

## INFORMAL CONTRACTS IN RUSSIAN LABOR MARKET

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### Abstract

In Russia it is quite common to avoid making formal labor contract or to fix all the employee's benefits expected in such a contract. A contract of informal type appears to be not obligatory for an employer. A firm has an opportunity to "deceive" an employee, paying him lower salary than expected. Even in cases when formal contracts concluded external legal enforcement of a contract often appears to be imperfect and costly. Sometimes, this brings to the employer the opportunity to 'deceive' the employee, paying him a lower salary than she had expected ex-ante. Underdevelopment of the judiciary system and weak enforcement of courts decisions make this problem more serious, and at the same time more difficult to resolve. The current paper provides a positive model of deception at labor markets. The aim of the paper is to compare legal and market mechanisms that could prevent deception and to study the interaction of market and legal forces.

### Introduction

In a transition economy, many of employee/employer's contracts are informal, rather than formal. Even in cases when formal contracts concluded external legal enforcement of a contract often appears to be imperfect and costly. Sometimes, this brings to the employer the opportunity to 'deceive' the employee, paying him a lower salary than she had expected ex-ante. Underdevelopment of the judiciary system and weak enforcement of courts decisions make this problem more serious, and at the same time more difficult to resolve. The current paper provides a positive model of deception at labor markets.

In Russia, it is quite common to avoid making a formal labor contract or to fix all the employer's benefits expected under such a contract. In this case, a verbal agreement between employee and employer may include payments that are much higher than the ones fixed in formal contract. Such an informal nature of labor contracts in Russia and other economies in transition might be due to inherited imperfections of the labor market, over-burdening payroll taxes, and over-protection of the workers once a formal contract has been signed, combined with pro-worker courts.

The contract theory literature (MasCollé et al, 1995, Salanie, 1998, etc.) is mainly concerned with the ability of the employer to make the *employee* exhibit socially optimal level of efforts (thus eliminating moral hazard). In transition countries, we observe labor contracts with weakened enforcement technology. Contracts of such a type are not obligatory for an *employer* since payments are usually made after the employee has performed the task. The incentives for execution of a contract by a firm are in focus of the current project.

All economic transactions, except spot exchanges of goods or services with objectively known attributes, offer opportunities for one or both of the parties to cheat for their own gain at the expense of the others.

The official legal system in modern advanced countries provides a benchmark against which the alternatives are measured. Economic and legal scholars have constructed numerous models where such an institution is designed to maximize social welfare, taking into account various constraints on information and policy and individuals' optimal responses. Polinsky and Shavell (2000) have surveyed this research.

One alternative to the formal legal system considers economic governance by private intermediary. Olson's (1993) analysis of private governance by profit-maximizing "bandit" is well known. The newest achievement in this way is Dixit (2001).

An alternative to external enforcement mechanism (public or private) that economic theorists have studied is self-governance, modeled as equilibria in repeated interactions.

It is widely recognized that in many economic transactions informal means are employed to execute mutually beneficial agreements. As S. Macaulay (1963) points out, "social pressure" and "reputation" are perhaps more widely used than formal contracts and filing suits. In many cases, people behave honestly because honesty is rewarded and/or defection is punished in future transactions.

Kandori (1992) classify such informal enforcement mechanisms into two categories. One is personal enforcement, in which cheating triggers retaliation by the victim. These mechanisms are effective if quick and substantial relations are available - that is, they work best in frequent and long-term relationships. The Folk Theorem in the repeated game literature (Rubinstein (1979) and Fudenberg and Maskin (1986)) provides a formal model of personal enforcement, showing that any mutually beneficial outcome can be sustained as a subgame-perfect equilibrium if the same set of agents frequently play the same stage game ad infinitum. However, many important transactions are infrequent in nature. Therefore, the control of incentives in such an infrequent trade is of vital importance to understand the organization of economic transactions. This observation leads to the second category of informal enforcement mechanisms, community enforcement, where agents change their partners over time and dishonest behavior against one partner causes sanctions by other members in the society. A wide branch of the literature based on Kandori's (1992) model of multilateral punishments devoted to the study of such mechanisms. Tirole's (1996) paper on "collective reputations" is more advanced step in this way.

Within this paper we examine internal private enforcement at labor market. We also introduce external legal enforcement when formal contracts concluded. The aim of the paper is to compare the two mechanisms and to study the interaction of market and legal forces.

