Anger and Regulation

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Abstract

We propose a model where voters experience an emotional cost when they observe a firm that has displayed insufficient concern for other people's welfare (altruism) in the process of making high profits. Even when there exist few truly altruistic firms, an equilibrium may emerge where all firms pretend to be kind, refraining from charging "abusive" prices to their customers (or "exploiting" workers). Our main result is that as competition decreases, the set of parameters for which such pooling equilibria exist is smaller and firms are more liekly to anger voters by displaying low levels of altruism. As a consequence, when firms have been shown to be unkind, the welfare of consumers will go up when these firms are punished (for example through fines), even when this does not imply a change in prices. Indeed, regulation affects welfare through three channels: First, there is the standard channel whereby a reduction in monopoly price lads to the production of units that cost less than their value to consumers. Second, regulation calms down existing consumers: a reduction in the profits of a firm viewed as excessively selfish increases total welfare by reducing consumer anger. Finally, there is a third (mixed) channel arising because individuals who were out of the market when they were excessively angry in the unregulated market, decide to purchase once the firm is regulated, reducing the standard distortions described in the first channel.

Keywords: Anger, regulation, public relations, commercial legitimacy, altruism, populism.

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1 Introduction

Governments routinely regulate markets, particularly those where there is a tendency towards little competition. One possible explanation is that such regulation improves efficiency. Indeed, economists have developed normative theories of regulation, explaining how social welfare increases when such regulation adopts a particular form. For example, forcing a monopoly to increase output might be desirable because in a monopoly equilibrium the cost to the firm of an extra unit is less than the value given to it by the consumer (see, Pigou, 1938, Laffont and Tirole, 1991, *inter alia*).

Given how far the logic of this explanation is from anything that voters seem to have in their minds when they think about regulation or when they go to the polling booth, it is useful to develop alternative theories that give weight to public opinion in the determination of policies that regulate business. Although most existing models do not focus on such "populist dynamics", they are central to our paper, which emphasizes the role of emotions in the motivation of consumers (that is distinct from a material motive). Thus, we assume that consumer's experience and decisions can be understood by studying total utility, constructed as the sum of a material payoff and an emotional payoff. Psychologists and some economists have gathered evidence on several emotions that are candidates to be part of the second term. One that appears to be particularly relevant for the setting we seek to describe, whereby a monopoly might "abuse" its market position and set "exploitation" prices, is consumer anger.

There are several episodes where consumers appear to react with anger in the face of price increases. The title of an article in a British newspaper describes one such emotional reaction: "Fare increases of up to 15% anger rail passengers".[1] Earlier on in history, the era of the big trusts and the rise of regulation in the US is frequently described as a period where consumers experienced emotional reactions to business activities.[2] More recently, riots and widespread anger have been linked to price increases in Bolivia. During January-April 2000, the city of Cochabamba witnessed a popular revolt after the newly privatized water company increased the tariffs. Protests included the occupation of the city's main square on February 4 in an incident that left 22 people wounded and 135 under arrest (See, Darocca Oller, 2004).[3] There

[1] See, *The Guardian*, Tuesday, January 1, 2008. According to the article "passengers and rail user watchdogs reacted angrily yesterday to 'outrageous' new year price increases which will see the cost of some train tickets rise by almost 15%. The new prices were also described as "unjustified and unfair". It also reports that one Gerry Doherty, leader of the TSSA (the union for people in transport and travel) described the increases as "outrageous".

[2] Even later, with anti-trust regulation in full swing, the review of the book "The Muckrakers", which appeared in *Time Magazine* on Friday, December 21st, 1966 was titled "A Time for Anger". Archives of Time Magazine, accessed on October 28th 2008.

[3] Conditions do not seem to have improved as a result. A report explains that "people of this high Andean city were ecstatic when they won the "water war." ....After days of protests and martial law, Bechtel - the

are several other episodes where emotions occupy center stage in the process whereby some form of punishment or regulation of business is put into place, including the 2008-9 subprime crisis in the US, although these are often dismissed as populist episodes and often involve indignation at actions that may be broader than price increases.

Psychologists have investigated several characteristics of angry emotional reactions. Some of the evidence gathered aims at distinguishing anger from other negative emotions, such as sadness or shame. For example, it suggests that anger is correlated with the belief that redress is still possible and that remedy requires (even indirectly) the intervention of the self. It also indicates that others (as opposed to the situation or the self) were responsible for the negative event (see, for example, Ellsworth and Smith, 1985, and Lazarus, 1991, as well as the review of Lerner and Tiedens, 2006).[4] An important finding for our purposes is reported in Lerner and Tiedens (2006), whereby anger makes people indiscriminately punitive (and optimistic about their own chances of success). There is also some evidence that anger does not seem to reflect a fixed personality trait of left-leaning individuals (with no connection to the stimulus), as in some experiments people can be induced to feel angry (and sometimes even provide what is the typical right wing answer). For example, Small and Lerner (2005) found that individuals induced to feel anger choose to provide less public assistance to welfare recipients than those induced to feel other emotions, while Bodenhausen et al (1994) found them to engage in more stereotyping. Less of this research has concerned itself with emotional reactions following price increases, although Tyran and Engelmann (2005) were able to generate experimental evidence on boycotts following increases in prices in the lab.

We study a model where an individual's experience as a client of a monopolistic firm improves when the price paid falls and the profits of those firms perceived as unkind go down.[5] The first of these two terms –the material payoff- is standard in economics, while the second term –the emotional payoff- captures the demand for fairness that has been analyzed in several recent models in economics such as Rabin (1993), Fehr and Schmidt (1999), Falk and Fischbacher (2005), inter alia. In particular, we follow Levine (1998) and Rotemberg (2008) and assume an individual's kindness towards others depends on their estimation of how kind

American multinational that had increased rates when it began running the waterworks - was forced out. ... Today, five years later, water is again as cheap as ever, and a group of community leaders runs the water utility, Semapa. But half of Cochabamba's 600,000 people remain without water, and those who do have service have it only intermittently - for some, as little as two hours a day, for the fortunate, no more than 14." See Forero (2005).

[4] Other negative emotions follow alternative appraisals: sadness (rather than anger) follows negative events that are blamed on situational forces whereas shame follows personal responsibility.

[5] Anecdotal evidence suggests that anger often arises at the announcements of high profits by firms that are under scrutiny. See, for example, "Railtrack profits spark anger", reported on *BBCNews* online, Thursday, November 4, 1999. http://news.bbc.co.uk/2/hi/business/504329.stm. Accessed on Tuesday October 28th , 2008.

others have been in relationships with them.[6] This allows Levine (1998) and Rotemberg (2008) to have agents who are "spiteful" towards others that are perceived to have behaved unkindly to the decision maker, a feature that plays a key role in our theory of regulation of monopolists. Note that this specifcation naturally leads to a signaling game, since individuals' actions can reveal how altruistic they are. Thus, we do not require that there be a a large fraction of truly altruistic firms for the equilibrium to be heavily influenced by altruism. Finally, part of the attraction in applying these preferences to the demand for regulation is that it may help explain both the amount of regulation, and some instances of arbitrary or redistributive regulation (such as when fines are applied to firms by "populist" governments) and of "inefficient" regulation (i.e. the type of regulation may not be optimal from a standard economic efficiency perspective).[7]

We develop a model of price competition along the lines of Salop (1979), but where consumers react with anger when they conclude that the firm has shown low levels of altruism towards them. Given the strength of consumer reactions to high prices by monopolistic competitors, there is a signaling game where it often pays for firms to act as if they were kind. This leads to a set of pooling equilibria, where consumers are not angry. The main result of the paper is that when the number of firms falls and competition decreases, the set of prices where a pooling equilibrium can be sustained is smaller. That is, as competition decreases, anger is more likely and leads to higher welfare losses. In this context, regulation might increase welfare through three different channels. First, there is the standard channel whereby a reduction in monopoly price lads to the production of units that cost less than their value to consumers. Second, regulation calms down existing consumers: a reduction in the profits of a firm viewed as excessively selfish increases total welfare by reducing consumer anger. Finally,

[6] Although there are differences (Levine's preferences are linear) in our context they lead to similar implications. One reason is that, although in Rotemberg the individual is angry or not whereas in Levine the "anger" is continuous, the tradeoffs in Levine are linear, so the optimal amounts of regulation (or of punishment) are corner solutions: the individual wants either no punishment or as large a punishment as possible. Rotemberg (2006) explains how the "minimal altruism" preference relations he defines explain a wide range of behavior in ultimatum and dictator games.

[7] Another instance where anger may be the driver of regulation is the rise of political pressure on CEO pay following the 2008-9 financial crisis. A report in the *Financial Times* explains "Gordon Brown, the prime minister, has said he would use the government's banking aid package to clamp down on compensation, adding 'the days of big bonuses are over'". And then describes how the Financial Services Authority actions reflected this heightened pressure. For example it states "The letter does not have the status of mandatory guidance, but the FSA has said it would increase the regulatory capital requirements for banks that do not sufficiently link pay with risk." See *FinancialTimes*, Monday October 13, 2008. With respect to forms of regulation, we note that a literature within regulation has explained the particular forms that are adopted at particular times, and the growth in the size of the market plays a key role in the explanations for why private litigation is substituted by ex-ante regulation during the progressive era in Glaeser and Shleifer (2003). Rotemberg (2001) is able to explain the choice of commercial policy (tariff vs quotas) using altruistic preferences.

there is a third (mixed) channel arising because individuals who were out of the market when they were excessively angry in the unregulated market, decide to purchase once the firm is regulated, reducing the standard distortions described in the first channel. Note that one of the most visible ways that regulation affects firm profits is by regulating prices, but the mechanism also allows fines (when they are credible) to play a similar role. Our theory connects the public's appreciation of firms with the extent of competition, noting that positive appraisals of big monopolies would be harder to maintain. This connection is emphasized in the literature on the history of public relations of large American corporations. For example, Marchand (1998) states "The crisis of legitimacy that major American corporations began to face in the 1890's had everything to do with their size, with the startling disparities of scale." (Marchand, 1998, p. 3). Indeed, it is possible to argue that there is a parallel between our paper's focus on the concept of commercial legitimacy and the concept of State legitimacy in political science.

