Ethics, welfare, and capital markets

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\begin{abstract}
We examine implications of a society’s cultural emphasis on moral sentiments. Entrepreneurs and investors interact in a game that entails both adverse selection and moral hazard; entrepreneurs may attempt to breach their contracts and expropriate investors. An agent is born into a particular culture but chooses whether to develop a moral conscience and thereby subject himself to moral sentiments. In equilibrium, societies that place less emphasis on guilt exhibit a lower risk of expropriation in contracts, a greater net price of capital, a larger size of firms, increased capital inflows and greater social welfare. The results of a greater emphasis on pride are in the same direction.
\end{abstract}

1. Introduction

It is often argued that a society’s culture is a significant factor in its economic performance and welfare (Weber, 1930; Banfield, 1958; Guiso et al., 2006). Support for this view also comes from recent empirical research that identifies important effects of culture on rent seeking, expropriation and contract breach (Guiso et al., 2003, 2004, 2006; Stulz and Williamson, 2003). Of particular interest is the empirical finding that culture impacts financial transactions (Stulz and Williamson, 2003; Guiso et al., 2004); since capital markets are often afflicted with asymmetric information and limited contractual enforcement (Hubbard, 1990; Rasmusen, 2007), they may be especially sensitive to informal instruments – such as cultural characteristics – that may mitigate such imperfections. However, despite the anecdotal and empirical evidence, the link between culture, finance and social welfare has received relatively little attention in formal economic theory.

In this paper, we construct a model of culture and capital markets to highlight a potential mechanism through which society’s ethical system may impact economic outcomes. Our analysis has two basic ingredients. First, it assumes that agents may experience intrinsic motivation in actions that have ethical implications (Smith, 1759); such intrinsic motivation may be both positive, in the form of pride, and negative, in the form of guilt (Benabou and Tirole, 2006). The strength of these moral sentiments may vary significantly across cultures (Murphy, 1974; Eid and Diener, 2001; Kitayama and Cohen, 2007;
Tracy et al., 2007). And second, in the spirit of the Chicago School (e.g., Becker and Murphy, 1988, 2001; Becker and Mulligan, 1997), our analysis incorporates rational agents who choose whether to become moral or amoral – i.e., whether to develop a conscience that allows them to subsequently experience intrinsic motivation.\footnote{For example, Becker and Murphy (1988) and Becker and Mulligan (1997) present models of endogenous preferences where individuals may shape their utility functions. In a different vein, Akerlof and Kranton (2000, 2005) note that agents may often choose their identity. In Tabelini (2008b), an agent's ability to choose (perfectly or imperfectly) an identity or a particular type from a culturally predefined – exogenously predetermined – set is a standard assumption in the literature (e.g., Akerlof and Kranton, 2000, 2005; Bisin and Verdier, 2000, 2001; Tabelini, 2008b).}

We adopt the view of culture of Weber (1930) and Guiso et al. (2006); the latter (p. 23) define it as “those customary beliefs and values that ethnic, religious, and social groups transmit fairly unchanged from generation to generation.” Thus in our model culture is exogenous and durable, possibly the outcome of a historical accident (Banfield, 1958; Tabellini, 2008a). Agents are born into a specific culture, but can choose whether to accept their society’s cultural moral code and become moral, or to reject it and become amoral.\footnote{An agent’s ability to choose (perfectly or imperfectly) an identity or a particular type from a culturally predefined – exogenously predetermined – set is a standard assumption in the literature (e.g., Akerlof and Kranton, 2000, 2005; Bisin and Verdier, 2000, 2001; Tabelini, 2008b).} Moral agents develop a conscience; when presented with an opportunity to engage in unethical behavior – i.e., in appropriation, – they have feelings of pride if they abstain from and feelings of guilt if they engage in it. Amoral agents are assumed to have no conscience and their overall payoff is solely pecuniary. We show that cultural moral codes having a weaker emphasis on guilt lead to a lower risk of expropriation in contracts, a higher net price of capital, larger firms, increased capital inflows and greater social welfare.

In our analysis, agents of unobservable and possibly different ethical types – moral and amoral – transact with each other as investors and entrepreneurs, where investors finance the projects of entrepreneurs. Entrepreneurs may attempt to expropriate some of the returns of their investors. To protect themselves from appropriation, investors safeguard (imperfectly) their contracts with entrepreneurs. The chosen level of attempted expropriation by an entrepreneur and of contract safeguarding by an investor is unobservable to other agents. We thus have a game that entails both adverse selection – when investors choose the entrepreneurs with whom they team up – and moral hazard – when entrepreneurs choose the extent of their expropriation activities.

The analysis shows that in equilibrium, moral entrepreneurs are always unable to separate themselves through signaling from amoral entrepreneurs. The benefits of being considered moral are greater for amoral, rather than for moral, entrepreneurs, which precludes the occurrence of a separating equilibrium. However, there exist perfect Bayesian pooling equilibria, among which there is a unique equilibrium that meets the Grossman–Perry criterion in the pricing subgame. Then, a greater emphasis on guilt in society’s cultural moral code generates opposing effects on the equilibrium risk of expropriation in contracts. The recognition of possibly experiencing stronger feelings of guilt in the future discourages agents from choosing to become moral in the first place ceteris paribus; this tends to increase the risk of expropriation. Guilt, on the other hand, discourages individual agents that have chosen to be moral from engaging in expropriation ceteris paribus; this tends to decrease the risk of expropriation.

Our analysis shows that the effect of the agent always outweighs the latter. In particular, a greater cultural emphasis on the negative feeling of guilt makes moral entrepreneurs worse off ceteris paribus. However, since in equilibrium the payoffs of moral and amoral entrepreneurs must be equal (otherwise agents would deviate), a stronger emphasis on guilt leads to a greater equilibrium risk of expropriation in contracts and thus greater safeguarding by investors. Greater safeguarding by investors equalizes the payoff of the two types of entrepreneurs by reducing the payoff of amoral entrepreneurs by more than that of moral ones; the payoff of moral entrepreneurs also contains non-pecuniary elements that are insensitive to safeguarding.

Since a greater cultural emphasis on guilt increases the equilibrium risk of expropriation in contracts, it results in a decrease in the net price (after the risk of expropriation and the cost of safeguarding) that investors obtain when they sell their capital. Furthermore, it leads to a Pareto-deterioration of the economy. In addition, the proportion of entrepreneurs is greater and the size of firms, – as measured by the amount of capital that each firm utilizes, – is smaller in an economy with a more guilt-based ethical system, in that the lower net price of capital encourages more agents to become entrepreneurs, rather than investors. As society’s capital is allocated among a larger number of entrepreneurs, the size of firms decreases. Furthermore, in the presence of international capital mobility a stronger cultural emphasis on guilt encourages capital outflows, reducing the amount of available capital in the economy. Finally, we also examine the sentiment of pride and show that the results of an increased cultural emphasis on pride are in the opposite direction of those of an increased emphasis on guilt.

There is some empirical evidence that relates to our analysis. For example, cultural psychology suggests that there may be substantial cross-cultural variation in the strength of the emotion of guilt (Kitayama and Cohen, 2007; Tracy et al., 2007). The emphasis on guilt in a few specific countries (Australia, China, U.S., Taiwan) has been recorded.\footnote{For example, the U.S. and Australian societies may place a weaker cultural emphasis on guilt than French Canadians (Murphy, 1974). As far as we know, there are no other major studies that compare the emphasis on guilt in specific countries. We thank Richard Robins and Jessica Tracy for providing us with information on related research in cultural psychology.} Then, our analysis is consistent with the casual observation that Australia and the U.S., which deemphasize guilt, appear to have a lower risk of expropriation.
emphasize guilt (World Bank, 2006, 2012). In addition, some research findings on the psychology of religion suggest that Protestantism may place a relatively weak emphasis on guilt (Albertsen et al., 2006; Sheldon, 2006). Then, our analysis is consistent with the casual observation that Protestant countries exhibit an especially low risk of expropriation and a large amount of physical capital per capita (World Bank, 2006, 2012). Of course, such evidence is only suggestive and more formal empirical research is needed to better assess the economic importance of cultural morality.

It is well-known that in several societies, agents sometimes resort to segregated business or social structures to protect themselves from expropriation in contracts (Weber, 1946; Greif, 1994). As per our analysis, the separation of different ethical types through economic signaling may often be infeasible. Then, in practice, to reduce the uncertainty about the ethical types of their counterparts, some agents may sometimes choose to limit the range of their potential business partners, – and thus to forego possible lucrative business opportunities, – by interacting only with members of rather small religious, ethnic or familial groups. Collectivist societies, for example, are characterized by such segregation (Greif, 1994).

In this way, our analysis is consistent with the casual observation that societies with a stronger cultural emphasis on guilt (and thus a higher equilibrium risk of expropriation in our model) may tend to be more collectivist (Eid and Diener, 2001; Tracy et al., 2007); in such societies, aiming to reduce the risk of expropriation from their counterparts, agents may be more willing to forego potentially profitable business opportunities.

Our work is related to a number of important theoretical contributions. Tabellini (2008b) examines the link between the rule of law and two types of cultural moral codes, limited morality (i.e., obligation for ethical behavior only toward a small group of close relatives) and generalized morality (i.e., obligation for ethical behavior toward the greater society). We supplement this work by focusing on a different dimension of culture, namely, its emphasis on feelings of guilt and pride. Frank (1987) and Guiso et al. (2008) show how morality may affect the pecuniary payoff of an agent – for example, by facilitating cooperation. In our model, morality also has non-pecuniary or intrinsic aspects. Benabou and Tirole (2006) examine how an agent’s positive or negative intrinsic motivation – i.e., feelings of honor or of stigma stemming from a desire for social esteem – may affect the design of optimal (pecuniary) government policies to promote a specific deed. In our paper, we extend the analysis of intrinsic motivation by focusing on a different issue; we introduce multiple cultural moral codes having different types of intrinsic motivation and examine how they may affect capital markets and social welfare at an economy-wide or general equilibrium level.

In a different vein, Akerlof and Kranton (2000, 2005) discuss the importance of social identity. In our model, an agent’s identity entails him being either moral or amoral. Bisan and Verdier (2000, 2001) examine the transmission of morality (from parents to their children) through the mechanism of “imperfect empathy” in which a parent views his child’s welfare in terms of his own preferences. Kaplow and Shavell (2007) derive optimal ethical rules for various types of behavior.