## The Model

We introduce a model of a labor market, where the relationships between parties are determined by the terms of a contract formal or informal. The main difference between the two types of the contracts is that in case of formal contract an employee can appeal to the third party (namely the Court) in case of deception. If the contract is informal an employee has no such an option and the only tool to prevent deception is strategic behavior.

There are two populations in the market: firms and employees. The number of firms is  $n$ , the number of employees is  $m$ . Any firm possesses one working place. The number of employees is greater than the number of working places:  $m > n$ . The numbers  $m$  and  $n$  are large enough that any individual decision has a negligible effect to market parameters. The production process is possible only in match of firm and employee. Economy exists for two periods.

The objective function of a firm is the present value of its expected profits  $E\Pi = E\{\pi_1 + \delta\pi_2\}$ . Here one period profit of a firm is calculated as  $\pi_i = x_i - C_i$ , where  $x_i$  is one period output of a firm,  $C_i$  represents one period costs. The discount factor of any firm is  $\delta$ .

The objective function of an employee is the present value of expected utilities  $E U = E\{u_1 + \delta' u_2\}$ . Here  $u_j = u(m_j)$  is the value of employee's utility function in period  $j$  where  $m_j$  is the one period money income of an employee,  $\delta'$  is the discount factor of an employee.

Firms and employees differ in types.

There are two types of employees: efficient (high productive) and inefficient (low productive). The value produced by efficient employee during a period is  $x_H$ , the value produced by inefficient employee in a period is  $x_L$ , where  $x_H > x_L$ . Thus the output of a firm is determined by the type of employee and takes one of the two exogenous values. The proportion of efficient employees in the population is  $\lambda$ . We assume for the sake of simplicity that the both types are present in the market  $0 < \lambda < 1$ .

In this model we consider just two types of firms in the market: good and opportunistic. Proportion of good firms is  $\alpha$ , proportion of opportunists is  $\gamma$ ,  $\alpha + \gamma = 1$ . We assume  $\alpha > 0, \gamma > 0$ . The differences of firm types are similar to those for the case of formal contracts and to be described formally below. The proportions  $\alpha, \lambda$  are common knowledge.

The wages of employees are determined by the set of contracts. Any contract is concluded for one period. The parameters of the contracts are exogenous and equal for all firms and employees.

We consider two settings that differ by the structure of the contracts concluded between the parties.

1. **Informal contracts.** In this setting we focus on the case of informal contracts (possibly combined with formal ones). Every match concludes two contracts of the following (exogenous) structure. Formal contract includes the payment  $w_L$  for a period of work irrespectively to the output. (It may be some legally stated minimal wage, or zero or something else). This contract is fully enforceable and binding for the firm.

Informal contract is concluded with any employee in combination with the formal one and includes the payment  $w_H > w_L$  if the output of a firm is high ( $x = x_H$ ).

This contract has no legal enforcement mechanism and its implementation is determined by the type of the firm. Good firms always fulfill informal contracts, bad firms always ignore them, opportunists decide whether to fulfill the contract through objective function maximization.

2. **Formal contracts.** A firm and an employee conclude a contract that provides different payments for different outputs. If an employee turns out to be efficient (the output is  $x_H$ ) then his wage would be high  $w = w_H$ , if an employee is inefficient (output is  $x_L$ ), then his wage is low  $w = w_L$ . The parameters of the contract are exogenous. Though this contract is written and formal it may occur nonbinding for the firm. Although we introduce the legal enforcement mechanism in the model this mechanism is supposed to be imperfect. We assume that the output of the firm is observable for the contracting parties but may be verified by the Court only with some probability  $0 < \eta < 1$ . Thus even if the legal procedure is initiated by employee the punishment for deviator is just stochastic and may or may not prevent deception.

A firm may deviate from the contract terms by insisting that the value of output was low, whereas the true high value is observable by both parties but imperfectly verifiable by the Court. We suppose that good firm always fulfills contract terms, opportunist maximizes his objective function by choosing strategically whether to deceive an employee or not.

We assume  $x_H - w_H > x_L - w_L$ , that is working honestly with efficient employee is more profitable then working with inefficient.

Let us now describe the timing in the model.

When the game starts all the firms and all the employees are unmatched.

At the beginning of the first period uniform random matching occurs. The number  $m - n$  of employees stays unemployed. We assume equal probabilities for all the matches with no respect to types. In the first period production takes place and the firms obtain revenues. Thus at the end of the period the type of an employee is observed by the firm.

