Trust and Moral Hazard: An Analysis of the Motorcycle-taxi Market in Togo and Benin∗

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Abstract

In the motorcycle taxi market in Sub-Saharan Africa, the relation between the owners and the drivers is characterized by a principal agent problem with the following features: (i) the principal cannot observe the final output of the agent and therefore cannot condition his wage on it. (ii) Higher effort from the agent depreciates the asset. These two features (i) and (ii) imply that the principal ideally wants the agent to exert as little effort as possible, while still leasing the asset from him. The problem with low effort implementation is that the asset will not generate enough revenue. I analyze the contractual arrangements between the owners and the drivers in this market and use survey data to address the determinant of the contracts and their implications. I show that the quest for trust between the principal and the agent can lead to the choice of a socially sub-optimal contract because of moral hazard problems.

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1 Introduction

In the standard moral hazard problem, it is often assumed that the output is observed and thus the compensation scheme relies directly on the observed output or an observable that correlate with the output. However, in many marketplace contracts in developing countries, this mechanism is not applicable. In particular, in the market of motorcycle taxi in Sub-Saharan countries, both the output and the effort are not observed. Yet, two type of contract coexist, one is a lease with a promise of transfer of ownership and the other being a simple lease arrangement. The *Lease with Ownership (LO henceforth)* basically consist of reselling the motorcycle to the rider at a price on average twice its original value. They then agree on a weekly minimum payment. The rider becomes the owner only when she finishes paying the entire amount initially agreed upon. With the *Simple Lease (L henceforth)* a daily fixed amount is agreed upon and the rider has to pay that amount everyday whether he makes more or less than that amount.

The difference between these two contracts is the central issue of ownership and the implications it has on both parties in the contract. The question of asset ownership in the economy is an important issue in industrial organization. Grossman and hart (1986) defined ownership as the monopole over residuals right that are not specified in a contract and argued that the distribution of those rights have efficiencies implications on the firm. Inefficiencies stem from the impact that ownership has on the incentives of the contracting parties. For instance, in the principal agent model context, a partial or total transfer of ownership to the agent solves partly the moral hazard problem. Conversely, in the environment where there is a lower moral hazard problem, one should observe more ownership to the principal. This is exactly one of the result by Baker and Hubbard (2003) regarding asset ownership in a trucking company. Among other things, they found that the adoption of a new class of on-board computer have significantly changed the patterns in the ownership of trucks.

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1 The lack of alternative capital market account for the existence of such high interest rate.
2 The gent could still pay daily if he would like to.
In this work I derive the theoretical implications of this particular setting and then I find that the two contract are not equivalent in term of the induced incentives and the output. Therefore I ask the following question: What determined the choice of one contract or the other? What are the outcomes of one contract compares to the other? These are the main questions I seek to answer empirically in the context of motorcycle taxi activity widely present in Sub-Saharan Africa.

I conjecture that trust play a key role in the choice of the contract and conduct an empirical investigation. The conjecture is supported by the observations in Table 2 which suggest that there could be an implicit element of trust between the contracting parties that plays an important role in the choice of one contract or the other.

It is important at this point to define what I mean by trust. To say that agent A trusts agent B is to say that A confidently believes that B will behave "appropriately" or that B will not cheat. Therefore, if founded and reciprocal, trust makes cooperation more likely between two people. For instance, trust will allow longer cooperation in a repeated prisoner dilemma or in settings where the agents interact repeatedly. This view of trust stresses the fact that the belief on the trusted is rational. As mentioned by Hardin(2004) in his view of trust as encapsulated interests relation, "I trust you because I believe it will be of your interest to be trustworthy". However, trust does not necessary have to involve a repeated interaction nor does it need to be founded. Experimental economists suggest that even in a situation of a one shot interaction, agents may cooperate as a result of believing that others will behave in a certain decent or fair manner (Camerer and Thaler, 1995). I do not adopt a rational view of trust nor see trust as encapsulated interest, rather, here I see trust as merely taking a risk due to the inability or impossibility to prevent the trusted from taking an inappropriate action. For Diego Gambetta (1988, 218-19) "For trust to be relevant, there must be a possibility of exit, betrayal, defection" . Therefore, trust involves situations where agents give up or are expected to choose to give up some opportunistic options.

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3I will get back to this point in the data description section. Previous research have shown these variable to be highly predictive of trust and trustworthiness.
In this paper, I show that LO dominate L in terms of revenues for the owner. It create the right incentives for safer driving, thus protecting both the drivers, the passengers and the public at large. In that sense, LO is socially ‘optimal’ at least more desirable than L. However, when the owners trust the driver, they are compelled to choose L which indeed appear more attractive to owners. The empirical evidence suggest that drivers responds more to their economic incentives that the expectation than stems from trust. In a closely related work from the New York City taxi market, Schneider (2010) showed that moral hazard account to a great extend for the accidents, driving violations, inspection failure. In a follow paper Jackson and Schneider (2011) found that drivers leasing from a member of their community of birth exhibit reduced moral hazard problem. They show that the effect operate through social sanctions. In the context of developing countries where monitoring technology is inaccessible or inexistnet, the judicial system is weak, and drivers are poor and credit constraint, I find that trust does not overcome the moral hazard problem.

