Worker Reciprocity and Employer Investment in Training

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Standard economic theory predicts that firms will not invest in general training and will underinvest in specific training. Empirical evidence, however, indicates that firms do invest in general training of their workers. Evidence from laboratory experiments points to less underinvestment in specific training than theory predicts. We propose a simple model in which a firm invests the socially optimal amounts in general and specific training if the worker is sufficiently motivated by reciprocity. A reciprocal worker may be willing to give the firm a full return on its investment. We present empirical evidence that supports the proposed mechanism. Workers with a high sensitivity to reciprocity have 15% higher training rates than workers with a low sensitivity to reciprocity.

INTRODUCTION

Standard economic theory predicts that, without appropriate measures being taken, firms will not invest in general training and will underinvest in firm-specific training. The zero investment of firms in general training results from the fact that workers will be able to reap the entire benefits of such training (cf. Becker 1962). Underinvestment in specific training results when firms and workers are unable to write binding contracts that condition post-training wages on the level of investment. This is an application of the holdup problem (cf. Williamson 1985).

Empirical evidence casts doubt on the severeness of firms' underinvestment in training. There are indications that firms actually do invest in general training. Acemoglu and Pischke (1998) and Pischke (2001) show that in Germany firms voluntarily offer apprenticeships to their workers. The skills provided in these programmes are highly general, but firms bear a considerable fraction of the costs of training. Leuven and Oosterbeek (1999) show that in Canada, the Netherlands, Switzerland and the United States firms often pay for the direct costs of training when the worker initiated the training and/or if this training was provided outside the firm. Booth and Bryan (2002) report that in the United Kingdom employers often pay for training that the recipients view as general.

Furthermore, recent studies of the wage returns to training question the occurrence of underinvestment in training. High (wage) returns to training can be interpreted as an indication of underinvestment in training. These wage returns may however be biased as a result of endogeneity of training participation. Leuven and Oosterbeek (2002, 2004) present selectivity-corrected estimates of the wage return to training. In both studies the wage returns to training are much smaller than in cases where there is no correction for selectivity bias (cf. Frazis and Loewenstein 1999).

To provide a theoretical underpinning of firms' willingness to invest in general training, Katz and Ziderman (1990), Stevens (1994, 1996), Acemoglu and Pischke (1999) and Booth and Zoega (1998) all present models in which firms may pay for general training. The common feature of these models is some market imperfection that causes a situation in which wages are compressed relative to productivity.

The limited underinvestment in training can also be explained by the fact that parties have made arrangements to alleviate such underinvestment. The arrangements include the introduction of up-or-out contracts (cf. Kahn and Huberman 1988; Oosterbeek *et al.* 2001), restructuring of the *ex post* bargaining process such that the investing party becomes residual claimant (cf. Aghion *et al.* 1994), or the introduction into the contract of breach remedies (cf. Shavell 1980; Chung 1992; Sloof *et al.* 2003).

In this paper we focus on an alternative explanation for the higher investment in training by firms than standard theory would suggest. In the standard model, the firm does not invest in general training and underinvests in specific training because it anticipates opportunistic behaviour of its workers. However, a large body of empirical evidence obtained in laboratory experiments shows that a substantial fraction of subjects behave as if they are motivated by factors other than their own monetary payoffs. Inequity aversion, fairness and reciprocity are such alternative motivations (cf. Fehr and Gächter 2000).

In this paper we test a model based on reciprocity. Reciprocity entails that a person is willing to sacrifice some monetary payoff in order to reward someone who has been kind towards him or to punish someone who has been unkind. When a firm invests more in a worker's skills than theory predicts, the worker may interpret this as a 'kind' action of the firm which deserves some reward. The worker can give this reward by behaving less opportunistically than standard theory assumes he will do. If the firm anticipates this kindness, it will be prepared to invest more (underinvest less).

In the next section we develop this argument more formally. We show that a firm has stronger investment incentives if the worker is sufficiently motivated by reciprocity. The main novelty of this paper, however, is the introduction of a measure of reciprocity in the empirical training literature. In a recently held survey concerning training we were allowed to include a question about the reciprocal attitudes of the respondents. Results show that workers who are more inclined to act reciprocally are substantially more likely to participate in a training course during the 12 months prior to the interview. This remains to be the case if we control for a large number of covariates or if we adapt the measurement of training. Our empirical evidence thus supports the relevance of the proposed reciprocity mechanism.

