SOCIAL PREFERENCES, OCCUPATIONAL CHOICE AND LABOR MARKET PERFORMANCE

by

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A dissertation submitted to the

Graduate School—New Brunswick

Rutgers, The State University of New Jersey

in partial fulfillment of the requirements

for the degree of

Doctor of Philosophy

Graduate Program in Economics

Written under the direction of

Professor Barry Sopher

and approved by

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New Brunswick, New Jersey

January, 2013

ABSTRACT OF THE DISSERTATION

Social Preferences, Occupational Choice and Labor Market Performance

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Professor Barry Sopher

The first essay analyzes the role of information transparency on fairness and reciprocity in long-term labor market relationships. The main finding of the second chapter is that transparency serves as an effective mechanism to both improve worker welfare and total market efficiency. Fairness, which means that an increase in the generosity of a contract offer is reciprocated by an increase in the effort level, is a prominent concern under information transparency. When workers are fully informed about firms' productivity levels and potential profits, firms propose higher wages that represent a relatively more fair division of total surplus. Workers respond to generous offers with high effort levels. However, workers' response to wages is not constant and depends on the following factors. First of all, it is elevated with information transparency. That is, for given wages, workers provide more effort under full information. Secondly, it depends on whether a wage offer represents a fair share of the final surplus.

The second essay analyzes the role of information transparency and communication in short-term labor market relationships. The experimental evidence shows that the level of trust and reciprocity is significantly reduced if there is no contract renewal. While information transparency was critical int the first essay with long-term relationships, it

does not have a substantial effect in short-term relationships. Wage offers are lower and compressed regardless of how workers are informed. On the other hand, communication enhances trust and reciprocity more significantly than any other factor that is controlled for.

The third essay studies the occupational choice of agents between working for wages and becoming entrepreneurs. The main observation is that policies that improve worker's welfare also potentially improve the terms for entrepreneurs. If the tax rates on entrepreneurs and the working wages are raised, the entry into entrepreneurship slows down significantly. This increases the average quality and consequently, the average success rate of entrepreneurs when a high wage-high tax regime is adopted. The credit market offers lower interest rates to potential entrepreneurs due to higher average success rates. On the other hand, overconfidence exists among potential entrepreneurs. This diminishes the positive effects of high wage and high tax policies. The average rate of success is lower with overconfidence, which only worsens the adverse selection problem in the credit market.

Acknowledgements

Though only my name appears on the cover of this dissertation, I could never have reached the heights or explored the depths without the help, support, guidance and efforts of a lot of people. First and foremost, I am grateful to my advisor Prof. Barry Sopher because of whom my graduate experience has been one that I will cherish forever. He introduced me to the field of experimental economics and provided endless support to accomplish my goals. I would not have succeeded without his valuable assistance.

I am also thankful to my committee members Prof. Killingsworth, Prof. Sjostrom and Prof. AbdulKarim Sadrieh. I was fortunate enough to have had many discussions and brainstorming sessions with Prof. Sjostrom. His comments and suggestions turned my primitive ideas into worthwhile research.

I owe a special note of gratitude to Prof. Killingsworth who has always been an amazing mentor to me. He put in countless hours to improve my research. His encouragement, guidance and constant moral support have helped me to overcome many crisis situations through the years and finish this dissertation.

I would like to thank Dorothy Rinaldi for her guidance and encouragement. She has the utmost patience and dedication that kept all of us calm and helped us carry on. I also want to thank our amazing staff: Donna, Mayra, Debbie, Janet G., Paula and Janet B. for being a family to me away from home.

I am particularly indebted to my friends Basak and Meenal who were always there for me. I am very lucky to have had their genuine companionship. Basak supported me day and night without a hesitation, kept my spirits up, and gave me the motivation right when I needed it. Her friendship is truly priceless. Meenal has been my rock since the day we met. She has been my source of strength and inspiration to go on when things were really tough. My experience here would have been much different without

her. I am also grateful to my friends Gozde and Aysun who shared my ups and downs every day from a distance. Also, special thanks go to my friends, Evin, Costie, Kaveh, Steve, Sameer, Jeff, Kathleen and Yoichi for their help and support.

My life in the U.S. has been pleasant rather than a struggle thanks to my cousins Mine and Ersoy, and my nephew Sean. They fully supported me in many different ways and made me feel like I am home. I feel blessed to have been around them and simply cannot thank them enough.

Finally, I would like to thank my ultimate source of energy, support and inspiration, my mom Necla. Her infinite love, patience and understanding made this possible. Behind any accomplishment I have had and will ever have is her encouragement and her faith in me. I simply owe her everything I have.

Dedication

To my mom.

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Chapter 1

Introduction

This dissertation introduces three experimental studies that study employment relationships and occupational choice of agents. The focal issue in all three chapters is the impacts of imperfect information on individuals' decisions, labor market outcomes and social welfare. The second and the third chapters study the dynamics of long-term and short-term labor market relationships from a behavioral perspective. The fourth chapter discusses the occupational choice of agents and consequences for the market under imperfect information. The main motivation behind this dissertation is to understand policies or mechanisms that remedy labor market inefficiencies and generate welfare gains.

Many theories based on fairness, inequity aversion and reciprocity have been offered to explain firm and worker behavior. Well-documented evidence from laboratory and field experiments confirms the existence of behavioral motives in labor market decisions. It is established that preferences for fairness are present in labor relations and that fairness serves as an incentive mechanism for workers to perform well (see Fehr et al., 2008). However, the role of information transparency has yet to be explored in detail. To this end, the second chapter studies the types of fairness firms have in mind and workers respond to. Then it studies the impacts of information on firms' and workers' choices and on whether there are efficiency and welfare gains from information transparency.

The second chapter provides a set-up which is applicable in a broad range of settings. Firms and workers sign incomplete contracts and interact repeatedly. Firms have multiple jobs with different productivity levels, i.e. at given effort levels some jobs are more productive or more profitable than others. However, the information on the productivity of these jobs may or may not be available to workers. When the market

is completely transparent, workers are fully informed about the exact productivity of their jobs. Thus, they know the size of potential final surplus and profits for their firms before making an effort decision. However, in the absence of transparency, workers are left in the dark about the total surplus created as a result of their efforts.

The key finding of the second chapter is that transparency serves as an effective mechanism to both improve worker welfare and total market efficiency. Fairness, which means that an increase in the generosity of a contract offer is reciprocated by an increase in the effort level, is a prominent concern under information transparency. When workers are fully informed about firms' productivity levels and potential profits, firms propose higher wages that represent a relatively more fair division of total surplus. Workers respond to generous offers with high effort levels. However, workers' response to wages is not constant and depends on the following factors. First of all, it is elevated with information transparency. That is, for given wages, workers provide more effort under full information. Secondly, it depends on whether a wage offer represents a fair share of the final surplus.

The third chapter addresses a similar question of whether and how information transparency matters in employment relationships with incomplete contracts. The main objective is to explain the roles of asymmetric information and communication in one-shot labor market relationships. I find that the level of trust and reciprocity is significantly reduced if there is no contract renewal. Wage offers are lower and compressed regardless of how workers are informed; whereas, the information regime is much more critical in the second chapter with relational contracts. Communication enhances trust and reciprocity more significantly than any other factor that is controlled for. It puts short-term labor relationships in a social context and increases wages and effort substantially.

The final chapter studies the occupational choice of agents between working for wages and becoming entrepreneurs. The experimental design is based on Ghatak, Morelli and Sjöström (2007); it allows for differences in entrepreneurial talent and overconfidence among entrepreneurs. There is an asymmetric information problem in the sense that agents hold private information about their entrepreneurial skills and probability to

succeed as entrepreneurs. This creates an adverse selection problem in the credit market since creditors cannot observe agents' success probabilities. The average talent of entrepreneurs determine the interest rate that the entrepreneurs face in the credit market. Therefore, due to the adverse selection problem, the returns to both occupations depend on the average quality of entrepreneurs. The objective of this chapter is to understand certain interventions that may result in more efficient choices and remedy the effects of the adverse selection problem. The chapter also addresses overconfidence among entrepreneurs and its welfare implications.

The main observation is that policies that improve worker's welfare also potentially improve the terms for entrepreneurs. If the tax rates on entrepreneurs and the working wages are raised, the entry into entrepreneurship slows down significantly. This increases the average quality and consequently, the average success rate of entrepreneurs when a high wage-high tax regime is adopted. The credit market offers lower interest rates to potential entrepreneurs due to higher average success rates. On the other hand, overconfidence exists among potential entrepreneurs. This diminishes the positive effects of high wage and high tax policies. The average rate of success is lower with overconfidence, which only worsens the adverse selection problem in the credit market.

Chapter 2

Information Transparency and Labor Market Efficiency

2.1 Introduction

This is an experimental study on information transparency and long-term employment relationships. The paper first asks specifically what types of fairness firms have in mind and workers respond to. Then it studies the impacts of information on firms' and workers' choices and on whether there are efficiency and welfare gains from information transparency.

The key finding is that transparency serves as an effective mechanism to improve both worker welfare and total market efficiency. When workers are fully informed about firms' productivity levels and potential profits, firms propose higher wages that represent fair divisions of total surplus. Workers respond to generous offers with high effort levels. However, workers' response is not constant and depends on the following factors. First of all, it is elevated with information transparency. That is, for given wages, workers provide more effort under full information. Secondly, it depends on whether a wage offer represents a fair share of the final surplus.

The definition of "fairness" is based on the behavioral and experimental paradigm by Ernst Fehr and his coauthors (Fehr and Schmidt, 1999 and Brown, Falk and Fehr, 2004 are some of the best known of this work). The models of fairness assume that there are fair-minded workers who adjust their behavior in the following manner: If the wage offer potentially represents an equal division of surplus, the fair-minded worker will react by supplying high effort to support that outcome. Otherwise, she will simply not be happy and reduce her effort. Thus, there is continuity in the worker's reaction to wage offers. Preferences for fairness do not imply blindly choosing the outcome where the surplus is split 50%-50%. Instead, these preferences are "focal", i.e the worker focuses on what

the wage offer represents.

This paper contributes to the behavioral account of labor markets in a few different ways. First, the findings can explain the positive firm size-wage relationship, in line with much empirical evidence (e.g. Schmidt and Zimmermann, 1991). Second and most important, transparency promotes fairness and increases workers' effort, hence it increases the size of the total surplus and the average payoff for workers. Therefore, from the social planner's perspective, transparency should be desirable. Finally, the evidence here indicates that total welfare and efficiency can be increased if workers (or their unions) can convince firms to reveal information on profits.

2.2 Experimental Approach to Labor Relationships

Many theories based on fairness, inequity aversion and reciprocity have been offered to explain firm and worker behavior. Well documented evidence from laboratory and field experiments confirms the existence of behavioral motives in labor market decisions. However, the role of information transparency has yet to be explored in detail.

In this paper, I consider a setup which is applicable in a broad range of market scenarios. Firms and workers sign incomplete contracts and interact repeatedly. There are more workers than jobs, so that the competitive equilibrium prediction is for the wage to be at the opportunity cost of the workers. Likewise, there is no incentive, in a one shot game, for a worker to exert more than the minimum level of effort, because any additional effort only decreases the worker's share of the surplus (since his share is the fixed wage he has already accepted), while increased effort only increases the firm's share. However, several facts stylized and empirical facts about labor relationships are at odds with this view. What is observed is that wages tend to be above the opportunity cost of workers, and effort levels tend to be increasing in the level of the wage offers. The interpretation usually given for this is that workers are concerned about the "fairness" of any given wage offer. This is the fairness version of the efficiency wage hypothesis (Akerlof, 1982, Akerlof and Yellen, 1990). Fairness is usually interpreted as "equal shares," which is a natural focal point in an experiment where roles are chosen randomly

and there is no compelling reason why either side would be entitled to a larger share than the other.

