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"Job Satisfaction and Employee Turnover: A Firm-level Perspective"

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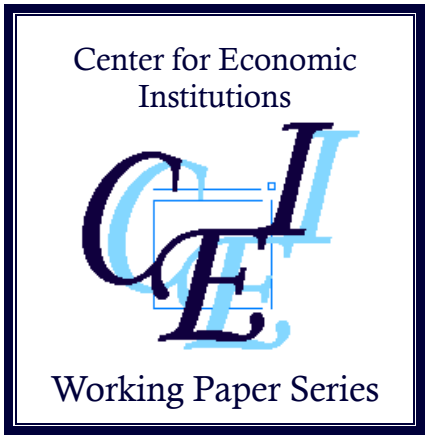

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JOB SATISFACTION AND EMPLOYEE TURNOVER: A FIRM-LEVEL PERSPECTIVE

By

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Abstract

In this paper, I study an employment situation where the employer and the employees cooperate about the implementation of a job satisfaction survey. Cooperation is valuable because it improves the firm's ability to predict employee quits, but it is only an equilibrium outcome because the employer-employee relation is repeated and long-term. Using a unique combination of firm-level data and information from job satisfaction surveys, the empirical analysis reveals that the cooperation reduces the firm's employee turnover costs significantly by improving its ability to predict quits. This cost reduction may easily exceed the cost of conducting the survey. The analysis also reveals that the firm is willing to sacrifice profits in a given year to be able to sustain the cooperative relationship with the employees.

JEL codes: M5

Key words: quits, job satisfaction, cooperation, retention

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INTRODUCTION

When an employee quits, it imposes costs on the organisation. The employee has to be replaced and the new employee trained. The quit may also cause significant and costly disruptions to the production process (Wasmuth and Davis, 1983). This provides clear incentives for the firm to prevent quits or, at least, to be able to predict when and where quits can be expected. In the literature, there have been numerous papers establishing how demographic and firm characteristics influence employee turnover propensities.[1] Researchers have also stressed the close link between employee job satisfaction and firms' ability to retain employees. For example, Clark (2001) uses data from the British Household Panel Survey (BHPS) to show that satisfaction with total pay, job security, ability to work on own initiative, the actual work itself and hours of work leads to fewer quits. The paradox is, however, that while information on job satisfaction at the individual level is available in supplement to representative datasets such as the BHPS, the National Longitudinal Survey of Youth (NLSY) or the German Socio-Economic Panel (GSOP), it is not available to decision-makers in companies. Hence, managers cannot use this information to predict quits.

The main reason job satisfaction data (or, more generally, survey data) at *the individual level* are unavailable to managers is that employees are likely to respond strategically if the answers will be used at the individual level. For example, if employees are asked to evaluate their immediate manager and the answers will be made available to the manager, it is most unlikely that negative feedback will be given. Hence, our representative datasets allow us to establish the effects of job satisfaction on employee retention, but decision-makers in companies are generally unable to use job satisfaction scores at the individual level in their management of firms.

Nevertheless, many companies have employee surveys conducted. To obtain useful information (i.e. secure *"truth telling"* by employees), employers apply a particular mechanism that secures the individual's anonymity: they have an external consulting company conduct the job satisfaction survey, and they receive information on employee job satisfaction scores from the consulting company in an aggregated form, for example as the average job satisfaction scores in departments. Managers can then make decisions based on these average job satisfaction scores, which is valuable, but clearly the average scores are less attractive than the individual scores.

A natural way to think about this employment situation is in the context of an infinitely repeated prisoner's dilemma. The company has a clear interest in eliciting truthful answers from employees, because they can be used to improve business performance, for instance through a better ability to

[1] Anderson and Meyer (1994) identify the characteristics of high employee turnover firms. Royalty (1998) focuses on how job separation rates differ by demographic characteristics. More recently, Frederiksen, Honoré and Hu (2007) and Frederiksen (2008) use employer-employee data to estimate the job separation process, and by doing so they are able to simultaneously study the importance of firm and individual characteristics. Studies using firm-level data similar to those being used in this study include Weiss (1984) and Sicherman (1996).

predict employee quits. The employees also have a clear interest in telling the truth, as they will receive better management. Hence, cooperation, in the sense that employees tell the truth in an employee survey and the company uses the information at an "aggregate" level that preserves the employees' anonymity, is a desirable equilibrium. The firm is tempted, however, to use the employees' individual answers to the survey questions because of the information advantage. However, if the employees cannot be sure that the firm keeps its promise only to use the answers in an anonymised and aggregated way, they will behave strategically and not tell the truth. This implies that, in the one-shot game, the only Nash equilibrium is the one where both parties do not cooperate. In other words, there is no point in conducting a survey. However, in an infinitely repeated game, a simple Grim Trigger Strategy can make cooperation a subgame perfect Nash equilibrium.

For the subgame perfect Nash equilibrium in the infinitely repeated game to exist, the survey information must be valuable to the firm when used at an aggregate level and even more valuable when applied at the level of the individual employee. For this reason, it is important to determine empirically how valuable aggregate and individual level survey information is to the firm. I will do this in the context of a quit analysis. The idea is to compare the firm's ability to predict quits in three situations: 1) using the information conveyed in personnel records, 2) using the information conveyed in personnel records and aggregate employee job satisfaction scores, and 3) using the information conveyed in personnel records and individual employee job satisfaction scores. Besides providing evidence for the relevance of the economic model such results are also important for other reasons: They provide new insights into the value of having employee surveys conducted, and they shed light on how much profit the firm is willing to give up in the short term to be able to sustain a long-term cooperative relationship with its employees.

