

It might seem remarkable that there is such a simple unique equilibrium and that it can be derived without reference to the distribution of types (*i.e.*, the distribution of true levels of altruism). The reason the distribution of types plays such a muted role is that, by assumption, consumers give firms the benefit of the doubt. As long as they act as if they were altruistic, consumers are willing to purchase from them.

The uniqueness of the equilibrium hinges on the assumption that consumers try to ascertain whether a firms has solved a specific altruistic optimization problem. In a sense, the optimization problem that consumers ask their altruistic suppliers to solve is naive because suppliers are not expected to take into account that certain prices will lead consumers to set $\xi = \bar{\xi}$ and thereby stop buying. It is therefore worth demonstrating that the prices in (9) also constitute an equilibrium in the game where the ξ function depends on consumer's overall perception of the firm's altruism as opposed to depending on whether the firm charges a price that solves a particular altruistic optimization problem.

Suppose that the function ξ equals zero if firms set prices that do not allow altruism-aware consumers to reject the hypothesis that the firms altruism is $\bar{\lambda}$, and equals $\bar{\xi}$ otherwise. Assume, further, that firms set prices according to (9). It follows that the hypothesis that the firm's altruism is $\bar{\lambda}$ cannot be rejected when the price is smaller than equal to the cutoff price $p_2^{o*}(\bar{\lambda}, c_o^{\alpha})$, while the opposite is true for strictly higher prices. Consumers thus use this cutoff price which, in turn, implies that setting prices according to (9) is optimal. Thus, these equations are also a signaling equilibrium in this more standard specification. The equilibrium remains unique in this formulation as long as consumers believe that at least a trivial fraction of firms is simultaneously altruistic and naive, in the sense that they maximize (2) without worrying about whether they will be punished for doing so. As long as such firms exist, consumers do not punish firms that set prices according to (9), since it impossible to reject the null hypothesis that firms that set this price are altruistic and naive. All the firms that do not want to be identified as unacceptably selfish then charge this price as well.

I complete the analysis of period 2 by considering the case where $H_2^o = 1$. The firm then faces only $(1-\gamma)K^o$ potential customers so that, by the argument above, its optimal price is

$p_2^{o*}(\lambda_2^o, c_o))$. Keeping this in mind, I now turn to an analysis of the market for the old good in period 0. A firm producing this good is evaluated by whether its current price p_0^o maximizes $W(\lambda) = W_0^o(\lambda, c_o, p_0^o) + W_2^o(\lambda, c_o, p_2^o)$ for $\lambda \geq \bar{\lambda}$.[11] Under the consumer's null hypothesis that the firm maximizes $W(\lambda)$, the firms chooses p_2^o independently of p_0^o even though the two prices end up being equal. Consumers in period 0 thus reject the hypothesis that the firm is sufficiently altruistic on the basis of p_0^o if this price exceeds $p_0^{o*}(\bar{\lambda}, c_o^\alpha)) = p_2^{o*}(\bar{\lambda}, c_o^\alpha))$.

If a firm with altruism λ could avoid punishment, its optimal price would be $p_0^{o*}(\lambda, c_o)) = p_2^{o*}(\lambda, c_o))$. It thus faces a tradeoff once again if this price is larger than the cutoff price $p_0^{o*}(\bar{\lambda}, c_o^\alpha))$. If it charges a price higher than the cutoff price, it has a lower demand for the old good in periods 0 and 2. It would also have a lower demand for the new good, if it were to introduce such a good in period 1. Ignoring this possibility for the moment, a firm with altruism parameter below $\bar{\lambda}$ gains 2 times the expression in (8) by charging the cutoff price instead of a higher price. This gain is positive, once again, if A_o is positive. For a firm with no intention of introducing a new good in period 1, the unique signaling equilibrium in period 0 is identical to the equilibrium in period 2. In particular, a firm with altruism parameter λ and cost c_o charges.

$$p_0^o(\lambda, c_o)) = \begin{cases} p_0^{o*}(\lambda, c_o) & \text{if} \quad p_2^{o*}(\lambda, c_o) \leq p_0^{o*}(\bar{\lambda}, c_o^\alpha) \\ & \text{or if} \quad p_0^{o*}(\lambda, c_o) > p_0^{o*}(\bar{\lambda}, c_o^\alpha) \;\; \text{and} \;\; A(\lambda^o, c_o) < 0 \\ p_0^{o*}(\bar{\lambda}, c_o^\alpha) & \text{if} \quad p_0^{o*}(\lambda, c_o) > p_2^{o*}(\bar{\lambda}, c_o^\alpha) \;\; \text{and} \;\; A(\lambda^o, c_o) > 0 \end{cases} \tag{10}$$

While the distribution of types is not needed to analyze the equilibrium of the model, I simplify the discussion of quality below by supposing that there are only two possible values for λ. For some firms (which I will call altruistic), this equals $\bar{\lambda}$ while for others (the selfish ones) this equals zero. The analysis of equilibrium quality below is further simplified by supposing that the actual cost of production is the same for all firms. This would appear to run counter the idea that consumers use a statistical test to gauge a firm's altruism because they are uncertain about the firm's actual condition. Interestingly, however, the special case

[11] To avoid clutter, I drop the subscripts and subscripts for the altruism parameter λ from now on, though it remains understood that consumers evaluate the current altruism of a firm using only the information available currently (and only use the past if they remember that the firm has been insufficiently altruistic).

where consumers actually know the cost of the firm is perfectly consistent with the model. To see this, denote the common level of marginal cost by c_o^α. Altruism-aware consumers then continue to expect firms with $\lambda = \bar{\lambda}$ to charge $p_2^{o*}(\bar{\lambda}, c_o^\alpha)$ and reject the hypothesis that a firm is sufficiently altruistic if it charges a higher price. While the case where consumers know the firm's cost is less realistic, it simplifies the model by giving a simple deterministic value to a firm's benefit from charging the price that makes it appear altruistic. For a firm with altruism parameter λ, this benefit equals

$$\Delta(\lambda, c_o^\alpha) = W_2^o(\lambda, c_o^\alpha, p_2^{o*}(\bar{\lambda}, c_o^\alpha)) - (1-\gamma)W_2^o(\lambda, c_o^\alpha, p_2^{o*}(\lambda, c_o^\alpha)) \tag{11}$$

Because Δ plays a large role in the analysis below, it is worth discussing its dependence on the parameters $\bar{\lambda}$ and γ. For this purpose, consider a selfish firm that is considering the tradeoff between charging the selfish price $\frac{Y+c_o^\alpha}{2}$ and the altruistic price $\frac{Y(1-\bar{\lambda})+c_o^\alpha}{2-\bar{\lambda}}$. Since W is just equal to profits in this case, Δ is given by

$$\Delta(0, c_o^\alpha) = \frac{(Y - c_o^\alpha)^2}{Y}\left[\frac{1-\bar{\lambda}}{(2-\bar{\lambda})^2} - \frac{1-\gamma}{4}\right]$$

For every $\bar{\lambda}$, there is thus a γ that makes the term in square brackets, and hence Δ, equal to zero. Figure 1 plots this critical value of γ and shows that it is a convex function of $\bar{\lambda}$. It is convex because firms suffer only second order losses when they depart slightly form their optimal price. So, imitating the price of firms with low values of $\bar{\lambda}$ leads to negligible costs. Even if $\bar{\lambda}$ is as large as .5, γ need only be equal to about .11 for a selfish firm to be willing to imitate the price of an altruistic one.

For Δ to be positive, γ must be larger than the level depicted in this Figure. Because $(1-\gamma)$ multiplies the welfare that firms would obtain if they could charge the price that they most prefer, the difference between the actual value of γ and that depicted in the figure gives the percentage of unconstrained welfare that the firm loses if it charges its preferred price. Thus, a firm with $\gamma = .2$ that fails to imitate altruistic firms when $\bar{\lambda} = .5$ loses about 9% of the level of its unconstrained welfare.

1.2 The New Good

A product that competes in a different market can be introduced in period 1. In this market, there are K^n potential consumers. Each of these buys at most a single unit. If the new good is of low quality, its value to all consumers equals L. A newly introduced high quality good, by contrast, is valued differently by different consumers. Let θ denote this valuation where θ is drawn from the pdf F_θ. To express the utility received by consumers, let I^h and I^ℓ be indicator functions that take a value of 1 if the consumer buys a high quality new good or a low quality new good respectively. Otherwise, these indicator functions equal 0. Since consumers cannot buy more than one of these goods, at most one of these indicator functions can equal 1. Supposing that the consumer pays p_1^n for a newly introduced good, his actual utility is

$$I^h\theta + I^\ell L - p_1^n \tag{12}$$

In period 1, a potential entrant has a probability $\beta < 1$ of having the capacity to produce a new good that competes in this market. In other words, there is an indicator variable σ_H, which equals 1 with probability β and equals zero otherwise. When it equals zero, the potential entrant is unable to produce such a good. By contrast, when it equals 1, the potential entrant can produce one of the two goods whose demand was described above. The reason to set $\beta < 1$ is to ensure that, as in real-world markets, new goods are not introduced in every period. This matters from a modelling point of view, because it avoids any stigma attached to the non-introduction of a good by an incumbent firm. Even so, most of the analysis is concerned with situations where $\sigma_H = 1$ so that firms have a nontrivial product introduction decision.

For simplicity, I suppose that both the high and the low quality new goods have the same marginal cost of production $\bar{c}$. There is, however, a difference in the cost of the two goods in that the high quality good has a setup cost κ while the low quality good involves no setup cost. Consumers do not know the quality of the new good in period 1 though they do learn it in time for making purchases in period 2.