The idea that workers respond to efficiency wages is well understood. According to the fair-wage effort hypothesis, workers compare wages with what they think is fair before making an effort choice. Models of reciprocity and inequity aversion explain deviations from standard labor market predictions (e.g. Fehr and Schmidt, 1999, Bolton and Ockenfels, 2000, Charness and Rabin, 2002, Dufwenberg and Kirschteiger, 2004). Meanwhile laboratory and field experiments largely support the claims of behavioral economic theory (e.g. Fehr et al. 1993, 1996). Concerns for fairness, trust and positive/negative reciprocity do exist in labor relationships and they significantly affect market outcomes.

It is established that preferences for fairness are present in labor relations and that fairness serves as an incentive mechanism for workers to perform well (see Fehr et al. 2008). The inequity aversion model by Fehr and Schmidt (1999) has been the framework for most experiments. The model is simply based on the idea that there are both selfish and fair-minded workers in the labor market. Fair-minded workers respond to generous offers with a generous effort level, thus firms have an incentive to offer rents even in one-shot interactions. But, the importance of fairness is amplified in repeated settings. Contractual incompleteness implies rewards and punishments in future periods and gives rise to "relational contracts" which are self-enforcing in nature (Macleod and Malcolmson, 1989). Since renegotiation and reputation become a concern, selfish workers have an incentive to mimic fair-minded workers and supply high effort when offered a generous wage. The presence of fair-minded workers also guarantee that greedy offers are penalized with low effort levels. Ultimately, the interaction between fairness concerns and repeated game incentives result in an outcome that involves non-minimal wage and effort and significant surplus sharing (Brown, Falk, Fehr, 2004).

The gift-exchange setup has been widely used to examine the performance effects of fairness (e.g. Hannan et al., 2002, Brandts and Charness, 2004). In a typical gift exchange experiment, the ordering of events is as follows. The firm proposes a fixed wage to be paid, but does not enforce worker performance. Then the worker chooses an

effort level which determines her and the firm's final payoffs. In this paper, I extend this paradigm in a couple more directions. First, I focus on long-term contracting by allowing employers to make offers to specific workers in a private fashion (similar to Brown, Falk, Fehr, 2004). Second, I introduce heterogeneity in the following sense: firms have multiple jobs with different productivity levels, i.e. at given effort levels some jobs are more productive or more profitable than others. Third and most important, I introduce the following information problem to the design: when the market is completely transparent, workers are fully informed about the exact productivity of their jobs, thus, they know the size of potential final surplus and profits for their firms before making an effort decision; however, in the absence of transparency, workers are left in the dark about the total surplus created as a result of their efforts.

The difference between these two hypothetical states (full information and limited information) summarizes the role of information on employment relations, fairness and efficiency. It is almost impossible to find field data that fits into this ideal setup. However, experimental methods permit exogenous variations in the informational structure.

2.3 Experiment Design

A total of 52 subjects participated in 4 sessions and interacted 646 times. Each session included 18 periods with 3 employers and 10 workers. The sessions were conducted in Gregory Wachtler Experimental Economics Laboratory. Subjects were seated in cubicles with computers connected to each other by z-Tree experimental software (Fischbacher, 2007). A typical session took an hour and a half and the average payment was approximately $20.

In a given session, 3 participants were assigned the role of an individual firm and 10 were assigned the role of a worker; these roles remained the same throughout the session. The program assigned each firm and each worker an identification number which was fixed throughout the session. Thus, workers were able to recognize each firm and vice-versa in all future periods, thus allowing renegotiation.

This setup, with repeated interactions, was adapted from Brown, Falk and Fehr

(2004). Then it was modified in the following ways to study information effects.

Each firm had three jobs with different productivity levels. The productivity coefficient, p, could take three different values: 10, 8 or 6 for high, medium or low productivity respectively.

Each firm could make multiple offers but was allowed to hire only one worker for each job. The offers included a wage to be paid, w, and a non-binding desired effort level, $\tilde{e}$ ($w \in \{0, 1, ..., 100\}$ and $\tilde{e} \in \{1, 2, ..., 10\}$).

Each firm had the option of submitting private and/or public offers. Public offers were known to and could be accepted by all workers. Private offers were known by and directed to specific workers.

Each worker could accept or reject offers. If a worker accepted an offer, she chose her actual effort level (e), and thus determining her final payoff. The payoffs were calculated in experimental currency units.

The firm's profit after each trade was $\pi_f = pe - w$, where p is the productivity coefficient.

The worker's payoff conditional on employment was $\pi_i = w - c(e)$ where $c(e)$ is the cost of effort. The cost schedule is given in Table 1. The firms were informed about the cost function c(e), which was the same for all workers.

(Table 2.1)

There was involuntary unemployment every period since there were 10 workers but 9 job openings. If a worker failed to find a job, she was paid an unemployment benefit of 5 experimental currency units.

When the next period started all workers and firms could renew contracts or find different matches. Firms and workers used the same ID numbers throughout the sessions, so that they could find (or avoid) each other in every subsequent session.

Two treatments were designed in order to analyze how information affects wage profiles and performance. In the **Full Information Treatment (FULL)**, the firm told workers the productivity level as part of its job offer. Workers could observe the productivity of each job. In the **Limited Information Treatment (LIM)**, the

employers were privately informed about the productivity levels at the beginning of each period, but this information was not revealed to the workers.

2.4 Findings

Table 2 summarizes the aggregate data on limited and full information sessions. Full information extracts higher wages and effort levels compared to limited information. The firms are left with comparable profits regardless of the availability of information while the workers are clearly better off. The size of the total surplus and workers' payoffs are significantly higher with full information. Optimal effort level that maximizes social surplus at 62 experimental currency units is 10. 73% of maximum efficiency is gained under transparency while it is only 58% under the lack of transparency.

(Table 2.2)

Table 3 suggests that the payoff distribution between workers and firms is close to being equal with full information especially for medium and high productivity jobs. The transparency seems to work for the firm's benefit if the job is of low productivity, but it works against the firm if the job is of high productivity.

(Table 2.3)

2.4.1 Private Offers and Contract Renewal

Private offers allow for renegotiation and contract renewal. The main instrument to engage in relational contracts was the option of sending private offers. Figure 1 shows that the percentage of private offers increases over time regardless of whether the regime is limited information or full information. Moreover, the majority of offers made in private were aimed at contract renewal according to Figure 2.

(Figures 2.1-2.2)

The use of private offers suggests that firms are interested in forming long-term relations. Information does not seem to have a particular impact on contract renewal as the firms want to hold onto productive relationships in any case.

Table 4 represents the decision to renew contracts. The likelihood of renewal mainly increases with reputation. Reputation of a worker, from the perspective of the firm, was measured as the worker's performance in their last encounter. On the other hand, the productivity level does not help explain contract renewal.

(Table 2.4)

2.4.2 Firms

While initially wages are around the same, the impact of information becomes clear later on. Figure 3 shows that average wage offers are consistently higher under information transparency.

(Figure 2.3)

Table 5 shows the results of the wage regression. Good reputation motivates generous wages. Likewise, private wage offers are greater than publicly made ones. The job characteristics are significant in explaining the wage decision; i.e. offers increase with the productivity level. There are within-firm wage differences in both sessions; however the difference is more defined when full information is enforced. Firms significantly separate wage offers. Limited information on the other hand results in weak separation of payoffs among co-workers; while both significantly greater than zero, coefficients for medium and high productivity job offers in the limited information regime are not statistically different from each other.

(Table 2.5)

2.4.3 Workers

Effort provision not only determines final payoffs but also potentially affects the length of the relationship. Figure 4 depicts the evolution of average wages over time. The first thing to notice is that the average effort is higher in full information sessions.

(Figure 2.4)

Table 6 shows the results of the random-effects ordered probit estimation of effort. Not surprisingly the effort choice depends significantly on the wage offer. But there are two very interesting observations in Table 6. The first one is that wages extract more effort under full information. The availability of information just by itself seems to be important for worker's performance. Secondly, the marginal effect of a wage offer is higher for low productivity jobs. That is, the workers do take into account that a dollar increase in wages represents a greater share of the total surplus if the job is of low productivity. Information transparency naturally improves relations between parties, while the lack of transparency reduces reciprocity by workers.

Desired effort is significant in explaining effort as well. Compliance with the firm's expectations must be an enforcement mechanism for higher performance and long lasting relations. This could also be considered as a simple form of cheap talk. The probability to work harder increases upon contract renewal too.

(Table 2.6)

2.4.4 Fairness and Efficiency

Figure 5 shows that average firm profit is more or less the same regardless of the information structure. Figure 6 confirms that firms end up with about half of the total surplus under full information, whereas their shares are larger when the workers are not informed. The finding is documented in Table 7 as well. The outcome under transparency reveals the emphasis on fairness preferences. Firms keep smaller shares of surplus although that does not mean they are worse off. Limited information dampens fairness incentives and leaves firms with higher shares without improving total gains. Finally total surplus is depicted in Figure 7 across limited and full information sessions where the difference between treatments is statistically significant.

(Figures 2.5-2.7)

(Table 2.7)

2.5 Conclusion

Fairness concerns shape employment relationships significantly. Theories that model social preferences are based on the assumption that people with fairness preferences reduce own payoffs to avoid unfair outcomes or punish unfair behavior. The existence of fair-minded people in the market increases wages and effort levels above the market clearing levels both in one shot and repeated interactions. Effort increases with wage but this effect is amplified in repeated settings due to renegotiation and reputation formation. Experimental research on employment relationships has shown that fairness is an incentive mechanism for workers to perform well and firms to offer rents to their workers. The contribution of this paper is on the role of information on workers' and firms' choices and on whether there are efficiency and welfare gains from information transparency.

The findings of this paper suggest that information affects the market outcome in significant ways. Information transparency on firms' profits motivates firms to offer higher wages which induce a relatively more fair distribution of payoffs and workers respond to wage increases by increasing effort. Most importantly, workers' response is elevated with information transparency. That is, for given wages, workers provide more effort under full information. The availability of information just by itself might have a positive psychological effect on worker's choice. The evidence is hard to explain with existing theories, and requires further research. Furthermore, workers respond to firms' intentions on how to share the potential final surplus. A dollar increase implies a larger share of surplus if the job has low productivity. The evidence shows that the marginal effect of a wage increase is slightly higher for lower productivity jobs.

Under full information, wage offers are higher and firms separate offers across different jobs, i.e. high wages are offered for high productivity jobs, that result in equal division of total surplus. Workers reciprocate to these offers by exerting more effort, thus increasing gains from interaction. On the other hand, wages are lower and more compressed when workers are left in the dark. Since firms have an incentive to pretend that their jobs have low productivity, workers do not choose high effort levels to increase

firms' payoffs. In the end, workers' payoffs are reduced and firms collect a larger of the surplus which is now lower in the absence of information transparency.

Transparency promotes preferences for fairness and increases workers' effort, hence it increases the size of the total surplus and the average payoff for workers. Therefore, from the social planner's perspective, transparency should be desirable. Finally, the evidence here indicates that total welfare and efficiency can be increased if workers (or their unions) can convince firms to reveal information on profits.

