Reciprocity in Labor Relationships

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Zusammenfassung


Abschnitt 1. Das Modell in Abschnitt 1 untersucht identische, profitmaximierende Firmen, die aus einem Arbeitsplatz bestehen und in einem Arbeitsmarkt mit Suchfraktionen um Arbeiter konkurrieren, die heterogene reziproke Präferenzen aufweisen. Wenn eine Firma einen Arbeiter rekrutieren kann, kann dieser eine beobachtbare aber nicht verifizierbare Anstrengung erbringen, um ein Anstrengungsergebnis zu produzieren. Zur Motivation des Arbeiters bietet die Firma einen linearen Anreizvertrag. Mit vollkommener Information über die sozialen Präferenzen der Arbeiter, z.B. durch geeignete Auswahlverfahren, kann die Firma den bevorzugten Arbeiter identifizieren. Folglich teilt sich der betrachtete Arbeitsmarkt in Subarbeitsmärkte auf, die durch den entsprechenden Arbeiter-Typ und den dazugehörigen, von der Firma angebotenen erwarteten Lohn charakterisiert sind. Da die Firmen jedoch als identisch angenommen werden, präferieren sie denselben Arbeiter-Typ, was dazu führt, dass Firmen Warteschlangen bilden, um
die besten Arbeiter anzuheuern.


Die Modellergebnisse legen nahe, dass bei Beobachtbarkeit der Arbeitertypen, eigen-


Selbst unter Nichtbeobachtbarkeit der Agententypen kann der Prinzipal von geringeren Beschäftigungskosten ohne Überwachung profitieren, indem er separierende Verträge anbietet. Verträge mit Leistungsüberwachung bieten dann immer höhere Löhne als Verträge ohne Leistungsüberwachung, da die Löhne bei den Letzteren so weit abgesenkt werden können, dass sowohl Leistungserbringung als auch Selbstselektion erfüllt sind, wenn reziproke Agenten Entscheidungsfreiheiten wichtig genug sind. Dieses Ergebnis gilt ebenso, wenn ein kompetitiver Arbeitsmarkt in Verbindung mit alternativen Bewer-
Abschnitt 3. Das Modell in Abschnitt 3 betrachtet eine Moral-Hazard-Situation mit einem Manager (Firma) und einem Arbeiter. Sowohl der Manager als auch der Arbeiter können entweder eigennützig oder reziprok sein. Der Manager bietet dem Arbeiter eine Beteiligung an den Unternehmensergebnissen an. Abhängig von der Manager-Arbeiter-Kombination können sich die angebotenen Verträge von Firma zu Firma unterscheiden, was manche Firmen trotz einheitlicher Produktionstechnologie profitabler macht. Ein rein reziprokes Manager-Arbeiter-Team ist dabei durch eine höhere Arbeiterbeteiligung und ein höheres Anstrengungsniveau des Arbeiters charakterisiert als ein Team aus reziprokem Arbeiter und einem eigennützigen Manager, wenn der Arbeiter positiv reziprok ist. Dagegen bieten beide Manager-Typen eigennützigen Arbeitern eine niedrige Gewinnbeteiligung, weil die Manager antizipieren, dass eigennützige Arbeiter im Gegensatz zu positiv reziproken Arbeitern nicht bereit sind, eine höhere Beteiligung durch überproportional hohe Anstrengung zu belohnen.

Summary

Numerous economic experiments suggest that a substantial part of individuals exhibit reciprocal preferences. It is also well documented in the economic literature that reciprocity plays an important role in employment relationships. As a source of gift exchange between employer and employee, positive reciprocity offers a prominent explanation for non-minimal wage offers and effort choices beyond the selfishly rational minimum effort. On the other hand, negative reciprocity can result in shirking and sabotage activities.

The focus of this thesis lies on the significance of reciprocal preferences for labor market outcomes and employment conditions. It comprises three independent research papers and is organized as follows: Section 1 theoretically investigates the labor market success of workers with heterogeneous reciprocal preferences in a competitive search equilibrium. Section 2 proposes a theoretical model to explain hidden costs of control based on heterogeneous reciprocal preferences of workers. The model presented in Section 3 explores the matching between heterogeneous reciprocal employers and workers in a Principal-Agent setting and the corresponding implications for the profitability of different matches. Concluding remarks and perspectives can be found in Section 4.

Section 1. The model presented in Section 1 examines identical profit-maximizing firms that consist of one job and compete for workers with heterogeneous preferences for gift exchange in a labor market with search frictions. If a firm is successful in hiring a worker, the latter can exert observable but non-verifiable effort to produce output. To motivate the worker, the firm offers a linear incentive contract. With perfect information about workers' social preferences, e.g., due to screening, the firm can identify the worker it wants to hire. As a consequence, the considered labor market divides into several sub-markets, where each sub-market is characterized by the type of worker and the expected wage he is offered by the firm. If firms are identical, they prefer to hire the same type of worker, which results in waiting queues of firms for the best types.

I show that in the described labor market reciprocal workers with higher reciprocity concerns are approached by more firms than workers with lower reciprocity concerns. Thus, they find a job more quickly, get higher expected wages, and exert higher efforts compared to low reciprocity types. These results are in line with empirical studies showing that positively reciprocal workers are associated with higher wages, efforts, and a higher probability to be employed compared to selfish workers. The presented model
further suggests that labor market regulations in form of binding minimum wages result in lower profits for firms in the corresponding labor market. Consequently, fewer firms engage in the labor market which implies a higher unemployment rate and more long-term unemployed workers.

To the best of my knowledge, this model is the first attempt to introduce social preferences as well as linear incentive contracts into a competitive search model. In the presented model workers’ heterogeneous reciprocity concerns affect the provision of incentives in ex ante homogeneous firms and thus represents a different approach to explain output differentials compared to traditional labor search models. In those models productivity differentials are either captured by random firm- or match-specific outputs or heterogeneous worker types by simply assuming that higher types produce higher output or have lower opportunity costs of labor captured by different unemployment benefits. In contrast, the model presented here is based on incentives provided by optimal contracts and workers’ heterogeneous reactions to these incentives.

SECTION 2. In Section 2, I consider a moral hazard setting where agents with heterogeneous reciprocal preferences based on Self-Determination Theory as proposed by psychological literature can choose whether to shirk or to work. The agent’s choice is restricted to a binary variable to capture the idea that some jobs leave only little scope for agents to choose their effort. Moreover, depending on the production process, agents might not be able to increase their productivity by exerting more effort.

The model results suggest that with observable agent types, selfish agents are always monitored while with reciprocal agents monitoring is not always necessary to ensure effort provision. The reason is that without monitoring, the principal’s contract offer is perceived as more friendly by a reciprocal agent which provides incentives for the agent to reciprocate by choosing high effort. These additional incentives from gift exchange can be high enough to balance shirking incentives such that the trust strategy dominates the control strategy. Whether monitoring and pay are substitutes or complements depends on the agent’s reciprocal preferences. Thus, heterogeneous reciprocity concerns can serve as an explanation for mixed empirical results on the relationship between monitoring and wages.

In addition, reciprocity and self-determination have important implications for the complementarity of optimal firm policies. For example, The presented model can explain why white collar jobs tend to offer more discretion than blue collar jobs. The reason is
that white collar jobs are associated with higher monitoring expenses compared to blue collar jobs. Higher monitoring costs imply higher distrust if monitoring is introduced. Consequently, an introduction of monitoring affects the principal’s friendliness stronger in white collar jobs compared to blue collar jobs which results in more discretion for the former and less for the latter in equilibrium. Moreover, the interdependence of monitoring and pay results in a complementarity between a firm’s recruiting policy and the discretion it offers to its workers which might explain why firms undertake considerable recruiting efforts that are designed not only to screen for ability but also the willingness to perform well.

Even with unobservable agent types the principal can benefit from lower employment costs under full discretion contracts by screening for applicant’s type with separating contracts. Monitoring contracts then always offer higher wages than full discretion contracts because wages under non-monitoring contracts can be reduced to an extent which ensure both, effort provision and self-selection, if agents care enough about not being monitored. This result also holds when introducing a competitive labor market and alternative screening devices.

**SECTION 3.** The model presented in Section 3 is based on a moral hazard setting with one manager (firm) and one worker. Both, manager and worker, can either be selfish or reciprocal. The manager offers a contract that lets the worker participate in output. Depending on matching, the offered contracts can differ among firms, making some firms more profitable than others although the production technology remains unchanged. I show that a purely reciprocal match is characterized by a strictly higher output share for the employee and a strictly higher effort, as compared to a mixed match led by a selfish manager if the worker is positively reciprocal. In contrast, both manager types offer the same low share to a selfish worker because they anticipate that selfish workers will not provide costly gifts.

Both manager types can increase their utilities by employing highly positively reciprocal workers, while the workers’ preferences for managers are only based on the size of the offered share of output but not on the type of employer. In the competition subsection, I focus on managers’ preference for the favored reciprocal workers to investigate its implications for the labor market. I introduce a labor market without frictions where the total number of workers available exceeds the total number of vacancies in the market but the share of highly positively reciprocal workers is not sufficient to fill all vacancies.
In this setting, competing managers might offer higher shares than without competition to attract highly positively reciprocal workers. The resulting competitive matching allocates those preferred reciprocal workers to reciprocal managers. Consequently, all scarce preferred reciprocal workers will be employed, while selfish workers, followed by unfavored reciprocal (i.e., less positively and negatively reciprocal) workers are only hired if there are still vacant jobs in the market. This result is in line with empirical studies that find that, compared to selfish workers, positively reciprocal workers are associated with higher wages, higher efforts, and a higher probability to be employed, while negatively reciprocal workers are associated with lower efforts, and a lower probability to be employed.
1 Optimal Contracting with Reciprocal Agents in a Competitive Search Model

1.1 Motivation

Firms invest a lot of money and time in screening and hiring activities to find suitable employees. They do so because workers are heterogeneous and gains can be realized by picking the right applicant. Psychological literature suggests that workers can differ in two main dimensions: job-related cognitive traits (“Can-dos”) and personality traits (“Will-dos”). While the former “Can-dos” are concerned with an individual’s ability to perform well on the job, the latter “Will-dos” emphasize the individual’s willingness to perform well (see Goffin and Boyd (2009)). A study by Behrenz (2001) indicates that “Will-dos” are a focus of recruiters’ attention and their importance in the recruiting process. Among other questions, 785 Swedish employers were asked “Which characteristic of those invited to the interviews had the greatest importance for the choice of the one finally hired?” The most important characteristics were “Professional competence” (55.7%), “Personal engagement” (27.8%), and “Social competence” (12.8%). Thus, in 40.6% of the cases (“Personal engagement” and “Social competence”) the recruiter’s perception of “Will-dos” rather than “Can-dos” decided about who got the job. The importance of non-cognitive skills for labor market outcomes was also stressed by Heckman et al. (2006) who find that non-cognitive skills predict many outcomes of labor market success equally well and some outcomes even better than cognitive skills.

Whenever a worker’s willingness to perform well comes into play, economists speak of motivation and incentives. But people do not react solely to monetary incentives. Instead, a substantial part of individuals exhibits social preferences that result in actions that cannot be explained by models which only consider monetary motivation (for an overview see Fehr and Schmidt (2006)). Since social preferences can motivate individual behavior, there seems to be a potential relation to “Will-dos”. Although not directly observable, the answers “Personal engagement” and “Social competence” from above might capture at least some aspects of social preferences.

That social preferences do play an important role in employment relationships is well

\footnote{For example in Switzerland, costs to fill a vacancy are on average CHF 13,500 with a maximum of CHF 170,000 as reported by Blatter et al. (2012). While around 70% of these costs are due to decreased productivity during the adaption period of a newly hired worker, the rest of around 30% can be attributed to recruitment and selection, which results in recruitment costs per vacancy of about CHF 4,050 on average.}
documented in the economic literature (for a theoretical treatment see, e.g., Akerlof (1982) and Fehr and Schmidt (2006), for empirical findings Dohmen et al. (2009), and for experimental evidence, e.g., Fehr and Fischbacher (2002)). The direction and the magnitude of incentives resulting from social preferences depend on the kind and the extent of social preferences an individual exhibits. Thus, if the employer’s hiring decision depends on the worker’s individual social preferences, choosing the “right” applicant implies choosing an applicant with a desirable amount of desirable social preferences. The gain from choosing the “right” employee is then realized in the form of enhanced efforts, outputs and profits as compared to the outcomes of an undesirable employee. But what if all firms identify the same type of worker as the best or desirable one? Then competition is likely to occur among the firms which might lead to wage differentials between different worker types and unemployment durations that are driven by heterogeneous social preferences.

The aim of this section is to theoretically explore the connection between workers’ heterogeneous social preferences and their labor market outcomes. I restrict my attention to reciprocity, i.e., the gift workers offer in return for perceived friendly firm behavior (positive reciprocity) or the punishment of the firm’s perceived hostility (negative reciprocity). As a source of gift exchange between employer and employee, positive reciprocity represents a prominent explanation for non-minimal wage offers and effort choices beyond the selfishly rational minimum effort (see, e.g., Dohmen et al. (2009) for empirical findings, and Fehr and Falk (1999) and Charness (2004) for experimental evidence).

My model examines identical profit-maximizing firms that consist of one job and compete for workers with heterogeneous preferences for gift exchange in a labor market with search frictions. If a firm is successful in hiring a worker, the latter can exert observable but non-verifiable effort to produce output. To motivate the worker, the firm offers a linear incentive contract. With perfect information about workers’ social preferences, e.g., due to screening, the firm can identify the worker it wants to hire. As a consequence, the considered labor market divides into several sub-markets, where each sub-market is characterized by the type of worker and the expected wage he is offered by the firm. If firms are identical, they prefer to hire the same type of worker, which results in waiting queues of firms for the best types. Consequently, firms engage in competitive search as modeled by Moen (1997). His concept of the competitive search equilibrium is the underlying equilibrium concept in my analysis and considers markets with fric-
tions where all agents are price takers. However, my approach is different. While Moen (1997) assumes homogeneous workers and exogenous productivity differentials among firms, in my setup there are heterogeneous workers and ex ante homogeneous firms. As a consequence, in contrast to Moen (1997) where workers build queues after observing the wages in the sub-markets, in my model the firms line up for the desired workers and thus determine the probability to fill the vacancy.

I show that in the described labor market reciprocal workers with higher reciprocity concerns are approached by more firms than workers with lower reciprocity concerns. Thus, they find a job more quickly, get higher expected wages, and exert higher efforts compared to low reciprocity types. These results are in line with those reported by Dohmen et al. (2009). Their study analyzes survey data of 20,774 individuals and relates measures of positive and negative reciprocity to the individuals’ actual and future labor market outcomes. Dohmen et al. (2009) show that positively reciprocal workers are associated with higher wages, higher efforts, and a higher probability to be employed compared to selfish workers. The corresponding wage effect of positive reciprocity is substantial: assuming a linear relationship, increased positive reciprocity implies an effect on wages which is about 10% of the size of the gender effect.\footnote{Dohmen et al. (2009) control for various variables - among others, for education, gender, work experience, job tenure, firm size, and industrial sector.}

My model further suggests that labor market regulations in form of binding minimum wages result in lower profits for firms. Consequently, fewer firms engage in the labor market which implies a higher unemployment rate and more long-term unemployed workers.

Macroeconomic models have considered reciprocity before. For example, Akerlof and Yellen (1990) assume that agents have a conception of a fair wage and are willing to provide additional effort if their actual wage exceeds the fair wage. As a result, unemployment occurs if the fair wage exceeds the market-clearing wage. Further, Danthine and Kurmann (2007) analyze a structural model of efficiency wages based on reciprocity and derive general equilibrium implications. In their model, reciprocity is based on Rabin (1993) such that a wage offer is perceived as friendly if it exceeds the reference wage which depends not only on the worker’s outside option but also on firm profits per worker thus incorporating the fairness of the offered rent-sharing. The friendlier the wage offer the higher the effort a worker is willing to exert. Danthine and Kurmann
(2007) find that the more important rent-sharing considerations in the reference wage the more adjustments to shocks are in terms of (un)employment instead of wages thus helping to resolve the so called wage-employment puzzle.\textsuperscript{13} In a following paper, the authors incorporate reciprocity into a dynamic stochastic general equilibrium model and allow the reference wage to additionally depend on wage entitlement (Danthine and Kurmann (2010)). Their estimation of the structural parameters of the model suggests that fairness of the offered rent-sharing and wage entitlement are the most important determinants of wage setting.

To the best of my knowledge, the presented model is the first attempt to introduce social preferences as well as linear incentive contracts into a competitive search model. In the presented model heterogeneous reciprocity concerns affect the provision of incentives in \textit{ex ante} homogeneous firms. This is in contrast to Moen and Rosén (2011) who first investigated linear incentive contracts within a competitive search model. In their setting, output is match-specific due to an exogenous stochastic matching term and firms use wage contracts not only to attract \textit{ex ante} identical workers but also to motivate them. As a result, the firms face a trade-off between extracting rents and providing incentives. This is also true for the model in this section. However, in contrast to Moen and Rosén (2011) the workers in my model are assumed to be \textit{ex ante} heterogeneous and allow for endogenous output differentials due to their responsiveness to incentives which in turn allows for type-dependent unemployment lengths. Reciprocity concerns that affect the provision of incentives in \textit{ex ante} homogeneous firms thus represents a different approach to explain output differentials compared to traditional labor search models. In those models productivity differentials are either captured by random firm- or match-specific outputs (for an overview see, e.g., Rogerson et al. (2005)) or heterogeneous worker types (by assuming that higher types produce higher output as in, e.g., Inderst (2005), or by assuming that more productive types have lower opportunity costs of labor captured by different unemployment benefits as in, e.g., Albrecht and Axell (1984)). In contrast, the model presented here incorporates incentives provided by optimal contracts and workers’ heterogeneous reactions to these incentives into the search framework.

The structure of this section is as follows: Section 1.2 introduces the formal model. Section 1.3 derives the results and extends the basic model by binding minimum wages.

\textsuperscript{13}The wage-employment puzzle refers to the failure of traditional models addressing the volatility of wages and unemployment to produce wage rigidity and large employment reactions observed in the data.
Finally, Section 1.4 concludes. All proofs can be found in Appendix 1.

1.2 Model Setup

1.2.1 Production and Profit Sharing

I consider a labor market with \( n \geq 2 \) different types of workers and a number of firms that is determined endogenously through entry. Workers are assumed to be heterogeneous in the extent to which they experience reciprocity. This heterogeneity is captured by a reciprocity concern \( \rho_i \in [0, 1] \) with \( i = \{S, R_1, ..., R_{n-1}\} \) and generates potentially different expected utility flows \( \Omega_i(w_i) \) whenever the worker is employed in the labor market. Workers are either selfish, i.e., \( \rho_S = 0 \), or reciprocal, i.e., \( \rho_{R_1}, ..., \rho_{R_{n-1}} \in (0, 1] \), and can be ordered according to their reciprocity concerns such that \( \rho_{R_{n-1}} > ... > \rho_{R_1} > \rho_S \). A firm has only one job and by participating in the labor market search the firm tries to fill its vacancy with a worker. As soon as a firm has been matched to a worker, the worker exerts an observable but non-verifiable effort \( e_i \geq 0 \) which comes at a convex cost \( c(e_i) = \frac{1}{2}e_i^2 \) to produce a verifiable output flow that accrues to the firm. The output flow is given by \( \pi(e_i) = e\epsilon_i \) where \( \epsilon \) denotes a random variable with \( \epsilon \in [0, 2] \) and \( E[\epsilon] = 1 \).

To motivate the worker, the firm offers a contract \( \Gamma_i = (\alpha_i, \beta_i) \) that consists of a fixed payment \( \alpha_i \) and a share of output \( \beta_i\pi(e_i) \) with \( \beta_i \in [0, 1] \) and which is associated with an expected wage \( w_i(e_i) = \alpha_i + \beta_i\pi(e_i) \). Workers have a reservation utility of zero and are protected by limited liability that forbids transfers from the worker to the firm for all \( \pi(e_i) \), i.e., \( w_i(e_i) \geq 0 \) for all \( \pi(e_i) \). Moreover, both, firms and workers, are assumed to be risk neutral.

1.2.2 Sub-Markets and Matching

An important assumption in this model is that worker types are public information. This allows firms to approach workers directly when searching for a worker. Therefore, I assume that the labor market can be divided into \( n \) different sub-markets indexed by \( i = \{S, R_1, ..., R_{n-1}\} \) which are characterized by potentially different expected wages \( w_i \). Note that this approach is closely related to Moen (1997) and Moen and Rosén (2011).

\(^{14}\) The reciprocity parameter \( \rho_i \) has an upper bound for two reasons. The first one is to avoid very high reciprocal utilities that completely outweigh monetary payoffs, the second is a technical one to ensure the solvability of the problem.

\(^{15}\) The corresponding utility functions will be defined in section 1.3.1.
However, in contrast to my setting, in Moen (1997) and Moen and Rosén (2011) the workers choose which sub-market to enter or, put differently, which firm to approach.

Although I assume that there is free entry of firms into the labor market, firms have to take on a cost to engage in labor market search. To enter a sub-market $i$, i.e., to approach workers of type $\rho_i$, the firm must open a vacancy at a cost $k \geq 0$. The flow of new worker-firm matches in each sub-market is given by $x(u_i, v_i)$. This matching function captures the frictions in the labor market. It depends on $u_i$, the measure of unemployed workers and on $v_i$, the measure of vacancies in a sub-market $i$. Furthermore, $x(u_i, v_i)$ is assumed to be concave and homogeneous of degree one in $(u_i, v_i)$.