In the empirical analysis, I make use of unique personnel records from a large Scandinavian service provider and information from employee job satisfaction surveys. The surveys were conducted by an external bureau among the company's employees on a yearly basis, and the results were reported to the firm as averages at the department level. I obtained both the personnel records and the job satisfaction surveys (scores at the individual level) and was able to merge the two data sources. The sampling period spans 2004 to 2010.

The empirical results show that the job satisfaction survey contains valuable information that can be used to predict employee quits. When the firm relies only on the information conveyed in the personnel records, the prediction error measured as the mean absolute distance (MAD) is 0.146. When information on job satisfaction at the department level is added, the MAD is reduced to 0.133, and when the job satisfaction scores are included at the individual level, it is further reduced to 0.117. Hence, the survey information is valuable for predicting quits, and when the firm applies the survey information in the best possible (aggregate) way, the improvements in predictive ability are significant. The firm's improved ability to predict quits will most likely result in a cost reduction that exceeds the cost of conducting the survey. The results also show that the firm foregoes profits in a given year to be able to maintain and sustain the long-term collaborative relationship with the employees. The firm could have benefited from using the survey data at an individual level as it

would have reduced the MAD, but to be able to conduct surveys in the future, it refrains from this temptation.

The remainder of the paper is organised as follows: In the next section, I provide a theoretical motivation for why the company and its employees corporate with respect to the collection of job satisfaction data. In section 3, I present the company, the personnel records and the data from the job satisfaction surveys. The empirical results are presented in section 4. Section 5 provides a discussion of the results, and section 6 concludes on the findings.

THEORY

In this section, I establish how employer-employee cooperation about the implementation of a job satisfaction survey can be seen as an equilibrium outcome. In the present context, cooperation means that employees answer truthfully to an employee survey and that the employer uses the answers from the employee survey at an aggregate level, such that the anonymity of the employees is preserved.

Cooperation is not a trivial equilibrium outcome. If the employees answer truthfully to the survey questions, the employer has a clear incentive to capture all the information conveyed in the survey answers (at the individual level), as the superior information can be used to increase profits. Naturally, employees anticipate this, and they will respond strategically to the survey questions. Thus, the only outcome in the one-shot game is non-cooperation. It turns out, however, that if the employer and the employees engage in a relationship with an infinite horizon, a Grim Trigger Strategy can make cooperation a subgame perfect Nash equilibrium. In other words, if both the employer and the employees see the relationship as ongoing, cooperation is a possibility.

To formally analyse the employment situation, consider the following situation: Employees have a choice between telling the truth about their job situation in an employee survey or strategically manipulating their answers, and the employer has the choice between using the information from the employee survey at an aggregate level, which maintains the employees' anonymity, or using the information at an individual level, which violates the employees' anonymity.

From the employees' perspective, telling the truth when the employer uses the data from the survey at an aggregate level is desirable because they will experience better management decisions; let us assume that this yields a payoff of 2. An even better situation for the employees occurs if they manipulate the feedback they give to the employer, i.e. lie, and the employer uses the data at an aggregate level. In this case, the employees can manipulate the employer into improving the working conditions, which gives an employee payoff of 3. However, there is a risk that the employer will capture all the information conveyed in the survey once the employees have provided their answers. If this happens and the employees have told the truth, it will have negative consequences. For instance, if some employees have revealed that they are dissatisfied with their immediate management or that they disagree with the way senior management is running the firm, it could prove harmful to the employees' future in the company. This situation would yield a payoff

of -1. Finally, manipulated answers are deemed useless information if used at the individual level, and both the firm and employee payoff are zero.

From the company's perspective, it is valuable when the employees tell the truth in the survey because it allows for better decision-making. When this information is applied at an aggregate level, the payoff to the firm is A. If the firm decides to use the information from the survey at the individual level, it is able to make even better decisions and the resulting payoff is B, with $B > A$. In contrast, in the very unfortunate situation that the employees strategically manipulate their answers in the survey and the firm uses the information at an aggregate level, the firm would be basing its decisions on false information and the consequence is a firm payoff of -1. Finally, as already established, manipulated survey information used at the level of the individual employee yields a payoff of 0 to the firm.

The payoffs to the employees and the company are summarised in Figure 1, where the (X,.) reflects the employees' payoff and the (.,X) reflects the employer's payoff. If A = 2 and B = 3, it is a standard prisoner's dilemma situation with a unique Nash equilibrium at {SM, EL} with resulting payoffs of $\{0,0\}$. In other words, the whole idea of collecting survey information about the employees' job situation is worthless.

[FIGURE 1 AROUND HERE]

Instead of modelling the situation as a one-shot game, it is more appropriate to think of it as an infinitely repeated game. This is reasonable if the company is expected to continue operations indefinitely (and the probability of bankruptcy is estimated at zero). In this case, a simple Grim Trigger Strategy can be used to implement cooperation in equilibrium. That is, if the parties cooperate in the first period and any period t thereafter, if the opponent has cooperated in every time period up to period t and if the parties defect in every period that follows a period where the opponent defected, then cooperation {TT, AL} is a subgame perfect Nash equilibrium (if the discount factor is not too low). In the present context, with $3 = B > A = 2$, the equilibrium exists if the discount factor is $\delta \geq 1/3$.[2] If we have $= 1/(1 + r)$, this condition is satisfied for $r < 2$. Hence, only in the situation where the employees or the company are very impatient (interest rate of more than 200%), they will stop cooperating.