The experiment is convenient for addressing some further questions. Although the findings from this specific experiment suggest that firms are not hurt by full information, it is still a question whether firms would want to reveal productivity information if they were given the option. Another question is whether the unemployment rate (which was constant in the experiment) changes the impact of information transparency. I believe it is worth looking into whether the rate of competition for jobs have significant effects on the market outcome. Concerns for fairness and the extent that it motivates performance are subject to question under various rates of unemployment.

2.6 Tables of Chapter 2

Table 2.1: Cost of Effort

Effort level	1	2	3	4	5	6	7	8	9	10
Cost of effort c(e)	0	2	4	5	7	8	10	12	15	18

Table 2.2: Descriptive Statistics I

	Limited Information		**Full Information**	
Wage	21.96	(0.72)	33.73	(0.90)
Effort	5.08	(0.16)	6.95	(0.18)
Worker's Payoff	15.92	(0.54)	23.98	(0.63)
Firm's Payoff	20.29	(1.24)	21.28	(1.11)
Total Surplus	36.21	(1.31)	45.26	(1.38)
Efficiency	58%		73%	
N	324		322	

Standard deviations are in parentheses.

Table 2.3: Descriptive Statistics II

	Limited Information		**Full Information**	
Low Productivity				
Worker's Payoff	12.25	(0.82)	18.21	(0.88)
Firm's Payoff	6.70	(1.25)	13.37	(1.34)
Medium Productivity				
Worker's Payoff	14.27	(0.86)	20.90	(0.74)
Firm's Payoff	19.90	(1.90)	19.24	(1.36)
High Productivity				
Worker's Payoff	23.25	(0.92)	30.85	(1.22)
Firm's Payoff	34.94	(2.25)	29.25	(2.07)

Standard deviations are in parentheses.

Table 2.4: Contract Renewal

	Limited Information		**Full Information**	
Reputation	0.09***	(0.01)	0.08	(0.09)
Medium productivity	0.02	(0.05)	-0.01	(0.02)
High productivity	-0.02	(0.05)	0.01	(0.05)
Constant	0.14***	(0.01)	0.19***	(0.05)

Random-effects Probit. $\chi^2(3) = 48.66$ for 'Limited Information' and $\chi^2(3) = 64.04$ for 'Full Information'.
Clustered robust standard errors in parentheses. $***$: $p < 0.01$, $**$: $p < 0.05$

Table 2.5: Dependent Variable-Wage

	Limited Information		**Full Information**	
Reputation	0.68^{***}	(0.30)	1.44^{***}	(0.12)
Private Offer	4.54^{***}	(1.76)	8.92^{**}	(4.20)
Medium productivity	6.65^{***}	(1.18)	3.28^{***}	(1.17)
High productivity	7.38^{***}	(3.03)	10.52^{***}	(1.71)
Constant	16.44^{***}	(2.75)	20.30^{***}	(3.13)

Random-effects GLS. $\chi^2(4) = 217.74$ for 'Limited Information' and $\chi^2(4) = 499.14$ for 'Full Information'.
Clustered robust standard errors in parentheses. $***$: $p < 0.01$, $**$: $p < 0.05$

Table 2.6: Dependent Variable-Effort

	Limited Information		**Full Information**	
Wage	0.09***	(0.02)		
Wage*low productivity			0.16***	(0.01)
Wage*medium productivity			0.14***	(0.01)
Wage*high productivity			0.12***	(0.00)
Desired effort	0.32***	(0.11)	0.25***	(0.08)
Last Period	-2.97***	(0.68)	-2.60***	(0.45)
Constant	1.05**	(0.37)	1.70**	(0.47)

Random-effects Ordered Probit. $\chi^2(3) = 238.56$ for 'Limited Information' and $\chi^2(5) = 352.98$ for 'Full Information'.
Clustered robust standard errors in parentheses. $***$: $p < 0.01$, $**$: $p < 0.05$

Table 2.7: Firm's Share

	Limited Information		**Full Information**	
Medium productivity	0.85**	(0.14)	0.65**	(0.16)
High productivity	0.77***	(0.13)	0.62***	(0.16)
Last Period	-0.90**	(0.19)	-1.02**	(0.39)
Constant	-0.25	(0.16)	0.06	(0.09)

Random-effects GLS. $\chi^2(3) = 58.26$ for 'Limited Information' and $\chi^2(3) = 66.68$ for 'Full Information'.
Clustered robust standard errors in parentheses. $***$: $p < 0.01$, $**$: $p < 0.05$