At the end of the first period the wages paid to employees. At this time opportunistic firms have to decide whether to fulfill the nonobligatory first period contract.

After the wage is paid an employee has an option (in the case of formal contracts) to go to the Court and contest his wage (of course this option is valuable in case of low wage only). To make a decision an employee has to compare expected costs of the legal procedure and expected benefit of possible positive judgement. If he decides to go to the Court then legal procedure takes place. For the sake of simplicity we assume it to be momentary. The legal procedure will be described below.

Now every match has to decide whether or not they would work together for the second period. The firm has an option to dismiss the employee, the employee has an option to leave firm. If both parties prefer to work together for the second period the match would survive.

At the beginning of the second period some of firms and employees are already matched and the rest of agents should go to the market and take part in new matching.

At the beginning of the second period new matching takes place. Free employees and free firms take part in this matching. The matching is random and uniform. In the second period production takes place and revenues are obtained. Then at the end of the second period the wages are paid, (opportunists have to decide whether to pay high or low wage to efficient workers). In case of formal contracts employee has an option to initiate legal procedure at the end of second period.

Let us now describe the legal procedure in the model.

We assume the legal procedure to be momentary (this assumption is made to simplify the description, time consuming procedures do not influence the spirit of the results).

To make a sentence the Court has to verify the output of the firm. We assume that low output is perfectly verifiable. It means that there is no reason for an inefficient employee to appeal to the Court. At the same time high output of the firm could be verified with some probability  $\eta \in [0,1]$ . Thus if an efficient employee goes to the Court there is a probability  $\eta$  that the judgement is in favor of the employee and  $1-\eta$  is the probability of judgement in favor of the firm. The value of  $\eta$  supposed to be exogenous.

The legal procedure is costly for an employee, the value of costs is  $c$ , but in the case of winning he receives the compensation of wage  $w_H - w_L$  and compensation of costs  $c$  from the firm. Besides these transfers to the employee if the firm lose the action it also have to pay some penalty  $s$  to the Court. We assume that  $c$  includes also the moral costs of the employee (that can be observed by the Court) thus the utility level of an employee if he wins is the same as if the firm fulfilling the contract.

Unless the two settings are different in the formal analysis we the case of informal contracts as being equivalent to particular case of the formal one, where the legal procedure is costly enough to be not available. Thus the following analysis considers the formal contracts.

### Model solution

Within this setting the strategic variables to be determined are as follows:

1. The opportunists have to decide whether to pay high or low wage to efficient employees in the first period.
2. The efficient employees have to decide whether to go to the Court in case of low wage in the first period.
3. Firms have to decide whether to dismiss an employee at the end of the first period given the observed output.
4. Employees have to decide whether to leave the firms at the end of the first period given received wage.
5. The opportunists have to decide whether to pay high or low wage to efficient employees in the second period.
6. The efficient employees have to decide whether to go to the Court in case of low wage in the second period.

First one can easily solve for the optimal dismiss strategy of the firm.

**Proposition 6** A firm of any type dismisses employee at the end of the first period if and only if employee is inefficient

Proof Let us note that working with efficient employee is still preferable for a firm then working with inefficient. In fact, a firm of any type (good or opportunistic) has an option to pay high wage to efficient employee in the second period and exclude possible costs of legal procedure. Since we assume  $x_H - w_H > x_L - w_L$  matching with efficient employee is more profitable for a firm then matching with inefficient in case of high wage.

Since  $m > n$  there is some unemployment in the market and because of the random nature of matching there are some efficient employees who stay unemployed. Thus if a firm observes the current employee being inefficient it is the best solution to dismiss this employee and to obtain some positive probability to meet efficient one for the second period. Controversially, there is some unemployment for inefficient workers, since if a firm dismisses efficient employee it has some chance to meet inefficient one.

As the next step let us solve for the optimal strategy of going to the Court. Let us note, that the second period utility of an employee is not affected by his decision to go to the Court in the first period. (In fact a firm may prefer to promise dismissal for employee who goes to the Court, but as we have seen above never commit ex post to do it). The second period decision of an employee affect only second period utility as well.

