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Signaling about norms: Socialization under strategic uncertainty*

Fabrizio Adriani† and Silvia Sonderegger‡

Abstract

We consider a society with informed individuals (adults) and naive individuals (children). Adults are altruistic towards their own children and possess information that allows to better predict the behavior of other adults. Children benefit from adopting behaviors that conform to the social norm determined by aggregate adult behavior, but, lacking accurate information, have to rely on the observed behavior of their adult parent to infer the norm. We show that this causes a signaling distortion in adult behavior. Compared to the benchmark case of no signaling, parents have a higher propensity to adopt attitudes that encourage their children to behave in a *socially safe* way, i.e. the way which would be optimal under maximum uncertainty about the prevailing social norm. This distortion is different in nature from the typical distortion due to a conflict of interest between sender and receiver in standard signaling games. The norm-signaling bias is self-reinforcing and might lead both to (Pareto) superior and inferior outcomes relative to the case of no signaling. We discuss applications to sexual attitudes, collective reputation, and trust.

JEL codes: C72, D83, D80, Z13. **Keywords: Signaling, Norms, Strategic Uncertainty, Complementarities, Coordination Games, Socialization.**

1 Introduction

Cultural anthropologists define the culture of a society as "...whatever one has to know or believe in order to operate in a manner acceptable to its members" (Goodenough, 1957). Information about what to expect from others is extremely valuable in social interactions. The behavior and attitudes of experienced individuals (parents, teachers, mentors) are often motivated by the need to teach what is socially acceptable to more naive members of a society (children, pupils, protégées). For example, a school for children aged 3-18 in Cambridge, UK, has recently

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introduced a policy where pupils are let off for minor misdemeanors if they come up with quick and clever excuses. The head teacher reportedly justified the policy by arguing that "it's a great lesson of life to talk your way out of a tight corner in a very short period of time."[1]

Less controversially, many readers will be familiar with the dilemmas of PhD student training. Should the advisor set high standards in order to encourage a student to invest in technical skills? Or should he "go easy" on the student? The answer to this question partly depends on the norms within a field. Investing in technical skills may be crucial for the student's career prospects if other senior academics (referees, reviewers, journal editors) happen to have high standards. Setting low standards may mislead the student into thinking that technical sophistication is not required. In a similar vein, many parents face the problem of which attitude to take towards particular forms of behavior such as pre-marital sex and, more generally, sexual promiscuity. A relaxed attitude by one's parent signals that society is relaxed about sex issues, and may thus encourage the child to try sex before marriage.

All the above examples share the common feature that the behavior of an "experienced" individual conveys information to a "naive" individual about social norms. In this paper, we look at this problem from a strategic viewpoint. We consider a setting with a continuum of informed players (adults) and naive players (children). Each adult has altruistic motives toward his own child. Adults face a binary choice between a high action (high academic standards, conservative attitude toward sex) and a low action (low standards, liberal attitude). An adult's direct payoff depends on the aggregate behavior of other informed players – i.e. the *social norm* – and on a state of nature. Children also face a binary choice (whether to invest in skills, whether to engage in pre-marital sex). The payoff from either choice depends on the social norm set by aggregate adult behavior.

We assume that adults observe private but correlated signals about the state of nature and that aggregate behavior is not directly observable. Adults' private information allows them to form accurate beliefs about the social norm. Children observe the behavior of their own parent and draw inferences about the norm set by adults.

Our main result is that, relative to the benchmark case where children directly observe the social norm, parent-child signaling causes a distortion in adult behavior. We call this distortion *the norm-signaling bias*. Intuitively, if the child knew the norm, then each adult could simply take the action that maximizes his own expected utility. By converse, with naive children, adults have to take into account the fact that their behavior might mislead their child into adopting a suboptimal behavior. The norm-signaling bias is thus different in nature from the standard

[1] Details can be obtained at http://www.bbc.co.uk/news/uk-england-cambridgeshire-20397480.

signaling distortion due to a conflict of interests between sender and receiver. Quite the opposite, it would not arise if adults did not care about their children's welfare.

Our setting allows to uniquely characterize the properties of the norm-signaling bias. We show that adults always distort their behavior in a way that encourages their child to take the *socially safe choice*. This is the action that would be optimal for the child under maximum strategic uncertainty.[2] The intuition is as follows. Although all adults possess precise information that in principle may help to predict the behavior of others, the marginal adult (i.e., who is indifferent between the two actions) faces maximum strategic uncertainty: He believes either action to be majoritarian with the same probability. He thus distorts his behavior to encourage his child to choose the action that he (the marginal adult) believes to be optimal, i.e. the socially safe choice. As it is usual in economics, what happens at the margin determines overall behavior. As a result, social norms will be partly shaped by the adults' desire to shelter their child from the potential costs of miscoordination. This may explain for instance why parents often adopt behaviors aimed at promoting a certain degree of "caution" in their children. If abstaining from pre-marital sex is optimal when one is uncertain about the social norm, parents will have a high propensity to take a conservative attitude on sex issues. A more direct example is provided by parental attempts to modify their own manner of speech (e.g. by smoothing their accent) in the hope of encouraging their children to speak with a more "neutral" accent (e.g. the Queen's English). The virtue of a neutral accent is that it is fairly understandable independently of whether one is used to a particular regional accent or not.

While the direction of the norm-signaling bias depends on the child's socially safe choice, its magnitude is determined by the strength of what we call *oblique complementarities*. These can be defined as the pressure faced by children to conform to the social norm set by aggregate adult behavior. In the sex attitudes example, this reflects the cost of being ostracized by conservative adults for having premarital sex. Stronger oblique complementarities increase the value to the child of the information conveyed by parental behavior. In turn, this increases the adult's incentive to distort his behavior.

The presence of oblique complementarities makes the norm-signaling bias self-reinforcing, since the very act of signaling determines the nature of what is being signaled. Parents who adopt a certain behavior (e.g. a conservative attitude) to signal that that particular behavior is the norm make the norm even more pervasive. In turn, this makes signaling more compelling.

[2] Our definition of socially safe choices is clearly strongly related to the concept of risk dominance in 2×2 games (the importance of risk dominance is stressed by the results of Carlsson and van Damme, 1993, and Kandori, Mailath, and Rob, 1993). Notice however that our point is slightly more subtle. Parents distort their behavior in a way that induces their child to choose *their* "risk dominant" action.

More generally, we show that signaling concerns dramatically affect the nature of the interaction among informed players. For instance, the norm-signaling bias may induce them to behave as if their actions were strategic complements even when, absent any signaling concerns, they would be substitutes.

In order to gather a better understanding of the socio-economic implications of the norm-signaling bias, we discuss three applications. The first is our running example: Parents select their attitude on sex issues and children choose whether to engage in pre-marital sex or not. The second application considers collective reputation problems (Arrow, 1973, Coate and Loury, 1993, Moro, 2003, Fang and Norman, 2006, Saez-Martí and Zenou, 2012). In a simplified version of Coate's and Loury's (1993) model, we investigate under what conditions it is optimal for parents to socialize their children to work hard. Following Adriani and Sonderegger (2009), the third application looks at under what conditions parents choose to instil honesty into their children.

In all three examples, the presence of a norm-signaling bias generates somewhat striking predictions. In the example of attitudes toward sex, a parent may want to take a conservative attitude on sex issues even if he has moderately liberal beliefs, i.e. even if he thinks that, on balance, pre-marital sex is a good thing. Even more, the equilibrium is characterized by hypocrisy: A conservative norm emerges even when all adults know that *all* other adults have moderately liberal beliefs. In the problem of collective reputation we find that – in environments where access to education is particularly costly – parents may find it optimal to give their children a weak work norm even when incentives are designed to reward hard work. The third application shows that parents may want to teach their children to be honest even when society appears to encourage dishonesty (e.g., due to weak or corrupt governance). This outcome is however possible only if the potential rewards from trusting others are sufficiently large. When this is not the case, a "street culture" (Silverman, 2004) might instead emerge whereby individuals engage in anti-social behavior even if crime does not pay.

The paper is organized as follows. In the next section we review the relevant literature. In Section 2 we present the baseline model. Section 3 provides a characterization of the norm-signaling bias. Section 4 considers some natural extensions of the baseline model. Section 5 illustrates the effects of the bias in applications. In all these cases, we are generally able to obtain unique predictions. In Section 6, however, we study two variants of the model that necessarily generate multiple equilibria. In the first, we look at what happens when children mostly care about conforming to their peers (rather than to adults). In the second, we allow for costless communication between adults and their children.

1.1 Related literature

Signaling models of culture/social norms have recently received much attention (see e.g. Bernheim, 1994, Fang, 2001, Bénabou and Tirole, 2006, Ellingsen and Johannesson, 2008, Daughety and Reinganum, 2009). With few notable exceptions (see e.g. Sliwka 2006, Acemoglu and Jackson, 2011), however, these models have restricted attention to situations where the sender is concerned about signaling his own characteristics. By contrast, we consider the problem of informed individuals who want to convey information about how they believe others are likely to behave.

Closely related to our work are Hermalin (1998), Bernheim and Thomadsen (2005), Adriani and Sonderegger (2009 and 2013) and Bénabou and Tirole (2011). Hermalin (1998) considers a setting where an informed leader distorts his effort to increase the effort exerted by his followers. The distortion in his case is due to a conflict of interest between leader and followers in the sense that the leader wants each follower to exert higher effort than the follower would like. As we argue below, the distortion we identify is not due to a conflict of interests and, therefore, would not arise in a standard "leading by example" model. A similar argument can be made for Bénabou and Tirole (2011) and Adriani and Sonderegger (2013). We discuss Bernheim and Thomadsen (2005) and Adriani and Sonderegger (2009) in Sections 4 and 5.3, respectively.

From a more technical viewpoint, our model is related to the literature on binary action global games (Carlsson and van Damme, 1993, Morris and Shin, 1998). A few papers in this literature have analyzed, as we do, settings with both payoff complementarities and information externalities (Corsetti et al. 2004, Goldstein and Pauzner, 2004). This literature has however mostly focused on financial applications and thus lacks a crucial ingredient in our story, namely intergenerational altruism.

2 The Baseline Model

Most of our results are driven by a single effect. For pedagogical purposes, we start off with an extremely stylized setup that allows to isolate the main force at work from confounding effects. These will be considered in the next section.

Consider an economy populated by a continuum of identical child-adult pairs, indexed by $i \in [0, 1]$, where each adult has exactly one child. Adult behavior is characterized by an action a. Each adult may choose between $a = 1$ (*high* action) or $a = 0$ (*low* action). Adults move simultaneously. The direct payoff to an adult from the low action is zero. The direct payoff from the high action is given by the random variable θ (the state of nature). We assume that the state of nature is uniformly drawn in the interval $[-D, D]$. However, parents do not perfectly observe θ; Each parent i only observes a private noisy signal θ_i uniformly drawn in the interval $[\theta - \epsilon, \theta + \epsilon]$. We will assume that ϵ is positive but small.