2.7 Figures of Chapter 2

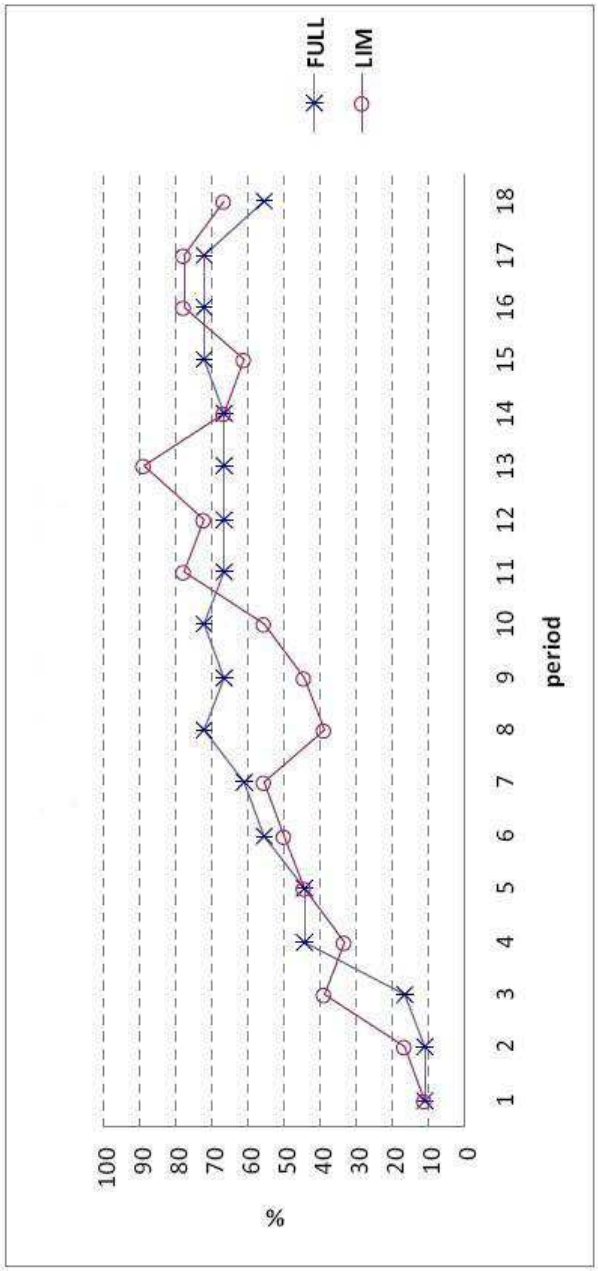

Figure 2.1: Ratio of Private Offers

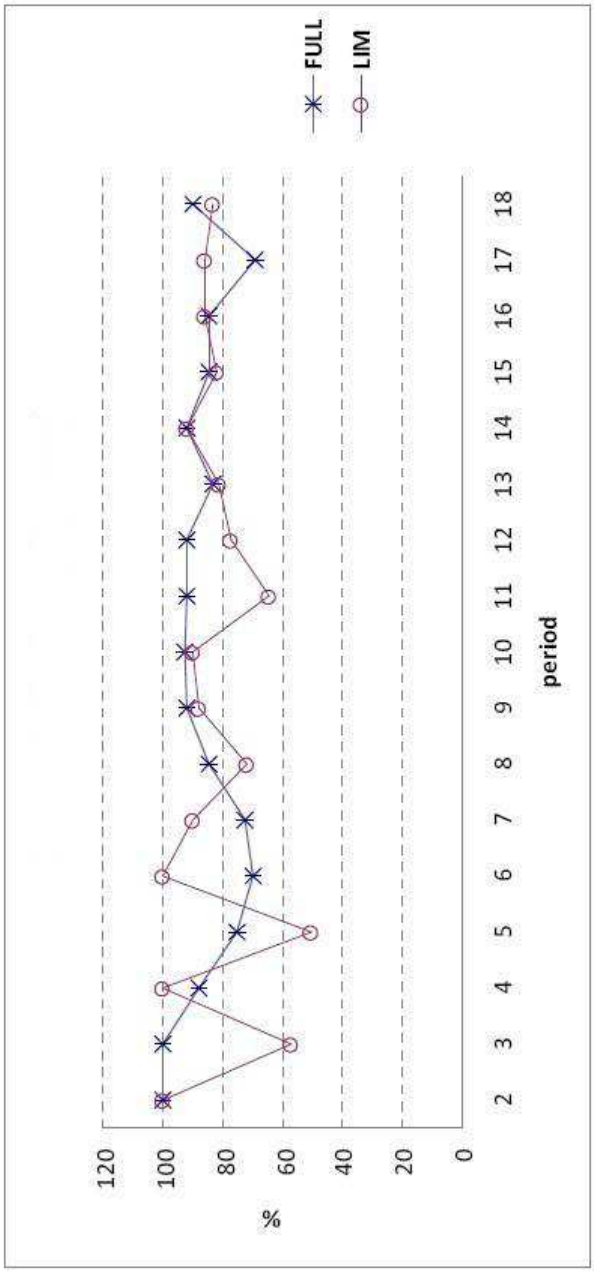

Figure 2.2: Contract Renewal Percentage

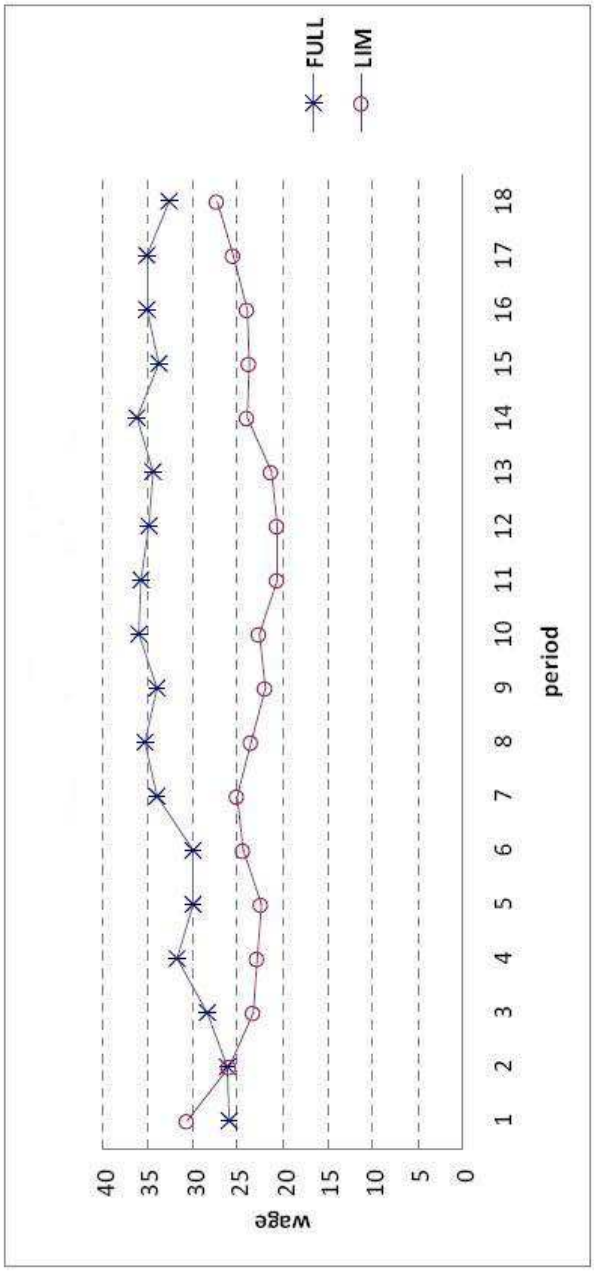

Figure 2.3: Average Wage

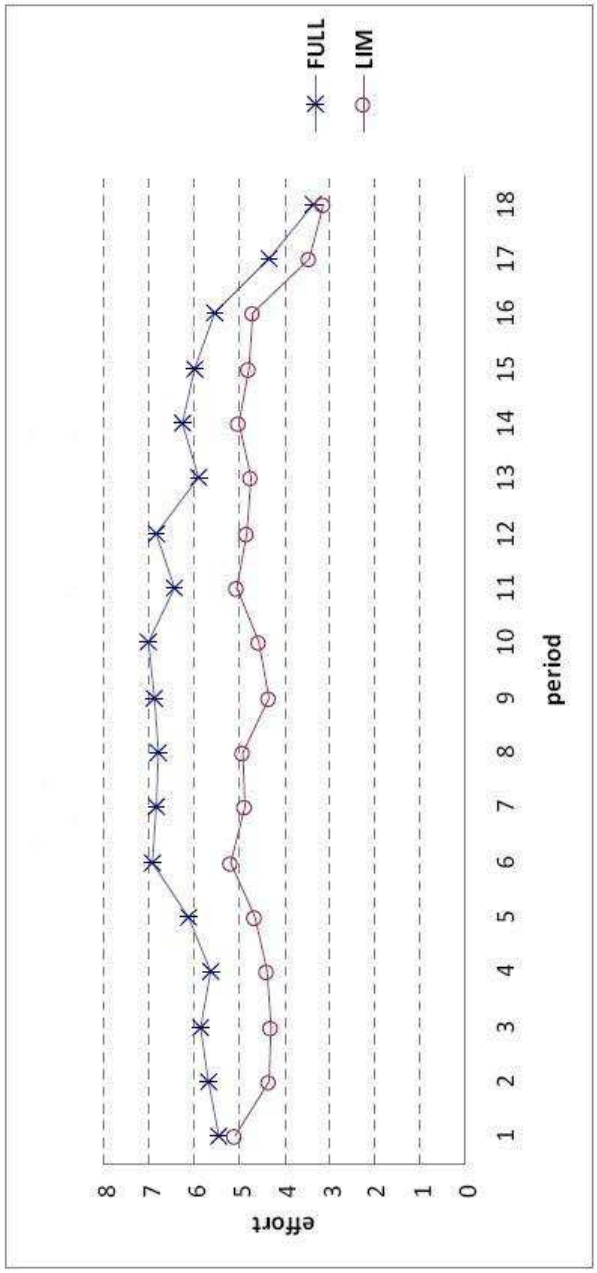

Figure 2.4: Average Effort

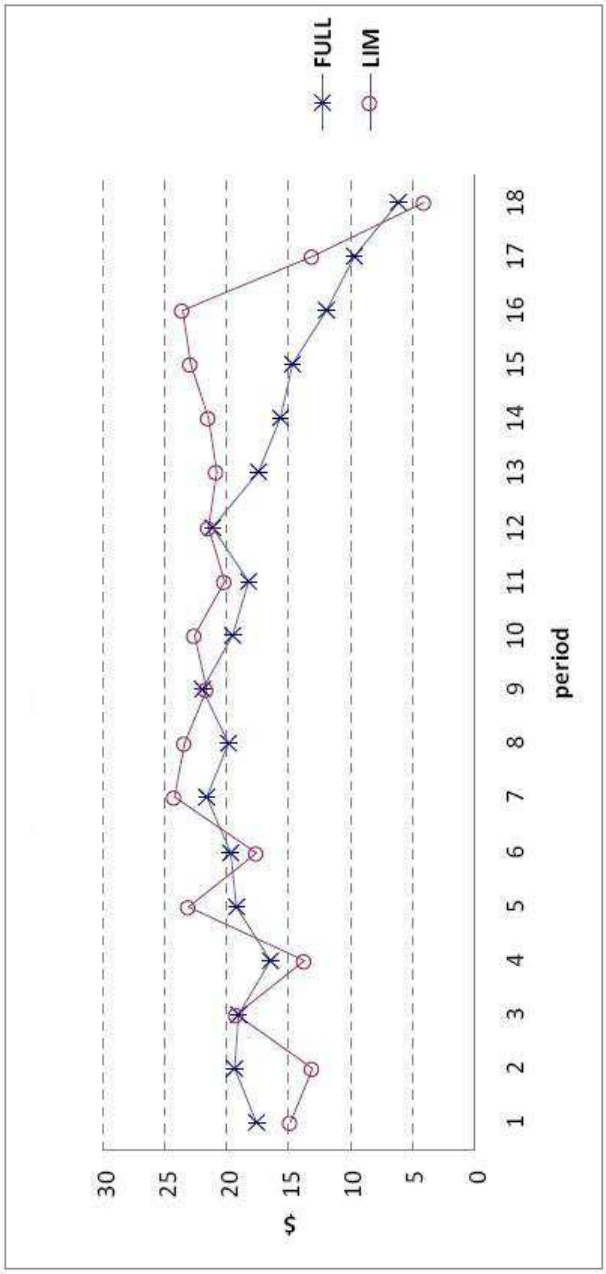

Figure 2.5: Firm's Profits

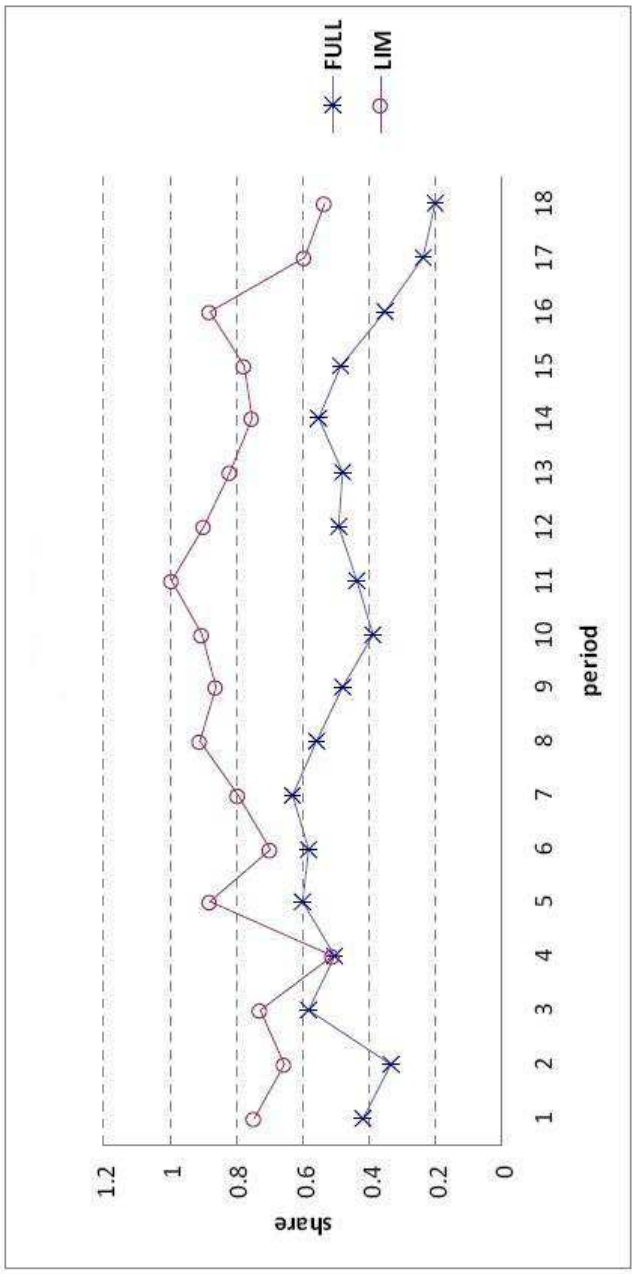

Figure 2.6: Firm's Share

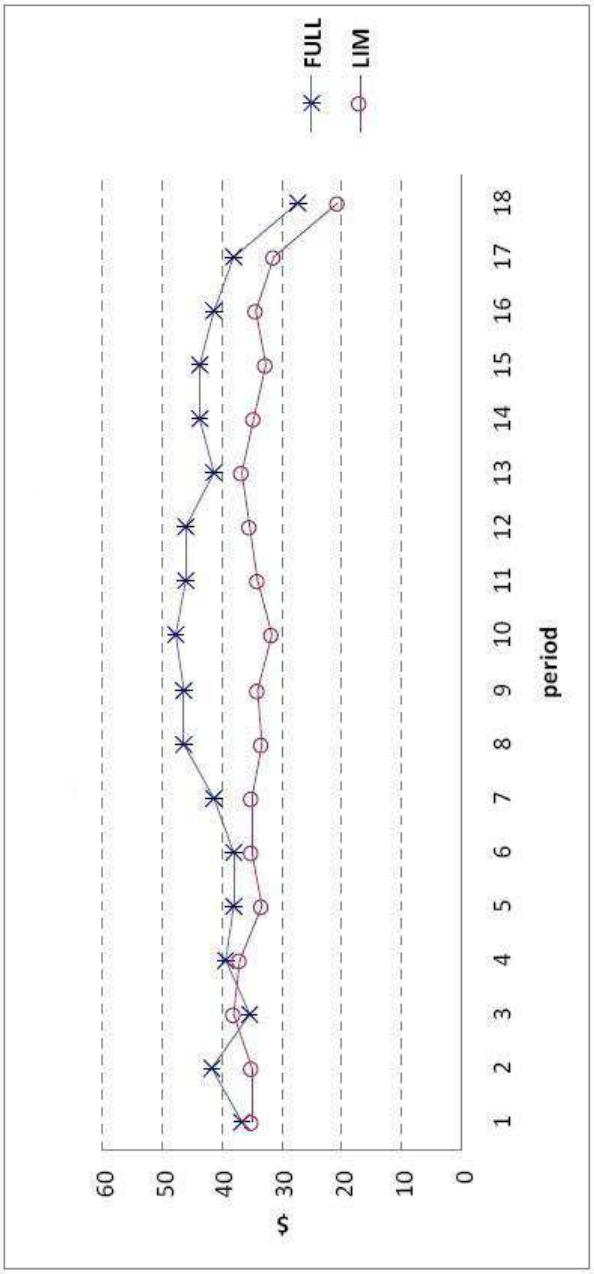

Figure 2.7: Total Surplus

Chapter 3

Effects of Communication on Trust and Reciprocity In The Labor Market

3.1 Introduction

This chapter studies one-shot labor market relationships under incomplete contracts. The purpose is to use basic experimental set-up to explain the roles of asymmetric information and communication in one-shot labor relationships. The key findings are: (a) gift-exchange behavior is present in labor market relationships, that is, wage offers and worker's effort is above the market clearing levels on average. (b) However, the evidence is weak in the absence of communication. (c) The average effort is slightly higher with information transparency. (d) But, communication enhances trust and reciprocity more significantly than any other factor that is controlled for.