Let $\theta_i$ denote the market tightness $\frac{v_i}{u_i}$ in a sub-market $i$. Then $p(\theta_i) = \frac{x(u_i, v_i)}{u_i} = x(1, \theta_i)$ denotes the transition rate from unemployment to employment (job-finding-rate) of a worker in a sub-market $i$ and is characterized by $\lim_{\theta_i \to 0} p(\theta_i) = 0$ and $\lim_{\theta_i \to \infty} p(\theta_i) = \infty$ with $\frac{\partial p(\theta_i)}{\partial \theta_i} > 0$. The first condition implies that as the market tightness of sub-market $i$ tends to zero, indicating that the number of vacancies in the sub-market is much lower than the number of unemployed workers, it takes infinitely long for a single worker to find a job in this sub-market. In contrast, the second condition ensures that the tighter a sub-market, the sooner a single worker finds a job in this sub-market. Similarly, the arrival rate of workers for a vacancy (job-filling-rate) in a sub-market $i$ is given by $q(\theta_i) = \frac{x(u_i, v_i)}{v_i} = x(1, \frac{1}{\theta_i})$ with $\lim_{\theta_i \to 0} q(\theta_i) = \infty$ and $\lim_{\theta_i \to \infty} q(\theta_i) = 0$ with $\frac{\partial q(\theta_i)}{\partial \theta_i} < 0$. Thus, if the market tightness of sub-market $i$ tends to zero, i.e., if the number of vacancies is very small as compared to the number of unemployed workers in this sub-market, a single firm is matched with a worker very fast. On the other hand, as the market tightness increases, a particular firm has a longer waiting time to fill its vacancy.

However, matches $x(u_i, v_i)$ within a sub-market $i$ are not stable over time. Instead, worker-firm matches are separated at an exogenous rate $s$. Otherwise, in equilibrium the maximum amount of matches could be realized resulting in an inflow into unemployment of zero which is in contrast to the observed positive long-term unemployment rate.

### 1.2.3 Asset Value Equations and Timing

The different building blocks of the model developed before can now be put together into asset value equations set in continuous time with a discount factor $r$. 

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Workers’ asset values \( rW_i \) and \( rU_i \) capture workers’ discounted values of employment and unemployment respectively. More precisely, a worker of type \( \rho_i \) who is employed at a wage \( w_i \) has an asset value of working as described by

\[
rW_i = \Omega_i (w_i) - s (W_i - U_i) .
\] (1.1)

The discounted value of employment consists of \( \Omega_i (w_i) \), the utility flow of a worker of type \( i \) who is employed at a wage \( w_i \) net of \( s (W_i - U_i) \) as the expected loss if his match is separated. In contrast, a worker of type \( \rho_i \) who is unemployed has an asset value of unemployment as captured by

\[
rU_i = p(\theta_i) (W_i - U_i) .
\] (1.2)

In the absence of unemployment benefits the discounted value of unemployment is the expected gain from participating in job search, i.e., \( p(\theta_i) (W_i - U_i) \). However, an unemployed worker is only willing to accept a job offer if employment offers a higher utility flow than unemployment, i.e., \( \Omega_i (w_i) \geq 0 \).

The information of both asset values can be captured by a single equation by substituting out \( W_i \).

**Lemma 1.1.** The worker’s asset value equation is given by

\[
rU_i = \frac{p(\theta_i) \Omega_i (w_i)}{p(\theta_i) + s + r} .
\]

Similarly, firms’ asset values \( rJ_i \) and \( rV_i \) describe firms’ discounted values of a filled job and a vacancy, respectively. More specifically, a firm that employs a worker of type \( i \) at a wage \( w_i \) has an asset value of a filled job as captured by

\[
rJ_i = E [\pi(e_i)] - w_i - s (J_i - V_i) .
\] (1.3)

With a filled job the firm earns a flow of expected payoff net of wage costs \( E [\pi(e_i)] - w_i \) but can be separated from its worker which incurs an expected loss of \( s (J_i - V_i) \). In contrast, a vacancy in sub-market \( i \) generates an asset value of

\[
rV_i = -k + q(\theta_i) (J_i - V_i) .
\] (1.4)

As long as the job is not filled, the firm bears a cost of \( k \) but by participating in labor market search the firm is matched with a worker of type \( \rho_i \) at a rate \( q(\theta_i) \) and enjoys
the gain from a filled job.\textsuperscript{16} Again, the two asset value equations can be summarized to obtain a single equation by substituting out $J_i$.

**Lemma 1.2.** The firm’s asset value equation is given by 
\[
V_i = q(\theta_i)[E[\pi(e_i)] - w_i] - (r + s)k \left( \frac{p(\theta_i)}{q(\theta_i)} + r + s \right).
\]

The firm’s and the worker’s asset value equation capture all the information that is needed to derive the labor market equilibrium. Recall that due to perfect information, from the firm’s point of view, entering a sub-market $i$ is equivalent to approaching workers of type $\rho_i$. Thus, a worker of type $\rho_i$ can never enter a sub-market $j \neq i$. Both, firms and workers, are assumed to be price takers, i.e., they choose their actions given the expected wages $w_S, ..., w_{R_n-1}$. More precisely, given $w_S, ..., w_{R_n-1}$, firms decide whether to participate in the labor market and which sub-market to enter (which type of worker to approach), whereas workers decide whether to engage in search or to stay unemployed, and which effort to exert if they are matched. Depending on the number of participating firms and workers within a sub-market, the queue lengths $p(\theta_i)$ and $q(\theta_i)$ will adjust to balance the firms’ demand for workers across sub-markets and worker types, respectively.

The exact timing of the model is as follows: First, given $w_S, ..., w_{R_n-1}$, firms decide whether to participate in the labor market and which sub-market to enter. Then, workers who are matched to firms according to $x(u_i, v_i)$ within a sub-market $i$ start production by choosing effort $e_i$ at cost $c(e_i)$. Finally, outputs are realized, wages are paid, and existing matches separate at the rate $s$.

### 1.3 Competitive Search Equilibrium

In equilibrium, workers and firms will choose their actions to maximize their expected returns. Since firms are identical, the market tightness of all sub-markets adjusts in a way that all sub-markets attracting firms have to generate the same expected value to the firms. I solve the model introduced in the previous subsection by backward induction. The optimal contracts are considered first in Section 1.3.1 while the set of equilibrium market tightnesses is deduced in Section 1.3.2. Finally, minimum wages are discussed in Section 1.3.3.

\textsuperscript{16} Note that a firm will enter the labor market and post a vacancy to attract a worker only if $\frac{E[\pi(e_i)] - w_i}{r+s} \geq k$. 

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1.3.1 Optimal Contracts

Recall that a worker of type $\rho_i$ does not decide about the sub-market to enter due to full information. But given $p(\theta_i)$ he can choose whether to be employed at a wage $w_i$ or not, and if employed, which effort level to exert. The worker thus chooses his effort to maximize the expected gain from labor market search, i.e., $\max_{e_i} RU_i$, which boils down to $\max_{e_i} \Omega_i (w_i)$.

Taking into account the worker’s optimal effort choice, the firm chooses $\alpha_i$ and $\beta_i$ to maximize its expected income from labor market search, i.e., $\max_{\alpha_i, \beta_i} V_i$, which can be reduced to $\max_{\alpha_i, \beta_i} E [\pi(e_i)] - w_i = (1 - \beta_i) \hat{e}_i - \alpha_i$.

1.3.1.1 Selfish Workers As a benchmark, first consider selfish workers who are characterized by $\rho_S = 0$. They choose their efforts to maximize their monetary payoff

$$\Omega_S (w_S) = \alpha_S + \beta_S e_S - \frac{1}{2} e_S^2. \quad (1.5)$$

The corresponding first-order condition is then given by $\hat{e}_S = \beta_S$ and represents the incentive compatibility constraint (IC). In addition, the participation constraint (PC) prescribes that $\Omega_S (w_S) \geq 0$ for the worker to be willing to accept a job offer. Limited liability (LL) implies $\alpha_S + \beta_S \pi(e_S) \geq 0$ but since profits are affected by randomness and can take a value of zero the limited liability constraint (LL) can be reduced to $\alpha_S \geq 0$. LL and IC then ensure PC, i.e., participation has not to be considered explicitly. The firm’s problem can thus be written as

$$\max_{\alpha_S, \beta_S} (1 - \beta_S) \hat{e}_S - \alpha_S \quad (1.6)$$

s.t. $\hat{e}_S = \beta_S$, $\alpha_S \geq 0$.

Lemma 1.3. The firm offers a bonus contract $\Gamma^*_S = (0, \frac{1}{2})$ with $\alpha^*_S = 0$ and $\beta^*_S = \frac{1}{2}$ to a selfish worker with $\rho_S = 0$.

Proof. See Appendix

1.3.1.2 Reciprocal Workers In contrast to selfish workers, a reciprocal worker characterized by $\rho_R \in (0, 1)\quad (1.7)$ cares about gift exchange. I assume that his expected utility flow

---

\(^{17}\)In the following I integrate the subscripts $i = R_1, ..., R_{n-1}$ for reciprocal workers to one subscript $R$.  

when employed is

\[ \Omega_R (w_R) = \alpha_R + \beta_R E \left[ \pi(e_R) \right] - c (e_R) \]
\[ + \rho_R \left[ \alpha_R + \beta_R E \left[ \pi(e_S^*) \right] - a_S^* - \beta_S^* E \left[ \pi(e_S^*) \right] \right] \left[ c' (e_R) - \frac{\partial w_R (e_R)}{\partial e_R} \right] \]

(1.7)

The first part of \( \Omega_R (w_R) \) is the worker’s monetary payoff. The second part represents his reciprocal utility with the firm’s friendliness multiplied by the worker’s friendliness \( \left[ c' (e_R) - \frac{\partial w_R (e_R)}{\partial e_R} \right] \) and weighted by \( \rho_R \), the worker’s reciprocity parameter, which measures the importance of reciprocal utility to the worker. More precisely, \( \rho_R \in (0, 1] \) measures the reciprocity concern in monetary units and can be interpreted as the relative weight that the worker puts on reciprocity as compared to his monetary net-payoff.

The firm’s friendliness can be rewritten to \( \left[ a_R - a_S^* + (\beta_R - \beta_S^*) E \left[ \pi(e_S^*) \right] \right] \) and is positive whenever the offered contract \( \Gamma_R \) is more generous than the contract offered to a selfish type \( \Gamma_S^* \) and thus offers a higher expected wage for the worker at the same effort level \( e_S^* \). The worker’s friendliness \( \left[ c' (e_R) - \frac{\partial w_R (e_R)}{\partial e_R} \right] \) is positive whenever the worker increases effort, and thus also the expected output, beyond the selfishly optimal amount, i.e., \( c' (e_R) > \frac{\partial w_R (e_R)}{\partial e_R} \), implying a monetary loss in form of a suboptimal monetary payoff.\(^{1.8}\)

According to this specification, friendly firm behavior results in additional reciprocal utility if the worker reacts friendly by choosing his effort \( e_R \) such that \( c' (e_R) > \frac{\partial w_R (e_R)}{\partial e_R} \).\(^{1.9}\)

Note that an offer \( \Gamma_R = \Gamma_S^* \) exactly meets the worker’s reference point. It is thus perceived as neutral by the worker and induces selfish worker behavior (maximizing monetary payoff) even if he is reciprocal (\( \rho_R = \rho_I \)). This assumption implies that the reference point of a reciprocal worker is given by the contract offered to the selfish agent.

The preferences of the reciprocal worker as modeled here were used in a modified form by Englmaier and Leider (2012a) or Englmaier and Leider (2012b) and are related to Rabin (1993). But intention-based reciprocity based on Rabin (1993) compares total payoffs to a reference payoff and thus has the feature of charging the receiving party for provided gifts since costly gifts decrease the total payoff of the giving party and thus reduce the friendliness of the receiving party although the gift was provided voluntarily.

\(^{1.8}\)Note that the worker’s hostile behavior or punishment, i.e., \( c' (e_R) < \frac{\partial w_R (e_R)}{\partial e_R} \), would also incur a cost in form of a reduced monetary payoff of the worker while the behavior of a selfish worker entails a binding first order condition, i.e., \( c' (e_S) = \frac{\partial w_S (e_S)}{\partial e_S} \).

\(^{1.9}\)In contrast, a hostile reaction, i.e., \( c' (e_R) < \frac{\partial w_R (e_R)}{\partial e_R} \), to friendly firm behavior implies negative reciprocal utility. The reverse is true for hostility on the part of the firm.
To overcome this charging feature, the reciprocal part of utility in this model is measured differently. Instead of comparing total payoffs to a reference payoff, in my model, reciprocal workers evaluate offered wages directly and are thus concerned with procedural fairness. Accordingly, they perceive a more generous wage offer as a friendly intention and are thus willing to return the firm’s friendliness by providing a gift. This alternative approach results in an independence of the friendliness of a player and the gift he receives in return.

Given Lemma 1.3 the reciprocal workers’ utility flow when employed can now be rewritten to

\[ \Omega_R (w_R) = \alpha_R + \beta_R e_R - \frac{1}{2} \rho_R [\alpha_R + \left( \beta_R - \frac{1}{2} \right) \frac{1}{2} (e_R - \beta_R)] . \] (1.8)

The corresponding IC is \( \hat{e}_R = \beta_R + \frac{1}{4} \rho_R [4 \alpha_R + 2 \beta_R - 1] \). In addition, LL prescribes \( \alpha_R \geq 0 \) and together IC and LL ensure PC. The firm’s problem is then

\[
\begin{align*}
\max_{\alpha_R, \beta_R} (1 - \beta_R) \hat{e}_R - \alpha_R \\
\text{s.t. } \hat{e}_R = \beta_R + \frac{1}{4} \rho_R [4 \alpha_R + 2 \beta_R - 1], \alpha_R \geq 0.
\end{align*}
\] (1.9)

Lemma 1.4. The firm offers a bonus contract \( \Gamma^*_R = (0, \frac{4 + 3 \rho_R}{8 + 4 \rho_R}) \) with \( \alpha^*_R = 0 \) and \( \beta^*_R = \frac{4 + 3 \rho_R}{8 + 4 \rho_R} \) to a reciprocal worker with \( \rho_R \in (0, 1] \).

Proof. See Appendix.

1.3.1.3 Optimal Contracts in the Labor Market The optimal contracts in the labor market are summarized in Proposition 1.1.

Proposition 1.1. Optimal contracts in the labor market are \( \Gamma^*_i = \left(0, \frac{4 + 3 \rho_i}{8 + 4 \rho_i}\right) \) with \( \alpha^*_i = 0 \), \( \beta^*_i = \frac{4 + 3 \rho_i}{8 + 4 \rho_i} \), and expected wages \( w^*_i (e^*_i) = \frac{(4 + \rho_i)(4 + 3 \rho_i)}{32(2 + \rho_i)} \). They implement efforts \( e^*_i = \frac{4 + \rho_i}{8} \) and result in expected net profits \( E [\pi (e^*_i)] - w^*_i (e^*_i) = \frac{(4 + \rho_i)^2}{32(2 + \rho_i)} \).

In equilibrium, the liability constraint is binding, i.e. \( \alpha^*_i = 0 \). Moreover, the equilibrium share \( \beta^*_i \) increases in the worker’s reciprocity concern \( \rho_i \). The higher \( \rho_i \), the higher the firm’s friendliness as perceived by the worker and the higher the effort the worker is willing to exert in return. Consequently, the firm can profit from higher reciprocal motivation by increasing the equilibrium share \( \beta^*_i \) and implementing higher efforts \( e^*_i \) as \( \rho_i \) increases. Obviously, since both, the equilibrium share and the equilibrium effort, increase
in $\rho_i$, the equilibrium expected wage $w^*_i(e^*_i)$ is also increasing in the worker’s reciprocity concern.\footnote{Accordingly, selfish workers earn the lowest wage which implies that the reference point of reciprocal agents corresponds to the lowest wage in the labor market.} However, the benefits from increased gift exchange outweigh the increased wage costs, such that the firm’s expected net profits rise as workers become more reciprocal. As a result, workers with stronger reciprocal preferences earn higher wages than workers who care less about gift exchange because they are willing to provide gifts in form of higher efforts in return for higher wages. These results are in line with Dohmen et al. (2009) who find that positively reciprocal workers are associated with higher wages and efforts compared to selfish workers.

Proposition 1.1 also identifies which workers are most valuable to the firms. Since expected net profits increase in the worker’s reciprocity concern, firms are especially interested in employing reciprocal workers with high reciprocity concerns $\rho_R$. Further, recall that firms are assumed to be identical. Consequently, they will have identical preferences concerning the type of worker to employ. But the more firms are interested in the same worker type, the longer the queue they build which results in more vacancies posted in the preferred sub-market. This in turn affects the corresponding market tightness and the corresponding job-filling-rate. Moreover, identical firms imply that all existing sub-markets must offer the same expected net payoff to the firms.

### 1.3.2 Reciprocity and Unemployment

To close the model, I assume free entry of firms into the labor market. Firms enter the labor market until the expected value of participating in labor market search equals zero. More precisely, free entry leads to $r\mathcal{V}_i(\theta^*_i, w^*_i(e^*_i)) = 0$, which can be rearranged for the equilibrium job filling rate $q(\theta^*_i)$ in sub-market $i$.

**Lemma 1.5.** The equilibrium job filling rate in sub-market $i$ is given by $q(\theta^*_i) = \frac{32k(2+\rho_i)(r+s)}{4(4+\rho_i)^2}$.

Due to a unique relationship between the job filling rate $q(\theta_i)$ and the corresponding market tightness $\theta_i$, which is assumed to be $\frac{\partial q(\theta_i)}{\partial \theta_i} < 0$ as argued in Section 1.2.2, the following must hold:

**Proposition 1.2.** In equilibrium, the market tightness of sub-market $i$ decreases in the entry costs $k$, the discount factor $r$ and the destruction rate $s$, but increases in reciprocity concerns $\rho_i$.\footnote{Accordingly, selfish workers earn the lowest wage which implies that the reference point of reciprocal agents corresponds to the lowest wage in the labor market.}
The market tightness in each sub-market adjusts to distribute vacancies among the existing sub-markets and to balance the job filling rates according to the realizable net payoffs in the sub-markets. An increase in vacancy costs \( k \) just as an increase in the discount rate \( r \) (as the opportunity cost of participating) and the rate \( s \) (as probability measure for the need to re-post a vacancy) reduce firms’ incentives to enter the market. Consequently, the equilibrium tightness of a sub-market \( i \) is negatively affected by an increase in \( k \), \( r \), and \( s \) due to fewer vacancies posted. In contrast, the worker’s reciprocity concern \( \rho_i \) has a positive effect on the equilibrium tightness of a sub-market \( i \) which implies that more vacancies are posted in this sub-market in equilibrium. The corresponding incentives for the firm result from the increased gift exchange that drives an increase in the firm’s expected net profits as shown in Proposition 1.1.

Furthermore, Proposition 1.2 directly implies Corollary 1.1:

**Corollary 1.1.** Reciprocal workers with stronger reciprocal preferences are approached by more firms and thus find a job more quickly than workers with weaker reciprocal preferences.

This is also supported by the findings of Dohmen et al. (2009) where, compared to selfish workers, positively reciprocal workers are associated with a higher probability to be employed. The mechanism behind this result as proposed by the model is that the job-filling-rates adjust across sub-markets to offer identical expected net payoffs to the firms. The more favored the worker type a firm wants to attract, the longer it takes to be successful in hiring this particular worker type due to higher competition. Consequently, the expected costs for a firm to maintain a vacancy in the corresponding sub-market increase. In contrast, less popular worker types can be hired more quickly implying reduced search costs. As a result, firms face a trade-off between the resources spent on hiring and the “quality” of the hired worker. This implies that whenever a vacancy must be filled quickly and at low costs, hired workers will tend to be of lower “quality”.

### 1.3.3 Minimum Wages

The basic model can be extended to analyze labor markets that are regulated by binding minimum wages. Let \( \omega > 0 \) denote the minimum wage that has to be paid to all workers in the labor market.

Selfish workers choose their efforts to maximize their utility flow from employment as defined by (1.5). The corresponding IC is still given by \( \hat{e}_S = \beta_S \). The minimum wage
now represents an additional constraint to the problem of the firm, i.e., \( \alpha_s \geq \bar{\alpha} \), and offers at least a payment \( \bar{\alpha} \) to the workers irrespective of the output realized by the worker, i.e., \( \Omega_i (w_i) \geq \bar{\alpha} \). Hence, PC and LL are fulfilled in the presence of a minimum wage \( \bar{\alpha} > 0 \) and have not to be considered explicitly by the firm. The firm’s problem then changes to

\[
\max_{\alpha_s, \beta_s} (1 - \beta_s) \hat{e}_s - \alpha_s \\
\text{s.t. } \hat{e}_s = \beta_s, \ \alpha_s \geq \bar{\alpha}.
\]

(1.10)

**Lemma 1.6.** In the presence of a minimum wage, the firm offers a bonus contract \( \Gamma^M_s = (\bar{\alpha}, \frac{1}{2}) \) with \( \alpha^M_s = \bar{\alpha} \) and \( \beta^M_s = \frac{1}{2} \) to a selfish worker.

