Hiring Strategies and the Evolution of Honesty

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Abstract

The evolution of honesty norms in a society is studied. Our approach is based on the hypothesis that hiring or firing strategies chosen by firms may affect honesty: if it becomes common knowledge in the society that being honest is better for workers than cheating employers, then the share of opportunists gradually go down. It is shown that different hiring strategies are rational under different honesty standards. If honesty is not a prevailing social norm and volumes of appropriated rent may by high enough, then firms are better off to stimulate honest behavior by increasing wages. For a relatively honest society, firing cheaters is the best strategy. If honesty standards are intermediate or citizens are too impatient, ignorance of cheating may be rational. Therefore one observes three possible patterns of honesty evolution: honesty norms may either descend to critically low level or stabilize at some point or rise and fall cyclically.

We prove that honesty standard rises as losses from dishonest behavior or hiring cost increase, honesty standard falls as rent appropriation opportunities expand or citizens get more impatient, and high expectations of economic growth promote honesty.

1 Introduction

It is shown by many studies in the last two decades that in order to explain differences in per-capita GDP growth over countries, one should take into account political and civic culture. Indicators used in empirical papers (Aaron (2000), Popov (2000)), such as indices of corruption, rule of law, property rights, are not fully determined by the judicial system, civil or criminal law or other formal institutions, they also depend substantially on behaviorial norms prevailed in the society (North, 1993). Interpersonal trust, norms of cooperative behavior and associations within groups are often referred to as *social capital*. There are a number of empirical and theoretical works showing that social capital and other cultural factors, such as corruption, observing the law, degree of paternalism, matter for economic performance, the choice of economic policy and the strategy of institutional development (Putnam et al (1993), Putnam (2001), Knack and Keefer (1997), Barro (1996), Shirley (2005)).

It is usually accepted that the features of civic culture grow out of centuries-old development of nations and states. Nevertheless, a number of important economic parameters, such as interpersonal trust or the level of corruption, can substantially change within twenty or thirty years (Conradt (1989), Radaev (1998), see also Polterovich (2001)). This means that studying growth, one should not consider the cultural indicators as completely exogenous parameters, as it is assumed by standard theories of economic growth. A description of mechanisms of cultural changes should be included in the model of long-term development.

The development of the formal theory of such mechanisms is just beginning. The evolutionary approach to different behaviorial norms was suggested by Bichierri and Rovelli (1996) (evolution of corruption behavior), Nyborg and Rege (2003) (evolution of considerate smoking behavior), Azar (2004) (evolution of tipping). The impact of cultural factors on the transformational recession is studied in papers by Hillman and Ursprung (1998), where a theoretical model is set up, and Polterovich (2000), where the report on the empirical data, basically, concerning Russia is given. There are a number of studies on trust (Rose-Ackerman (2001), Kornai et al (2003, 2004), Raiser et al (2003), Bohnet and Croson (2004)), which is closely related to honesty. Economic and institutional determinants of trust are studied by Zak and Knack (2001). The signaling role of social culture in fixing market failures is shown by Fang (2001). However, the interdependence between

cultural parameters and economic institutions is not enough studied.

In the present paper, the attempt is made to advance in this direction. We base our investigation on the hypothesis that this interdependence is bilateral: the culture affects the institutional structure, which in turn determine the evolution of a number of cultural indicators. We demonstrate this idea by studying the evolution of honesty norms in the society and hiring strategies of firms.

An economy, where all people are dishonest, is inefficient, because the implementation of contracts requires high transaction costs. At the same time, there is no reason to be honest in a totally dishonest society, so this is a stable inefficient equilibrium (institutional trap). It was noted in some papers (see, for example, Knott and Miller (1987), Polterovich (2005)) that the development of a civil society providing coordination of the economic agents is necessary for getting out of the trap. Acceleration of economic growth is another factor that can help the society get out of institutional traps, because an increase in returns to productive activity makes the latter more attractive than rent-seeking (Polterovich (2005), Balatsky (2002)).

The evolution of honest or dishonest behavior and formation of individual and collective reputations is studied by Tirole (1993). He sets up a model in which there are three types of agents: honest (never cheat), dishonest (always cheat) and opportunistic (cheat or do not cheat depending on what is better off). The principal can learn about dishonest behavior of an agent in the past with some probability and decrease his income by offering him less efficient task which is less sensitive to cheating. So, opportunists may have incentive to behave honestly in order to maintain their good reputation. Collective reputations of people communities (e. g., firms) are formed on the basis of individual reputations.