2. The model

There is a continuum of agents whose measure is normalized to unity. An agent can be either an investor or an entrepreneur. An investor is endowed by nature with one unit of capital while an entrepreneur is endowed with good managerial and entrepreneurial skills. Capital can be transformed into output through projects that are implemented by the entrepreneur. In such a transaction, an entrepreneur agrees to pay a specified amount of output to the investor in exchange for his capital. Each entrepreneur has the opportunity to initiate one project; by using k units of capital in his project, he produces \( f(k) \) of output. We make the standard assumption that the production function is strictly increasing and concave in the amount \( k \) of capital, i.e., \( \frac{\partial f(k)}{\partial k} > 0 \) and \( \frac{\partial^2 f(k)}{\partial k^2} < 0 \). The proportion of entrepreneurs and investors in the population is \( \eta \) (\( \eta \in (0, 1) \)) and \( 1 - \eta \), respectively.

Since an investor lacks the necessary managerial skills, he can acquire output only by selling his capital to an entrepreneur. In such a transaction, an entrepreneur agrees to pay a specified amount of output to the investor in the future after production is completed. Thus in the capital market, an entrepreneur has the opportunity to offer investors divisible take-it-or-leave-it capital contracts. An entrepreneur chooses a strategy \( \{ w, k \} \), where \( w \) is the unit price of capital specified in his contracts and \( k \) is the total amount of capital that he offers to buy through his divisible contracts. Each investor may choose an amount of capital that he will sell to the entrepreneur at the offered unit price \( w \). When all investors decide
to sell the entrepreneur more than k total units of capital, the entrepreneur randomly selects k units. Capital that is not sold to an entrepreneur fully depreciates, generating a zero payoff.

Capital needs to be delivered by investors to entrepreneurs before the onset of production, while output can only be delivered by entrepreneurs to investors after the completion of production. Then, since society can enforce contracts only imperfectly, an entrepreneur may attempt to expropriate some of the output that he owes to an investor by not paying the agreed-upon amount after production is completed. It follows that in our setting, moral hazard stems from entrepreneurs that develop projects, rather than the investors that finance them, which is consistent with the finance literature’s general emphasis on this form of one-sided moral hazard in investor-entrepreneur relationships.

In each contract, the level of attempted expropriation is a choice variable for an entrepreneur. An entrepreneur chooses an attempt to expropriate a proportion \( \gamma \) (\( \gamma \in [0,1] \)) of the output that he owes to an investor. Appropriation is costly for an entrepreneur; an expropriation attempt \( \gamma \) entails a cost that is equal to a proportion \( c(\gamma) \) of the amount that the entrepreneur owes to his investor (i.e., a cost \( c(\gamma)w \) if the entrepreneur has purchased \( K \) units of capital at a price \( w \) from the investor). We make the standard assumption that the expropriation cost function is strictly increasing and convex in \( \gamma \), i.e., \( \partial c(\gamma)/\partial \gamma > 0 \) and \( \partial^2 c(\gamma)/\partial \gamma^2 > 0 \). An entrepreneur independently chooses a level \( \gamma \) of attempted expropriation in each of his contracts with investors.

In his contract with an entrepreneur, an investor chooses a level \( \pi \) (\( \pi \in [0,\pi] \), \( \pi \in (0,1) \)) of safeguarding. Then, the investor has a probability \( \pi \) of successfully neutralizing an appropriation attempt against him by the entrepreneur. Safeguarding is costly for an investor; a level \( \pi \) of contract safeguarding entails a cost that is equal to a proportion \( m(\pi) \) of the amount that the entrepreneur owes to the investor. We make the standard assumption that the safeguarding cost function is strictly increasing and convex in \( \pi \), i.e., \( \partial m(\pi)/\partial \pi > 0 \) and \( \partial^2 m(\pi)/\partial \pi^2 > 0 \). An investor independently chooses a level of safeguarding in each of his contracts with entrepreneurs.

Parameters \( \gamma \) and \( \pi \) are chosen after contracts are signed in the capital market – i.e., after the transfer of capital from investors to entrepreneurs. The level \( \gamma \) of attempted expropriation that is chosen by an entrepreneur or the level \( \pi \) of contract safeguarding that is chosen by an investor is observable only to that agent. As is standard in games with unobservable actions, we assume that the beliefs of each agent concerning the choices of \( \gamma \) or \( \pi \) by all other agents constitute public information.

We also characterize an agent by his ethical type, moral or amoral. Moral agents develop a conscience; a moral agent has feelings of guilt that decrease his payoff if he decides to engage in expropriation and feelings of pride that increase his payoff if he chooses to abstain. However, if there are no appropriation opportunities, a moral agent has neither feelings of guilt nor feelings of pride, and his overall payoff is equal to his pecuniary payoff. In contrast, amoral agents have no conscience – no feelings of guilt or pride – and their overall payoff is always equal to their pecuniary payoff.

In the model, investors have no feelings of guilt or pride since they are unable to undertake expropriation activities, and thus it is immaterial whether they are moral or amoral. In contrast, entrepreneurs have the opportunity to engage in expropriation. If a moral entrepreneur owes an amount \( V \) to an investor and attempts to expropriate an amount \( \gamma V \), he has feelings of guilt that reduce his payoff by \( g \gamma V \), where \( g > 0 \). At the same time, by not seeking to expropriate the remaining proportion \( 1 - \gamma \) of \( V \), the moral entrepreneur has feelings of pride that increase his payoff by \( p(1 - \gamma) V \), where \( p > 0 \). It follows that for a given choice \( \gamma \) of attempted expropriation, a moral entrepreneur’s feelings of guilt or pride are triggered by a moral agent’s mere attempt (or the lack of it) to appropriate, rather than by the actual success of such an attempt.

An agent chooses his ethical type – moral or amoral – in a rational manner to maximize his individual expected payoff. Ethical types are chosen probabilistically; an agent chooses his probability \( \theta^M \in [0,1] \) of becoming moral (and thus his probability \( 1 - \theta^M \) of becoming amoral). Then, nature randomly determines an agent’s type on the basis of this probability \( \theta^M \). Ethical types are determined at the beginning of the game; as, for example, in Frank (1987), the inculcation of a conscience is a long-term process that starts at the beginning of an agent’s life. An agent’s ethical type is irreversible and his particular ethical predisposition characterizes him for the remainder of his life. This is consistent with the basic principles of psychology, especially of the psychoanalytic school whose view is that character formation mostly takes place in the early years of a person’s life (Erikson, 1985). An agent’s choice of \( \theta^M \), as well as his resultant ethical type, can be observed only

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5 For example, imperfect contracting may stem from the non-verifiability by an impartial third party (such as a court) of an entrepreneur’s level of output (although such level may be observed by investors).

10 This is a standard assumption in game theory: after a financial contract is signed, a party may take hidden actions that are unobservable to any other party. For example, the effort that a policy holder makes to avoid theft or to protect his health is often unobservable to an insurance company (Rasmussen, 2007).

11 All our results would carry through if amoral agents also had a conscience as long as such a conscience was weaker than the one of moral agents, i.e., as long as amoral agents experienced weaker feelings of guilt and pride than moral agents ceteris paribus (for the same expropriation activities).

12 The linearity of the payoff from guilt and pride is assumed for simplicity and without any loss of generality. Our findings would carry through if the negative payoff from guilt were a convex function of \( \gamma \) and the positive payoff from pride were a concave function of \( \gamma \).

13 The important feature is that moral agents experience intrinsic motivation. Our findings would be similar if feelings of guilt and pride were triggered by actual, rather than by attempted, appropriation.

14 In practice, an agent’s ethical type may also be influenced by his parents. Although in our model agents have no parents, our approach is equivalent to assuming that an agent’s ethical type is selected by parents who are perfectly altruistic toward their children and aim at maximizing their children’s payoff.
by that agent. As is standard in such games, we assume that the beliefs of an agent concerning the probability choices, ethical types and subsequent actions of other agents constitute public information.

We summarize the five-stage game:

Stage 1: Each agent chooses his probability $\theta^M \in [0, 1]$ of becoming moral. On the basis of this probability, nature determines the agent’s ethical type, moral or amoral.

Stage 2: Each agent learns whether he is endowed with capital or entrepreneurial skills.

Stage 3: Entrepreneurs have the opportunity to acquire the capital of investors. Each entrepreneur chooses the price $w$ of capital in his contracts and the total amount $k$ of capital that he offers to buy. Investors decide whether to accept.

Stage 4: Each entrepreneur chooses how much appropriation he will attempt to undertake, i.e., the levels of $\gamma$ ($\gamma \in [0, 1]$). Each investor chooses the levels of his contract safeguarding, $\pi$ ($\pi \in [0, \pi^e]$).

Stage 5: Projects are completed, appropriation and safeguarding activities are realized, and entrepreneurs make payments to investors.

Our game entails both adverse selection (stage 3) and moral hazard (stage 4). We follow the standard game theory methodology of rational expectations and subgame perfection. With rational expectations about the simultaneous decisions of other agents and of the future effects of these decisions on his payoff, an agent chooses his strategy in each stage of the game. Furthermore, our model follows the standard methodology of consistent beliefs; agents update their beliefs according to Bayes’ rule as play takes place in the game. Thus our analysis examines perfect Bayesian equilibria. We adopt the tie-breaking convention that if an agent in stage 1 is indifferent between several probabilities $\theta^M$ of becoming moral, he chooses the level of $\theta^M$ that he believes to be the average $\theta^M$ chosen by the remaining population (if, of course, such a level is among the agent’s tied choices).

3. Equilibrium

To solve for the perfect Bayesian equilibrium, we proceed by backward induction.