**Proof.** See Appendix

Now the reciprocal workers’ utility flow when employed as defined in (1.7) can be rewritten to

\[
\Omega_R (w_R) = \alpha_R + \beta_R e_R - \frac{1}{2} e_R^2 + \rho_R \left[ \alpha_R - \bar{\alpha} + \left( \beta_R - \frac{1}{2} \right) \frac{1}{2} \right] [e_R - \beta_R]. \tag{1.11}
\]

The corresponding IC is \( \hat{e}_R = \beta_R + \frac{1}{4} \rho_R [4\alpha_R - 4\bar{\alpha} + 2\beta_R - 1] \). In addition, LL prescribes \( \alpha_R \geq \bar{\alpha} \) and together IC and LL ensure PC. The firm’s problem is then

\[
\max_{\alpha_R, \beta_R} (1 - \beta_R) \hat{e}_R - \alpha_R \\
\text{s.t. } \hat{e}_R = \beta_R + \frac{1}{4} \rho_R [4\alpha_R - 4\bar{\alpha} + 2\beta_R - 1], \ \alpha_R \geq \bar{\alpha}.
\]

(1.12)

**Lemma 1.7.** In the presence of a minimum wage, the firm offers a bonus contract \( \Gamma^M_R = (\bar{\alpha}, \frac{4 + 3\rho_R}{8 + 4\rho_R}) \) with \( \alpha^M_R = \bar{\alpha} \) and \( \beta^M_R = \frac{4 + 3\rho_R}{8 + 4\rho_R} \) to a reciprocal worker.

**Proof.** See Appendix

As a result, a minimum wage increases the expected wages paid to all worker types without strengthening their incentives, i.e., \( w^M_i (e_i) = \bar{\alpha} + \beta^*_i (e^*_i) \). Consequently, the firm’s expected net profits decrease which reduces the firm’s incentives to enter the labor market. This results in overall fewer vacancies and thus fewer employed workers in equilibrium. Moreover, all worker types are approached less often by firms which increases their lengths of unemployment.
Proposition 1.3. The introduction of a binding minimum wage results in an overall higher unemployment rate and a larger fraction of long-term unemployment.

1.4 Conclusion

The presented model is a first attempt to introduce linear incentive contracts in combination with reciprocity into search theory and was developed to explore the connection between workers’ heterogeneous reciprocity concerns and their labor market outcomes. In a labor market with search frictions where homogeneous profit-maximizing firms can approach the desired heterogeneous reciprocal workers due to perfect information (e.g. from screening), the job-filling rates adjust across worker types to offer identical expected net payoffs to the firms. As a result, reciprocal workers with stronger preferences for gift exchange are approached by more firms than reciprocal workers with lower reciprocity concerns since they offer higher expected net payoffs to the firms. Thus, they find a job more quickly, get higher wages and exert higher efforts.

These findings are supported by earlier empirical results which stress the importance of non-cognitive skills for labor market success. They also attract notice to the significance of soft skills for labor market success. Increased soft skills in form of the willingness to return favors can decrease the length of unemployment. Accordingly, soft skills development can represent an important part in the reeducation of unemployed workers.

A worthwhile extension would be to introduce positive unemployment benefits into the model. If the utility flow from unemployment benefits outweighs the workers’ utility flow when employed, the worker will choose to stay unemployed. In the present model, the workers’ utility flow when employed is increasing in his reciprocity concerns. Selfish and less reciprocal workers are thus likely to choose unemployment if unemployment benefits are high enough. In principle, firms can take unemployment benefits into account via the participation constraints, i.e. they can increase wages to make worker types who are tempted to stay unemployed indifferent between employment and unemployment. But since reciprocal agents compare their contracts to the contract offering the lowest rent with selfish behavior in the overall labor market their expected wages are likely to rise as well to compensate for lower reciprocal incentives due to higher reference wages. Accordingly, the qualitative results of the basic model will not change, but as with minimum wages, unemployment benefits will lead to increased unemployment and
more long-term unemployment. However, if unemployment benefits are high enough, it might be optimal for firms to refrain from offering jobs to less productive workers. Then the model’s predictions about equilibrium wages and unemployment would depend on the reciprocal workers’ reference point. If all worker types are employed in equilibrium, it is natural to assume that reciprocal workers choose the contract offering the lowest rent with selfish behavior among all employed workers as their reference contract. But if there are unemployed worker types in equilibrium, it is just as natural to assume that the unemployment benefits form the reference point.
Appendix 1

Proof of Lemma 1.3  By inserting the corresponding IC into the firm’s maximization problem, the problem (1.6) can be rewritten to

\[
\max_{\alpha_S, \beta_S} (1 - \beta_S) \beta_S - \alpha_S \quad \text{s.t.} \quad \alpha_S \geq 0.
\]

The output share \(\beta_S\) can take values \(0 \leq \beta_S \leq 1\). However, the firm never chooses \(\beta_S = 1\) or \(\beta_S = 0\) because both would cause non-positive profits. Consequently, there is an interior solution such that the first order condition (FOC) regarding \(\beta_S\) is given by

\[
1 - 2\beta_S = 0
\]

which results in \(\beta_S^* = \frac{1}{2}\).

Moreover, the firm can only reduce its profits by paying a positive fixed wage \(\alpha_S\). As a consequence, it will choose \(\alpha_S\) as small as possible, i.e., \(\alpha_S^* = 0\).

Proof of Lemma 1.4  The firm’s maximization problem (1.9) can be rewritten to

\[
\max_{\alpha_R, \beta_R} E[\pi(e_R)] - w_R = (1 - \beta_R) \left(\beta_R + \frac{1}{4} \rho_R [4\alpha_R + 2\beta_R - 1]\right) - \alpha_R \quad \text{s.t.} \quad \alpha_R \geq 0.
\]

The derivative regarding \(\alpha_R\) is

\[
\rho_R (1 - \beta_R) - 1
\]

while the derivative regarding \(\beta_R\) is given by

\[
1 + \rho_R \left(\frac{3}{4} - \alpha_R\right) - \beta_R (2 + \rho_R).
\]

The firm never chooses \(\beta_S = 1\) because this would cause non-positive net profits. A corner solution \(\beta_R = 0\) would imply that the agent is paid a fixed wage \(w_R = \alpha_R\) and produces expected output \(E[\pi(e_R)] = \frac{1}{4} \rho_R [4\alpha_R - 1]\). Hence, the firm would make negative expected net profits \(E[\pi(e_R)] - \alpha_R = -(1 - \rho_R) \alpha_R - \frac{1}{4} \rho_R\) for \(\rho_R \in (0, 1]\) which cannot be optimal. Given an interior solution for \(\beta_R^*\), i.e., \(0 < \beta_R < 1\), (1.17) must equal
zero which results in $\beta_R^* = \frac{4 + 3\rho_R - 4\rho_R\bar{\alpha}}{8 + 4\rho_R}$. But $0 < \beta_R^* < 1$ implies that (1.16) is negative, i.e., the firm can only reduce its profits by paying a positive fixed wage. Consequently, the optimal contract is characterized by $\alpha_R^* = 0$ and $\beta_R^* = \frac{4 + 3\rho_R}{8 + 4\rho_R}$.

**Proof of Lemma 1.6** By inserting the corresponding IC into the firm’s maximization problem, the problem (1.10) can be rewritten to

$$\max_{\alpha_S, \beta_S} (1 - \beta_S)\beta_S - \alpha_S$$

subject to $\alpha_S \geq \bar{\alpha}$.  

As above, the firm never chooses $\beta_S = 1$ or $\beta_S = 0$. The interior solution is $\beta_S^M = \beta_S^* = \frac{1}{2}$.

Moreover, the firm chooses $\alpha_S$ as small as possible, i.e., $\alpha_S^M = \bar{\alpha}$.

**Proof of Lemma 1.7** The firm’s maximization problem (1.12) can be rewritten to

$$\max_{\alpha_R, \beta_R} E[\pi(e_R)] - w_R = (1 - \beta_R) \left( \beta_R + \frac{1}{4}\rho_R \left[ 4\alpha_R - 4\bar{\alpha} + 2\beta_R - 1 \right] \right) - \alpha_R$$

subject to $\alpha_R \geq \bar{\alpha}$.

The derivative regarding $\alpha_R$ is given by (1.16) while the derivative regarding $\beta_R$ changes to

$$1 + \rho_R \left( \frac{3}{4} - \alpha_R + \bar{\alpha} \right) - \beta_R (2 + \rho_R).$$

(1.20)

The firm never chooses $\beta_S = 1$ and a corner solution $\beta_R = 0$ would imply that the firm makes negative expected net profits $E[\pi(e_R)] - \alpha_R = -(1 - \rho_R) \alpha_R - \rho_R\bar{\alpha} - \frac{1}{4}\rho_R$ for $\rho_R \in (0, 1)$.

The interior solution is characterized by $\beta_R = \frac{4 + 3\rho_R - 4\rho_R\bar{\alpha}}{8 + 4\rho_R}$. Moreover, (1.16) is negative, i.e., the firm will choose the fixed wage as small as possible. Consequently, the optimal contract is characterized by $\alpha_R^M = \bar{\alpha}$ and $\beta_R^M = \beta_R^* = \frac{4 + 3\rho_R}{8 + 4\rho_R}$.  

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References 1


2 Efficiency Wages and Reciprocity

2.1 Introduction

In practice, firms use a mix of incentives to ensure effort provision. Among the most prominent are monitoring and wages. Efficiency Wage Theory based on Shapiro and Stiglitz (1984) and classical Principal-Agent Theory suggests that monitoring activities undertaken by the principal can reduce or prevent shirking by a selfish agent. Consequently, monitoring and wages are supposed to be substitutes as argued by Demougin and Fluet (2001) since wages can be reduced by introducing or increasing monitoring or, put differently, monitoring can be reduced by paying higher wages. However, the empirical results on the relationship between monitoring and pay are mixed.2,1

One reason for mixed empirical findings could be that the choice between pay and control might not only entail a substitution but also a scale effect concerning effort. The scale effect arises if the principal forces the implemented effort upwards, in order to maximize profits. Instead of substituting pay by higher monitoring to implement a certain effort level the principal increases monitoring and pays higher wages at the same time to implement a higher effort level. As a consequence, with selfish agents and continuous effort choices monitoring accuracy and pay are not necessarily substitutes but can also be complements as demonstrated by Allgulin and Ellingsen (2002).

Another possible reason for mixed empirical results is that monitoring can entail hidden costs of control for certain employee types. For example, Falk and Kosfeld (2006) find that monitoring can erode motivation and incentives. They conduct an experiment where the principal can control the agent by implementing a minimum effort. As a result, a substantial part of agents reduce their efforts as a reaction to an introduction of a minimum performance level compared to a situation with full discretion. Interestingly, Falk and Kosfeld (2006) report that most agents who react negatively to monitoring in their experiment say that they perceive the controlling decision as a signal of distrust and a limitation of their choice autonomy.

The latter reason indicates a mechanism which is strongly related to the Self-Determination Theory proposed by psychologists as Deci (1975), Deci and Ryan (1985), and Ryan and Deci (2000) which states that intrinsic motivation is eroded by extrinsic incentives or regulations if it reduces the perceived self-determination or self-evaluation. According2,1 See e.g., Malcomson (1999) for an overview of empirical testing of Efficiency Wage Theory.
to Self-Determination Theory, an introduction or increase in monitoring as an extrinsic regulation can lead to lower perceived self-determination and thus lower intrinsic motivation which results in lower efforts.

Self-determination in form of autonomy or the ability to work on one’s own initiative is a key determinant of job satisfaction and has been shown to have important implications for employment relations and labor market outcomes. Hence, I believe that Self-Determination Theory deserves more attention in economic models and argue that it can serve as an explanation for hidden costs of control by introducing a new approach to model intention-based reciprocity.

To link Self-Determination Theory to reciprocity I assume that actions of players have friendly intentions if they have a direct positive effect on another player’s utility or hostile intentions if they have a direct negative effect on his utility. An introduction of or increase in monitoring by the principal lowers the perceived self-determination of a worker and is thus perceived as hostile. The worker’s reciprocal answer to the increased hostility of the principal is to increase the hostility of his own actions. As a consequence, workers reduce their effort as a hostile reaction to the hostile introduction or increase in monitoring. Self-Determination Theory then not only applies to intrinsic motivation in form of intrinsically motivating tasks but also in form of reciprocal motivation as the willingness to provide a gift to the employer.

I consider agents with heterogeneous reciprocal preferences as described above in a moral hazard setting where they can choose whether to shirk or to work. The agent’s choice is restricted to a binary choice to capture the idea that some jobs leave only little scope for agents to choose their effort. Moreover, depending on the production process, agents might not be able to increase their productivity by exerting more effort. For example, a worker at the production line cannot increase output by working faster if the speed of the line is fixed.

The model results suggest that with observable agent types, selfish agents are always offered a monitoring contract while with reciprocal agents monitoring is not necessary to ensure effort provision. Without monitoring, the principal’s contract offer is perceived as more friendly by a reciprocal agent which provides incentives for the agent to recipro-

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22See, e.g., Judge et al. (2001) for a psychological study on positive correlation between job satisfaction and job performance and, e.g., Gaertner (2000) and the references therein for managerial studies on the empirical relevance of job satisfaction in turnover models, or, e.g., Clark (2001) and Cornelißen (2006) for economic studies on the negative relationship between job satisfaction and turnover.
cate by choosing high effort. These additional incentives from gift exchange can be high enough to balance shirking incentives such that the trust strategy dominates the control strategy. Whether monitoring and pay are substitutes or complements depends on the agent’s reciprocal preferences. Thus, heterogeneous reciprocity concerns can serve as an explanation for mixed empirical results on the relationship between monitoring and wages.

In addition, intention-based reciprocity and self-determination have important implications for the complementarity of optimal firm policies. For example, my model can explain why white collar jobs tend to offer more discretion than blue collar jobs. The reason is that white collar jobs are associated with higher monitoring expenses compared to blue collar jobs. Higher monitoring costs imply higher distrust if monitoring is introduced. Consequently, an introduction of monitoring affects the principal’s friendliness stronger in white collar jobs compared to blue collar jobs which results in more discretion for the former and less for the latter in equilibrium. This result is related to Frey (1993) who suggests that the principal’s monitoring activities can have different effects on the agent’s self-determination and self-evaluation depending on the complexity and explicitness of the tasks. He argues that in white collar jobs which are characterized by high discretion as management, financial services, and research and where success depends on non-verifiable inputs as “intuition” and “judgment” monitoring tends to reduce self-determination or self-evaluation compared to blue collar jobs that are relatively simple and well-defined.

Moreover, the interdependence of monitoring and pay results in a complementarity between a firm’s recruiting policy and the discretion it offers to its workers which might explain why firms undertake considerable recruiting efforts that are designed not only to screen for ability but also the willingness to perform well as indicated by Behrenz (2001).

Even with unobservable agent types the principal can benefit from lower employment costs under full discretion contracts by screening for applicant’s type with separating contracts if reciprocal types care enough about full discretion. Monitoring contracts then always offer higher wages than full discretion contracts because wages under non-monitoring contracts can be reduced to an extent which ensure both, effort provision and self-selection. This result also holds when introducing a competitive labor market and alternative screening devices.

The structure of this section is the following: In Section 2.2 I present the related lit-
erature. Section 2.3 provides the basic model setup with observable agent types. The corresponding optimal contracts and their implications for optimal firm policies are then discussed in Section 2.4. Trust contracts as a screening device are discussed in Section 2.5 while competition for unobservable agent types and alternative screening mechanisms are investigated in Section 2.6. Finally, Section 2.7 concludes. Proofs can be found in Appendix 2.

2.2 Related Literature

My analysis is closely related to the theoretical literature on motivational crowding-out with monitoring as Ellingsen and Johannesson (2008) and especially von Siemens (2013) who argue that reciprocal motives can be the driving mechanism behind motivational crowding-out with monitoring.

Ellingsen and Johannesson (2008) provide a model where the principal’s monitoring decision contains information about the principal’s altruistic type. As a result, principals who trust their agents and risk exploitation encourage higher effort by altruistic agents as a response to their higher esteem of the trusting principal compared to a controlling one. At first glance this seems to be another signaling argument which is a prominent explanation for motivational crowding-out through monitoring in economic literature. The underlying idea of the signaling literature is that the introduction or increase in monitoring can serve as an employment relevant signal. For example, Bénabou and Tirole (2003) argue that monitoring can serve as a signal for the attractiveness of the task. Alternatively, monitoring can also serve as a signal for prevailing work norms within a firm as proposed by Sliwka (2007). If there is a majority of selfish agents, the principal will rely on a control strategy that animates conformists to behave selfishly while trust indicates a majority of fair agents inducing conformists to act fairly as well. However, Ellingsen and Johannesson (2008) can also be interpreted as a new approach to the model reciprocity.

In addition, von Siemens (2013) shows that motivational crowding-out can be explained by intention-based reciprocity if workers’ reciprocity concerns are heterogeneous and private information. However, while intention-based reciprocity as modeled by von Siemens (2013) can explain motivational crowding-out (in form of lower efforts) only if reciprocity concerns are private information, the model presented here generates a crowding-out effect of monitoring (in form of a higher wage to implement a given
amount of effort) that does not depend on the information structure. The reason is the different modeling of intention-based reciprocity. von Siemens (2013) models intention-based reciprocity based on Rabin (1993) which compares total payoffs to a reference payoff and has the feature of charging the receiving party for provided gifts since costly gifts decrease the total payoff of the giving party and thus reduce the friendliness of the receiving party although the gift was provided voluntarily. Instead, my approach captures the intentions of the principal’s actions directly. Positive intentions of the principal in form of higher wages are evaluated against his negative intentions in form of higher monitoring expenses. This mechanism helps to overcome the charging of provided gifts which prevents the existence of a reciprocal equilibrium as observed in Falk and Kosfeld (2006) with full information on worker’s type.

Moreover, the presented model relates to the experimental literature on the hidden costs of control with continuous effort levels which show that full discretion contracts result in higher effort provision as Falk and Kosfeld (2006) which was mentioned above, Dickinson and Villeval (2008), but especially Bartling et al. (2012).

Dickinson and Villeval (2008) suggest that reciprocity can serve as an explanation for motivational crowding-out through monitoring. In their experiment they find that increased monitoring crowds out effort but only if the output that accrues to the principal positively depends on effort. This result indicates that the mechanism behind hidden costs of control is reciprocity instead of eroded intrinsic motivation. Yet, Falk and Kosfeld (2006) argue that the behavior as observed in their experiment is inconsistent with existing models of intention-based reciprocity. The reason is that intention-based reciprocity models based on Rabin (1993) evaluate intentions of actions via the resulting payoffs. Thus, with full information on reciprocal preferences full discretion is perceived as unkind if it is common knowledge that reciprocal workers employed under a non-monitoring contract exert higher effort and thus have reduced payoffs due to the gift they provide compared to selfish workers employed under a monitoring contract. But von Siemens (2013) demonstrates that with asymmetric information on reciprocal preferences, motivational crowding-out can be explained by intention-based reciprocity based on Rabin (1993) if workers’ reciprocity concerns are heterogeneous and private information.

Bartling et al. (2012) conduct an experiment where employers can choose the wage and whether to limit the set of possible effort levels of the employee (limited discretion)
while employees choose an effort level after observing the contract offer. In the screening treatment, the employers can additionally observe the employees’ effort in the last three periods before designing the contract. They find that without screening employers do best by offering low wages and limited discretion. In contrast, with screening, it pays for the employers to offer high wages and to abstain from limiting effort choices (full discretion) for workers with medium and high reputations. The reason for these distinct strategies is that workers with medium and high reputations (workers who have provided medium and high effort in the previous three periods) offer a steeper effort-wage ratio than workers with low reputations (workers who have provided low effort in the previous three periods) if the employers offer full discretion. With screening my model predicts that monitoring contracts are better paid which is in contrast to the experimental evidence of Bartling et al. (2012). The difference in results is due to the assumption on the feasible effort choices that are crucial for the possibility of the agent to return the principal’s friendliness. The experimental setting of Bartling et al. (2012) allows employees to reward the principal’s friendliness in form of full discretion and higher wages by choosing higher effort levels which directly translate in higher payoffs for the principal. In contrast, the agents in my model cannot work harder to reward the principal but some agent types are willing to work at a reduced wage. Consequently, besides the substitution effect described by my analysis, the setting in Bartling et al. (2012) allows for an additional scale effect concerning effort that dominates the substitution effect. Nevertheless, my analysis is not less rich compared to Bartling et al. (2012). Rather, the difference in results emphasizes that the relationship between screening, monitoring and pay strongly depends on the agent’s possibilities to provide gifts in return, i.e., the production process.

2.3 Basic Model

Consider a moral hazard setting related to Demougin and Fluet (2001) with one principal (she) and one agent (he). Both parties are risk-neutral and have an outside option of zero. Agents can be of two types $i = \{S, R\}$ – selfish ($S$) or vertically intention-based reciprocal ($R$), which is observable by the principal. The agent can choose either to shirk or to work to produce the non-verifiable individual output $\pi(e)$, where $e \in \{e_L, e_H\}$ with $e_L = 0$ and $e_H = 1$ denotes the worker’s non-contractible effort that comes at a cost.

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23 The corresponding utility functions are defined in Section 2.4. Moreover, in Sections 2.5 and 2.6 I relax the observability assumption.
\( C(e) = ce \) with \( c > 0 \).

The “take-it-or-leave-it” contract \( \Gamma_i = (M_i, w_i) \) offered by the principal consists of a monitoring strategy \( M_i \in \{0, 1\} \) and a wage \( w_i \). Whenever she applies the control strategy, i.e., \( M_i = 1 \), she invests in a monitoring technology \( m \) that detects the agent’s shirking with probability \( m \in (0, 1) \) at fixed costs \( K(M_i) \) with \( K(1) = k \) and \( k \leq \frac{c}{m} \). Instead, if the principal applies the trust strategy, i.e., \( M_i = 0 \), she cannot verify shirking but there are also no monitoring costs incurred, i.e., \( K(0) = 0 \).