2 The Context

The motorcycle taxi (informally known as ”Zemindjans” or ”Zems” for short) activity started in Benin in the early 90’s and kept growing ever since to constitute today an important economic sector, not only in Benin, but also in Togo, and many other African countries. The main reasons this system of transportation has been adopted and popularized, are that it was much cheaper than the existing traditional taxi fares. It also was, in most cases, more convenient, in the sense that it takes people to their front door while traditional taxis usually move from one station to another, and drop people on the roadside upon request. Finally, it is faster during rush hours since it allows to take shortcuts where a traditional taxi couldn’t pass, it can move forward by dodging in and out of cars on the street when circulation is congested. This market is similar to the NYC taxi cabs market. However, a

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4Zemidjan stands for ”Take me there fast” in the Fon Language, a language widely spoken in southern Benin.

notable difference is that it remains an informal market. There is no meter to record the earnings, many motorcycles are not ensured, there is no regulation for the entries and exits, and most contract are not signed with the formal authority.

Albeit informal, this activity has become a large part of the economy in many countries. In 2009 in Togo, this market accounted for nearly $0.4 billion worth of services, which is a significant contribution to an economy of about six billions US dollars.\textsuperscript{6}

By the time this study is being done, a typical motorcycle costs about $750, and drivers have reported to make on average more than $10 a day (Owner’s payment included). with fares starting at 20 cents and increase with the distance. The prices of new motorcycles have been decreasing over the years. The motorcycles are operated by young men on average in their late twenties. Many of them have another qualification in diverse sectors such as construction, accounting, etc. When asked why they are not working in their primary sector of choice, the typical answer translate literally as "There are no jobs" in their primary profession.

This sector has given rise to moral hazard problems. Those who own the motorcycles usually are not the drivers themselves. However, the drivers enter in a bilateral contract with the owners. Therefore, as in the case of workers in a firm, moral hazard problems emerge. The reason is that, there is practically no way the owner can observe or precisely predict the behavior of the agent. In general, In a standard moral hazard problem, the principal observes the output and base the compensation on it. Here, the principal cannot observe the output.

3 A Theoretical Framework

A principal (she) invests $K > 0$ to buy a business (or an asset) and hires an agent (he) to operate the business for two periods. Since the owners are often much less credit constrained, it is reasonable to assume that the principal is risk neutral. The principal choose the contract

\textsuperscript{6}Estimates based on information from the Zems’ Union in Togo and the reported daily revenue by drivers
and the agent accepts or declines. The principal cannot observe the effort of the agent. In addition, contrary to the standard moral hazard problem, the principal cannot observe the output either, and therefore, cannot condition the agent’s payment on it. However, it is known that higher effort increases the current output but it accelerates the deterioration or depreciation of the capital. The agent derives utility from consumption, $c$, and disutility from effort supplied, $e$, and his utility is characterized by:

$$u(c, e)$$

(1)

where $u$ is increasing in consumption ($c$), decreasing and convex in effort ($e$).

Let $e_h$ denote high effort, $e_l$ low effort ($e_h > e_l$), $R_h$ the higher revenue, and $R_l$ the lower revenue ($R_h > R_l$). If the agent supplies high effort (respectively low effort), he earns higher revenue with a probability $p_h > \frac{1}{2}$ (respectively $p_l < \frac{1}{2}$), and thus she earns the lower revenue with a probability of $1 - p_h$ (respectively $1 - p_l$). If the agent supplies effort $e_h$ (respectively $e_l$), there is a probability $\mu(e_h) > \frac{1}{2}$ (respectively $\mu(e_l) < \frac{1}{2}$) that the asset will vanish in that period. This can be thought of as the agent having an accident that damages the motorcycle. The agent has a per period outside value of $u$. The agent is credit constrained and cannot borrow or transfer consumption between the two periods. A key feature of this market is that the agent has a full discretion about the revenue earned and he has the incentives not to disclose the revenue truthfully. Therefore, the contract between the principal and the agent must have a form of lease. Let $r_1$ and $r_2$ be the rental price paid to the principal in the first period and in the second period respectively. The following lemma will help simplify the strategy sets by removing the agent’s dominated strategies.

**Lemma 1** It is not optimal for the agent to choose $e_h$ in the first period and $e_l$ in the second period or vice versa.

From Lemma 1, the strategy set of the agent is reduced by removing the dominated strategies and the resulting normal form of the game between the agent and the principal is
represented in the table below:

<table>
<thead>
<tr>
<th></th>
<th>$L$</th>
<th>$LO$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$(L, e_h)$</td>
<td>$u(c_{L,1}(e_h), e_h) + u(c_{L,2}(e_h), e_h); r_1 + (1 - \mu(e_h))(r_2 + (1 - \mu(e_h))K)$</td>
<td>$(0; 0)$</td>
</tr>
<tr>
<td>$(L, e_l)$</td>
<td>$u(c_{L,1}(e_l), e_l) + u(c_{L,2}(e_l), e_l); r_1 + (1 - \mu(e_l))(r_2 + (1 - \mu(e_l))K)$</td>
<td>$(0; 0)$</td>
</tr>
<tr>
<td>$(LO, e_h)$</td>
<td>$(0; 0)$</td>
<td>$u(c_{LO,1}(e_h), e_h) + (1 - \mu(e_h))u(c_{LO,2}(e_h), e_h) + \mu(e_h)u; r_1 + r_2$</td>
</tr>
<tr>
<td>$(LO, e_l)$</td>
<td>$(0; 0)$</td>
<td>$u(c_{LO,1}(e_l), e_l) + \mu(e_h)u(c_{LO,2}(e_l), e_l) + (1 - \mu(e_h))u; r_1 + r_2$</td>
</tr>
</tbody>
</table>

where:

\[
c_{L,t}(e_j) = p_j(R_j - r_t) + (1 - p_j)(R_{-j} - r_t)
\]

\[
c_{LO,1}(e_j) = p_j(R_j - r_1) + (1 - p_j)(R_{-j} - r_1)
\]

\[
c_{LO,2}(e_j) = p_j(R_j - r_2) + (1 - p_j) \times (R_{-j} - r_2) + (1 - \mu(e_j))K.
\]