In markets with incomplete contracts, workers usually have discretion over how much effort to put into their jobs. The neoclassical labor market theory predicts market clearing wages and minimum effort. However, wage and effort may very well exceed the conventional predictions if there are 'fair' people in the market (Fehr and Schmidt, 1999). The deviations from selfish behavior confirms that the 'fair wage effort hypothesis' (Fehr et al. 1993) is relevant and helps us explain some of the non-compensating wage differentials. My objective is to explore the impacts of communication in one-shot employment relationships under asymmetric information. The framework is based on Brown, Falk and Fehr's (2004)[1] one-shot interaction set-up.

Substantial attention has been given to the so-called gift-exchange games; but, the structure of these games are usually oversimplified. This chapter uses a more structured

[1]I am grateful to the authors for providing the Z-Tree code for their ICR treatment.

set-up that captures some of the more realistic conditions in real labor markets such as firm heterogeneity and asymmetric information. The design allows for studying firm's "trust" and worker's "reciprocity" when firms are no longer identical. Here 'trust' is defined as higher wage offers by firms and 'reciprocity' as higher effort by workers in response to a dollar increase in wages. First I introduce firm heterogeneity in terms of productivity. Then I create information asymmetry by leaving workers in the dark about their firms' types and profitability. The main question that the chapter addresses is: Can communication, purely in the form of cheap talk, effect the decisions of firms and the decisions of workers under these circumstances?

Farrel and Rabin (1996) argue that cheap talk does not guarantee the information will shared between parties and it doesn't restore full efficiency. According to Crawford and Sobel (1982), there is always a babbling equilibria where the sender's message is uninformative and ignored by the receiver. However, if the incentive to lie is limited and agents have overlapping interests, cheap talk can increase efficiency to some degree (Farrell and Rabin, 1996). Valley et al. study communication in bilateral bargaining with asymmetric information. They conjecture that for communication to be efficiency-enhancing, there must be truth telling and trust. Charness and Dufwenberg (2006) analyze a one-shot principle agent game with pre-play communication and find significant evidence of guilt aversion. The authors conclude that communication improves trust and efficiency since people dislike lying in certain circumstances.

The communication structure is computerized like the rest of the experiment and implemented by sending costless and non-binding broadcast text messages before the actual play. Benner and Putterman's (2009) and Benner, Putterman and Ren (2007) use a similar verbal pre-play communication in their trust game experiments. They report that verbal communication encourages trust and trustworthiness.

There is no suggestive evidence to believe that participants used communication as a tool to reveal information or mislead other players. But more importantly, sending messages back and forth, as insignificant as the their content might look, gave them a chance to cooperate. Rode (2009) approaches the issue of 'communication' in a 'social context' framework and argues that impact of cheap talk depends on the competitive/cooperative

context of the economic environment. Likewise in this case, pre-play communication can be interpreted as a means of putting labor relations in a social context as it increases cooperative behavior and leads to higher wages and higher worker performance.

Firm heterogeneity was studied by Fehr et al. (1996) who found significant differences in firms' offers due to differences in productivity. Later, Hannan, Kagel and Moser (2002) focused on worker's response to firm heterogeneity and observed that the workers reciprocate to wages rather than the firms' types and productivity levels. My findings are in line with Fehr et al. (1996) and Hannan et al. (2002).

The closest experiment to the current one is by Hennig-Schmidt, Rockenbach and Sadrieh (2003). The authors analyze the impacts of the same type of informational asymmetry, i.e. by design the workers are left in the dark about their employer's payoff. They find that asymmetric information on the surplus created lowers wages, effort and efficiency. Another example is Irlenbusch and Sliwka's (2005) experiments in which performance of the workers is hidden from the firms and significant evidence support the same conclusion: Asymmetric information deters gift-exchange behavior.

I find that information transparency weakly affects trust and reciprocity in one-shot interactions contrary to the findings of chapter 2 with long-term relationships. Communication motivated different firms to separate their wage offers. The worker's reciprocity to wages was higher under full information and no communication. Communication increased reciprocity in general while decreasing the impact of the information structure.

The rest of the paper is as organized as follows: the second section outlines the experimental design, findings are summarized in the third section and the fourth section is reserved for concluding remarks.

3.2 Experimental Design

The design [2] is a modified version of simple one-shot gift exchange experiments. Each session included 15 periods with 10 workers and 7 firms. At the beginning of a session

[2]The code for the experiment was adapted from Brown et al. (2004). The experiment was conducted with "z-Tree" software (Fischbacher, 2007) at Rutgers University Gregory Wachtler Experimental Economics Laboratory. A set of instructions is available in the Appendix.

17 subjects were randomly assigned the roles of firms and workers. The participants were given different aliases every time they met and repeated encounters were ruled out.

In a given period, the ordering of events was as follows:

Stage 1: Firms defined job offers which included a wage to be paid (w) and a non-binding desired effort level ($\tilde{e}$). The offers were posted on a public screen and were available for all workers to choose. The workers had to compete for available offers.

Stage 2: Workers chose actual effort levels (e) and determined the final payoffs.

Firm's payoff was $\pi_f = pe - w$, where p is the productivity coefficient and can take three different values: 20, 15 and 10 for high, medium and low productivity respectively.

Worker's payoff is $\pi_i = w - c(e)$ if he is employed; and he is paid the unemployment benefit of 5 experimental currency units if he is unemployed. The cost of effort schedule is identical for all workers and is common knowledge.

Stage 3: Firms and workers viewed a summary of their interactions. The next period started with the assignment of new aliases to everyone.

(Tables 3.1-3.2)

Table 3.2 summarizes the characteristics of the treatments.

Public Information Treatment (PUB): productivity levels of the firms were submitted along with their job offers. Workers could observe the type of each firm as they posted offers.

Private Information Treatment (PRT): the firms were privately informed about their productivity levels by the beginning of each period. This information was not revealed to the workers.

Public Information with Communication (CPUB) and **Private Information with Communication (CPRT)** were replications of PUB and PRT with an additional stage, Stage 0.

Stage 0: Subjects engaged in pre-play communication through costless and non-binding text messages. The messages were sent on a broadcast chat box so that everyone can read and respond to the messages.

3.3 Findings

There was a total of 8 sessions with 195 participants and 819 interactions. The analysis is based on the accepted contract offers.

3.3.1 Wage Decision

Average wages in every treatment start around the same levels. By the second period, the difference between sessions with and without communication becomes clear. It is worth noting that there is also more variation in CPUB and CPRT wages.

(Figure 3.1)

To better understand the wage decision the following model was estimated:

$w_{ft} = X'_{ft}\beta + c_f + u_{ft}, \qquad u \sim N(0, \sigma_u^2)$

Table 3.3 summarizes the estimation results for the sessions with "communication" and "no communication" separately. In the communication sessions, the wages are in general elevated. The reference category is the "low productivity" firm which offers significantly more when communication takes place. Medium and high types offer even higher wages. However, the information regime (PUB, PUBmedium, PUBhigh not statistically significantly different from 0.) does not seem to make much of a difference. In the absence of communication, wages are pulled down substantially. More productive firms separate themselves by offering higher wages, once again the estimates do not depend on the information regime.

(Table 3.3)

3.3.2 Effort Decision

Based on figure 3.2, the information structure does not have a clear effect while the pre-play communication substantially increases average effort.

(Figure 3.2)

To see what determines the effort decision I estimated a couple of different models. Table 4-5 present the results of the parametric model (1). Table 6 shows the results of the semiparametric model (2).

(1) $e_{it} = X'_{it}\gamma + g_i + h_{it}, \qquad u \sim N(0, \sigma_h^2)$

(2) $e_{it} = G(w) + c_0 + X_1\beta_1 + X_2\beta_2 + \epsilon_{it}$

Table 4 confirms that workers respond to wages more than any other factor in the model. They exert more effort in response to a dollar increase at a decreasing rate. The desired effort is also significant in explaining the effort decision. The wage effects are statistically the same between communication and no communication sessions. But the desired effort extracts more actual effort when communication is allowed.

(Table 3.4)

The most interesting observation in Table 4 is that the effect of wages in the Public Information sessions (PUBwage) is higher in the absence of communication. Communication increases reciprocity to wages in general; however, full information does not make a significant difference for the worker's decision. The information regime becomes more important when there is no communication. The worker's response to a dollar increase is to provide more effort under full information.

The same model was also estimated only in PUB sessions in order to see the workers' response to different firms under full information. Table 5 confirms that the response to wages is higher on average with communication. The marginal effects of wages are not statistically different among different firms. However under no communication, the reciprocity to wages is higher if the firm has low productivity. The marginal effect of wages on effort is the lowest when the firm has high productivity. The workers appreciate wage increases more if it comes from a low profit/productivity firm, which supports the claims of inequity aversion theory.

(Table 3.5)

To avoid the conventional functional forms of wage, I estimated (2) semiparametrically. A dollar increase in wages is higher if there is full information and communication.

The desired effort is also significant and its effect is slightly higher under full information. These are in line with Table 3.4 and Table 3.5. However, estimation of (2) reveals that the portion of effort that is determined by wage may take different functional forms (Table 3.6). Figures 3.3-3.4 depict $\hat{(}G)$, estimated portion of effort as a function of wage, in different sessions. The findings show that effort is an increasing function of wage in sessions with communication and is almost constant in sessions with no communication.

(Table 3.6) and (Figures 3.3-3.4)

Finally, I measured the marginal effects of different wage quartiles on effort. Table 3.7 shows the results for communication and no communication sessions. The marginal effects are larger under communication and are decreasing as wage increases.

(Table 3.7)

3.4 Conclusion

This chapter studies the role of asymmetric information and communication in short-term labor market relationships. The findings indicate that the level of trust and reciprocity is significantly reduced when there is no contract renewal and no communication. Wage offers are lower and compressed regardless of how workers are informed; whereas, the role of information is much more critical in the second chapter with relational contracts.

Different firms do not separate wage offers if there is no communication. The workers, on the other hand, respond to wages with higher effort under full information. However, this is true only in the absence of communication. Communication brings worker's reciprocity to similar levels across different information regimes. In other words, it mitigates the adverse effects of asymmetric information. Communication puts short-term labor relationships in a social context and increases wages and effort substantially.