1.2.1 Period 2

The analysis is simplified further by supposing that $\bar{c} > L$ so that low quality new goods are sufficiently bad that consumers are not willing to pay their marginal cost of production. As a result, sellers of a new good that is known to be of low quality in period 2 cannot sell this good profitably. It turns out to be convenient to let ϵ denote $\bar{c} - L$, the excess of the cost of production relative to the consumers' valuation of this good. In a sense to be made precise below, I will focus on situations where ϵ is relatively small.

By contrast, if the new good is known in period 2 to be of high quality, people with $\theta \geq p_2^n$ gain positive surplus by buying it. The demand for this good is then

$$d_2^n = K^n(1 - F_\theta(p_2^n)) \tag{13}$$

where d_2^n is the quantity demanded. As in the case of F_ψ, the analysis is simplified if F_θ is set to be uniform between 0 and Y. Indeed, the analysis is then the same as that for the old good in period 2. The demand curve in (13) is then linear and consumer surplus B_2^n is given by the expression in (1) with p_2^o replaced by p_2^n and K^o by K^n.

The incentives faced by the firm in period 2 depend to some extent on whether it is also supplying the old good. If it does not, its welfare in period 2 is given by

$$W_2^n(\lambda, p_2^o) = K^n \left\{ \left(1 - \frac{p_2^n}{Y}\right)(p_2^n - \bar{c}) + \frac{\lambda(Y - p_2^n)^2}{2Y} \right\}, \tag{14}$$

which is analogous to (2).

For a firm with altruism parameter $\bar{\lambda}$, the equilibrium price is $p_2^n(\bar{\lambda})$, which equals $p_2^{o*}(\bar{\lambda}, \bar{c})$ in (4). Its resulting level of period 2 welfare is $W_2^n(\bar{\lambda}, p_2^{o*}(\bar{\lambda}, \bar{c})))$. For a selfish firm, the equilibrium price $p_2^n(0)$ is also $p_2^{o*}(\bar{\lambda}, \bar{c})$ if $\Delta(0, \bar{c}) \geq 0$. Its period 2 welfare is then $W_2^n(0) = W_2^n(0, p_2^{o*}(\bar{\lambda}, \bar{c})))$. If, instead, $\Delta(0, \bar{c}) < 0$, the selfish entrant charges $p_2^n(0) = p_2^{o*}(0, \bar{c})$ and its resulting welfare is $W_2^n(0) = (1 - \gamma)W_n^o(0, p_2^{o*}(0, \bar{c})))$. Note that, in either case, $W_2^n(\bar{\lambda}) > W_2^n(0)$. This occurs both because the altruistic firm enjoys vicariously the welfare of its consumers and because the altruistic firm is able to charge its optimal price without fear of punishment.

Now consider the incentives faced by a firm that sells both the new and the old goods. If this firm charges more than $p_2^{o*}(\bar{\lambda}, \bar{c})$ for the former or more than $p_2^{o*}(\bar{\lambda}, c_o^{\alpha})$ for the latter, it is seen as insufficiently altruistic by the consumers with preferences given by (5). Firms with altruism parameter $\bar{\lambda}$ obviously wish to charge these prices. Selfish firms charge these prices as well if $\Delta(0, \bar{c}) + \Delta(0, c^{\alpha}) \geq 0$. If, by contrast, $\Delta(0, \bar{c}) + \Delta(0, c^{\alpha}) < 0$, selfish firms charge $p_2^{o*}(0, \bar{c})$ and $p_2^{o*}(0, c_o^{\alpha})$ for the new and old good respectively.

1.2.2 Behavior of New Entrants in Period 1

Focus now on period 1. A single firm has the potential to produce the new good and, in this subsection, it does so with a new brand. This means that the entrant has not sold any other good before and is thus devoid of any reputation to protect. If the entrant produces low quality in period 1, her sales and welfare in period 2 equal zero. By contrast, her welfare in period 2 is $W_2^n(\lambda)$ if she produces high quality.

If the entrant is altruistic, her utility depends on the level of consumer surplus, which depends in turn on the quality of the good. While consumers only learn this quality after their purchase is complete, the seller knows it before and can thus compute the surplus that consumers obtain *ex post*. Let $B_1^n(p_1^n, \text{high})$ be this surplus when quality is high, while $B_1^n(p_1^n, \text{low})$ is the surplus when quality is low. With sales of q_1^n at a price of p_1^n in period 1, an entrant with an altruism parameter of λ prefers to produce high to low quality in period 1 if

$$W_2^n(\lambda) + \lambda(B_1^n(p_1^n, \text{high}) - B_1^n(p_1^n, \text{low})) \geq \kappa \tag{15}$$

Similarly, this entrant prefers to produce high quality rather than not producing the new good if

$$W_2^n(\lambda) + \lambda B_1^n(p_1^n, \text{high}) + q_1^n(p_1^n - \bar{c}) \geq \kappa \tag{16}$$

Lastly, this entrant prefers to produce a low quality good to not producing the new good if

$$\lambda B_1^n(p_1^n, \text{low}) + q_1^n(p_1^n - \bar{c}) > 0 \tag{17}$$

An equilibrium where all entrants supply high quality exists if a price can be found such that (15) and (16) are satisfied when the demand at this price is given by (13) and such that the entering firm does not wish to deviate from this price. This equilibrium involves some coordination between the actions of producers and the beliefs of consumers, since demand is only given by (13) if consumers believe that high quality is forthcoming.

I first analyze a benchmark case where all entrants are selfish and consumers know this to be the case. This benchmark case is most easily analyzed by supposing also that $\gamma = 0$ so that firms are not punished for their selfishness. Even so, $W_2^n(0)$ still denotes the welfare of these entrants in period 2 if they provide high quality. This benchmark case provides a useful contrast for the analysis where consumers expect firms to be altruistic. The following proposition characterizes equilibria in this case

Proposition 1. *If $\gamma = 0$ and all firms have $\lambda = 0$, entrants provide high quality and charge the price $p_2^{o*}(0, \bar{c})$ if and only if*

$$W_2^n(0) \geq \kappa \tag{18}$$

Proof. When consumers expect high quality, the price $p_2^{o*}(0, \bar{c})$ is optimal for selfish firms. Since this yields positive profits, (18) implies that (15) and (16) are satisfied at this price. Thus, the firm wishes to provide high quality and has no reason to deviate from this price. This establishes that a high quality equilibrium exists when (18) is satisfied.

Conversely, the violation of this condition implies that (15) is violated as well so the firm prefers low to high quality at any price. □

The reason (18) is so essential for selfish firms is that, ignoring the setup cost, profits in period 1 are the same whether the firm produces high or low quality. Thus, the selfish firm's choice of high as opposed to low quality is based exclusively on whether second period profits cover the setup costs.

Consider now the incentives faced by an altruistic firm. For such a firm, the choice between high and low quality depends also on the effect of quality on consumer welfare. The benefits of high quality affect (16) and (15) equally (since both conditions involve comparing the provision of high quality to an alternate course of action) while the losses from low quality affect only (15). To determine the conditions under which (16) is a tighter constraint than (15), one must compute the size of losses when quality is low.

From the utility function (12), consumers lose $(L - p_1^n) = (\bar{c} - \epsilon - p_1^n)$ for each low quality unit that they buy at a price of p_1^n. We thus have

$$B_1^n(p_1^n, \text{low}) = (\bar{c} - \epsilon - p_1^n)q_1^n \tag{19}$$

Conditions (16) and (15) are thus identical when the price p_1^n is equal to the critical value $\tilde{p}_1^n$, such that

$$\lambda(\tilde{p}_1^n - \bar{c} + \epsilon)q_1^n = (\tilde{p}_1^n - \bar{c}) \qquad \text{or} \qquad \tilde{p}_1^n = \bar{c} + \frac{\lambda}{1-\lambda}\epsilon. \tag{20}$$

For prices above $\tilde{p}_1^n$, (15) is a tighter constraint because sales are so profitable that abstaining from production is not attractive to the firm. By contrast, for a low price close to $\bar{c}$, firm profits are negligible but consumer losses are not because $\epsilon > 0$. Thus, the vicarious losses to an altruistic firm from providing low quality exceeds its profits and the constraint (16) that keeps the firm from not producing at all is tighter than the constraint that the firm prefer high to low quality.

As mentioned above, I focus on the case where ϵ is relatively small. I suppose, in particular, that ϵ is small enough that the critical price $\tilde{p}_1^n$ is smaller than the altruistic firm's desired price. Using (4), the latter equals $(\bar{c} + (1-\bar{\lambda})Y)/(2-\bar{\lambda})$, so that it is always possible to find an ϵ such that $\tilde{p}_1^n$ is below this.

To analyze the equilibrium in the general case (where selfish firms often mimic altruistic ones), it is convenient to start with the special case where all firms are known to have an altruism parameter $\bar{\lambda}$. Demand is then given by $K^n(1 - p_1^n/Y)$ and consumer welfare can be computed as in (1) so that $B_1^n(p_1^n, \text{high})$ equals $K^n[Y - p_1^n]^2/2Y$. If this price p_1^n is above the critical price $\tilde{p}_1^n$, high quality is provided if (15) is satisfied. This requires that

$$W_2^n(\bar{\lambda}) + \bar{\lambda}\frac{K^n[Y - p_1^n)]^2}{2Y} - \bar{\lambda}\left[K^n\left(1 - \frac{p_1^n}{Y}\right)(\bar{c} - \epsilon - p_1^n)\right] \geq \kappa \tag{21}$$

Now consider the derivative of the left hand side of (21) with respect to price. This is

$$\bar{\lambda}K^n\left[-\frac{Y-p_1^n}{Y}+\frac{1}{Y}(R-\epsilon-p_1^n)+\left(1-\frac{p_1^n}{Y}\right)\right]=\frac{\bar{\lambda}K^n}{Y}[\bar{c}-\epsilon-p^n]$$

which is negative as long as firms do not charge prices below $\bar{c}-\epsilon$. Since $\bar{c}-\epsilon$ is below the critical price, this analysis demonstrates that high quality becomes easier to sustain when the price is lowered from the price that is optimal towards the critical price $\tilde{p}_1^n$.