The setting in the present paper is quite similar: honesty in the society may be thought of as its collective reputation. However, there is an important difference: the Tirole model studies the evolution of *behavior* driven by the reputational mechanism. The *behaviorial norms* of the society (proportion of honest, dishonest and opportunistic agents) are exogenous and remain unchanged. As distinct from the Tirole framework, we rather study the evolution of behaviorial norms through the process of establishing (or degrading) the civic culture which is much slower than the evolution of reputation. It is also worth noting that we focus on the choice of hiring strategies by firms, whereas in the Tirole setting,

there can be no analog of the tradeoff between hiring strategies because there is no hiring cost.

Somanathan and Rubin (2004) suggested the following hypothesis on the evolution of honesty: if an honest worker gets larger expected income than a dishonest one, then the share of honest persons in the society rises. This hypothesis represents the evolutionary mechanism of "interiorization" of successful behavior through family education and learning. This is similar to behavior norm selection principles in the evolutionary game theory (see Vasin (2005) for exposition of main ideas and references). Somanathan and Rubin assume that a dishonest worker is less productive than an honest one (so, his wage will be lower under perfect competition) but can appropriate rents. An honest worker may be recognized with some probability; in this case she earns basic wage plus extra payment The expected incomes of honest and dishonest workers must equate in equilibrium. If almost all people are honest, then the basic wage rate is close to the marginal product of a honest person, and dishonest workers earn larger income than honest ones. Therefore, the proportion of honest people decreases in societies with high honesty standards. It is shown that the accumulation of capital stock has a positive impact on the evolution of honesty.

In the present paper we use the Somanathan — Rubin hypothesis. However, we consider another mechanism, which, probably, essentially affects the evolution of honesty, but is not investigated so far in that context. This mechanism is based on hiring or firing strategies chosen by firms. We assume that there is no perfect labor market and unemployment takes place, so firms enjoy all of bargaining power and can fully control wages and hiring policy (in Somanathan and Rubin's framework, entrepreneurs have no possibilities of such control due to the perfect competition in the labor market). We study optimal strategies of firms under different honesty standards and the impact of these strategies on the evolution of honesty. We also study the impact of hiring cost, rent appropriation opportunities and other parameters on the evolution of honesty

What should the chief of the firm do, when he learns that his employee is dishonest? At first sight, the most natural reaction is to dismiss the worker. However, in societies with low standards of honesty, doing so is not typical. It is irrational to dismiss a skilled worker, if with a high probability a newly employed worker will be dishonest too. Such strategy retains the standards of honesty unchanged. However, it can be more profitable

for a firm to increase the wage of the worker so as to stimulate her behave honestly. If firms play this strategy, then, it is natural to assume, the share of conformists (those who follow the norm rather than the benefit), will rise since dishonest behavior turns out to be unreasonable. Does it mean that opportunists will disappear at all eventually? Not necessarily. Under high standards of honesty (significant share of conformists), the stimulating strategy is unprofitable for firms: there is no reason to reward for honesty, if almost everyone is honest. Dishonest workers will be dismissed, however their welfare may turn out to be higher than that of an honest worker. Hence, the standards of honesty will gradually fall. The above reasoning shows that such mechanism may lead to some intermediate standard of honesty, i. e. an equilibrium share of honest potential workers (conformists). This share is not necessarily 0 or 1. It depends on a number of parameters of the system. The equilibrium standard of honesty depends on the provision of the property rights (the opportunities of a dishonest worker to appropriate profits depend on the level of property rights protection), on the reputation mechanisms determining the alternative income of a dismissed worker, on costs of hiring and adaptation of new workers. The purpose of the present paper is to study the impact of these and some other factors on the equilibrium standard of honesty and hiring strategies.

It will be shown that one of the following hiring/firing strategies will be chosen by the firm (which one, depends on the share of honest people in the society):

- stimulating: increase wages to stimulate honest behavior;
- refining: firing cheaters, no extra wages;
- ignoring: no extra wages, no dismissals.

It turns out that the first strategy is rational for low honesty standards, the second one for high standards and the third one for some intermediate standards. It will be shown that stabilized long-run behavior of the system may take one of two forms: there is either a unique stable equilibrium or a stable cycle. It will also be shown that technical progress, growth expectations, political and economic stability may positively affect the attractiveness of honesty-stimulating strategy and lead to increasing the share of honest persons.