3.5 Tables of Chapter 3

Table 3.1: Cost of Effort

Effort level	1	2	3	4	5	6	7	8	9	10
Cost of effort c(e)	0	2	4	5	7	8	10	12	15	18

Table 3.2: Treatments

	No Communication	Communication
Public Information	PUB	CPUB
Private Information	PRT	CPRT

Table 3.3: Dependent Variable: Wage

	Communication		**No Communication**	
medium	10.796***	(6.948)	2.992***	(2.426)
high	11.796***	(3.764)	8.109***	(2.429)
PUB	0.830	(6.948)	1.243	(2.989)
PUBmedium	-1.646	(5.336)	0.230	(3.361)
PUBhigh	7.400	(5.449)	-4.428	(3.363)
constant	36.847***	(4.898)	14.389***	(2.152)

Random-effects GLS. $\chi^2(6) = 33.42$ for 'Communication', $\chi^2(6) = 14.35$ for 'No Communication'. Controlled for session effects. Standard errors in parentheses. $***$: $p<0.01$, $**$: $p<0.05$, $*$: $p<0.10$

Table 3.4: Dependent Variable: Effort

	Communication		**No Communication**	
w	0.141***	(0.013)	0.084***	(0.012)
w^2	-0.001***	(0.000)	-0.001***	(0.000)
PUBwage	0.004	(0.009)	0.047***	(0.006)
PUB	-0.032	(0.582)	-0.313	(0.237)
$\tilde{e}$	0.124***	(0.044)	0.069***	(0.028)
constant	0.264	(0.469)	0.223	(0.222)

Random-effects GLS. $\chi^2(6) = 454.81$ for 'Communication', $\chi^2(6) = 237.92$ for 'No Communication'. Controlled for session effects. Standard errors in parentheses. $***$: $p<0.01$, $**$: $p<0.05$, $*$: $p<0.10$

Table 3.5: Dependent Variable: Effort in PUB Treatment

	Communication		**No Communication**	
wage	0.930***	(0.008)	0.068***	(0.008)
mediumwage	0.000	(0.006)	-0.012	(0.008)
highwage	-0.011***	(0.007)	-0.024***	(0.008)
$\tilde{e}$	0.131***	(0.060)	0.103***	(0.035)
constant	0.415***	(0.203)	0.327	(0.459)

Random-effects GLS. $\chi^2(6) = 169.88$ for 'Communication', $\chi^2(6) = 68.40$ for 'No Communication'. Controlled for session effects. Standard errors in parentheses. $***$: $p<0.01$, $**$: $p<0.05$, $*$: $p<0.10$

Table 3.6: Semiparametric Estimation 1-Effort

	Communication		**No Communication**	
period	-0.038***	(0.005)	-0.032***	(0.004)
$\tilde{e}$	0.162***	(0.012)	0.137***	(0.014)
PUB	-0.362***	(0.021)	-0.539***	(0.082)
PUBwage	0.015***	(0.001)	0.044***	(0.002)

Standard errors in parentheses. $***$: $p<0.01$, $**$: $p<0.05$, $*$: $p<0.10$

Table 3.7: Semiparametric Estimation 2-Marginal Wage Effects

	Communication	**No Communication**
$0 < w \leq 10$	1.339	0.579
$10 < w \leq 20$	1.108	0.554
$20 < w \leq 50$	0.841	0.173
$50 < w \leq 100$	0.780	0.073