For p_1^n below the critical price, high quality is provided if (16) is satisfied. This requires that

$$W_2^n(\bar{\lambda})+\bar{\lambda}\frac{K^n(Y-p_1^n)^2}{2Y}+\left(1-\frac{p_1^n}{Y}\right)(p_1^n-\bar{c})\geq\kappa \tag{22}$$

It is apparent that the left hand side reaches a maximum at $p_2^{o*}(\bar{\lambda},\bar{c})$, the price that firms wish to charge for high quality. Moreover, since the expression is quadratic in the price, it declines monotonically as the price is lowered below this. This means that high quality becomes harder to sustain as the price is lowered below the critical price. Putting this together with the argument above, it follows that high quality cannot be sustained at any price if it cannot be sustained at the critical price $\tilde{p}_1^n$. If firms do supply high quality at this price, the price that they charge in equilibrium is either the highest price that satisfies (21) or the firms preferred price $p_2^{o*}(\bar{\lambda},\bar{c})$, whichever is smaller. The reason is that the firm has no desire to charge a price above this preferred price but cannot convince its customers that it is supplying a high quality good unless the price satisfies (21)

Retaining for the moment the assumption that $\gamma=0$, I now turn to the question of whether high quality will continue to be provided when some firms are altruistic while others are not. Suppose that entrants have a probability μ of having an altruism parameter equal to $\bar{\lambda}$ and that they have a probability $(1-\mu)$ of being selfish. I focus on the case where (18) is violated, because this assures that selfish firms prefer to provide low rather than high quality. The question is then whether this incentive to provide low quality by a fraction $(1-\mu)$ of firms is sufficient to prevent altruists from offering high quality as well.

One determinant of this is whether or not

$$\mu Y+(1-\mu)L\geq\bar{c}\qquad\text{or}\qquad\mu(Y+\epsilon-\bar{c})\geq\epsilon. \tag{23}$$

If this condition is satisfied, consumers who value the high quality good at Y (θ's largest possible value) are willing to pay the marginal cost of production of the new good even if only altruistic suppliers provide high quality. If (23) is not satisfied, there is no equilibrium where the altruistic firms provide high quality while the selfish ones provide low quality. The reason is that selfish firms stand ready to sell low quality goods if the price equals at least $\bar{c}$, but the violation of (23) implies that there would be no demand for the new good at a price of $\bar{c}$ even if altruistic firms sold high quality goods at this price. Higher prices reduce consumer's willingness to buy a good of uncertain quality even further. Lower prices, instead, lead the selfish low quality firms to leave the market. Note that (23) is more likely to be violated when μ is low so that true altruism is relatively rare. Indeed, one can always find a μ low enough that (23) is violated.

If, instead, (23) is satisfied, there is at least the potential for a "mixed" equilibrium where altruistic firms sell high quality and selfish firms sell low quality. Consumers for whom $(\mu\theta + (1-\mu)L)$ exceeds the price p_1^n buy the good so that its demand d_1^n is given by

$$d_1^n = K^n \left(1 - \frac{p_1^n - (1-\mu)L}{\mu Y}\right) \tag{24}$$

One immediate property of this demand worth noting is that its derivative with respect to μ equals $(K^n/Y)(p_1^n - L)/\mu^2$. Since L is smaller than the marginal cost $\bar{c}$, this is positive if any goods are actually sold. It follows that this demand rises when the firm is more likely to be selling high quality.

A mixed equilibrium with a price above $\bar{c}$ requires that, for the altruistic firms, (15) and (16) hold at this price. The following proposition demonstrates that these conditions are more stringent than in the case where it is common knowledge that firms are altruistic (so that $\mu = 1$).

Proposition 2. *For any* $p \geq \bar{c}$, $B_1^n(p, \text{high})$ *and* $-B_1^n(p, \text{low})$ *are higher when* $\mu = 1$ *than when* $\mu < 1$.

Proof. $B_1^n(p, \text{high})$ is given by

$$B_1^n(p, \text{high}) = K^n \int_{\frac{p-(1-\mu)(\bar{c}-\epsilon)}{\mu}}^{Y} \frac{\theta - p}{Y} d\theta \tag{25}$$

Moreover, $p \geq \bar{c}$ implies $p - \bar{c} + \epsilon > 0$, which implies that $(1 - \mu)(p - \bar{c} + \epsilon) > 0$ when $\mu < 1$. Therefore, $[p - (1 - \mu)(\bar{c} - \epsilon)]/\mu > p$. This means that, when $\mu < 1$, θ goes between a number strictly larger than p and Y in the integral above, whereas it goes between p and Y when μ equals one. Therefore, $B_1^n(p, \text{high})$ is larger in the latter case.

Similarly, $B_1^n(p, \text{low})$ is given by

$$-B_1^n(p, \text{low}) = K^n \left[1 - F\left(\frac{p - (1 - \mu)(\bar{c} - \epsilon)}{\mu}\right)\right] (p - \bar{c} + \epsilon)$$

so that $B_1^n(p, \text{low})$ is also larger when $\mu = 1$. □

These conditions establish that, for any given price, the left hand side of (15) and (16) are larger when $\mu = 1$ so that these conditions are easier to meet. The intuition for this result is straightforward. When some firms are providing low quality, demand is lower so that a firm producing high quality generates less consumer surplus. Similarly, the reduced sales mean that total customer losses are not as large if consumers buy low rather than high quality. The vicarious benefits of providing high quality are therefore reduced and this mutes altruists' incentives to raise quality.

A selfish firm is unwilling to sell goods at a price below $\bar{c}$ when (18) is violated. A firm that is willing to sell at such a price is thus necessarily altruistic.[12] Relative to not selling any good at all, an altruistic firm is worse off selling a low quality good at a price below $\bar{c}$, since it incurs losses that cannot be made up by gains from consumers. Thus, a firm that charges less than $\bar{c}$ must be selling a high quality good and this faces the demand curve (13). If the resulting allocation satisfies (15), the altruistic firm is indeed willing to provide high quality at this price. This can yield an equilibrium with high quality even if (23) is violated. Note, however, that if a price below $\bar{c}$ satisfies (15) so does a price equal to the critical value

[12]The model thus allows a low price to be used as a signal of quality. See Bagwell and Riordan (1991) for a model where, because high quality goods cost more than low quality ones, it is high prices that can be signals of quality.

$\tilde{p}_1^n$. This means that the parameters that lead all new suppliers to supply high quality high quality when $\mu < 1$ also imply that all firms would produce high quality if μ were equal to one.

The reverse is obviously not true, however. There are parameters such that (15) is satisfied by the critical price, which can exceed $\bar{c}$ by a substantial margin, but where this condition is not satisfied by $\bar{c}$ so that altruistic firms would be unwilling to sell high quality at this price. If, in addition, (23) is violated, there is no mixed equilibrium in which altruistic firms produce high quality.

This has established that the possibility that firms might be selfish reduces the range of parameters for which high quality provision is an equilibrium. It is also immediately obvious that in the cases where (23) is satisfied and altruistic firms produce high quality at a price above $\bar{c}$, the demand for the new good at a given price is lower than when selfish firms are absent.

So far, the discussion in this section has been carried out setting $\gamma = 0$ so that consumers are not concerned with the altruism of firms. As I now show, however, a positive γ does not facilitate the provision of high quality by new entrants. Indeed, it makes this slightly more difficult. To see this, note first that a positive γ has no effect on altruistic firms since these are already acting in accord with the expectations of altruism-aware consumers. A positive γ does affect selfish firms because it reduces $W_2^n(0)$, the welfare of these firms in period 2 if they provide high quality. The reason is that they must either charge a price they regard as suboptimal or lose a fraction $(1 - \gamma)$ of their customers. This reduction in $W_2^n(0)$ makes it more difficult to satisfy (18), and therefore more difficult for them to provide high quality. When condition (18) is violated, the analysis of selfish firms is the same as when $\gamma = 0$. As in that case, selfish firms provide low quality if they enter and charge the same price as altruists. Consumers realize this and lower their demand for goods accordingly.

In summary, this subsection shows that the presence of selfish potential entrants reduces the range of parameters such that high quality is provided by all firms that sell the new good. When consumers do not expect to receive high quality, their demand for the new good at any given price is obviously lower. In spite of this, there are circumstances where a new good is provided either at a price so low that only altruistic firms sell it or at a higher price that leads selfish firms to provide a low quality good.

1.2.3 Behavior of old brands in period 1

I now show that the range of parameters that allows firms to provide high quality expands when new products are introduced by firms that already supply the old good. Indeed, I show that it is now possible for selfish firms to sell high quality good even if (18) is violated. I focus on the case where γ, $\Delta(0, c^\alpha)$ and $\Delta(0, \bar{c})$ are all positive. This means that selfish firms charge the same prices in period 2 than their altruistic counterparts.