A further condition is required for the equilibrium to exist: $B > A$, i.e. that the truthful information about the employees' job situation is more valuable at the individual level than at the aggregate level.

In the empirical analysis conducted below, I will, in the context of a quit analysis, estimate the magnitudes of A and B and determine by how much B exceeds A. By doing this, it is possible to establish if a key condition that is required for the equilibrium to exist is satisfied. It is also possible to shed light on how valuable survey information is (the magnitude of A or B), and it is possible to

[2] For details, see Gibbons (1992) or Campbell (2006).

determine how much the firm is willing to give up in the short run to be able to collaborate with the employees in the future (the difference between B and A).

THE COMPANY AND DATA

The company is the market leader in the domestic market and has some activities abroad. In this study, I use information about domestic employees. This involves 17,649 unique individuals and 87,237 person-year observations during the period 2004 to 2010. I am aware that the last two years of data, from 2008 to 2010, are years where the financial crisis was at its peak and the market was highly uncertain. The applied econometric methodology accounts for this issue.

The data stem from two sources. The first source is the firm's personnel records. These records contain information about wages, tenure and demographic variables such as age and gender. The records also contain information about the employee's job level and department. The second source is an employee survey. The survey is structured around the "Nordic Employee Index Model" (Eskildsen, Westlund and Kristensen, 2004) and is conducted every year. The survey includes 38 questions covering the following domains: Overall satisfaction, loyalty, motivation, salary and benefits, corporate leadership, immediate manager, cooperation, conditions at work, career development and image. The survey is presented in Table A1 in the Appendix.

In Table 1, I present descriptive statistics for the personnel records used in the benchmark regression presented below. In that regression, I use a subsample consisting of 62,845 person-year observations. The main reasons for the drop in observations are the timing of the survey and the research design. The survey is conducted during the period late September to early October. For this reason, the survey information from year t-1 is matched to personnel records from January year t, and the quit variable is constructed by comparing the employment status in January year t with the employment status in January year t+1. This implies that the first and last sample years are excluded from the regression data. Additionally, dismissed employees are excluded from the sample, as the company has no difficulty in explaining an exit of this type.

[TABLE 1 AROUND HERE]

The regressions including information from the employee survey are based on a subset of the 62,845 person-year observations. The main reason being that the survey response rate is 88.7 per cent (across all years). Furthermore, some employees do not answer all 38 questions, for which reason there is an overall drop in sample size as a result of the response rate and an additional drop in the sample size when some employees have refrained from answering particular survey questions. The issue that regressions including survey data only run on a subsample is explicitly addressed in section 5 below.

Returning to the descriptive statistics presented in Table 1, it can be seen that the yearly quit rate in the company is 8.4 per cent. The average age is 43.83 years, tenure is 18.12 years and 53 per cent of the employees are women. Furthermore, 11 per cent of the employees serve as supervisors, and the employees are organised such that 52 per cent work in the branches, 37 per cent work in central

staff positions, 6 per cent work in market functions and the remaining employees work in "other" functions.

The personnel records also contain information about the employees' job level and compensation. There are nine job levels (detailed descriptions are not shown), and these will be controlled for in the regressions through a full set of job level dummies. I will also follow Card et al. (2012) who show that relative wages are important for job satisfaction, and control for the residuals from a log wage regression in the quit models presented below. In the log wage regression (not shown), I control for the job level, a polynomial of degree 4 in age, a quadratic in tenure, dummies for gender and supervisor together with fixed effects for year and department.

ESTIMATION RESULTS

In this section, I present the results from three types of quit models. The first model is based on the company's personnel records. This type of model can be estimated by the company (or any company). The second type of model is based on the personnel records and the information in the employee surveys used at the level of the individual employee. This model cannot be estimated by companies unless they breach the implicit anonymity contract they have with the employees and by that destroy the possibility to conduct useful employee surveys in the future. The third type of model is based on the personnel records and survey information used at the department level. This model can be estimated by companies conducting employee surveys.

The main purpose of estimating the three types of models is to assess how well the different information packages can be used to predict employee quits. Hence, the models are constructed with the purpose of maximising their predictive power. A second-order purpose is to identify the relations between particular variables available in the personnel records and the employee surveys and employee quits.

[TABLE 2 AROUND HERE]

The estimation results of the first model, which is based on the information available in the firm's personnel records, are presented in the first column of Table 2. The results show that demographic variables such as age and gender are significant predictors for a quit. While it is easily seen that women are less likely to quit, the interpretation of the age effect is more involved, as the effect is captured by a fourth degree polynomial. For this reason, the age effect is illustrated in Figure 2, which shows the predicted quit probabilities for the "average" employee when the age variable takes on values in the range from 20 to 60.[3] From the picture, it is clear that the youngest employees and employees in the mid-thirties have relatively high quit probabilities, whereas employees in their late twenties and those approaching fifty are unlikely to quit. It is also apparent from the figure that individuals aged sixty are very likely to quit as they start entering pension programmes, and this trend is continuing for individuals above sixty.

[3] The average employee is a 44-year-old woman with 18 years of tenure. She works in one of the branches at job level 5.