The remainder of this paper is organized as follows. The next section presents a simple standard economic model of firms' investment in training. In this model firms are not prepared to invest in general training and they underinvest in specific training. The section then continues by our analysing a simplified version of this model in the context of Dufwenberg and Kirchsteiger's (2000, 2003) theory of sequential reciprocity. Section II first describes the data and especially how we measure training and reciprocity; it then presents and discusses the empirical results. Section III summarizes and concludes.

I. THEORY

Firms' investment in training when parties are selfish

Consider the following simple two-stage model. There are two parties: a firm and a worker. In the first stage the firm chooses how much to invest in general (I_g) and specific training (I_s) of the worker, where investment levels are measured in money terms.

We assume that the worker does not invest, for instance because he is liquidity constrained. The firm's investment choice determines the worker's productivity within and outside the firm. Worker's productivity within the current firm equals $V_F = V_0 + G(I_g) + S(I_s)$; worker's productivity outside the firm equals $V_A = V_0 + G(I_g)$. Here the functions $G(\cdot)$ and $S(\cdot)$ are assumed to be increasing and strictly concave, with $G(0) = S(0) = 0$ and $G'(0) > 1$ and $S'(0) > 1$. (Primes are used to denote derivatives.)

In the second stage the firm and the worker negotiate about the worker's wage. The bargaining stage is assumed to result in the generalized Nash bargaining solution. This means that both parties receive their threat point payoffs and that the remaining surplus is divided in proportion to the parties' bargaining power. The gross surplus equals V_F, the firm's threat point is normalized to zero, and the worker's threat point equals V_A. The net payoffs of the firm are then equal to $\pi_F = \alpha_F S(I_s) - I_g - I_s$, while the net payoffs of the worker are equal to $\pi_W = V_0 + G(I_g) + (1 - \alpha_F)S(I_s)$. Here α_F is a measure of the firm's relative bargaining power (with $0 \leqslant \alpha_F \leqslant 1$).

The firm maximizes its net payoffs and thus chooses $I_g^{Nash} = 0$ and I_s^{Nash}, where the latter is the unique solution to

$$S'(I_s) = \frac{1}{\alpha_F}.$$

If $S'(0) < 1/\alpha_F$, then $I_s^{Nash} = 0$. The superscript *Nash* indicates that these investment levels belong to the situation in which bargaining always results in the Nash bargaining solution.

If the worker has some bargaining power ($\alpha_F < 1$), both investment levels fall short of the efficient levels I_g^* and I_s^*. These are given by the solutions to, respectively,

$$G'(I_g) = 1 \qquad \text{and} \qquad S'(I_s) = 1.$$

While the model presented above is very stylized, it contains the essential features that cause zero investment by the employer in general training and underinvestment in specific training in more complicated settings. The key determinant of no investment in general training by the employer is that the worker can capture the full returns of such training by moving to an alternative employer. The key determinant of underinvestment in specific training is that the parties are unable to write a binding contract that conditions the worker's future wage on the employer's investment in specific training.

Firms' investment in training when workers are reciprocal

This subsection presents a model in which the worker is motivated by reciprocity. We assume that the firm is not sensitive to reciprocity and is

motivated by profit maximization only. The model is an application of the reciprocity theory developed by Dufwenberg and Kirchsteiger (2000, 2003). Because our purpose here is to demonstrate that worker reciprocity may enhance employer investment in training, the model is kept as simple as possible. In particular, we abstract from the distinction between general and specific training and reduce the setup to a 2×2 game.

   The game that we consider is depicted in Figure 1. The firm first decides whether to invest in training (choice T) or not (choice N). Training requires an investment of 1, and increases the available surplus from 2 under no training to 4 after training. In the second stage the worker decides to demand a high wage H or a low wage L.[1] A high wage corresponds to claiming the available (gross) surplus completely, while a low wage splits this surplus equally.

   First, assume that the worker is not motivated by reciprocity at all. In this case the reciprocity parameter Y_W appearing in the worker's utility depicted in Figure 1 equals zero. For $Y_W = 0$ the utility of the worker reduces to his monetary payoffs. In particular, when the firm has decided to train him, choosing a high wage afterwards yields the worker 4 while choosing the low wage yields him only 2 (cf. Figure 1). Clearly, the worker prefers the high wage after training. Anticipating this, the firm decides not to train him. Hence without reciprocity considerations, the subgame-perfect equilibrium outcome equals (N, H). The firm does not invest in training, even though training is efficient.