3.1. Expropriation and safeguarding decisions

Suppose that an entrepreneur has bought $K$ total units of capital from an investor at a price $w$ per unit. Furthermore, suppose that according to the entrepreneur’s beliefs, the level of contract safeguarding by the investor is $\pi^e$. Then, in stage 4, if the entrepreneur is amoral, he has an expected payoff from such contractual obligations to the investor that is equal to $-wK[1 - \gamma(1 - \pi^e) + c(\gamma)]$. A greater $\gamma$ allows the entrepreneur to expropriate more output from his investor, but also entails a higher cost. If, on the other hand, the entrepreneur is moral, he has a payoff $-wK[1 - \gamma(1 - \pi^e) + c(\gamma) + \gamma g - (1 - \gamma)p]$ from his contractual obligations since he also experiences feelings of guilt and pride. The optimal levels $\gamma^A(\pi^e)$ and $\gamma^M(\pi^e)$ of attempted appropriation for amoral and moral entrepreneurs, respectively, are

$$
\gamma^A(\pi^e) = \arg \max_{\gamma} \gamma (1 - \pi^e) - c(\gamma),
$$

(1a)

$$
\gamma^M(\pi^e) = \arg \max_{\gamma} \gamma (1 - \pi^e) - c(\gamma) - \gamma g + (1 - \gamma)p.
$$

(1b)

The first-order conditions are

$$
1 - \pi^e - \frac{\partial c(\gamma)}{\partial \gamma} = 0,
$$

(2a)

$$
1 - \pi^e - \frac{\partial c(\gamma)}{\partial \gamma} - g - p = 0.
$$

(2b)

Conditions (2a) and (2b) imply that $\gamma^A(\pi^e) > \gamma^M(\pi^e)$ since a moral entrepreneur also faces sentimental penalties (guilt and foregone pride) when he attempts expropriation.

Let us suppose that according to an investor’s beliefs, there is probability $\theta^{Me} (\theta^{Me} \in [0, 1])$ of an entrepreneur to whom he has sold an amount $K$ of capital at a price $w$ being moral. Furthermore, suppose that an investor expects that a moral entrepreneur will attempt a level $\gamma^{Me}$ and an amoral entrepreneur a level $\gamma^{A(e)}$ of expropriation. Then, the expected
payoff of the investor from the contract is \( w K \{ 1 - (1 - \pi) [ (1 - \theta^M(\pi)) \gamma^A(\pi) + \theta^M(\pi) \gamma^M(\pi) - m(\pi) ] \} \). It follows that the investor maximizes his expected payoff by choosing the level of contract safeguarding

\[
\pi(\gamma^A(\pi), \gamma^M(\pi), \theta^M(\pi) = \arg \max_{\pi} \{ (1 - \theta^M(\pi)) \gamma^A(\pi) + \theta^M(\pi) \gamma^M(\pi) - m(\pi) \}, \tag{3a}
\]

as determined from the first-order condition

\[
(1 - \theta^M(\pi)) \gamma^A(\pi) + \theta^M(\pi) \gamma^M(\pi) - \frac{\partial m(\pi)}{\partial \pi} = 0. \tag{3b}
\]

Agents have rational expectations and beliefs. In equilibrium in stage 4, investors expect amoral and moral entrepreneurs to choose the levels \( \gamma^A(\pi) \) and \( \gamma^M(\pi) \), respectively, of attempted expropriation that maximize their payoffs, given the beliefs of investors. Then, in each contract, the unique equilibrium choice of safeguarding by an investor, \( \hat{\pi}(\theta^M(\pi)) \), is implicitly defined by

\[
(1 - \theta^M(\pi)) \gamma^A(\pi) + \theta^M(\pi) \gamma^M(\pi) - \frac{\partial m(\pi)}{\partial \pi} = 0. \tag{4}
\]

We can see that in stage 4 for a given quantity \( K \) and price \( w \) of capital, a moral entrepreneur’s expected payoff is less sensitive to (i.e., less decreasing in) believed investor’s safeguarding \( \pi^* \) than an amoral entrepreneur’s payoff. In particular, the payoff of moral entrepreneurs entails non-pecuniary elements – feelings of pride and guilt – that can cushion the negative impact of greater safeguarding by investors. Technically, this follows directly from an application of the envelope theorem to conditions (1a) and (1b) since \( \gamma^A(\pi^*) > \gamma^M(\pi^*) \). Furthermore, in condition (4) an investor’s equilibrium safeguarding is strictly decreasing in the probability \( \theta^M(\pi) \) that the investor assigns to the entrepreneur being moral (i.e., \( \partial \pi(\theta^M(\pi))/\partial \theta^M(\pi) < 0 \)) since moral entrepreneurs are less eager to appropriate. Then, if conditions (5a) and (5b) are met, there exists a unique probability \( \theta^M* \in (0, 1) \), such that when \( \theta^M* \) is assigned to the entrepreneur being moral, it equalizes the expected payoffs of moral and amoral entrepreneurs ceteris paribus (i.e., for a given quantity \( K \) and price \( w \) of capital).

\[
[1 - \pi(0)] [ \gamma^M(\pi(0)) - \gamma^A(\pi(0))] - (g + p) \gamma^M(\pi(0)) + p - c(\gamma^M(\pi(0))) + c(\gamma^A(\pi(0))) > 0, \tag{5a}
\]

\[
[1 - \pi(1)] [ \gamma^M(\pi(1)) - \gamma^A(\pi(1))] - (g + p) \gamma^M(\pi(1)) + p - c(\gamma^M(\pi(1))) + c(\gamma^A(\pi(1))) < 0. \tag{5b}
\]

In particular, condition (5a) (condition (5b)) implies that the expected payoff of moral entrepreneurs is strictly greater (strictly smaller) than the expected payoff of amoral entrepreneurs when \( \theta^M(\pi) = 0 \) (\( \theta^M(\pi) = 1 \)). Since the difference between the expected payoffs of moral and amoral entrepreneurs is decreasing in \( \theta^M(\pi) \), it is evident that there exists a unique \( \theta^M* \in (0, 1) \) for which the expected payoffs of the two types are equal.

Conditions (5a) or (5b) may not be satisfied.\(^{20}\) If condition (5a) is not met, the expected stage 4 payoff of an amoral entrepreneur is strictly greater than the expected payoff of a moral entrepreneur for all \( \theta^M(\pi) \in [0, 1] \). If (5b) is not met, the expected payoff of a moral entrepreneur is strictly greater than the expected payoff of an amoral entrepreneur for all \( \theta^M(\pi) \in [0, 1] \).\(^{21}\)

### 3.2. Capital market

Suppose that in stage 3 agents believe that the probability of each entrepreneur being moral is \( \theta^M(\pi) \in (0, 1) \). It is straightforward to see that there exists a pooling equilibrium in the stage 3 capital market subgame.\(^{22}\) We can possibly have multiple equilibria that are supported by a variety of out-of-equilibrium beliefs.\(^{23}\) Furthermore, let us suppose for the moment that conditions (5a) and (5b) are met. Then, in the capital market subgame there never exists a separating equilibrium where a moral entrepreneur signals his type and distinguishes himself from an amoral entrepreneur (through his strategy \( [w, k] \)).

In particular, we have seen that the payoff of moral entrepreneurs includes non-pecuniary elements, – feelings of pride and guilt, – that make it less sensitive to (i.e., less decreasing in) the investors’ level of safeguarding than the payoff of amoral entrepreneurs. Ceteris paribus, being considered moral – and thus being subjected to less safeguarding – leads to a greater payoff for moral, than for amoral entrepreneurs (condition (5b)). Furthermore, ceteris paribus, being considered amoral – and thus being subjected to more safeguarding – is less costly to moral entrepreneurs and thus leads to a greater

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18 Since (3a) is continuous and strictly concave on the closed interval \( \pi \in [0, \pi] \), it has a unique argument of the maximum on \( \pi \in [0, \pi] \).

19 Condition (4) is a continuous and decreasing function of \( \pi \). To focus on interior solutions, we assume that (4) is strictly positive when \( \pi \) is zero and strictly negative when \( \pi \) is \( \pi \). Then, there exists a unique \( \pi \in (0, \pi) \) for which (4) holds.

20 For example, condition (5a) (condition (5b)) is not met when society’s emphasis \( g \) on guilt is sufficiently strong (weak) and/or the emphasis \( p \) on pride is sufficiently weak (strong). Conditions (5a) and (5b) are met for intermediate levels of \( g \) and \( p \).

21 When condition (5a) (condition (5b)) is not met, condition (5b) (condition (5a)) is always met.

22 Similarly, there exist pooling equilibria, where an individual entrepreneur does not reveal his ethical type, when the probability \( \theta^M(\pi) \) is not necessarily the same for all entrepreneurs.

23 As is well-known, in standard adverse selection games we may often ensure through various sufficient conditions or out-of-equilibrium beliefs the existence of at least one equilibrium. For example, it would be straightforward to provide a detailed description of a pooling equilibrium in our model.
payoff for them, than for amoral, entrepreneurs (condition (5a)). Thus in the capital market subgame there is no strategy \( \{w,k\} \) through which a moral agent can profitably signal his type without being mimicked by an amoral agent. We summarize in Lemma 1.

**Lemma 1.** When conditions (5a) and (5b) are met, there never exists a separating equilibrium in the capital market subgame.

**Proof.** The proof is in Appendix A. \( \square \)

Intuitively, as is well-known, signaling may be possible only when its net benefits (payoffs minus costs) are greater for the high types than for the low types. Otherwise, the low types will imitate the high types, preventing separation through signaling. Since in our game the net benefits of signaling are greater for the low types (i.e., amoral entrepreneurs) than for the high types (i.e., moral entrepreneurs), successful signaling and separation cannot occur.

When, on the other hand, condition (5a) or condition (5b) is not met, there is no adverse selection in the capital market subgame. As we will see in Section 3.3, if condition (5a) is not met, all agents in the population are always amoral. If condition (5b) is not met, all agents are always moral. Thus when either condition (5a) or (5b) is not met, the capital market subgame is reduced to a standard deterministic game regarding player types; signaling or separation becomes immaterial. Therefore, it follows that in the range of parameters that can possibly accommodate a strictly positive proportion of both ethical types in the population, there can never exist a separating equilibrium.

### 3.3. Choices of ethical types

Let us first assume that conditions (5a) and (5b) are met. Suppose that in stage 1 the population believes that an agent chooses a probability \( \theta^{M(e)} \) of becoming moral. The agent expects that if he turns out to be an entrepreneur, he will subsequently adopt a strategy \( \{w,k\} \) in the stage 3 pooling equilibrium, buying an amount \( K (K \leq k) \) of capital at a price \( w \). Then, in stage 1 the agent’s expected payoff if he becomes an amoral entrepreneur is \( f(K) = wK(1 - \gamma^M(\pi(\theta^{M(e)}))) \) while his expected payoff if he becomes a moral entrepreneur is \( f(K) = wK(1 - \gamma^M(\pi(\theta^{M(e)}))) + c(\gamma^M(\pi(\theta^{M(e)}))) \) where \( c > 0 \). His expected payoff if he turns out to be an investor does not depend on his ethical type (since investors do not have the opportunity to engage in expropriation).