Let $u(c_{it}(e_j), e_j)$ be the utility from the expected consumption ($c_{it}$) of the agent under contract $i = L, LO$ in period $t = 1, 2$, if the agent supplies effort $e_j (j = h, l)$. Assume that the utility function is concave in effort, that is, $c'(e)u_1(c, e) + u_2(c, e)$ is decreasing. Intuitively, as the effort increases, the agent gains less and less from the additional effort. The depreciation of the asset due to higher effort will eventually outweigh the gain. Now it is easy to see that, if the residual rights are in the hands of the agent ($L$), then the optimal effort is when these two opposing forces neutralize each other. However, if the owner keeps the residual rights ($LO$), then the agent will find it optimal to choose higher effort even though the loss incurred by the principal outweighs the gain for the agent. The problem with $L$ for the principal is that the agent does not internalize the loss of the asset’s depreciation.
Proposition 1 Let $\pi$ be the total expected revenue of the principal. In the optimal contract, $r_1$ and $r_2$ are unspecified ex-ante and $\pi = r_1 + r_2$.

This proposition is a direct result from two simple factors combined: First, given that the principal is risk neutral, the average gain is what matters to him and the variation in the payments from one period to the next does not. However, the agent is risk averse and strictly prefers the flexibility in the payment for consumption smoothing motive.

Let $n$ be such that $r_2 = \frac{K}{n}$, where $n$ is the number of periods required for the principal to recover the initial investment. Then we have the following result:

Proposition 2 If $\mu(e_h)$ is sufficiently high, and specifically if $\mu(e_h) > \frac{1}{2n}(2n + 1 - \sqrt{4n + 1})$, then the principal strictly prefers LO.

In this particular two period model, it is reasonable to assume that $n$ is bounded above by 2, which means that the principal expect to receive at least an amount equals to the initial investment $K$. This particular bound translates into $\mu(e_h) \in (\frac{1}{2}, 1]$. The previous two proposition are now combined in the following proposition to characterize the optimal contract:

Proposition 3 The optimal contract has the following characteristics: The agent chooses $e_h$ under $L$ and $e_l$ under $LO$. The principal chooses $LO$.

The central question of this paper is to explain the high prevalence of $L$ in the data whereas in theory one should observe only $LO$. I argue and show evidence that, trust between the agent and the principal plays a key role in explaining this choice.

3.1 The role of trust

In an extension of the previous analysis, assume that there are two types of agent in the economy who are characterized by their trustworthiness to the principal. An agent is trustworthly with probability $\lambda(X_A, X_P, \varepsilon) \in [0, 1]$ where $X_A$ and $X_P$ are respectively observable
characteristics\(^7\) about the agent and the principal and \(\varepsilon\) is a random noise distributed according to the cdf \(G\). The idea is that observables about the agent and the principal will allow the principal to predict the trustworthiness of the agent with some noise. The trustworthy agent cares to some degree about the principal’s welfare, whereas the untrustworthy agent cares strictly about her own payoff only. The trustworthy agent behave optimally as well as the untrustworthy, however, she has a higher cost of effort. The intuition behind this setup goes as it follows: Being trustworthy is a choice that correspond to putting a constraint on one’s behavior. Given that constraint, the individual remain rational. Here, I choose the constraint such a way that it will make trustworthiness inherent to the individual’s behavior. This translate into a higher cost of effort for the agent in this particular setting. The per period utility of the agent who supplied effort \(e\) and earned \(\theta\) is given by:

\[
u_i(\theta, e) = v(\theta, e) - c_i(e) = \theta e - \frac{1}{2} \gamma e^2
\]

\[
\gamma = 1 \text{ if the agent is trustworthy}
\]

\[
\gamma > 1 \text{ if the agent is not trustworthy}
\]

where \(\theta\) is drawn from a common distribution with CDF \(F_e(.)\) over \([0, B]\), \(e \in [0, +\infty)\), and \(i = T(\text{trustworthy}), U(\text{untrustworthy})\).

It is important to note two points before I proceed: (i) The utility functions in (1) should be thought of as the revenue generated. The principal knows these preferences given the type of the agent. (ii) Throughout the analysis, I ruled out the set of contracts where the principal must link compensation to output in any way\(^8\). The set of contracts choice is limited to a lease with unconditional fixed payments (\(L\)) or a lease with transfer of ownership (\(LO\)). The

\(^7\)One could think of \(\lambda(X_A, X_P, \varepsilon)\) as \(\text{Prob}(\pi_1 X_A + \pi_2 X_P + \varepsilon > 0)\) where \(\varepsilon \rightarrow N(0, 1)\).

\(^8\)For instance a mechanism might required the agent to disclose the output and then have his compensation based on his report. There is no interest in such mechanism in this analysis.
heart of the analysis will then be the question of transfer of ownership.

If the principal chooses to lease, then he receives \( r \) today, the rent, and the values of the present value of the depreciated. That is:

\[
r + \beta \mu(e^*)K
\]

If the principal chooses to lease with a transfer of ownership instead (LO), then the agent commits to pay \( r_1 \) in the first period and \( r_2 \) in the second period and earn ownership thereafter. The principal then receives

\[
r_1 + \beta r_2 > K
\]

Now, let’s look first at the agent’s choice of effort given the contract and then, we will look at the principal’s choice of contract given the best response function of the agent.