I assume that it is profitable for the principal to implement \( e_H \), i.e., that the output \( \pi(e_H) \) is high enough to ensure positive net profits for the principal for all relevant \( w_i \) and \( k \). In case the principal invests in monitoring and the agent is caught shirking, she does not pay \( w_i \).

The agent is protected by limited liability such that the principal cannot extract a potential rent paid to the agent. More precisely, the offered wage must satisfy \( w_i \geq 0 \) and fines are prohibited when shirking is detected. Otherwise, the principal could implement \( e_H = 1 \) by selling the firm.

The principal chooses the wage \( w_i \) and the monitoring arrangement \( M_i \) to minimize her expected employment costs \( \kappa_i = w_i + K(M_i) \). Moreover, all offered contracts \( \Gamma_i = (M_i, w_i) \) are assumed to be public knowledge since workers might have information about working conditions in the labor market, e.g., statistics about wages and other conditions of employment.

The timing of the model is as follows: First, the principal observes the agent’s type and offers a contract specifying her monitoring strategy \( M_i \) and the wage \( w_i \). If she offers a monitoring contract \( (M_i = 1) \) she also undertakes the investment \( k \) to establish the monitoring technology \( m \). After signing the contract the agent decides whether to exert effort or to shirk. Finally, the results from monitoring are evaluated and contingent payments are made.

### 2.4 Optimal Contracts with Observable Types

#### 2.4.1 Selfish Agents

As a benchmark first consider the described agency problem with a standard selfish agent who only cares about his expected monetary outcome. The corresponding expected util-
ity function is given by

\[ U_S = (1 - M_S m)(1 - e)w_S - C(e) \]  \hspace{1cm} (2.1) \]

and consists of his expected wage \((1 - M_S m)(1 - e)w_S\) depending on the monitoring strategy \(M_S\) and effort \(e\) less the disutility of effort \(C(e)\). In case the principal chooses to trust the agent, i.e., \(M_S = 0\), the agent gets \(w_S\) independent of his effort choice \(e\). In contrast, under the control strategy, i.e., \(M_S = 1\), she detects shirking with probability \(m(1 - e)\), which equals \(m\) if the agent chooses to shirk \((e = 0)\) but is zero if the agent works \((e = 1)\).

The incentive compatibility constraint that ensures effort provision is thus given by \(w_S \geq \frac{c}{M_S m}\). Participation prescribes \(w_S \geq c\) and is always met whenever the incentive compatibility constraint is fulfilled due to \(M_S m \leq 1\) which is the case by assumptions \(M_S \in \{0, 1\}\) and \(m \in (0, 1)\). Furthermore, incentive compatibility implies that the limited liability constraint \(w_S \geq 0\) holds.

Recall that the principal wants to minimize total employment costs \(\kappa_S (M_S) = w_S + K(M_S)\) by choosing \(w_S\) and \(M_S\). This implies that the incentive compatibility constraint is binding under the optimal contract, i.e, \(w_S^* = \frac{c}{M_S m}\) and that the optimization problem reduces to

\[ \min_{M_S} \kappa_S (M_S) = \frac{c}{M_S m} + K(M_S). \]  \hspace{1cm} (2.2) \]

As a result, there exists no positive wage to ensure \(e_H\) from a selfish agent without monitoring.

**Proposition 2.1.** A selfish agent is offered a monitoring contract \(\Gamma_S^* = (1, \frac{c}{m})\).

### 2.4.2 Reciprocal Agents

In contrast to selfish agents, intention-based reciprocal agents not only care about their monetary outcome but also derive utility from gift exchange. More precisely, their expected utility is given by

\[ U_R = (1 - M_R m)(1 - e)w_R - C(e) + \rho [(w_R - w_S) - (M_R k - M_S k)] [e - e_L] \]  \hspace{1cm} (2.3) \]

with \(\rho > 0\).
The first part of the utility function of a reciprocal agent captures his monetary outcome as his expected wage less the disutility of effort. The second part is the reciprocal utility as the agent’s friendliness \([e - e_L]\) multiplied by the principal’s friendliness \([w_R - w_S - (M_R k - M_S k)]\), weighted by the agent’s reciprocity parameter \(0 < \rho\) which indicates the importance of reciprocal utility to the agent.\(^{24}\)

The principal’s friendliness \((w_R - w_S) - (M_R k - M_S k) > 0\) is interpreted as a gift by a reciprocal agent and motivates him to provide a gift in return by behaving friendly himself, i.e., \(e - e_L > 0\). To evaluate the principal’s friendliness, the reciprocal agent as modeled here compares his wage and monitoring offers to the offers made to a selfish agent. Positive intentions of the principal in form of the wage difference \(w_R - w_S\) are considered as friendly while negative intentions in form of higher monitoring expenses \(M_R k - M_S k\) are interpreted as hostile because they reflect more distrust of the agent’s willingness to provide effort.\(^{25}\)

Intention-based reciprocity as modeled here works differently compared to models based on Rabin (1993). Actions of other players are assumed to have friendly (hostile) intentions if they have a direct positive (negative) effect on a player’s utility and can thus be evaluated directly. The friendliness of a player is then independent of the gift he receives in return.

Moreover, increased monitoring expenses decrease the principal’s perceived friendliness even if it has no effect on the (expected) wage of a reciprocal agent (due to a provision of \(e_H\)) which is in line with Self-Determination Theory where monitoring per se can undermine motivation since it reduces the self-determination of the worker. As a consequence, wages below those offered to selfish agents are perceived as hostile while less monitoring compared to the monitoring arrangement offered to selfish agents is perceived as friendly. Consequently, intention-based reciprocity can provide additional incentives to exert effort but is also sensitive to the firm’s monitoring and wage policies.

Table 1 illustrates the reciprocal agent’s utility depending on the principal’s monitoring decision \(M_R\) and the agent’s effort choice \(e\). A principal who wants to minimize employment costs will offer \(w^C_R = w_S = \frac{c}{m}\) under the control strategy, i.e., for \(M_R = 1\),

\(^{24}\)Recall that all offered contracts are assumed to be public knowledge. Thus, a reciprocal agent can use the contract offered to the selfish agent as a reference point.

\(^{25}\)This approach is supported by Falk and Kosfeld (2006). In an additional treatment they investigate how offered wages in combination with offered discretion affect effort choices. They find a positive relationship between offered wages and effort choices which indicates reciprocity but also that reciprocal results were weaker if the principal chose to control the agent.
$$M_R = 0 \quad M_R = 1$$

<table>
<thead>
<tr>
<th>( e = 0 )</th>
<th>( w^T_R )</th>
<th>((1 - m)w^C_R)</th>
</tr>
</thead>
<tbody>
<tr>
<td>( e = 1 )</td>
<td>( w^T_R - c + \rho \left[ (w^T_R - \frac{c}{m}) + k \right] )</td>
<td>( w^C_R - c + \rho \left[ w^C_R - \frac{c}{m} \right] )</td>
</tr>
</tbody>
</table>

Table 1: A reciprocal agent’s utility depending on effort and monitoring.

and \( w^T_R = \frac{c}{m} + \frac{c}{\rho} - k \) under the trust strategy, i.e., for \( M_R = 0 \), to ensure incentive compatibility. Moreover, due to the assumption \( k \leq \frac{c}{m} \) participation is also ensured for both monitoring strategies.

To determine the optimal contract, the principal compares the total employment costs of a reciprocal agent with monitoring to the total employment costs without monitoring. As a consequence, the optimal monitoring decision depends on the shape of the total employment costs under the control strategy, i.e., \( k^C_R = \frac{c}{m} + k \), and under the trust strategy, i.e., \( k^T_R = \frac{c}{m} + \frac{c}{\rho} - k \), as illustrated in Figure 1.

![Figure 1: Total costs of employment depending on the agent’s reciprocity concerns.](image)

With total employment costs under the control strategy \( k^C_R \) (solid line) and under the trust strategy \( k^T_R \) (dashed line).

**Proposition 2.2.** A reciprocal agent is offered a monitoring contract \( \Gamma^*_R = (1, \frac{c}{m}) \) if \( \rho < \rho_L = \frac{c}{2k} \), but a full discretion contract \( \Gamma^*_R = (0, \frac{c}{m} + \frac{c}{\rho} - k) \) otherwise.

Only agents who care enough about gift exchange, i.e., \( \rho > \rho_L \), are offered a full discretion contract because they treasure full discretion enough to be willing to exert effort at lower employment costs. With higher (lower) monitoring costs \( k \), it is optimal to abstain from monitoring at lower (higher) reciprocity concerns. Thus, in jobs which can be monitored at relatively low costs (typically blue collar jobs) full discretion is optimal.
for agents with higher reciprocity concerns compared to jobs that entail higher monitoring costs (typically white collar jobs). Nevertheless, reciprocity can be a reason why full discretion can be found even in jobs which can be monitored at relatively low costs.

2.4.3 Optimal Firm Policies

As suggested by Propositions 2.1 and 2.2, the optimal monitoring arrangement as well as the corresponding optimal wage offered to the agent depend on his reciprocity concerns. As a consequence, complementarities arise between the wage policy, monitoring directive, and recruiting strategy pursued by the principal.

2.4.3.1 Monitoring and Wages

Although reciprocal agents with $\rho > \rho_L$ are willing to provide effort at lower employment costs this does not mean that they necessarily earn lower wages. In fact, the trust strategy can lead to both, lower and higher wages depending on the agents reciprocity concerns $\rho$.

Let $\Delta w^*_R = w^C_R - w^T_R = -\frac{c}{\rho} + k$ denote the difference in optimal wages with and without monitoring. On the one hand, an introduction of monitoring bears a disciplining effect of monitoring $\left( -\frac{c}{\rho} \right)$ since it lowers the wage that is needed to implement effort provision. On the other hand, with monitoring there is a crowding-out effect of monitoring which forces the principal to pay $(+k)$ to compensate the agent for his disutility of limited discretion. As illustrated in Figure 2, for $\rho < \rho_H$ with $\rho_H = \frac{c}{k}$ the disciplining effect of monitoring outweighs the crowding-out effect of monitoring which corresponds to a lower wage under a monitoring contract than under a non-monitoring one. In contrast, for $\rho > \rho_H$ higher wages must be offered to ensure effort provision under a monitoring contract compared to a non-monitoring one.

Consequently, selfish and less reciprocal agents with $0 \leq \rho < \rho_L$ are offered a monitoring contract with a wage $w_S$ while more reciprocal agents are offered a full discretion contract with wages $w^T_R > w_S$ if agents are of medium reciprocal types with $\rho_L < \rho < \rho_H$ but wages $w^T_R < w_S$ if agents are highly reciprocal with $\rho > \rho_H$. For medium reciprocal workers with $\rho_L < \rho < \rho_H$ the disciplining effect of monitoring outweighs the crowding-out effect of monitoring which leads to higher wages under the trust strategy. Yet, it is optimal for the principal to apply full discretion since the wage premium is lower than the investment costs to install monitoring. For highly reciprocal workers with $\rho > \rho_H$ the crowding-out effect of monitoring outweighs the disciplining effect of monitoring. These work-
Corollary 2.1. Full discretion and pay are complements if agents are of medium reciprocal types, i.e. $\rho_L < \rho < \rho_H$, but substitutes if they are highly reciprocal, i.e., $\rho > \rho_H$.

The overall effect of an introduction of monitoring thus highly depends on the reciprocity concerns of the employees. As a consequence, a change in the monitoring strategy might entail a change in the wage policy of the firm. Moreover, with higher (lower) monitoring costs, wages under the trust strategy fall below those under the control strategy for lower (higher) reciprocity concerns because full discretion is appreciated more (less). The reason is, that the distrust reflected by the control strategy at monitoring investments $k$ increases the crowding-out effect of monitoring which in turn makes the trust strategy more valuable to reciprocal agents. Consequently, they are willing to sacrifice a higher share of their wages in return for full discretion. Thus, ceteris paribus, firms which face high monitoring costs should tend to apply a trust policy for a wider range of agent types and can offer lower wages to reciprocal agents employed under a full discretion contract. The same is true for tasks that differ in their verifiability and the corresponding monitoring expenses within a firm. White collar jobs associated with higher monitoring expenses thus will tend to offer more discretion than blue collar jobs where monitoring is less costly. Higher monitoring costs imply higher distrust if monitoring is introduced. As a result, an introduction of monitoring decreases self-determination and the corre-
sponding principal’s friendliness stronger in white collar jobs compared to blue collar jobs where monitoring costs tend to be lower. This implication is related to Frey (1993) who argues that in white collar jobs which are characterized by high discretion as management, financial services, and research and where success depends on non-verifiable inputs as “intuition” and “judgment” monitoring tends to reduce self-determination or self-evaluation compared to blue collar jobs that are relatively simple and well-defined.

Note that Corollary 2.1 and its implications are driven by the binary effort assumption of the underlying shirking model. Restricting the effort choices of the agent rules out a scale effect and the resulting complementarity between full discretion and pay as observed in the experiment by Bartling et al. (2012) since agents cannot respond to a gift by providing more effort. Instead, agents in a shirking model are willing to work at lower wages to reward the principal’s trust.

2.4.3.2 Monitoring and Recruiting Propositions 2.1 and 2.2 also highlight the complementarity between the principal’s monitoring policy and her recruiting strategy. The principal can lower employment costs by employing reciprocal agents of types $\rho > \rho_L$ and by simultaneously embarking on a general trust strategy. Alternatively, employing workers of types $0 \leq \rho < \rho_L$ suggests to rely on a control strategy.

**Corollary 2.2.** Full discretion and a more reciprocal workforce are complements.

Thus, if the principal can choose the agent, she wants to implement trust and hire a reciprocal agent. The described interdependence of the discretion offered by a firm and its recruiting policy might explain why firms undertake considerable recruiting efforts which are designed not only to screen for ability but also the willingness to perform well, e.g., reciprocal preferences. Behrenz (2001) indicates that the willingness to perform well, are a focus of recruiters’ attention. He reports that in 40.6% of the cases the recruiter’s perception of the willingness to perform well (“Personal engagement” (27.8%) and “Social competence” (12.8%)) decided about who got the job.

This result is independent of the agent’s willingness to accept lower wages in return for full discretion. Even if all reciprocal agents with $\rho \geq \rho_L$ were paid the highest possible wage with full discretion, i.e., $w^T_R(\rho = \rho_L)$, which was shown to be larger than the optimal wage offered under the control strategy, a principal employing reciprocal agents with $\rho \geq \rho_L$ under a non-monitoring contract would face the same employment costs.
as a principal operating under a control strategy. The key difference is the savings of monitoring investments $k$ under full discretion which imply lower employment costs for reciprocal agents with $\rho \geq \rho_L$ even if their wages exceed the optimal wage with monitoring.

2.4.3.3 Efficiency Wages and Reciprocity  The presented model also addresses the Efficiency Wage Hypothesis which predicts that wages decrease in the monitoring technology. Accordingly, workers who are employed with full discretion should earn the highest wage while wages paid to workers employed under the control strategy are the lower the stronger they are monitored. To compare the prediction of the Efficiency Wage Hypothesis with the prediction of the presented model, consider Figure 3. It shows the optimal wages depending on the monitoring technology which is captured by $m$ in this model and the optimal monitoring policy of the principal. The solid line corresponds to the optimal wage under the control strategy, i.e., $w_S$, which is optimal for agents with $0 \leq \rho < \rho_L$. The dashed lines illustrate optimal wages under the trust strategy, i.e. $w^T_K$ for medium reciprocal agents of types $\rho_L < \rho < \rho_H$ (largely dashed) and highly reciprocal agents of types $\rho > \rho_H$ (slightly dashed). While medium reciprocal agents are offered a wage $w^T_K > w^C_R$, highly reciprocal agents receive a wage $w^T_K < w^C_R$.

Note that the optimal wages offered to reciprocal workers with $\rho > \rho_L$ under the trust strategy are decreasing in the monitoring technology $m$ although the considered agent types are not directly affected by monitoring due to full discretion. However, indirectly their wages react to a change in the monitoring technology. This effect is due to the
reciprocal agents’ reference points. Recall that the reciprocal agent compares his wage and monitoring offers to the offers made to a selfish agent to evaluate the principal’s total friendliness. As the monitoring technology $m$ improves, the optimal wage of the selfish workers decreases. Consequently, the reference wage of reciprocal agents decreases and the principal can reduce wages offered under the trust strategy.

**Corollary 2.3.** A better monitoring technology reduces the wage levels for all agent types irrespective of the applied monitoring strategy.

Corollary 2.3 thus presents another reason for mixed empirical results concerning the Efficiency Wage Hypothesis. If firms operate under different monitoring technologies, e.g., in different industrial sectors, interpersonal comparisons without controlling for individual reciprocity concerns and the monitoring technology in the reference industry can lead to mixed empirical results on the relationship between monitoring and wages.

### 2.5 Full Discretion Contracts as a Screening Device

In the previous subsection it was shown that with observable agent types the principal will choose different monitoring arrangements and wages to motivate effort provision depending on the agent’s reciprocity concerns. The trust strategy dominated the control strategy if reciprocal incentives were high enough to ensure effort provision even without monitoring. While observability of an agent’s type is rather given if the agent is recruited to a new job from within the firm, i.e., the internal labor market, the type of an agent is more or less unobservable if he is recruited from the external labor market. However, appropriate screening mechanisms can overcome the informational asymmetry.

In this subsection, I show that full discretion contracts can be used as a screening device. In the absence of alternative screening mechanisms, the monitoring strategy $M_i$ and the wage $w_i$ can be sufficient to achieve a self-selection of the agents. I extend the model introduced in Section 2.3 by assuming that there is a continuum of agent types differing in their reciprocity concerns $\rho$ and that the principal cannot observe the type of an applying agent. However, the distribution of agents’ types $F(\rho)$ is common knowledge. All remaining assumptions from the previous subsection still hold. The timing is the following: First, the principal states her contract offer or a menu of contract offers specifying the corresponding monitoring strategy and the corresponding wage. If a monitoring contract ($M = 1$) is accepted she also undertakes the investment $k$ to establish the
monitoring technology $m$. Then, the agent decides whether to exert effort or to shirk. Finally, the results from monitoring are evaluated and contingent payments are made.

### 2.5.1 Characterization of Pooling and Separating Equilibria

In general, the principal is interested in minimizing her expected employment costs. When confronted with unobservable agent types she can pursue two different strategies. On the one hand, she can refrain from screening and instead offer a pooling contract that is independent of agent’s type. On the other hand, she can design a menu of contracts that results in a self-selection of agent types.

First, consider the optimal pooling contract. The pooling contract is offered whenever the principal does not screen for the agent’s type. To prevent shirking by selfish agents, the optimal pooling contract thus has to be a monitoring contract. In addition, it cannot be optimal to offer a monitoring contract that offers a wage $w_{\text{Pool}} > \frac{c_m}{m}$ because $e_H$ can be implemented at a wage $w_{\text{Pool}} = \frac{c_m}{m}$ under monitoring for all agent types. As a consequence, under the optimal pooling contract $\Gamma_{\text{Pool}} = \Gamma^C = (1, \frac{c_m}{m})$ the principal pursues a control strategy and offers a wage $w_{\text{Pool}} = \frac{c_m}{m}$.

Now, consider the optimal separating contracts. Since there is a continuum of agent types a menu of separating contracts can potentially consist of a continuum of contracts. However, the optimal menu of contracts cannot contain two different monitoring contracts which differ only in the wage they offer, i.e., $\Gamma^C_{\text{Sep}, x} = (1, w_{C, x})$ and $\Gamma^C_{\text{Sep}, y} = (1, w_{C, y})$ with $w_{C, x} > w_{C, y}$ for $x > y$, since all agent types derive additional utility from increased wages and would prefer the contract that offers the higher wage, i.e., $\Gamma^C_{\text{Sep}, x} = (1, w_x)$. The same argument also holds for any two trust contracts within the offered menu of contracts, i.e., $\Gamma^T_{\text{Sep}, x} = (0, w_{T, x})$ and $\Gamma^T_{\text{Sep}, y} = (0, w_{T, y})$ with $w_{T, x} > w_{T, y}$ for $x > y$. Consequently, the optimal menu of contracts consists of one monitoring contract and one trust contract only, i.e., $\theta = (\Gamma^C_{\text{Sep}} = (1, w_C) \Gamma^T_{\text{Sep}} = (0, w_T))$, which offer potentially different wages $w_C$ and $w_T$.

Recall that with full information about the agent’s type it is optimal to offer monitoring contracts to agents with $\rho < \rho_L$ but to offer trust contracts to agents with $\rho \geq \rho_L$. The optimal menu of separating contracts should thus achieve a self-selection of lower types and higher types into monitoring contracts and trust contracts, respectively. More precisely, untrustworthy agents ($a = C$), i.e., with reciprocity concerns $\rho \leq \rho_{\text{Sep}}$ and expected utilities $U_C$, should self-select into monitoring contracts $\Gamma^C_{\text{Sep}} = (1, w_C)$ while trustworthy
agents \((a = T)\), i.e., with reciprocity concerns \(\rho > \rho_{\text{Sep}}\) and expected utilities \(U_T\), should self-select into trust contracts \(\Gamma^T_{\text{Sep}} = (0, w_T)\). The separating contracts then have to fulfill the following requirements.