   Next, assume that the worker is motivated by reciprocity. Then his utility is determined not only by the monetary payoffs he obtains, but also by a term $Y_W h''$ that expresses reciprocity payoffs.[2] This term consists of two components. Y_W is a non-negative parameter reflecting the worker's sensitivity to reciprocity. The second component h'' represents the worker's belief about how kind the firm is towards the worker. This belief is based on the (mixed) strategy the worker himself chooses after training. Note that there is only one type of worker (reflected by Y_W), but workers may use a mixed strategy.
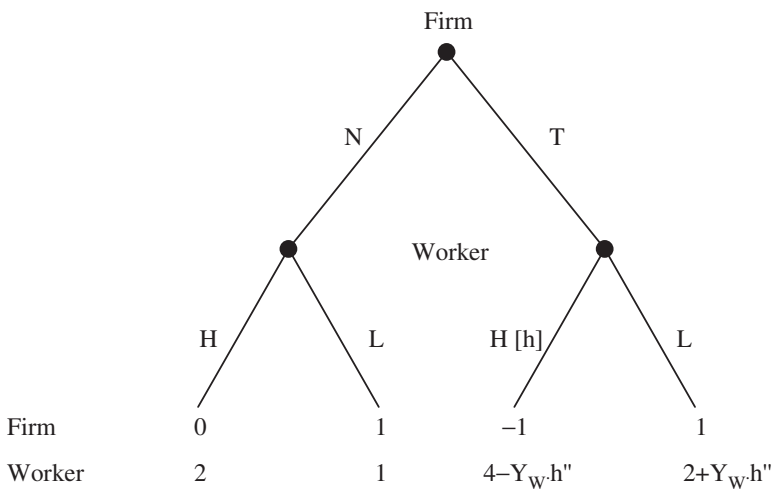

FIGURE 1. Game tree.

To explain the belief term h'', let $h \in [0, 1]$ denote the probability with which the worker demands a high wage after the firm invested in training (cf. Figure 1). Then $h' \in [0, 1]$ gives the firm's expectation of h. The higher is h', the more likely the firm believes it is that the investment is unprofitable for the firm itself. Or, to put it differently, the higher is h', the more the firm's investment in training can be interpreted as a kind act. To form beliefs about how kind the firm is to him, the worker thus has to form expectations about h'. These are denoted $h'' \in [0, 1]$. The higher is h'', the more kind the worker believes the firm is to him. Choosing a kind response (low wage) then becomes more attractive, while an unkind response (high wage) becomes less attractive. The worker's utility function thus reflects that when he believes the firm is kind demanding a high wage makes him feel bad, whereas demanding a low wage makes him feel good.

A (sequential) reciprocity equilibrium of the game in Figure 1 now corresponds with a subgame-perfect equilibrium, with the additional requirement that beliefs are correct: $h'' = h' = h$. The equilibrium analysis is straightforward. First, suppose $h = h'' = 0$ in equilibrium. Because perceived kindness (as measured by h'') is zero, the reciprocity term $Y_W h''$ vanishes. The worker thus strictly prefers the high wage demand after training, irrespective of the value of Y_W. This implies $h = 1$, contradicting our initial supposition. Hence $h = h'' = 0$ cannot occur in equilibrium. Next, assume $h = h'' = 1$. The worker does indeed prefer to choose the high wage only when $Y_W < 1$. In that case the firm does not invest in training. Finally, let $0 < h = h'' < 1$. The worker's indifference between the two wages requires $h = h'' = 1/Y_W$. The firm then prefers to train whenever $h(-1) + (1 - h) \cdot 1 \geqslant 0$, i.e. $h \leqslant \frac{1}{2}$. This comes down to $Y_W > 2$. Taking all cases together, it follows that the firm chooses to train whenever $Y_W > 2$, but never does so when $Y_W < 2$.

Overall we conclude that, when the worker is sufficiently motivated by reciprocity, the firm will invest in training.