**Proposition 7** Efficient employee goes to the Court (in the both periods) if and only if the wage is low and  $\eta > \eta^*$ , where

$$\eta^* = \eta^*(c) = \frac{u_L - u(w_L - c)}{u_H - u(w_L - c)} \quad (1)$$

Proof In case of high wage there is no reason to go to the Court. In case of low wage an employee has to compare his payoffs for alternative strategies.

1. No legal procedure. Employee's utility is  $u_L$ .
2. Employee goes to the Court.
  - (a) Firm wins (probability  $1 - \eta$ ). Employee's utility is  $u(w_L - c)$ .
  - (b) Employee wins (probability  $\eta$ ). Employee's utility  $u_H$ .
 Thus in the case if employee initiates legal procedure the expected one period payoff is  $u = (1 - \eta)u(w_L - c) + \eta u_H$ .

Employee initiate the legal procedure if  $u_L < (1 - \eta)u(w_L - c) + \eta u_H$ . This condition is equivalent to (1).

Thus an employee goes to the Court if the enforcement power (characterized by probability of verification) is high enough. We should mention that  $\eta^*$  rises with the costs  $c$  of legal procedure. That is high costs of the procedure make the reduce the incentives to go to the Court.

One can solve for the firm's one period payoffs as well.

1. No legal procedure. Firm's profit is  $x_H - w_L$ .
2. Employee goes to the Court.
  - (a) Firm wins (probability  $1 - \eta$ ). Firm's profit is  $x_H - w_L$ .
  - (b) Employee wins (probability  $\eta$ ). Firm's profit  $\pi$ .

Thus in the case if employee initiates legal procedure the expected one period payoff of the firm is  $\pi = x_H - [(1 - \eta)w_L + \eta(w_H + c + s)]$ . Thus the payoff of the firm in the case of efficient employee and low wage is

$$\pi_L(\eta) = x_H - C_L(\eta),$$

where

$$C_L(\eta) = \begin{cases} w_L, & \eta < \eta^*(c) \\ w_L + \eta[(w_H - w_L) + c + s], & \eta > \eta^*(c) \end{cases} \quad (2)$$

The payoff of an employee is

$$u_L(\eta) = \max \{u_L, u(w_L - c)(1-\eta) + u_H\eta\} = \begin{cases} u_L, & \eta < \eta^*(c) \\ u(w_L - c)(1-\eta) + u_H\eta, & \eta > \eta^*(c) \end{cases} \quad (3)$$

Now one can easily find the optimal strategy for opportunist in the second period.

**Proposition 8**

Opportunistic firms fulfill contract terms in the second period if and only if

$$\eta > \max \{\eta^*, \eta^{**}\}, \quad (4)$$

where  $\eta^*$  is determined by (1),  $\eta^{**}$  is defined as

$$\eta^{**} = \eta^{**}(c, s) = \frac{w_H - w_L}{(w_H - w_L) + c + s}.$$

Proof Opportunists fulfill contract terms in the second period if and only if  $C_L(c) > w_H$ , where  $C_L(c)$  is the expected costs of deception, determined by (2). It's easy to see that this inequality is equivalent to (4).

We see that the Court procedure prevent deception of an employee by an employer is employee goes to the Court and if the probability that he wins is high enough. One could see that  $\eta^{**}$  falls with the rise of  $c$  and  $s$  that is higher procedure costs to be paid and higher penalties produce incentives for honest behavior.

The two questions that remain unsolved are decision of employee to stay or to leave given the wage paid and decision of opportunist to pay high or low wage to efficient worker in the first period. The decision of inefficient employee to stay or to leave is irrelevant for he is dismissed by a firm anyway. Thus we should concentrate at efficient employees and opportunistic firms.

We introduce the notation the same as in the previous section.

The strategy of  $i$ -th opportunistic firm is determined by probability  $p^i$  to fulfill contract terms in the first period. With the probability  $1-p^i$  firm deceives an efficient employee and pays low wage.

The strategy of  $j$ -th efficient employee is a pair of probabilities  $q^j = (q_H^j, q_L^j)$ . In case of high wage in the first period  $j$ -th employee stays with the firm with probability  $q_H^j$ , in case of low wage he stays with probability  $q_L^j$ .

Denote by  $p = \frac{1}{n} \sum_{i=1}^n p^i$  an average value of  $p^i$  in the population of opportunists. Average values of the

probabilities to stay within the population of efficient employees are  $q = (q_H, q_L)$ ,  $q_H = \frac{1}{m} \sum_{j=1}^m q_H^j$ ,

$$q_L = \frac{1}{m} \sum_{j=1}^m q_L^j.$$

Consider the behavior of the efficient employee under the conditions of the game. Note, that decisions are to be made by employees at the end of the first period thus only the second period component of payoff function is affected by this decision.