First, given the separating contract \(\Gamma^a_{\text{Sep}}\) an agent of type \(a \in \{C, T\}\) prefers to provide effort instead of shirking, i.e.,

\[
U_a(\Gamma^a_{\text{Sep}}, e_H) \geq U_a(\Gamma^a_{\text{Sep}}, e_L). \tag{2.4}
\]

Second, an agent of type \(a\) prefers exerting effort under contract \(\Gamma^a_{\text{Sep}}\) to exerting effort under the alternative contract \(\Gamma^b_{\text{Sep}}\) with \(b \neq a\), i.e.,

\[
U_a(\Gamma^a_{\text{Sep}}, e_H) \geq U_i(\Gamma^b_{\text{Sep}}, e_H). \tag{2.5}
\]

And last, an agent of type \(a\) prefers exerting effort under contract \(\Gamma^a_{\text{Sep}}\) to shirking under the alternative contract \(\Gamma^b_{\text{Sep}}\) with \(b \neq a\), i.e.,

\[
U_a(\Gamma^a_{\text{Sep}}, e_H) \geq U_a(\Gamma^b_{\text{Sep}}, e_L). \tag{2.6}
\]

While condition (2.4) is related to the incentive compatibility constraint with observable types, conditions (2.5) and (2.6) are a feature of separating contracts. They ensure that both agent types are best off with exerting \(e_H\) under the contract intended for their type and thus make deviation from the intended contract costly for the agents. However, separating contracts also incur potential costs for the principal. To ensure non-deviation under separating contracts she has to provide a wage gap \(w^C_{\text{Sep}} - w^T_{\text{Sep}}\) that are high enough to ensure non-deviation from selfish agents but at the same time low enough to ensure non-deviation from reciprocal ones. These wage gaps are characterized by conditions (2.5) and (2.6). In addition, participation prescribes

\[
U_a(\Gamma^a_{\text{Sep}}, e_H) \geq 0. \tag{2.7}
\]

### 2.5.2 Optimal Contracts with Unobservable Agent Types

There are several combinations of contracts \(\theta_z = \left(\Gamma^C_{\text{Sep},z}, \Gamma^T_{\text{Sep},z}\right)\) that fulfill requirements (2.4) - (2.7). Moreover, the principal has also to consider a pooling equilibrium. Consequently, she can pick among different menus of contracts \(\Theta = \{\theta_z, \Gamma_{\text{Pool}}\}\) that she can
offer to the agents. However, she will prefer to offer only those menus of contracts that minimize the expected costs of employment which are a weighted sum of the employment costs of an agent of type $a \in \{C, T\}$. More precisely, the principals optimization problem is to minimize expected employment costs

$$E[\kappa(\Theta)] = \begin{cases} \frac{c}{m} + k & \text{if } \Theta = \Gamma_{\text{Pool}} \\ F(\rho_{\text{Sep},z}) \left( w_{\text{Sep},z} + k \right) + [1 - F(\rho_{\text{Sep},z})] w_{\text{Sep},z} & \text{if } \Theta = \theta_z \end{cases}$$

subject to (2.4) - (2.7) by choosing among the possible contracts $\Theta$. The resulting optimal menu of contracts is characterized by Proposition 2.3.

**Proposition 2.3.** The principal will offer separating contracts $\Gamma_{\text{Sep}}^C = (1, \frac{c}{m})$ and $\Gamma_{\text{Sep}}^T (0, \frac{c}{m} - c)$ if and only if $c < k \leq \frac{c}{m}$.

**Proof.** See Appendix.

$\Gamma_{\text{Sep}}^C$ and $\Gamma_{\text{Sep}}^T$ ensure that agents of types $0 \leq \rho \leq \rho_{\text{Sep}}$ with $\rho_{\text{Sep}} = \frac{c}{m}$ self-select into monitoring contracts $\Gamma_{\text{Sep}}^C$, while agents of types $\rho > \rho_{\text{Sep}}$ choose full discretion contracts $\Gamma_{\text{Sep}}^T$.\footnote{More precisely, selfish agents and reciprocal agents of type $\rho_{\text{Sep}}$ are indifferent between $\Gamma_{\text{Sep}}^C$ and $\Gamma_{\text{Sep}}^T$, while reciprocal agents with $0 < \rho < \rho_{\text{Sep}}$ strictly prefer $\Gamma_{\text{Sep}}^C$ and reciprocal agents with $\rho > \rho_{\text{Sep}}$ strictly prefer $\Gamma_{\text{Sep}}^T$. Further, participation is ensured under $\Gamma_{\text{Sep}}^C$ and $\Gamma_{\text{Sep}}^T$ for $k \leq \frac{c}{m}$.} If reciprocal applicants are of sufficiently high type, i.e., $\rho > \rho_{\text{Sep}}$, they are willing to waive a considerable part of their wage payment in exchange for full discretion. Note that $w_{\text{Sep}}^T = \frac{c}{m} - c$ implies that monitoring contracts exhibit higher wages than full discretion contracts. Lower wages under the trust strategy $\Gamma_{\text{Sep}}^T$ provide less incentives for selfish applicants to pick a full discretion contract. At the same time the control strategy $\Gamma_{\text{Sep}}^C$ is unalluring enough for reciprocal applicants of types $\rho > \rho_{\text{Sep}}$ despite the higher wage offer $w_{\text{Sep}}^C$. Consequently, applicants select into the offered separating contracts according to their type. Therefore, it can be optimal to screen for applicants’ reciprocity concerns by offering a menu of separating contracts since full discretion contracts are valued by reciprocal agents and offer the possibility to reduce employment costs.

As with observable types, this result is driven by the binary effort setting and the corresponding possibility for the agent to repay the principal’s trust under full discretion. In contrast to Bartling et al. (2012) in the underlying shirking model the different control strategies with the corresponding wage offers can be used as a screening device.
since reciprocal agents are willing to partly waive wage payments in exchange for more discretion.

2.6 Competition and Alternative Screening Devices

Up to now, my analysis has ignored competition among firms for workers with a high work moral, i.e., high reciprocity concerns. But as Huang and Cappelli (2010) point out, competition for workers who care about not being monitored is likely to drive those workers’ wages upwards since they offer a possibility to save monitoring costs. The empirical results of Huang and Cappelli (2010) support the findings of Bartling et al. (2012) by showing that screening for work attitude is associated with less monitoring, more teamwork, increased productivity and higher wages while screening for skills is not. Yet, in their data set, workers with a high work moral tend to increase their productivity which indicates a scale effect and is not suited to investigate the substitution effect between monitoring and wages if a given effort level needs to be implemented.\textsuperscript{27}

Moreover, other screening devices than contract specifications must be available in the firms analyzed by Huang and Cappelli (2010). The reason is that self-selection due to monitoring and wages as modeled in the previous subsection is only possible if agents who are not monitored (workers with desirable work attitude) receive lower wages. With competition for such workers which drives their wages upwards, selfish workers would push into non-monitoring contracts and lead to a break-down of separating contracts if the only screening devices were contract specifications.

To show that competition for workers with a high working moral does not necessarily imply higher wages under trust contracts but rather depends on the underlying production technology I extend my model by a few assumptions to allow for alternative screening mechanisms and a competitive labor market. As in the previous subsection, I assume that there is a continuum of agent types differing in their reciprocity concerns $\rho$.

The principal can choose whether to implement a screening strategy or not, i.e, to screen for the applicant’s type at a cost $\sigma$ with $0 < \sigma < 2k$ before offering a contract, or to offer a contract without screening which involves no additional costs. Moreover, I assume that there is a competitive labor market, i.e., wages must correspond to the outputs net of potential monitoring and screening costs. As a consequence, irrespective of their screen-

\textsuperscript{27}The scale effect is also observed in Bartling et al. (2012) and is due to the fact that agents can increase their effort to return a gift.
ing strategy, principals make zero profits and are indifferent between screening and not screening.

As shown in the basic model, there exists no positive wage to ensure $e_H$ from a selfish agent without monitoring. Thus, non-screening firms offer a monitoring contract $\Gamma_C = (1, \pi(e_H) - k)$ irrespective of the agent’s type. Instead, screening allows for contracts based on agent type which are either monitoring contracts $\Gamma_C^{\text{screen}} = (1, \pi(e_H) - k - \sigma)$ for workers with low reciprocity concerns $\rho < \rho_T$ (low work moral) or trust contracts $\Gamma_T^{\text{screen}} = (0, \pi(e_H) - \sigma)$ for workers with high reciprocity concerns $\rho \geq \rho_T$ (high work moral). Note that the monitoring contract in a non-screening firm $\Gamma_C$ offers a higher wage than the monitoring contract in the screening firm $\Gamma_C^{\text{screen}}$. Therefore, selfish workers are always attracted to the non-screening firm.

Reciprocal workers also value high wages but they are willing to trade wage payments against discretion since they care about not being monitored. Table 2 shows the reciprocal agent’s utility depending on the principal’s screening strategy and the corresponding contracts.$^{2,8}$

\[
\begin{array}{ccc}
\Gamma_C & \Gamma_C^{\text{screen}} & \Gamma_T^{\text{screen}} \\
\hline
\Gamma_C & (1 - m) [\pi(e_H) - k] & (1 - m) [\pi(e_H) - k - \sigma] & \pi(e_H) - \sigma \\
\Gamma_C^{\text{screen}} & \pi(e_H) - k - c & \pi(e_H) - k - \sigma - c & \pi(e_H) - \sigma - c + \rho [2k - \sigma] \\
\end{array}
\]

Table 2: Agents’ utilities depending on effort, screening, and the offered contract.

From Table 2 we can infer that for $\pi(e_H) - k - \sigma \geq \frac{c}{m}$ incentive compatibility is ensured under both monitoring contracts $\Gamma_C$ and $\Gamma_C^{\text{screen}}$. Moreover, only agents with reciprocity concerns $\rho \geq \rho_T$ with $\rho_T = \frac{c}{2k - \sigma}$ are willing to exert effort without monitoring and will thus be offered a trust contract $\Gamma_T^{\text{screen}}$ by a screening firm. Consequently, reciprocal workers with $\rho < \rho_T$ have no incentive to apply at a screening firm since $\Gamma_C^{\text{screen}}$ offers lower wages but not more discretion compared to $\Gamma_C$.

A reciprocal agent with reciprocity concerns $\rho \geq \rho_T$ will be willing to work under a trust contract offered by the screening firm only if his expected utility with $e_H$ under contract $\Gamma_T^{\text{screen}}$ is at least as high as his expected utility with $e_H$ under the next best contract, i.e., $\Gamma_C$.$^{2,9}$ This condition provides a threshold of reciprocity concerns for applying at a

\[\text{Note that under monitoring contracts } \Gamma_C \text{ and } \Gamma_C^{\text{screen}} \text{ the utility of a selfish agent is identical to the utility of a reciprocal agent.}
\]

\[\text{Since } \Gamma_C^{\text{screen}} \text{ offers lower wages but not more discretion compared to } \Gamma_C, \text{ the next best alternative to a}\]
screening firm which is given by $\rho \geq \rho_{\text{screen}} \geq \rho_T$ with $\rho_{\text{screen}} = \frac{\sigma - k}{\pi - \sigma}$. From $\rho_{\text{screen}} \geq \rho_T$ we can conclude that screening costs must be sufficiently high, i.e., $\sigma \geq c + k$, for full discretion contracts to arise in equilibrium. As a result, workers of types $\rho \geq \rho_{\text{screen}}$ undergo screening and are then employed under full discretion contracts $\Gamma^\text{screen}_T = (0, \pi(e_H) - \sigma)$ while the remaining worker types seek employment in non-screening firms and are offered monitoring contracts $\Gamma_C = (1, \pi(e_H) - k)$.

**Proposition 2.4.** In a competitive labor market with screening, trust contracts offer lower wages than monitoring contracts.

### 2.7 Conclusion

Efficiency Wage Theory and classical Principal-Agent Theory suggest a negative relationship between monitoring and wages. However, the corresponding empirical results are mixed. I argue that mixed empirical results could be driven by hidden costs of control as well as the underlying production process.

The presented model explores the firm’s optimal monitoring and wage strategy in the presence of potential hidden costs of control by introducing intention-based reciprocity. In a binary effort setting where effort can be imperfectly monitored, I find that with observable agent types, selfish agents are always monitored while monitoring is not necessary to ensure effort provision by reciprocal agents. Offering full discretion increases the principal’s friendliness which in turn provides incentives for the agent to reciprocate by choosing high effort. If reciprocal agents care enough about gift exchange, these additional incentives from reciprocity can be high enough to balance shirking incentives and to render the trust strategy dominant. Accordingly, employees’ reciprocal preferences can be a reason to offer high discretion even in blue collar jobs that involve relatively low monitoring costs. Full discretion and pay can be both, complements and substitutes, depending on the agent’s reciprocity concerns. The relationship between the optimal discretion and the corresponding wage also affects the firm’s recruiting policy and results in full discretion and a more reciprocal workforce being complements. Heterogeneous reciprocity concerns thus have important implications for the complementarity of firm policies and can serve as an explanation for mixed empirical results on the relationship between monitoring and wages. Even with unobservable agent types the principal

\[\text{trust contract is the monitoring contract offered by a non-screening firm, i.e., } \Gamma_C.\]
can benefit from lower employment costs under full discretion contracts. Screening for applicant’s type is optimal if reciprocal types care enough about full discretion. In the corresponding separating equilibrium, optimal monitoring contracts always offer higher wages than full discretion contracts because wages under full discretion can be reduced to an extent which ensure both, effort provision and self-selection, if reciprocal incentives from full discretion are sufficiently high. This result is robust to changes in the competitive structure of the labor market.

Most reported results are driven by the restriction of agent’s effort choice to a binary choice and thus concentrate on the substitution effect between offered discretion and pay. They are in contrast to the experimental and empirical evidence by Bartling et al. (2012) and Huang and Cappelli (2010) but not less rich. Rather, the difference in findings emphasizes that the complementarity of screening, monitoring and pay strongly depends on the agent’s possibilities to provide gifts in return for full discretion, i.e., the production process. The binary effort approach used in this model captures the idea that some jobs leave only little scope for agents to choose their effort. Production processes with limited or even binary effort choices can be usually found among simple, repetitive blue collar tasks as, e.g., a worker at the production line cannot increase output by working faster if the speed of the line is fixed. However, this does not mean that all blue collar jobs are sufficiently represented by a binary effort assumption. Some blue collar jobs offer the opportunity to affect output in a non-binary way as, e.g., a foreman who is considered to be blue collar but also performs organizational tasks that are typically associated with white collar occupations. Thus, empirical studies that do not take the nature of the production process and the corresponding possible effort choices into account when considering data from different job categories in different industries might end up with mixed results on the wage effect of monitoring.
Appendix 2

Proof Proposition 2.3  The conditions for separating contracts (2.4) - (2.6) translate into:

\[ U^C(\Gamma^C_{\text{sep}}, e_H) \geq U^C(\Gamma^C_{\text{sep}}, e_L) : w^C_{\text{sep}} - c \geq (1 - m)w^C_{\text{sep}} \]

\[ \Rightarrow w^C_{\text{sep}} \geq \frac{c}{m} \]

\[ U^C(\Gamma^C_{\text{sep}}, e_H) \geq U^C(\Gamma^T_{\text{sep}}, e_L) : w^C_{\text{sep}} - c \geq w^R_{\text{sep}} \]

\[ \Rightarrow w^C_{\text{sep}} \geq w^R_{\text{sep}} + c \]

\[ U^T(\Gamma^T_{\text{sep}}, e_H) \geq U^T(\Gamma^T_{\text{sep}}, e_L) : w^T_{\text{sep}} - c + \rho \left[ (w^T_{\text{sep}} - w^C_{\text{sep}}) + k \right] \geq w^T_{\text{sep}} \]

\[ \Rightarrow w^T_{\text{sep}} \geq w^C_{\text{sep}} + \frac{c \rho}{1 + \rho} \]

\[ U^T(\Gamma^T_{\text{sep}}, e_H) \geq U^T(\Gamma^C_{\text{sep}}, e_H) : w^T_{\text{sep}} - c + \rho \left[ (w^T_{\text{sep}} - w^C_{\text{sep}}) + k \right] \geq w^C_{\text{sep}} - c \]

\[ \Rightarrow w^T_{\text{sep}} \geq w^C_{\text{sep}} - \frac{c \rho}{1 + \rho} \]

\[ U^T(\Gamma^T_{\text{sep}}, e_H) \geq U^T(\Gamma^C_{\text{sep}}, e_L) : w^T_{\text{sep}} - c + \rho \left[ (w^T_{\text{sep}} - w^C_{\text{sep}}) + k \right] \geq (1 - m)w^C_{\text{sep}} \]

\[ \Rightarrow w^T_{\text{sep}} \geq \frac{1 - m + \rho}{1 + \rho} w^C_{\text{sep}} + \frac{c - \rho k}{1 + \rho} \]

Since a selfish agent always shirks if not monitored, \( U^C(\Gamma^C_{\text{sep}}, e_H) \geq U^C(\Gamma^T_{\text{sep}}, e_H) \) has not to be considered.

The possible combinations of the different conditions result in different cases. Since the lowest possible wages \( w^C_{\text{sep}} \) and \( w^T_{\text{sep}} \) must be at the intersections of the binding conditions (2.4) - (2.6) in the \( w^C_{\text{sep}} - w^T_{\text{sep}} \) - space, I combine a binding condition for \( w^C_{\text{sep}} \) with a binding condition for \( w^T_{\text{sep}} \) and check for which parameter intervals these wage combinations are feasible, i.e., the remaining conditions just as the participation constraint (2.7) are fulfilled. All possible combinations of \( w^C_{\text{sep}} \) and \( w^T_{\text{sep}} \) are shown in Table 3.

<table>
<thead>
<tr>
<th>( w^C_{\text{sep}} = \frac{c}{m} )</th>
<th>case 1</th>
<th>case 2</th>
<th>case 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>( w^C_{\text{sep}} = w^T_{\text{sep}} + c )</td>
<td>not feasible</td>
<td>not feasible</td>
<td>not feasible</td>
</tr>
</tbody>
</table>

Table 3: Possible combinations of wages in a separating equilibrium.

**case1:** \( w^C_{\text{sep}} = \frac{c}{m} \) & \( w^T_{\text{sep}} = \frac{c}{m} + \frac{\rho}{k} - k \) for \( c < k \leq \frac{c}{m} \) & \( \rho = \frac{c}{k-c} \)

**case2:** \( w^C_{\text{sep}} = \frac{c}{m} \) & \( w^T_{\text{sep}} = \frac{c}{m} - \frac{\rho k}{1 + \rho} \) for \( c < k \leq \frac{c}{m} \) & \( \rho \geq \frac{c}{k-c} \)

**case3:** \( w^C_{\text{sep}} = \frac{c}{m} \) & \( w^T_{\text{sep}} = \frac{(1 - m + \rho)}{m(1 + \rho)} w^C_{\text{sep}} + \frac{c - \rho k}{1 + \rho} \) for \( c < k \leq \frac{c}{m} \) & \( \rho \geq \frac{c}{k-c} \)

Note that case 1 is a special case of case 2. Moreover, case 2 and case 3 apply for identical
Parameter intervals of $k$ and $\rho$ and $\frac{1-m+\rho}{1+p}w_{sep}^C + \frac{c-\rho k}{1+p} \geq \frac{c}{m} - \frac{\rho k}{1+p}$ for $c < k \leq \frac{c}{m}$ and $\rho > \frac{c}{k-c}$. Consequently, case 3 is dominated by case 2 since employment costs can be reduced by choosing case 2 for $c < k < \frac{c}{m}$ and $\rho \geq \frac{c}{k-c}$. Moreover, the expected employment costs with separating contracts in case 2, i.e.,

$$E[\kappa(\theta_2)] = F(\rho_{sep,2}) \left(w_{sep,2}^C + k\right) + \left[1 - F(\rho_{sep,2})\right] w_{sep,2}^T$$

(2.9)

are potentially lower than the employment costs under the pooling contract

$$\kappa(\Gamma_{pool}) = \frac{c}{m} + k$$

(2.10)

for all $\rho_{sep,2}$ whenever case 2 applies, i.e., for $c < k \leq \frac{c}{m}$ and $\rho \geq \frac{c}{k-c}$. Consequently, the pooling contract is dominated by the separating contract described by case 2.

As a result, Table 4 shows the optimal menus of contracts depending on $k$ and $\rho$.

<table>
<thead>
<tr>
<th>$k \leq c$</th>
<th>$c &lt; k \leq \frac{c}{m}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\rho &lt; \frac{c}{k-c}$</td>
<td>not feasible</td>
</tr>
<tr>
<td>$\rho \geq \frac{c}{k-c}$</td>
<td>$\Gamma_{pool} = (1, \frac{c}{m})$</td>
</tr>
</tbody>
</table>

Table 4: Optimal menus of contracts.

Inserting the threshold for self-selection $\rho_{sep} = \frac{c}{k-c}$ into $\Gamma_{sep}^T = (0, \frac{c}{m} - \frac{\rho k}{1+p})$ then leads to $\Gamma_{sep}^T (0, \frac{c}{m} - c)$. 

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References 2


3 Reciprocity, Matching, and Wage Competition

3.1 Motivation

In real world labor relations, firms spend a considerable amount of resources to identify the types of potential workers by way of assessment centers, job interviews or close observation during the worker’s probation period.\(^3\) Besides productivity aspects like intelligence or experience, potential employees are also evaluated with regard to their social behavior or, put differently, their social preferences.\(^2\) As confirmed by numerous experimental findings, people exhibiting other-regarding preferences coexist with selfish individuals (see, e.g., Fehr et al. (1993), Fehr et al. (1997), Fehr et al. (1998a), Fehr et al. (1998b) and Fehr and Schmidt (2006)). The difference in behavior of these two types has important implications for their employer. To understand why social preferences might play a role in employment relationships, consider reciprocity: As a source of gift exchange between employer and employee, positive reciprocity offers a prominent explanation for non-minimal wage offers and effort choices beyond the selfishly rational minimum effort (for a theoretical treatment, see, e.g., Akerlof (1982) and Rabin (1993), for experimental evidence, e.g., Fehr and Falk (1999) and Charness (2004), and for empirical findings Dohmen et al. (2009)). On the other hand, negative reciprocity can result in shirking and sabotage activities (see, e.g., Bewley (1999), Krueger and Mas (2004), and Dohmen et al. (2009)).