3.6 Figures of Chapter 3

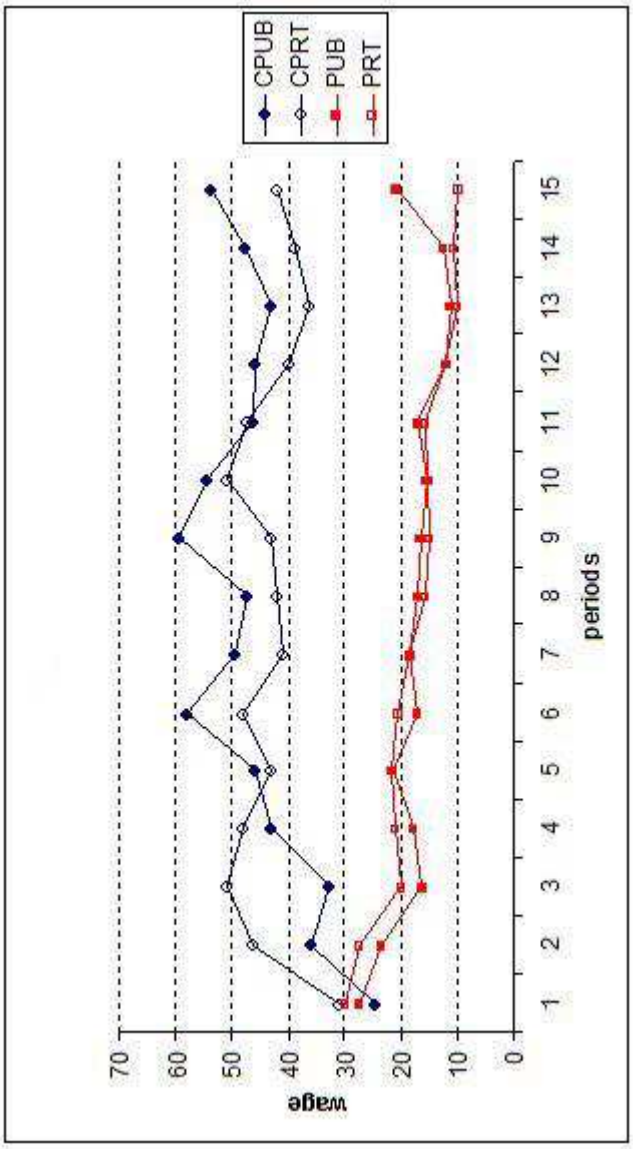

Figure 3.1: Average Wage

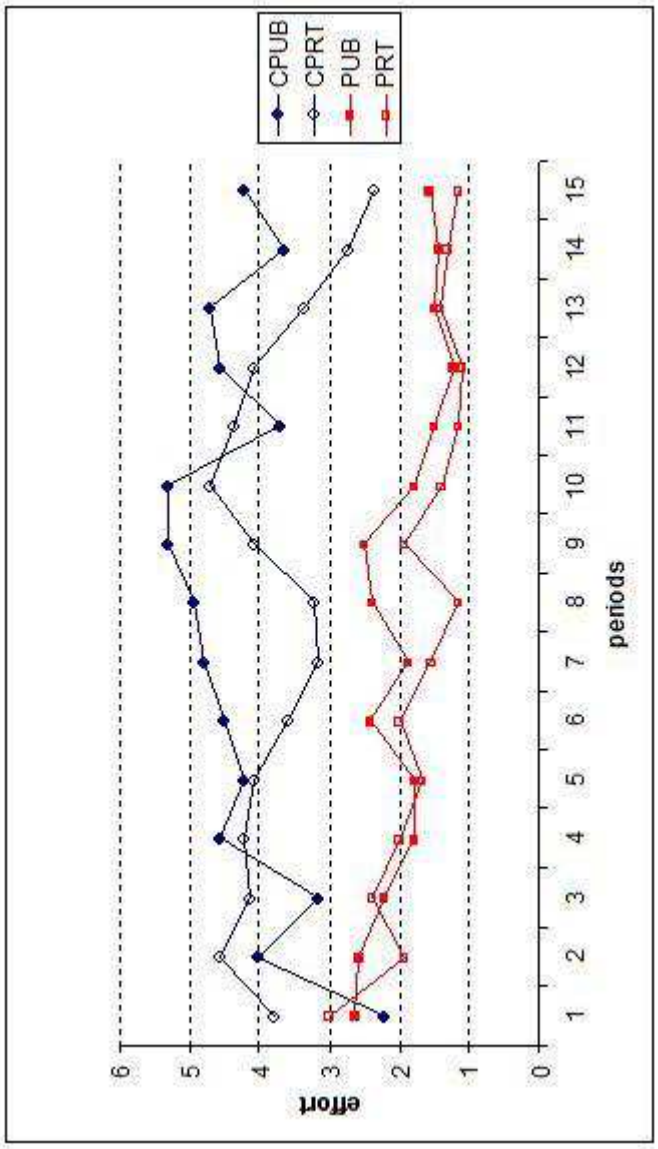

Figure 3.2: Average Effort

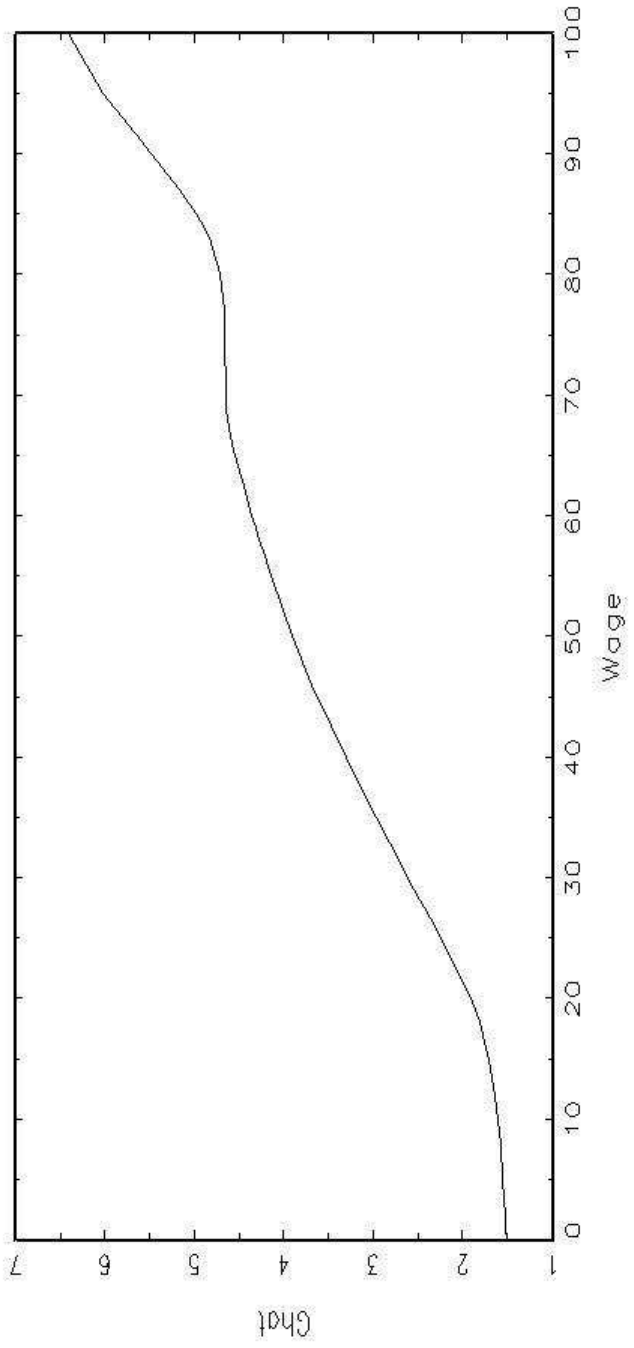

Figure 3.3: $\hat{G}$ in Communication

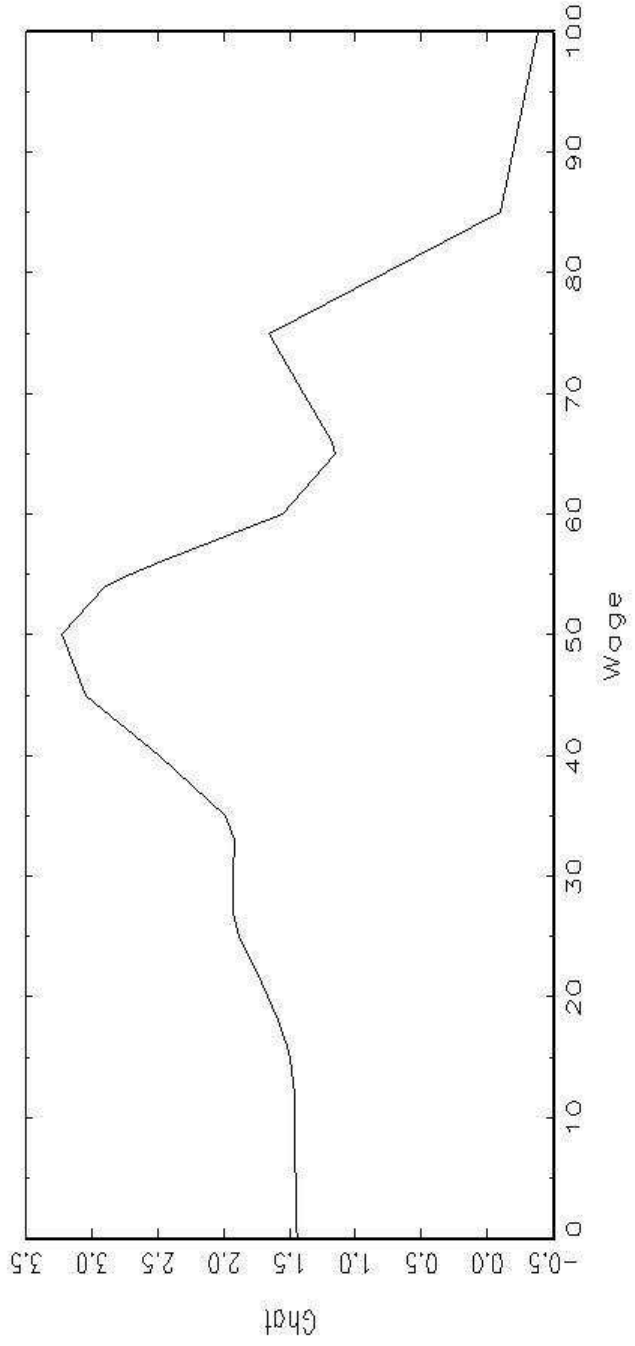

Figure 3.4: $\hat{G}$ in No Communication

Chapter 4

Occupational Choice And Labor Market Performance

4.1 Introduction

Effects of Communication on Trust and Reciprocity In The Labor Market This chapter examines the occupational choice between working for wages and entrepreneurship when people differ in their ability as entrepreneurs. With this paper, I experimentally study policies that may lead to more efficient occupational choices by agents and economy-wide welfare gains. The experiment accounts for differences in entrepreneurial talent and overconfidence among entrepreneurs. The key finding of this chapter is that policies that improve worker's welfare also potentially improve the terms for entrepreneurs. However, these policies become less effective when overconfidence among entrepreneurs is taken into account.

Entrepreneurs are believed to play a crucial role for aggregate productivity and welfare. Job growth heavily relies on small businesses in the U.S. which generate about two thirds of new jobs every year. According to BLS, the number of entrepreneurs has been decreasing since 2000. In 2009, 15.3 million individuals were self-employed with the the share of entrepreneurs to U.S. labor force around 10.9% (Hipple, 2010). BLS defines "the self-employed" as who they work for themselves in an unincorporated business for their main job. On the other hand, entrepreneurs are the ones who carry out innovations and come up with new ways to use factors of production (Schumpeter, 1934). In this chapter, the terms "self-employed" and "entrepreneur" are used interchangeably as is the case in most studies in the literature.

The experimental design is based on the seminal work of Ghatak, Morelli and

Sjöström, 2007 (referred to as GMS henceforth). GMS[1] provide a general equilibrium model of occupational choice that provides profound insights on the topic.

Instead of the number of entrepreneurs, GMS focus on the quality of entrepreneurial activity in an economy. Some of the basic assumptions of the model are as follows: First, agents are assumed to have different levels of entrepreneurial talent. This is represented by a probability of success as an entrepreneur. Second, talent is unobservable to creditors. Starting up a new business requires credit and the probability that a loan is repaid depends on the unobserved talent of the entrepreneur. Due to the lack of a screening device[2], the interest rate is inversely related to the average quality of all entrepreneurs. Therefore, the existence of untalented entrepreneurs creates a burden on talented entrepreneurs. Agents live for two periods. Everyone works for fixed wages in the first period. In the second period, they choose between remaining workers and becoming entrepreneurs.

GMS propose a mechanism through which agents sort themselves into occupations more efficiently. Some of the key predictions of the model are:

1. The returns to different occupations depend on the average talent of entrepreneurs.

2. The adverse selection problem can be remedied by policies that improve the outside option of entrepreneurs, *i.e.* returns to being a worker.

3. Following a wage increase, agents with the least entrepreneurial ability remain as workers. This raises the quality of the pool of entrepreneurs and reduces the interest rate. Another example could be imposing higher taxes on entrepreneurs.

4. GMS call this the "the pool quality effect" due to which talented entrepreneurs see better opportunities in the credit market. They may even expand their businesses at higher wages.

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[1]The predictions listed in this article are based on a partial analysis of the labor and the credit markets. The authors also present a detailed discussion of interactions between the product and the labor markets.

[2]GMS also discuss the case with screening options. The current experiment is limited to the no-screening case for the purposes of design.

Finding naturally occurring data to test these predictions is almost impossible. Instead, one can control for individual characteristics such as talent, and market conditions such as wages and taxes in a synthetic environment.

The experimental findings provide strong support for some of these predictions by GMS[3]. If the tax rates on entrepreneurs and the working wages are raised, the entry into entrepreneurship slows down significantly. This increases the average quality of the entrepreneurs. The average success rate among entrepreneurs significantly increases when a high wage-high tax regime is adopted. Consequently, the credit markets offer better interest rates to potential entrepreneurs due to higher average success rates. The entrepreneurs are able to borrow more under the high wage-high tax regime. On the other hand, overconfidence exists among potential entrepreneurs. This diminishes the positive effects of high wage and high tax policies. The average rate of success is lower with overconfidence, which only worsens the adverse selection problem in the credit market.

4.2 Background and Literature Review

Several models of occupational choice discuss economy-wide impacts of entrepreneurship. The examples include Evan and Dean (2002) and Levesque et al. (2002) both of which analyze agents risk attitudes toward risk, work effort and independence. Lazear (2004) introduces individual heterogeneity, i.e. different levels and types of skills in his entrepreneurship model. Other studies have broader perspectives, for instance Banerjee and Newman (1993) focus on the consequences for economic development.

GMS differs from earlier studies with a general equilibrium model that links individual heterogeneity and total welfare. The exogenous talent variation for occupational choice dates back to Roy (1951). Roy discusses the economic implications of exogenous ability for occupational choice, the structure of wages and the distribution of earnings. Willis (1985) provides a version of the Roy model as background for the ability bias and self-selection in educational choice. The model predicts that the self selection process

[3]The experimental setup is not suitable to test whether entrepreneurs expand their business at higher wages. By design, the entrepreneurs do not hire real workers or pay real wages in the experiment.

produces an efficient allocation of resources. The supply of efficiency units is maximized in one occupation that requires a certain degree for any given supply of efficiency units in another occupation that requires a different degree. This happens as individuals sort themselves into education and occupations according to their comparative advantages.

Jovanovic (1994) analyzes a version of the Roy model with known managerial abilities. Poschke (2008) extends this model with uncertainty about firm's productivity and by agent's ability to search for a good project. The main prediction is that individuals with high or low ability are more likely to become entrepreneurs. Poschke argues that entrepreneurs come from extreme educational backgrounds as opposed to the common belief that only high ability workers enter into the occupation. Selection into entrepreneurship from the extremes of the ability distribution naturally explains why the variance of returns to entrepreneurship is so much higher than the variance in wages. In addition, the model provides a plausible rationale for the existence and persistence of small firms. Poschke claims that model's prediction that low-ability entrepreneurs are more selective in their search for a good project is supported well by data.

Earlier studies by Evans and Leighton (1989) show that lower wage workers are more likely to enter into self-employment all else equal. However, Poscke suggests a U-shaped relationship between worker's ability and the choice of self-employment. He argues that low ability agents face low wages and have low opportunity cost of starting a firm. If the entry cost is not too high, they might find it worthwhile to start a firm. Recent findings based on the Global Entrepreneurship Monitor suggest that the share of nascent entrepreneurs differ widely between countries (Wagner, 2007). According to Wennekers et al. (2005), the relationship between country's economic development and the share of nascent entrepreneurs is also U-shaped. The share of entrepreneurs decreases with the social security costs as a ratio of GDP.

A number of theoretical models of entrepreneurship address the implications of quantity and quality of entrepreneurs (Banerjee and Newman, 1993, DeMeza and Webb, 2000). GMS (2007) goes beyond the classic models of occupational choice with the outside option of entrepreneurs as a function of the average quality of the entrepreneurs, so

called 'the pool quality effect' by the authors. The policy implications of the model are in the same vein as those of the Scandinavian model [4]. Increases in wages or taxes improves the welfare of all agents through the pool quality effect by mitigating the adverse selection problem. However, if the outside option is exogenous, taxing entrepreneurs is no longer optimal.

The role of the credit market constraints in limiting entry to entrepreneurship is well-documented (Evans and Leighton, 1989, Blanchflower and Oswald, 1990). Evans and Leighton (1989) find that people with greater assets are more likely to switch to entrepreneurship. Having controlled for ability, Blanchflower and Oswald (1990) show that financial constraints still matter. Boadway and Marceu (1998) explore the impacts of asymmetric information that affect entrepreneurship and unemployment in the economy. Part of their analysis focus on the information problem in the credit market. As banks engage in credit rationing therefore the number of entrepreneurs increases. Since successful entrepreneurs can hire too little capital and therefore too little labor, unemployment increases. The government intervention in this case can be in the form of a tax or subsidy with ambiguous implications.

According to the State of the Small Business Economy (2008), credit constraints create major anxiety among business owners. They are observed to become less wiling to borrow, hire new workers or invest in new capital and equipment. In the meantime, the single most important problem is reported as taxes, along with the cost and availability of health insurance. Even though the bulk of the research has focused on tax rates, the main issue for business owners remains to be the non-rate taxes, such as depreciation rules and health insurance deductibility.

Bruce and Schuetze (2004) utilize panel data to study the long-term consequences of self-employment. They find that the self-employment experiences are usually brief and they reduce the average wages upon return to wage employment. Therefore, efforts

[4]In the Scandinavian model, the core is the broad public participation on various areas of economics and social life to unite the population instead of dividing it into "who gets the benefit" and "who has to pay for it". The goal is to set egalitarian institutions which not only give the poor access to a minimum standard of income and services, but also bring those who would have been poor closer to the general standard of the society, bring about some overall redistribution of income and other resources (Erikson, 1987).

to improve entrepreneurial activity may reduce the adverse effects of switching back to wage employment. The interplay between tax policy and entrepreneurial activity has attracted great deal of attention. Even though taxes are considered as disincentives for survival and success, the empirical evidence is mixed. Caroll et al. (2000) show that individual income taxes exert a statistically significant influence on the probability that an entrepreneur hires workers. Similarly, Bruce and Gurley (2005) use longitudinal data and find that marginal tax rates have negative effects on the entry and the exit rates of entrepreneurs and the duration of entrepreneurship. On the other hand, Bruce and Deskin (2012), argue that the state taxes have minor influences on entrepreneurship, and tax policies are not effective tools for altering entrepreneurial activity significantly. Authors argue that one possible explanation is the ease of tax avoidance for the self-employed.

Finally, individual characteristics and attitudes are major factors for the quality and the quantity of entrepreneurs in an economy (e.g. Wagner, 2007). Men with greater assets are more likely to choose self-employment (Evans and Leighton, 1989), while the probability to switch into self-employment decreases by age (Reynolds et al. 2001). With regards to the attitudes, overconfidence and optimism has been shown to exist among entrepreneurs (Camerer and Lovallo, 1999). According to Reynolds et al. (2001), when asked, the greater share of nascent entrepreneurs reported that "fear of failure is not a problem for them" and "they have the right skills to run a successful business".