We should consider separately the two cases a)  $\eta > \max \{\eta^*, \eta^{**}\}$  and opportunists are honest in the second period and b)  $\eta < \max \{\eta^*, \eta^{**}\}$  and opportunists deceive in the second period.

a) Let  $\eta > \max \{\eta^*, \eta^{**}\}$  and all firms are honest in the second period. Then there is no reason for an employee to leave firm, since employment in any firm in the second period leads the same payoff but leaving a firm after the first period may lead to unemployment.

**Proposition 9** If  $\eta > \max\{\eta^*, \eta^{**}\}$  then efficient employees stay with their firms.

b) Let  $\eta < \max\{\eta^*, \eta^{**}\}$  and opportunists deceive in the second period.

One can solve for equilibrium strategies of efficient employees.

**Proposition** Let  $\eta < \max\{\eta^*, \eta^{**}\}$ . Let  $q^{j*H}(r)$  (resp.  $q^{j*L}(r)$ ) be the probability of efficient employee to stay with firm when he receives high (resp. low) wage in the equilibrium and  $r$  is the unemployment rate. Then

$$q_H^{j*} = 1,$$

$$q_L^{j*}(r) = \begin{cases} 0, & r < r_0(\eta) \\ 1, & r > r_0(\eta) \\ q_L^j, & r = r_0(\eta) \end{cases}$$

where  $r_0(\eta)$  is a threshold value of unemployment rate calculated by

$$r_0(\eta) = \frac{1}{1 + \frac{K^*(\eta)}{\alpha(1-\lambda)}}, \quad (5)$$

$$K^* = \frac{u_L(\eta) - u_0}{u_H - u_L(\eta)},$$

$q_L$  is a probability.

**Note** One can easily see that  $r_0(\eta)$  in  $(0,1)$ .

One can see that the optimal strategy for an employee is either one of two pure strategies or their mix:

1. Active strategy. Employee stays in the firm if the wage is high and leaves the firm if the wage is low ( $q_H = 1, q_L = 0$ ).

2. Passive strategy. Employee stays with the firm in any case ( $q_H = q_L = 1$ ).

In the following analysis we omit for simplicity the "zero-probability" case  $r = r_0$ .

Now we should calculate the optimal strategy of opportunistic firm.

1.  $r > r_0(\eta)$ . Then employees play passive strategy:  $q_H = q_L = 1$ . Then one can state a proposition for equilibrium strategies of opportunists in this case.

**Proposition** Let  $\eta < \max\{\eta^*, \eta^{**}\}$ . Suppose the unemployment rate exceeds the threshold value  $r_0(\eta)$  given by (5). Then in equilibrium firms never fulfill the terms of informal contracts.

2. Now consider the case  $r < r_0(\eta)$ . In this case employees are active: they stay with firms if and only if the wage in the first period was high.

**Proposition** Suppose  $\eta < \max\{\eta^*, \eta^{**}\}$ ,  $r < r_0(\eta)$ ,  $r_0(\eta)$  is given by (5) and employees play their equilibrium strategies. Then the optimal probability for  $i$ 'th opportunistic firm to fulfill informal contract terms is determined by the rule

$$p^i(p, r) = \begin{cases} 0, & r > R(p, \eta) \\ 1, & r < R(p, \eta) \\ p^i, & r = R(p, \eta) \end{cases} \quad (6)$$

Here  $p$  is the market average probability for an opportunist to fulfill informal contract terms,  $R(p, \eta)$  is the threshold value, given by

$$R(p, \eta) = 1 - \frac{1 - \frac{\delta(1-\lambda)}{K^{**}(\eta)}}{\lambda(\alpha + \gamma p)}, \quad (7)$$

$K^{**}(\eta)$  is calculated as

$$K^{**} = \frac{w_H - C_L(\eta)}{x_H - x_L},$$

$p^i$  a probability.

**Note** Unlike the threshold  $r_0(\eta)$  that distinguishes the strategic areas of an employee and lies between 0 and 1 the function of  $R(p, \eta)$  may take values outside  $[0, 1]$  interval. If it happens some of the cases in (6) become impossible. Note that  $R(p, \eta)$  is increasing function of  $p$  if and only if it takes values lesser than 1. In fact the both properties are equivalent to inequality  $K^{**}(\eta) > \delta(1-\lambda)$ .