The aim of this section is to theoretically explore how reciprocity between a firm (manager) and a worker can explain why some firms are more profitable than others, although the production technology remains unchanged. Moreover, I investigate how the coexistence of reciprocal and selfish types influences the formation of employment relationships, wage differentials, wage competition, and unemployment in the presence of moral hazard. I consider a moral hazard setting with one manager (principal) and one worker (agent). The manager offers a contract that lets the worker participate in output.

\(^3\)For example in Switzerland, costs to fill a vacancy are on average CHF 13,500 with a maximum of CHF 170,000 as reported by Blatter et al. (2012). While around 70% of these costs are due to decreased productivity during the adaption period of a newly hired worker, the rest of around 30% can be attributed to recruitment and selection, which results in recruitment costs per vacancy of about CHF 4,050 on average.

\(^2\)A study by Behrenz (2001) indicates that “Will-dos” (the individual’s willingness to perform well) are a focus of recruiters’ attention and their importance in the recruiting process. Among other questions, 785 Swedish employers were asked “Which characteristic of those invited to the interviews had the greatest importance for the choice of the one finally hired?”. The most important characteristics were “Professional competence” (55.7%), “Personal engagement” (27.8%), and “Social competence” (12.8%). Thus, in 40.6% of the cases (“Personal engagement” and “Social competence”) the recruiter’s perception of “Will-dos” rather than the individual’s ability to perform well decided about who got the job.
Both, manager and worker, can either be selfish or reciprocal. Depending on matching, the offered contracts, efforts, and outputs can differ, making some firms more profitable than others. I show that, if the worker is positively reciprocal, a purely reciprocal match is characterized by a strictly higher output share for the employee and a strictly higher effort, as compared to a mixed match led by a selfish manager. In contrast, both manager types offer the same low share to a selfish worker because they anticipate that selfish workers will not provide costly gifts. Furthermore, both manager types can increase their utilities by employing reciprocal workers with low reference points, while the workers’ preferences for managers are only based on the size of the share offer but not on the type of employer.

Vertical social preferences have been explored theoretically before. For example, Akerlof (1982) states that gift exchange between firms and its employees can be a reason for above minimum wages and enhanced efforts. Since then, numerous theoretical studies have considered workers with heterogeneous reciprocal preferences (see, e.g., von Siemens (2011) and Kosfeld and von Siemens (2011)). However, only few theoretical analyses have considered heterogeneous worker preferences in interplay with heterogeneous manager preferences. Approaches to this question have been made by, e.g., Englmaier and Leider (2012) or Ellingsen and Johannesson (2008). The field experiment and the corresponding model by Englmaier and Leider (2012) is closely related to my setup. They investigate worker reactions to gifts by the manager and find that worker reciprocity enhances effort if the worker is able to influence manager payoff in return for the gift. However, in contrast to the model in Englmaier and Leider (2012) which is based on Rabin (1993) and thus investigates outcome-based reciprocity, the model presented here incorporates procedural reciprocity. Furthermore, Ellingsen and Johannesson (2008) provide a model where the principal’s monitoring decision contains information about the principal’s altruistic type. As a result, principals who trust their agents and risk exploitation encourage higher effort by altruistic agents as a response to their higher esteem of the trusting principal compared to a controlling one.

In the competition subsection, I focus on managers’ preference for the favored reciprocal workers to investigate its implications for the labor market. I introduce a labor

\[^{33}\text{Models of intention-based reciprocity based on Rabin (1993), which compare total payoffs to a reference payoff, have the feature of charging the receiving party for provided gifts since costly gifts decrease the total payoff of the giving party and thus reduce the friendliness of the receiving party although the gift was provided voluntarily. The approach presented here helps to overcome the described charging of provided gifts.}\]
market without frictions where the total number of workers available exceeds the total number of vacancies in the market but the share of positively reciprocal workers is not sufficient to fill all vacancies. In this setting, competing managers might offer higher output shares than without competition to attract highly positively reciprocal workers. The resulting competitive matching allocates those preferred reciprocal workers to reciprocal managers. Consequently, all scarce preferred reciprocal workers will be employed, while selfish workers, followed by unfavored reciprocal (i.e., less positively and negatively reciprocal) workers are only hired if there are still vacant jobs in the market.

This result is in line with the findings of Dohmen et al. (2009), who relate measures of reciprocity of 20,774 individuals to their labor market outcomes. They find that positively reciprocal workers are associated with higher wages, efforts, and a higher probability to be employed, while negatively reciprocal workers are associated with lower efforts, and a lower probability to be employed. An early attempt to infer labor market outcomes from gift exchange was made by Akerlof (1982) and Akerlof and Yellen (1990). The underlying idea is that workers have a conception of a fair wage and are willing to provide additional effort if their actual wage exceeds the fair wage. As a result, unemployment occurs if the fair wage exceeds the market-clearing wage. Nevertheless, it does not pay for firms to cut wages because of the positive relationship between wages and effort norms. My approach is different in the sense that it focuses not at the emergence of unemployment but on the type of unemployed workers in a labor market with an excess labor supply. A competitive labor market with heterogeneous workers is also assumed by Kosfeld and von Siemens (2011). But they are interested in incentives and self-selection of workers and the resulting corporate cultures in equilibrium rather than unemployment and the type of unemployed workers. Wage differentials and unemployment are usually investigated within the framework of search-theoretic labor market models that include search frictions by assumption. In these models unemployment is voluntary since workers can decide whether to participate in a (sub)market for labor or not, depending on the (sub)market wage and the probability to find a job in this (sub)market. My model gives an explanation of wage and profitability differentials without assuming any search frictions. Furthermore, unemployment in my model is involuntary and type-dependent.

The section is structured as follows: Section 3.2 introduces the formal model. Section 3.3 derives individually rational output shares, efforts, and outputs of different ex-

\[3^4\text{For an overview, see Rogerson et al. (2005).}\]
ogenous firm compositions and the corresponding comparative statics. In Section 3.4, matching preferences are analyzed. Section 3.5 captures the outcomes of wage competition. Finally, Section 3.6 concludes. All proofs can be found Appendix 3.B.

3.2 Model Setup

I assume that a firm consists of two parties – the manager (firm) and the worker, who are both risk neutral. The worker produces verifiable output $\pi(e) = \varepsilon e$, where $e \geq 0$ denotes the worker’s observable but non-verifiable effort that comes at a convex cost $c(e) = \frac{1}{2}e^2$ while $\varepsilon \in [0, 2]$ is a random variable with expected value $E[\varepsilon] = 1$.\(^{35}\) Furthermore, the worker is protected by limited liability which prescribes that wages must be non-negative, and the worker’s outside option is normalized to zero.

The manager offers a contract $\Gamma(\beta, \pi(e)) = \beta\pi(e)$ with $\beta \in [0, 1]$ to the worker to compensate him for his effort. A microeconomic condition for the optimality of a pure output share contract can be found in Appendix 3.A. An alternative interpretation of the contract might be that, due to a bargaining process, a share $\beta$ of output accrues to the worker in form of a wage, without explicitly considering the form of the optimal wage contract.

Both, the manager and the worker, can be of two different types, either selfish ($s$) or reciprocal ($r$) which is public information due to e.g. screening. While $s$-types only care about their monetary outcome, $r$-types gain additional utility from reciprocity, i.e., reciprocating the behavior of reference agents. As a consequence, reciprocal types are willing to incur costs to reward friendly behavior or punish hostile behavior of their reference agents. The difference in types is captured by the reciprocity parameters $\mu \in [0, 1]$ and $\omega \in [0, 1]$, respectively, where $\mu$ refers to the manager type and $\omega$ refers to the worker type. While $\mu = 0$ and $\omega = 0$ describe selfish types, $0 < \mu \leq 1$ and $0 < \omega \leq 1$ represent reciprocal types. The reciprocity parameters have an upper bound to avoid unusually high reciprocal utilities that would completely outweigh monetary payoffs.

The corresponding manager’s expected utility is assumed to be

$$U_m = (1 - \beta) E[\pi(e)] + \mu \left[ c'(e) - \frac{\partial \Gamma(\beta, E[\pi(e)])}{\partial e} \right] (\Theta(\beta) - R). \quad (3.1)$$

\(^{35}\)Especially in small firms the observability of effort is not absurd. When working together on a daily basis, all members of the firm develop a good idea of how much everybody contributes to the overall output. Nevertheless, their observations are hardly verifiable in court or by another third party, whereas output is usually verifiable.
The first part of the manager’s utility is his monetary payoff which consists of his share of the expected output \((1 - \beta) E [\pi(e)]\). In addition, the second part of his utility function captures the manager’s reciprocal utility. It consists of the worker’s friendliness measured by \(c'(e) \frac{\partial [\beta E[\pi(e)]]}{\partial e}\), multiplied by the manager’s friendliness measured by \(\Theta(\beta) - R\), where \(\Theta(\beta) = \beta\) with \(\Theta(\beta) \in [0, 1]\) captures the generosity of the offered contract and \(R \in [0, 1]\) stands for a reference point of the worker which represents the share of output a reciprocal worker perceives as fair. Finally, the product of worker friendliness and manager friendliness is weighted by \(\mu\), the manager’s reciprocity parameter, which indicates the importance of reciprocal utility to the manager.

If the worker’s behavior is perceived as friendly, i.e., \(\mu c'(e) > 0\), the manager experiences positive reciprocal utility if his offered share exceeds the worker’s reference value, i.e., \(\beta > R\), but would suffer from negative reciprocal utility if he reacted hostile to the worker’s friendliness by offering \(\beta < R\). Similarly, if the worker’s behavior is perceived as hostile, i.e., \(\mu c'(e) < 0\), the manager gains positive utility from reciprocity by reacting hostile, i.e., offering \(\beta < R\), but loses utility if he reacts friendly to the worker’s hostility, i.e., \(\beta > R\).

The worker’s friendliness is measured by \(c'(e) - \frac{\partial [\beta E[\pi(e)]]}{\partial e}\). Only if the worker increases effort beyond the selfishly optimal amount, i.e., \(c'(e) > \frac{\partial [\beta E[\pi(e)]]}{\partial e}\), implying a monetary loss in form of a suboptimal monetary payoff, is his behavior perceived as friendly.\(^{3.6}\)

Similar to the manager’s utility function, the worker’s utility is represented by

\[
U_w = \beta E[\pi(e)] - c(e) + \omega [\Theta(\beta) - R] \left[ c'(e) - \frac{\partial \Gamma(\beta, E[\pi(e)])}{\partial e} \right].
\] (3.2)

The first part of the worker’s utility is the monetary payoff as his share of expected output net of effort costs, i.e., \(\beta E[\pi(e)] - c(e)\). The second part represents his reciprocal utility with the manager’s friendliness \([\beta - R]\) multiplied by the worker’s friendliness \(c'(e) - \frac{\partial [\beta E[\pi(e)]]}{\partial e}\) and weighted by \(\omega\), the worker’s reciprocity parameter, which measures the importance of reciprocal utility to the worker. The reciprocal worker can increase his utility by reciprocating the behavior of the manager, i.e., to react friendly if \(\beta > R\) by choosing \(c'(e) > \frac{\partial [\beta E[\pi(e)]]}{\partial e}\) but to react hostile if \(\beta < R\) by choosing \(c'(e) < \frac{\partial [\beta E[\pi(e)]]}{\partial e}\). Note that the worker’s hostile behavior (punishment), i.e., \(c'(e) < \frac{\partial [\beta E[\pi(e)]]}{\partial e}\), also incurs a cost in form of a reduced monetary payoff of the worker. In contrast, the behavior of a selfish worker entails a binding first order condition, i.e., \(c'(e) = \frac{\partial [\beta E[\pi(e)]]}{\partial e}\).
Note that an offer $\beta = R$, which exactly meets the worker’s reference point, is perceived as neutral by the worker and induces selfish worker behavior (maximizing monetary payoff) even if he is of the $r$-type. Similarly, even a reciprocal manager reacts selfishly, if the worker’s effort choice is characterized by $c'(e) < \frac{\partial \Gamma(\beta, E[\pi(e)])}{\partial e}$. Consequently, the manager’s reference point corresponds to the utility maximizing effort of a selfish worker.

This approach to model intention-based reciprocity is different from models based on Rabin (1993) as, e.g., Englmaier and Leider (2012). These models of intention-based reciprocity compare total payoffs to a reference payoff and thus have the feature of charging the receiving party for provided gifts. The reason is that costly gifts decrease the total payoff of the giving party and thus reduce the friendliness of the receiving party although the gift was provided voluntarily. Instead, in my model, reciprocal agents compare offered shares and effort choice behavior. Thus, they evaluate the other’s behavior directly and are concerned with procedural fairness. Recall that although effort is not verifiable, it is observable. Consequently, although effort cannot be prescribed in a contract, it can be used to evaluate worker behavior.

The timing of the model is as follows: First, types are observed. Then the manager makes a binding contract offer. After observing the offered share, the worker decides about effort. Finally, output is realized and the wage payment is made.

### 3.3 Individual Optimization

First, I solve the optimization problem for a purely reciprocal match. The results of the other possible matches are then deduced from the obtained solutions by manipulating $\mu$ and $\omega$.

#### 3.3.1 Purely Reciprocal Match

As derived before, the expected utilities in a purely reciprocal match are given by equations (3.1) and (3.2). Incentive compatibility requires that the worker choose his effort to maximize his utility, i.e., $e \ arg \ max \ U_w$.

**Lemma 3.1.** The optimal effort of a reciprocal worker is characterized by $e = \beta + \omega (\beta - R)$.

**Proof.** See Appendix
As a result, a reciprocal worker provides a gift of $\omega (\beta - R)$ additional effort units if the offered share is perceived as friendly by the worker, i.e., $(\beta - R) > 0$, but punishes the manager by reducing his effort by $\omega (R - \beta)$ effort units if the offered share is perceived as hostile, i.e., $(\beta - R) < 0$.

In addition, limited liability prescribes that wages must be non-negative for every outcome of $\pi(e)$, which is always satisfied for $\beta \geq 0$. The equilibrium share of output offered by a reciprocal manager to a reciprocal worker is then given by $\beta = \arg \max E [U_m]$ with $\beta \geq 0$, subject to the incentive compatibility constraint $e = \beta + \omega(\beta - R)$.

**Lemma 3.2.** In equilibrium, the reciprocal manager offers a share $\beta_{rr}^* = \frac{1+\omega(1+R(1-2\mu))}{2(1+\omega(1-\mu))}$ to the reciprocal worker and thus implements effort $e_{rr}^* = \frac{(1+\omega)^2-\omega R(2\mu+1)}{2(1+\omega(1-\mu))}$.

**Proof.** See Appendix

Evaluating the firm’s optimal behavior allows for further inferences about employment relations by combining the results of Lemmas 3.1 and 3.2.

**Proposition 3.1.** Labor relations

- If the reference share of the worker is low, i.e., $R < \frac{1+\omega}{2+\omega}$, the employment relationship is characterized by positive reciprocity (gift exchange).
- Otherwise, if $R > \frac{1+\omega}{2+\omega}$, negative reciprocity (hostility) is a feature of employment.

**Proof.** See Appendix

The distinction between positive and negative reciprocity is important to understand the equilibrium behavior of both, the firm and the worker. If the reference share of the reciprocal worker is low, i.e., $R < \frac{1+\omega}{2+\omega}$, the share offered by a manager in equilibrium is higher than the worker’s reference point, i.e., $\beta^* > R$. This implies that the worker perceives the manager’s behavior as friendly and is willing to provide a gift of $\omega (\beta^* - R)$ additional effort units compared to a selfish worker with $\omega = 0$. Otherwise, if the reference share of the reciprocal worker is high, i.e., $R > \frac{1+\omega}{2+\omega}$, the equilibrium offer will fall short of the worker’s reference share, i.e., $\beta^* < R$, implying that the worker perceives the manager’s behavior as hostile and punishes him with a decrease in effort of $\omega (R - \beta^*)$ effort units compared to a selfish worker with $\omega = 0$. Thus, depending on whether the worker is positively or negatively reciprocal, equilibrium shares, equilibrium efforts, and the corresponding comparative statics will differ.
3.3.2 Comparative Statics

While the optimal share $\beta_{rr}^*$ increases in the worker’s reference share $R$, his effort $e_{rr}^*$ decreases in $R$. The higher the entitlement of the reciprocal worker, the lower the perceived manager friendliness given $\beta_{rr}^*$, resulting in an decrease in worker friendliness. This effect can only be curtailed by an increase in $\beta_{rr}^*$. However, the optimal increase in $\beta_{rr}^*$ can not entirely compensate the reduction in manager friendliness, causing a decrease in optimal effort $e_{rr}^*$.

The higher $\omega$, the stronger the reaction of the worker to manager friendliness (hostility). The manager thus has an incentive to increase the optimal share $\beta_{rr}^*$ to enhance gifts (avoid punishment) from the worker as his reciprocity concern increases. In contrast, the effect of an increase in the manager’s reciprocity concern $\mu$ is twofold. If the employment relationship is characterized by positive reciprocity, i.e., $R < \frac{1+\omega}{2+\omega}$, an increase in $\mu$ indicates that the worker’s behavior is perceived as more friendly. As a consequence, a reciprocal manager then wants to repay the worker’s gift by a larger gift in return, i.e., a higher $\beta_{rr}^*$. Instead, if the employment relationship is characterized by negative reciprocity, i.e., $R > \frac{1+\omega}{2+\omega}$, an increase in $\mu$ implies that the worker’s behavior is perceived as more hostile, which is punished by the manager with a decrease in $\beta_{rr}^*$.

The impacts of the reciprocity concerns $\mu$ and $\omega$ on the equilibrium effort $e_{rr}^*$ also depend on employment relations. If the worker is positively reciprocal, $e_{rr}^*$ rises with $\mu$ and also with $\omega$. Otherwise, if the worker is negatively reciprocal, $e_{rr}^*$ decreases with $\mu$ due to a decreased share $\beta_{rr}^*$. Furthermore, $e_{rr}^*$ might also decrease in $\omega$. A negatively reciprocal worker perceives manager behavior as hostile and repays manager hostility by hostility in form of reduced effort. This effect can only be curtailed by an increase in $\beta_{rr}^*$. But if the increase is too small to outweigh the worker’s increased hostility, which is the case for $\frac{(1+\omega)^2+\mu(1+\omega^2)}{(1+\omega)^2+\mu(2+\omega^2)} < R$, $e_{rr}^*$ will decrease in $\omega$.

3.3.3 Other Matches

Given Lemma 3.2, the results for all the other matches can be deduced by manipulating $\mu$ and $\omega$.

3.3.3.1 Selfish Manager and Reciprocal Worker In case a selfish manager faces a reciprocal worker, $\mu = 0$ and $\omega > 0$ apply.
Lemma 3.3. In a mixed match with a selfish manager, optimal outcomes are given by $\beta_{sr}^* = \frac{1 + \omega(1 + R)}{2(1 + \omega)}$ and $e_{sr}^* = \frac{1 + \omega(1 - R)}{2}$.

Proof. See Appendix

An increase in the worker’s reference share $R$ has an enhancing effect on the optimal share $\beta_{sr}^*$, but the opposite effect on the optimal effort $e_{sr}^*$. As in a purely reciprocal match, the optimal share $\beta_{sr}^*$ increases with the worker’s reciprocity concern $\omega$. This is driven by conditional cooperation of selfish managers. Knowing that a positively reciprocal worker is willing to reciprocate a gift, a selfish manager is willing to behave friendly by choosing a share above the worker’s entitlement $R$. This result corresponds to the results of many laboratory experiments that have shown that people are willing to cooperate conditional on the cooperation of others (for an overview, see Gächter (2007)). Otherwise, when employing a negatively reciprocal worker, the selfish manager has to face punishment. He tries to reduce this punishment by offering a share that is larger than the share he would offer to a selfish worker. Moreover, in contrast to the purely reciprocal match, $e_{sr}^*$ is definitely increasing in $\omega$ since the selfish manager refrains from punishing the worker even if the latter is negatively reciprocal. Consequently, the increase in $\beta_{sr}^*$ outweighs the increase in the worker’s hostility.

3.3.3.2 Matches with Selfish Workers In case a manager with $\mu \geq 0$, meets a selfish worker, the managers anticipate that a selfish worker will never reciprocate friendly manager behavior. Thus, managers offer a selfish worker a share that maximizes the manager’s monetary payoff.

Lemma 3.4. Optimal outcomes in matches with a selfish worker are given by $\beta_{rs}^* = \beta_{ss}^* = \frac{1}{2}$ and $e_{rs}^* = e_{ss}^* = \frac{1}{2}$.

Proof. See Appendix

As the reciprocal manager, the selfish manager anticipates a selfish worker not to reciprocate a gift. Thus, his offer and the resulting worker effort will equal the results of a mixed match with a reciprocal manager.

3.3.4 Individually Optimal Outcomes

Given Lemmas 3.2, 3.3, and 3.4 equilibrium shares and efforts can be compared by pairs, either for a fixed worker type or a fixed manager type.
3.3.4.1 Fixed Worker Type  A reciprocal worker can either be employed by a reciprocal or a selfish manager. As stated by Lemma 3.2, employment by a reciprocal manager implies \( \beta^*_{rr} = \frac{1+\omega(1+R(1-2\mu))}{2(1+\omega(1-\mu))} \) and \( e^*_{rr} = \frac{(1+\omega)^2 - R\omega(1+2\mu+\omega)}{2(1+\omega(1-\mu))} \), while employment by a selfish manager is characterized by \( \beta^*_{sr} = \frac{1+\omega(1+R)}{2(1+\omega)} \) and \( e^*_{sr} = \frac{1+\omega(1-R)}{2} \), as stated by Lemma 3.3.