[FIGURE 2 AROUND HERE]

Tenure is found to have a convex influence on the quit probability, which is a common finding in the literature (Farber, 1999). It is also established that there is some variation in quit probabilities across departments. Employees working in the branches have lower quit rates than the reference group "other", and employees in central staff positions are relatively more likely to quit. Employees in market functions have the same quit propensities as the reference group. Finally, in line with Card et al. (2012), it is established that employees with relatively higher wages (residuals) are less likely to quit.

The second model presented in Table 2 is based on the information conveyed in the personnel records and individual level job satisfaction scores from the employee survey. The presented model is tested down from a "full" model consisting of the variables from model 1, a university dummy (see note in Table 2) and the 38 variables coming from the employee surveys. The variables from the personnel records are maintained throughout, but the survey variables are tested down. The final model (presented in Table 2) includes only statistically significant survey variables. The significant survey variables are:

1. I would like to be working in the company in two years' time
2. I would recommend others to seek employment with the company
3. My salary (including allowances and bonuses) compared to what I could get in a similar position elsewhere
4. My general benefits (holidays, pension and other benefits) compared to what I could get in a similar position elsewhere
5. I feel good about the workload in my job
6. The attention given to my professional and personal development
7. The company has a good image

The effects of the personnel record variables change only marginally when the survey variables are included. The age profile is somewhat altered, and the employees working in central staff positions are now determined to have quit probabilities similar to the reference group.

The effects of the survey variables are important. Many of the survey variables have an expected negative effect on the quit probability. For instance, when employees give a high score to the question "my salary (including allowances and bonuses) compared to what I could get in a similar position elsewhere", they are less likely to quit. Furthermore, when people feel good about their workload, when they are looking forward to going to work and they feel that attention is given to their professional development, they are more likely to stay. Finally, those employees giving high scores to the question "I would like to be working in the company in two years' time" have relatively low quit propensities.

More puzzling is that employees who give high scores when asked if they would recommend others to seek employment in the company and those with high scores on how they perceive the company's image are significantly more likely to leave the firm. These results suggest that the

firm's external branding, which is a device normally used to attract employees, has an unintended negative retention effect, but other interpretations may also apply. Another result, which at first appears puzzling, is that employees rating their general benefits (holidays, pension and other benefits) relatively high compared to what they could get in a similar position elsewhere are more likely to leave. There are two (likely complementary) explanations for this: These benefits are not highly valued and they are likely to vary only marginally within similar positions across companies. Additionally, the number of holidays and working hours, the pay, etc. are, to a large extent, outcomes of negotiations with unions at a national level.

[TABLE 3 AROUND HERE]

The third set of models builds on the information in the personnel records in combination with the information in the employee surveys used at the department level. The first model of this type is presented in Table 3 (model 3). This model controls for the personnel records used previously and averages at the department level for the survey variables. Model 4 is similar to model 3, except that it contains both the averages and standard deviations for the survey variables at the department level. Model 5 is identical to model 4, but is estimated on the subsample of departments that have 10 or more employees. This final model is the most important model of the three, because it is the model which can be estimated by the firm. The reason is that the company is divided into as many as 1,014 unique departments across the years. The largest of these units consists of 373 employees and the smallest consists of just one person. This implies that in some of the smallest departments, there is almost no difference (if any) between the averages (and standard deviations) and the employees' individual answers. Hence, for the company to respect the implicit contract of not violating the anonymity of the employees, they only receive feedback (averages and standard deviations) from the survey for departments with 10 or more employees.

The results in Table 3 show that the effect of the personnel record variables are very stable across the three models (models 3-5), and they mirror the results found in models 1 and 2. What is much less stable is the set of survey variables ending up in the final specifications for each of the three models (see detailed results in the Appendix, Table A2). In model 3, the following survey questions survive the testing down of the model:

1. I would like to be working in the company in two years' time
2. My general benefits (holidays, pension and other benefits) compared to what I could get in a similar position elsewhere
3. I rarely look for other jobs outside the company
4. The company is an organisation characterised by sincerity
5. I feel that I would have many alternative job opportunities if I were to leave the company
6. My job security
7. The professional cooperation with my colleagues
8. My opportunities for professional and personal development

When compared to model 2, only the first question, the intention to work in the company in two years' time, and the second question, general benefits, are present in both models. When comparing across models 3 to 5, only four of the mean variables are present in all three models. A similar fining pertains to the standard deviations, where only five can be found in both model 4 and model 5. Naturally, part of the explanation is that the survey questions are constructed to produce highly correlated answers within each of the domains: Overall satisfaction, loyalty, motivation, salary and benefits, corporate leadership, immediate manager, cooperation, conditions at work, career development and image. However, the lack of consistency between model 2 and models 3 to 5 questions if the models using the department averages can be used to learn about individual quit behaviour. Nevertheless, models 3 to 5 turn out to be important because they have higher predictive powers than baseline model 1 – an issue which will be discussed explicitly in the next section.

DISCUSSION

The empirical results presented in the previous section established the relationship between personnel and survey data and quit probabilities. In this section, I will establish by how much the predictive power increases when the personnel data is supplemented with information from the employee surveys. I will also provide estimates of how much the firm can save by appropriately exploiting available survey information at the department level and how much the firm could gain (in the short run) if it decided to violate the employees' anonymity and use the survey information at the level of the individual employee.