### 3.1.1 Agent’s choice

**Under L**

The agent’s decision is to maximize her ex-ante expected utility given the contract. Under the lease (L) contract, the optimal effort level is given by:

\[
\max_{e \in \mathbb{R}^+} E_\theta(u_i(\theta, e) - r), \quad i = T, U
\]

\[
\Rightarrow e^L_T = \frac{\bar{\theta}}{\gamma}, \quad e^L_U = \bar{\theta}
\]

where \( \bar{\theta} \) is the mean of the revenue distribution \( F_e(.). \)

**Under LO**

Under the lease with transfer of ownership (LO), the agent’s problem becomes:
\[
\max_{e \in K_+} E_\theta(u_i(\theta, e) + \beta K \mu(e)) - r_1 - \beta r_2, \ i = T, U
\] (5)

Given the structure of the setup, there is a unique interior solution for the optimal effort supplied. The following two equations respectively solves for the optimal effort for agent \(T\) and agent \(U\).

\[
\bar{\theta} - \gamma e_T^{LO} + \beta K \mu'(e_T^{LO}) = 0 \quad \text{and}
\]
\[
\bar{\theta} - e_U^{LO} + \beta K \mu'(e_U^{LO}) = 0
\] (6)

Proposition 4  
(i) Under the lease contract \((L)\), the trustworthy agent always supplies lower effort than the untrustworthy agent, that is: \(e_T^L < e_U^L\).

(ii) Under the lease with transfer of ownership \((LO);\) the relative level of effort between \(T\) and \(U\) is ambiguous.

(ii) Given the type of the agent, the effort supplied is higher under \(L\) than under \(LO\), that is: \(e_T^{LO} < e_T^L\) and \(e_U^{LO} < e_U^L\).

In (i), under \((L)\), agent’s effort affects adversely the principal’s payoff, this in turn makes the trustworthy agent to optimally supply less effort. However, when the effort does not affect the principal’s payoff, that is under \((LO)\), then trust plays no role in the behavior of the agent. The second part of the proposition is an important result which means that both types of agents respond correctly to the incentives induced by the contracts.

3.1.2 The principal’s choice

Assume that the principal is uncertain about the trustworthiness of the agent. He must now compare the expected value of the lease \((L)\) with the return from the lease with transfer of ownership \((LO)\). That is, he chooses to lease if:
\[ E_e \left( r + \beta \mu(e^L)K \right) > r_1 + \beta r_2 \]

Which can be readily arranged to

\[
\left\{ r + \beta \mu(e^L)K \right\} + \beta K \lambda(X_A, X_P, \varepsilon) \left[ \mu(e^L_T) - \mu(e^L_U) \right] > r_1 + \beta r_2 \tag{7}
\]

where \( \lambda(X_A, X_P, \varepsilon) = \int \lambda(X_A, X_P, \varepsilon)dG(\varepsilon) \)

The first expression in the LHS \((I)\) is the return when the lease is given to an untrustworthy agent who takes only economics incentives into account, the second term \((II)\) is the 'return to trust', which is the expected gain to the principal for assuming that a given agent is trustworthy. The probability of choosing to lease is also the probability that inequality \((7)\) is satisfied. Using \((7)\) and \((4)\) let define

\[
G(X_A, X_P, K) \equiv r + \beta f(\theta)K + \beta K \lambda(X_A, X_P, \varepsilon) \left[ \mu(\frac{\theta}{\gamma}) - \mu(\bar{\theta}) \right] - (r_1 + \beta r_2).
\]

we then have

\[
Prob(Lease) = Prob(G(X_A, X_P, K) > 0) \tag{8}
\]

which implies the following result:

**Proposition 5** The probability of choosing the "Lease" \((L)\) is an increasing function of

\^9\text{Note that}

\[
Prob(e = e^L_T) = Prob(Agent is trustworthy) = \int \lambda(X_A, X_P, \varepsilon)dG(\varepsilon)
\]

it follows that

\[
E_e \left( r + \beta \mu(e^L)K \right) = (r + \beta \mu(e^L_T)K) \int \lambda(X_A, X_P, \varepsilon)dG(\varepsilon) + (1 - \lambda(X_A, X_P, \varepsilon)dG(\varepsilon))
\]
\( \lambda(X_A, X_P, \varepsilon) \), the level of trust between the agent and the principal.

4 Implications and empirical analysis

Theoretical Implications

The main result of this theoretical analysis is then that trust can explain the deviation from the optimal contract that is observed in the data. Trust is often modeled in a way that amounts to the rationalist view of trust. This can be done here by making the agent internalize the loss of the principal due to higher effort under \( L \). However, as I argued earlier, trust does not have to be grounded on rational beliefs. This view leaves trust as an essentially empirical question. The choice of by the principal \( L \) is grounded on the belief that the agent will choose lower effort. Since the principal cannot verify the effort of the agent, then there is a possibility of betrayal by the agent. Whether this belief by the principal is fulfilled or not is an empirical question that I address in this paper.

Hypothesis

There are two key hypothesis to be tested: the first hypothesis is that trust positively and significantly related to the likelihood of the choice of \( L \). The second hypothesis is that one should observe higher effort, accidents, speeding under \( L \). The second hypothesis aims answer to the question as of whether it pays to trust. Do the agents under \( L \) respond more to the trust put in them or do they respond more the induced economic incentives of the contract.

4.1 Data

The data used in this paper were collected first in summer 2006 in Lome, Togo by a group of college students at the University of Lome. The data were expanded during the summer of 2009 by second round of data collection in southern Benin. Students at the University of Abomey Calavi in Benin conducted this second survey.
The most challenging part of the empirical analysis is the measure of the main independent variable, Trust. One way of measuring trust is to conduct a survey, asking people directly about their past trusting behavior and whether they trust others. The first predicts whether they are trusting and the latter if they are trustworthy\(^{10}\). Since I am interested in the trustworthiness of the drivers, I asked the following question drawn from the GSS\(^{11}\) questions: “Generally speaking, would you say that most people can be trusted or that you can’t be too careful in dealing with people?” But this method may suffer some problems of interpretation as the concept is very subjective. This problem is exacerbated by the fact that the interviews were often conducted in the local languages. Therefore, I do not rely on this variable.