Closest to our paper are models that study price rigidity when consumers' utility functions display psycholgically realistic features. In particular, Heidhues and Kőszegi (2008) study prices and competition focusing on the possibility that consumers are loss averse and discuss the emergence of focal points and its implications for price rigidity. Rotemberg (2005) on the other hand, focuses on the same set of preferences as this paper (consumers get angry when firm's display insufficient levels of altruism), developing a new model of price rigidity and analysis of monetary policy. Our model, which extends their analysis of realistic preferences to the context of regulation, is related to theories of exploitation by big firms. Marxist theories emphasize how capitalist institutions (including private ownership of the means of production and an accomplice State) lead workers to pay "surplus value" (see Brewer, 1987, *inter alia*). In our theory, consumers have a simple approach to deciding when such exploitation takes place (they measure firm altruism) and are not alienated or passive (they get angry). The problem with monopoly is that consumers cannot go to other firms when these misbehave, and because of this firm's are more likely to do so.

Interestingly, our approach to regulation and emotions is connected to capture theory. The Chicago and Virginia schools argue that regulations are the product of interest group activity (see, for example, Stigler, 1971, Peltzman, 1976, Buchanan, 1976, Djankov et al, 2002, *inter alia*). The basic idea is that regulations are correlated with profits across industries and that this could reflect the interaction of groups in society, with different costs and benefits of organizing to obtain favorable regulations. Indeed, noting that "the Civil Aeronautics Board has not allowed a single new trunk line to be launched since it was created in 1938" and other examples where the regulatory actions appear to benefit firms, Stigler (1971) concludes that the most plausible explanation for their existence is firm demand for protection and regulation. Such demand for regulation on the part of firms and other interest groups has occupied the

majority of positive theories of regulation. Whereas the public could in principle be treated as an interest group, as in the more modern generalizations of the theory (see, for example, Becker, 1983, Baron, 1994, Grossman and Helpman, 1994, *inter alia*), the emphasis there is on material payoffs and the public typically ends up with a low influence on the final outcome given the well known problems of free riding in voting. Note however, that Stigler himself refers to the public's demand for regulation, but it seems that he believed that it could not be modeled. When explaining the existence of regulations that harm social welfare, he states "the second view is that the political process defies rational explanation: "politics" is an imponderable, a constantly and unpredictably shifting mixture of forces of the most diverse nature, comprehending acts of great moral virtue (the emancipation of slaves) and of the most vulgar venality (the congressman feathering his own nest)". Our theory of regulation focuses on fairness (and anger) and thus is capable of explaining the type of regulatory phenomena Stigler is concerned about.

In section II, we introduce the basic model, whereas in Section III we present the main results. Section IV discusses some implications and extensions while section V concludes.

2 The model

There are n consumers, each characterized by a parameter x interpreted, as in Salop (1979), as either a "preferred variety" or as a "location parameter". For each consumer, his location is drawn from a uniform distribution on the circle of circumference 1. There are m evenly distributed firms along the circle (there are m firms, but we use $b = 1/m$ as the relevant parameter); firms are of one of two types, altruistic or selfish; the prior probability that a firm is altruistic is q. Consumers want to buy (at most) one unit of the good, for which they would obtain a gross surplus of s (gross of price and transport costs). If they have to travel a distance x, and then pay a price of p_i, their net surplus is $s - tx - p_i$ (i.e. they have a transport cost of t per unit of distance traveled). In addition the consumer may be angry with the firm from which it is buying. In that case, we must subtract to his utility, a term $\lambda(\pi + p - c)$ where p is the price he is paying to the firm, c is marginal cost, and π is the profit the firm obtains from the other customers. This term is just a "spite" term: when angry, the consumer dislikes the firms making a profit, and he is angrier when he contributes to those profits. As in Rotemberg (Levine's preferences are observationally equivalent in this setting) what triggers anger is that the consumer rejects the hypothesis that the firm is altruistic.

Firm i chooses a price p_i, and has a cost c, so when demand for its product is D_i, its profits are $(p_i - c) D_i$. If the firm is not altruistic, that is all there is in the firms' utility (utility = profits). If the firm is altruistic, its utility is profits plus a term that depends on the utility of the consumer. The altruistic firm has a cost of α if consumer utility is lower than a certain

level (this level is exogenous for this model, but can come from learning, adaptation, history, etc). We call the threshold τ; we will set it to be the utility the consumer would obtain in a "fairly competitive" industry (see Section 5 for an example).

In what follows, and without loss of generality, we normalize $t = 1$ and all other parameters are just "normalized by t". This normalization is completely general. We also assume (without loss of generality) that the number of consumers is $n = 1$.[8] Finally, we restrict s to be $s \leq c+1$, which ensures that in a monopoly not all consumers are served.

2.1 Equilibrium

We will analyze a signalling game, in which firms choose a price which signals their type. An equilibrium in this setting is a triplet $[a(p, x; \mu), p(\theta); \mu(p)]$ where:

- $a(\cdot)$ is an "acquisition" decision strategy (the same for all consumers; we are looking at symmetric equilibria) as a function of price, tastes x (or distance) and beliefs μ (of whether the firm is altruistic or not) into $\{0, 1\}$, where $a = 1$ means "buy" and $a = 0$ means "don't buy";
- $p(\cdot)$ is a function that maps types into prices (one price for each type; the same function for all firms);
- $\mu(\cdot)$ is a function that maps prices into $[0, 1]$, such that $\mu(p)$ is a number that represents the probability that the consumer assigns to the firm being altruistic.
- a is optimal given x, p and μ; p is optimal given a (and other firms playing p); μ is consistent (it is derived from Bayes' rule whenever possible).

Whether we are analyzing pooling or separating equilibria, we will focus on equilibria where beliefs are of the sort "I reject the firm is altruistic if and only if its price p is such that $p > \overline{p}$" where $\overline{p}$ is the equilibrium pooling price $\overline{p}$, or the equilibrium price of the altruistic firm in a separating equilibrium (that is, $\overline{p} = p(\theta_a)$ for θ_a the altruisitc type). We are ruling out (for example) equilibria in which the consumer rejects that the firm is altruistic if the firm charges a price $p \neq \overline{p}$ (i.e. we do not allow that the consumer comes to believe the firm is selfish even if it could be charging a price below the "target" price); in standard signalling models, beliefs like these may still be part of an equilibrium, because in equilibrium one does

[8] Our general formulation with n consumers is not equivalent to a formulation where there is a continuum of consumers of mass n (the standard assumption). In the continuum formulation, a consumer's purchase does not affect the firm's profits, and so anger is irrelevant. Formally, our formulation is equivalent to a formulation with a continuum of mass n of consumers who dislike buying from a selfish firm (this is different from disliking the firm having high profits, because as argued, a consumer's purchase does not affect firms' profits).

not observe prices $p < \overline{p}$ and so the consistency condition (that beliefs be derived from Bayes rule) places no constraints on beliefs. We are also ruling out equilibria in which the consumer rejects that a firm is altruistic iff its price is $p > \overline{p}$, and in equilibrium the altruistic firm charges a price $p(\theta_a) < \overline{p}$.

2.2 Parameter restrictions

We will assume throughout that $s - c - \frac{3b}{2} \geq 0$ for all $b \leq \frac{1}{2}$; or $s \geq c + \frac{3}{4}$. This assumption ensures that in an oligopoly, the market is covered. This is a "non-triviality" assumption, since otherwise an oligopoly behaves just like a group of local monopolies.

We will also assume that $s \leq c + 1$. This condition ensures that the market is not covered when there is a monopoly, which is the relevant case for studying anger.

Regardless of the parameter restrictions, in the Appendix, we show that utility is always higher in an oligopoly, and that price is always *lower* in a monopoly. We note however, that this counter-intuitive finding is also true in the setup without anger.

3 Oligopoly

In this section we characterize the symmetric pooling equilibria in an oligopoly: both types of firm charge the same price. Of course, there may be separating equilibria too. But we focus the analysis of pooling equilibria for four reasons.

1. The first is "analytic": we want to know whether the set of parameters for which there exists a pooling equilibrium shrinks as the number of firms decreases; since there is no anger in pooling equilibria, this would establish that the "chances" of anger appearing are larger when there is less competition.

2. The second reason for focusing on pooling equilibria is "historic": before the start of regulation, we assume, there was no anger at firms; hence, we may presume that the existing equilibrium was one with pooling (or maybe one with separating, but where the firm was actually altruistic; but this wouldn't explain why later these same firms started to behave as selfish firms).