**Lemma 3.5.** If the worker is positively reciprocal, i.e., \( R < \frac{1+\omega}{2+\omega} \), \( \beta^*_{rr} > \beta^*_{sr} \) and \( e^*_{rr} > e^*_{sr} \). Otherwise, if the worker is negatively reciprocal, i.e., \( R > \frac{1+\omega}{2+\omega} \), \( \beta^*_{sr} > \beta^*_{rr} \) and \( e^*_{sr} > e^*_{rr} \) hold.

**Proof.** See Appendix □

Lemma 3.5 indicates that in case of positively reciprocal workers, manager reciprocity has an enhancing effect on both, the offered share and the effort. This is due to the fact that the reciprocal manager is willing to reciprocate the worker’s enhanced effort by further increasing the worker’s share. This is in turn perceived as more friendly by the worker and results in a further increase in effort. In contrast, a negatively reciprocal worker perceives manager behavior as hostile. He repays this hostility by hostility in form of reduced effort which, in turn, provokes more hostile behavior on the part of the reciprocal manager in form of a further decrease in the worker’s share. In contrast, a selfish manager would not react to the worker’s hostile behavior.

3.3.4.2 Fixed Manager Type  A reciprocal manager can either employ a reciprocal or a selfish worker. Employment of a reciprocal worker implies \( \beta^*_{rr} = \frac{1+\omega(1+R(1-2\mu))}{2(1+\omega(1-\mu))} \) and \( e^*_{rr} = \frac{(1+\omega)^2 - R\omega(1+2\mu+\omega)}{2(1+\omega(1-\mu))} \), as stated by Lemma 3.2, while employment of a selfish worker is characterized by \( \beta^*_{rs} = \frac{1}{2} \) and \( e^*_{rs} = \frac{1}{2} \) as given by Lemma 3.4.

**Lemma 3.6.** If the worker is positively reciprocal, i.e., \( R < \frac{1+\omega}{2+\omega} \), a reciprocal manager offers \( \beta^*_{rr} > \beta^*_{rs} \) and implements \( e^*_{rr} > e^*_{rs} \). Instead, if the worker is negatively reciprocal, i.e., \( R > \frac{1+\omega}{2+\omega} \), a reciprocal manager offers \( \beta^*_{rs} > \beta^*_{rr} \) if and only if \( \mu > \frac{1}{2} \) and \( R < \frac{\mu}{2\mu-1} \), and implements effort \( e^*_{rs} > e^*_{rr} \) if and only if \( R > \frac{1+\mu+\omega}{1+2\mu+\omega} \).

**Proof.** See Appendix □

As before, if the worker is positively reciprocal, reciprocity has an enhancing effect on both, the offered share and the implemented effort. In contrast, a negatively reciprocal worker perceives the manager’s behavior as hostile and repays the manager’s hostility with hostility which in turn forces optimal shares downwards. This might even lead to a drop in \( \beta^*_{rr} \) below \( \beta^*_{rs} \) if the manager’s hostility implies a substantial decrease in
the worker’s share due to a high $\mu$. Otherwise, despite hostility a negatively reciprocal worker might still receive a higher share than a selfish worker employed by the same reciprocal manager.

In addition, even with hostility the effort of a negatively reciprocal worker ($e_{rr}^*$) can exceed the effort of a selfish one ($e_{rs}^*$) if hostility is not too high, i.e., $R \leq \frac{1+\mu+\omega}{1+2\mu+\omega}$. In this case, fearing the punishment of his highly reciprocal manager, the reciprocal worker punishes the manager by only slight reductions in effort. Otherwise, if the employment relationship is characterized by very hostile behavior, i.e., $R > \frac{1+(\mu+\omega)}{1+(2\mu+\omega)}$, $e_{rr}^*$ drops below $e_{rs}^*$.

A selfish manager’s situation is described by Lemmas 3.3 and 3.4. Employment of a reciprocal worker thus implies $\beta_{sr}^* = \frac{1+\omega(1+R)}{2(1+\omega)}$ and $e_{sr}^* = \frac{1+\omega(1-R)}{2}$ while the employment of a selfish worker implies $\beta_{ss}^* = \frac{1}{2}$ and $e_{ss}^* = \frac{1}{2}$.

Lemma 3.7. A selfish manager always offers a higher share to the reciprocal worker, i.e., $\beta_{sr}^* > \beta_{ss}^*$, and thus implements effort $e_{sr}^* > e_{ss}^*$.

Proof. See Appendix

If a selfish manager employs a positively reciprocal worker, it pays for him to increase the worker’s share (compared to the share of a selfish worker) to benefit from enhanced effort. Otherwise, if employment is characterized by hostility, the selfish manager does not react hostile to worker effort below the selfishly optimal level. The reason is that punishment reduces the manager’s monetary utility. Thus, hostile behavior is only one-sided and can be reduced by increasing the worker’s share. As a result, the share offered to a reciprocal worker is higher than the one offered to a selfish worker in equilibrium. In addition, higher shares have a positive effect on effort even in the presence of worker hostility.

3.4 Matching Preferences

In the previous subsection it has been shown that equilibrium shares and efforts differ with matching resulting in different utility levels for both, the manager and the worker. If managers can choose what type of worker to employ and workers can choose the type of their employer, both can select the type that generates the largest utility.
3.4.1 Managers’ Preferences

Denote the expected indirect utility of a manager with reciprocity concerns $\mu$ as $U_m(\beta_{rr}) = V_m(\mu, \omega)$ with $\mu, \omega \geq 0$. Comparing $V_m(\mu, \omega)$ to $V_m(\mu, 0)$ leads to Lemma 3.8.

**Lemma 3.8.** If the reciprocal worker is positively reciprocal, i.e., $R < \frac{1 + \mu + \omega}{4\mu + \omega}$, $V_m(\mu, \omega) > V_m(\mu, 0)$ if and only if $R < \frac{1 + \mu + \omega}{4\mu + \omega}$ and $V_m(0, \omega) > V_m(0, 0)$ if and only if $R < \frac{1 + \mu + \omega}{4\mu + \omega}$.

**Proof.** See Appendix.

Note that $R < \frac{1 + \mu + \omega}{4\mu + \omega}$ is a more restrictive condition than $R < \frac{1 + 2\mu + \omega}{4\mu + \omega}$. Thus, for $R < \frac{1 + \mu + \omega}{4\mu + \omega}$ both manager types prefer positively reciprocal workers to selfish workers. In contrast, for $R < \frac{1 + \mu + \omega}{4\mu + \omega}$ selfish managers prefer to employ selfish workers, while reciprocal managers still prefer employing positively reciprocal ones. Finally, for $R < \frac{1 + \mu + \omega}{4\mu + \omega}$, although workers are still positively reciprocal and are willing to engage in gift exchange, they generate a lower manager utility than selfish workers. The reason is that a higher reference point $R$ forces equilibrium shares upward, while the increase in the worker’s gift in return is not sufficient to compensate the increase in wage costs. Since managers can only increase their utility by employing a positively reciprocal worker as long as the increase in wage costs is small enough, they refrain from employing less positively reciprocal workers with $R < \frac{1 + \mu + \omega}{4\mu + \omega}$.

3.4.2 Workers’ Preferences

The expected indirect utility of a worker of type $\omega$ is given by $U_w(\beta_{rr}) = V_w(\mu, \omega)$ with $\mu, \omega \geq 0$. Comparing $V_w(\mu, \omega)$ to $V_w(0, \omega)$ leads to Lemma 3.9.

**Lemma 3.9.** $V_w(\mu, \omega) > V_w(0, \omega)$ if and only if the reciprocal worker is positively reciprocal, i.e., $R < \frac{1 + \mu + \omega}{4\mu + \omega}$. For selfish workers $V_w(\mu, 0) = V_w(0, 0)$ holds.

**Proof.** See Appendix.

A reciprocal worker’s priority is to find an employer who offers the highest share since $\frac{\partial U_w(\beta)}{\partial \beta} = \frac{\partial (\beta_w^2 + \omega^2 \beta_{rr}^2)}{\partial \beta} > 0$. Thus, his preference for reciprocal managers is only due to the higher share offer in equilibrium and not to the type of employer. If the worker is
positively reciprocal, the share offered by a reciprocal manager is higher than that offered by a selfish manager. Otherwise, if the worker is negatively reciprocal, the share offered by a selfish employer is higher than that offered by a reciprocal employer.

Proposition 3.2 sums up the results on matching preferences.

**Proposition 3.2. Matching Preferences**

- Managers of both types prefer hiring reciprocal workers instead of selfish ones if $R < \frac{1+\omega}{\omega} - \sqrt{\frac{1+\omega}{\omega} - \frac{\mu\omega}{(4\mu+\omega)^2}}$ but prefer hiring selfish workers instead of reciprocal ones with $R > \frac{1+2\mu+\omega}{4\mu+\omega} - \sqrt{\frac{1+\omega}{\omega} - \frac{\mu\omega}{(4\mu+\omega)^2}}$.

- For $\frac{1+\omega}{\omega} - \sqrt{\frac{1+\omega}{\omega} - \frac{\mu\omega}{(4\mu+\omega)^2}} < R < \frac{1+2\mu+\omega}{4\mu+\omega} - \sqrt{\frac{1+\omega}{\omega} - \frac{\mu\omega}{(4\mu+\omega)^2}}$ manager types differ in their preferences, with reciprocal managers preferring reciprocal workers but selfish managers preferring selfish workers.

- Positively reciprocal workers prefer employment by reciprocal managers, while negatively reciprocal workers prefer employment by selfish managers.

- Selfish workers are indifferent about manager type.

### 3.5 Wage Competition

As stated in Proposition 3.2, both manager types can increase their utilities by employing a positively reciprocal worker instead of a selfish one. However, if the number of positively reciprocal workers is not sufficiently large to fill all vacancies, competition among managers is likely to occur.

Assume that in the competitive labor market of interest without frictions workers are either selfish or reciprocal with $\omega = \tilde{\omega}$ and $R = \frac{1}{2}$. This is a natural reference point to evaluate the manager’s behavior because it represents the optimal share an employed selfish worker earns in the labor market. Note that $R = \frac{1}{2}$ satisfies $R < \frac{1+\omega}{2+\omega}$ and thus implies that reciprocal workers are positively reciprocal. Furthermore, $R = \frac{1}{2}$ also satisfies $R < \frac{1+\omega}{\omega} - \sqrt{\frac{1+\omega}{\omega} - \frac{\mu\omega}{(4\mu+\omega)^2}}$ ensuring that $V_m(\mu, \tilde{\omega}) > V_m(\mu, 0)$ for $\mu \geq 0$. Nevertheless, given Proposition 3.2 the results of this subsection can be expanded to simultaneously allow for negatively reciprocal workers, as will be discussed in the last part of this subsection.

The total number of workers denoted by $W$ is the sum of selfish workers ($W_s$) and reciprocal workers ($W_r$). $W$ is assumed to be sufficiently large to team up with the available total number of managers $M$ (selfish managers ($M_s$) and reciprocal managers ($M_r$)),

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i.e., $W \geq M$. However, the number of reciprocal workers is small such that not every manager will succeed in hiring a reciprocal worker i.e., $W_r < M$.

A manager will then be willing to pay a share $\beta^C (\mu, \bar{\omega})$ to a reciprocal worker (instead of the equilibrium share without competition $\beta^* (\mu, \bar{\omega})$) as long as his utility from employing a reciprocal worker at a share $\beta^C (\mu, \bar{\omega})$ is at least as high as his utility from employing a selfish worker at $\beta^* (\mu, 0) = R = \frac{1}{2}$ i.e., $U_m (\beta^C (\mu, \bar{\omega})) \geq U_m (\beta^* (\mu, 0))$.

3.5.1 Competitive Shares

Recall that a manager can win favor with a worker by simply offering a share that at least matches the share a rivaling manager is willing to pay.

**Lemma 3.10.** The maximum competitive share $\beta^C_{\text{max}} (\mu, \bar{\omega}) = \frac{1+\bar{\omega}(2-\mu)}{2(1+\bar{\omega}(1-\mu))}$ is increasing in $\mu$. Thus, a more reciprocal manager can always out-compete less reciprocal managers whenever competing for a reciprocal worker with $\omega = \bar{\omega}$ and $R = \frac{1}{2}$. Consequently, the maximum amount of purely reciprocal matches is realized in a competitive equilibrium with homogeneous reciprocal workers.

**Proof.** See Appendix

3.5.1.1 High Competitive Shares Define the last reciprocal manager to employ a reciprocal worker by $\underline{\mu}$. If $W_r < M_r$, there are still reciprocal managers $\mu_- < \underline{\mu}$ in the market but only selfish workers for hire. Consequently, the competition for reciprocal workers solely takes place among reciprocal managers. Thus, reciprocal managers with $\mu \geq \underline{\mu}$ competing for a reciprocal worker with reciprocity concern $\bar{\omega}$ have to fulfill an additional constraint stating that a manager who was successful in hiring a reciprocal worker must have offered a wage $\beta^C (\mu, \bar{\omega}) \geq \beta^C (\underline{\mu}, \bar{\omega}) \geq \beta^C_{\text{max}} (\mu_-, \bar{\omega})$. Since $\beta^C_{\text{max}} (\mu_-, \bar{\omega}) > \beta^C_{\text{max}} (0, \bar{\omega})$, as shown by Lemma 3.10, competition among reciprocal managers with $\mu \geq \underline{\mu}$ and selfish managers need not be considered explicitly.

**Lemma 3.11.** If $W_r < M_r$, a reciprocal manager offers $\beta^C (\mu, \bar{\omega}) = \beta^C_{\text{max}} (\mu_-, \bar{\omega}) > \beta^* (\mu, \bar{\omega})$ to a reciprocal worker.

**Proof.** See Appendix

Since both $\beta^* (\mu, \bar{\omega})$ and $\beta^C_{\text{max}} (\mu, \bar{\omega})$ are increasing in $\mu$, highly reciprocal managers can always out-compete reciprocal managers with lower reciprocity concerns (including
selfish managers). Thus, only the managers with the highest reciprocity parameter $\mu$ will be able to hire a reciprocal worker. Consequently, competition represents a matching mechanism that allocates the managers with the highest possible reciprocity concern to reciprocal workers. Efforts are enhanced due to an exchange of larger gifts because of higher shares under competition. Anyhow, managers are left with a smaller utility since the increase in effort cannot balance the increased costs.

When all reciprocal workers are employed, only selfish workers are available in the labor market. The manager's utility from employing a selfish worker is then independent of manager type if there is no competition for workers among the remaining managers.

**Lemma 3.12.** For $W_r < M_r$, both manager types offer $\beta^*(\mu, 0) = R = \frac{1}{2}$ to selfish workers.

### 3.5.1.2 Low Competitive Shares

If, instead, the labor market is characterized by $W_r \geq M_r$, $\mu$ represents the last reciprocal manager in the market. This manager competes exclusively with selfish employers. Thus, the reciprocal managers maximize their utilities given the additional competition constraint $\beta^C(\mu, \omega) = \beta^C(\mu, \bar{\omega}) = \beta^C_{\text{max}}(0, \bar{\omega})$. If there are enough reciprocal workers to be employed by all the reciprocal managers, these do not have to compete among each other but only with the selfish managers who they can out-rival already at a share $\beta^C_{\text{max}}(0, \bar{\omega})$. Again, efforts are enhanced due to an exchange of larger gifts because of higher shares under competition. But still, managers are left with smaller utilities due to increased wage costs.

If there are still some reciprocal workers left after all reciprocal managers have hired a reciprocal worker, all remaining reciprocal workers will work for selfish managers who will compete among each other.

**Lemma 3.13.** For $W_r \geq M_r$ reciprocal managers offer $\beta^C(\mu, \omega) = \beta^C_{\text{max}}(0, \omega) > \beta^*(\mu, \omega)$ while selfish managers offer $\beta^C_{\text{max}}(0, \omega)$ to reciprocal workers.

**Proof.** See Appendix

The remaining selfish managers will employ selfish workers.

**Lemma 3.14.** For $W_r \geq M_r$, selfish managers who could not attract a reciprocal worker offer $\beta^*(\mu, 0) = R = \frac{1}{2}$ to selfish workers.

Low competitive shares for positively reciprocal workers are thus due to a larger supply of such workers in the labor market. Nevertheless, as long as they are scarce, com-
petition forces their shares upward and implies larger utilities for positively reciprocal workers.

3.5.2 Output and Total Utilities

Recall that output is assumed to be \( \pi(e) = \varepsilon e \) with the individual optimal worker effort \( e = \beta + \omega(\beta - R) \). Lemmas 3.11 and 3.13 show that positively reciprocal workers earn shares \( \beta^C(\mu, \bar{\omega}) > \beta^*(\mu, \bar{\omega}) \), implying \( e^C(\beta^C, \mu, \bar{\omega}) > e^*(\beta^*, \mu, \bar{\omega}) \). Thus, managers employing a positively reciprocal worker have a larger expected output with competition than without. This increase in output cannot outbalance the loss in manager utility due to smaller managers’ shares of output if they are involved in competition, as already stated by Lemmas 3.11 and 3.13. However, workers’ utilities with competition increase far more than managers’ utilities decrease, leading to larger total utilities.

3.5.3 Unemployment

Also recall that \( W \geq M \) by assumption. Since positively reciprocal workers are scarce and offer potentially larger utilities to their employers, competition among managers for those workers leads to their full employment. The remaining workers in the market are selfish and their number potentially exceeds the number of the remaining managers still looking for an employee. Thus, the workers that are left unemployed after all managers have filled their vacancies can only be of the selfish type.

3.5.4 Other Reciprocal Workers

The previous results can also be extended to contain not only preferred reciprocal workers but also unfavored reciprocal workers. Recall that managers are only willing to compete for reciprocal workers as long as \( R \leq \frac{1+2\mu+\bar{\omega}}{4\mu+\bar{\omega}} - \sqrt{\frac{1+\bar{\omega}-\mu\omega}{(4\mu+\bar{\omega})^2}} \), implying \( V_n(\mu, \omega) > V_m(\mu, 0) \) for \( \mu \geq 0 \). Thus, for \( R > \frac{1+2\mu+\bar{\omega}}{4\mu+\bar{\omega}} - \sqrt{\frac{1+\bar{\omega}-\mu\omega}{(4\mu+\bar{\omega})^2}} \) – which is a more restrictive condition than \( R > \frac{1+\bar{\omega}}{2\mu+\bar{\omega}} \) – managers will not be willing to engage in competition since the resulting gift exchange is not sufficient to outweigh the increase in wage costs. Consequently, workers who are willing to behave positively reciprocal but offer a small gift due to a high reference point are less attractive than selfish workers. Note that \( \frac{1+2\mu+\bar{\omega}}{4\mu+\bar{\omega}} - \sqrt{\frac{1+\bar{\omega}-\mu\omega}{(4\mu+\bar{\omega})^2}} \) is increasing in \( \mu \), indicating that more reciprocal managers allow for higher reference shares before they switch their attention to selfish work-
ers. Moreover, $R > \frac{1+2\mu+\bar{\omega}}{4\mu+\bar{\omega}} - \sqrt{\frac{1+\bar{\omega}-\mu\bar{\omega}}{(4\mu+\bar{\omega})^2}}$ includes not only reciprocal workers who were positively reciprocal in equilibrium without competition, i.e., $R < \frac{1+\bar{\omega}}{2+\bar{\omega}}$, but also those who were negatively reciprocal, i.e., $R > \frac{1+\bar{\omega}}{2+\bar{\omega}}$. Consequently, managers’ preferences are given as follows: Their first choice is to employ a positively reciprocal worker with $R \leq \frac{1+2\mu+\bar{\omega}}{4\mu+\bar{\omega}} - \sqrt{\frac{1+\bar{\omega}-\mu\bar{\omega}}{(4\mu+\bar{\omega})^2}}$, their second choice are selfish workers, and their third and last choice are reciprocal workers with $R > \frac{1+2\mu+\bar{\omega}}{4\mu+\bar{\omega}} - \sqrt{\frac{1+\bar{\omega}-\mu\bar{\omega}}{(4\mu+\bar{\omega})^2}}$.

Thus, managers will compete first for highly positively reciprocal workers and then for selfish workers. Moreover, managers who were not successful in hiring a highly positively reciprocal worker will be willing to offer a share to selfish workers that is higher than the one offered without competition to avoid hiring an unfavored worker (a less positively reciprocal or a negatively reciprocal worker). As a result, selfish workers who are offered a share that is higher than the one offered without competition will increase their effort, produce larger output, and gain larger utilities. In this setting, negatively reciprocal workers are the first to be unemployed, followed by unfavored workers and selfish workers.

### 3.5.5 Competition and Unemployment

Summarizing the results of the competition setting leads to Proposition 3.3:

**Proposition 3.3.** Competition and unemployment

- The lower the number of desired reciprocal and selfish workers in the labor market, the higher the wages they are paid and the larger the output they produce with wage competition.

- Managers who are competing for a certain worker type and offer shares $\beta^C > \beta^*$ suffer from lower utilities while their workers enjoy larger utilities compared to a situation without competition. However, total utilities with competition are at least as high as total utilities without competition.

- Negatively and less positively reciprocal workers, followed by selfish workers, are the first to be affected by unemployment.

**Proof.** See Appendix

The last result is perfectly in line with the findings of Dohmen et al. (2009), that positively reciprocal workers are associated with higher wages, efforts and probability to be
employed while negative reciprocity has no significant effect on overall wage but leads to lower efforts and lower probability to be employed.