Alternatively, one can ask questions about variables that previous studies have shown to be indicative of level of trust between two people. Both experimental and survey studies by Glaeser et al. (2000) suggest that trust and trustworthiness increase as the individuals have closer ties and, decrease when they are from different nationality, race, ethnic group or family. I surveyed the drivers mainly on three sets of questions: The first is our dependent variable, which is the type of contract. The second set of variables helps predict the level of trust between the two parties. Those variables are for instance the time since they have known each other, whether the driver has worked for/with the owner before utilizing his motorcycle, whether they have family/ethnic/community ties, etc. Finally, variables such as speed, length of daily breaks, daily revenues, etc. are used to characterize behavior per type of contracts\(^{12}\). The survey was conducted from July 15 to July 19 in Lome, the capital city of Togo and Cotonou, the capital city of Benin. Further details on the survey are available upon request.

\(^{10}\)See Glaeser et al.(2000) for more details.
\(^{11}\)General Social Survey
\(^{12}\)I have also collected many control variables as well. Those are variables such as the age, education, marital status, Number of motorcycles that the owner has, etc.

The complete survey questions and data set are available upon request.
4.2 Empirical framework

I model the probability of choosing $L$ in a standard Probit specification where our main independent variable is trust related variables. I create a score variable for trust which I will describe next. As in the standard probit model, it is assumed that the choice of the contract is determined by an unobserved or latent variable $h^*$ which modeled as:

$$h^* = \beta_0 + \beta_1 Trust + \delta_1 X_{i,A} + \delta_1 X_{i,P} + \varepsilon_i$$

where $\varepsilon_i \sim i.i.d \Rightarrow N(0, 1)$

$X_{i,A}$ and $X_{i,P}$ are observable covariates on the agent respectively on the principal such as education level, age, other source of revenues, the price of the asset etc. The econometrician observes only the type of the contract, which is presumably determined by the value of the latent variable according to the following equation:

$$Prob(L) = Prob(h^* \geq 0)$$

$$= Prob(\varepsilon_i \geq 0)$$

$$= \Phi(\beta_0 + \beta_1 Trust + \delta_1 X_{i,A} + \delta_1 X_{i,P})$$

where $\Phi$ is the CDF of the standard normal distribution,

$$Trust = f(X_{iAP})$$

and $f(.)$ is the principal component analysis that creates a score of trust based on a number variable ($X_{iAP}$) determinant of trust. Those variables include the parental, ethnic, and professional relation between the agent and the principal. The higher the score, the
more trusting is the relation between the owner and the driver.

4.3 Results and Discussions

Before I look at the probit estimates, let’s look first, at some basic statistical indicators, in Table 2, that affect the choice of contract through trust. A test of comparison of mean is conducted between the two contracts. Table 2 hints clearly results which are consistent with our predictions. Having known each other for a longer time, having had previous professional relationship, or being from the same ethnic group tend to favor significantly the choice of $L$. Remember that $L$, as argued before, is more likely to be chosen where there is higher trust between the parties. Three quarters of the $L$ contracts did not involve a collateral whereas about half of the LO contract did not. More than half (58%) of the contract $L$ are agreed under non-formal setting (no collateral, no formal representative), whereas only 34% do the same thing under LO. This observation would suggest that, in absence of trust, people tends to sign formal contracts and rely more on legal and formal institutions. Note however that, the sociodemographic characteristics not linked to trust, the two groups are relatively balanced. For example, Figures 3, 4, and 5 show respectively the age, tenure, and education of the drivers across contract and there is no systematic difference across contract.

The probit estimates in Table 3 support the main argument that trust plays an important role when it comes to choosing a contract. After controlling for the variables such as the owner’s education, the number of motorcycles owned and other variables, the composite variable ”trust” has a persistently significant, and positive effect on the choice of $L$. The more educated is the owner, the less likely he is to choose the inefficient contract $L$. However, the owner’s education becomes insignificant as more controls enter into the specification.

In Table 4, trust is defined as dummy variable that take the value one if the owner and the driver share the same ethnic group or if they are from the same family. This alternative proxy for trust serves as a robustness check to show that the results are not sensitive to the measure of trust. With this alternative definition of trust, the results have remained
robust. This result does not imply that ‘trust’ is the only explanatory variable for the choice of contract, nor does it rule out all the other explanatory variables. However the aim is to show that trust play a key role and that the mechanism is likely through trust. An alternative mechanism could be the heterogeneity among owner with respect to monitoring. This would be true, for example, if certain owners, namely those using $L$, manage to monitor the agents whereas others cannot. However this is unlikely to be the case because no Zem bears a meter or other devices to measure effort or other outcomes.

So, why should we care about the existence of $L$? If the outcomes of the two contracts were equivalent in term of the drivers behavior and risk taking on the road, then it should not matter for policy makers which contract is chosen. However, the evidence indicates otherwise. Evidence show that drivers have the worse behavior under $L$. That is, the incentive implied by their contract dominate the response to trust. One can see this by simply looking at the basic statistics from the data as shown in Table 5. On average, drivers drive faster under $L$ than those under $LO$. They take less breaks (77% under $L$ versus 86% under $LO$). There is 6% more accidents and mishaps under $L$, but the difference is not statistically significant. The drivers reported their earning the day before the interview and the average is about $14 under $L$ and $11 under $LO$. There is also a noticeable difference in the distribution of the revenue per contract. Figures 1 and 2 show the distribution reported daily revenues between the two contract. It shown that distribution under $L$ is shifted to the right relative to the distribution under $LO$. This suggest that the behaviors of drivers under $L$ is more aggressive. The drivers under $L$ reported to have had on average 2.40 owners in the past whereas the drivers under $LO$ have reported on average 1.70. The difference is statistically significant and suggests that $L$ is less stable. Maybe over time, the owner learns about the moral hazard associated with trust.