II. EMPIRICAL EVIDENCE

Data

The analysis of the previous section implies that a worker's sensitivity to reciprocity may affect a firm's willingness to invest in his training. In this section we test this implication by relating workers' participation in training to their sensitivity to reciprocity. For this purpose we use data from the so-called NIPO Post-initial Schooling Survey that were collected in January and February 2001. This is the second round of a cross-section survey that was first administered in 1999.[3] Interviews were held by telephone using computer-aided techniques. The data are a representative sample of the Dutch population aged 16–64. The employed persons were asked questions concerning various background characteristics such as age, gender and formal education. They also responded to an extensive set of questions about the training activities they undertook in the 12 months prior to the interview. The survey questions pertaining to training are similar to those used in the International Adult Literacy Survey (OECD and Statistics Canada 1995). Finally, we were allowed

to include a question measuring respondents' sensitivity to reciprocity (their Y_W) in the 2001 questionnaire.

Training participation is measured by response to the following question: 'Did you spend time following a course/training for purposes of your work or career opportunities during the past 12 months?' Of the 3127 respondents in the sample who held a job, 1393 (45%) gave an affirmative answer to this question.

The prediction we want to test in this section relates to firms' willingness to invest in training of their workers. This requires information about who paid the costs of the workers' training participation. For up to three training events that a worker took part in during the past 12 months, we asked which party had paid the direct costs of training. This gives information about a total of 2200 training events. In 78% of such training events, respondents said that the employer paid the full direct costs of training. For another 3% of the events, the employer and the worker shared the direct training costs. (For 14% of the events the worker paid the full direct costs, and in 5% of the cases these costs were borne by another party.)

A second measure of firms' investment in training is the opportunity costs in the form of forgone productivity. Of the 2200 training events, 41% occurred completely during work time. Another 25% of the training events occurred partially during work time, with on average 56% of the training time during work time. And 33% of the training events took place completely outside work time. When this happened employers compensated the workers for their forgone leisure in 15% of such events. Taking the information about direct costs and time costs together, in only 12% of the training events had the employer not contributed to the training costs at all. It should be noted, however, that the information from these questions does not really prove that the employer actually bears the costs of training; it is possible that workers bear the full costs in the form of a reduction of their wages. We have no information to discard this possibility.

We use the information on firms' contribution to the direct costs and opportunity costs to construct a dichotomous variable indicating whether the worker had participated in a firm-sponsored training spell (1213 respondents). We also constructed an indicator variable for workers who had participated in a training spell to which the firm had not contributed at all (180 respondents). A further 1734 respondents had not participated in any training. We make the distinction between firm-sponsored training and training without firm support to test the prediction that reciprocity affects the former but not the latter.

The main novelty of the analysis in this paper is the introduction of a measure of reciprocity in the empirical training literature. With this specific aim in mind, the questionnaire included a question that reads: 'If someone does something that is beneficial to you, would you be prepared to return a favour, even when this was not agreed upon in advance?' Respondents had to choose one answer out of five categories:

1. Not at all (1.0%)
2. No (3.3%)
3. Maybe (9.1%)
4. Yes (60.8%)
5. Certainly yes (25.8%)

The percentages of the observations in our sample that choose the respective categories are given in parentheses. A vast majority of 86% indicates that they are prepared to return a favour, but even in this group some seem to be more inclined to do so ('Certainly yes') than others ('Yes'). Because the frequencies (and numbers of observations) in the categories 'Not at all', 'No' and 'Maybe' are rather low, we merge these three categories. This results in a three-point scale of workers' sensitivity to reciprocity. In the sequel, we will refer to these categories as 'Low' (= Not at all, No and Maybe), Intermediate (= Yes) and High (= Certainly yes).

The analyses in the next subsection include a set of covariates. Table A1 in the Appendix presents descriptive statistics of these covariates.

Results

Before we turn to the training equations, we first present results from an ordered probit equation in which the ordered variable sensitivity to reciprocity has been regressed on a set of commonly used background characteristics: age, gender, migration status, being single, number of children and education. The results in Table 1 show that respondents' sensitivity to reciprocity varies systematically with respondents' age and with their level of education. Older respondents are less inclined to return a favour if someone does something that is beneficial to them. Respondents with lower vocational, education, are less reciprocal than respondents with intermediate vocational education, while respondents with university education are more reciprocal than respondents with intermediate vocational education. There is no systematic relation between respondents' reciprocal attitudes and whether they are female, migrant, single or have children.