### Equilibria

Let us now summarize the results obtained and describe the equilibria in the game. We shall concentrate at the case of symmetric equilibria, that is the players of given type choose the same mixed strategy. The problem still unsolved is the choice of opportunistic firm in the case  $r < r_0(\eta)$ . Assuming the symmetry one can easily solve the equation (6).

Assume  $r < r_0(\eta)$ .

First if  $K^{**}(\eta) < \delta(1-\lambda)$  then all the firms are honest in the first period.

Now consider the case  $K^{**}(\eta) > \delta(1-\lambda)$ . Find the condition for the equality  $p^i = p$  to be satisfied in (6) Consider three cases.

1. Let  $p^i = p = 0$  Then (6) takes the form  $r \geq r^*(\eta)$ , where

$$r^*(\eta) = 1 - \frac{1 - \frac{\delta(1-\lambda)}{K^{**}(\eta)}}{\lambda\alpha} \quad (7)$$

2. Let  $p^i = p = 1$  Then (6) takes the form  $r \leq r^{**}(\eta)$ , where

$$r^{**}(\eta) = 1 - \frac{1 - \frac{\delta(1-\lambda)}{K^{**}(\eta)}}{\lambda} \quad (8)$$

One can easily see that  $r^*(\eta) < r^{**}(\eta)$  as soon as  $\gamma > 0$ .

3. Suppose  $p^i = p \in (0, 1)$ . Then the equality

$$r(\eta) = 1 - \frac{1 - \frac{\delta(1-\lambda)}{K^{**}(\eta)}}{\lambda(\alpha + \gamma p)}$$

has to be satisfied. One can solve the equation and find

$$p(r, \eta) = \frac{1 - \frac{\delta(1-\lambda)}{K^{**}(\eta)}}{\gamma\lambda(1-r)} - \frac{\alpha}{\gamma} \quad (9)$$

It can be stated that  $p(r, \eta) \in (0, 1)$  if and only if  $r \in (r^*(\eta), r^{**}(\eta))$ .

Now we can summarize the results obtained.

Efficient employees choose whether to stay with a firm for the second period or not according to the wage received in the first period. In the equilibrium they choose one of the two strategies:

(A) Active strategy -- to stay with a firm if the wage is high and to leave firm if the wage is low.

(P) Passive strategy -- to stay with the firm in any case.

The choice of efficient employees and the first period choice of opportunistic firms (whether to pay high wage to efficient employees) are determined by the value of unemployment rate and by the parameters of the model. There are three threshold values of unemployment rate  $r_0(\eta)$ ,  $r^*(\eta)$  and  $r^{**}(\eta)$ , determined by (5), (7) and (8). (For the sake of generality we introduce the values  $r^*(\eta)$ ,  $r^{**}(\eta)$  even in case  $K^{**}(\eta) < \delta(1-\lambda)$ .)

Let us now formulate the results obtained for the two settings.

Let  $r_0 = r_0(0)$ ,  $r^* = r^*(0)$ ,  $r^{**} = r^{**}(0)$ .

**Theorem 1: Informal Contracts.**

Consider symmetric equilibria in the game. The equilibrium strategies of the players are the following:

1. Opportunists never pay high wages in the second period.
2. All the firms dismiss inefficient employees at the end of the first period and never dismiss efficient employees.
3. (a) For  $r < \min\{r^*, r_0\}$  employees are active, opportunists fulfill contract terms in the first period.  
 (b) For any  $r$  such that  $\min\{r^*, r_0\} < r < \min\{r^{**}, r_0\}$  three equilibria of different structure exist in the game  
 i. Good equilibrium: employees are active, firms fulfill contract terms in the first period  
 ii. Bad equilibrium: employees are active, opportunistic firms pay low wages in the first period nevertheless  
 iii. Intermediate equilibrium: employees are active, firms choose mixed strategy with the probability to fulfill contract terms in the first period given by (9).  
 (c) For  $\min\{r^{**}, r_0\} < r < r_0$  employees are active but the opportunists fail to fulfill contract terms in the first period.  
 (d) For  $r > r_0(\eta)$  employees are passive and opportunists pay low wages to them.