As we showed in Section 3.1, if \( \theta^{M(e)} > \theta^{M(s)} \) (\( \theta^{M(e)} < \theta^{M(s)} \)), the expected payoff of an amoral entrepreneur is strictly greater (smaller) than the expected payoff of a moral entrepreneur. Thus in this case, the belief that the agent chooses a probability \( \theta^{M(e)} \) of becoming moral cannot be consistent; given such a belief by the population, the agent would have an incentive to become moral (amoral) with probability one (zero), which would lead to an actual probability \( \theta^M \) equal to zero (one), rather than equal to \( \theta^{M(e)} \). As a result, the beliefs of the population are consistent if and only if each agent is believed to choose a probability \( \theta^{M(s)} \) of being moral. Given such a belief, an agent indeed chooses a probability \( \theta^{M(s)} \) and has no incentive to deviate from it. This unique equilibrium probability \( \theta^{M(s)} \) is independent of \( w \) and \( K \), i.e., of the specific subsequent stage 3 pooling equilibrium. It follows that in all subsequent stages of the game the population rationally believes that each agent has chosen a probability \( \theta^{M(s)} \) of becoming moral, and the proportion of moral agents in the population is \( \theta^{M(s)} \).

Let us now assume that condition (5a) is not met, i.e., ceteris paribus, an amoral agent always earns a larger payoff than a moral agent regardless of investor beliefs \( \theta^{M(e)} \) about the agent’s type. Suppose that a moral agent expects to follow a strategy \( \{w,k\} \) in subsequent stage 3 should he turn out to be an entrepreneur. Then, however, the moral agent can strictly increase his expected payoff by simply switching his ethical type to being amoral and following the same subsequent strategy \( \{w,k\} \). It follows that when condition (5a) is not met, all agents choose to become amoral in stage 1. Similarly, when (5b) is not met, all agents choose to become moral.

We summarize in Lemma 2.

**Lemma 2.**

(i) When conditions (5a) and (5b) are met, all agents choose a unique probability \( \theta^{M(s)} \in (0,1) \) of becoming moral in all perfect Bayesian equilibria.

(ii) When condition (5a) is not met, we have a corner perfect Bayesian equilibrium where the proportion of moral agents in the population is 0.

(iii) When condition (5b) is not met, we have a corner perfect Bayesian equilibrium where the proportion of moral agents in the population is 1.

**Proof.** It directly follows from the discussion above. \( \square \)

In an internal perfect Bayesian equilibrium (i.e., \( \theta^{M(s)} \in (0,1) \), Lemma 2(i)), although the proportion \( \theta^{M(s)} \) of moral agents in the population is unique, we may have a continuum of possible equilibrium prices of capital (in the stage 3 subgame),
which can be supported by a variety of out-of-equilibrium beliefs. The Grossman–Perry refinement is often used to eliminate equilibria with “unreasonable” out-of-equilibrium beliefs (Grossman and Perry, 1986).24 We do so here to refine equilibrium prices in a capital market subgame where the probability of each agent being moral, or the proportion of moral agents in the population, is \( \theta^M \). We use the term Grossman–Perry (henceforth G–P) price criterion to describe such a refinement of equilibrium prices in a capital market where \( \theta^M \) is \( \theta^M^* \). This refinement allows us to bring out our argument in a clear and straightforward manner. However, as the Appendix A on robustness will explain, most of our results would be similar if we did not adopt any equilibrium refinement.

In the range of internal perfect Bayesian equilibria (Lemma 2(i)), there exists a unique equilibrium that meets the G–P price criterion. Each entrepreneur adopts a strategy \( \{w^*, k\} \), where \( k > (1 - \eta)/\eta \) and

\[
w^* = \frac{\frac{\partial f(k)}{\partial k}}{1 - \gamma^A(\tilde{\pi}(\theta^M^*))[1 - \tilde{\pi}(\theta^M^*)] + C(\gamma^A(\tilde{\pi}(\theta^M^*))}.
\]

In equilibrium, each entrepreneur buys \((1 - \eta)/\eta\) units of capital. The expected payoff of moral entrepreneurs \( (u^M^*) \), amoral entrepreneurs \( (u^A^*) \) and investors \( (u^I^*) \) is

\[
u^E = u^M^* = u^A^* = f \left( \frac{(1 - \eta)}{\eta} \right) - \frac{1 - \eta}{\eta} \frac{\partial f(k)}{\partial k} \bigg|_{k=(1-\eta)/\eta},
\]

\[
u^I = w^* \left[ 1 - \left( 1 - \tilde{\pi}(\theta^M^*) \right) \gamma^A(\tilde{\pi}(\theta^M^*)) + \frac{\partial^M \gamma^M(\tilde{\pi}(\theta^M^*))}{1 - \theta^M} \right] - m(\tilde{\pi}(\theta^M^*).\]

We summarize in Lemma 3.

**Lemma 3.** In the range of internal perfect Bayesian equilibria (Lemma 2(i)), there exists a unique such equilibrium that meets the Grossman–Perry price criterion. In this equilibrium, each entrepreneur buys \((1 - \eta)/\eta\) units of capital at a price \( w^* \).

**Proof.** The proof is in Appendix A. □

The perfect Bayesian equilibrium that meets the G–P price criterion has the empirically appealing feature that the gross price \( w^* \) of capital is equal to each entrepreneur's marginal revenue product (taking into account any expected gains or losses from expropriation or from non-pecuniary feelings). This is in the spirit of the neoclassical theory of factor prices. In this equilibrium, any expected gains or losses from subsequent expropriation or non-pecuniary feelings (pride and guilt) do not impact an entrepreneur’s expected payoff in stage 3 (condition (7a)). Such gains or losses are fully incorporated into the gross price \( w^* \) of capital (condition (6)), so that the net payment for one unit of capital that an entrepreneur makes after accounting for expected expropriation and non-pecuniary gains or losses is equal to \( \delta f(k)/\partial k \big|_{k=(1-\eta)/\eta} \).

**4. Culture and ethics**

Society’s ethical system \( \{g, p\} \) entails the strength of each moral agent’s conscience – the strength \( g \) and \( p \) of his feelings of guilt and pride, respectively. The exogenous nature of \( \{g, p\} \) – which, for example, could stem from a historical accident in the past – is consistent with Weber (1930) and with the view that culture is a relatively durable feature of a society, changing only very slowly over the generations (Banfield, 1958; Guiso et al., 2006; Tabellini, 2008a).25 Society's cultural definition \( \{g, p\} \) of moral behavior impacts agents’ rational choices of their ethical types, as well as agents’ subsequent decisions.

We now examine how society’s cultural emphasis on guilt affects capital market transactions, expropriation and social welfare; the analysis for pride follows in Section 4.2. We focus on interior perfect Bayesian equilibria in which there is a strictly positive proportion of both moral and amoral agents in the population (Lemma 2(i)). Such interior equilibria are of particular empirical importance. As is well-known in psychology, in practice societies exhibit substantial ethical heterogeneity, consisting of individuals of diverse ethical types (Erikson, 1985).26 Statistical surveys confirm that within the same country individuals tend to exhibit marked differences in their disposition to moral behavior (World Values Survey, 2005). Section 4.3 will briefly discuss corner equilibria in which society exhibits complete ethical homogeneity, i.e., in which all agents are moral or amoral.

24 An equilibrium can be eliminated on the basis of the Grossman–Perry refinement if there exists at least one information set that is not reached in the given equilibrium according to which: (i) Uninformed players hypothesize that the deviation was made by a set of types of the informed players and revise their prior according to Bayes’ rule conditional upon informed players being in the specified set of types. (ii) Given these beliefs, the deviation from the equilibrium is preferred by exactly the pre-specified set of informed player types.

25 Furthermore, in practice, various cultures may be separated by substantial “ethnic distances,” so that switching to a different culture may entail substantial costs for an agent (Caselli and Coleman, 2013). In this way, agents are largely born into a specific culture.

26 In this spirit, Benabou and Tirole (2006), who consider an agent's disposition to altruistic behavior to be predetermined by nature, assume that such disposition may vary across individuals.
Fig. 1. Effects of stronger emphasis on guilt ($g_2 > g_1$) on equilibrium safeguarding.

A stronger cultural emphasis $g$ on guilt generates two opposing effects on the equilibrium risk of expropriation. Ceteris paribus, a larger $g$ discourages agents from becoming moral (and thereby from experiencing guilt), but also reduces the level of attempted appropriation by each individual moral entrepreneur. However, the former effect is always dominant.

In any internal perfect Bayesian equilibrium a stronger emphasis $g$ on guilt increases the equilibrium risk of expropriation $(1 - \theta M^*)\gamma^A(\hat{\pi}(\theta M^*)) + \theta M^*\gamma^M(\hat{\pi}(\theta M^*))$ for investors. Furthermore, in an internal equilibrium that meets the G–P price criterion, a larger $g$ reduces the equilibrium net price of capital for investors, i.e., the net (after accounting for the risk of expropriation and the cost of safeguarding) expected output that an investor earns through the sale of one unit of capital. Since in our model each investor is endowed with exactly one unit of capital, the equilibrium net price of capital coincides with the investor’s equilibrium expected payoff $u^I$. Proposition 1 follows. As we will see in Appendix A on robustness, Proposition 1(ii) may carry through even without the G–P price criterion.

**Proposition 1.** A greater emphasis $g$ on guilt in society’s cultural moral code:

(i) Strictly increases the equilibrium risk of expropriation for investors in any internal perfect Bayesian equilibrium, i.e., $\partial((1 - \theta M^*)\gamma^A(\hat{\pi}(\theta M^*)) + \theta M^*\gamma^M(\hat{\pi}(\theta M^*))) / \partial g > 0$.

(ii) Strictly decreases the equilibrium net price of capital in an internal perfect Bayesian equilibrium that meets the Grossman–Perry price criterion, i.e., $\partial u^I / \partial g < 0$.