In the advisor/advisee example, the advisor may choose whether to require high or low standards. Whether requiring high standards is appropriate or not depends on the advisor's personal assessment of the intrinsic characteristics of the field, θ_i, (e.g. whether it is a young field with abundant "low hanging fruits" that do not require much sophistication to be reaped or it is a mature field where sophistication is crucial).

Children also face a binary action problem. They can choose between a *top* action ($\alpha = 1$) and a *bottom* action ($\alpha = 0$). In the advisor/advisee example, the action α can be interpreted as investment in technical skills. The payoff from the bottom action is again set equal to zero. The payoff from the top action depends on the share of adults who have chosen the high action, $x \in [0, 1]$,

$$C(x) = \omega(x - r_C). \tag{1}$$

Intuitively, it is worth investing in skills only if there are enough senior academics with high standards, (i.e. only if their share is at least equal to r_C). The parameter $\omega > 0$ captures the sensitivity of the child's payoff to the behavior of adults. It is thus a measure of the strength of *oblique complementarities*. The parameter r_C determines whether it is worse to lack technical sophistication when most people demand it or to be technically sophisticated when most people do not require it.[3] It is thus clearly related to the concept of risk dominance developed for 2×2 games,

Definition 1. *Action $\alpha \in \{0, 1\}$ is the* socially safe choice *if it is optimal for the child under maximum uncertainty over adults' behavior (i.e. if it is optimal when x is uniform in $[0, 1]$).*

Notice that the top action is socially safe when $r_C < 1/2$, while the low action is socially safe when $r_C > 1/2$. For $r_C = 1/2$, the two actions have the same safety level.

We assume that adults are altruistic towards their children. However, in order to better illustrate the differences between our setting and a standard signaling game, we allow for the possibility of a conflict of interests between an adult and his child. In the advisor/advisee example, the advisor may not fully internalize the advisee's cost of investing in technical skills. We model this by assuming that the adult's intrinsic preference over the child's action is given by $C^P(x) = C(x) + \beta$, where $\beta \in \mathbb{R}$ measures the conflict of interests. A value of β equal to zero means that incentives are perfectly aligned. A positive β implies that the parent wants his child to choose the top action in situations where the child would prefer the bottom action (e.g. he

[3]The case where the child's payoff also depends on θ is addressed below, in section 4.

does not fully internalizes the costs of the top action), while a negative β means that the parent is biased against the top action. The role of β will be particularly relevant in section 6.2 where we discuss the possibility of parent-child communication via cheap-talk.

	Bottom action	Top action
Low action	0	$\boldsymbol{C(x)+\beta}$
High action	θ	$\theta + [\boldsymbol{C(x)+\beta}]$

Table 1: Total parental utility (bold symbols reflect parent's utility from the child's choice).

Table 1 shows an adult's total utility. More compactly, this can be expressed as

$$u(x, a, \alpha; \theta) \equiv a\theta + \alpha[C(x) + \beta]. \tag{2}$$

Information Structure and Timing

The timing is as follows.

Stage 0 Nature draws a realization of $\theta \in [-D, D]$ and, for each adult i, draws a signal $\theta_i \in [\theta - \epsilon, \theta + \epsilon]$.

Stage 1 Each adult i observes θ_i (but not θ) and chooses action a_i. All adults move simultaneously.

Stage 2 Each child i observes a_i (but not θ_i, θ, or x) and chooses action α_i.

Stage 3 Payoffs are realized.

Most of our results throughout the paper will be derived under the assumption that D is large. While it is standard to assume uninformative priors in the global games literature, in our case the prior also represents the children's ex-ante beliefs about the state of nature. The implicit assumption is therefore that children have poor information about θ (and thus about x), beyond the information conveyed by parental behavior. This seems to be a reasonable way to model young children, for whom the main source of information about the 'adult world' is usually the behavior of the adults who take care of them. It becomes less reasonable when we consider more "sophisticated" children, who have independent access to multiple information sources. For this reason, in Section 4 we extend the analysis to the case where children are able to observe the aggregate behavior of adults (x) with some positive probability. This information structure allows us to have meaningful comparative statics on the degree of sophistication of children, while keeping the problem tractable.

3 Equilibrium characterization

We first consider the benchmark case where children are able to perfectly observe x. In that case, the child's equilibrium strategy consists in choosing the top action whenever $x \geq r_C$ and is independent of parental behavior. We can thus treat the children's behavior as fixed and analyze the adults' problem in isolation. It is then clear that, with no signaling concerns, each parent will choose the high action when $\theta_i \geq 0$ and the low action for $\theta_i < 0$.[4]

Consider now the more interesting case where children do not observe x, but only the action chosen by their own parent. This opens the door to the possibility of parent-child signaling. Notice that parents do not directly observe the behavior of other adults. However, a parent's private signal θ_i is informative of the distribution of beliefs in the adult population. This gives the parent an informational advantage over the child in predicting aggregate adult behavior (x). Through his own behavior, each parent can convey information about θ_i – and, thus, about x – to his child.

Parent-child signaling affects the nature of strategic interactions among parents in a fundamental way. To see how this happens, let $\alpha(a)$, $\alpha : \{0, 1\} \to [0, 1]$ denote the probability that a child chooses the top action upon observing his parent choosing action $a \in \{0, 1\}$, and let $\Delta\alpha \equiv \alpha(1) - \alpha(0)$. The value of $\Delta\alpha$ is determined in equilibrium and reflects the extent to which a parent's action affects his child's choice. In the case of informed children we have for instance $\Delta\alpha = 0$. In general, (2) implies that the parent's total net payoff can be expressed as

$$a\{\theta + [C(x) + \beta]\Delta\alpha\}. \tag{3}$$

We refer to (3) as the parent's *inclusive payoff*. Differentiating the term in graphs with respect to x yields

$$\frac{d[u(1, \alpha(1), x; \theta) - u(0, \alpha(0), x; \theta)]}{dx} = C'(x)\Delta\alpha = \omega\Delta\alpha. \tag{4}$$

Whenever $\Delta\alpha > 0$ a parent's incentive to choose the high action is (weakly) increasing in the share of parents who choose the high action. Intuitively, by choosing the high action, parent i affects the outcome associated with the choices of parent j's child. This increases parent j's desire to choose the high action, in order to signal to his child that parent i is likely to choose the high action. This stands in contrast with the case of informed children, where there is no complementarity in adult behavior. The difference between the two cases emerges even though payoffs are exactly the same – the only difference is in the information structure. The presence of ω in (4) is an equilibrium feature, that emerges endogenously, motivated by the child's equilibrium strategy.

[4]Throughout the paper, we use the convention that a parent who is indifferent chooses the high action.

By inducing a "spurious" complementarity in adults' behavior, norm signaling thus affects the nature of social norms that will emerge in equilibrium. Having analyzed the core mechanism at work in our model, we are now ready to give a full characterization of the equilibrium of the game.

Proposition 1. *For D sufficiently large, there exists a unique equilibrium where each parent i chooses $a = 1$ if θ_i exceeds a cutoff θ^* and chooses $a = 0$ otherwise. The equilibrium cutoff θ^* is equal to*

$$\underset{\substack{\textit{Conflict of}\\ \textit{interest}}}{-\beta} \quad + \quad \underset{\substack{\textit{Norm-signaling}\\ \textit{bias}}}{\omega\left(r_C - \tfrac{1}{2}\right)}. \tag{5}$$

Each child chooses the top action ($\alpha = 1$) if and only if he observes his parent choosing the high action ($a = 1$).

Compared with the case of informed children, norm signaling signaling introduces additional effects into the picture. When children are informed, adults have a cutoff equal to zero. Expression (5) thus measures the distortion due to signaling. This has two components. The first, captured by the term β, is the distortion due to the conflict of interests. This distortion arises because there are situations where the parent would like the child to choose one action, but the child would prefer the other. The second component, the term $\omega(r_C - 1/2)$, is what we call the *norm-signaling bias*. Differently from the first term, the norm signaling bias does not reflect a misalignment of incentives and would arise even with $\beta = 0$. Rather, it reflects the notion that, through his own behavior, each parent reveals his beliefs about the behavior of others to his child. Since parents are altruistic, they internalize the information externality that they impose on their children. The end result is that the norm-signaling bias goes in the direction of encouraging the child to select his socially safe choice. For instance, when the top action is socially safe, the bias is negative. This is because parents are more inclined to select the high action in order to induce their children to choose the top action. The reverse occurs when the socially safe choice is the bottom action.

To see the intuition for this result, note that the marginal parent (i.e., the parent who observes a θ_i equal to the cutoff) has a uniform *posterior* over x: He expects exactly half of the parents to choose the high action and half to choose the low action. As far as he is concerned, the child should therefore select the action that is optimal under maximum strategic uncertainty (the socially safe choice). On the other hand, when children are naive, their behavior is fully determined by their observation of parental behavior. Each adult is thus willing to tolerate a movement of the cutoff away from his private bliss point if this increases the chances that his child will adopt the socially safe action. The desire to induce children to "play it safe" (from a social viewpoint) thus forces adults to distort their behavior.

Although the socially safe choice may determine the direction of the norm signaling bias, its magnitude depends on the strength of oblique complementarities (ω). Intuitively, the larger the sensitivity of the child's payoff to the behavior of other adults, the higher the propensity of the parent to distort his behavior to shelter his child from costly mistakes.

An implication of Proposition 1 will play an important role in the discussion that follows. Since, as we saw, signaling generates a "spurious" complementarity in parental behavior, the norm-signaling bias is self-reinforcing. For instance, consider the case of no conflict of interests ($\beta = 0$). When the top action is socially safe, parents who have observed a signal slightly below zero choose to switch to the high action in order to induce their child to choose the top action. By doing this, they make the high action more widespread – and thus the top action more attractive – inducing parents with lower signals to switch as well. As a result, the very act of signaling determines the nature of what is being signaled. Parents who follow the norm to signal that that is the norm make the norm even more pervasive, thus making signaling more compelling.

4 Mixed motives signaling, partially sophisticated children, horizontal spillovers

We now extend the results of Proposition 1 in several directions. First, we allow the child's payoff to also depend on the state of nature. This implies that the parent's motives for signaling are now mixed: Parental behavior conveys information both about the social norm and about the state of nature. Second, we allow children to observe the norm with some probability. Third, we allow for direct strategic interaction among adults and for pure externalities.

Mixed motives signaling In some cases, the child may also care directly about the state of nature. For instance, in the advisor/advisee example, whether investing in skills is opportune or not may also depends on the nature of the field. To allow for this possibility, we thus assume that the child's payoff is given by

$$C(x; \theta) = \omega(x - r_C) + l_\theta \theta, \tag{6}$$

where the parameter $l_\theta \geq 0$ measures the child's payoff sensitivity to the state of nature.