The key variables in Table 5 are combined to construct a composite variable capturing the behavior of the drivers. The resulting variable is used to assess its association with the

\[13\] A similar work on NYC taxicabs found that drivers under lease have the worse outcome (Schneider 2007)
type of contract and the measure of trust. Table 6, reports the estimates of the impact of the contract type on the behavior of the driver. The contract type is found to have a significant effect on the behavior of the driver, even when controlling for the measure of trust. This indicates a significant difference in behavior per contract type. However, trust does not seem to affect significantly the ex-post behavior of the driver. The evidence suggests that excessive effort is being supplied by $L$ drivers. People under $L$ are trying to make the most of the day and do not care too much about the maintenance of the motorcycle. The incentives induced by the contract override the trusting relation.

5 Conclusion

In the market of motorcycle taxis in Sub-Saharan Africa, a seemingly suboptimal contract coexists with the optimal contract between owners and drivers. Our analysis in this paper shows that the contract is actually suboptimal and that trust plays a significant role in the choice of that contract. I have first developed a simple moral hazard model that accounts for trust and the main implication is that the higher the trust level between the contracting parties, the higher the probability of choosing the suboptimal contract. I have then constructed a measure of trust based on proxy variables from survey data, and found it to have a positive significant effect on the choice of the inefficient contract. The data suggests that drivers under this contract are subject to the daily shocks and hence behave more aggressively. Their behavior is not only a threat to the public safety, but it also reduces the future earnings of the owner through the deterioration of the motorcycle.

In this work, trust seems then to be the main source of inefficiencies. However, the large literature on trust tend to support that trust is good for economic activities both at micro level and macro level\textsuperscript{14} Fukuyama (1995), La Ports et. al.(1997). In this work however, trust tends to make contracts further incomplete than they would have been otherwise and the problems of time inconsistency tends to be ignored in presence of trust. These are the main

\textsuperscript{14}For a criticism of this view, see Roberts Solow’s 1995 article in the New Republic
sources through which trust creates inefficiencies.

References


Trust and Moral Hazard


## Tables

Table 2: Key characteristics per contract

<table>
<thead>
<tr>
<th></th>
<th>$L$</th>
<th>$LO$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time both parties have know each other (Month)</td>
<td>81.48***</td>
<td>47.17</td>
</tr>
<tr>
<td>Had Past Professional relation = 1</td>
<td>0.46***</td>
<td>0.18</td>
</tr>
<tr>
<td>Same ethnic group = 1</td>
<td>0.63***</td>
<td>0.48</td>
</tr>
<tr>
<td>Age of the driver</td>
<td>28.11</td>
<td>28.84</td>
</tr>
<tr>
<td>Formal Contract = 1</td>
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</tr>
<tr>
<td>Collateral = 1</td>
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<td>0.43***</td>
</tr>
<tr>
<td>Price of the Motorcycle</td>
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<td>432**</td>
</tr>
<tr>
<td>Weekly Payment</td>
<td>11.50*</td>
<td>11</td>
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<tr>
<td>Total Payment (Before transfer of ownership)</td>
<td>No limit</td>
<td>687</td>
</tr>
<tr>
<td>Observations</td>
<td>159</td>
<td>260</td>
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</table>

Standard errors in parenthesis. Test of comparison of means: ***, **, * means that the difference is statistically significant at the 1% level, respectively 5%, and 10%
Table 3: Probit estimates. Dependent variable is the contract.

<table>
<thead>
<tr>
<th></th>
<th>I</th>
<th>II</th>
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<th>V</th>
<th>VI</th>
<th>VII</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trust</td>
<td>0.30***</td>
<td>0.36***</td>
<td>0.35***</td>
<td>0.27***</td>
<td>0.27***</td>
<td>0.31***</td>
<td>0.24**</td>
</tr>
<tr>
<td></td>
<td>(0.07)</td>
<td>(0.08)</td>
<td>(0.08)</td>
<td>(0.09)</td>
<td>(0.09)</td>
<td>0.09</td>
<td>0.10</td>
</tr>
<tr>
<td>Owner's education</td>
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<td>-0.06**</td>
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<td>-0.04</td>
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<td></td>
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<td>(0.03)</td>
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<td>0.04</td>
</tr>
<tr>
<td>Owner's Number of motorcycles</td>
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<td>-0.18***</td>
<td>-0.13**</td>
<td>-0.13**</td>
<td>-0.13**</td>
<td>-0.14**</td>
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<tr>
<td></td>
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<td>(0.05)</td>
<td>(0.05)</td>
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<tr>
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<td>0.001*</td>
<td>0.001**</td>
<td>-0.001**</td>
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<td>0.0001</td>
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<td>0.0001</td>
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<tr>
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</tr>
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<td>Year Dummy</td>
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<td>-</td>
<td>-</td>
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<tr>
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<td>0.22***</td>
<td>0.56*</td>
<td>0.82*</td>
<td>1.67**</td>
<td>1.70**</td>
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<td></td>
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<td>(0.14)</td>
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<td>(0.45)</td>
<td>(0.67)</td>
<td>(0.71)</td>
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<tr>
<td>Pseudo R2</td>
<td>0.04</td>
<td>0.07</td>
<td>0.11</td>
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<td>0.11</td>
<td>0.18</td>
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<td>Obs</td>
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<td>300</td>
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<td>215</td>
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</table>

***, **, * means that the difference is statistically significant a the 1% level, respectively 5%, and 10%.
Standard errors in parenthesis. The main independent variable is the variable "Trust", that is constructed through factor analysis.
Table 4: Probit estimates. Dependent variable is the contract.