2 Basic Model

Consider an economy, which consists of a large number of potential workers and a fixed number of firms which form the "industrial sector". The model is dynamic, with two levels of discrete time which we call "fast time" and "slow time". Allowing for some loss of strictness, we assume that each period of slow time includes infinitely many periods of fast time. In fast time, firms and workers produce, earn profits and incomes, make plans about their behavior (the planning horizon is assumes to be infinite but not spreading to future periods of slow time). In slow time, the evolution of fundamental societal and cultural parameters (in particular, honesty standard) take place. This evolution can be thought of as the process of educating new generations of people, transferring them basic cultural settings. The evolution is supposed to have some features of Darwin's natural selection: those settings survive which lead to higher benefits (it is implied that being more successful, owners of such settings have more impact on the evolution). Firms and workers are assumed to be infinitely long living. The intertemporal preferences of firms and workers are represented by discount factors, respectively, $R = \frac{1}{1+r}$ and $\Gamma = \frac{1}{1+\gamma}$ $(r, \gamma > 0)$.

The pool of all workplaces in the industrial sector is modelled by $[0, 1]$ interval of real numbers. The number of potential workers is much larger that the number of workplaces, so the pool of all potential workers is modelled by $[0, \infty)$ interval[1]. It is supposed that those who are out of the industrial sector are occupied in other sectors of the economy or are unemployed. Without loss of generality, let us assume that their income is equal to zero[2]. We assume also that firms in the industrial sector cannot pay wages lower than some minimal level w_0 ($w_0 \geq 0$; this threshold level may occur because of sunk costs of training or adaptation or formal restrictions).

Each worker can yield the firm y units of value added and the firm pays him wage $w \geq w_0$. However, some information asymmetry is inevitable in the production process, so dishonest workers can cheat the employer and appropriate some part of his profit.

[1] Although this setting seems to describe an economy at a rather early stage of industrialization, it allows for more general interpretation, if we take the key assumption that the honesty norms in the society are strongly affected by the "rules of the game" among people with relatively high income.

[2] Thus, the incomes of workers in the industrial sector introduced below should be thought of as excess earnings comparing to the reservation income rather than as absolute values.

We assume that there are two types of workers: honest workers and opportunists. An honest worker never appropriates the rent, so his income is w, whereas the profit of the firm is $\pi = y - w$. An opportunist may choose the honest strategy too (if it looks profitable), but alternatively he can appropriate rent s ($s > 0$), so his income is $w + s$. In this case, rent dissipation takes place (the process of appropriation takes some additional resources), so the profit of the firm is $y - w - b$, where $b \geq s$ and $b - s$ is the dissipated part of the rent.

Among potential workers, there is a share $q \in [0, 1]$ of unconditionally honest ones (conformists) and $1 - q$ of opportunists. Here q may be considered as a measure of honesty norms in the society. This parameter may evolve over time (see below).

A worker can leave the firm in the following cases:

- Spontaneous leaving (retirement etc): the worker leaves the industrial sector forever. A randomly taken worker from outside is invited instead. The probability of this event is ε.
- The worker is fired for cheating (in accordance with the owner's strategy). In this case, he has to leave the industrial sector forever and a randomly taken worker from outside is hired instead. Thus, we assume that the society has a perfect reputation mechanism, so that any cheater becomes bad-reputed and cannot find another job in the industrial sector.

Employers may have many ways to control cheating from worker's side. In this paper, we assume that they exercise the control through hiring strategies. The hiring strategy is a rule assigning to each possible pre-history of observed cheating the corresponding wage $w \geq w_0$ or $w = 0$, which is treated as firing. Each firm declares its strategy and randomly chooses candidates for each workplace[3]. The type of a worker is unknown for the employer at the moment of hiring; only after one period may the employer observe worker's type (for example, if the worker cheats). Each time that a new worker is employed, the firm incurs sunk cost $h > 0$ (training expenditures, lack of experience etc). Hiring cost h is

[3]The labor market in the model is assumed imperfect in the following sense: workers are not free to choose the firm they are hired to, this decision is made by employers. This is so because there are infinitely many potential workers per workplace, so there is tough competition among workers for workplaces in the industrial sector.

also associated with the amount of human capital needed for production, i. e. with the level of technology and knowledge-intensity of production.

Let us consider the following basic hiring strategies:

- **Strategy I (stimulating):** the employer fires cheaters and offers wage $w = w^*$, which is so high that there is no reason for a worker to cheat. This strategy leads to honest behavior of all workers, even if they are opportunists. Life-time contracts practiced in Japan may be considered as a prototype of this strategy.
- **Strategy II (refining):** the employer fires cheaters and offers minimal wage $w = w_0$. As a result, cheaters are revealed and fired after one period of work. Thereby, the firm achieves high percentage of honest workers (refines its staff) but more often has to hire new people and incur the hiring cost.
- **Strategy III (ignoring):** the employer does not fire cheaters and pays minimal wage $w = w_0$. Perhaps, this kind of strategy was practiced by employers in USSR (stealing from the workplace was almost never punished).