Partially sophisticated children It is natural to assume that children may have direct access to information sources beyond parental control. For instance, a PhD student may independently acquire some notion of the prevailing norms of the field by attending seminars and conferences. We model this by assuming that, with probability $1 - \delta$ the child is able to directly observe aggregate behavior, x. With the complementary probability $\delta \in [0, 1]$ he is naive, i.e. he only observes his parent's behavior. Adults do not know in advance what their child will observe, but are aware that their actions will provide relevant information to their child with probability δ.

Horizontal complementarity In some cases, adults may care directly about coordinating with other adults. For instance, an academic may want to adopt standards that conform to the standards of other senior academics in the field. We thus assume that an adult's payoff is given by

$$P(x; \theta) = v(x - r_P) + \theta, \tag{7}$$

where r_P plays an analogous role to r_C in the child's payoff. The parameter v is the sensitivity of the parent's net payoff to changes in x, the share of adults selecting the high action. Consistent with the literature on global games, we will predominantly concentrate on the case $v \geq 0$ (strategic complementarity). However, in Section 5.3 we will discuss an application where $v < 0$, so that parents' actions are strategic substitutes.

Pure externalities In some cases, the behavior of adults may generate *pure* externalities, i.e. externalities with no direct consequence for strategic behavior, but with consequences on aggregate welfare.[5] We denote with $e \in \mathbb{R}$ the social marginal benefit of an adult taking the high action. For instance, academics with high standards may generate research of higher quality, so that all academics in the field will benefit ($e > 0$). On the other hand, they may also produce work that is not easily accessible, so that the academic community will be worse off ($e < 0$).

Taking into account all these features, we can express an adult's total utility as

$$u(a, \alpha, x; \theta) = aP(x; \theta) + \alpha[C(x; \theta) + \beta] + ex. \tag{8}$$

Relative to the low action, the adult's inclusive net payoff from the high action is now

$$P(x; \theta) + \delta\Delta\alpha[C(x; \theta) + \beta]. \tag{9}$$

where the presence of δ in (9) reflects the fact that an adult's behavior is now determinant for his child's choice only if the child is naive. Compared to the baseline model, we need two technical assumptions. The first is mostly for analytical convenience and requires $\delta l_\theta < 1$. In

[5] We consider pure externalities in the behavior of adults. It is however clear that nothing would change if we were to consider pure externalities in the behavior of children.

words, the direct impact of the state of nature on the parent's payoff is always larger than its indirect impact (i.e. through the child's payoff).[6] The second is more crucial,

A1 $v + \delta\omega \geq 0$.

Intuitively, this ensures that, once the child's reaction is taken into account, the *inclusive* payoff of each adult is supermodular. Notice that supermodularity of the adults' *direct* payoff (i.e. $v \geq 0$) is not required. As a result, it will be possible to give a full characterization of the equilibrium even in the presence of mild horizontal substitutability.

In the Appendix (see proof of Proposition 1) we show that, under $\delta l_\theta < 1$ and A1, the equilibrium behavior of children who do not directly observe x is uniquely determined. This reduces to choosing the top (bottom) action whenever the parent chooses the high (low) action, i.e. $\Delta\alpha = 1$. Adults follow a threshold strategy with cutoff

$$\theta^* = \frac{v\left(r_P - \frac{1}{2}\right) + \delta\omega\left(r_C - \frac{1}{2}\right) - \delta\beta}{1 + l_\theta\delta}. \tag{10}$$

We can obtain the cutoff in the absence of signaling concerns, θ^I, by setting $\delta = 0$ in (10),

$$\theta^I = v\left(r_P - \frac{1}{2}\right). \tag{11}$$

The distortion due to signaling is thus

$$\theta^* - \theta^I = \frac{\delta}{1 + l_\theta\delta}\left[-\beta + \omega\left(r_C - \frac{1}{2}\right) - l_\theta v\left(r_P - \frac{1}{2}\right)\right]. \tag{12}$$

The total distortion is now scaled by a factor $\delta/(1+l_\theta\delta)$. Clearly enough, the less naive are children, the lower the parents' incentives to distort their behavior for signaling purposes. Consider now what happens as l_θ increases. Intuitively, a higher l_θ increases the importance for the child of "getting θ right". Signaling about the state of nature becomes more important relative to norm-signaling. As a result, as l_θ becomes larger, the parent wants to move his cutoff away from the child's socially safe choice and toward the optimal cutoff when all that matters is the state of nature (i.e. $\theta^* = 0$). This is evident by looking at the cutoff expression (10). An increase in l_θ reduces the weight of the norm-signaling term $\omega(r_C - 1/2)$. In general, this effect will partially counteract the norm-signaling bias. There is however another effect. The weight of the term $v(r_P - 1/2)$ in (10) is also inversely related to l_θ. Intuitively, as the child becomes more exposed to the state of nature, it becomes also less crucial *for the parent* to conform to other adults. As a result, the parent gives less importance to his own socially safe choice. When the

[6] If $\delta l_\theta \geq 1$, the equilibrium we characterize would still be an equilibrium, but proving uniqueness for all possible parameters configurations is more complicated.

parent's safe choice is misaligned with that of the child (e.g. $r_C < 1/2$ and $r_P > 1/2$) and there is strong horizontal complementarity, this indirect effect outweighs the direct effect, so that the norm-signaling bias is reinforced. As a result, higher sensitivity to the state of nature of the child's payoff may either increase or reduce the norm signaling bias depending on which effect prevails.

Finally, to fully appreciate the welfare consequences of the norm-signaling bias, consider the case of positive externalities ($e > 0$). With perfectly informed children, an adult's problem would look like that depicted in Figure 1. Notice that, when θ_i belongs to the "free rider" portion of the line, the high action maximizes aggregate welfare even though the low action is optimal for each adult independently of what other adults do. Clearly enough, with informed children, no cooperation is possible when θ_i falls in that portion of the line. This is because the cutoff, θ^I, necessarily falls in the "coordination" portion and, therefore, $\theta_i < \theta^I$. This is not necessarily true with naive children. If the top action is the socially safe choice and oblique complementarities are sufficiently strong, the cutoff, θ^*, will fall in the "free rider" segment. In this case, the presence of a norm-signaling bias induces adults to cooperate for all realizations of $\theta_i \geq \theta^*$ (the thick line in Figure 1). Hence, in this example, signaling boosts cooperation. We will see in Section 5.3 an application where parents choose to provide a public good (pro-social values) to signal to their children that a norm for honesty is widespread. That said, it is easy to come up with parameter configurations where the reverse occurs, so that the norm-signaling bias reduces cooperation.

The bottom line is that signaling forces adults to engage in behavior that would be otherwise dominated. The intuition for this result is similar to that given in Bernheim and Thomadsen (2005) for the case of self-signaling. There are, however, two important differences. First, our model generates "otherwise dominated" behavior as the only possible outcome – at least for parameter values – whereas in Bernheim and Thomadsen (2005) dominated behavior may or may not emerge depending on which equilibrium is selected. Second, our results impose precise restrictions on the range of behaviors that could emerge in equilibrium. Adults may choose an action that is "otherwise dominated" only when it encourages their child to select the socially safe choice.

In order to gather a better understanding of the socio-economic implications of the norm-signaling bias, we discuss now a few examples. In most cases, we will assume no conflict of interest to isolate the effect of norm-signaling. That said, it is not difficult to see how in each case the interests of parents and their children may be imperfectly aligned.

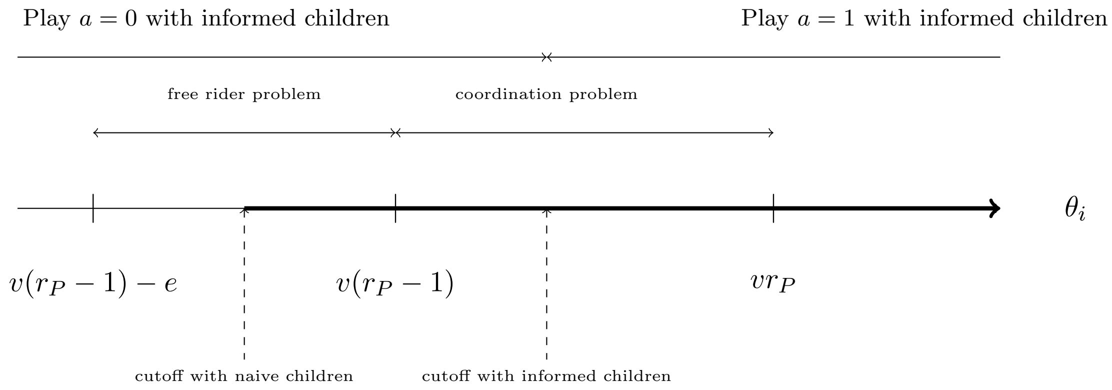

Figure 1: The game among adults with informed and naive children

5 Applications

5.1 Attitudes towards sex, hypocrisy, and self-fulfilling norms

Parental attitudes towards sex are obviously important determinants of the sexual behavior of children. A direct and obvious channel through which parental attitudes affect child behavior is the fear of confronting disapproval by one's parent. In this section, we discuss an alternative channel through which parental attitudes affect their children's sexual behavior. This is an indirect channel where the parent acts as a vehicle for societal pressures to conform.

Suppose that parents have to decide whether to take a liberal attitude toward sex ($a = 1$) or a conservative attitude ($a = 0$). Taking a conservative attitude involves disapproving of 'deviant' behavior. For concreteness, suppose that this takes the form of stigmatizing youngsters who have sex before marriage.[7] Children in turn choose whether to engage in pre-marital sex ($\alpha = 1$) or to abstain ($\alpha = 0$). Payoffs are as follows. Engaging in pre-marital sex yields a direct utility

$$\theta - \omega(1 - x), \tag{13}$$

where $1 - x$ is the share of adults who take a conservative attitude. The first term, θ, represents the direct net benefits (or costs) from pre-marital sex. These clearly reflect the direct utility from the act or from a better informed choice of partner, the quality and availability of contraceptives,

[7] Note that we are implicitly assuming that parents can commit *ex ante* to shame future deviant behavior. This may for instance be done by choosing an appropriate identity (liberal, conservative), in the vein of Akerlof and Kranton (2000). In that model, different identities come with different prescriptions of appropriate behavior. A person with identity A who does not behave in conformity with the behavioral prescriptions appropriate for A-types would suffer a cost (an 'identity loss' in Akerlof's and Kranton's terminology). Alternatively (at the cost of additional expositional complication) we could have constructed a model where different parent-child pairs move sequentially, and where each parent may send a signal to his child by shaming/not shaming deviant children from the previous cohort.

the risk of unwanted pregnancies and of sexually transmitted diseases. The second term, $\omega(1-x)$, represents the costs of shaming/social boycott coming from society. These increase as more adults take a conservative attitude toward sex. As in the baseline model, we assume that children do not observe θ when choosing between sex and abstinence.