3. The third is to avoid having to make choices for which there is little empirical evidence indicating the right track, and that however we resolved them, would leave some readers unhappy. For example in a separating equilibrium, consumers facing an unkind firm are angry; when they are, the optimal price by the unkind firms is lower than if consumer's weren't angry; this leads to a larger material utility for consumers. This leaves us with the conundrum that selfish firms are giving angry consumers a higher material

utility than to consumers who are not angry. This leads to a substantial question: are consumers (in reality, not in the model) angry because the firm is selfish, or because the firm acts in ways that harm consumers? Put differently, how angry would you be at somebody you know is nasty, but is temporarily pretending to be nice (not because he is trying to change, but just to avoid some punishment)? Psychological research has not answered this question in a satisfactory manner yet.

4. The final reason is tractability: in a separating equilibrium when there are many firms the patterns of combinations of firms becomes complicated (a selfish firm surrounded by two selfish firms, or by one selfish and one altruistic, or by two altruistic, etc; similarly for an altruistic firm and its neighbors). In ex-ante terms, though, each firm does not know whether its neighbors will be of one kind or the other. Yet, once the uncertainty about types of neighbors is resolved, a dynamic re-adjustment of prices would take place, complicating matters further.

3.1 Pooling Equilibria

Our first step is to find necessary conditions under which a price p^o is part of a pooling equilibrium in which consumers attain their target level of utility. The case of consumers with low utility is qualitatively similar and adds no further insights.

Consider a firm who maximizes profits in a deviation from a pooling equilibrium with price p^o (we are not including a utility cost of the deviating firm, since we assume for the time being that the equilibrium is such that consumers attain their target utility level τ). If the firm lowers its price, consumers won't be angry. In that case, demand is given by the sum of all (unit) demands of consumers who are closer to the deviating firm than the two consumers (one to each side) who are indifferent:

$$s - p - x = s - p^o - (b - x) \Leftrightarrow D = 2x = p^o - p + b$$

Profits are then

$$(p - c)(p^o - p + b).$$

When the firm maximizes this expression, we obtain an optimal price of

$$p = \frac{p^o + b + c}{2}.$$

For the firm not to want to deviate from p^o, it must be the case that this optimal price is larger than p^o, or equivalently

$$b + c \geq p^o. \tag{1}$$

In words, if the oligopoly price is too large, the firms are better off lowering their price, and the consumers will not punish them (by getting angry).

If the firm raises its price, consumers become angry, and demand is given by the condition that

$$s - p - x - \lambda (p - c) = s - p^o - (b - x) \Leftrightarrow D = p^o - (1 + \lambda) p + b + \lambda c. \tag{2}$$

In that case, profits are

$$(p - c) \left(p^o - (1 + \lambda) p + b + \lambda c\right).$$

For the firm not to want to deviate and charge the optimal price

$$p = \frac{p^o + b + c (1 + 2\lambda)}{2 (\lambda + 1)} \Rightarrow \pi = \frac{\left(p^o - c + b\right)^2}{4 (1 + \lambda)} \tag{3}$$

it must be the case that profits in the equilibrium are larger than these deviation profits.[9] Formally,

$$(p^o - c) b \geq \frac{\left(p^o - c + b\right)^2}{4 (1 + \lambda)} \Rightarrow p^o \geq c + b \left[1 + 2\lambda - 2\sqrt{\lambda (1 + \lambda)}\right]. \tag{4}$$

Notice that when $\lambda = 0$ (the standard Salop case), we obtain from equations (1) and (4)

$$p^o = b + c. \tag{5}$$

An additional restriction is that for a given τ, as we decrease the number of firms the price must also decrease to achieve the target utility. Consumer utility (in a pooling equilibrium with price p^o) is the number of firms, $1/b$, times the total utility of consumers served by each firm (the 2 in the equation below is because each firms serves consumers to both sides):

$$\frac{2}{b} \int_0^{\frac{b}{2}} \left(s - p^o - x\right) dx = s - p^o - \frac{b}{4}. \tag{6}$$

This utility is larger than τ if and only if

$$s - p^o - \frac{b}{4} \geq \tau \Leftrightarrow s - \tau - \frac{b}{4} \geq p^o. \tag{7}$$

We now present an important result: as competition decreases (enough), anger is more likely. The proposition shows that as competition decreases, a pooling equilibrium is less likely. But since pooling equilibria have no anger, and separating equilibria do (in expected terms there will be some selfish firms), when pooling equilibria disappear, anger appears.

Proposition 1 *There is a critical n^* such that for all $n^* \geq n' > n$, the set of pooling prices is smaller when there are n firms than when there are n'. That is, as competition decreases, anger is more likely.*

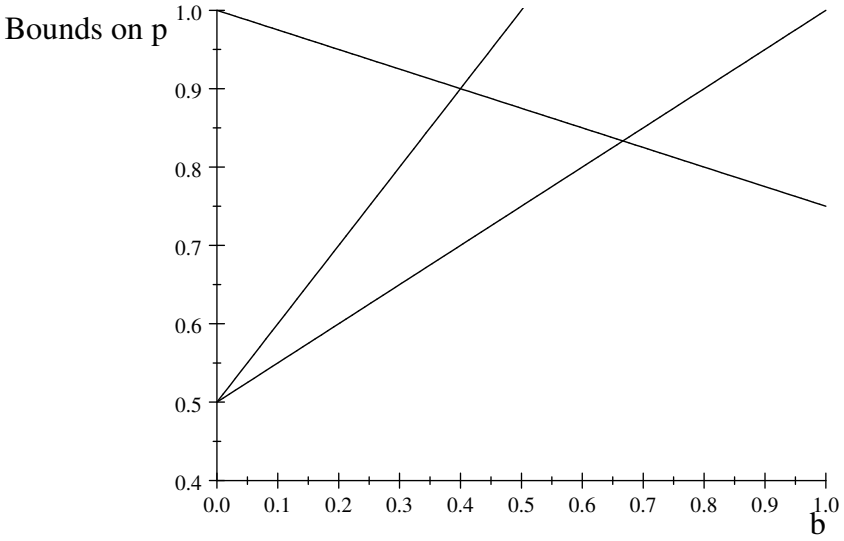
[9] It could happen that the firm considers raising its price and discovers that the optimal price in the deviation with angry consumers is lower than p^o (this happens if p^o is larger than the optimal price, given in the previous equation). If that happens, the firm is better off not raising its price. Hence, our assumption that the optimal price in a deviation is achieved (with angry consumers) is justified.

Proof. For $b \leq \frac{4}{5}(s - c - \tau) \equiv b^* = 1/n^*$, we have

$$b + c \leq s - \tau - \frac{b}{4}$$

so that the constraint in equation (7) is not binding, because the constraint in equation (1) is tighter. For $b > b^*$, the situation is reversed, and equation (1) is binding but (7) is not. Starting at b^*, increasing b (lowering competition) lowers the upper bound on p^o (the derivative of $s - \tau - \frac{b}{4}$ with respect to b is negative) and increases the lower bound since the derivative of the bound in equation (4) is positive: $1 + 2\lambda - 2\sqrt{\lambda(1+\lambda)}$. ■

The plot below illustrates the three constraints on p^o. The price p^o must lie between the two loci with positive slopes (the steeper one is equation (1) and the flatter, (4)) which arise from the firms' incentives not to deviate. The price must also lie below the negatively sloped constraint (equation (7)) that arises from the condition that fewer firms imply lower prices (if consumers are to obtain their target utilities).



Next we present another relevant result, connecting the cost structure of firms and the rise in anger. As will be argued later, this link could be the cause of subsequent regulation. The result provides a potential explanation for why people in less developed countries don't like capitalism. If costs are larger and more volatile in LDCs, that would explain why capitalists and capitalism are not popular.

Proposition 2 *When costs increase, or when they become more volatile, anger is more likely.*

Proof. When costs increase, the two loci of equations (1) and (4) move upwards by the amount of the increase in costs. Since equation (7) is unchanged, the set of (b, p) pairs for which

a pooling equilibrium exists shrinks. More importantly, if for a given b there was a pooling equilibrium, there is an increase in costs that makes that pooling equilibrium impossible.

Symetrically, when costs fall, the set of pooling equilibrium prices increases. But a larger volatility in costs makes it more likely that a high (pooling-breaking) cost will happen, and then the selfish firms will reveal themselves as such and anger will arise. ■

The next result illustrates another obvious feature of the rise in anger: when for some exogenous reason consumers become "captive" of one particular firm, anger is more likely. The mechanism is as one would expect: when consumer's elasticity of demand decreases, local monopolies have an incentive to increase prices. The temptation may be large enough that an anger-triggering price increase may be profitable. The motivation for this result is the anger expressed towards hotels that increased their prices in cities near New Orleans after hurricane Katrina struck.

We model this increase in captivity by changing the transport cost of consumers going to rivals, while keeping rival's prices fixed.[10] An equivalent way of modeling this is of course assuming that the two neighbors of the firm being analyzed move farther away, as if there had been a decrease in the number of firms.