One of these hiring strategies is implemented as far as some workplace gets vacant in the end of some period. A new worker is hired by the beginning of the next period (we assume that the moment of hiring relates to the current period, so the hiring cost h is not discounted for the employer). There are reasons to believe that other hiring strategies are "worse" than these three. At least, it will be shown that one of these strategies is an optimal response on others' using these strategies. Note also that it makes sense to distinguish among these strategies only if minimal wage w_0 is not honesty-stimulating ($w^* > w_0$). Otherwise, strategies I and II actually lead to the same outcome, with wage w_0 offered and no one cheating (strategy III is never played in this case, because it is definitely better off to stimulate the honest behavior "for free" than not stimulate). This "happy" case is not very interesting and will not be considered here.

It is assumed that each firm choose an optimal strategy each period[4]. It could be possible that different firms play different strategies (profits of all firms would be equal then) but it will be shown that only for some special values of q will this be possible.

[4]The optimal choice of each firm does not depend on the others' behavior in this simple setting. Generally, the concept of Nash equilibrium should be used.

Now let us describe the evolution of societal parameter q. The game presented above is considered in "quick time" (in the medium-run perspective). The parameter of honesty is considered constant in this perspective. However, in the "slow time" (in the long-run perspective, out of workers' and firms' planning horizon) φ can evolve. We follow the approach suggested by Somanathan and Rubin (2004) in modelling the long-run evolution of q: if honest behavior is better off for a worker than dishonest one, then q slowly rises; in the opposite case, q falls. Note that in our setting, the share of honest people will rise, if the stimulating strategy is played by all firms[5] and fall, if it is played by no firm.

Thereby, the basic model is described. The next section presents some analysis of the model.

3 Characterization of Equilibria

Firstly, note that only the three strategies numbered above can be rational ones. Indeed, it could be rational to pay wages higher than w_0 only to stimulate workers to behave honestly. The way of stimulation implemented by strategy I requires the lowest possible wage (if, for example, the firm promised to lower the cheater's wage to w_0 rather than dismiss him, a higher wage would be needed to stimulate the honest behavior). If strategy I is not rational, then either $w = w_0$ or $w = 0$. If it is better off to dismiss a worker, then doing this immediately is the best decision.

Firms' choice of hiring strategies is based on comparing the present discounted values of expected future profits for each strategy (respectively, V^I, V^{II}, V^{III}). Values V^I and V^{III} are given by

$$(1 - R)V^I = \pi_\varepsilon - \delta, \tag{1}$$

$$(1 - R)V^{III} = \pi_\varepsilon - (1 - q)b, \tag{2}$$

where $\pi_\varepsilon = \pi_0 - \varepsilon h$ and $\delta = w^* - w_0$ is the extra wage needed to stimulate the honest behavior (it is assumed that $\delta > 0$).

[5]Strictly speaking, under the minimal honesty-stimulating wage, an honest opportunist will earn just the same income as a cheater. However, it is natural to assume that, other things being equal, the honest behavior is more pleasant, even for an opportunist.

The value of V^{II} is not constant and depends on the period of continuous using of the refining strategy (let τ denote the duration of this period). Indeed, suppose that the firm has never played the refining strategy and has decided to switch to it at moment $\tau = 0$. Just after the switching, the firm has share q of honest workers. As τ increases, dishonest workers are being filtered out and other workers are hired instead (not all of them dishonest) and the present discounted value of expected future profits V_τ^{II} gradually grows. The evolution of V_τ^{II} is given by the following Bellman recursive formula:

$$V_\tau^{II} = \psi_\tau \pi_\varepsilon + (1 - \psi_\tau)(\pi_\varepsilon - b)) - (1 - \varepsilon)(1 - \psi_\tau)h + RV_{\tau+1}^{II}, \tag{3}$$

where ψ_τ is the share of honest workers at the firm, which is determined by

$$\psi_{\tau+1} = \psi_\tau - \varepsilon(\psi_\tau - q) + q(1 - \varepsilon)(1 - \psi_\tau), \quad \psi_0 = q \tag{4}$$