Parents' direct payoff from taking a conservative attitude is set equal to zero. Their direct expected payoff from liberalism reflects their assessment of the intrinsic benefits/costs of pre-marital sex, θ_i. We say that an adult has *conservative beliefs* if, on balance, he thinks that pre-marital sex is a bad thing ($\theta_i < 0$). We say that an adult has *liberal beliefs* in the opposite case ($\theta_i > 0$). We set for simplicity $\beta = 0$, so that there is no conflict of interest between parent and child. Our results would simply become more extreme if parents had a bias against pre-marital sex (for instance because they do not fully internalize the utility the child derives from the act).[8] We also assume that children are naive with probability $\delta < 1$. Table 2 illustrates the parents' overall utility.

	Abstinence	Pre-marital sex
Conservative attitude	0	$\delta[\boldsymbol{\theta - \omega(1 - x)}]$
Liberal attitude	θ	$\theta + \delta[\boldsymbol{\theta - \omega(1 - x)}]$

Table 2: Total parental utility (bold symbols reflect parent's utility from the child's choice).

If children were always able to observe x (i.e. $\delta = 0$), their choice between sex and abstinence would be independent of parental attitudes. It is then clear that parents would choose conservatism whenever they have conservative beliefs ($\theta_i < 0$) and would choose liberalism otherwise. As we now argue, things change when children are (at least in some cases) unable to observe x, so that norm-signaling occurs.

It is immediate to check that this setup is analogous to the one seen in Section 4 having set $v = r_P = \beta = 0$ and $r_C = l_\theta = 1$. We can thus apply the result.

Result 1. *When $\epsilon > 0$ and D is sufficiently large, there exists a unique equilibrium where (i) Parents adopt a liberal attitude if $\theta_i \geq \theta^* = (\omega/2)(\delta/1+\delta)$, adopt a conservative attitude otherwise. (ii) Naive children choose pre-marital sex if their parent has a liberal attitude and choose abstinence (i.e. the socially safe choice) otherwise.*

Figure 2 illustrates adults' behavior.

[8] We consider a setup where parents who fail to shame deviants do not incur any direct sanction themselves. As a result, we abstract from horizontal complementarities among parents, so that $v = 0$. This is meant to clarify that signaling motives *alone* may be sufficient to induce excessive stigmatization.

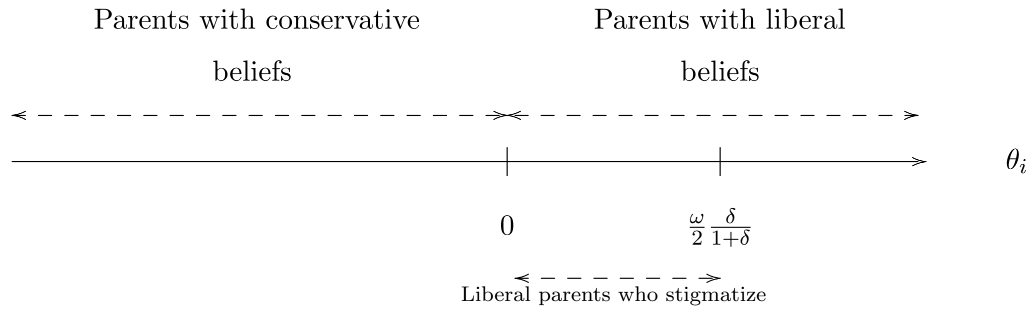

Figure 2: Attitudes toward sex

The interesting feature of the model is that some parents may take a conservative attitude even if they have liberal beliefs, i.e. even when they think that, on balance, pre-marital sex is a good thing. This is done to signal to their children that pre-marital sex is not acceptable in society.

Interestingly, for ϵ sufficiently small, there exist realizations of θ such that *all* parents have liberal beliefs, but still take a conservative attitude. Even more, it may happen that all parents *know* that all other parents have liberal beliefs, but they still choose to be conservative. We call this feature of the model *hypocrisy.* Intuitively, the need to signal to children that there is a norm against pre-marital sex forces parents to follow the norm, thus helping to preserve it. To see how hypocrisy may occur, suppose that $\theta \in (3\epsilon, \theta^* - \epsilon)$. Since all parents have $\theta_i > 0$, they all have liberal beliefs. However, since $\theta + \epsilon < \theta^*$ all choose to be conservative. This happens in spite of the fact that all know that all expect the benefit from pre-marital sex to outweigh the costs. A parent with signal θ_i knows that any other parent necessarily has $\theta_j \geq \theta_i - 2\epsilon$. Hence, the parent with the lowest signal – equal to $\theta - \epsilon$ – knows for sure that all other parents have $\theta_j \geq \theta - 3\epsilon > 0$. All other parents clearly know that the lowest θ_j is above that level.[9]

There is evidence to suggest a degree of hypocrisy in parents. Using questionnaire data, Newcomer and Udry (1985) show that teenagers substantially underestimate their mothers' liberalism over sex issues. This is consistent with the idea that parents may strategically adopt a more conservative attitude than their personal inclinations, in order to influence their children's behavior.

Finally, notice that hypocrisy decreases as children become less naive (lower δ). This suggests that we should observe less hypocrisy when children are likely to get information from sources beyond parental control.

[9] While it is common knowledge that all have liberal beliefs, it is not necessarily common knowledge that all know that all have liberal beliefs. This would require the stronger condition $\theta > 5\epsilon$. In turn, common knowledge of the fact that all know that all know that all would benefit requires $\theta > 7\epsilon$ and so on.

5.2 Work ethic and collective reputation: Coate and Loury (1992) meets Bénabou and Tirole (2006)

Work ethic has traditionally been on the foreground of much public discourse on welfare and inequality. Nineteenth-century moralists saw the moral and physical weakness of the poor as inextricably linked. Contemporary social commentators also lament the "deteriorating work ethic in white working class males (..)", and identify this deterioration as an important problem of Western society.[10]

A point raised by Bénabou and Tirole (2006) is that whether a society is perceived as "fair" or not determines the type of work norms that will prevail.[11] Beliefs about the fairness of society are typically passed by parents onto their children through narratives that do not always reflect the facts on the ground. Understanding the mechanisms through which these beliefs are formed is thus crucial to understanding what work norms are likely to emerge.

At the same time, a separate line of inquiry has looked at problems of statistical (i.e. information driven) discrimination (see e.g. Coate and Loury, 1993). These models rely on a collective reputation mechanism. Since the human capital investment of a worker is imperfectly observed, employers use stereotypes about the characteristics of workers from the same social group to form their beliefs. The setup is thus characterized by multiple equilibria. If people believe that individuals from a certain group are "lazy", each individual group member will be more reluctant to invest. In turn, this makes it rational for employers to discriminate that particular group. The extent to which a group will be discriminated thus ultimately depends on the beliefs about the behavior of its members. A possible shortcoming of these theories is that they do not provide an account of the beliefs formation process.

We believe that there might be some value in bringing together the two approaches and that our model may help in this task. We consider a simplified adaptation of Coate and Loury (1993), which is augmented with an explicit account of belief formation. There is a continuum of parent-child pairs. Parents choose whether to instil strong or weak work norms into their children. We model work norms as a commitment to exert effort. Once employed, children with strong work norms exert high effort, while children with weak work norms exert low effort. There are two types of jobs: skilled and unskilled. The unskilled job pays $w > 0$ if the worker exerts low effort and $w + \theta$ if he exerts high effort. The skilled job pays the same as the unskilled

[10] This quote is drawn from an interview with the political scientist and social commentator Charles Murray, available at http://www.christianpost.com/news/interview-political-scientist-charles-murray-on-class-marriage-and-the-christian-right-69359/

[11] See also Piketty (1995, 1998), Bénabou and Ok (2001) for other analyses of the role of beliefs on social mobility.

	Not invest	Invest
Weak norms	w	$w + (\boldsymbol{x\Delta w} - \boldsymbol{c})$
Strong norms	$w + \theta$	$w + \theta + (\boldsymbol{x\Delta w} - \boldsymbol{c})$

Table 3: Total parental utility (bold symbols reflect parent's utility from the child's choice).

job plus a skill premium $\Delta w > 0$ (See Table 3). The state of nature θ captures the extent to which effort on the job is rewarded net of its cost. We will interpret it as the incentive system of society.

Workers can access the skilled job only by investing in skills. The investment costs $c > 0$, with $c < \Delta w$, and is imperfectly observed by employers. We assume that if the worker has not invested, the employer will receive a low signal for sure and allocate the worker to the unskilled job. If the worker has invested, the employer will observe a high signal (and allocate the worker to the skilled job) with probability x, where x is the aggregate share of workers with strong work norms in the group. With the complementary probability, $1 - x$, the employer receives a low signal and allocates the worker to the unskilled job.

An interesting feature of this setup is that oblique complementarities arise *indirectly*, from the collective reputation mechanism. An employer is more likely to notice that a worker is skilled if the worker belongs to a group with high work ethic. Hence, employers partly form their beliefs based on aggregate information – namely stereotypes about the pervasiveness (or lack thereof) of work ethic in the group. This implies that, if the group is perceived as lacking work ethic, each worker will face worse job prospects (even if he has invested), and vice-versa. Just as in Coate and Loury (1993), these stereotypes will prove to be relevant since in equilibrium a group's work ethic actually reflects its aggregate level of human capital.

Since parents' choices of work norms are correlated – they all depend on the net return from effort θ – a child's own work norm is a good indicator of the work norms of other group members and, accordingly, of whether it is worth to invest in skills. Hence, work norms have a dual role in our setting. First, they determine the level of effort exerted by children. Second, they shape children's beliefs about the chances that investing in skills will be rewarded. A child with a strong work norm not only exerts higher effort once he gets a job, he is also more inclined to invest in order to land a better job. In turn, this implies that stereotypes on a group's work ethic are informative about the group's human capital investment.

This setup is equivalent to that of the baseline model if we set $r_C = c/\Delta w$, $\omega = \Delta w$ and $\beta = 0$. It follows that,

Result 2. *When $\epsilon > 0$, and D is sufficiently large, there exists a unique equilibrium where (i)*

Parents instill a strong work norm in their child if $\theta_i \geq \theta^* \equiv c - \Delta w/2$, and a weak work norm otherwise. (ii) Children with strong work norms invest in skills, while children with weak norms do not.

The result has implications both for socio-economic theories of work ethic and for theories of information-based discrimination. In the absence of signaling concerns a parent would give his child a weak work norm if and only if he expects a negative net return from effort ($\theta_i \leq 0$). In the presence of signaling, it is necessary to distinguish between two cases. We say that a group lives in a *low mobility* environment if access to education is costly relative to the skill premium ($c > \Delta w/2$, or, equivalently, $r_C = c/\Delta w > 1/2$). We say that it lives in a *high mobility* environment if the reverse occurs. Since $r_C > 1/2$, in a low mobility environment, not investing in skills is the socially safe choice. A parent may thus choose a weak work norm even if the net return from effort is positive. Intuitively, the parent expects that, since other children of the group will lack work ethic, his child will be at a disadvantage. A weak work norm is optimal because it signals to the child that he should not waste resources in trying to climb the social ladder. This implies that weak work norms may persist even when incentives (e.g. the benefit system) are designed to make effort profitable. By contrast, in a highly mobile environment, investing is socially safe. Strong work norms may thus persist even in the presence of poorly designed incentives that favor low effort.