Predictive performance

One way of evaluating the predictive performance of the models is to determine the mean absolute distances (the MADs)[4] between the actual outcome and the predicted quit probability. That is, let $Quit$ be the realised value for the quit dummy and let $\widehat{Quit}$ be the predicted quit probability, then the MAD is:

$$MAD = \frac{1}{n}\sum_{i=1}^{n}\left|Quit_i - \widehat{Quit}_i\right|$$

[4] An alternative to the MAD is the mean squared distances (MSD):

$$MSD = \frac{1}{n}\sum_{i=1}^{n}\left(Quit_i - \widehat{Quit}_i\right)^2$$

This measure penalise more heavily the larger differences. The results produced by the MSD mirror those of the MAD.

The MADs for the five estimated models from the previous section are presented in the first row of Table 4. The first model, which is based on the personnel records, has a MAD of 0.146. The second model supplements the information from the personnel records with individual level information from the employee surveys and produces a MAD of 0.127. The remaining results in Table 4 show the MADs for the three models where the personnel records are supplemented with survey information applied as department averages and standard deviations, and these MADs are very similar to that of model 1.

[TABLE 4 AROUND HERE]

At first sight, it appears as if the survey information used at the individual level leads to a significant improvement in the predictive power; however, we have to take into account that only a subset of employees provides complete survey information. Hence, the predictions based on the results from model 2 cover only 69.4 per cent of the employees. Because of this, it is relevant to look at the relative performance of model 1 and 2 for the subset of employees for whom predictions can be made in both models. When doing so, I achieve a MAD of 0.131 for model 1 and a MAD of 0.127 for model 2. Hence, model 2 is better, but its superiority is less pronounced.

One could also argue that the survey information should be used when available and that model 1 is the default. This implies that predictions from model 2 are used when available and predictions from model 1 are used when predictions from model 2 are unavailable. This mixing produces a MAD of 0.117 (covering all employees) for model 2, which is to be compared to the model 1 MAD of 0.146 or to the original model 2 MAD of 0.127 covering only 69 per cent of employees (see row 4 in Table 4). When similar exercises are done in relation to model 3 to 5, models 3 and 4 remain similar to model 1 in performance, while the MAD for model 5 drops to the relatively low level of 0.133. Thus, survey information is certainly valuable, and the mixing strategy, using the survey information when available, produces superior predictions.

Cost Performance

While the MAD summarise the models' predictive powers, it is not directly informative about the monetary benefits of better predictions. However, it turns out to be a difficult exercise to produce a metric for how much turnover costs are reduced when a firm improves its ability to predict employee turnover. The reason is that such benefits can result both from more accurate expectations about actual employee turnover and from preventing employee turnover. In the first case, the firm can reduce the costs that result from disruptions of the production process when employees leave (not so) unexpectedly. The firm can also improve its succession planning and recruitment strategies. In the second case, turnover is prevented. The literature does contain estimates of the cost of turnover – costs that are saved if an unintended quit is prevented – but, the costs vary significantly across employees. Wasmuth and Davis (1983) produce an extensive list of all the cost drivers for employee turnover. In turn they argue that the cost of turnover for employees in the hospitality industry ranged from USD 500 to USD 5,000, with an average of USD 2,300 (most likely in 1983 prices). This conclusion is the result of a careful assessment of both direct and indirect costs associated with employee turnover. Hence, even in the relatively standard employment situation of

hospitality employees, turnover cost varies substantially across employees. From conversations with the firm that I study in this paper, it becomes clear that replacement of white collar specialists easily can cost what corresponds to six months salary. Higher level managers are significantly more expensive to replace. Hence, irrespective of the type of employee there are substantial costs associated with turnover and an improved ability to reduce employee turnover will therefore lead to significant cost savings – cost savings that with a high probability will be larger than the cost of conducting the survey.

Summary

The empirical analysis shows that the collaboration between the employer and the employees regarding implementation of a job satisfaction survey is very valuable. From the firm's perspective, the information from the survey results in a significant improvement in its ability to predict employee turnover. In turn this is likely to result in a reduction in turnover costs that clearly exceeds the costs of conducting the survey. Equally important, the results also show that the firm foregoes profits in a given year to maintain the long-term cooperation with employees. That is, if the firm breached the confidentiality agreement with the employees and used the survey information at the individual level, it would be able to make better predictions about employee turnover in that year. It is the benefits from future collaborations that prevent the firm from doing so.

CONCLUSION

In this paper, I analyse an employment situation building on cooperation. The employer and the employees agree to implement a yearly job satisfaction survey where the employees answer truthfully on the survey questions and the employer agrees to maintain the employees' anonymity. Successful implementation of the survey is by no means trivial. Only in the case where the relationship between the employer and the employees is repeated and long-term can cooperation be achieved in equilibrium. Otherwise, both the employer and the employees have clear incentives not to cooperate.

The empirical results show that there are significant gains to be made from the employer-employee collaboration: The firm can improve its ability to predict employee turnover and by that reduce turnover costs. A second important finding is that the employer is willing to forego profits in a given year to be able to sustain the collaboration with the employees.