Given that altruistic firms provide high quality, the provision of low quality leads consumers to reject the hypothesis that the firm is altruistic. A firm selling a new good of low quality thus loses a fraction γ of the customers for its old good in period 2. For a selfish firm, the cost of these customer losses equals $\Delta(0, c^\alpha)$. Thus, the condition under which a selfish firm prefers producing high quality rather than low quality ceases to be (15) and becomes

$$W_2^n(0) + \Delta(0, c^\alpha) \geq \kappa \tag{26}$$

Similarly, the condition under which such a firm prefers to produce a low quality good rather than not producing the new good at all is no longer (17) and is instead

$$q_1^n(p_1^n - \bar{c}) - \Delta(0, c^\alpha) > 0 \tag{27}$$

The condition (16) that the selfish firm prefer the production of high quality to not producing the new good remains unchanged. It can be rewritten as

$$W_2^n(0) + q_1^n(p_1^n - \bar{c}) \geq \kappa \tag{28}$$

The changes in (15) and (17) make it easier for equilibria where high quality goods are produced to exist. This is demonstrated in the next two propositions.

Proposition 3. *Consider a price* p_1^n *which is an equilibrium with high quality in the case where* $\mu = 1$*. Then both altruistic and selfish firms provide high quality new products at this price when* $\mu < 1$ *as long as a)* (26) *is satisfied and b)* (28) *is satisfied when* q_1^n *is given by* $F^n(1 - p_1^n/Y)$*.*

Proof. If consumers expect high quality at p_1^n, the quantity demanded is $F^n(1 - p_1^n/Y)$. Moreover, because this is an equilibrium price when $\mu = 1$, altruistic firms provide high quality if they expect selfish firms to do so. Moreover, if (26) and (28) are satisfied at this price-quantity combination, selfish firms produce high quality as well since they prefer this to producing low quality and to producing no new good. There is thus an equilibrium where consumers expect high quality and both types of firms supply it. □

To see that this proposition implies that high quality is easier to provide when firms have an existing product, note that selfish new entrants are unwilling to provide high quality unless (18) is satisfied. Moreover (18) is more difficult to satisfy than either (26) or (28). Thus, when (18) is violated while (26) and (28) are satisfied at p_1^n, the fact that new goods are being provided by existing brands ensures that all suppliers offer high quality. What is attractive about this proposition is that it covers a case where firms provide high quality not because they are in fact altruistic but only because they pretend to be.

In the next proposition, (28) is violated so that selfish firms are not induced to supply high quality. Nonetheless, a role remains for the introduction of new products by existing brands.

Proposition 4. *Let* $\hat{p}_1^n$ *denote the minimum of the critical price* $\tilde{p}_1^n$ *and the price that makes* (27) *hold as an equality when* q_1^n *is given by* $F^n(1 - \tilde{p}_1^n/Y)$*. Then, if* (15) *and* (16) *are satisfied at this price while* (28) *is not, altruistic firms provide high quality while selfish firms do not sell the new good.*

Proof. With (28) failing so that the selfish firm prefers not to produce over producing a high quality good, the definition of $\hat{p}_1^n$ leads the selfish firm not to produce at all. This means that the altruistic's firm's actions are guided by (15), (16) and (17). Given that the first two inequalities are satisfied, altruistic firms produce high quality. □

What occurs here is that the fear of losing customers for its old good is sufficient to ensure that selfish firms do not provide low quality, though it is not enough to actually lead them to produce high quality new goods. Nonetheless, the lack of low quality provision by selfish firms helps altruistic ones sell high quality goods. Recall that, when new goods were provided by new entrants, altruists had to charge a price below $\bar{c}$ to prevent selfish firms from selling low quality goods in the case where (18) was violated. When the new good is sold by incumbent firms, selfish firms require a price premium above $\bar{c}$ to be willing to sell a low quality good (because doing so leads to a loss in period 2). The fact that selfish firms are now deterred even with a price above $\bar{c}$ helps the altruists provide high quality because condition (16) becomes easier to meet as the price rises from $\bar{c}$ to the critical price $\tilde{p}_1^n$.

The discussion in this section has been couched in terms of the existence of equilibria with high quality. This corresponds fairly closely to the concerns of marketers who study whether the demand for a new product will be high or low. In the case where there is no equilibrium where any firm provides high quality as in the case where (18) and (23) are violated and new firms provide the good, demand will obviously be low at any price. In the cases where consumers can expect altruists to provide high quality while selfish firms provide low quality, demand will still be considerably lower than it would be if all firms could be counted on to seek to produce high quality.

One interpretation of the model developed up to this point is to see it as supposing that all incumbent firms are expected to be equally altruistic towards all consumers. While this interpretation has the benefit of simplicity, it is not consistent with the tendency of consumers to have see themselves as being involved in a personal relationship with the brands that they purchase. This would suggest that consumers expect more altruism from firms from whom they have been keen buyers in the past. An example of this attribution can be found in the narrative that Fournier (1998, p. 355) attributes to "Karen." In recollecting a design change by Mary Kay cosmetics, "Karen" says: "I remember feeling, 'how could they do that to me?'."

As discussed in the introduction, the attribution of extra altruism to brand managers towards core customers is actually somewhat rational. The model presented in this paper makes it clear that managers of firms that feel more altruism towards a group of customers will tend to design products that these customers like more. If consumers expect brand managers to persist, the logic of using all available data for inference would lead them to expect more altruism from managers of brands that they enjoy. This higher expected altruism might also lead to a higher altruism threshold so that these managers are subject to a higher standard. An extreme form of this would be to suppose that they expect an altruism $\bar{\lambda}$ only from brands that they see as having produced a product that they are particularly keen on.

This raises the question of whether the expectation of altruism leads people to be more forgiving of transgressions or whether it leads them to be angered more easily. The view that consumers who expect more altruism from a company impose a higher altruism threshold (so that they become angry in response to actions they would tolerate from others) is consistent with the later view. Some evidence for this point of view can be found in Ohbuschi *et al.* (2004). They show that people are angered when people who are close to them engage in actions that do not, for example, take proper account of their feelings while anger is less likely to be triggered in response to such behavior from people who are less close.

Suppose, then, that one accepts that such reactions apply also to brands because, as emphasized by Fournier (1998) people's relationship to certain brands can be quite intense. One can then reinterpret the analysis that I have carried out in this subsection as applying only to those brands with whom certain people have such intense connections. In other words, people will only trust the new products of those brands for whom consumers know that the provision of low quality will lead a fraction γ of customers to react with anger in the market for the existing product.

Under this reinterpretation, the model implies that the capacity of brands to extend into new product categories is enhanced when there exist customers who expect these brands to be particularly keen to seek high quality in the new category. The model thus avoids the implication that any existing brand has an equal advantage in all potential new products. In the next section, I illustrate an even more surprising implication, namely that it is sometimes helpful for a brand to be seen as caring only for some - as opposed to for all - its customers.

2 Targeted versus broad brands

In this section I consider an extension where a brand can either be altruistic towards all the potential customers of a new good or it can be altruistic only towards the most quality-sensitive subset of these customers. The section is designed to show that there are circumstances where the brand that is more selective actually generates more demand for its new product. This occurs because firms that care only about their most quality-sensitive customers turn out to have a higher incentive to improve their quality relative to reducing their costs of production. Another way of thinking about this is that they have lower incentives to do what price-sensitive customers want, which is to ultimately cut costs.

I consider a situation where, as before, firms can introduce goods whose value to consumers depends on the consumer's realized value of θ. Now, however, the value of these goods to consumers equals $m\theta$ where m is a quality parameter that is constant across consumers. All consumers prefer a higher value of m, and this preference is particularly strong for people whose realized θ is large. The key choice faced by firms in this section is whether to choose a high or a low value for this quality parameter m.

Since consumers with higher values of θ are more quality sensitive, it is appealing to suppose that "high-end" firms care only about consumers with relatively high values of θ. I assume, in particular, that there exist firms that feel altruism only towards consumers whose θ lies between X and Y. The behavior of these firms will be contrasted with that of firms that feel the same altruism towards all their customers.

To keep the analysis simple, I do not explicitly analyze the behavior of selfish firms in this section. The implicit assumption is that, as for certain parameters in the earlier section, new firms are unable to provide high quality goods so that only incumbents can do so. These act altruistically because they can be punished in their existing good if their behavior in the market for the new good reflects insufficient altruism. I thus analyze the behavior of incumbents as if they had the altruism that people expect of them, on the ground that acting in this way prevents them from being punished by customers of their core good.

2.1 Period 2

In period 2, customers know that the good is worth $m\theta$ to them. They thus purchase the good if $m\theta$ exceeds the price p_2^n so that demand is $K^n(1 - p_2^n/mY)$. Adapting the analysis of section 1.1, the logic of (1) implies that total consumer welfare is $K^n(mY - p_2^n)^2/2mY$, while that of (4) implies that the optimal price for firms that care about all their consumers is

$$p_2^n = \frac{mY(1 - \lambda_2^n) + c}{2 - \lambda_2^n} \tag{29}$$

where c is marginal cost. For future reference, it is worth recording the lowest θ which still buys the good. I denote this by θ^- and, since this equals p_2^n/m, it is given by

$$\theta^- = \frac{(1 - \lambda_2^n)Y + c/m}{2 - \lambda_2^n} \tag{30}$$

Firm welfare when a firm that cares for all consumers charges the price in (29) equals

$$W_2^n(m, c) = K^n \left\{ \left(1 - \frac{p_2^n}{mY}\right)(p_2^n - c) + \frac{\lambda_2^n(mY - p_2^n)^2}{2mY} \right\} = K^n \left(\frac{mY - c}{2 - \lambda_2^n}\right)^2 \left(1 - \frac{\lambda_2^n}{2}\right)\frac{1}{mY} \tag{31}$$

where I explicitly let m determine W_2^n.