3.6 Conclusion

This section provides a theoretical model to investigate how the coexistence of reciprocal and selfish types influences the formation of employment relationships and the corresponding implications for the profitability of firms, wage differentials, wage competition, and unemployment.

I show that in a workplace where the manager and the worker can be either selfish or reciprocal, depending on matching, offered contracts and implemented efforts can differ, making some matches more profitable than others although the production technology remains unchanged. The differences in workers’ reactions to the offered shares of output drive managers’ preferences for worker types. Comparing manager and worker utilities in different matches reveals that both manager types can increase their utilities by hiring a favored highly positively reciprocal worker instead of a selfish one but prefer selfish workers to less positively and negatively reciprocal ones. This result implies that competition among managers for highly positively reciprocal workers as well as selfish workers is likely to occur if their number is sufficiently small.

To investigate the implications of wage competition, I consider a labor market without frictions where the total number of workers available exceeds the total number of vacancies but the number of favored reciprocal workers is not sufficient to fill all vacancies. In this setting, managers might offer higher expected wages than without competition to attract favored reciprocal and selfish workers, respectively. Thus, the resulting competitive matching allocates favored reciprocal workers to reciprocal managers. Consequently, unemployment arises first among unfavored reciprocal and selfish workers. These results are similar to experimental and empirical findings as, e.g., Fehr and Falk (1999), Charness (2004), Gächter (2007) and Dohmen et al. (2009).

However, further research needs to be done to improve the presented model. Given the underlying assumptions the pure share contract is always optimal with selfish agents but is only optimal for reciprocal workers under the conditions provided in Appendix 3.A. Thus, the underlying pure share contract is not generally optimal. The reason is, that positively reciprocal workers with low reference wages or shares are willing to provide
high effort levels even in the absence of strong monetary incentives, i.e., high output
shares, if a sufficiently high fixed wage is paid. Still, for a reference wage $R = \frac{1}{4}$ which
corresponds to the expected wage of a selfish worker and the additional assumption that
the manager cannot offer contracts that result in expected wages which are higher than
expected outputs, it can be shown graphically that the optimal contract is indeed a pure
share contract for all $\mu, \omega \in [0, 1]$. 

Appendix 3.A  Optimal Linear Incentive Contract

Assume that the manager offers the worker a linear contract $\Gamma(\alpha, \beta) = \alpha + \beta \pi(e)$ with $\alpha, \beta \geq 0$ due to limited liability. Furthermore, let $\Theta(\alpha, \beta)$ denote a measure of the generosity of the offered contract, which the worker uses to evaluate the friendliness of the manager by comparing it to a reference point $R$. The manager’s expected utility can then be written as

$$U_m = E[\pi(e)] - \Gamma(\alpha, \beta) + \mu \left[ K'(e) - \frac{\partial \Gamma(\alpha, \beta)}{\partial e} \right] [\Theta(\alpha, \beta) - R],$$

(3.3)

while the worker’s utility is given by

$$U_w = \Gamma(\alpha, \beta) - c(e) + \omega \left[ \Theta(\alpha, \beta) - R \right] \left[ c'(e) - \frac{\partial \Gamma(\alpha, \beta)}{\partial e} \right],$$

(3.4)

where $\pi(e) = \epsilon e$ with $e \geq 0$ and $\epsilon \in [0, 2]$ with $E[\epsilon] = 1$, $c(e) = \frac{1}{2}e^2$, $\mu \in [0, 1]$, and $\omega \in [0, 1]$. Moreover, $\Theta(\alpha, \beta) \geq 0$, $\frac{\partial \Theta(\alpha, \beta)}{\partial \alpha} > 0$ and $\frac{\partial^2 \Theta(\alpha, \beta)}{\partial \alpha^2} = 0$, and $\frac{\partial \Theta(\alpha, \beta)}{\partial \beta} > 0$ and $\frac{\partial^2 \Theta(\alpha, \beta)}{\partial \beta^2} = 0$ just as $R > 0$.

To determine the optimal linear contract, first derive the incentive compatibility constraint, since the worker will choose an effort that maximizes his expected utility. Optimal worker effort is thus given by $e = \beta + \omega \left[ \Theta(\alpha, \beta) - R \right]$.

Taking the worker’s optimal behavior into account, the manager solves the following optimization problem:

$$\max_{\alpha, \beta} U_m(\alpha, \beta)$$

s.t. $\quad e = \beta + \omega \left[ \Theta(\alpha, \beta) - R \right].$

(3.5)

The corresponding first derivatives are given by

$$\frac{\partial U_m(\alpha, \beta)}{\partial \alpha} = \omega (1 - \beta) \frac{\partial \Theta(\alpha, \beta)}{\partial \alpha} - 2\mu \omega \left[ \Theta(\alpha, \beta) - R \right] - 1$$

(3.6)

and

$$\frac{\partial U_m(\alpha, \beta)}{\partial \beta} = 2\mu \omega \frac{\partial \Theta(\alpha, \beta)}{\partial \beta} \left[ \Gamma(\alpha, \beta) - R \right] + (1 - \beta) \left[ 1 + \omega \frac{\partial \Theta(\alpha, \beta)}{\partial \beta} \right] - \beta + \omega \left[ \Theta(\alpha, \beta) - R \right].$$

(3.7)

From (3.6) rearranging yields the condition for $\alpha^* > 0$, i.e.
\[
\omega \frac{\partial \Theta (\alpha, \beta)}{\partial \alpha} \left[(1 - \beta) - 2\mu \omega \left[\Theta (\alpha, \beta) - R\right]\right] = 1,
\]
while
\[
\omega \frac{\partial \Theta (\alpha, \beta)}{\partial \alpha} \left[(1 - \beta) - 2\mu \omega \left[\Theta (\alpha, \beta) - R\right]\right] < 1
\]
is the condition for \( \alpha^* = 0 \).

Similarly, rearranging (3.7) gives an interior solution for \( \beta^* \), i.e.
\[
\beta^* = \frac{1 + \omega \left[\frac{\partial \Theta (\alpha, \beta)}{\partial \beta} (1 + 2\mu \left[\Theta (\alpha, \beta) - R\right]) - \left[\Theta (\alpha, \beta) - R\right]\right]}{2 + \omega \frac{\partial \Theta (\alpha, \beta)}{\partial \beta}},
\]
while
\[
1 + \omega \left[\frac{\partial \Theta (\alpha, 0)}{\partial \beta} (1 + 2\mu \left[\Theta (\alpha, 0) - R\right]) - \left[\Theta (\alpha, 0) - R\right]\right] < 0
\]
represents the condition for \( \beta^* = 0 \).

From condition (3.8) we know that only reciprocal workers might receive a positive fixed payment \( \alpha^* \), since only with \( \omega > 0 \) the LHS of (3.8) is different from zero. Nevertheless, even for reciprocal workers \( \alpha^* = 0 \) is optimal whenever \( \frac{\partial \Theta (0, \beta)}{\partial \alpha} < \frac{1}{\omega |1 - \beta - 2\mu(\Theta (0, \beta) - R)|} \) with \( R \leq \frac{1 - \beta}{2\mu} \) or with \( R > \frac{1 - \beta}{2\mu} \) and \( |R - \Theta (0, \beta)| < \frac{1 - \beta}{2\mu} \). Alternatively, \( |R - \Theta (0, \beta)| \geq \frac{1 - \beta}{2\mu} \) also yields \( \alpha^* = 0 \). Similarly, it is optimal for the manager to offer no share of output if \( \frac{\partial \Theta (a, 0)}{\partial \beta} < \frac{\omega |\Theta (a, 0) - R| - 1}{\omega |1 + 2\mu| \Theta (a, 0) - R|} \) with \( \Theta (a, 0) - R \geq \frac{1}{2\mu} \).

Thus, depending on \( \Theta (\alpha, \beta) \) it is possible, that the optimal linear contract is of the form \( \Gamma (0, \beta) = \beta \pi (e) \) and offers no fixed payment but a pure share contract for all acceptable \( \omega, \mu \) and \( R \). This in turn allows to restrict attention to generosity measures which depend on \( \beta \) only as assumed in in the presented model.

**Appendix 3.B Proofs**

**Proof of Lemma 3.1** The worker chooses effort to solve
\[
\max_{e} \beta E \left[\pi (e)\right] - c (e) + \omega \left[\Theta (\beta) - R\right] \left[c' (e) - \frac{\partial \Gamma (\beta, E [\pi (e)])}{\partial e}\right]
\]
(3.12)

The corresponding FOC is given by
\[
\beta - e + \omega [\beta - R] = 0.
\]
(3.13)
Rearranging yields

\[ e = \beta + \omega (\beta - R), \]  

(3.14)

implying that a selfish worker with \( \omega = 0 \) chooses \( e = \beta \). Thus, a reciprocal worker with \( \omega > 0 \) will choose a higher effort than a selfish worker whenever \( (\beta - R) > 0 \), but a lower effort than a selfish one whenever \( (\beta - R) < 0 \).

**Proof of Lemma 3.2**  The manager’s optimization problem is given by

\[
\begin{align*}
\max_{\beta} & \quad (1 - \beta) E[\pi(e)] + \mu \left[ c'(e) - \beta \frac{\partial E[\pi(e)]}{\partial e} \right] [\Theta(\beta) - R] \\
\text{s.t.} & \quad \beta \geq 0, \; e = \beta + \omega (\beta - R).
\end{align*}
\]

(3.15)

This can also be written as

\[
\begin{align*}
\max_{\beta} & \quad (1 - \beta) E[\pi(e)] + \mu \left[ c'(e) - \beta \frac{\partial E[\pi(e)]}{\partial e} \right] [\Theta(\beta) - R] \\
\text{s.t.} & \quad \beta \geq 0.
\end{align*}
\]

(3.16)

The corresponding FOC is given by

\[-[\beta + \omega (\beta - R)] + [1 + \omega] (1 - \beta) + 2\mu \omega (\beta - R) = 0.\]  

(3.17)

Rearranging yields

\[ \beta_{rr}^* = \frac{1 + \omega(1 + R(1 - 2\mu))}{2(1 + \omega(1 - \mu))}. \]  

(3.18)

Inserting \( \beta_{rr}^* \) into the incentive compatibility constraint finally yields

\[ e_{rr}^* = \frac{(1 + \omega)^2 - \omega R(1 + (2\mu + \omega))}{2(1 + \omega(1 - \mu))}. \]  

(3.19)

**Proof of Proposition 3.1**  Lemma 3.2 states that a reciprocal worker will exert more effort than a selfish worker thus behaving positively reciprocal if \( (\beta - R) > 0 \) or more precisely \( (\beta_{rr}^* - R) > 0 \). Rearranging this condition for \( R \) yields \( R < \frac{1 + \omega}{2 + \omega} \). In contrast a reciprocal worker will exert less effort than a selfish one, i.e., behave hostile, whenever \( (\beta_{rr}^* - R) < 0 \) which is true for \( R > \frac{1 + \omega}{2 + \omega} \).

**Proof of Lemma 3.3**  Given Lemma 3.2, \( \beta_{sr}^* \) and \( e_{sr}^* \) can be derived by setting \( \mu = 0 \) and \( \omega > 0 \) in \( \beta_{rr}^* \) and \( e_{rr}^* \). As a result \( \beta_{sr}^* = \frac{1 + \omega(1+R)}{2(1+\omega)} \) and \( e_{sr}^* = \frac{1+\omega(1-R)}{2} \).
Proof of Lemma 3.4  The results can be derived by manipulating $\beta^*_r = \frac{1 + \omega(1 + R(1 - 2\mu))}{2(1 + \omega(1 - \mu))}$ and $e^*_r = \frac{(1 + \omega)^2 - \omega R(1 + (2\mu + \omega))}{2(1 + \omega(1 - \mu))}$. Since the worker is assumed to be selfish in both cases, setting $\omega = 0$ leads to $\beta^*_s = \beta^*_s = \frac{1}{2}$ and $e^*_s = e^*_s = \frac{1}{2}$ irrespective of the value of $\mu$.

Proof of Lemma 3.5  $\beta^*_r > \beta^*_r$ implies that $\frac{1 + \omega(1 + R(1 - 2\mu))}{2(1 + \omega(1 - \mu))} > \frac{1 + \omega(1 + R)}{2(1 + \omega)}$. Rearranging this inequality for $R$ leads to $R < \frac{1 + \omega}{2 + \omega}$ for $\mu < \frac{1}{2}$, which is always satisfied for $R \in [0, 1)$, and $R < \frac{\mu}{2\mu - 1}$ for $\mu > \frac{1}{2}$. If $e^*_r > e^*_r$, $R > \frac{1 + \mu + \omega}{1 + \mu + \omega}$ holds. Otherwise, if $e^*_r > e^*_r$, $R > \frac{1 + \mu + \omega}{1 + \mu + \omega} = \frac{1}{2}$ must hold which is true whenever $R > \frac{1 + \omega}{2 + \omega}$. Given Lemma 3.1 this implies $e^*_r > e^*_r$.

Proof of Lemma 3.6  $\beta^*_s > \beta^*_s$ implies that $\frac{1 + \omega(1 + R(1 - 2\mu))}{2(1 + \omega(1 - \mu))} > \frac{1}{2}$. Rearranging for $R$ leads to $R > -\frac{\mu}{2\mu - 1}$ for $\mu < \frac{1}{2}$, which is always satisfied for $R \in [0, 1)$, and $R < \frac{\mu}{2\mu - 1}$ for $\mu > \frac{1}{2}$. If $e^*_r > e^*_r$, $R > \frac{1 + \mu + \omega}{1 + \mu + \omega}$ holds. Otherwise, if $e^*_r > e^*_r$, $R > \frac{1 + \mu + \omega}{1 + \mu + \omega}$ holds.

Proof of Lemma 3.7  $\beta^*_s > \beta^*_s$ implies that $\frac{1 + \omega(1 + R)}{2(1 + \omega)} > \frac{1}{2}$, which is always satisfied for the given parameter intervals.

Proof of Lemma 3.8  $V_m(\mu, \omega) > V_m(\mu, 0)$ implies that $\frac{1 - \omega(1 - R)(4\mu R - \omega(1 - R) - 2)}{4(1 - \omega(1 - \mu))} > \frac{1}{4}$. Rearranging for $R$ yields $R < \frac{1 + 2\mu + \omega}{4\mu + \omega} - \sqrt{\frac{1 + \omega - \mu^2}{(4\mu + \omega)^2}}$ with $\frac{1 + 2\mu + \omega}{4\mu + \omega} - \sqrt{\frac{1 + \omega - \mu^2}{(4\mu + \omega)^2}} < \frac{1 + \omega}{2 + \omega}$ for $0 \leq \mu \leq 1$ and $0 < \omega \leq 1$. Similarly, $V_m(0, \omega) > V_m(0, 0)$ is true whenever $R < \frac{1 + \omega}{\omega} - \sqrt{\frac{1 + \omega}{\omega^2}}$ with $\frac{1 + \omega}{\omega} - \sqrt{\frac{1 + \omega}{\omega^2}} < \frac{1 + \omega}{2 + \omega}$.

Proof of Lemma 3.9  Rearranging $V_w(\mu, \omega) > V_w(0, \omega)$ for $R$ yields $R < \frac{1 + \omega}{2 + \omega}$. Furthermore, $V_w(\mu, 0) = \frac{1}{4}$ irrespective of $\mu$.

Proof of Lemma 3.10  The maximum competitive share $\beta^{c}_{max}(\mu, \bar{\omega})$ is defined as the share which satisfies $U_m(\beta^c(\mu, \bar{\omega})) = U_m(\beta^*(\mu, 0))$. The indirect utility of the manager is given by

$$U_m(\beta, \mu, \bar{\omega}) = \mu \bar{\omega} (\beta - \frac{1}{2})^2 + (1 - \beta) (\beta + \bar{\omega} (\beta - \frac{1}{2}))$$  \hspace{1cm} (3.20)

with $U_m(\beta^*(\mu, 0)) = \frac{1}{4}$. Solving for $\beta$ then yields $\beta^{c}_{max}(\mu, \bar{\omega}) = \frac{1 + \omega(2 - \mu)}{2(1 + \omega(1 - \mu))}$.

Proof of Lemma 3.11  A manager who was successful in hiring a reciprocal worker in a setting with $W_r < M_r$ must have offered a wage $\beta^C(\mu, \bar{\omega}) \geq \beta^C(\mu, \bar{\omega}) \geq \beta^{c}_{max}(\mu, \bar{\omega})$. 

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Since $\beta_{\text{max}}^c (\mu -, \bar{\omega}) > \beta^* (\mu, \bar{\omega})$ for all $\mu > \mu -, U_m (\beta^c)$ must be decreasing in $\beta^c$. Consequently, the reciprocal managers offer the smallest possible share which attracts a reciprocal worker, i.e. $\beta^c (\mu, \bar{\omega}) = \beta_{\text{max}}^c (\mu -, \bar{\omega}) > \beta^* (\mu, \bar{\omega})$.

**Proof of Lemma 3.13** For $W_r \geq M_r$ all managers who have attracted a reciprocal worker must have offered $\beta^c (\mu, \bar{\omega}) \geq \beta^c (\mu, \bar{\omega}) \geq \beta_{\text{max}}^c (0, \bar{\omega})$. Since $\beta_{\text{max}}^c (0, \bar{\omega}) > \beta^* (\mu, \bar{\omega})$ for all $\mu > 0$, $U_m (\beta^c)$ must be decreasing in $\beta^c$. Consequently, all managers offer the smallest possible share which attracts a reciprocal worker, i.e. $\beta^c (\mu, \bar{\omega}) = \beta_{\text{max}}^c (0, \bar{\omega}) > \beta^* (\mu, \bar{\omega})$.

**Proof of Proposition 3.3** In Lemma 3.8 managers’ preferences for different worker types were derived as follows: Their first choice is to employ a positively reciprocal worker with $R \leq \frac{1 + 2 \mu + \bar{\omega}}{4 \mu + \bar{\omega}} - \sqrt{\frac{1 + \bar{\omega} - \mu \bar{\omega}}{(4 \mu + \bar{\omega})^2}}$, their second choice are selfish workers, and finally their last choice are reciprocal workers with $R > \frac{1 + 2 \mu + \bar{\omega}}{4 \mu + \bar{\omega}} - \sqrt{\frac{1 + \bar{\omega} - \mu \bar{\omega}}{(4 \mu + \bar{\omega})^2}}$. Since unfavored reciprocal workers represent the least choice of a manager, managers will also be willing to compete for selfish workers. This in turn implies that the competitive share offered to selfish workers will be higher if their number is lower which results in higher outputs.

Higher shares $\beta$ result in redistribution from the managers to the workers. Thus managers’ monetary payoffs decrease while workers’ monetary payoffs increase. In addition, higher shares enhance reciprocal utility and gift exchange. This results in higher worker utilities. However, managers’ utilities decrease because $U_m (\beta^c)$ is decreasing in $\beta^c$ for $\mu \geq 0$ and $\beta^c > \beta^*$. Nevertheless, match utilities increase due to enhanced gift exchange and the additional reciprocal utility.

Given managers’ matching preferences as stated in Lemma 3.9 undesired reciprocal workers with $R > \frac{1 + 2 \mu + \bar{\omega}}{4 \mu + \bar{\omega}} - \sqrt{\frac{1 + \bar{\omega} - \mu \bar{\omega}}{(4 \mu + \bar{\omega})^2}}$ are the last to be employed followed by selfish workers.
References 3


4 Concluding Remarks and Perspectives

This thesis proposes three theoretical models that emphasize the significance of reciprocal preferences for labor market outcomes and employment conditions.

Section 1 presents an approach to investigate the implication of workers’ heterogeneous reciprocal preferences on their labor market success in a competitive search equilibrium. It suggests that reciprocal workers with stronger preferences for gift exchange are approached by more firms than reciprocal workers with lower reciprocity concerns since they offer higher expected net payoffs to the firms. Thus, they find a job more quickly, get higher wages and exert higher efforts.

The binary effort model in Section 2 explores the firm’s optimal monitoring and wage strategy in the presence of potential hidden costs of control based on reciprocity. As a result, with observable agent types, selfish agents are always monitored to prevent shirking while monitoring is not necessary to ensure effort provision by reciprocal agents. Employees’ reciprocal preferences can thus be a reason to offer high discretion even in blue collar jobs that involve relatively low monitoring costs. Moreover, heterogeneous reciprocity concerns have important implications for the complementarity of firm policies and can serve as an explanation for mixed empirical results on the relationship between monitoring and wages. Finally, with unobservable agent types, screening for applicant’s type is optimal if reciprocal types care enough about full discretion. In the corresponding separating equilibrium, optimal monitoring contracts always offer higher wages than full discretion contracts.

Finally, Section 3 provides a model to investigate how the coexistence of reciprocal and selfish manager and worker types influences the formation of employment relationships and the corresponding implications for the profitability of firms, wage differentials, and unemployment. The model shows that depending on matching, offered contracts and implemented efforts can differ, making some matches more profitable than others although the production technology remains unchanged. These differences in profitability drive managers’ preferences for particular worker types and can thus lead to wage competition. As a consequence, the model suggests that in a labor market with excess supply of labor, unemployment arises first among negatively and less positively reciprocal workers, followed by selfish workers.

Although the importance of reciprocal preferences for employment outcomes has
been emphasized by numerous laboratory experiments and theoretical models in the economic literature, field experiments and empirical studies in this regard are rare. Yet, the latter methods are most suited to substantiate the implications of reciprocity for real world labor market success. Thus, future economic research on reciprocal preferences should concentrate on empirical evidence of the significance of reciprocity for labor relationships.
Bibliography