While the empirical results show significant gains from employer-employee collaboration, the presented estimates are likely to be a lower bound. The survey was originally implemented to elicit information from the employees about their job satisfaction – not to reduce turnover costs. Such job satisfaction scores could be used directly as Key Performance Indicators (KPIs) for managers and, as such, play a role for how they are remunerated, or they could be used indirectly as input in promotion decisions. These additional uses of the survey information also provide benefits for the firm. Nevertheless, the estimates on the costs and benefits of employer-employee collaborations presented in this paper are likely to be the first of their kind in the literature.

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TABLES

TABLE 1

DESCRIPTIVE STATISTICS

	Mean (std. dev.)
Quit rate	0.084
Age	43.83
	(10.56)
Tenure	18.12
	(13.35)
Women	0.53
Supervisor dummy	0.11
Employee distribution	
Branches	0.52
Central staff	0.37
Market functions	0.06
Other	0.05
Unique individuals	16,464
Person-year observations	62,845

TABLE 2

LOGIT ESTIMATES OF EMPLOYEE QUIT BEHAVIOUR

	Model 1	**Model 2**
	Personnel records	Personnel records and employee survey information
		(Individual level)
Personnel records:		
Wage residuals*	-0.491***	-0.604***
	(0.100)	(0.144)
Age	-1.574***	-0.486
	(0.273)	(0.453)
Age^2/100	6.824***	3.107*
	(1.010)	(1.622)
Age^3/1000	-1.277***	-0.729***
	(0.161)	(0.251)
Age^4/10000	0.087***	0.058***
	(0.009)	(0.014)
Tenure	-0.088***	-0.098***
	(0.004)	(0.006)
Tenure^2	0.002***	0.002***
	(0.000)	(0.000)
Woman	-0.171***	-0.215***
	(0.034)	(0.045)
Education: University**		-0.098**
		(0.046)
Supervisor	-0.053	0.027
	(0.063)	(0.074)
Branches	-0.188***	-0.331***
	(0.034)	(0.046)
Central Staff	0.134**	0.023
	(0.065)	(0.087)
Market functions	0.051	0.010
	(0.066)	(0.082)
Employee survey: Individual answers (scale 1-10)		
I would like to be working in the company in two years' time		-0.135***
		(0.014)
I would recommend others to seek employment with the company		0.044**
		(0.017)
I always look forward to going to work		-0.039**
		(0.017)
My salary (including allowances and bonuses) compared to what I could get in a similar position elsewhere		-0.060***
		(0.013)
My general benefits (holidays, pension and other		0.040**

benefits) compared to what I could get in a similar position elsewhere		(0.017)
I feel good about the workload in my job		-0.032** (0.013)
The attention given to my professional and personal development		-0.033** (0.014)
The Company has a good image		0.059*** (0.018)
Dummies for job level	YES	YES
Year dummies	YES	YES
Observations	62,845	43,637

Note: * The wage residuals used stem from a log wage regression controlling for the job level, a polynomial of degree 4 in age, a quadratic in tenure, dummies for gender and supervisor together with fixed effects for year and department. ** Information on education is not available in the personnel records, and for that reason it is obtained from the survey. The answer to the education question can take one of 7 different values, but the data reveal that the employees have problems identifying the right category, and their answers vary significantly across years. Based on the survey information, I construct one dummy called “university degree” comprising employees with college or graduate degrees. The university category accounts for 26 per cent of the individuals, but it is likely to be subject to significant measurement error.

TABLE 3

LOGIT ESTIMATES OF EMPLOYEE QUIT BEHAVIOUR AS MODELLED BY THE FIRM

	Model 3 Personnel records and employee survey information (department level)	**Model 4** Personnel records and employee survey information (department level)	**Model 5** Personnel records and employee survey information (department level) *Departments sized 10+*
Personnel records			
Wage residuals	-0.583***	-0.658***	-0.742***
	(0.101)	(0.104)	(0.112)
Age	-1.600***	-1.606***	-1.794***
	(0.275)	(0.276)	(0.299)
Age^2	6.918***	6.955***	7.636***
	(1.016)	(1.023)	(1.106)
Age^3	-1.291***	-1.298***	-1.406***
	(0.162)	(0.163)	(0.176)
Age^4	0.088***	0.088***	0.094***
	(0.009)	(0.009)	(0.010)
Tenure	-0.086***	-0.087***	-0.086***
	(0.004)	(0.005)	(0.005)
Tenure^2	0.001***	0.002***	0.001***
	(0.000)	(0.000)	(0.000)
Woman	-0.162***	-0.166***	-0.158***
	(0.034)	(0.034)	(0.037)
Education: University	-0.080**	-0.091**	-0.093**
	(0.037)	(0.037)	(0.040)
Supervisor	0.006	0.005	-0.010
	(0.064)	(0.064)	(0.074)
Branches	-0.223***	-0.193***	-0.240***
	(0.040)	(0.040)	(0.046)
Central staff	0.004	0.053	0.009
	(0.069)	(0.069)	(0.073)
Market functions	0.029	0.113	0.068
	(0.069)	(0.069)	(0.076)
Averages for departments	YES	YES	YES
Std. dev. for departments	NO	YES	YES
Dummies for job level	YES	YES	YES
Year dummies	YES	YES	YES
Observations	62,663	62,083	52,015