The restriction that some firms care only for consumers with $\theta > X$ matters only if $X > \theta^-$, and this fits with the idea that these firms care only about the keenest consumers. I thus assume this from now on. The consumer surplus of consumers with θ between X and Y is then

$$K^n \int_X^Y (m\theta - p_2^n)dF_\theta(\theta) = K^n \left(1 - \frac{X}{Y}\right)\left(\frac{m(X + Y)}{2} - p_2^n\right) \tag{32}$$

This expression can easily be interpreted. It equals the number of buyers with θ between X and Y, which is $K^n(1 - X/Y)$, times their average surplus, which is $m(X + Y)/2$.

I denote the welfare of a firm with altruism λ_2^n for only these consumers by W^x. In period 2, such a firm maximizes

$$W_2^x(m,c,X) = K^n\left[\left(1-\frac{p_2^n}{mY}\right)(p_2^n - c) + \lambda_2^n\left(1-\frac{X}{Y}\right)\left(\frac{m(X+Y)}{2} - p_2^n\right)\right]. \tag{33}$$

The first order condition for this maximization can be written as

$$1 - \frac{2p_2^n - c}{mY} - \lambda_2^n\left(1-\frac{X}{Y}\right) = 0.$$

So that the optimal price is

$$p_2^n = \frac{mY + c - \lambda_2^n m(Y-X)}{2} \tag{34}$$

This price is clearly rising in X. As X rises, the firm cares about fewer and fewer customers so that it has less and less of a desire to lower its price. A firm for whom $X = Y$ cares about no customers so that it acts as if its altruism parameter λ_2^n were equal to zero. At the opposite extreme, a firm that cares for all its customers acts as if X were equal to θ^-, and is optimal price is (29).

Since the price that satisfies (29) exceeds marginal cost, and the expression in (34) is larger for $X > \theta^-$, the price that satisfies (34) exceeds c as well. This means that the requirement that X exceed the minimum θ that leads people to buy the good implies that $m(Y - \lambda_2^n(Y-X)$ exceeds c.

One clear and unsurprising implication of (33) is that the firm is better off if either quality m rises or marginal cost c declines. This can be verified by differentiating this equation and obtaining

$$\frac{dW_2^x(m,c,X)}{dm} = \frac{p_2^n}{m^2Y}(p_2^n - c) + \frac{\lambda_2^n Y}{2}\left[1-\left(\frac{X}{Y}\right)^2\right] \tag{35}$$

$$\frac{dW_2^x(m,c,X)}{dc} = -\left(1-\frac{p_2^n}{mY}\right) \tag{36}$$

The first of these expressions is positive because p_2^n exceeds marginal cost while the second is negative because demand is positive only if p_2^n is smaller than mY. These signs imply that one can always find a combination of an increase in c and an increase in m that leave overall firm welfare constant.

The sign of the derivatives in (35) and (36) is independent of the size of the parameters λ_2^n and X. It is immediately apparent, however, that the size of these derivatives depends on X both directly and through the dependence of the price p_2^n on X. This is the basis of the finding that increases in X starting at its lowest possible value of p_2^n/m raise the desirability of increasing c and m simultaneously. This is demonstrated in the following proposition

Proposition 5. *Consider a combination of infinitesimal increases in c and m that leaves W_2^n unchanged when $X = \theta^-$. Then, this combination increases $W_2^x(X)$ when X is strictly above θ^-.*

Proof. For clarity, I neglect most superscripts and subscripts of W, λ and p in this proof. Using (31), the cost c that leads firms that care for all their consumers to obtain a particular welfare level W satisfies

$$c = mY - \sqrt{2(2-\lambda)mYW} \tag{37}$$

Using (37) to substitute for c in (33), one obtains

$$W^x(X) = \frac{2-\lambda}{2}W - \frac{\lambda(2-\lambda)m(Y-X)^2}{4Y} + \frac{\lambda(Y-X)}{2Y}\sqrt{2(2-\lambda)mYW}$$

The derivative of this welfare with respect to m is then

$$\frac{dW^x(X)}{dm} = -\frac{\lambda(2-\lambda)(Y-X)}{4Y} + \frac{\lambda(Y-X)}{4}\sqrt{\frac{2(2-\lambda)W}{mY}}$$

When marginal cost is given by (37), the minimal value of X, namely θ^- is

$$\theta^- = Y - \sqrt{\frac{2YW}{(2-\lambda)m}}$$

Given this relationship. it turns out to be convenient to write X as

$$X = Y - (1-\zeta)\sqrt{\frac{2YW}{(2-\lambda)m}}$$

so that X equals θ^- when ζ is zero while it is strictly greater than θ^- when $\zeta > 0$. Note that ζ is at most equal to one if the firm feels any altruism at all. Using this value of X in the derivative above yields

$$\frac{dW^x(X)}{dm} = \frac{\lambda W \zeta(1-\zeta)}{2m}$$

which is positive for all ζ between zero and one. □

Reductions in c (combined with reductions in m) tend to be relatively more attractive to firms that care for all their customers for two main reasons. The first is that such firms tend to charge lower prices and sell correspondingly more, so they obtain the savings from cost reductions on more units. Second, all consumers benefit equally from a cost reduction (though its effect on the price that they pay) whereas the benefits of an increase in m accrues disproportionately to consumers with high values of θ. This means that, even though a firm that cares about all its consumers receives a larger total vicarious benefit from an increase in m than a firm that cares only for a subset (because all consumers gain something), its vicarious benefits from a reduction in c are relatively larger.

While Proposition 5 deals only with marginal changes, its validity for all $X > \theta^-$ implies that it has global implications. Suppose, in particular, that we consider any pair of c and m combinations that give the same welfare to a firm that cares about all its customers equally. One can then reach the higher $\{c, m\}$ combination from the lower one by a series of infinitesimal changes, each of which leaves the broadly altruistic firm indifferent and each of which makes the narrowly altruistic firm better off. This latter firm thus strictly prefers the combination with the higher m.

Figure 2 shows this graphically for $Y = 10$ and $\lambda_2^n = .5$. For each m between .3 and 1, the top panel depicts the level of c such that the combination $\{c, m\}$ makes the value of W_2^n the same as when $m = 1$ and $c = 5$. The bottom panel then depicts both W^n (which is a constant) and W^x when X is such that the narrowly altruistic firm cares only for those consumers that buy when $m = 1$ and $c = 5$ and the price is set according to (29). At this point, both types of firms care about the same customers so the two welfare levels are identical. For lower values of m, the firm that cares about the most quality conscious consumers is worse off. It should be noted, however, that the reductions in firm welfare are modest even though the changes in cost and quality considered in this Figure are substantial.

Figure 3 depicts the converse situation. For the same Y and λ_2^n, it lets c vary with m so that W^x is unaffected. Again, X is chosen so both firms get the same welfare when m and c are at the highest values I consider. Now, however, reductions in m are matched by reductions in c that keep W^x constant. This means that W^n rises with c, since a firm that cares for all its consumers benefits more from simultaneous reductions in c and m.

This section thus has demonstrated that it is possible to find two $\{c, m\}$ combinations such that broadly altruistic firms derive more welfare in period 2 from the one with lower m while the narrowly altruistic ones derive more period 2 welfare from the one with higher m. It is worth closing the section by demonstrating that the converse is not true. In particular

The result is that

Proposition 6. *Consider any two combinations $\{c^H, m^H\}$ and $\{c^L, m^L\}$ of marginal cost and quality. If a firm that cares for all its customers derives more welfare in period 2 from $\{c^H, m^H\}$ and $m^H > m^L$ then a firm that cares only for consumers with $\theta > X$ also derives more welfare in period 2 from $\{c^H, m^H\}$.*

Proof. Consider m^x such that the more narrowly altruistic firm is indifferent between $\{c^L, m^L\}$ and $\{c^H, m^x\}$. Then m^x must be smaller than m^H because m^H is larger than the m that leaves the broadly altruistic firm indifferent between $\{c^L, m^L\}$ and $\{c^H, m\}$, and 5 implies that this m is in turn greater than m^x. Since narrowly altruistic firms receive strictly more welfare in period 2 when m is increased, they must prefer $\{c^H, m^H\}$ to $\{c^H, m^x\}$ and thus to $\{c^L, m^L\}$. □

2.2 Period 1

I simplify the analysis of period 1 by supposing that firms can only introduce two kinds of new goods. One of these has quality m^H while the other has quality $m^L < m^H$. The marginal cost of these goods in the second period is c^H and c^L respectively. Lastly, the period 1 setup costs for these two goods are κ^H and κ^L.