(note that $\varepsilon(\psi_\tau - q)$ honest people are dissipated (substituted with dishonest ones) and $q(1 - \varepsilon)(1 - \psi_\tau)$ honest people are hired instead of dismissed cheaters). The system of difference equations (3)–(4) can be easily solved[6]. We obtain the following explicit formulas for ψ_τ and V_τ^{II}:

$$\psi_\tau = \frac{1 - \Big((1 - \varepsilon)(1 - q)\Big)^{\tau+1}}{\varepsilon + q - \varepsilon q}\, q, \tag{5}$$

$$(1 - R)V_\tau^{II} = \pi_\varepsilon - \frac{(1 - q)B}{\varepsilon + q - \varepsilon q}\left(\varepsilon + \frac{(1 - \varepsilon)qr}{r + \varepsilon + q - \varepsilon q}\Big((1 - \varepsilon)(1 - q)\Big)^{\tau}\right), \tag{6}$$

where $B = b + (1 - \varepsilon)h$. In particular, for $\tau = 0$ we have

$$(1 - R)V_0^{II} = \pi_\varepsilon - \frac{(1 - q)(\varepsilon + r)B}{r + \varepsilon + q - \varepsilon q}. \tag{7}$$

In the stabilized regime, we have

$$\psi_\infty = \frac{q}{\varepsilon + q - \varepsilon q}, \tag{8}$$

$$(1 - R)V_\infty^{II} = \pi_\varepsilon - \frac{(1 - q)\varepsilon B}{\varepsilon + q - \varepsilon q}. \tag{9}$$

Now we are ready to derive conditions for medium-run equilibria (not taking into account the evolution of honesty. Let us consider the following cases:

[6]It might seem that one edge condition is missing. However, the requirement of a finite limit of V_τ^{II} as $\tau \to \infty$ is actually such a condition.

All firms play the stimulating strategy: this is an equilibrium, if $q < \min(q_{12}, q_{13})$, where

$$q_{12} = \frac{B - \delta}{B + \delta\frac{(1-\varepsilon)}{r+\varepsilon}}, \tag{10}$$

$$q_{13} = 1 - \frac{\delta}{b}, \tag{11}$$

where $\delta = w^* - w_0$ is the extra wage under strategy I, $w^* = \tilde{\gamma}s$ is the minimal honesty-stimulating wage and $\tilde{\gamma} = \frac{\varepsilon+\gamma}{1-\varepsilon}$ is the worker's discount parameter modified by the possibility of retirement.

All firms play the refining strategy: this is an equilibrium, if $q > \max(q_{21}, q_{23})$, where

$$q_{21} = \frac{B - \delta}{B + \delta\frac{(1-\varepsilon)}{\varepsilon}} \qquad (q_{21} < q_{12}), \tag{12}$$

$$q_{23} = \frac{\varepsilon h}{b}. \tag{13}$$

All firms play the ignoring strategy: this is an equilibrium, if $q_{13} < q < q_{32}$, where

$$q_{32} = \frac{(\varepsilon + r)h}{b} \qquad (q_{32} > q_{23}). \tag{14}$$

The above considerations suggest that the stimulating strategy is played for low q, the refining strategy for high q and the ignoring strategy for medium q (or for low q, if the benefits of the stimulating strategy are low, see case 1 below).

Now let us study the long-run evolution of honesty parameter q. Remember that according to our assumption, q rises when the stimulating strategy is played by all firms and falls when it is played by no firms. The following cases are then possible:

Case 1: $\delta > b$. The stimulating strategy is never played; the standard of honesty eventually falls to the minimal possible level (zero). At the early stage of this honesty collapse (when $q > q_{23}$), firms try to fight cheating by using the refining strategy; at the next stage, they ignore cheating (strategy III).

Case 2: $b - \varepsilon h < \delta < b$. If the system starts from low q ($q < q_{13}$), then the stimulating strategy is played and the standard of honesty rises until it reaches the level q_{13}. After that, q stays at $q = q_{13}$, because after a small increase the ignoring strategy is played

and q falls and after a small decrease the stimulating strategy is played and q rises. If the system starts from high q ($q > q_{32}$), then the refining strategy is played and q falls till the level q_{23}. Then firms switch to the ignoring strategy and q falls again down to the equilibrium level q_{13}. Thus, there is a unique stable equilibrium in the long run, $q = q_{13}$.

Case 3: $b - (\varepsilon + r)h < \delta < b - \varepsilon h$. As in the previous case, the system eventually gets to the unique stable long-run equilibrium $q = q_{13}$ but the transitional dynamics is slightly different: if the system starts from high q, then the refining strategy is played until q falls down to q_{21}. Then firms switch to the stimulating strategy and q rises up to the equilibrium level.