We next turn to the relation between respondents' sensitivity to reciprocity and training participation. Table 2 gives training participation rates for

TABLE 1
ORDERED PROBIT ESTIMATES FOR LEVEL OF RECIPROCITY[a]

Regressor	coef.	s.e.
Age	− 0.006	(0.002)**
Female	− 0.011	(0.041)
Migrant	0.081	(0.091)
Single	− 0.091	(0.064)
No. children	0.005	(0.017)
Primary education	− 0.028	(0.106)
Lower vocational	− 0.139	(0.069)*
Lower general	− 0.034	(0.066)
Intermediate vocational	reference	
Intermediate general	− 0.040	(0.078)
Higher vocational	0.068	(0.057)
University	0.170	(0.083)*
Observations	3127	

[a]Standard errors in parentheses; *significant at 5%; **significant at 1% level.

TABLE 2

TRAINING PARTICIPATION RATES BY SENSITIVITY TO RECIPROCITY

	All training (1)	Firm-sponsored training (2)	Training without firm support (3)
Low	0.356	0.325	0.075
Intermediate	0.441	0.404	0.100
High	0.502	0.475	0.105

workers in each of the three categories of reciprocity. The first column refers to all training participation, the second column is restricted to participation in firm-sponsored training, while the third column pertains to training that was undertaken without a firm's support. In all columns the participation rate increases with the sensitivity to reciprocity. In the first two columns the difference between the Low and Intermediate reciprocity groups is about 0.08, and that between the Intermediate and High reciprocity groups is around 0.06.

These differences are highly significant. The null-hypothesis of equal training rates between the different reciprocity groups is always rejected at the 1% level or better for the first two columns.[4] This supports the relevance of the proposed reciprocity mechanism. In the last column the Intermediate and High reciprocity groups have similar participation rates. The difference between the Low and Intermediate reciprocity groups is about 0.025 and that between the Intermediate and High groups, 0.005. These differences are not statistically significant. These contrasting results for firm-sponsored training and training without firm support are consistent with the predictions from our model.[5]

We next test whether this result survives when we control for differences in characteristics between workers in the three reciprocity groups. Otherwise, we cannot preclude that the result just follows from the fact that more highly educated and younger workers are more reciprocal and participate more in training. Table 3 reports estimates of three different specifications of probit equations in which training participation is the dependent variable. The top panel relates to all training participation, the second panel to firm-sponsored training participation, and the bottom panel to participation in training without firm support. The first specification includes only dummies for reciprocity groups Low and High and has no control variables. Reciprocity group Intermediate is the omitted category. The estimates in the first column reflect the results from Table 2.

The second specification includes controls for respondents' gender, age, migration status, number of children, being single, and level of formal education. The coefficients for these control variables are not reported in the table. They indicate that women are less likely to participate in firm-sponsored training than men, but are more likely to participate in training that the firm did not support. Training participation decreases with age and increases with the level of formal education. Migration status, number of children and being single have no effect on training participation. These results are consistent with other studies. The important finding of the second specification in Table 3 is that the effects of the reciprocity variables stay almost the same and the significance levels do not change.

TABLE 3
EFFECT OF RECIPROCITY ON TRAINING PARTICIPATION[a]

	(1)	(2)	(3)
All training participation			
Low	− 0.086	0.078	− 0.074
	(0.026)**	(0.027)**	(0.027)**
Intermediate	reference	reference	reference
High	0.061	0.052	0.051
	(0.021)**	(0.021)*	(0.021)*
Firm sponsored training participation			
Low	− 0.080	− 0.071	− 0.068
	(0.027)**	(0.027)**	(0.028)*
Intermediate	reference	reference	reference
High	0.071	0.064	0.064
	− (0.021)**	(0.022)**	(0.022)**
Training without firm support			
Low	− 0.025	− 0.021	− 0.025
	(0.018)	(0.017)	(0.016)
Intermediate	reference	reference	reference
High	0.005	0.004	0.003
	(0.016)	(0.016)	(0.015)
Controls	No	Personal	Personal, Firm

[a]Change in probability based on probit estimates evaluated at the sample means of the explanatory variables. Standard errors in parentheses. *significant at 5% level; **significant at 1% level. *Personal control variables*: Gender, Age, Migrant, No. children, 7 Education dummies, Single. *Firm controls*: 5 Firm size dummies, Firm has training centre.