**Theorem 2: Formal Contracts** Consider symmetric equilibria in the game. The equilibrium strategies of the players are the following:

- a) Let  $\eta > \max\{\eta^*, \eta^{**}\}$ . Then
  1. Opportunists are honest in the first and in the second period.
  2. Firms dismiss inefficient employees after the first period and do not dismiss efficient.
  3. Efficient employees stay with the firms they matched with. No legal procedures initiated.
- b) Let  $\eta < \max\{\eta^*, \eta^{**}\}$ . Then
  1. Opportunists deceive in the second period.
  2. All the firms dismiss inefficient employees at the end of the first period and never dismiss efficient employees.
  3. In the both periods legal procedures initiated by efficient employees in case of low wage if and only if  $\eta > \eta^*$ .
  4. (a) For  $r < \min\{r^*(\eta), r_0(\eta)\}$  employees are active, opportunists fulfill contract terms in the first period.

- (b) For any  $r$  such that  $\min\{r^*(\eta), r_0(\eta)\} < r < \min\{r^{**}(\eta), r_0(\eta)\}$  three equilibria of different structure exist in the game
- i. Good equilibrium: employees are active, firms fulfill contract terms
  - ii. Bad equilibrium: employees are active, opportunistic firms pay low wages nevertheless
  - iii. Intermediate equilibrium: employees are active, firms choose mixed strategy with the probability to fulfill contract terms in the first period given by (9).
- (c) For  $\min\{r^{**}(\eta), r_0(\eta)\} < r < r_0(\eta)$  employees are active but the opportunists fail to fulfill contract terms in the first period.
- (d) For  $r > r_0(\eta)$  employees are passive and opportunists pay low wages to them.

## Comparative statics I

In this section we analyse of the effects made to the equilibria by parameters of the model that are not related with the legal procedure.

We should be interested in dependence of threshold values  $r_0(\eta)$ ,  $r^*(\eta)$ ,  $r^{**}(\eta)$ , from market parameters.

First consider the value of  $r_0(\eta)$ , that determine the switch of employees from active to passive strategy. Note that active strategy of employees could be treated as a kind of market enforcement mechanism for firms to fulfill the contracts (when employees are passive opportunistic firms break the contracts). Active strategy is applicable if unemployment rate is low enough,  $r < r_0(\eta)$ . We should examine the dependence of active zone from market parameters.

From (5) one could see that  $r_0(\eta)$  increases with  $\alpha$  and falls with  $\lambda$ . Thus higher is the proportion of good firms at the market wider is the active zone. However the growth of proportion of competing efficient employees narrows the active zone.

Then,  $r_0(\eta)$  is affected by utility gaps between different states for an employee. One should compare the utility increase when moving from unemployment to low wage and from low wage to high wage. If the gap between high and low wages is wide enough it provides greater incentives for active behavior.

Now let us consider the parameters of opportunistic firms' strategies. There are two threshold values of unemployment rate  $r^*(\eta)$ ,  $r^{**}(\eta)$ . If unemployment is low  $r < r^*(\eta)$ , then firms fulfill the contracts (conditional to activity of the employees). If unemployment is high  $r > r^{**}(\eta)$  then firms break the contracts already in the first period. In the intermediate zone the both cases are possible and the behavior of one firm is positively related with the others'. What parameters determine the threshold values?

One can see from (7), (8), that the both threshold values increase with discount factor of firms  $\delta$ . That is higher is valuation of future profits wider is honest zone.

The both threshold values grow with the proportion of good firms and  $r^*(\eta)$  grows with proportion of opportunists. Thus, one obtains positive externality in firms behavior: more honest firms are at the market higher are the incentives for given firm to be honest.

Then, higher relative productivity of efficient employees (in comparison with inefficient) produce incentives for honesty and vice versa higher relative wages for efficient work are less likely to be paid.

## Comparative statics II

Let us now examine the effects made by the parameters of legal procedure on the equilibria at the model.

Remind that for low values of probability for an employee to win in the Court,  $\eta < \eta^*$ , legal enforcement does not work: employees find it unprofitable to go to the Court. Note that the critical value  $\eta^*$  rises with the rise of procedure costs, that is costly procedure is less likely to be realized.