Case 4: $\delta < b-(\varepsilon+r)h$. As before, if the system starts from low q, then the stimulating strategy is played until q rises up to q_{12}. Then firms switch to the refining strategy and q falls down to q_{21}. Then firms switch to the stimulating strategy and so on: the system gets into a stable cycle between q_{21} and q_{12}[7].

The graphs of intertemporal profit functions V^I, V_0^{II}, V_∞^{II}, V^{III} for cases 2,3 and 4 are depicted in Figure 1.

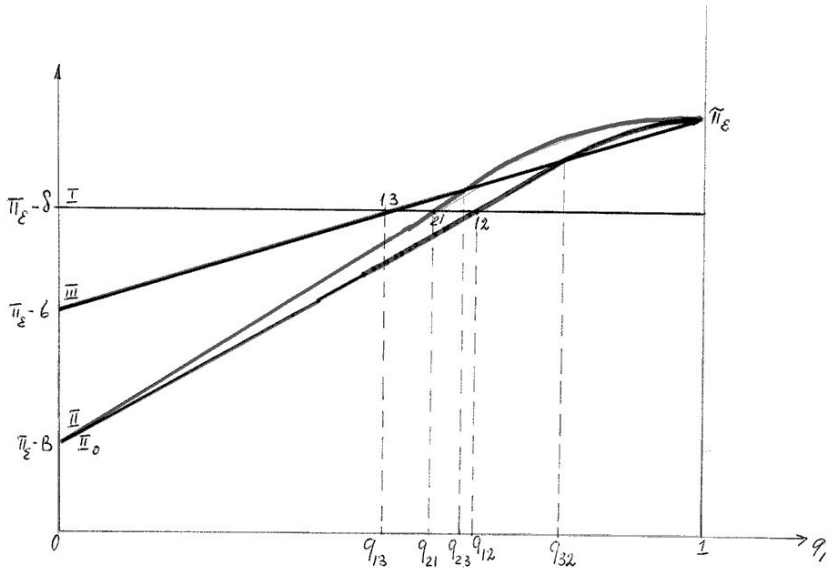
4 Comparative Statics

In the previous section, the typical cases of long-run behavior of honesty standard q were characterized. We have seen that in long-run equilibrium, honesty standard q is either equal to zero or q_{13} or oscillates between q_{21} and q_{12}. Now we can study how the equilibrium honesty standards depend on the parameters of the model.

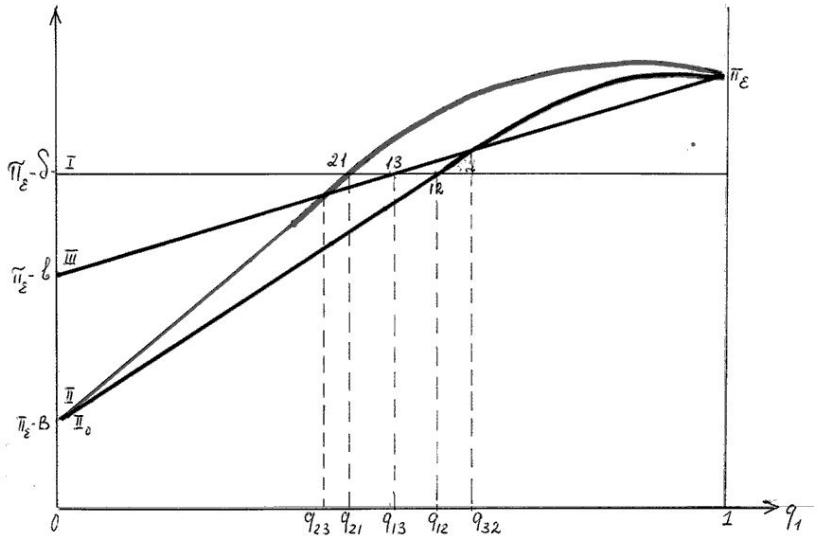
1. Honesty standard rises as hiring cost increase. Since hiring cost h is associated with accumulating human capital, this result may be interpreted in the following way: the more human capital needed for production, the higher the attractiveness of honesty-stimulating strategy, which does not requires hiring so much new workers as the refining strategy. Although, if the refining strategy is not used in equilibrium ($q = q_{13}$), then the hiring cost does not matter.

[7]The cycle occurs because of our assumption about "slow" changes of honesty standards. If the speed of adjustment of honesty standards were not much slower than the speed of filtering the staff (in case of strategy II), then it would be likely that the amplitude of the cycle be small. As the extreme case, there would be no cycle and the equilibrium intertemporal profit would be V_τ^{II}, with $0 < \tau < \infty$.