In the analysis so far, periods 1 and 2 have been treated as having the same length and discounting between the periods has been neglected. However, the length of time during which the quality of a good is relatively uncertain might well be different from the length of time during which this quality is relatively well understood and the good continues to be sold. Indeed, one can imagine that for many products the uncertainty dissolves quickly relative to the life of the product. In this case, the present value of the welfare the firm obtains from the new product can be written as

$$W^n = W_1^n + \rho W_2^n.$$

The parameter ρ captures both discounting and the relative length of periods 1 and 2.[13] When the length of time during which quality is uncertain is small relative to the life of the product, ρ is large. And, for ρ sufficiently large and a finite difference between κ^H and κ^L, the decision of which product to introduce depends only on the profitability of the two products in period 2. The analysis in the previous section then implies that whenever $\{c^H, m^H\}$ gives more welfare in period 2 to the broadly altruistic firm, both firms introduce this good rather than the one with quality m^L. It also establishes that there exist combinations of parameters such that, once the welfare functions $W_2^n(m, c)$ and $W_2^x(m, c, X)$ have been maximized with respect to their respective prices, they satisfy

$$W_2^n(m^L, c^L) > W_2^n(m^H, c^H) \qquad W_2^x(m^L, c^L, X) < W_2^x(m^H, c^H, X) \tag{38}$$

For the numerical example considered above, for example, these inequalities are satisfied when $c^H = 5$, $c^L = 1.43$, $m^H = 1$, and $m^L = .5$. With these parameters, welfare is about 2 percent higher for the broadly altruistic firm when it has low costs and low quality rather than high costs and high quality. For a firm that cares only about the equilibrium purchasers

[13]Suppose one slices period 2 into n periods of time of the same length as period 1 and lets $\tilde{\rho}$ denote the discount rate between period 1 and the first of these subperiods of period 2. Then $\rho = \tilde{\rho}(1 - \tilde{\rho}^n)/(1 - \tilde{\rho})$, which rises with n and $\tilde{\rho}$.

of the good with high cost and high quality, welfare is about one third of one percent lower when it has low costs and low quality instead.

It follows that when (38) holds and ρ is sufficiently large, firms that care for all their customers introduce the low cost good while firms that care only about their most quality sensitive customers introduce the high quality good. Knowing this, consumers that are faced with a new product introduction of unknown quality are willing to pay a higher price for a good that is being introduced by a firm that is expected to care only for the quality-sensitive segment of their potential customers.

If ρ is not extremely large, on the other hand, the product introduction decision also depends on welfare in period 1 and on the κ's. To compute these welfare levels, one must analyze the equilibrium in period 1. I now study this equilibrium, but do so only for relatively special parameter values. I choose these values because they make the equilibrium easy to analyze and because they provide convenient conditions under which firms whose altruism is more narrowly focused provide higher quality goods than those whose altruism is broader. The analysis of other parameter configurations is left for further research.

Suppose, in particular, that the marginal cost of production in period 1 is c^H for both the low and the high quality good. This means that marginal cost falls quickly when firms are producing low quality goods (perhaps as result of learning-by-doing) but not when they are producing high quality ones. I explain below why this assumption simplifies the analysis.

An equilibrium where firms of a certain type provide a good of particular quality exists if, given how consumers form their expectations, these firms have higher welfare providing this rather than a different level of quality. The welfare that firms obtain by supplying a good of a particular quality can obviously depend on the quality expected by consumers. I start the analysis by treating this expected quality as exogenous (and independent of price) with m^e denoting the value of m expected by consumers. Consumer demand thus equals $K^n(1 - p_1^n/m^eY))$. The welfare in period 1 of a broadly altruistic firm that introduces a good of quality m at a price p_1^n is then

$$\begin{aligned} W_1^n(m, m^e, p_1^n) &= \left(1 - \frac{p_1^n}{m^e Y}\right)(p_1^n - c^H) + \lambda \int_{p_1^n/m^e}^{Y} \frac{\theta m - p_1^n}{Y} d\theta \\ &= \left(1 - \frac{p_1^n}{m^e Y}\right)(p_1^n - c^H) + \lambda \left[\frac{mY}{2} + \frac{2m^e - m}{2(m^e)^2}\frac{(p_1^n)^2}{Y} - p_1^n\right] \end{aligned} \tag{39}$$

Similarly, the period 1 welfare of a narrowly altruistic firm that cares for a subset of the customers that it sells to

$$\begin{aligned} W_1^x(m, m^e, p_1^n, X) &= \left(1 - \frac{p_1^n}{m^e Y}\right)(p_1^n - c^H) + \lambda \int_{X}^{Y} \frac{\theta m - p_1^n}{Y} d\theta \\ &= \left(1 - \frac{p_1^n}{m^e Y}\right)(p_1^n - c^H) + \lambda \left(1 - \frac{X}{Y}\right)\left(\frac{m(X+Y)}{2} - p_1^n\right) \end{aligned} \tag{40}$$

The price that maximizes the welfare of broadly altruistic firms (39) is

$$p_1^n = \frac{m^e Y(1-\lambda) + c^H}{2(1-\lambda) + \lambda m/m^e} \tag{41}$$

and the quantity sold at this price is

$$q_1^n = 1 - \frac{m^e Y(1-\lambda) + c}{2m^e Y(1-\lambda) + \lambda m Y} \tag{42}$$

As the next proposition demonstrates, the fact that the marginal cost for both the high and low quality good is the same in the first period implies that, for plausible values of m^e, c^H, λ_2^n and X, the optimal price (and the resulting level of welfare) are the same for broadly and narrowly altruistic firms.

Proposition 7. *Let firms who care only for their most quality-sensitive customers have an X equal to $X^* = [(1-\lambda_2^n)Y - c^H/m^H]/[2-\lambda_2^n]$ so that (30) implies that they care for all the customers that buy the good of quality m^H when this is produced at a marginal cost of c^H and $m^e = m^H$. In addition, let $c^H > \lambda_2^n m^H Y$. Then, for any exogenous m^e smaller than or equal to m^H, firms that care only for the customers with $\theta \geq X$ and firms that care for all their customers set the same price for a given level of quality. They also obtain the same period 1 welfare from charging these prices.*

Proof. This proposition follows if firms that care for all their customers sell only to people whose θ is greater than or equal to X^* (so that they sell only to people that narrowly altruistic firms care for as well). The definition of X^* implies that both types of firms care about all their customers when $c = c^H$ and $m = m^H$ and $m^e = m^H$. What needs to be established, then, is that the optimal quantity sold by a firm that cares about all its customers is lower both when m^e is lower (while m remains equal to m^H) and when $m = m^L$ (while m^e varies between m^L and m^H.

Consider first, the case where m remains equal to m^H. The effect of m^e on the quantity purchased can be obtained by differentiating (42). This gives

$$\frac{dq_1^n}{dm^e} = \frac{(1-\lambda)YK_1^n[2c^H - \lambda mY]}{[(2-\lambda)m^eY + \lambda mY]^2},$$

which is positive as long as c^H is larger than λmY. It is thus positive under the conditions of the proposition.

Now, consider keeping $m^e = m^H$ but lowering the actual quality m from m^H to m^L. Equation (41) and (42) make it clear that price rises and quantity supplied falls in response to reductions in actual quality for given perceptions of quality. The reason for this is that altruistic firms suffer vicarious losses when people who buy the good value it less than p_1^n. In the case where consumers expect m^e to be larger than it is, an altruistic firm who raises its price slightly thus gains vicariously from the reduction in q_1^n. Thus, reductions in m for given m^e lead to higher prices and reduced purchases.

Lastly, consider what happens when $m = m^L$ and m^e is lowered from m^H to m^L. The discussion above demonstrates that quantity falls as long as $c^H > \lambda_2^n m^L Y$. Since $m^L < m^H$, this is implied by the conditions of the proposition as well. □

There is another property of the welfare functions W_1^n and W_1^x that is important for characterizing equilibria. This is that, for fixed price and actual quality provided, firms are generally better off if consumers expect their quality to be higher. In the case of narrowly altruistic firms, this is immediate from differentiation of W_1^x in (40). In the case of broadly altruistic firms, differentiation of (39) yields

$$\frac{dW_1^n}{dm^e} = \frac{p_1^n}{(m^e)^2 Y} \left[p_1^n - c^H + \lambda_1^n \left(\frac{m}{m^e} - 1 \right) \right] \tag{43}$$

This expression is positive when $p_1^n > c^H$ (which is guaranteed if the firm acts optimally) and $m^e \geq m$. A reduction in m^e (for given m) leads consumers to lower their purchases. This has only a second order effect on consumer welfare when $m = m^e$ because consumers are then receiving zero surplus from marginal purchases. For firms, by contrast, the reduction in purchases represents a first order reduction in profits.

The fact that firms gain from having consumers perceive quality to be higher means that consumers need to be concerned with the possibility that low quality producers might mimic the behavior of high quality producers to convince consumers that their goods are of high quality. Consumers need not be concerned, however, with the lack of sincerity of firms that claim to be low quality producers. This means that firms producing the good with quality m^L can charge the price that maximizes their period 1 welfare subject to the constraint that consumers set $m^e = m^L$. This price, which I denote by p_1^L equals the expression in (41) when m and m^e are set to m^L.

For firms to provide high quality, there must exist a price p_1^H such that firms prefer to provide high rather than low quality at this price. This means that this price must satisfy two conditions

$$W_1^i(m^H, m^H, p_1^H) - W_1^i(m^L, m^L, p_1^L) + \rho(W_2^i(m^H, c^H) - W_2^i(m^L, c^L)) \geq \kappa^H - \kappa^L \tag{44}$$

$$W_1^i(m^H, m^H, p_1^H) - W_1^i(m^L, m^H, p_1^H) + \rho(W_2^i(m^H, c^H) - W_2^i(m^L, c^L)) \geq \kappa^H - \kappa^L \tag{45}$$

where i equals n for a broadly altruistic firm and equals x for a narrowly altruistic one. The first of these conditions says that the firm prefers to provide high quality at p^H, with consumers believing that quality is m^H, to providing low quality at p^L when this price leads consumers to believe that quality is m^L. This can be thought of as assuring that the firm does not want to deviate in an overt way from providing high quality. The second of these conditions requires the firm suffer a loss when it sells low rather than high quality at the price p^H, where the fact that it keeps the price constant at p^H leads consumers to believe that the firm provides high quality. This condition prevents the firm from making a covert deviation in the quality it provides.