Notice that a child with a strong work norm has a positive outlook on society and its fairness. He expects that investing in skill will ultimately be rewarded. In the terminology of Benabou and Tirole (2006), he believes in a "just world". By converse a child with a weak work norm expects discrimination to be rife. Hence, at the micro level, the model highlights that the work norms one inherits from his family background are important determinants of beliefs. At the aggregate level, the beliefs of a group (and thus its chances of social advancement) will ultimately be determined by the interaction between its perception of the incentive system (θ), and other characteristics of the environment like the accessibility of the education system vis-á-vis the skill premium.

5.3 Boy scouts and hoods: Trust, values, and crime

A large body of work spanning psychology and economics challenges the assumption that individuals act exclusively to maximize their narrowly-defined self-interest. Evidence shows that individuals often reduce their own earnings in order to increase the earnings of their opponent, even in situations where there are no positive future consequences associated with behaving pro-socially (see, e.g., Camerer 2003). A related question is why we observe parents passing pro-social values to their children even in societies that, because of a weak or inefficient legal system, appear not to reward pro-social behavior or even to encourage opportunism. Shedding light on this puzzle is relevant because pro-social norms are often all that prevents societies characterized by weak or corrupt governance from unravelling. At the same time, recent economic literature on crime raises the opposite puzzle (see e.g. Silverman, 2004). Why do we observe anti-social behavior even in environments where this is manifestly sub-optimal? We argue here that pro-social values have hidden benefits and costs, which may help to shed light on these puzzles.

The crucial observation, borrowed form Adriani and Sonderegger (2009), is that, by instilling pro-social values into his child, a parent may signal that a norm for honesty is dominant in society. Equipped with the knowledge that honest individuals are the majority, the child then finds it optimal to trust others. By contrast, a child that is raised with anti-social values will infer that dishonesty is rife among his contemporaries, and will therefore not trust.

The setup is as follows. Each child can behave either in a trusting or distrustful manner. He can also be either honest or dishonest. Trusting yields a material payoff $tx - q(1 - x)$, where x is the share of honest children and $(1 - x)$ the share of dishonest children. Hence, $t > 0$ is the marginal benefit of an additional honest individual and $q > 0$ is the marginal cost of an additional dishonest individual. The payoff from being distrustful is set equal to zero.

Consider now the rewards from honesty and dishonesty. Again, we set the payoff from honesty equal to zero. The payoff from dishonesty is $b\xi - \theta$, where $\xi \in [0, 1]$ is the share of trusting individuals. We assume that $b > 0$, so that the rewards from dishonesty increase with the share of trusting individuals. Intuitively, a larger share of trusting individuals means a larger pool of potential victims. The state of nature θ can be interpreted as the extent to which the institutional environment punishes or rewards dishonesty. This may for instance reflect the quality of governance, the legal system, or the effectiveness of enforcement.

We assume that children do not observe θ, nor x or ξ. Parents observe a private signal θ_i about θ and choose whether to give pro-social or anti-social values to their child. A child with pro-social (anti-social) values is committed to honesty (dishonesty).[12] The child can however choose whether to trust or not. Table 4 illustrates the payoffs.

The question we ask is the following. Under what conditions, if any, would a parent want to raise his child as pro-social? In the absence of signaling motives, parents may want to give pro-social values only when the consequences of dishonesty (θ) are negative enough to counteract

[12]Notice however that this would be consistent with the child's equilibrium behavior so long as θ is unobservable. We assume commitment to keep exposition simple and to make the setup comparable with what we have seen in the previous sections.

	Trusting	Distrustful
Pro-social values	$(\boldsymbol{tx - (1-x)q})$	0
Anti-social values	$b\xi - \theta + (\boldsymbol{tx - (1-x)q})$	$b\xi - \theta$

Table 4: Total parental utility (bold symbols reflect parent's utility from the child's choice).

the material advantages ($b\xi$). It is then clear that no parent with $\theta_i < 0$, i.e. believing that dishonesty pays, will ever pass pro-social values to his child.[13]

Consider now what happens in this setup if we introduce norm signaling. We argue that, if the potential rewards from trust are sufficiently large, so that $t > b + q$, a parent may raise his child as pro-social even if he believes that the institutional environment rewards dishonesty ($\theta < 0$). Symmetrically, if $t < b + q$, a parent may raise his child as anti-social even when dishonesty is suboptimal. The first step is to establish that, in equilibrium, the share of honest children must coincide with the share of trusting children.

Lemma 1. *Assume that $\epsilon > 0$. Then, for D is sufficiently large $\xi = x$ in any equilibrium of the game.*

Proof. See Appendix.

Notice now that, since all individual players are small, there is no loss of generality in imposing $\xi = x$ at the outset. It is convenient to work directly with these "reduced form" payoffs. The inclusive payoff from pro-social values is thus

$$\underbrace{-(bx-\theta)}_{\text{Forgone dishonesty rents}} \qquad + \qquad \underbrace{[(t+q)x-q]}_{\text{Utility from trusting}} \qquad \times \qquad \Delta\alpha. \tag{14}$$

Setting $v = -b$, $\omega = t + q$, $r_C = q/(t+q)$, $\beta = l_\theta = r_P = 0$, $\delta = 1$, and $\theta = -\theta$ shows that the "reduced form" setup is analogous to that of Section 4. A peculiar feature of this setting deserves special attention, though. Since $b > 0$, we have $v < 0$. In words, parental actions (to raise their child as pro-social/anti-social) are *strategic substitutes.* Intuitively, since (in equilibrium) pro-social children are trusting, a parent's choice to raise his child as pro-social increases the stock of trusting children. In turn, this increases the expected rents obtained

[13] Formally, if children could observe the share of pro-social agents x, a child's choice to be trusting or not would be independent of his values. A child will be trusting if the proportion of pro-social individuals is sufficiently large ($x \geq q/(q+t)$) and will not trust otherwise. Consider now parents. If they choose to endow their child with pro-social values their child cannot benefit from dishonesty. This costs $\xi b - \theta$. Hence, the expected net payoff from passing pro-social values of a parent with private signal θ_i is $\theta_i - bE(\xi|\theta_i)$.

from dishonesty, thus weakening the incentives, for other parents, to raise their children as pro-social. This setup is thus characterized by *horizontal substitutability.* In order to ensure that Assumption A1 (supermodularity of inclusive payoff) is satisfied, we need to impose $t + q > b$.

Result 3. *Assume that $\epsilon > 0$, D is sufficiently large, and $t+q > b$. Then, there exists a unique equilibrium where (i) Parents choose pro-social values for their children if $\theta_i \geq \theta^* = (q+b-t)/2$ and choose anti-social values otherwise. (ii) Children choose to be trusting if and only if they are pro-social.*

Notice that, for $t > q$, $r_C < 1/2$. Thus, trusting is the socially safe choice. If the potential rewards from trusting are large enough ($t > q + b$), the norm signaling bias generates a negative cutoff ($\theta^* < 0$). As a result, there exist $\theta_i < 0$ such that parents want to pass pro-social values to his child even if dishonesty appears to be materially optimal ($bx - \theta > 0$). They do this to signal that they are optimistic about the share of honest individuals in society, so that their child will trust. Since other parents do the same, the honesty norm becomes self-fulfilling and the actual rewards from trusting outweigh the forgone rents from dishonesty. For $t < q$, $r_C > 1/2$, so that the socially safe choice is not to trust. As a result, the cutoff is always strictly positive. In this case, a "street culture" may emerge, whereby parents instil anti-social values even when dishonesty does not pay (i.e. $bx - \theta < 0$). Again, the reason they do this is to signal that trusting others is a bad idea. Since other parents reason in a similar way, this prophecy becomes self-fulfilling.

Adriani and Sonderegger (2009) study this problem in a setup with homogenous beliefs and find that there is a continuum of equilibria where parents choose pro-social values for their children. Compared to AS, the present setup does away with indeterminacy, delivering clear comparative statics. The unique equilibrium prediction ($\theta^* = (q + b - t)/2$) implies that the parents' propensity to raise their children as pro-social depends not only on the marginal benefit from dishonesty b, which is somehow expected, but also on the marginal benefits and costs from trusting (t and q). This is a byproduct of the fact that the decision of being trusting or not depends on the beliefs about the ethical values of others, which in turn are determined – through parental signaling – by one's ethical values. This generates a connection between the returns from participating in economic exchange and the distribution of pro-social preferences in the population.

6 Norm-signaling and multiple equilibria

This section discusses interesting cases where the model may generate multiple equilibria.

6.1 Children's peer effects, intergenerational conflicts, and sexual revolutions

In some applications, it may be reasonable to assume that children are more concerned with coordinating with other children, rather than with adults. Recent history is littered with examples of rebellious youth subcultures, which openly challenge the mainstream adult society. In the Western world, intergenerational conflict possibly reached the highest intensity in the 60s. This decade led to profound changes in social norms. One of the most striking social phenomena of that period is the so called sexual revolution. In this section we sketch what might happen in our setup when children are not interested in conforming to adults but only care about coordinating with their peers.

Consider again the "sex attitudes" application seen in Section 5.1. Suppose that parents' inclusive payoff from liberalism is unchanged,

$$\underbrace{\theta}_{\substack{\text{Parent's direct utility} \\ \text{from liberalism}}} + \Delta\alpha \times \underbrace{\delta[\theta - \omega(1-x)]}_{\substack{\text{Parental perception of} \\ \text{child's utility from sex}}}. \tag{15}$$

The second term represents the parent's perception of the child's payoff from pre-marital sex. Assume now that, different from the case seen before, the child's actual payoff does not reflect the second term in (15). The child does not care about the direct consequences of pre-marital sex or about social stigma from adults, but is instead only interested in coordinating with his peers. His net payoff from pre-marital sex ($\alpha = 1$) is thus

$$C(X) \equiv X - r_C, \ r_C \in (0,1), \tag{16}$$

where $X \in [0,1]$ is the share of *children* who choose pre-marital sex. His payoff from abstinence is zero. He thus chooses pre-marital sex whenever he expects X to be larger than r_C. Notice that this conflict of interests between a parent and his child cannot be fully captured by a constant parameter, so that the results of Section 4 do not apply here.[14] We assume that the existence of this conflict of interests is common knowledge. Parents know that children maximize (16), children know that parents know, and so on.

