Relational Contracts and the Nature of Market Interactions

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(Econometrica 72(3): 747-780)
Motivation 1

- In many markets obligations of the contracting parties are imprecisely specified.
- Neutral third parties are often unable to verify whether contractual obligations have been met.
- Generates important moral hazard problems.
- How do markets function that are characterized by these moral hazard problems?
Motivation 2

- The employment relation is a key feature of modern firms.
- Most employment relations are open-ended long term relations. They persist until one of the parties quits or is fired.
- Average duration of employment relations is several (5) years.
- How do markets function in which the trading parties are engaged in repeated long-term relations? Which forces shape the terms of trade in these relations?
- Answers to these questions are related.
Main Message of the Paper

- In markets with moral hazard problems the contracting parties tend to form long-term relations and this fundamentally changes the functioning of the market relative to a situation where no moral hazard problem exists.

- The moral hazard problem is solved through appeals to fairness and the establishment of reputation in long-term relations.

- In the presence of a moral hazard problem trades are initiated by private offers and the parties share the gains from trade equally. Low effort (quality) is punished by the termination of the relationship.
• The market resembles a collection of bilateral trading islands rather than a competitive market.

• If the moral hazard problem is absent, rent-sharing and long-term relations are absent, most trades take place in one-shot interactions and the contracting parties are indifferent with regard to their trading partner.

• The Theory of Fairness by Fehr and Schmidt (1999) organizes the experimental data rather well and provides interesting insights into how the moral hazard problem is solved.
• There is a large theoretical literature that suggests that reputation and long-term relations can provide effective solutions to the moral hazard problem.
  
  Klein & Leffler (1981)
  Shapiro & Stiglitz (1984)
  Bowles (1985)
  Bull (1987)
  Hart and Holmström (1987)
  MacLeod & Malcolmson (1989, 1998)
  Baker, Gibbons and Murphy (1994, 2002)
  etc., etc.,

• but there is surprisingly little evidence that this is in fact so.

• Very difficult to test in the field because exogenous variation of the moral hazard problem is difficult to find.
• Theory does not make very precise predictions because often there are a large number of equilibria.

• Important pieces of evidence suggest that long-term relations are important.


  McMillan and Woodruff (1999) report results in line with the importance of long-term relations (e.g. more trade credit for customers with no or little alternatives).

  Banerjee and Duflo (2000) show the importance of reputation in the Indian software industry
Experiment design

First stage

• 10 workers and 7 firms all with an identification number \{F1, \ldots, F7; W1, \ldots, W10\}

• Trades take place in a one-sided continuous auction

• Firms make offers including:
  o a binding wage \( w \in [0, 100] \)
  o a desired effort \( \bar{e} \in [1, 10] \)
  o the firm’s ID
• Two types of offers
  o private offers: offer to a specific worker, unknown to anybody else
  o public offers: known to all participants

Second stage

• Workers who have concluded a contract have to choose $e \in [1, 10]$

Table 1: Cost of effort levels

<table>
<thead>
<tr>
<th>$E$</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>$c(e)$</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>4</td>
<td>6</td>
<td>8</td>
<td>10</td>
<td>12</td>
<td>15</td>
<td>18</td>
</tr>
</tbody>
</table>

• Firms report their expected effort.
Payoffs

i) firms

\[ \pi = \begin{cases} 
10e - w & \text{if contract concluded} \\
0 & \text{if no contract concluded} 
\end{cases} \]

ii) workers

\[ \pi = \begin{cases} 
w - c(e) & \text{if contract concluded} \\
5 & \text{if no contract concluded} 
\end{cases} \]
Treatments

- Incomplete contract treatment with fixed IDs (ICF)
  - ∼ non-binding

- Complete contract treatment (C)
  - ∼ binding

- Incomplete contract treatment with random IDs (ICR)
  - ∼ non-binding

- Total of 15 periods (plus 2 practice periods)
- Total of 14 sessions (238 participants)
- Experiments lasted about 90 minutes
- Average earnings: CHF 62,30 (∼ $42)
Predictions based on Self-Interest

• A1: Money maximizing behavior and rationality are common knowledge.
• A2: Posted contract institution.

• Complete contract treatment (C)
  o Highest effort e = 10
  o \( w = 23 \)
  o Total surplus reaped by the firms

• Incomplete contract treatment (ICF and ICR)
  o Lowest effort e = 1
  o \( w = 5 \)
  o Total surplus reaped by the firms

⇒ Long-run relations have no value and arise only by coincidence, i.e., no systematic difference between treatments.
Predictions based on Social Preferences
(Fehr and Schmidt 1999)

• A1’: There is a fraction of inequity averse workers (60% fair, 40% selfish) who dislike advantageous and disadvantageous inequality.

• Inequity averse workers reciprocate to high wages with high (egalitarian) effort levels → positive correlation between offered wage and chosen effort.