Suppose  $\eta < \eta^*$  that is employees have enough incentives to go to the Court in case of deception. If moreover  $\eta > \eta^{**}$  then the Court provide punishment strong enough to prevent deception. The value of the punishment

is determined by the probability  $\eta$  to catch the violator the costs  $c$  to be paid and the penalty  $s$ . We have seen that the rise of  $c$  and  $s$  would reduce the threshold  $\eta^{**}$  thus strengthening the incentives for honest behavior. (Remind that the rise of  $c$  has also an opposite effect of frightening away the employees from legal procedure).

Let us now consider the case  $\eta < \max\{\eta^*, \eta^{**}\}$ . In this case legal procedure does not prevent deception but nevertheless has some effect on market equilibria.

The growth of  $\eta$  increases the value of  $K^*$ , and since falls  $r_\theta(\eta)$ . The fall of procedure costs  $c$  has the same effect. Thus an improvement of legal enforcement mechanism narrow the employees' activity zone.

This effect may be interpreted in the following way. Employees' activity is a mechanism alternative to legal enforcement to stimulate honest behavior of firms. These the two mechanisms are *substitutes*. Thus intensification of legal enforcement weaken the "market enforcement mechanism" of the activity.

Now consider the firms. First, one can easily see that  $r^*(\eta)$ ,  $r^{**}(\eta)$  increase with  $\eta$ , that is improving of legal enforcement widens honest zone and narrows deception zone, that is the effect is positive. The rise of penalty value has a positive effect also, whereas the rise of procedure costs have positive effect if it does not prevent employees from going to the Court.

(Note however that these improvements could be irrelevant if active zone is narrow enough).

The condition  $\eta > \max\{\eta^*, \eta^{**}\}$  guarantees the execution of the contract by the firm with no respect to employees' behavior. For this range of values of probability  $\eta$  the legal enforcement mechanism acts as contract guarantee: since the mechanism exists firms execute contract terms, the mechanism in fact is passive.

Thus, conditional on the order of values  $\eta^*$  and  $\eta^{**}$  one of the following pictures take place.

$\eta^{**} < \eta^*$ . Then

$\eta < \eta^*$  **No enforcement case.** Employees do not go to the Court, firms are honest or dishonest according to market incentives.

$\eta > \eta^*$  **Passive enforcement case.** Firms fulfill contract terms because otherwise employee goes to the Court and expected punishment is greater than the gain of contract breach.

$\eta^* < \eta^{**}$  Then

$\eta < \eta^*$  **No enforcement case.**

$\eta^* > \eta^{**}$  **Active enforcement case.** Employees if deceived go to the Court but the expected punishment is not high enough to prevent contract breach of the firm. Thus it is a common case that a firm breaks the contract, employee goes to the Court and possibly gets a compensation.

$\eta > \eta^{**}$  **Passive enforcement case.**

The active enforcement case is the most costly one for the economy. In the model terms social welfare dissipates by penalties paid by firms. In practice the society has to pay for a large number of costly court examinations. As it is shown this case take place for the medium values of enforcement quality, high enough to initiate legal procedure and low enough not to prevent contract breaches.

## Conclusion

In the paper a model of deception in labor market was constructed and analyzed in two different frameworks. We considered the case of informal contract between employee and employer when external enforcement is impossible. We examined the personal enforcement tool -- the possibility for efficient employees to leave firms in case of deception. We've found that in a wide range of consequences this tool may prevent firms

from dishonest behavior and therefore play the same role as the trigger strategy in multi-period prisoners' dilemma models. This result looks attractive since the short-time (two period) model was considered. The dependence of equilibrium structure from market parameters was analyzed in the paper.

Nevertheless, internal enforcement fails to prevent deception in a wide range of consequences. For example, this tool never prevents deception in the second period (that is in the last period before firm's closure).

To go further we introduce a possibility of external enforcement of contracts in the model. We should revise the formulation of labor contracts for this reason. Now we consider formal written contracts that may be contested in the Court. We have shown, that in case of costly and/or imperfect legal procedure deception of employee by employer may occur as well. In fact, if the costs of the procedure are high and the probability to win is not so high then an employee prefers not to go to the Court. Even if the procedure is initiated by the worker the expected punishment may occur low enough to keep incentives to deceive valuable. The latest case was referred to as active enforcement case. It appears for medium values of enforcement power and happens to be extremely inefficient.

If the two mechanisms -- internal and external enforcement -- coexist they appear to be substitutes. That is the existence of legal procedure (even if it doesn't work) weakens the incentives for efficient employees to be active and therefore prevent deception by internal tool.

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