TABLE 4
EVALUATION OF MODEL PREDICTIONS AND COVERAGE

	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**
	Personnel records	Personnel records and employee survey information (individual level)	Personnel records and employee survey information (department level)	Personnel records and employee survey information (department level)	Personnel records and employee survey information (department level) *Departments sized 10+*
Mean absolute distance (MAD)	0.146	0.127	0.145	0.145	0.147
Coverage (people)	62,845	43,637	62,663	62,083	52,015
Coverage (per cent)	100	69.4	99.7	98.8	82.8
MAD when supplemented with predictions from Model 1	0.146	0.117	0.145	0.144	0.133
Coverage (per cent)	100	100	100	100	100

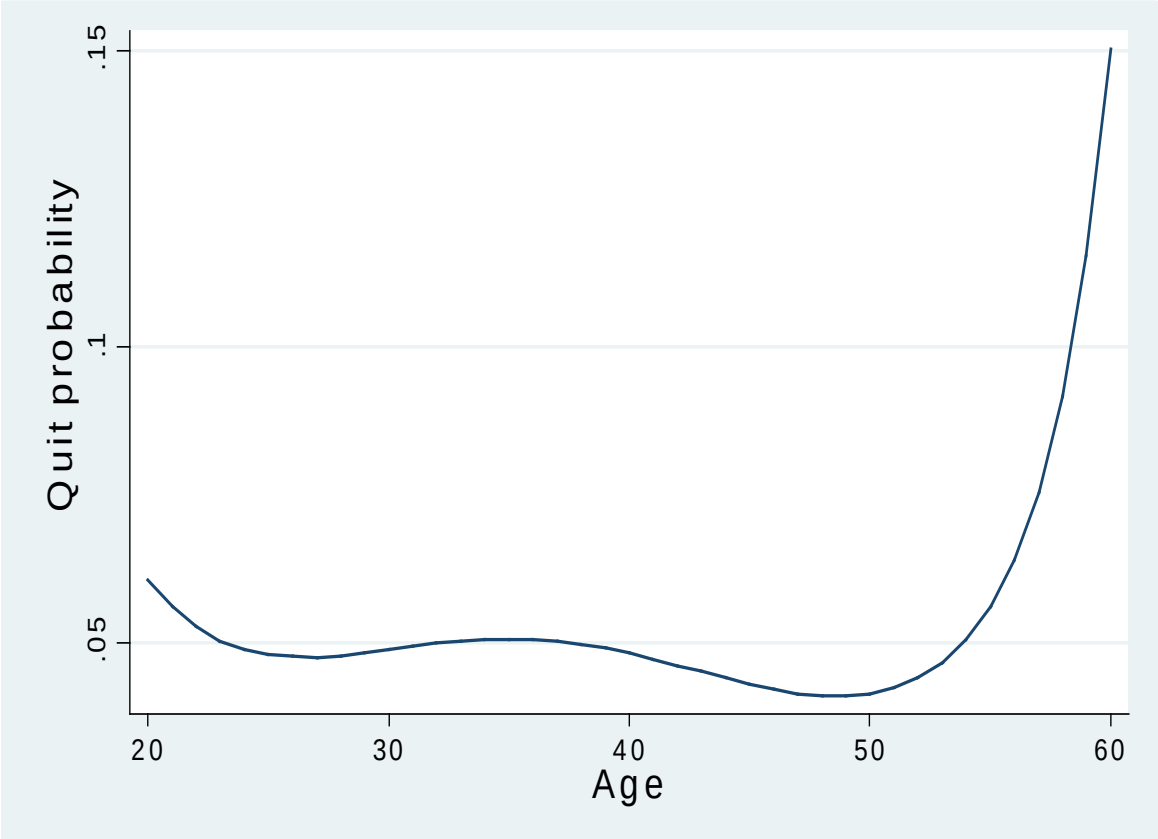
FIGURES

FIGURE 1
THE PRISONER'S DILEMMA

		Company	
		Applies survey information at an aggregate level (AL)	Applies survey information at the level of the employees (EL)
Employees	Truth telling (TT)	2 , A	-1 , B
	Strategic manipulation (SM)	3 , -1	0 , 0

FIGURE 2

THE QUIT-AGE PROFILE



APPENDIX

TABLE A1
THE EMPLOYEE SURVEY

Satisfaction	Overall, how satisfied are you as an employee at your workplace?
	Imagine a place of work, which is perfect in all aspects. How far from or close to this ideal do you consider your place of work to be?
Loyalty	I would like to be working in the company in two years' time
	I would recommend others to seek employment with the company
	I rarely look for other jobs outside the company
	I feel that I would have many alternative job opportunities if I were to leave the company
Motivation	I feel motivated in my job
	I always look forward to going to work
Salary and benefits	My salary (including allowances and bonuses) compared to what I could get in a similar position elsewhere
	My general benefits (holidays, pension and other benefits) compared to what I could get in a similar position elsewhere
	My job security
Corporate leadership	The ability of Senior Manager to make the right decisions
	The ability of Senior Manager to inform the employees
Immediate manager	The professional skills of my immediate superior
	The leadership skills of my immediate superior
	My immediate superior is energetic and effective
	My immediate superior gives constructive feedback on my work
	My immediate superior delegates responsibility and authority so I can complete my work effectively
	My immediate superior helps me to develop personally and professionally
	What my immediate superior says is consistent with what he/she does
Cooperation	The professional cooperation with my colleagues
	The general atmosphere among my colleagues
	Social relations and interaction with my colleagues
	In my unit we are good at learning from each other
Conditions at work	My job objectives and work content
	The physical working environment at my place of work
	I feel good about the workload in my job
	I have sufficient influence over the setting of my job objectives
	I am able to observe and adhere to the core values
	I am satisfied with the way job objectives and work is distributed in my unit

	My work tasks present me with appropriate challenges
Career development	My opportunities for professional and personal development
	The attention given to my professional and personal development
	My job enhances my future career opportunities
	My appraisal conversation supports my further development
Image	The company has a good image
	I am proud to tell other people that I work for the company
	Other people consider the company to be a good place to work
	The company has a good image

Note: The scale used is a 10-point Likert scale with 1 corresponding to: low, not satisfied, do not agree and 10 corresponding to: high, satisfied, agree.