**Proof.** The proof is in Appendix A. □

Intuitively, in an internal equilibrium the payoffs of moral and amoral entrepreneurs are expected to be equal, otherwise, agents would have an incentive to deviate from their ethical type (or from their chosen probability $\theta M^* \in (0, 1)$ of becoming moral). When the cultural emphasis $g$ on the negative sentiment of guilt increases, it makes a moral entrepreneur worse off ceteris paribus, i.e., for any given level $\pi^e$ of expected safeguarding by investors (condition (1b)). Then, an equilibrium can occur only by investors being rationally expected to raise their level $\pi^e$ of contract safeguarding and thus by investors actually encountering a greater equilibrium risk of expropriation. Greater contract safeguarding reduces the payoff of amoral entrepreneurs more than the payoff of moral entrepreneurs (which also entails insensitive non-pecuniary elements (Section 3.1)), equalizing the payoffs of the two ethical types. This is also shown in Fig. 1.

In a perfect Bayesian equilibrium that meets the G–P price criterion, the gross price $w^*$ of capital is equal to the marginal revenue product of each entrepreneur, fully incorporating expected gains or losses from expropriation and from non-pecuniary feelings. Thus a stronger emphasis $g$ on the negative sentiment of guilt, as well as the resulting greater equilibrium level of contract safeguarding (Proposition 1(i)), implies that the equilibrium gross price $w^*$ of capital or the marginal revenue product of entrepreneurs decreases. Furthermore, since investors face a higher equilibrium risk of expropriation, they net a smaller proportion of the (now smaller) gross price of capital. As a result, the equilibrium net price of capital for investors – or the equilibrium expected payoff of each investor – decreases.

In a perfect Bayesian equilibrium that meets the G–P price criterion, an entrepreneur’s expected payoff is shaped only by the form of the production function $f(k)$ (condition (7a)). Thus, society’s cultural moral code $(g, p)$ does not affect an entrepreneur’s expected payoff. Since an ethical system that places a less pronounced emphasis on guilt strictly enhances the payoffs of investors while it does not affect the payoffs of entrepreneurs, we have Proposition 2. As we will see in Appendix A on robustness, such a proposition may carry through even without the G–P price criterion.

**Proposition 2.** In an internal perfect Bayesian equilibrium that meets the Grossman–Perry price criterion, a greater emphasis $g$ on guilt in society’s culture leads to a weak Pareto-deterioration.
Proof. It directly follows from condition (7a) and Proposition 1. □

4.1. Endogenous entrepreneurship and firm size

The proportion \( \eta \) of entrepreneurs in the population is exogenous in the base model, which allows us to focus on the link between culture and welfare. We now extend the analysis to examine how society’s cultural moral code may impact an agent’s occupational choice between becoming an investor and an entrepreneur. As we will see, a more guilt-based culture increases the extent of entrepreneurship, decreasing the size of each firm – i.e., the amount of capital that each firm utilizes – in the economy.

In particular, we assume that an agent decides in stage 2 whether to become an investor or an entrepreneur.\(^{27}\) We can think of each agent as endowed by nature with one unit of capital. An agent that chooses to become an entrepreneur uses his one unit of capital to develop good managerial and entrepreneurial skills, i.e., he utilizes his capital for setting up a company.\(^{28}\) The agent that becomes an investor sells his capital to an entrepreneur. For simplicity, we also make the standard assumption that an entrepreneur’s production function \( f(k) \) meets the Inada conditions, i.e., \( \lim_{k \to 0} \frac{\partial f(k)}{\partial k} = \infty \) and \( \lim_{k \to \infty} \frac{\partial f(k)}{\partial k} = 0 \); this ensures the existence of interior solutions with a strictly positive proportion of entrepreneurs and investors in the population. Society’s ethical composition can be effectively defined as the proportion of moral agents in the group of entrepreneurs; as we have seen, the ethical types of investors are immaterial for economic outcomes. Then, for any given \( \eta \), the outcome of the rest of the game is the same as in the base model; Lemmas 1 through 3 and Proposition 1(i) hold. The proportion of moral agents in the group of entrepreneurs is \( \theta^{ME} \) regardless of the fraction \( \eta \) of agents that choose to be entrepreneurs.

If we adopt the G–P price criterion in subsequent stage 3, the expected payoff \( u^E(\eta) \) of an entrepreneur in stage 2 is \( f((1 - \eta)/\eta) - [(1 - \eta)/\eta] \frac{\partial f(k)}{\partial k}|_{k=1-\eta}/\eta \) (condition (7a)). The expected gross price \( w(\eta) \) of capital is \( \partial f(k)/\partial k|_{k=1-\eta}/\eta [1 - \gamma^A(\pi(\theta^{ME}))] [1 - \pi(\theta^{ME})] + c(\gamma^A(\pi(\theta^{ME})))] \) (condition (5)), while the expected payoff \( u^I(\eta) \) of an investor is \( w(\eta) [1 - \pi(\theta^{ME})] [1 - \theta^{ME}] \gamma^A(\pi(\theta^{ME}) + \theta^{ME}) \gamma^M(\pi(\theta^{ME}))] - m(\pi(\theta^{ME})) \) (condition (7b)). The unique equilibrium proportion \( \eta^* \) of entrepreneurs in the population is defined by\(^{29}\)

\[
u^E(\eta) - u^I(\eta) = 0. \tag{8}\]

Society’s cultural emphasis \( g \) on guilt affects the occupational choices of agents. We can see that a stronger emphasis \( g \) on guilt increases the equilibrium proportion \( \eta^* \) of agents that choose to become entrepreneurs. The size \( (1 - \eta^*)/\eta^* \) of each entrepreneur’s firm – i.e., the amount of capital that a firm utilizes – is smaller. Proposition 3 follows.

Proposition 3. In an internal perfect Bayesian equilibrium that meets the Grossman–Perry price criterion, a stronger emphasis \( g \) on guilt in society’s culture leads to a strictly greater proportion of entrepreneurs in the population and a strictly smaller size of firms, i.e., \( \partial \eta^*/\partial g > 0 \) and \( \partial[(1 - \eta^*)/\eta^*]/\partial g < 0. \)

Proof. The proof is in Appendix A. □

Intuitively, as we have seen, in an equilibrium that meets the G–P price criterion, the gross price of capital is equal to the marginal revenue product of entrepreneurs, which is also in the spirit of the neoclassical theory of factor prices. Thus the impact of changes in society’s cultural moral code \{\( g, p \}\} is fully incorporated into the gross price of capital without affecting the expected payoff of entrepreneurs (condition (7a)). Since a more guilt-based cultural moral code strictly reduces the payoff of investors (Proposition 1) without affecting the payoff of entrepreneurs, it encourages more agents to become entrepreneurs. As Fig. 2 shows, the proportion \( \eta^* \) of entrepreneurs in the population that equalizes the payoff of entrepreneurs and investors increases. It directly follows that a more guilt-based cultural moral code is associated with smaller firms since each entrepreneur has less capital \( (1 - \eta^*)/\eta^* \).

The direction of the impact of the cultural emphasis \( g \) on guilt on the net price of capital and on social welfare is the same as the base model. In particular, when occupational choices are endogenous, an investor’s equilibrium payoff \( u^I(\eta^*) \) (or the net price of capital) is equal to an entrepreneur’s equilibrium payoff \( u^E(\eta^*) \). An entrepreneur’s payoff is decreasing in \( \eta^* \), and a greater emphasis on guilt increases \( \eta^* \). Thus a more guilt-based cultural moral code leads to a strictly lower payoff for each entrepreneur and investor, as well as a strictly lower net price of capital.

\(^{27}\) The outcome of the game would be identical if the order of stages 1 and 2 were reversed.

\(^{28}\) Thus, for simplicity, we effectively assume that the fixed cost of setting up a company is one unit of capital. Our results would be similar for any fixed cost that is not too large to prevent the establishment of multiple companies in the economy.

\(^{29}\) It is straightforward to see that \( \partial u^E(\eta)/\partial \eta < 0 \) and \( \partial u^I(\eta)/\partial \eta > 0 \). Since \( u^E(\eta) - u^I(\eta) \) is a continuous and decreasing function of \( \eta \) and we also have \( \lim_{\eta \to 0}[u^E(\eta) - u^I(\eta)] = \infty \) and \( \lim_{\eta \to 1}[u^E(\eta) - u^I(\eta)] = -\infty \), there exists a unique \( \eta^* \in (0, 1) \), so that \( u^E(\eta^*) = u^I(\eta^*) \).
4.2. The sentiment of pride

By following the same procedure, we can see that the effects of an increased cultural emphasis $p$ on pride are in the opposite direction of those of an increased emphasis $g$ on guilt. In any case, the impact of the sentiment of pride on equilibrium expropriation and welfare is probably less surprising than the impact of guilt; ceteris paribus, a larger $p$ encourages agents to become moral (and thereby to experience pride), and also reduces the level of attempted appropriation by each individual moral entrepreneur.\(^{30}\) We have $\partial(1 - \theta^M)^{\gamma_{A}}(\mathcal{F}(\theta^M)) + \theta^M\gamma_{M}(\mathcal{F}(\theta^M))/\partial p < 0$, $\partial u^M/\partial p > 0$ and $\partial \eta^*/\partial p < 0$. A greater cultural emphasis on pride also leads to a weak Pareto-improvement. Proposition 4 follows.

**Proposition 4.** In Propositions 1, 2 and 3, the effects of a weaker cultural emphasis $p$ on pride are in the same direction as the effects of a stronger cultural emphasis $g$ on guilt.

**Proof.** It is the same as the proofs of Propositions 1, 2 and 3. \(\square\)

4.3. Corner solutions

Our analysis focuses on interior perfect Bayesian equilibria that entail a strictly positive proportion of moral and amoral agents in the population (conditions (5a), (5b)). If, on the other hand, condition (5a) is not met, there is a unique corner solution in which all agents are amoral (Lemma 2(ii)); the game does not entail any adverse selection and becomes deterministic regarding player types. Then, any changes in society’s cultural moral code $\{g, p\}$ are immaterial for economic outcomes since no agent experiences feelings of guilt or pride (since all are amoral). Furthermore, if instead condition (5b) is not met, there is a unique corner solution in which all agents are moral (Lemma 2(iii)). Then, the effects that the cultural emphasis $p$ on pride has on expropriation, capital prices, social welfare and firm size (or endogenous entrepreneurship) are similar to the base model. However, the effects of the cultural emphasis $g$ on guilt are different. A greater $g$ does not impact the proportion of moral agents in the population (since all agents are moral) while it discourages each entrepreneur from expropriating. Thus a greater $g$ reduces the risk of expropriation. The effects on social welfare (as well as on capital prices and endogenous entrepreneurship) are ambiguous since the costs of expropriation and safeguarding are reduced, but the emphasis on negative feelings of guilt is more pronounced.