This chapter contributes to the literature in a few different ways. First, this is the first experiment to study occupational choice both at the micro and macro scales to the best of my knowledge. It starts from agent's decisions and tests broader policy implications. Second, the experiment accounts for certain behavioral attributes of entrepreneurs, such as overconfidence, and checks the robustness of these implications.

4.3 Experimental Design

40 Rutgers undergraduate students participated in two experimental sessions [5]. There were four different market structures in the experiment. Table 4.1 summarizes the characteristics of all markets.

(Table 4.1)

Each session consisted of 40 periods. The first 32 periods of a session were designed to test certain policy effects **(The Baseline Treatment)** and the remaining 8 periods were designed to test the effects of overconfidence among entrepreneurs **(The Overconfidence Treatment)**. Below I describe what happens in a period and a session.

4.3.1 Periods 1-32: The Baseline Treatment

There were four market scenarios (Table 4.1) in the baseline treatment. Each market consisted of 8 periods. Periods were independent and each one represented a new life in the labor market. In a given period, agents lived for two stages. Everyone started out as a worker in stage 1 and received an hourly wage (w_1). Then they were given the options of becoming an entrepreneur and remaining as a worker in second 2. Once stage 2 was over, the next period started. All agents started from zero and the above process was repeated every new period.

Going into stage 2, the workers were informed about:

1. Whether stage 2 wage (w_2) was selected form a set of low wages ($w_L \in \{20, 21, ..., 40\}$) or a set of high wages ($w_H \in \{41, 42, ..., 60\}$).

2. That success as an entrepreneur was not guaranteed and every agent had a probability of success (θ) and $\theta \in \{0.1, 0.2, ..., 0.9\}$.

3. Their own probability of success (θ), privately, if they chose to become an entrepreneur. (Note that θ represents agent's talent as an entrepreneur.)

[5]The experiment took place at Rutgers University Gregory Wachtler Experimental Economics Laboratory. A session took approximately half an hour. The participants used experimental currency units (ECU), and were paid in dollars at the end of the experiment. The average payment was around $25-$30.

4. Whether they would be taxed by a rate selected from a set of low tax rates ($t_L \in \{0.10, 0.20\}$) or a set of high tax rates ($t_H \in \{0.30, 0.40\}$), if they choose to become and succeed as an entrepreneur.

***Becoming an entrepreneur*:** In order to become an entrepreneur, the participants had to make a minimum investment of 40 ECU's in the second stage. To make their total investment (I), they could use their first period earnings (c out of w_1). They could also borrow from the bank at the interest rate of r.

Since entrepreneurial talent was not observable to the banks, and with no screening mechanisms, the interest rate was determined by the average success probability of entrepreneurs in the second stage.
Specifically, $r = 0.1/average(\theta)$.

After they made their investments, the program informed the entrepreneurs about whether their business was successful or not. If they succeeded, their investments were multiplied by 4; and, if they failed, they lost the investment and paid back everything they owed to the bank.

Total payoff for the worker: $\pi_w = w_1 + w_2$

Total payoff for the entrepreneur:

$$\pi_e = \left\{ \begin{array}{ll} (w_1 - c) + (1-t)4I - (1+r)(I-c), & \textit{with probability } \theta; \\ (w_1 - c) - (1+r)(I-c), & \textit{with probability } 1-\theta. \end{array} \right\}$$

where,

π_w: payoff for the worker

π_e: payoff for the entrepreneur

θ: probability of success w_1: wage in stage 1

w_2: wage in stage 2

t: tax rate on entrepreneurial gains

I: total investment by the entrepreneur

c: self-financed investment

r: interest rate on loans

4.3.2 Periods 33-48: Overconfidence Treatment

The last 16 periods of the experiment was to measure the degree and the impacts of overconfidence among entrepreneurs. Two markets were randomly selected for this final part.

The key feature here is that the participants created their own probabilities of success instead of being assigned one by the program, in a similar fashion as Camerer and Lovallo's (1999) overconfidence treatment. First, the participants were asked to answer 20 SAT questions, which was a mix of sentence completion and basic algebra questions, in 15 minutes. They were able to go back and forth through questions and change answers before submitting.

Once everyone submitted their answers, they were ranked according to the number of correct answers they had. These rankings then determined the probabilities of success. At the beginning of the experiment, the experimenter told the participants how this procedure works. However, until the end of the experiment they did not know their rankings, success probabilities or whether they were successful in a given period.

After submitting their answers, the participants were asked to report their expectations on how they performed and what their success probability would be. The overconfidence variable was then created by taking the difference between the expected and the actual probabilities of success.

4.4 Findings

Table 4.2 shows some basic findings on the frequency of entrepreneurship, average interest rate and average success rate under different regimes. There are significant differences between Market 1 (low wages-low taxes) and Market 4 (high wages-high taxes). In the overconfidence treatment, these differences become less obvious. Notice that in the overconfidence treatment, agents receive success probabilities (θ) based to their performances in the competitive task of answering a set of SAT questions.

(Table 4.2)

Table 4.3 is the probit regression of entry into entrepreneurship. The probability of switching into entrepreneurship is lower in the reference category (Market 4) with w_H and t_H. As we move to Market 1 with w_L and t_L, the probability of becoming an entrepreneur increases. However, the difference between markets 2 and 3 is not significantly different. Individual effects of wages and taxes can be seen more clearly in Table 4.4. A dollar wage increase decreases the probability by 0.015. Compared to the reference category (high tax regime), low tax rates increase this probability by around 0.50.

(Tables 4.3-4.4)

The lowest interest rates are observed in Market 4; while other markets end up with higher interest rates (Table 4.5). Likewise, the average success rate of entrepreneurs is the highest in Market 4, consistent with the prediction that the least talented entrepreneurs drop out as the policies are relatively more in favor of the workers (Table 4.5).

(Tables 4.5)

As far as borrowing is concerned, the only significant effects are due to θ and the tax rate. Entrepreneurs with high ability borrow more and lower tax rates increase borrowing; while, wages do not have a major effect (Table 4.6).

(Table 4.6)

The Overconfidence Treatment is different from the Baseline with regards to how "ability" (θ) is determined. Following the first 32 periods, the participants competed in a real task before the session started and were not informed about their performances until the end of the experiment. θ was calculated based on their rankings in the competitive task. The variable "overconfidence" is the difference between the participants' beliefs and their actual rankings. Overconfidence is present among agents who choose to become entrepreneurs (Table 4.7).

(Table 4.7)

On average, agents are more likely to choose entrepreneurship in the Overconfidence Treatment. The wage effect is almost absent. On the other hand, lower tax rates increase the probability more than they do in the Baseline Treatment (Table 4.8). Overconfidence and actual SAT scores increase the probability of becoming an entrepreneur; although, these effects are not statistically significant.

(Table 4.8)

4.5 Conclusion

This chapter analyzes the occupational choice between working for wages and entrepreneurship from an experimental perspective. The experiment is based on Ghatak, Morelli and Sjostrom (2007). The set-up allows for different levels of entrepreneurial talent across individuals which leads to an adverse selection problem and hurts talented entrepreneurs in the credit market.

The findings show that increasing wages for workers and/or taxes on entrepreneurs reduces the number of entrepreneurs in the market. Only the talented agents switch to entrepreneurship after being a worker. The average success rate among entrepreneurs significantly increases when a high wage-high tax regime is adopted. The credit market offers better interest rates to potential entrepreneurs due to higher average success rates. However, overconfidence is present among entrepreneurs. Potential effects of wage and tax policies are smaller when overconfidence is accounted for.

While it is hard to identify these effects using real data, this chapter provides evidence for individual occupational choice and implications for the labor market in general. However, the experiment has certain limitations. In particular, the analysis is limited to an "individual decision-making" game. Further analysis requires an extension of the current experiment which would capture actual interactions between entrepreneurs and workers in the lab.

4.6 Tables of Chapter 4

Table 4.1: Market Characteristics

	Low Tax (t_L)	High Tax (t_H)
Low Wage (w_L)	Market 1	Market 2
High Wage (w_H)	Market 3	Market 4

Table 4.2: Descriptive Statistics

	Market 1	**Market 4**	**Overconfidence Treatment**
Entrepreneurship	57%	38%	55%
Interest Rate	19%	12%	23%
Success Rate	46%	68%	44%

Table 4.3: Baseline Treatment

Dependent Variable: Pr{Entrepreneurship}		
Market 1 (w_L, t_L)	0.954^{***}	(0.135)
Market 2 (w_L, t_H)	0.302^{***}	(0.130)
Market 3 (w_H, t_L)	0.330^{***}	(0.134)
θ	5.436^{***}	(0.273)
Constant	-3.370^{***}	(0.210)

N=1280. Probability to choose entrepreneurship: Random-effects Probit $\chi^2(4) = 400.27$.
$***$: $p<0.01$, $**$: $p<0.05$, $*$: $p<0.10$

Table 4.4: Baseline Treatment

Dependent Variable: Pr{Entrepreneurship}		
$wage_1$	-0.015***	(0.003)
$t_{0.10}$	0.607***	(0.131)
$t_{0.20}$	0.458***	(0.117)
$t_{0.30}$	0.079	(0.147)
θ	5.446***	(0.273)
Constant	-2.639***	(0.227)

N=1280. Probability to choose entrepreneurship: Random-effects Probit $\chi^2(4) = 401.61$.
$***$: $p<0.01$, $**$: $p<0.05$, $*$: $p<0.10$

Table 4.5: Baseline Treatment

	Interest Rate		**Average Success Rate**	
Market 1 (w_L, t_L)	0.0128***	(0.0011)	-0.047***	(0.0047)
Market 2 (w_L, t_H)	0.0078***	(0.0011)	-0.033*	(0.0050)
Market 3 (w_H, t_L)	0.0038***	(0.0011)	-0.013***	(0.0051)
Constant	0.1454***	(0.0007)	0.690**	(0.0037)

Interest rate and average success rates: Linear estimation. Controlled for session effects.
Standard errors in parentheses. $***$: $p<0.01$, $**$: $p<0.05$, $*$: $p<0.10$

Table 4.6: Baseline Treatment-Entrepreneurs

Dependent Variable: Borrowing		
t_L	4.027^{***}	(1.993)
$wage_1$	0.056	(0.344)
$wage_L$	-3.754	(10.576)
θ	70.264^{***}	(0.008)
interest rate	-58.457	(73.595)
constant	-4.604	(24.050)

Random-effects GLS. $\chi^2(5) = 170.87$.
Controlled for session effects.
Standard errors in parentheses. $***$: $p<0.01$, $**$: $p<0.05$, $*$: $p<0.10$

Table 4.7: Overconfidence

	Mean	Std Error
Workers	0.071	0.082
Entrepreneurs	0.168	0.012

Table 4.8: Overconfidence Treatment

Dependent Variable: Pr{Entrepreneurship}		
$wage_1$	-0.0001	(0.011)
$t_{0.10}$	0.788***	(0.169)
SAT score	0.075	(0.057)
overconfidence	0.476	(0.624)
constant	-1.282	(1.144)

N=320. Probability to choose entrepreneurship: Random-effects Probit $\chi^2(4) = 24.20$.
$***$: $p<0.01$, $**$: $p<0.05$, $*$: $p<0.10$

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