<table>
<thead>
<tr>
<th></th>
<th>I</th>
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<th>III</th>
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<th>V</th>
<th>VI</th>
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<tbody>
<tr>
<td>Trust (Ethnicity)</td>
<td>0.36***</td>
<td>0.43***</td>
<td>0.38***</td>
<td>0.29*</td>
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<td>-0.13**</td>
<td>-0.13**</td>
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<td>(0.05)</td>
<td>(0.05)</td>
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<td>0.002***</td>
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<td>(0.02)</td>
</tr>
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</tr>
<tr>
<td>Year Dummy</td>
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<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
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<tr>
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<td>0.56*</td>
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<tr>
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<td>(0.45)</td>
<td>(0.69)</td>
</tr>
<tr>
<td>Pseudo R2</td>
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<td>0.05</td>
<td>0.08</td>
<td>0.10</td>
<td>0.10</td>
<td>0.18</td>
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<td>Obs</td>
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<td>336</td>
<td>297</td>
<td>297</td>
<td>251</td>
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</tbody>
</table>

***, **, * means that the difference is statistically significant at the 1% level, respectively 5%, and 10%.
Standard errors in parenthesis. The main independent variable is the variable "Trust", that is measured as sharing the same ethnic group.
Table 5: drivers’ behavior and risk taking per type of contract

<table>
<thead>
<tr>
<th></th>
<th>$L$</th>
<th>$LO$</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reported higher speed than normal (%)</td>
<td>0.47**</td>
<td>0.35</td>
<td>0.40</td>
</tr>
<tr>
<td></td>
<td>(0.04)</td>
<td>(0.03)</td>
<td>(0.02)</td>
</tr>
<tr>
<td>Accidents &amp; Mishaps (% last week)</td>
<td>0.44</td>
<td>0.38</td>
<td>0.41</td>
</tr>
<tr>
<td></td>
<td>(0.04)</td>
<td>(0.03)</td>
<td>(0.03)</td>
</tr>
<tr>
<td>Take breaks (Other than lunch)</td>
<td>0.77</td>
<td>0.86**</td>
<td>0.83</td>
</tr>
<tr>
<td></td>
<td>(0.03)</td>
<td>(0.02)</td>
<td>(0.02)</td>
</tr>
<tr>
<td>Revenues yesterday</td>
<td>7.26***</td>
<td>5.60</td>
<td>6.17</td>
</tr>
<tr>
<td></td>
<td>(0.34)</td>
<td>(0.22)</td>
<td>(0.19)</td>
</tr>
<tr>
<td>Revenues maximum</td>
<td>11.05***</td>
<td>9.49</td>
<td>10.08</td>
</tr>
<tr>
<td></td>
<td>(0.30)</td>
<td>(0.26)</td>
<td>(0.20)</td>
</tr>
<tr>
<td>Revenues minimum</td>
<td>2.48</td>
<td>2.48</td>
<td>2.48</td>
</tr>
<tr>
<td></td>
<td>(0.10)</td>
<td>(0.10)</td>
<td>(0.07)</td>
</tr>
<tr>
<td>Turnover (Number of past owners)</td>
<td>2.40***</td>
<td>1.74</td>
<td>1.94</td>
</tr>
<tr>
<td></td>
<td>(0.18)</td>
<td>(0.08)</td>
<td>(0.08)</td>
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<tr>
<td>Observations$^\text{®}$</td>
<td>159</td>
<td>263</td>
<td>422</td>
</tr>
</tbody>
</table>

***, **, * means that the difference is statistically significant at the 1% level, respectively 5%, and 10%. Standard errors in parenthesis. $^\text{®}$ The number of observations varies across variables due to missing data.
Table 6: Effect of the contract’s incentive versus trust

<table>
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<tr>
<th></th>
<th>I</th>
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<th>III</th>
<th>IV</th>
<th>V</th>
<th>VI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contract</td>
<td>0.28***</td>
<td>0.31***</td>
<td>0.31***</td>
<td>0.30**</td>
<td>0.31***</td>
<td>0.26**</td>
</tr>
<tr>
<td></td>
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<td>(0.11)</td>
<td>(0.12)</td>
<td>(0.12)</td>
<td>(0.12)</td>
<td>(0.12)</td>
</tr>
<tr>
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<td>-</td>
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<td>0.08</td>
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<td>0.06</td>
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<tr>
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<td>(0.06)</td>
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<tr>
<td>driver children</td>
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<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
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</tr>
<tr>
<td></td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>(0.05)</td>
</tr>
<tr>
<td>Age of the driver</td>
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<td>No</td>
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<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>driver’ schooling</td>
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<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
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<tr>
<td>Constant</td>
<td>-0.11*</td>
<td>0.42**</td>
<td>0.72***</td>
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<td>-0.03</td>
<td>-0.33</td>
</tr>
<tr>
<td></td>
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<td>(0.30)</td>
<td>(0.30)</td>
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<td>(0.32)</td>
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<tr>
<td>R-square</td>
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<td>0.03</td>
<td>0.04</td>
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<tr>
<td>Obs</td>
<td>398</td>
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<td>327</td>
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<td>321</td>
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</table>

***, **, * means that the difference is statistically significant at the 1% level, respectively 5%, and 10%. Standard errors in parenthesis.