This setup generates multiple equilibria. There exist for instance equilibria where children do not pay attention to parents and coordinate on either of the two actions independently of what they observe their parents doing. Clearly enough, $\Delta\alpha = 0$ in these cases. This implies that there is no norm signaling bias and therefore no hypocrisy.

There also exist, however, more interesting equilibria where children use parental actions as a coordinating device, so that $\Delta\alpha \neq 0$. We say that there is a norm for *intergenerational*

[14] The conflict of interest is measured by the difference $\theta - \omega(1-x) - X + r_c$ and thus depends on the endogenous variables x and X.

harmony if $\Delta\alpha > 0$. Symmetrically, we say that there is a norm for *intergenerational conflict* if $\Delta\alpha < 0$. It is clear that in the case of intergenerational harmony all the results of Section 5.1 (including hypocrisy) would apply. Under intergenerational conflict, however, a parent choosing a conservative attitude increases the chances that his child will engage in pre-marital sex. For parameter values, equilibria with intergenerational conflict exist and are characterized by adults adopting a negative cutoff.[15] This implies that even parents with moderately conservative beliefs will now take a liberal attitude. In other words, we have hypocrisy in reverse. Notice that adults still want their child to choose what they perceive as the socially safe choice (abstinence). However, the presence of intergenerational conflict implies that they need to adopt a relaxed attitude toward sex to achieve this.

In general, it is clear that intergenerational harmony promotes hypocrisy whereas a dose of intergenerational conflict may reduce it or even generate reverse hypocrisy. This suggests that it might not be by chance that the sexual revolution was brought about by a period of extraordinary intergenerational conflict.

6.2 Costless communication in parent-child relationships

It is almost a platitude to observe that, in parent-child relationships, actions speak louder than words. A parent that does not practice what he preaches often loses credibility in the eyes of his child. Applied to our context, this implies, for instance, that a liberal parent would have a hard time getting his child to conform to conservative values he does not subscribe to himself. This emerges endogenously, as a feature of the signaling equilibrium. Upon observing his parent taking a liberal attitude, a child rationally infers that society at large is unlikely to be predominantly conservative.

A possible objection to our setup is that it does not explicitly allow parents to use other methods except their own actions to transmit information to children. What might happen if we allow for direct (and possibly costless) communication between parents and children?

It is clear that, in the absence of oblique complementarities, allowing for cheap talk would never eliminate the conflict of interests component of the distortion. However, since the norm signaling component does not arise from a conflict of interests, it is fair to ask whether it might disappear if we allowed for costless communication. We offer two remarks on this. First, at a very informal level, we suspect that once a society has settled on an equilibrium without

[15]For instance, if δ is not too large relative to ϵ, there exists a continuum of equilibria where sophisticated children choose sex whenever $x < x^*$, with $x^* \in [1 - r_C/\delta, (1 - r_C)/\delta]$, and choose abstinence for $x \geq x^*$. Naive children choose sex if and only if their parent takes a conservative attitude. Adults follow a threshold equilibrium with cutoff equal to $-\omega\delta/2(1 - \delta) < 0$.

communication, it might be quite difficult for parental cheap talk to destabilize it. Consider for instance a parental deviation consisting in choosing the low action and giving instructions to the child to choose the top action. For this to work, the child needs to hold conflicting beliefs about his parent. First, he has to believe that his parent is fairly representative of the adult population (otherwise there is no point in paying attention to what he does or says in the first place). However, he also needs to believe that his parent is somewhat special (i.e. the deviation is truly unilateral). If the child suspects that other parents might behave like his own, his incentive to choose the top action will be small.

There is another, point though. So long as a conflict of interests is present, a norm-signaling bias will characterize *all* equilibria of the game. Intuitively, if the parent could use cheap talk to avoid the distortion due to norm signaling, he would use it also to avoid the distortion due to the conflict of interests. In other words, if the parent could "talk" his child into choosing a particular action, he would exploit communication to deceive the child when their interests are misaligned.

We now formalize this insight. Consider our baseline model augmented with cheap talk. We want to check whether there exist equilibria where the only distortion is due to the conflict of interest (i.e. equilibria with cutoff $\hat{\theta} = -\beta$) even when $\omega(r_C - 1/2) \neq 0$. Suppose first that both $\beta > 0$ and $\omega(r_C - 1/2) < 0$, so that the conflict of interests component and the norm signaling component reinforce each other (they both take the form of the parent wanting the child to select the top action). Consider a candidate equilibrium where parents take the high action if and only if $\theta_i \geq \hat{\theta}$ (see Figure 3.A).

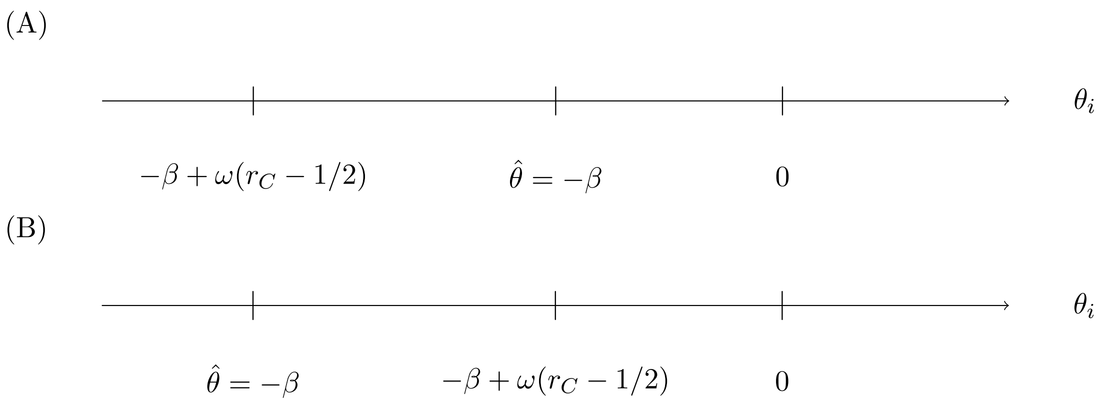

Figure 3: Costless communication

Clearly enough, parents with $\theta_i < \hat{\theta}$ choose the low action. Those parents for whom θ_i is sufficiently close to $\hat{\theta}$ also send a message to their children instructing them to choose the top action. This is because these parents have posteriors beliefs that are very close to those of the marginal parent, and thus want their child to take the socially safe action (which in this case is the top action, since $r_C < 1/2$). These instructions must be followed by the children in equilibrium, or else these parents would prefer to switch to the high action. On the other hand, this cannot be consistent with the postulated equilibrium. If the child were to follow the instructions, the parent would find it optimal to choose the low action and send the message whenever $\theta_i < 0$ (i.e. including for some signals $\theta_i > \hat{\theta}$). Intuitively, if the child were to believe the message, the parent would take advantage of this and use the message to mislead the child in situations where he wants the child to take the top action but the child prefers the bottom action. Consider now the case where $\beta > 0$ but $\omega(r_C - 1/2) > 0$, so that the conflict of interest and the norm signaling bias partially offset each other (Figure 3.B). In this case, the socially safe action for the child is the bottom action. Suppose that $\hat{\theta} = -\beta$. For $\theta_i > \hat{\theta}$ but sufficiently close to $\hat{\theta}$, parents select the high action and send a message to their child to take the bottom action – this is because these parents have posteriors that are very close to those of the marginal parent, and thus want their child to take the socially safe action. Notice however that, abstracting from signaling concerns, these parents actually prefer the low action. The only reason why they might want to choose the high action is to induce their child to choose the *top* action. It follows that this cannot be an equilibrium. These parents would clearly benefit from switching to the low action.[16] Intuitively, by sending the message, parents are "undoing" what they are trying to achieve by choosing the high action. Clearly enough, a symmetric argument applies to the case where $\beta < 0$. Cheap talk may possibly eliminate the norm signaling component only in the special case where the interests of parents and children are perfectly aligned ($\beta = 0$).

Summing up, so long as a conflict of interest is present, norm signaling will matter independently of whether costless communication is allowed or not.

7 Concluding Remarks

Many models of culture emphasize how societies may endogenously value some personal characteristics or activities beyond their intrinsic economic value (see e.g. Cole et al. 1992, Fang, 2001, Mailath and Postlewaite, 2006). One question that these models are not designed to tackle is why some activities end up being overvalued while others do not. For instance, is there anything inherently special in an Oxford accent? Addressing this problem in a theoretically compelling way (i.e. without assuming the result) is of course extremely difficult. While our paper does not

[16]Interestingly, when the two distortions go in opposite directions and the norm signaling bias is larger than the conflict of interest, there exist cheap talk equilibria where no distortion arises, i.e. $\hat{\theta} = 0$. In other words, the norm signaling distortion totally compensates for the conflict of interests.

provide a direct answer to the question, it nevertheless contributes an intermediate step that may prove useful in answering it. The very nature of the process of cultural transmission implies that whether an activity is *socially safe* or not may shape attitudes towards that particular activity. While in some cases different activities may be perfectly symmetric (e.g. driving on the left or on the right), our applications suggest that, generally, an asymmetry will be present. In these cases, the criterion of social safety allows to identify a precise activity. Our theory suggests that society will be more likely to display a favorable attitude towards *that* activity. Understanding the conditions that make an activity socially safe/unsafe could thus provide a valuable clue to understanding which activities might be valued beyond their intrinsic economic worth.

8 Appendix

8.1 Preliminaries

Before starting, we determine several statistics, distributions, and probabilities that will be used throughout the proofs. First, standard results imply that $E(\theta_j|\theta_i) = E(\theta|\theta_i) = \theta_i$. Consider now the share of adults in the population whose private signal exceeds a threshold k, i.e. parents with $\theta_i \geq k$. Denote with $x_k \in [0,1]$ this share. We need to determine the following conditional expectations

1. given a realization θ of the state of nature, $E(x_k|\theta)$;
2. given a realization θ_i of adult i's private signal, $E(x_k|\theta_i)$;
3. given θ_i and a real number s, $E(x_k|\theta_i < s)$ and $E(x_k|\theta_i > s)$.