The third specification augments the second specification with controls for characteristics of the firm for which the respondents work. Included is one dummy variable indicating whether the respondent's employer has its own training centre, and five dummy variables for categories of firm size. The coefficients for these additional controls (also not reported in the table) indicate that a worker is more likely to participate in firm-sponsored training when the employer possesses its own training centre and when the firm size is larger. This latter finding is consistent with other studies. (The finding with respect to the employer owning a training centre is new, as this variable has not been included in earlier analyses.) For training events that the firm did not support, we see that the presence of a firm's own training centre correlates negatively with participation whereas firm size does not matter. Including these additional regressors does not change the findings of the second specification. More importantly, the effects of the reciprocity variables are virtually unchanged, as are the significance levels.

We did not include firm tenure in the set of control variables. The reason is that tenure may also be the result of (past) training and hence causality may be reversed. Ignoring this, however, and including tenure and tenure-squared in the third specification does not change the findings with respect to the effect of reciprocity on training.[6]

Another concern is that it takes time for employers to learn about their employees' degree of reciprocity. If this is the case, one would expect that workers' reciprocity is a better predictor of training incidence for long(er)-tenure workers. To test this hypothesis, we estimated a specification with interaction terms of tenure and reciprocity. We found no significant effects for these interactions terms. Although one could interpret this as evidence against the proposed reciprocity mechanism, it also suggests that firms learn quickly about their workers' reciprocity.[7] This is perhaps not very surprising. If a straightforward survey question can elicit a respondent's degree of reciprocity, then employers who interview their employees before hiring or who make use of assessments, and who interact with their employees on a daily basis, are likely to learn this very quickly as well.

The results from the second and third specifications in Table 3 show that the result from Table 2 (and from the first specification) cannot be attributed to the exclusion of some relevant characteristic of the worker or the firm. The data-set does not contain information about the industries in which respondents are employed or about their occupations. Our results are biased when the reciprocity variables are picking up the effects of these omitted variables. While we have no proof to exclude this, we think it very unlikely that inclusion of industry and occupation dummies would render the reciprocity effects insignificant. This is based on the fact that inclusion of the firm characteristics 'training centre' and 'firm size' did not affect the results. Another possible concern is that the findings in this paper are driven by reversed causality. This would be the case if participation in (firm-sponsored) training affected workers' sensitivity to reciprocity. Given that the reciprocity question is phrased in general terms and that reciprocity is measured in only three broad categories, we judge it unlikely that a (typically short) training event would shift workers' general reciprocity attitude from Low to Inter-mediate or from Intermediate to High.

III. Conclusion

Standard economic models predict that firms will not invest in general training and will underinvest in specific training. This result is driven by the assumption that workers behave opportunistically. In this paper we tested a model in which workers may be motivated by reciprocity. We first showed that, when this reciprocal motivation is sufficiently strong, the firm has stronger investment incentives. In the main part of the paper we presented empirical results on the relation between workers' participation in (firm-sponsored) training and their sensitivity to reciprocity. This latter variable is measured as the response to the question whether respondents would be prepared to return a favour to someone who did something that was beneficial to them. Respondents with a high score on this reciprocity question are 15% more likely to receive training in a 12-month period than respondents with a low reciprocity score. This is also true when a large number of control variables are included, a finding that supports the proposed reciprocity mechanism.

The second contribution of this paper is that it confronts insights from experimental economics with field data. Experimental economists are all

convinced of the relevance of alternative motivations besides pure selfishness. They have shown that reciprocity can serve as a commitment device that can be efficiency enhancing. Yet, their evidence is solely based on laboratory experiments. Economists outside the circle of experimental economists are often sceptical about the external validity of results obtained in the laboratory. The results of this paper should reduce this scepticism somewhat.

APPENDIX: DERIVATION OF RECIPROCITY PAYOFFS FROM SEQUENTIAL RECIPROCITY

In the theory of Dufwenberg and Kirchsteiger (2003) the worker's utility is given by

$$(A1) \qquad u_W = \pi_W + Y_W \kappa \lambda,$$

Where π_W denotes the worker's monetary payoffs. The reciprocity term consists of three components. Parameter $Y_W \geqslant 0$ reflects the worker's sensitivity to reciprocity. κ represents the worker's kindness toward the firm; it is positive when the worker is kind and negative when the worker is unkind towards the firm. λ represents the worker's belief about how kind the firm is him. With this specification it is in the worker's interest to have κ and λ of equal sign. This sign matching is a key ingredient of the theory.