Case 2



Case 3



Case 4

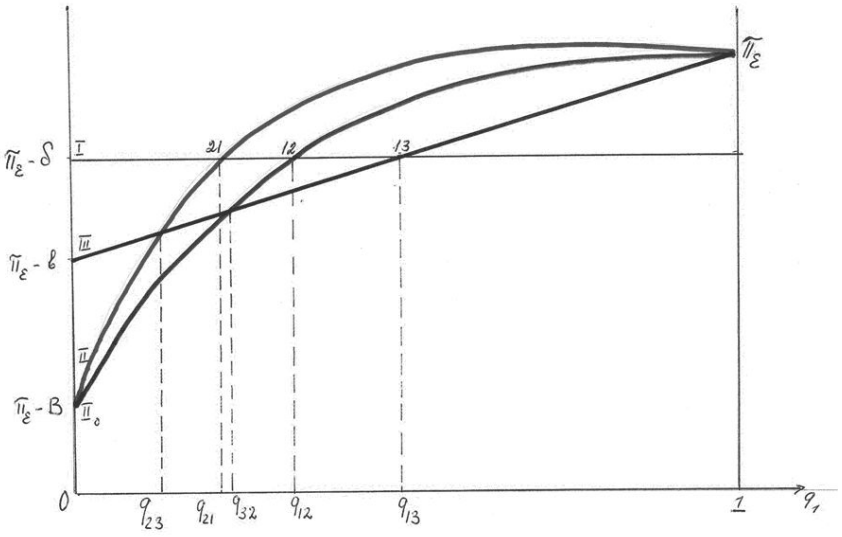


Figure 1: Intertemporal profit of firms (cases 2,3,4).

2. Honesty standard rises as losses from dishonest behavior increase. Losses from dishonest behavior b are associated with technical progress: as noted before, the adverse effect of cheating is likely to be higher for more advanced technologies. Honesty-stimulating strategy I gets more attractive than strategies II and III which lead to cheating by opportunists. So, the model shows that technical progress promotes honesty. Note that Somanathan and Rubin (2004) obtained a similar result: an increase in capital per worker (which is closely related to technical progress) positively affects honesty.

3. Honesty standard rises as rent appropriation opportunities shrink. If s decreases (because of institutional development), then the honesty-stimulating wage gets lower and the stimulating strategy more attractive. As s decreases, the losses from dishonest behavior decrease too, so the refining strategy also gets more attractive. However the former effect is stronger than the latter. This is also close to one of the results by Somanathan and Rubin (2004): the inefficiency and corruptibility of the government can adversely influence the accumulation of honesty.

4. Honesty standard rises as citizens get less impatient. As γ decreases, the honesty-stimulating wage gets lower and the stimulating strategy more attractive. So, political and economic stability promotes honesty. The extent of impatience is also a matter of social culture, so the result may also be interpreted as the interdependence between the two cultural characteristics (impatience and honesty).

5. Growth expectations promote honesty. If proportional growth of incomes and profits at rate g is expected, this equivalent to decreasing the discount factors R and Γ down to $(1+g)R$ and $(1+g)\Gamma$, respectively. Extra wage δ stimulating honest behavior negatively depends on g while V_∞^{II} and V^{III} do not depend on g, so q_{13} and q_{21} are increasing in g. V_0^{II} is increasing in g too, so the total effect on q_{12} is ambiguous.

5 Endogenous probability of detection and dishonesty trap

In the basic model, this probability of detecting the cheater was assumed to be 1. Suppose now that it is equal to p $(0 \leq p \leq 1)$. Then the critical (for our analysis) levels of honesty

standard are given by

$$q_{13} = 1 - \frac{\delta}{b}, \tag{15}$$

$$q_{12} = \frac{B - \delta}{B + \delta p \frac{(1-\varepsilon)}{r+\varepsilon}}, \tag{16}$$

$$q_{21} = \frac{B - \delta}{B + \delta p \frac{(1-\varepsilon)}{\varepsilon}}, \tag{17}$$

where $\delta = \frac{s}{p/\gamma - 1 + p} - w_0$ and $B = b + (1-\varepsilon)ph$ (provided that $p(q) > \frac{\gamma}{1+\gamma}$; otherwise, no wage is honesty-stimulating). It is easy to see that δ is decreasing in p, so if $q = q_{13}$ in equilibrium (case 2 or 3 on page 11)[8], then the equilibrium honesty standard positively depends on p. If the long-run evolution of honesty forms the cycle between q_{21} and q_{12}, then the effect seems to be ambiguous because an increase in the probability of detection positively affects not only the attractiveness of strategy I but also that of strategy II. However, it can be shown that the eventual honesty standard positively depends on p in this case too.