TABLE A2
LOGIT ESTIMATES OF EMPLOYEE QUIT BEHAVIOR AS MODELLED BY THE FIRM

	Model 3	**Model 4**	**Model 5**
	Personnel records and employee survey information (department level)	Personnel records and employee survey information (department level)	Personnel records and employee survey information (department level) *Departments sized 10+*
Personnel records			
Wage residuals	-0.583***	-0.658***	-0.742***
	(0.101)	(0.104)	(0.112)
Age	-1.600***	-1.606***	-1.794***
	(0.275)	(0.276)	(0.299)
Age^2	6.918***	6.955***	7.636***
	(1.016)	(1.023)	(1.106)
Age^3	-1.291***	-1.298***	-1.406***
	(0.162)	(0.163)	(0.176)
Age^4	0.088***	0.088***	0.094***
	(0.009)	(0.009)	(0.010)
Tenure	-0.086***	-0.087***	-0.086***
	(0.004)	(0.005)	(0.005)
Tenure^2	0.001***	0.002***	0.001***
	(0.000)	(0.000)	(0.000)
Woman	-0.162***	-0.166***	-0.158***
	(0.034)	(0.034)	(0.037)
Education: University	-0.080**	-0.091**	-0.093**
	(0.037)	(0.037)	(0.040)
Supervisor	0.006	0.005	-0.010
	(0.064)	(0.064)	(0.074)
Branches	-0.223***	-0.193***	-0.240***
	(0.040)	(0.040)	(0.046)
Central staff	0.004	0.053	0.009
	(0.069)	(0.069)	(0.073)
Market functions	0.029	0.113	0.068
	(0.069)	(0.069)	(0.076)

Employee survey (scale 1-10)			
Averages for departments			
I rarely look for other jobs outside the company	-0.084***	-0.117***	-0.122***
	(0.031)	(0.031)	(0.040)
The company is an organisation characterised by sincerity	-0.171***	-0.185***	-0.207***
	(0.047)	(0.044)	(0.061)
My general benefits (holidays, pension and other benefits) compared to what I could get in a similar position elsewhere	0.057***	0.042**	0.056**
	(0.020)	(0.021)	(0.025)
I feel that I would have many alternative job opportunities if I were to leave the company	0.102***	0.093***	0.120***
	(0.025)	(0.025)	(0.034)
I would like to be working in the company in two years' time	-0.176***		
	(0.039)		
My job security	-0.066**		
	(0.031)		
The professional cooperation with my colleagues	0.160**		
	(0.064)		
My opportunities for professional and personal development	-0.103***		
	(0.037)		
I am proud to tell other people that I work for the company	0.120***		
	(0.038)		
Overall, how satisfied are you as an employee at your workplace?		-0.206***	-0.259***
		(0.064)	(0.089)
I always look forward to going to work		0.110**	0.206***
		(0.051)	(0.064)
My immediate superior gives constructive feedback on my work		0.128**	0.248***
		(0.053)	(0.066)
My immediate superior helps me to develop personally and professionally		-0.179***	
		(0.055)	
The general atmosphere among my colleagues		0.130***	
		(0.048)	
I have sufficient influence over the setting of my job objectives		-0.120**	
		(0.051)	
I have the opportunity to complete/present my own work		0.195***	
		(0.057)	
I would recommend others to seek employment with the company			0.201***
			(0.059)
The leadership skills of my immediate superior			-0.301***
			(0.068)
My immediate superior is energetic and effective			0.121**
			(0.054)
The professional cooperation with my			0.242***

colleagues			(0.088)
My opportunities for professional and personal development			-0.257*** (0.060)
Std. dev. for departments			
Overall, how satisfied are you as an employee at your workplace?		-0.180*** (0.054)	-0.297*** (0.073)
I would like to be working in the company in two years' time		0.131*** (0.037)	0.236*** (0.047)
I would recommend others to seek employment with the company		0.136*** (0.046)	0.283*** (0.064)
The leadership skills of my immediate superior		-0.104** (0.048)	-0.216*** (0.070)
My immediate superior gives constructive feedback on my work		0.147*** (0.057)	0.176** (0.070)
My job security		0.085** (0.039)	
My immediate superior helps me to develop personally and professionally		-0.122** (0.055)	
I have sufficient influence over the setting of my job objectives		-0.148*** (0.054)	
I am able to observe and adhere to the core values		0.196*** (0.061)	
I am proud to tell other people that I work for the company		-0.135*** (0.052)	
My salary (including allowances and bonuses) compared to what I could get in a similar position elsewhere			-0.123** (0.049)
The ability of my senior manager to make the right decisions			0.126*** (0.043)
My opportunities for professional and personal development			-0.152** (0.067)
Dummies for job level	YES	YES	YES
Year dummies	YES	YES	YES
Observations	62,663	62,083	52,015