The worker's kindness κ of a particular choice is formally defined as the difference between what the worker actually gives to the firm and the average of the maximum and the minimum monetary payoff that he could give to the firm in principle. Suppose the firm chose to train the worker. Then the kindness of choosing a low (resp. high) wage in response equals:

$$(A2) \qquad \kappa(L) = 1 - \frac{1}{2}[-1 + 1] = 1,$$

TABLE A1
DESCRIPTIVE STATISTICS

	Mean value	St. dev.
Female $= 1$	0.520	0.500
Age	39.47	10.25
Migrant $= 1$	0.054	0.227
No. children	1.04	1.28
Primary education	0.043	0.202
Lower vocational	0.123	0.328
Lower general	0.142	0.349
Intermediate vocational	0.292	0.455
Intermediate general	0.090	0.286
Higher vocational	0.232	0.422
University	0.078	0.269
Single $= 1$	0.129	0.335
Training centre $= 1$	0.383	0.486
Fsize [1, 10)	0.207	0.405
Fsize [10, 50)	0.230	0.421
Fsize [50, 100)	0.102	0.302
Fsize [100, 200)	0.106	0.309
Fsize [200, + +)	0.311	0.463
Fsize unknown	0.044	0.205
No. observations	3127	

(A3) $\kappa(H) = -1 - \frac{1}{2}[-1 + 1] = -1.$

Next we turn to λ, the worker's belief about how kind the firm's choice of training is to him. This belief is defined as the difference between what the worker believes the firm believes it gives to the worker by choosing T, and the average of the maximum and the minimum payoff that the worker believes the firm believes it could give to the worker in principle. Now, after no training the worker necessarily chooses the high wage (see below). By choosing N, the firm thus gives a payoff of 2 to the worker. We therefore obtain that the believed kindness of a choice for T is (A4)

(A4) $\lambda = h'' \cdot 4 + (1 - h'') \cdot 2 - \frac{1}{2}[h'' \cdot 4 + (1 - h'') \cdot 2 + 2] = h'',$

where h'' is defined as in the main text. By inserting expressions (A2)–(A4) into (A1), the worker's payoffs after training in Figure 1 are obtained.

What remains is the specification of the worker's utility after no training. Because the worker's monetary payoffs after no training (2 and 1, respectively) are always weakly lower than those after training (4 and 2, respectively), the firm's choice of no training is unkind (or, better, not kind). Hence the worker must believe that the firm is unkind ($\lambda \leqslant 0$). The reciprocity payoffs $Y_W \kappa \lambda$ then give the worker an incentive to react in an unkind way, i.e. to choose the high wage. This is the same choice the worker would make on the basis of monetary payoffs alone. The reciprocity payoffs thus do not affect the worker's actual choice after no training; he always chooses H. For ease of exposition, they are therefore left out in Figure 1.

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NOTES

1. In an alternative interpretation of this game, the firm first offers both a training level and a wage. (N then corresponds to a combination with a low training level, T to one with a high training level.) Subsequently, the worker decides whether to stay with the firm (corresponding to L), or to quit (corresponding to H). In this interpretation a kind act of the worker would be to stay with the firm even if that is financially unattractive.
2. Although our specification of the reciprocity payoffs may appear *ad hoc*, they in fact follow from applying the theory of Dufwenberg and Kirchsteiger (2003) to our strategic setup. This is shown in the Appendix.
3. Leuven and Oosterbeek (2004) use the 1999 data for their analysis.
4. This was tested using ranksum tests; the highest *p*-value equals 0.0035 and pertains to the difference in participation in firm-sponsored training between the Low and Intermediate reciprocity groups.
5. Here we look at percentage-point differences. In percentage differences the difference between Low and Intermediate is similar in columns (2) and (3), which suggests that the reciprocity measure might pick up unobservables that correlate with training. It should be pointed out, however, that for training without firm support this difference is not statistically significant. In addition, for the Intermediate *v.* High groups (the majority of the observations) the difference in training rates is basically zero.
6. In the all training and firm sponsored training equations, tenure has the usual inverse U-shaped effect; for training without firm support the tenure profile is U-shaped.
7. However, the sign of the interaction of tenure and reciprocity seems ambiguous. A worker with long tenure, for example, is less likely to have good outside options and therefore has less scope for opportunistic behaviour, suggesting that reciprocity matters less for the training incidence of long-tenured workers.

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