Proposition 3 *Assume that for a given parameter configuration, there is a pooling equilibrium with a price of p^o. If the cost of transportation to firms $i-1$ or $i+1$ increases from 1 to $t>1$, but the cost of getting to firm i remains constant, the firm's incentives to raise its price increase. There is a threshold t^* such that if $t \geq t^*$ firm i raises its price and consumers become angry.*

Proof. When the cost of getting to firms $i-1$ and $i+1$ increases to t, the demand faced by firm i (after an increase in price) and its profits, are

$$D = 2\frac{p^o - p + \lambda(c-p) + bt}{t+1} \quad \pi = (p-c)\,2\frac{p^o - p + \lambda(c-p) + bt}{t+1}$$

and the optimal price and profit are

$$p = \frac{c + p^o + 2c\lambda + bt}{2\lambda + 2} \Rightarrow \pi = \frac{(p^o - c + bt)^2}{2(\lambda+1)(1+t)}.$$

For large enough t, these profits exceed the oligopoly profit, and the firm raises its price, causing anger. ■

In the above proposition we have assumed that the consumers continue to make inferences based on the equilibrium prior to the shock. Although one could argue that a new equilibrium

[10] Keeping rivals' prices fixed keeps competition constant for the firm being analyzed. Wouldn't rivals lower their prices after consumers' transport costs to them increased? The assumption of fixed rival's price reflects the simple idea that, for example, hotels in New Orleans were no longer available so, if anything, the price would have been infinity.

(one with fewer firms) should be the benchmark, we believe that keeping the old equilibrium beliefs is also plausible. In addition, the case of fewer firms also leads to more anger, as established by Proposition 1.

Any price p^o in the range determined by equations (1) and (4) can be part of a pooling equilibrium if we choose τ or α appropriately. Note that if the firm is altruistic and it raises its price enough, there could be a utility cost of providing consumers with a very low level of utility. Since we found necessary conditions, we focused only on the incentives of the selfish firm. When we want to build an equilibrium with a price p^o within the range we have just identified, we need to take into account this utility cost for the altruistic firm. But choosing τ or α low enough, any one of these prices is an equilibrium. We do not elaborate, because the construction is simple.

In order to compute what would consumer utility be in some market, so that we can set the "target" level of utility τ at some "reasonable" level, we need to choose one of the possible equilibrium prices. For the purposes of "benchmarking" consumer utility in each market, we set $p^o = b + c$ as in the standard Salop case without anger. Then, consumer utility is as in equation (6):

$$\frac{2}{b}\int_0^{\frac{b}{2}} (s - b - c - x)\, dx = s - c - \frac{5}{4}b.$$

Here the definition of what utility to consider (for consumers) is not obvious. Why consider total utility of all consumers? Maybe firm 1 is behaving really badly and slaughtering its consumers, but still total utility is large in the market, and so firm 1 experiences no utility cost. In equilibrium this will make no difference (if firm 1 is treating its consumers badly, all firms are doing the same), but it matters in a deviation. In the set of questions we will analyze in this paper, this makes no difference, but in general it would seem more "psychologically plausible" that the firm cares about how it treats its consumers, and not about "average utility in the market (including the welfare of other firms' consumers)".

4 Monopoly

Let us analyze the conditions for a pooling equilibrium in a monopoly setting. For the selfish firm, it must be the case that sticking with the equilibrium p^m is better than deviating, angering consumers, and getting $(p - c) D$, where $D = 2x$ for x such that

$$s - p - x - \lambda (p - c) = 0 \Leftrightarrow x = s - p (1 + \lambda) + \lambda c.$$

Of course, it must also be the case that $x \leq 1/2$ (otherwise, $D = 1$). For that to be the case, we must have

$$p \geq \frac{s + c\lambda - \frac{1}{2}}{\lambda + 1}$$

(in the standard case, with $\lambda = 0$, this just says that the individual located at $x = 1/2$ has negative net surplus from buying the good).

Hence, profits for the selfish monopolist who deviates are

$$(p-c)\,2\,(s-p\,(1+\lambda)+\lambda c) \Rightarrow p_s = \frac{c\,(1+2\lambda)+s}{2\,(1+\lambda)} \Leftrightarrow \pi^{dev} = \frac{(c-s)^2}{2\,(1+\lambda)}. \tag{8}$$

So the condition on parameters for p^m to be an equilibrium is that the equilibrium profits, $2\,(p^m-c)\,(s-p^m)$, are larger than π^{dev} :

$$2\,(p^m-c)\,(s-p^m) \geq \frac{(c-s)^2}{2\,(1+\lambda)} \Rightarrow p^m \geq \frac{c+s}{2} - \frac{s-c}{2}\sqrt{\frac{\lambda}{\lambda+1}}. \tag{9}$$

One thing worth noting is that consumer anger has two different effects on demand. First, and most obviously, it reduces demand

$$\frac{dD}{d\lambda} = \frac{d\,(2\,(s-p\,(1+\lambda)+\lambda c))}{d\lambda} = 2\,(c-p) < 0.$$

Second, and more subtle, is the effect on the incentives of the firm (that is, the effects on marginal revenue). In this setting, price as a function of quantity D is

$$D = 2\,(s-p\,(1+\lambda)+\lambda c) \Leftrightarrow p = \frac{2s-D+2c\lambda}{2\,(1+\lambda)}$$

which implies that marginal revenue is

$$pD = \frac{2s-D+2c\lambda}{2\,(1+\lambda)}D \Rightarrow MgR = \frac{s-D+c\lambda}{\lambda+1}.$$

Notice that in the standard model (with $\lambda = 0$), marginal revenue equal marginal cost implies that $D^* = s - c$. As λ increases (from 0), the effect on marginal revenue is given by

$$\frac{dMgR}{d\lambda} = \frac{D-(s-c)}{(\lambda+1)^2}$$

which is negative for $D < D^* = s - c$ and positive for $D > D^*$. Hence, for $D < D^*$, the monopolist facing angry consumers has a smaller incentive to increase D (quantity demanded is more sensitive to price, so increasing quantity marginally, requires a bigger drop in price than before, when λ was 0). Similarly, for $D > D^*$ the monopolist facing angry consumers has a smaller incentive to decrease quantity. But since the sign of $MgR - c$ is the same as before the change in λ, the optimal quantity is the same as in the standard model:

$$D^\lambda = 2\,(s-p^m\,(1+\lambda)+\lambda c) = 2\left(s - \frac{c\,(1+2\lambda)+s}{2\,(1+\lambda)}\,(1+\lambda)+\lambda c\right) = s-c.$$

So far we have been concerned with the conditions that p^m must satisfy to be part of a pooling equilibrium, but only on those restrictions implied by the preferences of the selfish firm. The next two subsections deal with the constraints that implied by the preferences of the altruistic firm.

4.1 Consumers with high utility

For the altruistic firm, utility in the equilibrium is $2\left(p^m - c\right)\left(s - p^m\right)$ (we don't subtract α because we are looking for a pooling equilibrium in which the consumer gets at least the threshold utility level) and utility from the deviation is, for π^{dev} as defined in equation (8), $\pi^{dev} - \alpha$. Of course, if one analyzes a pooling equilibrium in which consumers obtain high utility, one needs to check that consumer utility in the monopoly deviation is less than the threshold. So p^m can be maintained as a pooling equilibrium if and only if

$$2\left(p^m - c\right)\left(s - p^m\right) \geq \frac{\left(c - s\right)^2}{2\left(1 + \lambda\right)} - \alpha \Rightarrow p^m \geq \frac{s + c}{2} - \frac{1}{2}\sqrt{\frac{\lambda}{\lambda + 1}\left(c - s\right)^2 + 2\alpha} \tag{10}$$

Total consumer utility for a price p^m is then

$$2\int_0^{s - p^m} \left(s - p^m - x\right) dx = \left(s - p^m\right)^2 \tag{11}$$

4.2 Consumers with low utility

For the altruistic firm, utility in the equilibrium is $2\left(p^m - c\right)\left(s - p^m\right) - \alpha$. The firm has, in principle, three alternatives

1. stick with the equilibrium monopoly price, which yields $2\left(p^m - c\right)\left(s - p^m\right) - \alpha$;
2. deviating and charging consumers the optimal price. This raises the question of whether the firm's optimal price is above or below the price that would anger consumers and whether it is above or below the price that would give consumers their threshold utility.

    - First, the equilibrium monopoly price is $p^m \leq p^*$ (the optimal price of the altruistic firm). This is always the case, since if the equilibrium monopoly price was higher than p^*, then the altruistic firm could lower its price without being punished. Hence a deviation to the optimal price must be with a higher price.
    - Second, since the optimal price is higher than the equilibrium price, we conclude that the equilibrium price must be the largest price for which consumers don't reject that the firm is altruistic (otherwise the firms could have increased their prices without being punished, and this price increase wouldn't do any additional harm in terms of worsening the altruistic firm's utility cost of consumers not achieving their target utilities, since the firm is already paying that cost with the "low" initial price).
    - Third, as a consequence of the first two points, since the deviation is with a higher price, it must still leave consumers with a low (below threshold) utility.

- All of the above ensures that an altruistic firm who deviates angers consumers, and still pays the utility cost α. The firm's utility is then $\frac{(c-s)^2}{2(1+\lambda)} - \alpha$.