The price that make it easiest to satisfy condition (44) is the price that maximizes W_1^n for $m = m^e = m^H$ since this makes the left hand side as large as possible. I denote this price, which is given by (41) when m and m^e are set to equal m^H, by p_1^{H*}. In my numerical experiments, however, condition (45) is substantially more stringent than (44) when p_1^H is set equal to this value.[14]

At least for broadly altruistic firms, lowering p_1^H below p_1^{H*} increases the left hand side of (45). By lowering this price, sales increases, and this increases the vicarious losses to the firm from providing low rather than high quality. Still, this effect is modest for small values of λ_1^n. By the same token lowering p_1^H lowers the left hand side of (45), and this left hand side can be negative for p_1^H low enough. There is thus a value of p_1^H, which is denoted by $\bar{p}_1^H$, such that the left hand side of the two conditions is the same. This is the price that makes it easiest to supply high quality because it maximizes the smallest of the left hand sides of the constraints (45) and (44).

Even at this price, broadly altruistic firms are at a disadvantage in providing high quality if ρ is large enough. By the same token, a large ρ lets narrowly altruistic firms supply high quality even at their most desired price p_1^{H*}. The result is that

Proposition 8. *When* (38) *is satisfied, one can always find values of* ρ *and* $\kappa^H - \kappa^L$ *such that narrowly altruistic firms have no incentive to deviate from providing high quality at a period 1 price of* p_1^{H*} *while broadly altruistic firms cannot provide high quality even at* $\bar{p}_1^H$*. This means that broadly altruistic firms provide low quality goods in equilibrium.*

[14] I am unable to show this analytically. However, the envelope theorem establishes that the derivative of W_1^n with respect to m^e is positive also when the price is set to maximize W_1^n. This means that $W_1^i(m^L, m^H, p_1^H)$ is larger than $W_1^i(m^L, m^L, p_1^L)$ (so that the second condition is indeed more stringent) when p_1^H maximizes $W_1^i(m^L, m^H, p_1^H)$. The price p_1^{H*} is somewhat lower than this because it maximizes welfare when the firm provides high quality rather than when the firm provides low quality. Still, the numerical difference between these two prices turns out to be relatively small so that the more optimistic beliefs of consumers in (44) make this condition more demanding.

Proof. Let $\delta^n = W_1^n(m^H, m^H, \bar{p}_1^H) - W_1^n(m^L, m^H, \bar{p}_1^H)$ and let $\delta^x = W_1^n(m^H, m^H, p_1^{H*}) - W_1^n(m^L, m^H, p_1^{H*})$. Then,

$$\rho^* = \frac{\delta^n - \delta^x}{W_2^x(m^H, c^H, X) - W_2^x(m^L, c^L, X) - W_2^n(m^H, c^H) + W_2^n(m^L, c^L)} > 0$$

solves the linear equations

$$\delta^n + \rho^*(W_2^n(m^H, c^H) - W_2^n(m^L, c^L)) = (\kappa^H - \kappa^L)^*$$
$$\delta^x + \rho^*(W_2^x(m^H, c^H, X) - W_2^x(m^L, c^L, X)) = (\kappa^H - \kappa^L)^*$$

This means that (44) and (45) are satisfied for $i = x$ when rho is slightly above ρ^* and $\kappa^H - \kappa^L = (\kappa^H - \kappa^L)^*$. Thus, the narrowly altruistic firm has no incentive to deviate from providing high quality at p_1^{H*}.

At the same time, these equations guarantee that (44) and (45) are both violated for $i = n$ when $p_1^H = \bar{p}_1^H$ when rho is slightly above ρ^* and $\kappa^H - \kappa^L = (\kappa^H - \kappa^L)^*$. This means that there is no price p_1^H such that the broadly altruistic firm does not deviate from the provision of high quality. □

We thus have a separating equilibrium where customers expect a high quality good from a narrowly altruistic firm that charges p_1^{H*} and where this firm does not disappoint customers. By the same token, customers would expect a broadly altruistic firm to provide low quality at this (or any other) price, so that their demand for a new good provided by such a firm is lower.

3 Conclusions

This paper has sought to show that the association of a brand with altruism for a particular group of consumers can explain some consumer attitudes for branded products. It can explain both why consumers are quick to accept certain new product offerings of particular brands, but also why some brand extensions are regarded by consumers with suspicion. The model also shows why it may be difficult for brands to “move up” and acquire associations with higher quality whereas “moving down” and generating demand by consumers with limited quality sensitivity may be easier. The reason is that people expect high quality not so much from brands that they regard as having a particular affection for themselves but rather from brands that they regard as devoted to their most quality-sensitive purchasers.

While the model seems to have promise for explaining both some of the advantages and some limitations of incumbent brands relative to newcomers, there may well be aspects of this phenomenon that are not consistent with the model developed here. This model emphasizes that brands obtain credibility from the identity of the customers that buy their core product as opposed to obtaining it from other brand associations. This means that evidence suggesting that other brand associations are important in determining the success of extension would require some modification of the model. While only suggestive, such evidence does appear to exist. Aaker and Keller’s (1990), for example, show that people are not attracted to a potential Vidal Sassoon extension into perfume because “it smells like shampoo.” Still, it is possible that this comment only reflects the view that the core group of customers for particular perfumes is not sufficiently similar to the group that sees Vidal Sassoon as providing products that are good for hair. This interpretation seems somewhat consistent with Aaker and Keller’s (1990) finding that Vidal Sassoon potential extensions into skin products were perceived more favorably.

A different dimension of the model that would benefit from further analysis is the way in the perceptions of a firm’s altruism evolves over time. In this paper, the implicit assumption has been that firms were seen as altruistic towards those customers who purchased their incumbent products. This is broadly consistent with the model itself, since the model implies that firms will pursue products that are particularly suitable for the customers that they care about. On the other hand, I have shown that caring for “up-market” customers can induce “low-market” customers to buy the good as well. When this happens, however, the firm may come to be perceived as caring for a broader range of customers. This evolution in the perception of a brand’s altruism could then be expected to affect the demand for future product introductions.

As emphasized by Tadelis (1999), some firms also lose their reputations for good quality over time. In the model of Tadelis (1999), this is the result of reductions in quality that are the result of changes in ownership (where some owners are intrinsically able to provide high quality while others are not). The model developed here has the potential for providing an alternative explanation. This is that new product introductions can lead customers to reject the hypothesis that managers are sufficiently altruistic, even in the absence of ownership changes or changes in management. Extending the model so that this disappointment takes place in equilibrium (as opposed to being only a threat that induces good behavior) thus seems a promising avenue of future research.

4 References

Aaker, David A. and Kevin L. Keller, "Consumer Evaluations of Brand Extensions," *Journal of Marketing,* 54, January 1990, 27-41.

Bagwell, Kyle and Michael H. Riordan, " High and Declining Prices Signal Product Quality," *American Economic Review,* 81, March 1991, 224–239.

Choi, Jay Pil, "Brand Extension as Informational Leverage," *Review of Economic Studies,* 65, October 1998, 655-69.

Broniarczyk, Susan M. and Joseph W. Alba, "The Importance of the Brand in Brand Extension," *Journal of Marketing,* 21, May 1994, 214-28.

Cabral, Luis M. B., "Stretching Firm and Brand Reputation," *Rand Journal of Economics,* 31, Winter 2000, 658–673.

Fournier, Susan, "Consumers and their brands: Developing relationship theory in consumer research," *Journal of Consumer Research,* 24, March 1998, 343–373.

Keller, Kevin L., *Strategic Brand Management,* Upper Saddle River, NJ: Prentice Hall, 1998.

Keller, Kevin L. and David A. Aaker, "The Effects of Sequential Introduction of Brand Extensions," *Journal of Marketing Research,* 29, February 1992, 35-50.

Klink, Richard R. and Daniel C. Smith, "Threats to the External Validity of Brand Extension Research," *Journal of Marketing Research,*, 38, August 2001, 326-335.

Loken, Barbara and Roedder-John, Deborah, "Diluting brand beliefs: when do brand extensions have a negative impact?, *Journal of Marketing,* 57, July 1993, 71-84.

Ohbuchi, Ken-Ichi, Toru Tamura, Brian M. Quigley, James T. Tedeschi, Mawaf Madi, Michael Bind and Amelie Mummendey, "Anger, Blame, and Dimensions of Perceived Norm Violations: Culture, Gender, and Relationships," *Journal of Applied Social Psychology,* 34, August 2004, 1587–1603.

Pina, Jose M., Eva Martinez, Leslie de Chernatony and Susan Drury, "The effect of service brand extensions on corporate image An empirical model," *European Journal of Marketing,* 40, 2006, 174-197.

Roedder-John, Deborah, Barbara Loken and Christopher Joiner, "The Negative Impact of Extensions: Can Flagship Products Be Diluted?," *Journal of Marketing,* 62, January 1998, 19-32.

Rotemberg, Julio J., “Fair Pricing,” *NBER Working Paper 10915,* November 2004.

— “Minimally Acceptable Altruism and the Ultimatum Game.” *Journal of Economic Behavior and Organization,* 2007, forthcoming.

Sullivan, Mary, “Measuring Image Spillovers in Umbrella Branded Products,” *Journal of Business,* 63, 1990, 309-30.