5. International capital mobility

Although our base model examines closed economies, most of its findings carry through when there is international capital mobility. We now briefly study a two-country world that consists of countries $\alpha$ and $\beta$. To focus on the role of culture, we assume that the only difference between the two countries is their cultural moral code. Thus countries $\alpha$ and $\beta$ have the same population of agents and proportion $\eta$ of entrepreneurs, but may differ in their ethical systems $\{g_\alpha, p_\alpha\}$ and $\{g_\beta, p_\beta\}$. The structure of the game in each country is the same as before. However, in stage 2 an investor also chooses whether to keep his one unit of capital at home or transport it to (and subsequently invest it in) the foreign country.

We make the standard assumption that international capital mobility is costly for an investor (Feldstein and Horioka, 1980). For simplicity, the cost of cross-border mobility is of the iceberg type although our findings do not depend on the specific form of costs; when an investor transports his one unit of capital to the foreign country, he dissipates a proportion $t$ of his capital along the way. Within each country, investors differ in their cross-border mobility costs. Placing a country’s investors on a line segment of length $1 - \eta$ in ascending order according to their mobility costs, the cost to an investor that is at a distance $e$ ($e \in [0, 1 - \eta]$) from the origin is $t(e)$, where $\partial t(e)/\partial e > 0$. To ensure the existence of an interior solution where there is a strictly positive amount of capital in both countries, we assume that $t(0) = 0$ and $t(1 - \eta) > 1$.

\[^{30}\] A stronger emphasis $g$ on guilt, on the other hand, gives rise to opposing effects ceteris paribus as we have explained.
By following the same procedure as in the base model, we can see that in any internal perfect Bayesian equilibrium, the equilibrium proportion \( \theta_{j}^{M_j} \), of moral entrepreneurs in a country's population of entrepreneurs, as well as the equilibrium risk \( (1 - \theta_{j}^{M_j})\gamma^A(\pi(\theta_{j}^{M_j})) + \theta_{j}^{M_j}\gamma^P(\pi(\theta_{j}^{M_j})) \) of expropriation, is exactly the same as in autarky. Thus in each country, \( \alpha \) or \( \beta \), the impact of the country's cultural emphasis on guilt, \( g_{\alpha} \) or \( g_{\beta} \), on the country's equilibrium risk of expropriation is exactly the same as in a closed economy; Proposition 1(i) still holds. Furthermore, in an internal perfect Bayesian equilibrium that meets the G–P price criterion, there is a unique equilibrium amount \( \Delta K_{j} \) of gross (before accounting for the costs of cross-border mobility) capital inflows into country \( j \), \( j \in \{\alpha, \beta\} \) (with \( \Delta K_{j} \) being negative if there are outflows).\(^{31}\) Since the world consists of only two countries, we have \( \Delta K_{\alpha} = -\Delta K_{\beta} \).

The gross price \( w_{j}^{*} \) of capital and the expected payoffs \( u_{E}^{*} \) and \( u_{I}^{*} \) of entrepreneurs and domestic investors who invest their capital in their home country \( j \) are given by conditions (6), (7a) and (7b) if first, we substitute \( \theta_{j}^{M_j} \) for \( \theta_{j}^{M_j} \) and second, when \( \Delta K_{j} > 0 \), we substitute \( (1 - \eta + \Delta K_{j})(1 - \int_{0}^{\Delta K_{j}} t(e)de)/\eta \) for \( (1 - \eta)/\Delta_{1} \) (given that there is an amount \( \Delta K_{j}[1 - \int_{0}^{\Delta K_{j}} t(e)de] \) of net capital inflows into country \( j \) after accounting for the costs of cross-border mobility) or when \( \Delta K_{j} < 0 \), we substitute \( (1 - \eta + \Delta K_{j})/\eta \) for \( (1 - \eta)/\Delta_{1} \) (given that there is an amount \( \Delta K_{j} \) of capital outflows from country \( j \)). It is easy to see that a weaker emphasis on guilt in the ethical system of country \( j \) strictly increases capital inflows \( \Delta K_{j} \) into \( j \) since it decreases the expected risk of expropriation.\(^{32}\) Proposition 5 follows.

**Proposition 5.** In an internal perfect Bayesian equilibrium that meets the Grossman–Perry price criterion, a smaller emphasis \( g_{j} \) on guilt in country \( j \)'s cultural moral code strictly increases capital inflows into country \( j \), i.e., \( \partial \Delta K_{j}/\partial g_{j} < 0 \).

**Proof.** It directly follows from the discussion above. \( \square \)

Furthermore, in an internal perfect Bayesian equilibrium that meets the G–P price criterion, a smaller emphasis \( g_{j} \) on guilt in home country \( j \)'s cultural moral code increases the amount of available capital per entrepreneur in home country \( j \) and decreases the amount of available capital per entrepreneur in foreign country \( i \). Then, as condition (7a) implies, the expected payoff of foreign country \( j \)'s entrepreneurs strictly increases while the expected payoff of foreign country \( i \)'s entrepreneurs strictly decreases, i.e., \( \partial u_{E}^{*}/\partial g_{j} < 0 \) and \( \partial u_{I}^{*}/\partial g_{j} > 0 \). Condition (7b) implies that the payoff of foreign country \( i \)'s investors strictly increases because the smaller availability of capital in \( i \) raises the marginal product of capital (while expropriation risk in \( i \) is unchanged), i.e., \( \partial u_{I}^{*}/\partial g_{j} < 0 \). Furthermore, we can see that the payoff of home country \( j \)'s investors strictly increases, i.e., \( \partial u_{I}^{*}/\partial g_{j} < 0 \).\(^{33}\) Thus overall, there is a strong Pareto improvement in home country \( j \) while in foreign country \( i \) investors are better off and entrepreneurs are worse off.

If entrepreneurship is endogenous, in country \( j \) the equilibrium size of each entrepreneur's firm – i.e., the amount of capital that the entrepreneur utilizes – is given by condition (8) if we substitute \( H_{j} \) for \( \eta \), where \( H_{j} \) is the proportion of entrepreneurs within country \( j \)'s aggregate amount of capital (after the realization of any cross-border capital flows), i.e., the proportion of entrepreneurs in \( 1 - \eta + \Delta K_{j}(1 - \int_{0}^{\Delta K_{j}} t(e)de) \) if \( \Delta K_{j} > 0 \) or in \( 1 - \eta + \Delta K_{j} \) if \( \Delta K_{j} < 0 \). It follows that the equilibrium size \( (1 - H_{j}^{\alpha})/H_{j}^{\alpha} \) of firms in an open economy (i.e., the amount of capital per entrepreneur) is exactly same as if the economy were closed (i.e., equal to \( (1 - \eta^{\alpha})/\eta^{\alpha} \) in condition (8)). Then, as in Section 4.1, a weaker emphasis on guilt in the cultural moral code of country \( j \) leads to larger firms in \( j \) (while it has no impact on the size of firms in foreign country \( i \)) i.e., \( \partial[(1 - H_{j}^{\alpha})/H_{j}^{\alpha}]/\partial g_{j} < 0 \).\(^{34}\)

It is straightforward to see that in the presence of international capital mobility, the impact of a weaker cultural emphasis \( p \) on pride is in the opposite direction of the impact of a weaker cultural emphasis \( g \) on guilt. Finally, in Appendix A on robustness we show that the overall results of the model are robust to several changes in the structure of the game.

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31 Suppose that the equilibrium risk of expropriation is strictly lower in country \( j \) than in \( i \). Then, some capital flows toward country \( j \), and the unique level of \( \Delta K_{j} \) is implicitly defined by \( 1 - t(\Delta K_{j})|u_{E}^{*} - u_{I}^{*}| = 0 \), so that the payoff of the marginal investor that invests in a foreign country is the same as if he invested at home. Expression \( 1 - t(\Delta K_{j})|u_{E}^{*} - u_{I}^{*}| = 0 \) is a continuous and decreasing function of \( \Delta K_{j} \). Since it is strictly positive when \( \Delta K_{j} = 0 \) and strictly negative when \( \Delta K_{j} = 1 - \eta \), there exists a unique \( \Delta K_{j} \in (0, 1 - \eta) \) for which the expression is zero. The net (after accounting for the costs of cross-border mobility) capital inflows into country \( j \) are \( \Delta K_{j}[1 - \int_{0}^{\Delta K_{j}} t(e)de] \).

32 It follows directly from note 31 since ceteris paribus, i.e., for a given level of \( \Delta K_{j} \), a smaller \( g_{j} \) (smaller \( g_{j} \)) strictly increases the payoff of an investor in country \( j \) (country \( i \)) without impacting the payoff of an investor in the other country. Thus in equilibrium an increase in \( \Delta K_{j} \) (increase in \( \Delta K_{j} \)) leads to \( |u_{E}^{*} - u_{I}^{*}| = 0 \).

33 If \( \Delta K_{j} \) is positive (negative), we have \( u_{E}^{*} = u_{I}^{*}/(1 - t(\Delta K_{j})) \) \( (u_{E}^{*} = [1 - t(\Delta K_{j})]u_{I}^{*}) \). Then, \( \partial u_{I}^{*}/\partial g_{j} < 0 \) and \( \partial \Delta K_{j}/\partial g_{j} < 0 \) always imply that \( \partial u_{E}^{*}/\partial g_{j} > 0 \).

34 However, in an open economy there are no general implications for the impact of culture on endogenous occupational choices, i.e., on the proportion \( \eta^{\alpha} \) of agents within the country's initial population (before the realization of cross-country capital flows) that choose to become entrepreneurs. Although a weaker emphasis on guilt reduces the risk of expropriation, which discourages agents from becoming entrepreneurs (Proposition 3), it also increases capital inflows \( \Delta K_{j} \) (Proposition 5), which encourages agents to become entrepreneurs to utilize the additional capital.
6. Conclusion

While empirical and anecdotal evidence suggests a role for society’s cultural moral code in the promotion of economic prosperity, the mechanism has been relatively unexplored in formal economic theory. We provide a general equilibrium model for examining the impact of moral sentiments on capital markets and social welfare. In a game that entails both adverse selection and moral hazard, our analysis shows that a smaller emphasis on guilt in society’s culture may lead to a lower risk of expropriation in contracts, a greater net price of capital for investors, a larger size of firms, increased capital inflows and greater overall social welfare. Furthermore, the results of a smaller emphasis on pride are in the opposite direction.