Table 7: Factor Analysis: Measure of trust and measure of driver behavior

**Trust (1 Factor retained)**

<table>
<thead>
<tr>
<th>Factor</th>
<th>Eingenvalue</th>
<th>Variables</th>
<th>Rotated Factor Loading</th>
</tr>
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<tr>
<td>1</td>
<td>1.38</td>
<td>Duration relation</td>
<td>0.79</td>
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<tr>
<td>2</td>
<td>1.09</td>
<td>Past Prof. relation =1</td>
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</tr>
<tr>
<td>3</td>
<td>1.01</td>
<td>Same Ethic Group=1</td>
<td>0.69</td>
</tr>
</tbody>
</table>

**Behavior at the workplace**

<table>
<thead>
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<th>Eingenvalue</th>
<th>Variables</th>
<th>Rotated Factor Loading</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
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<tr>
<td>2</td>
<td>1.24</td>
<td>Breaks</td>
<td>0.72</td>
</tr>
<tr>
<td>3</td>
<td>0.88</td>
<td>Accidents &amp; Mishaps</td>
<td>0.58</td>
</tr>
<tr>
<td>4</td>
<td>0.46</td>
<td>Revenue</td>
<td>0.72</td>
</tr>
</tbody>
</table>
Figures

Figure 1: Revenue per type of contract

![Distribution of Revenue per Contract](image1)

Figure 2: Distribution of daily maximum revenue ever made.

![Distribution of Maximum Revenue per Contract](image2)
Figure 3: Distribution of drivers’ age by type of contract

Figure 4: Drivers’ tenure in the profession of Zemidjan
Proof. (Of Lemma 1)

Under $C_1$: Starting in the second period, the agent compare extra cost $c(e_h) - c(e_l)$ to the extra gain from high effort over low effort. The resulting optimal choice is also the optimal choice in the first period because the agent faces an identical problem. Under $C_2$: Now the agent takes into account the deterioration of the asset that she will own at the end of the contract. The same argument as under $C_1$ holds. ■

Proof. (of Proposition 2)

Let $\Gamma_A(S)$ and $\Gamma_P(S)$ represent respectively the payoff of the agent under the strategy profile $S$ (respectively of the principal under the strategy profile $S$)

$$\Gamma_P((LO, e_h), LO) - \Gamma_P((L, e_h), L) > 0$$ (9)
\[ r_1 + r_2 > r_1 + (1 - \mu(e_h))(r_2 + (1 - \mu(e_h))K \]
\[ \Rightarrow K\mu(e_h)^2 - (2K + r_2)\mu(e_h) + K < 0 \]

Consider the roots of the quadratic equation in \( \mu(e_h) \):

\[ K\mu(e_h)^2 - (2K + r_2)\mu(e_h) + K = 0 \]

Let \( X = \mu(e_h) \), and solve the equation above to get:

\[ X_1 = \frac{1}{2n} \left[ 2n + 1 - \sqrt{4n + 1} \right] \]
\[ X_2 = \frac{1}{2n} \left[ 2n + 1 + \sqrt{4n + 1} \right] \]

The initial inequality is satisfied for

\[ X \in (-\infty, X_1) \cup (X_2, +\infty) \]

But given that \( X \) is bounded between 0 and 1, it follows that \( 1 \geq \mu(e_h) > \frac{1}{2n}(2n + 1 - \sqrt{4n + 1}) \) ■

Proof. (of Proposition 4) (i)

- \textit{Under (L), } \( e_T^L < e_U^L \) comes from (4) and the condition that \( \gamma > 1 \).
- \textit{Under (LO), } \( e_T^{LO} \neq e_U^{LO} \)

First notice that the two equation in (6) cannot be simultaneously satisfied if \( e_T^{LO} = e_U^{LO} \).

Therefore, (LO), \( e_T^{LO} > e_U^{LO} \) or (LO), \( e_T^{LO} < e_U^{LO} \)

Next, I show that the inequality can be consistent either way. To do this, without loss in generality, let \( e_T^{LO} = e_U^{LO} + \eta \) and plug it into the first equation in (6) to get

\[ \bar{\theta} - \gamma(e_U^{LO} + \eta) + \beta K\mu'(e_U^{LO} + \eta) = 0 \]

\[ (*) \]
a) Assume $\eta > 0$ : then by convexity of $\mu$, $\mu'$ is increasing. So, $\exists \ \nu > 0$ such that $\mu'(e_U^{LO} + \varepsilon) = \mu'(e_U^{LO}) + \nu$ and rewrite (*) as

$$\overline{\theta} - e_U^{LO} + \beta K \mu'(e_U^{LO}) - \gamma \eta + \beta K \nu = 0.$$  

(see (6)) $\exists (\eta, \nu)$ s.t. this is 0

The same argument goes through with $\eta < 0$ which implies that $\nu < 0$.

(ii) Assume the agent is trustworthy. From (4) we know that $e_T^L = \overline{\theta}$. Now, divide equation (**) by $\gamma$ to get

$$\frac{\overline{\theta}}{\gamma} - e_T^{LO} + \frac{\beta}{\gamma} K \mu'(e_T^{LO}) = 0$$

<0(\text{f decreasing}) \Rightarrow e_T^L - e_T^{LO} > 0

Similarly, if the agent is untrustworthy, we know from (4) that $e_U^T = \overline{\theta}$, therefore the second equation in (6) becomes

$$e_U^L - e_U^{LO} + \beta K \mu'(e_U^{LO}) = 0$$

<0 \Rightarrow e_U^L - e_U^{LO} > 0.$