In the setting described above, the probability of detection is exogenous and constant. However, there are reasons to believe that it actually depends on the percentage of honest persons in the society. Indeed, if cheating is imperfectly observed, some additional investigation for each case of possible cheating may be needed. The total cost of all such investigation is low, if honesty is a social norm, and is high, the share of dishonest persons is large. Here we are not going to model this issue in detail (it is rather standard), we just want to note that it is typical that p positively depends on q. The dynamical structure of the long-run behavior of the honesty standard may differ substantially from the case of exogenous p. In particular, multiple long-run equilibria may occur.

To show this, let us consider either of equations (15–17) determining the long-run steady-state equilibrium or the equilibrium cycle. Now each of these equations allow for multiple solutions. Additionally, a "bad" long-run asymptotically stable equilibrium with $q = 0$ may occur, if using strategy I is irrational under low honesty standards. Since, as it can be easily checked, strategy III is better than strategy II at this level, the totally dishonest equilibrium does exist, if $p = p(0)$ is lower than some critical level p_c:

$$p(0) < p_c = \frac{\gamma}{1+\gamma}\left(1 + \frac{s}{w_0 + b}\right). \tag{18}$$

[8]The relationships between the parameters of the model determining cases 1–4 for any p are the same as for $p = 1$.

At the same time, if $p(q)$ is sufficiently high for high q, then a long-run equilibrium with positive q must exist, so there are two stable equilibria, with high and low (actually zero) level of honesty.

Let us consider for example a linear dependence between p and q: $p(q) = p_0(1-q)+p_1 q$. Suppose that there is no cycles in long-run equilibria. This is guaranteed by the following condition:

$$p_1 < \frac{\gamma}{1+\gamma}\left(1 + \frac{s}{w_0 + b - (r+\epsilon)h}\right) \tag{19}$$

(if the hiring cost h is sufficiently high, (19) holds).

As follows from (18), the zero equilibrium exists, if

$$p_0 < p_c. \tag{20}$$

The (unique stable) positive equilibrium exists, if

$$\begin{array}{l} \left(2 + \frac{w_0}{b}\right) p_0 - \left(1 + \frac{w_0}{b}\right) p_1 < \frac{\gamma}{1+\gamma}; \\ \frac{w_0}{b} p_0 - \left(1 - \frac{w_0}{b}\right) p_1 > \frac{\gamma}{1+\gamma}; \\ 4\gamma(1+\gamma)(p_1 - p_0)bs < \left((bp_1 + w_0(p_1 - p_0))(1+\gamma) - \gamma b\right)^2. \end{array} \tag{21}$$

Thus, if conditions (19-21) hold (generally, they are consistent), then there are two long-run equilibria with different levels of honesty. In particular, if the total losses from cheating are relatively low ($b < w_0/2$), then the following condition is sufficient for the multiplicity of equilibria:

$$p_1 - p_0 > \frac{\gamma}{1+\gamma}, \tag{22}$$

i. e. if the graph of dependence $p(q)$ is sufficiently steep, then there are multiple equilibria.

The situation described above gives us the trap of dishonesty which is a special case of institutional trap (see Polterovich, 1999). Once having got to the attraction area of the bad equilibrium, the system converges to this equilibrium and cannot leave it by itself.

6 Conclusion

The model considered above shows that not only social culture affects economic development but there is also the reverse causality. In particular, a positive change may be

inspired by the class of entrepreneurs who are interested in honesty of their employees. It was shown that stimulating honesty is rational for low honesty standards, firing cheaters without stimulation for high standards and ignoring dishonest behavior for intermediate standards. In the simple basic model, there is either a unique stable long-run equilibrium or a stable cycle. It was shown that technical progress, growth expectations, political and economic stability may positively affect the attractiveness of honesty-stimulating strategy and lead to moving up the honesty standards. However, if the probability of detecting cheaters positively depends on the honesty standard, a trap of dishonesty may occur.

The investigation is not completed yet. There are several ways of further development. It would be interesting to study how the structure and evolution of information channels in the society (on which the reputation mechanism is based) affects the evolution of honesty. Another interesting issue is the impact of labor force movement among firms. Among other directions of further investigation are: wage rate formation under unemployment (in the current version of the model, wages are totally controlled by the firm which is a simplification), dynamic framework with capital and technical progress, more sophisticated rules to prevent cheating, the possibility of cheating by managers (some empirical observations show that there can be high honesty standard among ordinary workers and low among managers), the role of natural resources. Some ways of empirical verification are also in plans.

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