Swaminathan, Vanitha, Richard J. Fox, and Srinivas K. Reddy, “The Impact of Brand Extension Introduction on Choice,” *Journal of Marketing,* 65, October 2001, 1-15.

Tadelis, Steven, “What’s in a name? Reputation as a tradeable asset,” *American Economic Review,* 89, June 1999, 548–63.

Wernerfelt, Birger, “Umbrella Branding as a Signal of New Product Quality: An Example of Signaling by Posting a Bond,” *RAND Journal of Economics,* 19, 1988, 458-66.

Appendix: Derivation of $A(\lambda^o, c_o)$

Using the formula in (4) to substitute for both $p_2^{o*}(\bar{\lambda}, c_o^\alpha)$ and $p_2^{o*}(\lambda_2^o, c_o)$ in (8), one obtains

$$A(\lambda^o, c_o) = \left(1 - \frac{c_o^\alpha + (1-\bar{\lambda})Y}{(2-\bar{\lambda})Y}\right)\left(\frac{c_o^\alpha + (1-\bar{\lambda})Y}{(2-\bar{\lambda})Y} - c_o\right) + \frac{\lambda_2^o}{2Y}\left(Y - \frac{c_o^\alpha + (1-\bar{\lambda})Y}{(2-\bar{\lambda})Y}\right)^2$$
$$- (1-\gamma)\left\{\left(1 - \frac{c_o + (1-\lambda_2^o)Y}{(2-\lambda_2^o)Y}\right)\left(\frac{c_o + (1-\lambda_2^o)Y}{(2-\lambda_2^o)Y} - c_o\right) + \frac{\lambda_2^o}{2Y}\left(Y - \frac{c_o + (1-\lambda_2^o)Y}{(2-\lambda_2^o)Y}\right)^2\right\}$$

Rearranging, this becomes

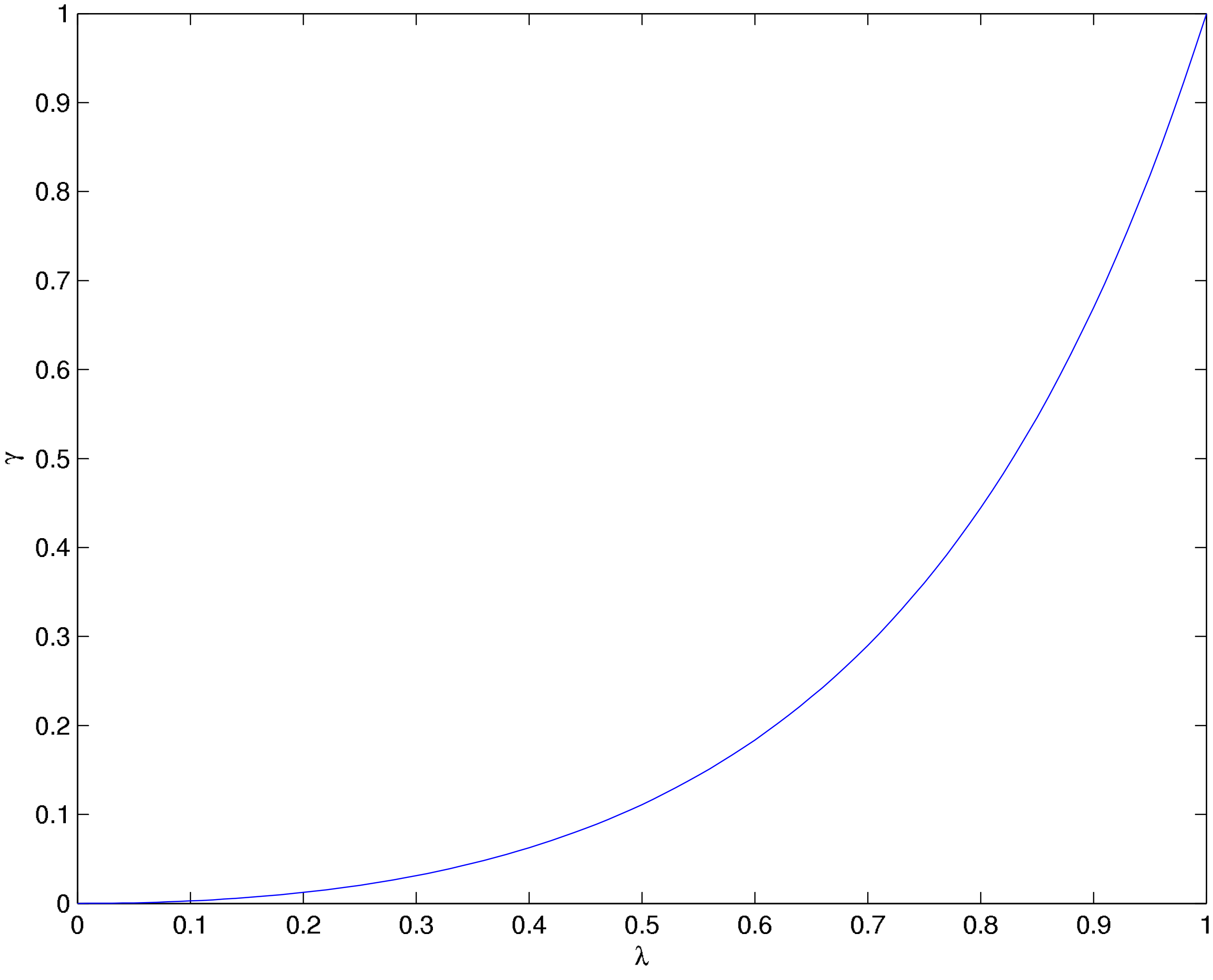
$$A(\lambda^o, c_o) = \frac{(Y - c_o^\alpha)[(1-\bar{\lambda})(Y - c_o^\alpha) + (2-\bar{\lambda})(c_o^\alpha - c_o)]}{(2-\bar{\lambda})^2 Y} + \frac{\lambda_2^o}{2Y}\left(\frac{Y - c_o^\alpha}{2-\bar{\lambda}}\right)^2$$
$$- (1-\gamma)\left\{\frac{(Y - c_o)^2(1-\lambda_2^o)}{(2-\lambda_2^o)^2 Y} + \frac{\lambda_2^o}{2Y}\left(\frac{Y - c_o}{2-\lambda_2^o}\right)^2\right\}$$

and the expression in the text follows immediately.

Table 1

Timing of the model

Period	0	1	2
Goods	Incumbent good	New good	Incumbent and new goods
Prices	p_0^o	p_1^n	p_2^o and p_2^n



0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
γ
λ

Figure 2: Variations in m and c that keep W^n constant

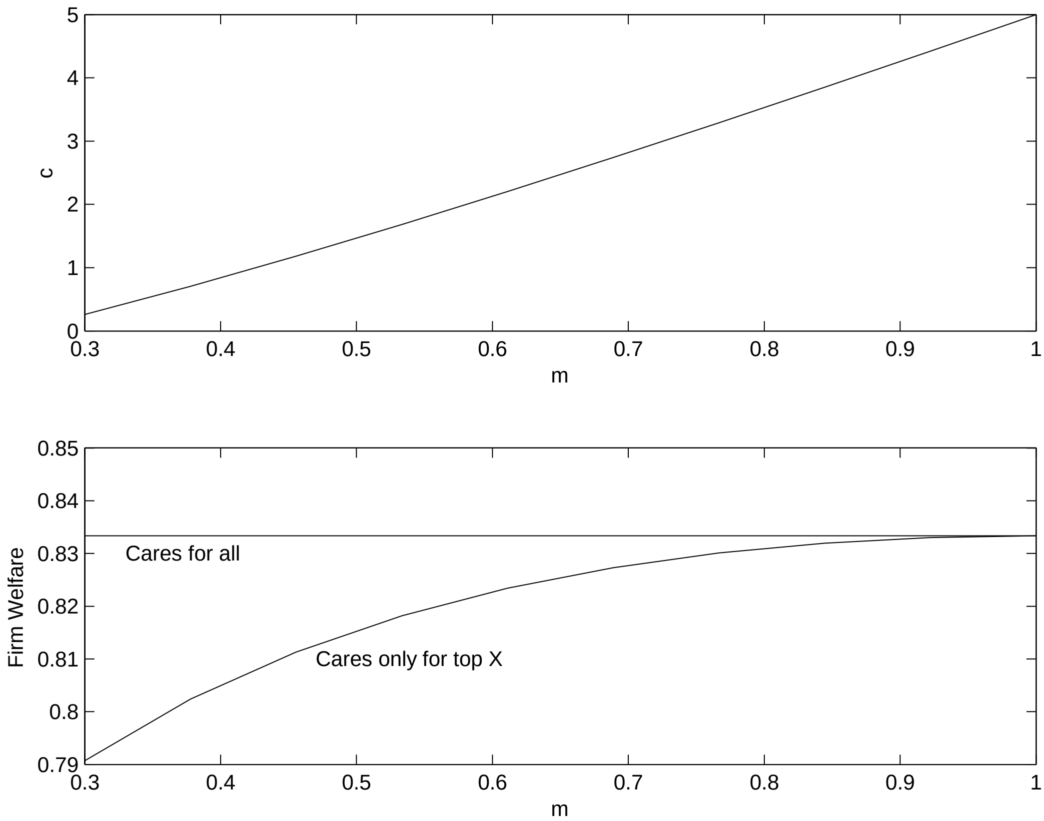


Figure 3: Variations in m and c that keep W^x constant