• There is a perfect Bayesian equilibrium in the ICF in which there are seven trades in each period and the same seven workers always trade.

  for t = 1-13: maximum effort and egalitarian wage
  for t = 14: \( e = \bar{e} = 7 \) with the associated egalitarian wage \( (w = 40) \)
  \( (w, \bar{e}) = (32, 6) \) in t = 15 is offered by the selfish firms and \( (w, \bar{e}) = (5, 1) \) by the fair firms.
Intuition

- Incentive for selfish firms to offer rents \([w - c(e) > 5]\) to all workers in the final period (if sufficiently many inequity averse workers exist).

- In \(t=14\) firms can threaten to not renew the contract \(\rightarrow\) selfish workers are disciplined in \(t = 14\) because if they shirk they are “fired”.

- Why do the selfish firms not extract the worker’s period-15 rent by making a “bad” offer in \(t=14\)?

- Note that rent in \(t = 14\) is irrelevant for the worker’s performance in \(t = 14\) as long as the worker believes he gets the rent in \(t = 15\).

- If the worker believes that he will not get the rent in \(t = 15\) (e.g. because he is fired) in case he does not get the fair offer in \(t = 14\), the selfish firm has an incentive to make the fair offer also in \(t = 14\).
Testable Hypotheses

1) To solve effort enforcement in the ICF firms trade repeatedly with the same workers.

2) Therefore, there is a larger share of private offers in the ICF compared to the C and the ICR treatment.

3) Larger share of trades takes place in long-term relations in the ICF compared to C.

4) In the ICF workers who provide low effort are fired.

5) Firing is associated with an income loss and constitutes a punishment.
6) The punishment arises from the fact that firms pay very high (egalitarian) wages in the ICF.
   - higher wages than in C because effort enforcement requires fair sharing
   - higher wages than in ICR because selfish types can be disciplined so that the surplus that can be shared is higher.

7) Average effort in the ICF is higher than in the ICR
In the ICF the majority of private offers are addressed to the firm’s previous employee.

<table>
<thead>
<tr>
<th>Period</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
<th>14</th>
<th>15</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percent</td>
<td>57</td>
<td>38</td>
<td>54</td>
<td>47</td>
<td>68</td>
<td>73</td>
<td>63</td>
<td>73</td>
<td>66</td>
<td>73</td>
<td>79</td>
<td>74</td>
<td>63</td>
<td>69</td>
</tr>
</tbody>
</table>
Cumulative frequency of trades in relationships of different lengths in the C- and the ICF-treatment
Probability of contract renewal as a function of previous effort

![Probability of contract renewal as a function of previous effort](image_url)
### Probability of Contract Renewal in the ICF-treatment

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Standard Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Effort in previous period</td>
<td>0.125**</td>
<td>0.052</td>
</tr>
<tr>
<td>Positive surprise</td>
<td>0.192**</td>
<td>0.077</td>
</tr>
<tr>
<td>Negative surprise</td>
<td>-0.836**</td>
<td>0.381</td>
</tr>
<tr>
<td>Previous length</td>
<td>2.449***</td>
<td>0.653</td>
</tr>
<tr>
<td>constant</td>
<td>-5.045***</td>
<td>1.535</td>
</tr>
</tbody>
</table>

N = 488
LL = -41.93
Waldχ(3) = 11.89
Prob = .000
Pseudo R² = .8747

**Note:** The estimation procedure is a probit regression with robust standard errors (in parentheses). The regression includes dummies to control for session effects. *** indicates significance at the 1-percent level, ** at the 5-percent level and * at the 10-percent level, respectively.
In all periods of the ICF the denial of contract renewal imposed considerable costs on the worker.

### Total rents of trading workers

<table>
<thead>
<tr>
<th>Period</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
<th>14</th>
<th>15</th>
</tr>
</thead>
<tbody>
<tr>
<td>$V_t^e - V_t^u$</td>
<td>102</td>
<td>50</td>
<td>66</td>
<td>113</td>
<td>148</td>
<td>105</td>
<td>139</td>
<td>110</td>
<td>99</td>
<td>95</td>
<td>91</td>
<td>79</td>
<td>71</td>
<td>42</td>
<td>27</td>
</tr>
</tbody>
</table>
Relation between firms’ profits and workers’ rents in the ICR-condition

- Firms’ profits:
  - <=10
  - 11-20
  - 21-30
  - 31-40
  - >40

- Workers’ rents:
  - <=10
  - 11-20
  - 21-30
  - 31-40
  - >40
The evolution of wages over time

![Graph showing the evolution of wages over time with different markers for ICF, C, and ICR.](image-url)
Distribution of the earnings per trade

- ICR
- 1 to 2
- 3 to 5
- 6 to 10
- 11 to 15
- C

Earnings per trade vs. ultimate length of relationship in the ICF.