Standard arguments imply that the expected value of x_k conditional on θ is

$$E(x_k|\theta) = \begin{cases} 1 & if \quad \theta \geq k+\epsilon \\ 1/2 + \frac{\theta-k}{2\epsilon} & if \quad k-\epsilon < \theta < k+\epsilon \\ 0 & if \quad \theta \leq k-\epsilon \end{cases} \tag{17}$$

In order to determine $E(x_k|\theta_i)$, we need the conditional distribution of adult j signal conditional on the realization of adult i's signal, i.e. $\theta_j|\theta_i$. This is

$$f(\theta_j|\theta_i) = \begin{cases} 0 & if \quad \theta_j \geq \theta_i + 2\epsilon \\ \frac{\theta_i + 2\epsilon - \theta_j}{3\epsilon^2} & if \quad \theta_i + 2\epsilon > \theta_j \geq \theta_i + \epsilon \\ \frac{1}{3\epsilon} & if \quad \theta_i + \epsilon > \theta_j > \theta_i - \epsilon \\ \frac{\theta_j - \theta_i + 2\epsilon}{3\epsilon^2} & if \quad \theta_i - \epsilon \geq \theta_j > \theta_i - 2\epsilon \\ 0 & if \quad \theta_j \leq \theta_i - 2\epsilon \end{cases} \tag{18}$$

Although this is also relatively standard, we sketch the argument. The area below $f(\theta_j|\theta_i)$ consists in a trapezoid. The trapezoid is composed of a rectangle with base given by the interval $[\theta_i - \epsilon, \theta_i + \epsilon]$, i.e. 2ϵ in length, and height d to be determined, plus two triangles each with height d. The left triangle has base defined over the interval $[\theta_i - 2\epsilon, \theta_i - \epsilon]$, the right triangle over the interval $[\theta_i + \epsilon, \theta_i + 2\epsilon]$. Hence, each triangle has base of length ϵ. The total area must be equal to one. Hence, $2\epsilon d + 2\epsilon d/2 = 1$, which yields $d = 1/3\epsilon$.

Endowed with $f(\theta_j|\theta_i)$, it is then easy to determine $E(x_k|\theta_i) = \int_{\theta_i - 2\epsilon}^{k} f(\theta_j|\theta_i) d\theta_j$

$$E(x_k|\theta_i) = \begin{cases} 1 & if \quad \theta_i \geq k + 2\epsilon \\ 1 - \frac{(\theta_i - 2\epsilon - k)^2}{6\epsilon^2} & if \quad k + 2\epsilon > \theta_i \geq k + \epsilon \\ 1/2 + \frac{\theta_i - k}{3\epsilon} & if \quad k + \epsilon > \theta_i > k - \epsilon \\ \frac{(\theta_i + 2\epsilon - k)^2}{6\epsilon^2} & if \quad k - \epsilon \geq \theta_i > k - 2\epsilon \\ 0 & if \quad \theta_i \leq k - 2\epsilon \end{cases} \tag{19}$$

For $\theta_i - 2\epsilon \geq k$, $x_k = 1$ with certainty. For $\theta_i + 2\epsilon \leq k$, $x_k = 0$ with certainty. For $\theta_i + 2\epsilon > k > \theta_i - 2\epsilon$, $E(x_k|\theta_i)$ is given by the total area of the trapezoid to the right of k.

We also need to determine, for a real number s, $E(x_k|\theta_i < s)$ and $E(x_k|\theta_i > s)$. To this purpose, we need the unconditional (prior) density of θ_i, $f(\theta_i)$, and the unconditional (prior) cumulative $F(\theta_i)$. Consider f first. Again, the area below $f(\theta_i)$ consists in a trapezoid composed by a rectangle with base given by the interval $[-D, D]$ (of length $2D$) and height h (to be determined) and two triangles also of height h. The left triangle has base defined by the interval $(-D - \epsilon, -D)$. The right triangle has base defined by the interval $(D, D + \epsilon)$. Hence, both triangles have base equal to ϵ and height h. Since the total area must be one, it follows that $h = 1/(2D + \epsilon)$. Then, simple calculations show that

$$f(\theta_i) = \begin{cases} 0 & if \quad \theta_i \geq D + \epsilon \\ \frac{D + \epsilon - \theta_i}{\epsilon(2D + \epsilon)} & if \quad D + \epsilon > \theta_i > D \\ \frac{1}{2D + \epsilon} & if \quad D \geq \theta_i \geq -D \\ \frac{\theta_i + D + \epsilon}{\epsilon(2D + \epsilon)} & if \quad -D > \theta_i > -D - \epsilon \\ 0 & if \quad \theta_i \leq -D - \epsilon \end{cases} \tag{20}$$

Consider now the cumulative prior F. This is given by

$$F(s) = \Pr(\theta_i < s) = \begin{cases} 1 & if \quad s \geq D + \epsilon \\ \frac{1}{2D+\epsilon}\left[\frac{\epsilon}{2} + s + D - \frac{(s-D)^2}{2\epsilon}\right] & if \quad D + \epsilon > s > D \\ \frac{1}{2D+\epsilon}\left[\frac{\epsilon}{2} + s + D\right] & if \quad D \geq s \geq -D \\ \frac{1}{2D+\epsilon}\left[\frac{(s+D+\epsilon)^2}{2\epsilon}\right] & if \quad -D > s > -D - \epsilon \\ 0 & if \quad s \leq -D - \epsilon \end{cases} \tag{21}$$

Then, for $s \leq k - 2\epsilon$, $E(x_k|\theta_i < s) = 0$. For $s > k - 2\epsilon$, we have instead

$$E(x_k|\theta_i < s) = \left(\int_{k-2\epsilon}^{s} E(x_k|\theta_i) f(\theta_i) d\theta_i\right) \frac{1}{F(s)}. \tag{22}$$

By using a symmetric approach, one obtains $E(x_k|\theta_i > s) = 1$ for $s \geq k + 2\epsilon$ and

$$E(x_k|\theta_i > s) = \left(1 - F(k + 2\epsilon) + \int_{s}^{k+2\epsilon} E(x_k|\theta_i) f(\theta_i) d\theta_i\right) \frac{1}{1 - F(s)}, \tag{23}$$

for $s < k+2\epsilon$. In what follows, we will often make use of the limit of $E(x_k|\theta_i < s)$ and $E(x_k|\theta_i > s)$ for $D \to \infty$. Notice that, for s and $q > s$ finite, $\lim_{D\to\infty} F(s) = \lim_{D\to\infty} F(q) = 1/2$ and $\lim_{D\to\infty} \int_s^q E(x_k|\theta_i) f(\theta_i) d\theta_i = [\lim_{D\to\infty} \frac{1}{2D+\epsilon}] \int_s^q E(x_k|\theta_i) d\theta_i = 0$. Hence,

$$\lim_{D\to\infty} E(x_k|\theta_i < s) = 0 \tag{24}$$

and

$$\lim_{D\to\infty} E(x_k|\theta_i > s) = 1. \tag{25}$$

8.2 Proof of the main result (Proposition 1)

We give the proof for the slightly more general result stated in Section 4. It is clear that the statement in Proposition 1 is a special case of that once we set $\delta = 1$ and $l_\theta = v = 0$. The proof is structured in the following way. We keep fixed the equilibrium behavior of those children who directly observe x (*sophisticated children*) and solve for the equilibrium behavior of adults and of those children who only observe their parent's action (*naive children*). This is clearly without loss of generality. The next two results (Lemmata 2 and 3) are useful to derive (for D sufficiently large) the equilibrium value of $\Delta\alpha$ for naive children. We then turn to the adults and, subsequently, characterize the behavior of sophisticated children.

Intermediate results on the equilibrium strategy of naive children

Lemma 2. *In any equilibrium, 1)* $\lim_{D\to\infty} E(\theta|a = 1) = \infty$ *and* $\lim_{D\to\infty} E(\theta|a = 0) = -\infty$*; 2)* $\lim_{D\to\infty} E(x|a = 1) = 1$ *and* $\lim_{D\to\infty} E(x|a = 0) = 0$.

Fix an equilibrium. Given $\delta l_\theta < 1$, there always exist D so large that, for extreme realizations of θ_i, either action is dominant for the parent independently of the child's response. Let θ^1 denote the infimum of the set of realizations of θ_i for which playing $a = 1$ is strictly dominant and let θ^0 be the supremum of the set for which playing $a = 1$ is strictly dominated. It is then clear that

$$E(\theta|a = 1) \geq E(\theta|\theta_i > \theta^0) \tag{26}$$

$$E(\theta|a = 0) \leq E(\theta|\theta_i < \theta^1) \tag{27}$$

Notice that, necessarily, θ^0 and θ^1 are independent of D. It is then immediate to verify that $\lim_{D\to\infty} E(\theta|\theta_i > \theta^0) = \infty$ and $\lim_{D\to\infty} E(\theta|\theta_i < \theta^1) = -\infty$, which is sufficient for statement 1). Let us now focus on the second statement. Consider two alternative strategy profiles for parents. In the first, parent i follows his equilibrium strategy, but all parents $j \neq i$ use a threshold strategy with cutoff at θ^1. In the second, i sticks to his equilibrium strategy, but all the other adults use a cutoff θ^0. Denote with $X_{-i}(\theta^1)$ and $X_{-i}(\theta^0)$ the realized values of x under these two profiles – the subscript $-i$ refers to the fact that all adults except i use cutoff θ^1 or θ^0. Clearly, it must be that

$$E(X_{-i}(\theta^1)|a_i) \leq E(x|a_i) \leq E(X_{-i}(\theta^0)|a_i). \tag{28}$$

In words, keeping fixed the information content of parent i's strategy, the child's expectation of x in equilibrium must exceed the expectation he would have if all parents $j \neq i$ were playing action $a = 1$ only when it were strictly dominant. Symmetrically, the child's expectation of x cannot exceed the expectation he would have if all parents $j \neq i$ were playing action $a = 1$ whenever it is not strictly dominated. The rest of the proof of the Lemma consists in showing that both the upper and lower bound for $E(x|a_i)$ in (28) converge to one (zero) for $a_i = 1$ ($a_i = 0$).

Denote with $\Theta_i(a) \subseteq [-D - \epsilon, D + \epsilon]$ the set of realizations of θ_i for which parent i plays a in equilibrium and with $\mathcal{D}(a) \subseteq \Theta_i(a)$ the subset of realizations for which playing action a is strictly dominant. Clearly enough, $\mathcal{D}(0) = [-D - \epsilon, \theta^0)$ and $\mathcal{D}(1) = (\theta^1, D + \epsilon]$. Let also x_k denote the realized value of x when *all* parents (including i) use cutoff k. Note that

$$E(X_{-i}(\theta^0)|a) = E(X_{-i}(\theta^0)|\theta_i \in \Theta_i(a)) = E(x_{\theta^0}|\theta_i \in \Theta_i(a)) \tag{29}$$

$$E(X_{-i}(\theta^1)|a) = E(X_{-i}(\theta^1)|\theta_i \in \Theta_i(a)) = E(x_{\theta^1}|\theta_i \in \Theta_i(a)). \tag{30}$$