3. lowering its price enough to give consumers their threshold utility. Utility from the deviation is, for the maximum p that yields the threshold utility, $2(p-c)(s-p)$. This maximum price is defined by consumer utility (as in equation 11) equal τ :

$$(s-p)^2 = \tau \Leftrightarrow p = s - \sqrt{\tau} \tag{12}$$

Then, the altruistic firm's utility is

$$2(p-c)(s-p) = 2\left(s - \sqrt{\tau} - c\right)\left(s - s + \sqrt{\tau}\right) = 2\sqrt{\tau}\left(s - c - \sqrt{\tau}\right). \tag{13}$$

and the condition for a pooling equilibrium in which the consumer gets low utility is that

$$2(p^m - c)(s - p^m) - \alpha \geq 2\sqrt{\tau}\left(s - c - \sqrt{\tau}\right) \Rightarrow p^m \geq \frac{c+s}{2} - \frac{1}{2}\sqrt{\left(s - c - 2\sqrt{\tau}\right)^2 - 2\alpha}$$

5 Example: Pooling in duopoly, no pooling in monopoly

We now show that if τ is the utility with 3 firms, for some parameter configurations there is a pooling equilibrium in which both types of firms choose the same price (resulting in no anger, and consumers obtaining a "high" utility from consumption, $u \geq \tau$) with 2 firms. At the same time, there is no pooling equilibrium when there is a monopoly. This results in consumers being angry if the monopolist happens to be of the selfish type. The point of this example is to show:

1. That anger is more likely in a monopoly, so the monopoly is the right model to look at when focusing on anger.[11] This is so, because the only equilibria without anger are pooling equilibria (in any separating equilibrium, in expected terms there will be some selfish firms, and so long as they charge a price larger than marginal cost, there will be anger; and price equal to marginal cost is never optimal).

2. That there is some distance between assumptions and results. If we had chosen τ to be the utility attained by consumers in a duopoly and shown that there is no pooling equilibrium in a monopoly, one could suspect that the "no pooling" result was the consequence of focusing on a market structure different from the one used to calculate the benchmark utility τ. The example shows that that is not the case: the benchmark

[11] For different parameter configurations one can obtain anger also in an oligopoly; anger is not "proprietary" of markets with a monopoly.

utility is with 3 firms; one can still obtain that utility and a pooling equilibrium with a different (more concentrated) market, in particular in a duopoly; the pooling only breaks when moving to a monopoly.

Suppose $\lambda = \frac{1}{15}, s = 1, c = 0, \alpha = \frac{7}{50}$ and $\tau = \frac{7}{12}$, corresponding to the utility of the consumer in a market with 3 firms. Note that $\alpha = \frac{7}{50} = 0.14$ is fairly small, relative to the profits (maximum profits are: 1/2 in a monopoly with these parameters; and 1/4 for each firm in a duopoly). We say that the altruistic motive is "fairly small" in the sense that it is not larger than total firm profits in either the monopoly or duopoly (if it were, one could argue that the altruistic motive is driving "everything"; we have that α is not too large, and we obtain differential behavior in the case of the monopoly vis a vis the duopoly)

5.1 No pooling in monopoly with high utility for consumers

The price in the monopoly situation must be, from equation (9),

$$p^m \geq \frac{c+s}{2} - \frac{s-c}{2}\sqrt{\frac{\lambda}{\lambda+1}} = \frac{3}{8}$$

for the selfish firm to want to pool. But such a price yields a consumer utility of $\frac{25}{64} < \frac{7}{12} = \tau$.

5.2 No pooling in monopoly with low utility for consumers

For the altruistic firm, the alternatives are

1. charging the equilibrium monopoly price and getting $2\left(p^m - c\right)\left(s - p^m\right) - \alpha$,
2. charging its optimal price $p^* > p^m$ (leaving consumers angry and still with a low utility), which yields $\frac{(c-s)^2}{2(1+\lambda)} - \alpha$.
3. lowering its price enough to satisfy consumers, which yields a utility given by equation (13), $2\sqrt{\tau}\left(s - c - \sqrt{\tau}\right)$.

But (1) is better than (3) iff $p^m\left(1 - p^m\right) \geq \sqrt{\frac{7}{12}}\left(1 - \sqrt{\frac{7}{12}}\right) + \frac{7}{100} = 0.25043$ which is impossible. We conclude that there's no pooling, because the altruistic firm always wants to lower its price and satisfy consumers. (even though α is relatively small).

5.3 Pooling in duopoly

We consider a pooling equilibrium in which the price charged guarantees consumers their acceptable utility level of $\frac{7}{12}$. Total utility of consumers for a price of p in a duopoly is:

$$4\int_0^{\frac{1}{2}} (s - p - x)\, dx = 4\int_0^{\frac{1}{2}} (1 - p - x)\, dx = \frac{3-4p}{2} \geq \frac{7}{12} \Rightarrow p \leq \frac{11}{24}.$$

We will show that $p^* = \frac{11}{24}$ is indeed part of a pooling equilibrium. Profits for both types of firm in the equilibrium are price times demand (half the market for each firm): $\pi^* = \frac{11}{48}$.

Faced with this price, neither the altruistic nor the selfish firm wants to deviate by decreasing its price. For both firms, the alternative is choosing p to maximize its profits in a situation where consumers are angry and demand is given by the following condition

$$s - p(1+\lambda) - x = s - p^* - \left(\frac{1}{2} - x\right) \Leftrightarrow D = p^* - p(\lambda+1) + \frac{1}{2} = \frac{23}{24} - p(\lambda+1).$$

Profits pD are maximized for

$$p = \frac{23}{48(\lambda+1)} = \frac{115}{256} \Rightarrow \pi^{dev} = \frac{2645}{12\,288} < \frac{11}{48} = \pi^*$$

and the altruistic firm has an extra utility cost of α. Both firms are then happy to choose the equilibrium price p^*.

6 Initial (unanticipated) Regulation of a Monopoly

In order to study regulation and its consequences for welfare, we make two assumptions. The first, is that the two types of the single firm and consumers are initially playing a separating equilibrium. The reason is that with a pooling equilibrium there is no anger, and the premise of this paper is that anger is an important factor in the rise of regulation. Our second assumption is that when choosing the price to charge, the firm does not anticipate that if it angers consumers, it will be regulated. Although the case of "anticipated" regulation is certainly very interesting, we believe that the problem of the origin of regulation, when firms were not aware of the possibility of regulation, is also interesting.

To study the rise of unanticipated regulation, we must first characterize a separating equilibrium in a monopoly.

6.1 Separating equilibrium in a monopoly

The initial situation is one in which there is a separating equilibrium; the type of equilibrium we focus on is one in which beliefs are "don't reject that the firm is altruistic if and only if $p \leq \overline{p}$" for some the price $\overline{p}$ charged by the altruistic firm. Two cases can arise: for the altruistic firm the consumer's utility is above the threshold, or it is below.

If the consumer's utility is below the threshold for the price of the altruistic firm in some equilibrium, then both firms face the same incentives, and that can't be a separating equilibrium (not a strict one at least[12]). The same is true if the consumer's utility is above the

[12] The firm charging the high price would make "more profits" out of the larger price, but "less" from the punishment, than the firm charging the low price. The two effects would net out.

threshold for both prices. Therefore, we will only focus on separating equilibria in which the high price yields a utility below the threshold, and the low price a utility above the threshold. That is, in the equilibria we analyze, we will have $p_a \leq p^\tau$, for p_a the price of the altruisic firm in equilibrium, and p^τ the highest price that gives consumers their target utility when they are not angry (as defined in equation 12), $p^\tau = s - \sqrt{\tau}$.

Lemma 1 *In a separating equilibrium, the only possible price for the selfish firm is the price that maximizes profits when consumers are angry:*

$$p_s = \frac{c\left(1+2\lambda\right)+s}{2\left(1+\lambda\right)} \Leftrightarrow \pi_s = \frac{\left(c-s\right)^2}{2\left(1+\lambda\right)}. \tag{14}$$

Proof. Suppose p_s is not as in equation (14). Since p_s is a (separating) equilibrium price, consumers will know that the firm is selfish and will therefore be angry. Hence, playing p_s must be better than playing any price p for which consumers have rejected that the firm is altruistic: $\left(p_s - c\right) 2\left(s - p_s\left(1+\lambda\right)+\lambda c\right) \geq \left(p-c\right) 2\left(s - p\left(1+\lambda\right)+\lambda c\right)$. But the right hand side has a unique maximizer given by equation (14), so we obtain a contradiction. ■

We now find the range of prices for the altruistic firm that can be part of a separating equilibrium.

Lemma 2 *In a separating equilibrium the price p_a of the altruistic firm must satisfy*

$$\frac{c+s}{2} - \frac{s-c}{2}\sqrt{\frac{\lambda}{\lambda+1}} \geq p_a \geq \frac{s+c}{2} - \frac{1}{2}\sqrt{\frac{\lambda}{\lambda+1}\left(c-s\right)^2 + 2\alpha}. \tag{15}$$

Moreover, any price in that range can be sustained as a separating equilibrium, as long as it gives consumers their target level of utility.

Proof. Necessity. For the altruistic firm not to want to deviate (upwards) and charge its optimal price (the optimal price is the same as for the selfish firm) we must have (as in the analysis prior to equation 10),

$$2\left(p_a - c\right)\left(s - p_a\right) \geq \frac{\left(c-s\right)^2}{2\left(1+\lambda\right)} - \alpha \Rightarrow p_a \geq \frac{s+c}{2} - \frac{1}{2}\sqrt{\frac{\lambda}{\lambda+1}\left(c-s\right)^2 + 2\alpha}.$$

Similarly, the selfish firm must want to charge its equilibrium price, and not the maximum price for which consumers are not angry, $\overline{p}$. To connect this relationship with an upper bound on p_a, notice that we must have $p_a = \min\left\{\overline{p}, p^\tau\right\}$. This is so, first, because we must have $p_a \leq \min\left\{\overline{p}, p^\tau\right\}$ for beliefs to be consistent, and for consumers to obtain their target utility. Second, if we had $p_a < \min\left\{\overline{p}, p^\tau\right\}$, the altruistic firm could increase its price towards its optimal price (without anger) $\frac{c+s}{2}$; since

$$\frac{c+s}{2} > \frac{c\left(1+2\lambda\right)+s}{2\left(1+\lambda\right)} > \overline{p} \geq \min\left\{\overline{p}, p^\tau\right\} > p_a$$

such a price increase would strictly increase its profits without lowering consumer utility below τ.