- Workers (light grey bars)
- Firms (dark grey bars)
Hedonic Pricing: Average rents in the ICF-condition

<table>
<thead>
<tr>
<th>Effort</th>
<th>Rents</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>7.2</td>
</tr>
<tr>
<td>2</td>
<td>3.6</td>
</tr>
<tr>
<td>3</td>
<td>6.9</td>
</tr>
<tr>
<td>4</td>
<td>5.3</td>
</tr>
<tr>
<td>5</td>
<td>4.8</td>
</tr>
<tr>
<td>6</td>
<td>7.2</td>
</tr>
<tr>
<td>7</td>
<td>10</td>
</tr>
<tr>
<td>8</td>
<td>6.7</td>
</tr>
<tr>
<td>9</td>
<td>8.1</td>
</tr>
<tr>
<td>10</td>
<td>40.3</td>
</tr>
</tbody>
</table>
Hedonic Pricing: Average rents in the C-condition

<table>
<thead>
<tr>
<th>Effort</th>
<th>Rent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.2</td>
</tr>
<tr>
<td>2</td>
<td>0.7</td>
</tr>
<tr>
<td>3</td>
<td>2.2</td>
</tr>
<tr>
<td>4</td>
<td>6.5</td>
</tr>
<tr>
<td>5</td>
<td>13.7</td>
</tr>
<tr>
<td>6</td>
<td>16.1</td>
</tr>
<tr>
<td>7</td>
<td>60.6</td>
</tr>
</tbody>
</table>

no obs.
The evolution of average effort over time

![Graph showing the evolution of average effort over time with different conditions labeled as C, ICF, and ICR.](image)
Distribution of effort in the ICF- and the ICR-condition

![Graph showing distribution of effort in ICF and ICR conditions.](image)
**DETERMINANTS OF EFFORT AND TREATMENT DIFFERENCES BETWEEN ICF AND ICR**

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>all periods</td>
<td>all periods</td>
<td>all periods</td>
<td>period 15 only</td>
</tr>
<tr>
<td>ICF-Dummy</td>
<td>5.919***</td>
<td>1.978***</td>
<td>1.332***</td>
<td>.597</td>
</tr>
<tr>
<td></td>
<td>(1.869)</td>
<td>(.577)</td>
<td>(.462)</td>
<td>(1.691)</td>
</tr>
<tr>
<td>Period</td>
<td>.433 (.338)</td>
<td>.319* (.182)</td>
<td>.229 (.158)</td>
<td></td>
</tr>
<tr>
<td>Period$^2$</td>
<td>-.026 (.019)</td>
<td>-.022* (.011)</td>
<td>-.018* (.010)</td>
<td></td>
</tr>
<tr>
<td>Wage</td>
<td>.215***</td>
<td>.203***</td>
<td>.256***</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(.011)</td>
<td>(.009)</td>
<td>(.033)</td>
<td></td>
</tr>
<tr>
<td>Private offer</td>
<td>.598***</td>
<td>1.548**</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(.199)</td>
<td>(.702)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Private offer</td>
<td>.829**</td>
<td>-1.124</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$\times$ ICF-Dummy</td>
<td>(.362)</td>
<td>(1.559)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>.515 (1.610)</td>
<td>-3.737***</td>
<td>-3.192***</td>
<td>-6.516***</td>
</tr>
<tr>
<td></td>
<td>(.892)</td>
<td>(.737)</td>
<td>(1.197)</td>
<td></td>
</tr>
</tbody>
</table>

N = 940  Wald$\chi(3) = 12.22$  Wald$\chi(4) = 927.68$
N = 940  Wald$\chi(6) = 823.07$
N = 62   Wald$\chi(4) = 140.29$
Prob = .007  Prob = .000  Prob = .000  Prob = .000

*The estimation procedure is a censored regression with robust standard errors adjusted for clustering on sessions (in parentheses). *** indicates significance on the 1-percent level, ** on the 5-percent level and * on the 10-percent level, respectively.

Ernst Fehr – Experimental & Behavioral Economics
High wages and effort initiate successful relationships

Ernst Fehr – Experimental & Behavioral Economics
Conclusions

1) Reputation formation in endogenous bilateral long-term relations constitutes a powerful solution for the problem of effort (quality) enforcement.

2) Effort enforcement is based on the firing (punishment) of shirkers and on the payment of fair wages that share the available cake equally.

3) Markets with an effort enforcement problem function in a fundamentally different manner compared to markets without the enforcement problem.

4) When there is an enforcement problem:
   - markets resemble bilateral trading islands rather than competitive markets.
   - firms voluntarily restrain the set of trading partners by making private offers to the previous employee.
   - rent-sharing and long-term relations prevail.
<table>
<thead>
<tr>
<th>Third Party Enforcement</th>
<th>No Third Party Enforcement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public offers more profitable</td>
<td>Private offers more profitable</td>
</tr>
<tr>
<td>Firms do not care about the worker’s identity</td>
<td>Offers go to the previous worker in case of satisfactory effort</td>
</tr>
<tr>
<td>One-shot interactions</td>
<td>Long-term interactions with performing workers</td>
</tr>
<tr>
<td>Firms use excess supply to appropriate the surplus</td>
<td>Firms use excess supply to enforce high effort</td>
</tr>
<tr>
<td>Wages converge to competitive level</td>
<td>Wages embody a sizeable rent</td>
</tr>
<tr>
<td>Higher effort is just compensated</td>
<td>Higher effort associated with higher rents</td>
</tr>
</tbody>
</table>