The first equality in (29) and (30) comes from the child updating his beliefs using the parent's equilibrium strategy. The second equality follows from the weight of parent i's action in the aggregated level of x being zero. The last terms in (29) and (30) can be decomposed into,

$$\begin{array}{l} E(x_{\theta^0}|\theta_i \in \Theta_i(a)) = \frac{P(\mathcal{D}(a))}{P(\Theta_i(a))} E(x_{\theta^0}|\theta_i \in \mathcal{D}(a)) + \left[1 - \frac{P(\mathcal{D}(a))}{P(\Theta_i(a))}\right] E(x_{\theta^0}|\theta_i \in \Theta_i(a) \setminus \mathcal{D}(a)) \\ E(x_{\theta^1}|\theta_i \in \Theta_i(a)) = \frac{P(\mathcal{D}(a))}{P(\Theta_i(a))} E(x_{\theta^1}|\theta_i \in \mathcal{D}(a)) + \left[1 - \frac{P(\mathcal{D}(a))}{P(\Theta_i(a))}\right] E(x_{\theta^1}|\theta_i \in \Theta_i(a) \setminus \mathcal{D}(a)) \end{array} . \tag{31}$$

where $P(S)$ denotes the probability that $\theta_i \in S$. Clearly enough,

$$E(x_k|\theta_i \in \mathcal{D}(1)) = E(x_k|\theta_i > \theta^1), \quad \text{and}$$
$$E(x_k|\theta_i \in \mathcal{D}(0)) = E(x_k|\theta_i < \theta^0). \tag{32}$$

From (24) and (25), $E(x_k|\theta_i > \theta^1)$ converges to one for $D \to \infty$, while $E(x_k|\theta_i < \theta^0)$ converges to zero. Moreover, $P(\Theta_i(a)) = P(\Theta_i(a) \setminus \mathcal{D}(a)) + P(\mathcal{D}(a))$. Given $\Theta_i(a) \setminus \mathcal{D}(a) \subseteq [\theta^0, \theta^1]$, we have $P(\Theta_i(a) \setminus \mathcal{D}(a)) \le F(\theta^1) - F(\theta^0)$, where F is the cumulative prior distribution of θ_i given in (21). Using $P(\mathcal{D}(0)) = F(\theta^0)$ and $P(\mathcal{D}(1)) = 1 - F(\theta^1)$ we therefore have

$$\frac{P(\mathcal{D}(1))}{P(\Theta_i(1))} \ge \frac{1 - F(\theta^1)}{1 - F(\theta^0)} \tag{33}$$

and

$$\frac{P(\mathcal{D}(0))}{P(\Theta_i(0))} \ge \frac{F(\theta^0)}{F(\theta^1)}. \tag{34}$$

From (21), the RHS of both (33) and (34) converges to one as $D \to \infty$. Then, taking the limit in (31) we obtain

$$\lim_{D\to\infty} E(X_{-i}(\theta^0)|a=1) = \lim_{D\to\infty} E(X_{-i}(\theta^1)|a=1) = 1 \tag{35}$$

and

$$\lim_{D\to\infty} E(X_{-i}(\theta^0)|a=0) = \lim_{D\to\infty} E(X_{-i}(\theta^1)|a=0) = 0. \tag{36}$$

The Lemma is then proved by taking the limit in (28).

Consider now the equilibrium strategy of naive children. A strategy for a naive child maps the parent's action space $\{0, 1\}$ into the set of probability distributions over $\{0, 1\}$. As seen in the text, a naive child's strategy can be summarized for our purposes by the variable $\Delta\alpha$,

Lemma 3. *If D is sufficiently large, then, in any equilibrium of the game, $\Delta\alpha = 1$ for naive children.*

Consider a child's expected net payoff from the top action conditional on his parent's action

$$E[C(x; \theta)|a] = \omega[E(x|a) - r_C] + l_\theta E(\theta|a). \tag{37}$$

Notice that the first term is bounded above by $\omega(1 - r_C)$ and below by $-\omega r_C$. Whenever $l_\theta > 0$, $\Delta\alpha = 1$ follows from statement 1) of Lemma 2. The only other possible case is $l_\theta = 0$. However, Lemma 2 implies that $\lim_{D\to\infty} E[C(x)|a = 1] = \omega(1 - r_C) > 0$ and $\lim_{D\to\infty} E[C(x)|a = 0] = -\omega r_C < 0$. As a result, $\Delta\alpha = 1$.

Proof of the main result

Given the characterization of naive children's equilibrium strategies for D large, we now turn our attention to the strategies of parents. Given $\Delta\alpha = 1$ for naive children, the expected inclusive payoff from the high action for parent i can be written as

$$\pi(x;\theta_i) = (v + \delta\omega)E(x|\theta_i) + (1 + l_\theta\delta)\theta_i - A, \tag{38}$$

where $A \equiv vr_P + \delta\omega r_C - \delta\beta$.

Let $\pi(x_k;\theta_i)$ denote the expected net payoff from selecting the high action of a parent i observing θ_i when all other parents follow a threshold strategy with cutoff k. From (17), x_k is equal to one if $\theta > k + \epsilon$, is zero if $\theta < k - \epsilon$ and is equal to

$$x_k = \frac{1}{2} + \frac{\theta - k}{2\epsilon} \tag{39}$$

otherwise. A parent with signal θ_i assigns positive probability only to signals θ_j such that $\max\{\theta_i - 2\epsilon, -D - \epsilon\} \leq \theta_j \leq \min\{\theta_i + 2\epsilon, D + \epsilon\}$. As a result, for signal realizations $\theta_i \geq k + 2\epsilon$, $x_k = 1$ for sure, while, for $\theta_i \leq k - 2\epsilon$, $x_k = 0$ for sure. Hence, the derivative of $E(x_k|\theta_i)$ is zero outside the interval $\theta_i \in (k - 2\epsilon, k + 2\epsilon)$. Suppose now that $k \in [-D + 3\epsilon, D - 3\epsilon]$. Clearly enough, $\theta_i \in (k - 2\epsilon, k + 2\epsilon)$ implies $\theta_i \in [D - \epsilon, D + \epsilon]$. As a result, $\theta|\theta_i$ is uniformly distributed in the interval $[\theta_i - \epsilon, \theta_i + \epsilon]$. This implies that, for $\theta_i \in (k - 2\epsilon, k + 2\epsilon)$

$$\frac{d}{d\theta_i}E(x_k|\theta_i) = \left(\frac{\theta_i + \epsilon - k}{2\epsilon} - \frac{\theta_i - \epsilon - k}{2\epsilon}\right)\frac{1}{2\epsilon} > 0. \tag{40}$$

Hence $E(x_k|\theta_i)$ is non-increasing in θ_i. Given $v + \delta\omega \geq 0$ (Assumption A1), this in turn implies that $\pi(x;\theta_i)$ is strictly increasing. Moreover,

$$E(x_k|k) = \int_{k-\epsilon}^{k+\epsilon}\left(\frac{1}{2} + \frac{\theta - k}{2\epsilon}\right)\frac{1}{2\epsilon}d\theta = \int_0^1 udu = \frac{1}{2}. \tag{41}$$

The equilibrium cutoff θ^* is thus found by solving

$$\pi\left(\frac{1}{2}, \theta^*\right) = 0 \tag{42}$$

which yields expression (10) for θ^*. Finally, since (10) is independent of D, then it is clear that there exists D sufficiently large that $\theta^* \in [-D + 3\epsilon, D - 3\epsilon]$.

Hence, for D large, a strategy profile where all adults use a cutoff θ^* is consistent with equilibrium behavior. We now show that, for D sufficiently large, no other equilibrium is possible. To this purpose, we will follow Morris and Shin (1998). Fix an equilibrium and let $\mu(\theta_i)$ denote the probability that a parent i observing θ_i chooses $a = 1$. Let also

$$\underline{\theta} \equiv \inf\{\theta_i|\mu(\theta_i) > 0\}; \tag{43}$$

$$\overline{\theta} \equiv \sup\{\theta_i | \mu(\theta_i) < 1\}. \quad (44)$$

No parent with $\theta_i < \underline{\theta}$ chooses $a = 1$ with positive probability and no parent with $\theta_i > \overline{\theta}$ chooses $a = 0$ with positive probability. Clearly enough, if we can prove that $\underline{\theta} = \theta^* = \overline{\theta}$, then the equilibrium where all parents use cutoff θ^* must be the only equilibrium. Notice that $\overline{\theta} \geq \sup\{\theta_i | 1 > \mu(\theta_i) > 0\} \geq \inf\{\theta_i | 1 > \mu(\theta_i) > 0\} \geq \underline{\theta}$. Hence, $\overline{\theta} \geq \underline{\theta}$. We now show that $\overline{\theta} \leq \theta^* \leq \underline{\theta}$.

If $\mu(\theta_i) < 1$, it must be that $\pi(x; \theta_i) \leq 0$. By continuity, this has to hold for $\theta_i = \overline{\theta}$. Hence, we have

$$\pi(x, ; \overline{\theta}) \leq 0. \quad (45)$$

Consider now the expected net payoff from choosing $a = 1$ under a strategy profile such that all other parents use a threshold strategy with cutoff $\overline{\theta}$ and children follow their equilibrium strategy (summarized by $\Delta\alpha = 1$). Then, for D sufficiently large, it must be that

$$0 \geq \pi(x; \overline{\theta}) \geq \pi(x_{\overline{\theta}}, \overline{\theta}) \quad (46)$$

where the first inequality comes from (45) and the second inequality comes from the fact that $E(x|\overline{\theta})$ cannot be lower than $E(x_{\overline{\theta}}|\overline{\theta})$.

A symmetric argument for $\overline{\theta}$ reveals

$$0 \leq \pi(x; \underline{\theta}) \leq \pi(x_{\underline{\theta}}.\underline{\theta}) \quad (47)$$

Given that $\pi(x_k; k)$ is continuous and strictly increasing and is zero for $k = \theta^*$, (46) and (47) imply $\overline{\theta} \leq \theta^*$ and $\underline{\theta} \leq \theta^*$ respectively. Since we have already shown that $\overline{\theta} \geq \underline{\theta}$, then $\underline{\theta} = \theta^* = \overline{\theta}$.

To conclude the characterization of the equilibrium, consider sophisticated children. (Notice that the above results apply given *any* equilibrium behavior of sophisticated children). A strategy for a sophisticated child maps the set $[0, 1]$ of possible realizations of x into the set of probability distributions over the child's action space $\{0, 1\}$. It is clear that these children will choose the top action whenever

$$\omega(x - r_C) + l_\theta E(\theta|x) \geq 0 \quad (48)$$

and will choose the bottom action otherwise. Given that adults follow the threshold strategy described above, the LHS of (48) is strictly increasing in x. As a result, the behavior of sophisticated children is uniquely determined.

□

8.3 Proof of Lemma 1

Suppose by contradiction that $\xi > x$. Then, some children with anti-social values are choosing to be trusting. This implies that, for some child, the expectation of x conditional on his parent's choosing anti-social values must be at least equal to $q/(t+q) > 0$. However, we have already established (see Lemma 2) that that conditional expectation converges to zero as D goes to infinity. As a result, for D sufficiently large, the conditional expectation is lower than $q/(t+q)$, which contradicts our premise. Symmetrically, $\xi < x$ implies that, for some child, the expectation of x conditional on his parent choosing pro-social values must be lower than or equal to $q/(t+q) < 1$. However, since the conditional expectation converges to one, we have a contradiction. Hence, there always exists D sufficiently large such that $\xi = x$ in any equilibrium of the game.

□

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