For the selfish firm not to want to deviate to $\overline{p}$, we must have

$$2\left(\overline{p}-c\right)\left(s-\overline{p}\right)\leq\frac{\left(c-s\right)^{2}}{2\left(1+\lambda\right)}\Rightarrow p_{a}\leq\overline{p}\leq\frac{c+s}{2}-\frac{s-c}{2}\sqrt{\frac{\lambda}{\lambda+1}}$$

and this establishes the upper bound for p_a.

Sufficiency. It is straightforward to check that for any $p_a \leq p^\tau$, and p_a in the range defined by equation (15), there is an equilibrium with $\overline{p} = p_a$. This condition defines μ as

$$\mu\left(p\right)=\begin{cases}1 & p\leq\overline{p}\\ 0 & p>\overline{p}\end{cases}.$$

Given this, the selfish firm optimally charges p_s as in equation (14), the altruistic firm optimally charges $p_a = \overline{p}$, beliefs are consistent, and consumer's acquisition decisions are optimal given their beliefs and tastes. ■

For an equilibrium with $p_a \leq p^\tau$ to exist, we must have of course $p^\tau \geq \frac{s+c}{2}-\frac{1}{2}\sqrt{\frac{\lambda}{\lambda+1}\left(c-s\right)^{2}+2\alpha}$ (otherwise the range is empty). If we continue with the assumption that τ is consumer utility in some oligopoly with $m = 1/b$ firms, so that $\tau = s - c - \frac{5}{4}b$, the condition for existence of a separating equilibrium becomes

$$p^{\tau}=s-\sqrt{s-c-\frac{5}{4}b}\geq\frac{s+c}{2}-\frac{1}{2}\sqrt{\frac{\lambda}{\lambda+1}\left(c-s\right)^{2}+2\alpha}.$$

Although, as usual, the set of equilibria is large, the Cho and Kreps "Intuitive criterion" refinement in this context yields that the price is as large as possible in the range determined by Lemma 2:

$$p_{a}=\frac{c+s}{2}-\frac{s-c}{2}\sqrt{\frac{\lambda}{\lambda+1}}.$$

6.2 Regulation with market not fully covered

Recall that we had assumed $s \leq c+1$, which was the condition for the market not to be fully served by a monopoly. We compare two types of regulatory policies: mandated prices for the firms, and subsidies.

Consider a situation where there was a separating equilibrium and the firm turned out to be selfish firm (think for example about the railroads in the US at the time of the Sherman Act). What is total welfare? Consumer utility is, using p_s from equation 8,

$$2\int_{0}^{s-p-\lambda\left(p-c\right)}\left(s-p-\lambda\left(p-c\right)-x\right)dx\Big|_{p=p_{s}}=\frac{\left(s-c\right)^{2}}{4}.$$

Notice that consumer welfare is exactly the same as in the case where the consumer's utility is standard: the expression of consumer welfare is independent of λ. The reason is that, while for each price less consumers would purchase because anger diminishes the incentives to purchase, the monopolist lowers his price so that exactly the same number of consumers as before purchases:

$$\frac{D}{2} = s - \lambda\left(p_s - c\right) - p_s = s - \lambda\left(\frac{c\left(1+2\lambda\right)+s}{2\left(1+\lambda\right)} - c\right) - \frac{c\left(1+2\lambda\right)+s}{2\left(1+\lambda\right)} = \frac{s-c}{2}.$$

In order for the marginal consumer to be the same (with $\lambda > 0$ or $\lambda = 0$) the price decrease must exactly offset anger; indeed, an increase in λ decreases price p_s

$$\frac{dp_s}{d\lambda} = \frac{c-s}{2\left(\lambda+1\right)^2} < 0.$$

Since transportation cost (or taste) x is additive, the effect on every other consumer is exactly the same as with the marginal consumer, and therefore total utility is the same.

Just to repeat: the reason for the price decrease, is that demand becomes more elastic when λ grows. This lower optimal price leads to a decrease (relative to the standard case) of the welfare of the firm:

$$\left(p-c\right)D\big|_{p=p^s} = \left(p-c\right)2\left(s-\lambda\left(p-c\right)-p\right)\big|_{p=p_s} = \frac{\left(s-c\right)^2}{2\left(1+\lambda\right)}.$$

We now calculate the welfare in six cases: standard and anger model, crossed with 3 policies; laissez faire, regulated price $p = c$ and a subsidy under which $p = c$ and the monopolist gets $p_s - c$ per unit from the government, as an incentive to lower prices to consumers. For these calculations we assume that even for $p = c$, not all consumers are served.

In the standard model, as has been argued, the firm maximizes $\left(p-c\right)2\left(s-p\right)$, charges an optimal price of $p^* = \frac{c+s}{2}$ and obtains profits of $\pi^* = \frac{\left(c-s\right)^2}{2}$. The rest of the cases are given by:

	Firm's Profits in Standard and Anger Models	
Policy↓	Standard Model	Anger Model
Laissez Faire	$\frac{\left(c-s\right)^2}{2}$	$\frac{\left(s-c\right)^2}{2\left(1+\lambda\right)}$
Regul.	0	0
Subsidy	$\left(p^*-c\right)2\left(s-c\right) = \left(c-s\right)^2$	$\left(p^s-c\right)2\left(s+\lambda\left(c-p^s\right)-c\right) = \frac{\left(\lambda+2\right)\left(c-s\right)^2}{2\left(\lambda+1\right)^2}$

Consumer welfare is given by

	Consumer Welfare in Standard and Anger Models	
Policy↓	Standard Model	Anger Model
Laissez	$2\int_0^{s-\frac{c+s}{2}}\left(s-\frac{c+s}{2}-x\right)dx = \frac{\left(c-s\right)^2}{4}$	$2\int_0^{s+\lambda\left(c-p_s\right)-p_s}\left(s+\lambda\left(c-p_s\right)-p_s-x\right)dx = \frac{\left(c-s\right)^2}{4}$
Regul.	$2\int_0^{s-c}\left(s-c-x\right)dx = \left(c-s\right)^2$	$2\int_0^{s+\lambda\left(c-c\right)-c}\left(s+\lambda\left(c-c\right)-c-x\right) = \left(c-s\right)^2$
Subsidy	$2\int_0^{s-c}\left(s-c-x\right)dx = \left(c-s\right)^2$	$2\int_0^{s+\lambda\left(c-p_s\right)-c}\left(s+\lambda\left(c-p_s\right)-c-x\right) = \frac{\left(\lambda+2\right)^2\left(c-s\right)^2}{4\left(\lambda+1\right)^2}$

Note that in the anger model, the consumer cares not only about how much he pays, but also about how much the firm receives. In calculating the subsidy, we assume that the firm gets p_s, the price in the absence of regulation. Note that the consumer welfare is the same in the absence of regulation; not only that, the consumer who is indifferent between buying and not buying is also the same individual; the price reduction, that the monopolist must make in the anger model, leaves the welfare of each consumer intact.

Then, total welfare in all scenarios is

	Total Welfare in Standard and Anger Models	
Policy↓	Standard Model	Anger Model
Laissez	$\frac{(c-s)^2}{4}+\frac{(c-s)^2}{2}=\frac{3(c-s)^2}{4}$	$\frac{(c-s)^2}{4}+\frac{(s-c)^2}{2(1+\lambda)}=\frac{(\lambda+3)(c-s)^2}{4(\lambda+1)}$
Regul.	$(c-s)^2+0$	$(c-s)^2+0$
Subsidy	$(c-s)^2+(c-s)^2=2(c-s)^2$	$\frac{(\lambda+2)^2(c-s)^2}{4(\lambda+1)^2}+\frac{(\lambda+2)(c-s)^2}{2(\lambda+1)^2}=\frac{(c-s)^2\left(\lambda^2+6\lambda+8\right)}{4(\lambda+1)^2}$

Since consumer welfare with and without anger is the same, and the profits of the monopolist are lower with anger, total welfare in the economy is lower in the anger model.

The following table shows the gains to regulation: total welfare after regulation, minus total welfare before regulation. An obvious point that we haven't addressed yet is where is the money for subsidies coming from? How is it counted in total welfare. We will address this issue shortly.