Of course, our analysis is suggestive, rather than conclusive. For one thing, although culture is an especially broad concept, our model focuses on a narrow aspect of it, namely on moral sentiments. Furthermore, our model studies a specific type of activity, namely capital market transactions. However, we can see that even such a simple framework may provide a formal explanation for some of the available stylized facts, pointing to a possible link between moral sentiments and economic outcomes. At the same time, more formal empirical work is required to bridge the gap between cultural psychology and economics (or between anthropology and economics) and to provide more definitive evidence on the specific features of culture that may impact economic welfare.

Appendix A

Proof of Lemma 1. Suppose that there is a separating equilibrium in the stage 3 subgame where an amoral and a moral entrepreneur’s strategies are \( (w^A, k^A) \) and \( (w^M, k^M) \), respectively. These strategies lead to an equilibrium outcome where each amoral entrepreneur buys \( k^A \) (where \( k^A \leq k^M \)) units of capital at a price of \( w^A \) per unit, while each moral entrepreneur buys \( k^M \) (where \( k^M \geq k^M \)) units of capital at a price of \( w^M \) per unit.\(^{35}\) The expected payoff of amoral and moral entrepreneurs will be \( u^A \) and \( u^M \), respectively, where

\[
\begin{align*}
u^A &= f(\hat{k}^A) - \hat{k}^A w^A [1 - \pi(0)] y^A (\pi(0)) + c(y^A (\pi(0))], \\
u^M &= f(\hat{k}^M) - \hat{k}^M w^M [1 - \pi(1)] y^M (\pi(1)) + c(y^M (\pi(1)))].
\end{align*}
\]

(1)

If an amoral (moral) entrepreneur deviated from the equilibrium and mimicked a moral (amoral) entrepreneur, he would earn a payoff \( u^A \) (\( u^M \)). We have

\[
\begin{align*}
u^A' &= f(\hat{k}^M) - \hat{k}^M w^M [1 - \pi(1)] y^A (\pi(1)) + c(y^A (\pi(1)))], \\
u^M' &= f(\hat{k}^A) - \hat{k}^A w^A [1 - \pi(0)] y^M (\pi(0)) + c(y^M (\pi(0)))].
\end{align*}
\]

(2a)

In such a hypothetical equilibrium either \( u^M \geq u^A \) or \( u^A \geq u^M \) needs to hold. Suppose first that \( u^M \geq u^A \). Then, condition (5b) implies that \( u^A' > u^M \geq u^A \). Thus such signaling is not possible since amoral entrepreneurs can strictly increase their payoff by mimicking moral entrepreneurs. Suppose now that \( u^A \geq u^M \). Then, condition (5a) implies that \( u^M' > u^A \geq u^M \); such signaling is not profitable since a moral entrepreneur can strictly increase his payoff by adopting the strategy of an amoral entrepreneur.\(^{36}\) It follows that in the capital market subgame, a separating equilibrium can never exist. \( \square \)

Proof of Lemma 3. We consider a capital market (stage 3) subgame in which the proportion of moral agents in the population is \( \theta^M \) (as in all perfect Bayesian equilibria). We will show that a perfect Bayesian equilibrium in which the equilibrium price \( w \) is not \( w^* \) does not meet the G–P criterion in the capital market subgame (part (i)). Then, we will show that in a perfect Bayesian equilibrium in which \( w = w^* \), the G–P criterion is met (part (ii)).

(i) Suppose that in an equilibrium each entrepreneur buys \( (1 - \eta) \) units of capital at a price \( w < w^* \). At this price, each entrepreneur’s marginal revenue product of capital is strictly greater than his (pecuniary plus non-pecuniary) marginal cost. Consider a stage 3 deviation strategy in which an entrepreneur offers a price \( w' = w^* + \varepsilon \), where \( \varepsilon \) is infinitesimal. Also, suppose also that investors’ out-of-equilibrium beliefs are \( \{ \theta^M, 1 - \theta^M \} \), i.e., according to investors’ out-of-equilibrium beliefs, an entrepreneur that adopts the deviating strategy has a probability \( \theta^M \) and \( 1 - \theta^M \) of being moral and amoral, respectively.

Then, investors that were offered a price \( w' \) would accept all of the deviating entrepreneur’s contracts. The contract price would be higher than the equilibrium price investors would otherwise accept, and the probability of the entrepreneur

35 For example, in such a hypothetical separating equilibrium, the strategy \( (w^M, k^M) \) of a moral entrepreneur may be less lucrative than the strategy \( (w^A, k^A) \) of an amoral entrepreneur \( ceteris paribus \), i.e., for a given level of safeguarding by investors. However, the reduced level of safeguarding that a moral entrepreneur subsequently encounters may make the signaling strategy profitable to him while it may not make it profitable to a mimicking amoral entrepreneur.

36 We have \( u^A \geq u^M \) if the strategy of amoral entrepreneurs \( (w^A, k^A) \) is sufficiently more lucrative than the strategy \( (w^M, k^M) \) of moral entrepreneurs \( ceteris paribus \) (see note 35). Then, signaling is unprofitable to a moral entrepreneur; moral entrepreneurs prefer to switch to \( (w^A, k^A) \), also given that being considered amoral is less costly to moral than to amoral entrepreneurs.
being moral would be the same as in the pooling equilibrium. Furthermore, such a deviation would be profitable for any entrepreneur – moral or amoral – since the entrepreneur would face exactly the same level of safeguarding as in equilibrium and would be able to buy more capital (since the higher price would encourage investors to sell more than \((1 - \eta)/\eta\) units of capital). The marginal revenue at least from the first extra units of capital would be strictly greater than the marginal cost (given that \(w < w^*\), i.e., \(\arg\max_k \{f(k) - w^k[1 - \gamma^A(\pi^A(\theta^M))]\} + c(y^A(\pi^A(\theta^M)))\} = \arg\max_k \{f(k) - w^k[1 - \gamma^A(\pi^A(\theta^M))]\} + c(y^A(\pi^A(\theta^M)))\} = (1 - \eta)/\eta\). It follows that the deviation would be indeed preferred by the pre-specified set of types \([\theta^M, 1 - \theta^M]\). As a result, the G–P criterion is violated when \(w < w^*\).

Suppose now that in an equilibrium each entrepreneur buys \((1 - \eta)/\eta\) units of capital at a price \(w > w^*\). At this price, each entrepreneur’s marginal revenue product of capital is strictly smaller than his (pecuniary plus non-pecuniary) marginal cost. Consider a stage 3 deviation strategy in which an entrepreneur offers to buy a smaller amount \((1 - \eta)/\eta\) of capital, at the same price \(w\). Suppose also that investors’ out-of-equilibrium beliefs are \([\theta^M, 1 - \theta^M]\). Such a deviation would be profitable for any entrepreneur – moral or amoral – since the entrepreneur would face exactly the same level of safeguarding as in equilibrium, and the marginal revenue product he foregoes by buying less capital would be smaller than the marginal cost he saves (given that \(w > w^*\)). It follows that the deviation would indeed be preferred by the pre-specified set of types \([\theta^M, 1 - \theta^M]\); the G–P criterion is violated when \(w > w^*\).

(ii) We will examine whether a deviation from the equilibrium may be preferred by the pre-specified set of types when the out-of-equilibrium beliefs are \([1, 0]\) (i.e., only moral agents are believed to deviate), \([0, 1]\) (i.e., only amoral agents are believed to deviate) or \([\theta^M, 1 - \theta^M]\) (i.e., all agents are believed to deviate). In equilibrium, each entrepreneur buys \((1 - \eta)/\eta\) units of capital, equalizing his marginal revenue product and his marginal (pecuniary plus non-pecuniary) cost of capital given that the gross price of capital is \(w^*\).

Suppose that investors’ out-of-equilibrium beliefs for a stage 3 deviation strategy are \([\theta^M, 1 - \theta^M]\). The deviation strategy entails the purchase of \(k' \neq (1 - \eta)/\eta\) units of capital by an entrepreneur, or the adoption of a price \(w > w^*\) (investors would never accept a price strictly lower than \(w^*\) since they would accept their equilibrium offers from other entrepreneurs in this case), or both. Then, since the deviation entails exactly the same level of safeguarding as in equilibrium, it would strictly reduce the payoff of any (moral or amoral) entrepreneur, i.e., \(\sup_k \{f(k) - w^k[1 - \gamma^A(\pi^A(\theta^M))]\} + c(y^A(\pi^A(\theta^M)))\} < \arg\max_k \{f(k) - w^k[1 - \gamma^A(\pi^A(\theta^M))]\} + c(y^A(\pi^A(\theta^M)))\} = (1 - \eta)/\eta\). Thus such a deviation would not be preferred by the pre-specified set \([\theta^M, 1 - \theta^M]\) of types; the G–P criterion is not violated.

Suppose now that investors’ out-of-equilibrium beliefs for a deviation strategy in stage 3 are \([1, 0]\). Suppose that the deviation strategy leads to a payoff \(u^M\) for a moral entrepreneur which is strictly larger than his equilibrium payoff \(u^M(u^M > u^M)\). Then, condition (5b) implies that if an amoral entrepreneur adopts the same deviation strategy, he earns a payoff \(u^A\) so that \(u^A > u^M > u^M = u^A\). The deviation would be preferred by both amoral and amoral entrepreneurs, rather than by the pre-specified set of types \([1, 0]\); the G–P criterion is not violated. Finally, it is straightforward to see that when investors’ out-of-equilibrium beliefs for a deviation strategy are \([0, 1]\), no entrepreneur deviates.