	Benefits of Interventions in Standard and Anger Models	
Policy↓	Standard Model	Anger Model
Regul.	$(c-s)^2-\frac{3(c-s)^2}{4}=\frac{(c-s)^2}{4}$	$(c-s)^2-\frac{(\lambda+3)(c-s)^2}{4(\lambda+1)}=\frac{(c-s)^2(3\lambda+1)}{4(\lambda+1)}$
Subsidy	$2(c-s)^2-\frac{3(c-s)^2}{4}=\frac{5(c-s)^2}{4}$	$\frac{(c-s)^2\left(\lambda^2+6\lambda+8\right)}{4(\lambda+1)^2}-\frac{(\lambda+3)(c-s)^2}{4(\lambda+1)}=\frac{(c-s)^2(2\lambda+5)}{4(\lambda+1)^2}$

In both the standard and in the anger models the government subsidy equals the firm's profit: $T_A=\frac{(\lambda+2)(c-s)^2}{2(\lambda+1)^2}$ is the transfer in the anger case and $T_S=(c-s)^2$ in the standard case. It is easy to check that the subsidy is always larger in the standard case; yet, as we now show, it is not the extra subsidy in the standard case that make subsidies less attractive in the anger model. Let $\Delta_{St.}^{S-R}$ be the difference in welfare between Subsidies and Regulation in the standard model (by how much more do subsidies increase welfare); similarly, let $\Delta_{Ang.}^{S-R}$ be the difference in welfare between Subsidies and Regulation in the anger model. We have that

$$\begin{aligned}\Delta_{St.}^{S-R}-\Delta_{Ang.}^{S-R} &= (c-s)^2-\frac{(c-s)^2\left(4-3\lambda^2-2\lambda\right)}{4(\lambda+1)^2}=\frac{1}{4}\frac{\lambda(c-s)^2(7\lambda+10)}{(\lambda+1)^2}\\ &> (c-s)^2-\frac{(\lambda+2)(c-s)^2}{2(\lambda+1)^2}=T_S-T_A\end{aligned}$$

Hence, imagine that due to the costs of raising the money (or the political economy costs) the regulator was indifferent between the two policies when he thought the economy was a standard one. If he learns that consumer preferences include the anger term that we study in this paper, he would favor regulation without subsidies.

Although subsidies are less attractive than in the standard model, good old fashioned price setting by the regulator is better in the model with anger:

$$\frac{(c-s)^2(3\lambda+1)}{4(\lambda+1)} - \frac{(c-s)^2}{4} = \frac{1}{2}\frac{\lambda}{\lambda+1}(c-s)^2 > 0$$

6.3 Three channels

In this model with anger, there are three channels through which regulation can potentially increase welfare.

1. standard channel whereby a reduction in price from above marginal costs increases total welfare by getting a good of cost c to be produced and transfered to a consumer who values it at s.

2. for each consumer, who was purchasing and was angry, a reduction in price increases total welfare by reducing his anger (because the firm is making lower profits).

3. any channel that reduces anger (whether it reduces price or not) induces people who were out of the market to start buying the good, and that also increases total welfare. Imagine for example a policy that kept the price fixed, but "expropriated" the profits from the firm. In that case, in the standard model, welfare would be unchanged. In the current model welfare increases for two reasons: first, each consumer who was purchasing before, is happier. But also, some consumers who were not purchasing, will now become customers.

7 Discussion

Our Results: The starting point of the paper is our assumption that total utility is made up of a material payoff and an emotional payoff. While the former is standard, the emotional payoff is assumed to become negative when agents that are perceived to be unkind do well, or more precisely, when a firm that has charged "excessive" prices makes positive profits. While other specifications for these emotional reactions might also be natural, this one is sufficient for our purposes: firms in our model are extremely interested in appearing to behave altruistically and often, though not always, charge relatively low prices so as not to irritate consumers. Indeed in competitive markets (i.e., when there are still enough competitors in the market

so that it pays for a selfish firm to pretend to be altruistic) the introduction of an emotional payoff makes demand more elastic.[13]

It is worth pointing out that, in our paper, even though the introduction of emotions introduces more discipline on firms in principle, it does not mean that there are lower welfare gains from regulation. Indeed, when we study reductions in the numbers of competitors, we note that when emotions matter, the increase in prices can be considerably higher than when emotions don't affect total utility. Put differently, when there are few competitors, consumers have a higher cost of "punishing" firms that misbehave (charge them high prices) by abstaining from purchasing from them. This introduces a bigger role for regulation.

Relationship to Other Work: Our paper is related to previous research emphasizing the fact that one important attribute that people look to see in prices is their fairness. In a seminal paper, for example, Kahneman, Knetsch and Thaler (1986) noted a remarkable degree of agreement amongst survey respondents in what changes in prices they considered fair and which ones they did not. A small literature has studied the theoretical implications of assuming consumers' preferences display a concern for fairness, including Rabin (1993), Fehr and Schmidt (1999), Bolton and Ockenfelds (2000), *inter alia*. Of particular interest for our purposes are Levine (1998) and Rotemberg (2005, 2006), who assume that a person's altruism towards others depends on his/her estimation of how altruistic others are in return. Introducing heterogeneity in agent's preferences allows them to explain a wide range of phenomena observed in dictator and ultimatum experiments (see the discussions in Levine, 1998 and Rotemberg, 2006). Their specification of consumer preferences allows us to introduce a feature that is relevant in the regulation of monopoly: high prices sometimes anger consumers, so there is a cost of monopoly that is closer to the informal descriptions of "exploitation" and "abuse" observed in the anecdotal evidence (which regulation and antitrust actions are seen to address).[14]

Rotemberg (2005) describes how altruistic preferences can give rise to price rigidity. In his model, missing on good deals gives rise to regret and facing prices that are unjustifiably high induces customer anger. He observes that the frequency of price adjustment can depend on economy-wide variables observed by consumers and derives implications for the effects of monetary policy. While our specification of preferences is very much related, he does not

[13]Interestingly, Supreme Court judge Stephen Breyer mentions that an additional justification for regulation (beyond efficiency) is Fairness, by which he means that competition prevents firms from "arbitrary or unjustifiably discriminatory exercise of personal power" and that a monopolist might be able to get away with discriminating or more generally "treating a customer unfairly". See Breyer (1982).

[14]See also the reactions to the 2009 subprime crisis, in particular the public fallout after it was disclosed that some of the troubled firms had paid bonuses to their executives. One example is "The Outrage Factor: Do populist outbursts like the on sparked by the AIG bonuses represent a threat to capitalism -or an opportunity? Our essayists on populism and its discontents", cover story in *Newsweek*, March 30, 2009.

analyze how equilibrium outcomes depend on the level of competition, the main purpose of our paper. Heidhues and Kőszegi (2008) on the other hand describe a market equilibrium closely related to our paper (as it is also based in Salop, 1979). They also introduce a realistic assumption of consumer preferences (in their case, it is that consumers have loss aversion, and so a price increase is worse than a price decrease of the same magnitude). One inconvenience for applying their model to study monopoly is that consumers who do not purchase do not experience disutility. In contrast, in the monopoly setting it seems important that models allow for the possibility that bystanders can get upset even when they are not themselves the victims of "exploitative" prices. Heidhues and Kőszegi (2008) develop a "disciplined approach" where the behavioral model is based on the classic (intrinsic utility) model of Salop, and fully endogeneize the reference point (as the lagged rational expectations point). In our model, the predictions also reduce to Salop's when there are no psychologically realistic features and the "fair" outcome is defined within the model (the outcome for the consumer when there is a reasonable amount of competition). For a discussion of how a behavioral model becomes generally applicable when it is based on a "disciplined approach", see also Kőszegi and Rabin (2006).

Relationship to Public Relations (the Practice and the particular Instruments): Given that the public is keen to find out which type of firms they face, there is ample room for firms to try and influence these perceptions. For simplicity, we only allow firms in our model to signal their type through their choice of prices. But in reality, firms employ a variety of means to influence the perceptions of potential clients. For example, one interpretation of the large amounts of money spent in "public relations" is that they are an attempt to signal a "kind" type by other (presumably cheaper) means than lowering prices.[15] Similarly, it is possible to interpret the particular form that such public relations efforts take in terms of our model. For example, publicizing charitable actions (by the firm as a whole or by its founder or main shareholders) cannot be easily interpreted when consumers care only about their material payoffs. A simpler explanation is that it is an attempt to influence the perception of the type of firm.[16]

[15] See, for example, Boyd (2000), Metzler (2001) and the discussion in Patel et al (2005). On the role of status and how legitimacy confers power but depends on the support of stakeholders, see Pfeffer and Salancik (1978) and Suchman (1995).

[16] One of the first and most famous of the public relations practitioners was Ivy Ledbetter Lee, who had the Rockefeller family as a client. After the so-called Ludlow Massacre in 1913 (where striking miners and children where eventually killed), Lee advised John D. Rockefeller to visit the mines personally and to advertise his philanthropic activities (which had been secret up to then). See, for example, Bates (2002). Note that even if potential clients were just altruistic towards the beneficiaries of the firm's charitable giving it is unlikely that (in the absence of the signalling role of donations) they would favor the firm's publicizing their largesse. The reason is that the publicity might crowd out other donors (unless they think that this publicity will now re-direct further giving by others, perhaps by raising awareness of the "worthiness" of this cause). It seems

Another particular form of public relations that is consistent with our approach is that firms often "humanize corporations", emphasizing the identity of the founder or main shareholder. One interpretation of this relatively common form of marketing is that by doing so a firm is more likely to be perceived to have the attributes of humans (such as kindness) than of "soulless" corporations that "only care about profits". Again, such language is unlikely to make sense in a world where customers only care about material payoffs. Figure 1 is taken from Marchand (1998), who studies the role of corporate imagery in the creating and maintaining the perception that corporations in America have a "soul" (interpreted by the author as forms of kindness, tolerance and other positive human attributes).

Figure 1. An ad in the campaign by Bell Telephone System to humanize the corporation.

It depicts an elderly lady cooking and describes her as one of the many shareholders of the telephone company. The caption also emphasizes that these are neither exceptional nor sophisticated investors (occupations mentioned include housewife, miner, clerk, teacher), are not opportunistic investors (more than half "have held their shares for five years or longer"), approximately half are women, and often hold small amounts (a large number of them "own 5 shares or less", which was not a lot) for saving purposes (instead of speculation). In terms of our model, we note that it is harder to get angry at higher prices when these are ultimately benefiting a gentle-looking, cooking grandmother than when the beneficiary is a rich capital-

implausible that this is the primary logic that is triggered by the publicity of a firm's charitable giving.

ist. Interestingly, Marchand (1998) also mentions that it is related to an attempt to appear democratic at a time when the big companies are perceived to have grown dramatically in size relative to traditional institutions (the advertisement mentions that the Bell company is a democracy run by the people it serves).

Note that it is unlikely that the public has good information about the structure of costs faced by the firm. In that case a firm that is perceived as kind will be granted more tolerance and allowed to charge relatively higher prices than an unkind firm in similar circumstances without triggering consumer anger.[17]

Positive Theories of Regulation: Finally, the model has also some implications for a positive theory of regulation. Most models emphasize the role of interest groups in lobbying and bribing their way to favorable regulation, as in Stigler (1971). Our paper is complementary in the sense that we give a role to the demand for regulation on the part of the public (rather than on the part of firms) and the mechanisms we describe may also give rise to the set up of regulatory bodies that are not carefully designed by benevolent policymakers (for example, it may not consider the firms' welfare as part of the objective function).

It is worth emphasizing that the evidence available also suggests the opposite causal link (from corruption to regulation), at least in some instances. For example, within a country, individuals who perceive lots of corruption in the country are precisely those who declare to want more regulation; and that this demand is stronger when big companies are thought to be involved. Even over time, regulation bursts seem to follow corruption scandals (see, for example, Di Tella and MacCulloch, 2002).[18]

This is consistent with the model we present: when capitalists are perceived to be corrupt and unkind, voters demand regulation. Of course, in sophisticated legal systems, more efficient punishment directed only at those that are perceived to be breaking the rules might be available. In such cases, a descent into distrust and a regulated economy might be avoided by "moral crusaders", who often explicitly frame their campaigns as a benefit to broad capitalism.[19] More broadly, we give a central role to the interaction between the legal system and regulation as both are seen as limiting and punishing deviant business actions.

There are several episodes where regulation is put into place as a result of considerable public anxiety. The classic case is the Sherman Act of 1890, which laid the basis of the reg-

[17] This may be the consequence of a purely rational Bayesian calculation in which the prior belief shifts "upwards" towards higher (better or nicer) types, but it can also be the consequence of basic psychological mechanisms ("nice people don't do this kind of thing")

[18] Anecdotal evidence is consistent with this interpretation: after the Enron scandal in 2002 there was heightened regulation even though a Republican administration was in place (including additional funding for the Securities and Exchange Commission, Sarbanes-Oxley legislation, etc). Note that authors who see these reforms as insufficient, like Conrad (2004), discuss how policymakers undercut pressures for more reforms during this period.

[19] Eliot Spitzer was a recent example of a tradition that goes back at least to Teddy Roosevelt.

ulation of big business in America. Our reading of this episode is that its political support originated in perceptions of their "abusive" nature rather than the possibility of their introducing inefficiencies by restricting trade. One example is John D. Rockefeller's Standard Oil trust. Various practices that reinforced an ability to charge high prices made the concern the target for attacks. These were discussed in the press and the muckrakers' writings, including Ida Tarbell's 1902 popular series on Standard Oil in McClure's Magazine (later compiled in a book History of Standard Oil Company). Starting in 1904, the States filed a series of lawsuits (13 in 1906 alone) which ended in a Federal district court decision to break up the Standard Oil Company into its component companies. Although doubts remain as to the impact of the separation on its conduct, it is clear that the motivation for regulation in this case is unlikely to have been a preoccupation with efficiency (particularly when there are efficiencies to be gained on the cost side as scale is increased). Wildavsky and Tenenbaum (1981) describe this and other episodes where high prices led to widespread mistrust between the public (and politicians) and the oil industry. In particular, it describes the public reactions to the first oil shock and the subsequent debates over how much of these increases could be justified by dwindling oil and gas reserves (versus taking advantage of the increases engineered by the OPEC cartel).

8 Conclusions

In this model we have analyzed the role of emotions in the demand for regulating monopolies. The root assumption is that consumers get angry when they think that a firm is charging "abusive" or "exploitative" prices (or more generally, when they see agents they dislike doing well). We model this as consumers that experience utility from consumption at low prices (a standard material payoff) and disutility from observing high profits in the hands of firms that have displayed low levels of altruism towards their clients (an emotional payoff). In the context of a simple monopolistic competition model, this implies that firms experience large drops in demand when their activities (e.g., price selections) irritate consumers. We show that market equilibrium in these circumstances displays a series of interesting properties. For example, in some circumstances, even with a very low proportion of truly altruistic firms, most firms in the market charge a low price in order to appear to be kind, as in Rotemberg (2008). An important feature of the equilibrium is that, as the number of firms in the market drops, switching to a firm who has not raised prices becomes more costly to the consumer, and the threat to punish unkind firms by not making a purchase becomes less credible. This leads to price increases by firms, which in turn leads to anger.

The main result of the paper is that, under a reasonable set of circumstances, public anger is more likely under monopoly than under (oligopolistic) competition. This introduces a new

normative justification for regulation of monopoly: by reducing the profits of firms revealed to be unkind, anger of captive consumers (and of the public that is witness to the "abuses") falls and welfare is increased. More precisely, regulation helps through the standard channels (increasing output when it is valuable), a purely emotional channel (captive consumers are less angry as unkind firms earn less in profits), and a mixed channel (individuals who were out of the market as they were too angry in the unregulated market, decide to purchase and reduce the standard distortions described in the first channel). The anger mechanism emphasized here suggests that firms will invest resources in trying to appear kind, perhaps developing professionals devoted to "public relations", or by advertising campaigns emphasizing the founder's identity (in contrast to the anonymous set of shareholders) or through philanthropy (see, for example, the evidence collected in Marchand, 1992).

As a consequence of these features, the model can be used to justify the regulation of monopoly. Given the new mechanisms highlighted, it can also be used to choose between different regulatory approaches, such as anti-trust versus regulatory agencies or between regulatory instruments, such as fines versus price regulation. More generally, given our assumption that emotional payoffs play a role, the optimal reaction to small restrictions in output under monopoly (a small "Harberger triangle") and high bureaucratic costs of setting up regulatory agencies may still be to regulate. This fits well with the fact that we often wish to regulate utilities (like Water and Sewage), even though it is clear that high prices bring about small reductions in output. Given this, some authors have opted for introducing a weight in the social welfare function that can yield a small influence of firm profits on regulated price (see, for example, Laffont and Tirole, 1993). The results in this paper could be used to formally justify the inclusion of such low weight on profits, hopefully providing some guide on how to estimate them through experimental methods.

9 Appendix

In this appendix we show that consumer utility *and* price are higher in an oligopoly than in a monopoly.

9.0.1 Higher Utility in Oligopoly (always satisfied).

As long as $p \geq s - \frac{1}{2}$, demand in a monopoly market is determined by the marginal consumer, the consumer who is indifferent betwen buying and not: $s - p - x = 0$. This is as opposed to a situation in which demand is determined by the consumer who is indifferent between buying from firm i, or from firm $i+1$. The problem of the monopolist is then that of choosing $p \geq s - \frac{1}{2}$ to maximize $(p - c) 2 (s - p)$, which yields $p^m = \frac{c+s}{2}$. This price falls in the correct

range $p \geq s - \frac{1}{2} \Leftrightarrow \frac{c+s}{2} \geq s - \frac{1}{2} \Leftrightarrow s \leq c + 1$. If $s \geq c + 1$, then $p^m = s - \frac{1}{2}$. That is

$$p^m = \begin{cases} \frac{c+s}{2} & s \leq c+1 \\ s - \frac{1}{2} & s \geq c+1 \end{cases}. \tag{16}$$

Consumer utility is then:

$$U = 2\int_0^{s-p} (s - p - x)\, dx = (p - s)^2 = \frac{(s-c)^2}{4}$$

when $s \leq c + 1$. If $s \geq c + 1$, utility is

$$U = 2\int_0^{\frac{1}{2}} (s - p - x)\, dx = s - p - \frac{1}{4} = \frac{1}{4}.$$

We will see later that consumer utility in an oligopoly when the market is covered is $s - c - \frac{5}{4}b$. For this number to be larger than in a monopoly for all b, we need the following two conditions:

- $s - c - \frac{5}{8} \geq \frac{1}{4} \Leftrightarrow s - c \geq \frac{7}{8}$ (for $s \geq c + 1$). So no restrictions here.
- and $s - c - \frac{5}{8} \geq \frac{(s-c)^2}{4} \Leftrightarrow s - c \leq \frac{1}{2}\sqrt{2}\sqrt{3} + 2$ (for $s \leq c + 1$). So no restrictions here either.

9.0.2 Higher price in monopoly (impossible)

Since the oligopoly price is $b+c$ and the monopoly price is given by equation (16), the oligopoly price is lower than the monopoly price for all b iff $c + \frac{1}{2} \leq \frac{c+s}{2}$ if $s \leq c+1$ (so this is impossible) or $c + \frac{1}{2} \geq s - \frac{1}{2}$ if $s \geq c + 1$ (so this is also impossible).

That is: price is higher in the Salop oligopoly.

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