**Proof of Proposition 1.** (i) We have seen that in stage 4 an amoral and a moral entrepreneur’s expected payoff is equal when the agent is perceived as having a probability \(\theta^M\) of being moral, i.e.,

\[
[1 - \pi^A(\theta^M)]\{\gamma^A(\pi^A(\theta^M)) + c(y^A(\pi^A(\theta^M)))\} = 0
\]

By implicitly differentiating (A.3) (which also entails applying the envelope theorem to conditions (1a) and (1b)), we have

\[
\frac{\partial \pi^A(\theta^M)}{\partial g} = \frac{\gamma^A(\pi^A(\theta^M))}{\gamma^A(\pi^A(\theta^M)) - \gamma^M(\pi^A(\theta^M))} \geq 0.
\]

Condition (4) implies that \(\partial \pi^A(\theta^M)/\partial g > 0 \Rightarrow \partial((1 - \theta^M)\gamma^A(\pi^A(\theta^M)) + \theta^M\gamma^M(\pi^A(\theta^M)))/\partial g > 0\).

(ii) In a perfect Bayesian equilibrium that meets the G–P price criterion, the equilibrium gross price of capital is \(w^*\) (condition (6)). Since \(\partial \pi^A(\theta^M)/\partial g > 0\), applying the envelope theorem to condition (1a) implies that \(\partial((1 - \theta^M)\gamma^A(\pi^A(\theta^M)) + \theta^M\gamma^M(\pi^A(\theta^M)))/\partial g > 0\), or \(\partial w^*/\partial g < 0\). Furthermore, we saw above that \(\partial((1 - \theta^M)\gamma^A(\pi^A(\theta^M)) + \theta^M\gamma^M(\pi^A(\theta^M)))/\partial g > 0\). In a perfect Bayesian equilibrium that meets the G–P price criterion, the expected payoff of an investor is \(u^M = \sup_{\pi^A} w^*[1 - (1 - \pi)(1 - \theta^M)\gamma^A(\pi^A(\theta^M)) + \theta^M\gamma^M(\pi^A(\theta^M))] - m(\pi)\). Thus it follows from the envelope theorem that \(\partial u^M/\partial g < 0\).

**Proof of Proposition 3.** Condition (7a) implies that \(\partial u^M(\eta)/\partial g = 0\). Furthermore, according to Proposition 3(ii), we have \(\partial u^M(\eta)/\partial g = 0\). It follows that \(\partial u^M(\eta) - u^M(\eta)/\partial g > 0\). Since \(\partial u^F(\eta) - u^F(\eta)/\partialg < 0\), implicit differentiation implies that \(\partial u^F(\eta)/\partial g > 0\). As a result, we also have \(\partial u^F(\eta)/\partial g < 0\).

**Robustness**

We now discuss the robustness of our findings to changes in the structure of the model.
(1) Timing of appropriation and safeguarding decisions

In stage 4 the base model entails a simultaneous choice of the levels $\gamma$ of appropriation by entrepreneurs and of the levels $\pi$ of safeguarding by investors. However, the outcome of the game would remain identical (and all lemmas and propositions would carry through) if the levels $\pi$ of safeguarding were chosen first in a stage 4a while the levels $\gamma$ of appropriation were chosen afterward in a stage 4b, or the reverse. Since $\pi$ and $\gamma$ are unobservable variables, the timing of the choices of $\pi$ and $\gamma$ is immaterial for our results. Suppose, for example, that investors choose their safeguarding in stage 4a. As condition (3a) implies, such a decision is based on an investor’s expectations $\gamma^{A(e)}$ and $\gamma^{M(e)}$ about the levels of appropriation that will be adopted by amoral and moral entrepreneurs, respectively, and on the investor’s belief $\theta^{M(e)}$ about the probability of the entrepreneur being moral. Furthermore, as conditions (2a) and (2b) imply, an entrepreneur’s choice of $\gamma$ in stage 4b is based on his belief $\pi^e$ about the investor’s (unobservable) level of safeguarding.

As is standard in games with unobservable variables, an agent’s beliefs about other agents constitute public information. Thus, since the equilibrium beliefs of both the investor and the entrepreneur are consistent, equilibrium is determined by condition (4) as in the base model; the equilibrium is identical to the base model. Similarly, the equilibrium remains identical to the base model if the levels $\gamma$ of appropriation were chosen first in a stage 4a while the levels $\pi$ of safeguarding were chosen afterward in a stage 4b. Overall, since $\gamma$ and $\pi$ are unobservable variables, a first mover is unable to make credible commitments, and thus the timing of choices immaterial.37

(2) Timing in the capital market

In the base model entrepreneurs offer investors take-it-or-leave-it capital contracts, and afterward investors choose whether to accept (stage 3). However, the outcome of the game would be similar (and all lemmas and propositions would carry through) if timing in the capital market was reversed, i.e., if investors offered entrepreneurs take-or-leave-it contracts and entrepreneurs afterward decided whether to accept. Then, an entrepreneur’s contract acceptance decisions would have the potential to affect other agents’ beliefs about the entrepreneur’s ethical type in the same way that an entrepreneur’s contract offers may affect beliefs in the base model. Thus the equilibrium outcome of the game would remain similar.

In particular, suppose that each investor can choose a price $w$ at which he offers to sell his capital to an entrepreneur. We can see that in the capital market subgame there exist pooling equilibria that can be supported by a variety of out-of-equilibrium beliefs, i.e., beliefs about the ethical type of an entrepreneur that would accept an out-of-equilibrium contract price or would buy an out-of-equilibrium quantity of capital.38 Furthermore, to examine the possibility of separation, we also suppose that investors can make their price offers conditional on the amount of capital $K$ that an entrepreneur subsequently buys. However, we can see that even such a capability of conditional contract offers does not allow investors to separate the ethical types of entrepreneurs. As in the base model, in the range of parameters where there can be a strictly positive proportion of both ethical types in the population (conditions (5a) and (5b)), there exists no separating equilibrium in the which the price $w$ at which moral entrepreneurs buy capital and the quantity $K$ of capital that they buy are different from the prices and quantities of amoral entrepreneurs. The proof is exactly the same as in Lemma 1. Since the subsequent benefits (costs) of being considered moral (amoral) are greater for amoral entrepreneurs, there is no contract acceptance strategy through which a moral entrepreneur can profitably signal his type without being imitated by an amoral type.

Similarly to the base model, in stage 1 an agent expects that he will subsequently buy a specific amount $K$ of capital at a specific price $w$ in the stage 3 pooling equilibrium if he turns out to be an entrepreneur. Thus agents’ stage 1 choices are identical to the base model and Lemma 2 carries through. Furthermore, the unique internal perfect Bayesian equilibrium that meets the Grossman–Perry price criterion is identical to the equilibrium in Lemma 3 in the base model. The proof is similar to the proof of Lemma 3. Overall, timing in the capital market – i.e., whether entrepreneurs make take-it-or-leave-it contract offers to investors, or the reverse – is immaterial for our findings and Propositions 1 through 5 hold irrespective of such timing.

(3) Other price equilibria

In the base model, we use the G–P price criterion to refine perfect Bayesian equilibria. This allows us to bring out our argument in a clear and straightforward manner. It also leads to an equilibrium with empirically appealing features that are consistent with the neoclassical theory of factor prices. However, the results of the base model would be similar even without the use of any refinement. In this case, we would still have a unique proportion $\theta^{M(e)}$ of moral agents in all perfect Bayesian equilibria (Lemma 2), but we would have multiple possible prices of capital; there would be a continuum of price equilibria around price $w^\ast$. We can see that most of our results would carry through if a price other than $w^\ast$ materialized in the stage 3 equilibrium, and in stage 1, agents rationally expected this price (i.e., agents expected a fixed gross price of capital).

37 More generally, Bagwell (1995) shows that even with a slightest degree of imperfection in the observability of a first mover’s choice, the value of strategic commitment may be totally lost, reducing the game to a game with simultaneous moves.38 Rasmusen (2007) discusses the classic game in which education may be used by high-ability workers to signal their type before they are offered wage contracts (Spence, 1973). As Rasmusen (2007) points out, if the order of stages is reversed, and employers offer wage contracts before education is chosen by workers, out-of-equilibrium beliefs are immaterial and only one equilibrium may exist; a worker is not interested in how his contract acceptance decision may shape the beliefs of the population about his type because his payoff has already been determined in the wage contract. In our game, however, an agent is interested in how his contract acceptance choices may affect the beliefs of the population about his ethical type; such beliefs impact his payoff in subsequent stage 4. Thus in our game the outcome is similar regardless of whether entrepreneurs or investors move first.
In particular, for a fixed gross price \( w \) of capital, a stronger emphasis on guilt would strictly increase the equilibrium risk of expropriation (Proposition 1(i)). Since investors would net a smaller proportion of \( w \), they would obtain a strictly lower net price of capital and earn a strictly smaller payoff. Furthermore, a stronger emphasis on guilt would strictly reduce the payoff of entrepreneurs; although entrepreneurs would pay a fixed gross price \( w \), they would encounter more contract safeguarding by investors and face (if they are moral) less favorable non-pecuniary sentiments. Proposition 2(ii) would still hold while Proposition 3 would be even stronger since the Pareto effects would be strong, rather than weak.

Similarly, in the extension of the model with endogenous occupational choices (Section 4.1), our welfare results would still carry through if we departed from the G–P price criterion, i.e., if in stage 1 agents rationally expected a specific price other than \( w(\eta^*) \) to materialize in the capital market subgame. However, the findings on the extent of entrepreneurship and the size of firms apply only when the system of out-of-equilibrium beliefs leads to an equilibrium price of capital that is sufficiently pegged to the marginal revenue product of entrepreneurs. Otherwise, the effects of the cultural moral code on the extent of entrepreneurship may be ambiguous.39

In the presence of international capital mobility the outcome of the game would be qualitatively similar without the G–P price criterion as long as out-of-equilibrium beliefs were flexible toward or conditional on the amount of capital that is available in the economy, so that the equilibrium price of capital were decreasing in the quantity of available capital. Then, Proposition 5 about the comparative statics effects of the sentiment of guilt on capital inflows would carry through qualitatively.

References


Frank, Robert H., 1987. If Homo Economicus could choose his own utility function, would he want one with a conscience? Amer. Econ. Rev. 77, 593–604.


39 For example, if the equilibrium gross price of capital is fixed, a stronger emphasis on guilt shifts both the \( u^i(\eta) \) and \( u^E(\eta) \) curves downwards in Fig. 2, leading to an ambiguous effect on \( \eta^* \).