

Involuntary Absence from an Organizational Point of View

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Abstract: Involuntary absence is often seen as an exogenous factor, but firms can take actions to reduce it. In this paper the notion that firms, especially SMEs, are faced with a single decision whether or not to undertake these actions is questioned. A firm model on involuntary absence measures is constructed and estimated in which four successive steps are distinguished. It turns out that this model is supported by the data. Furthermore a clear firm-size effect exists. Larger firms tend to take more precautionary actions than small firms because they have more attention for work- and health-related topics in general and more easily recognise the influence they can exert on the level of involuntary absence.

Key words: involuntary absenteeism, precautionary measures, SME
JEL classification: J28

1. Introduction

Absenteeism is an important area for management concern: numerous publications on this subject have seen the light, and often authors have calculated the substantial costs of absenteeism¹. In many publications a classification is made into voluntary and involuntary absenteeism. It has been estimated that involuntary absence accounts for between a half and two-thirds of all absence². However, choosing the label 'involuntary' seems only correct from the point of view of an individual employee: research has shown that firms are able to reduce the level of involuntary absenteeism within their company.

Regarding the decision whether or not to take measures to reduce involuntary absence, very little research has taken place. According to neoclassical theory a profit-maximising firm would be aware of the fact that absenteeism can be reduced by specific measures. The firm is faced with a single decision whether or not to take measures reducing involuntary absenteeism. This decision will be based on a cost/benefit analysis. Especially for small- and medium-sized enterprises (SMEs) the supposition of a single decision is not realistic. Many SMEs don't consider absenteeism to be a serious topic³. Therefore they will never think about taking measures to reduce involuntary absenteeism. The purpose of this study is to investigate whether SMEs are faced with a single decision whether or not to take measures reducing involuntary absence, or that several stages can be distinguished. In a recent publication for the Dutch Ministry of Social Affairs, Bosch and te Brake (1995) have identified four steps in the decision process regarding precautionary measures. Based on these steps a model will be constructed and empirically tested.

In the next section findings from previous research will be presented, including the work by Bosch and te Brake. Section three will be concerned with the data used in the empirical part of this study. In the fourth section a firm model on involuntary absence measures will be developed. This model will be estimated using LISREL 7; some specifications of the estimation procedure will be discussed in section five, and the next

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¹ Lindeboom and Kerkhofs (1996), Geurts (1994), Huczynski and Fitzpatrick (1989).

² Geurts (1994), p.59 and Huczynski and Fitzpatrick (1989), p.77.

³ Versloot, van der Pol and Rozeman (1997a).

section will deal with the estimation results. Finally, some concluding remarks will be made.

2. Absenteeism

This section will present previous research on absenteeism. Firstly, the concept of absenteeism will be discussed. Subsequently, empirical results concerning involuntary absenteeism will show that the label 'involuntary' isn't correct from an organizational point of view. The remainder of this section will focus on two models on involuntary absenteeism: a model by Prins (1990) concerning individual employees, and the model by Bosch and te Brake (1995) which focuses on an organizational point of view.

The concept of absenteeism

Absenteeism can be classified in four categories⁴:

- Absence on a legal or contractual basis (annual leave, maternity leave, birthday, death in family).
- Certificated sickness absence.
- Absence from work due to injury.
- Absence for other reasons, for example non-certificated absences, strikes.

The second and third category correspond with voluntary absenteeism, the fourth category with involuntary absenteeism⁵.

Absenteeism can be studied from various perspectives. Within the economic literature, the common perspective is that of 'absenteeism as a deliberate labor supply adjustment of a worker dissatisfied with the number of contracted working hours' (Yaniv 1995, p.298). This is clearly directed towards explaining voluntary absence. Within the psychological literature various perspectives appear, and several explanatory models of absenteeism have been developed⁶. An influential model is that of Steers and Rhodes (1978). According to this model attendance of employees is largely a function of two factors: the motivation to attend and the ability to attend. This corresponds with the division in voluntary and involuntary absence. In the Steers and Rhodes model the main emphasis is put on the motivation to attend, and this has not changed since.

According to Steers and Rhodes, the ability to attend is made up of three components: illness and accidents, family responsibilities and transportation problems. Involuntary absenteeism as a result of illness or accidents can be further divided, depending whether the absence is due to occupational causes or not. In the remainder of this paper we will focus on involuntary absenteeism as a result of illness and accidents, due to occupational causes.

Empirical findings

Little empirical research into involuntary absenteeism has taken place, but some general conclusions can be made:

- Poor physical working conditions (such as heat, dust, gasses, noise, unsafe conditions), heavy work conditions and ergonomic shortcomings are associated with higher absence rates⁷.
- Psychological job demands are also related to absenteeism: involuntary absenteeism can increase as a result of continuing high levels of job stress⁸.
- Measures to improve the physical and psychic working conditions can reduce the involuntary absence due to occupational causes⁹.
- Involuntary absence *not* due to occupational causes can also be reduced by specific health promotion programs¹⁰.

⁴ Prins (1990), p.58.

⁵ The classification into voluntary and involuntary absence excludes absence on a legal or contractual basis.

⁶ See Geurts (1994) for a review on this subject.

⁷ Geurts (1994), p.12 and Prins (1990), p. 128.

⁸ Geurts (1994), p.11 and p.59, Huczynski and Fitzpatrick (1989), p.77.

⁹ Lindeboom and Kerkhofs (1996), Schabracq (1995), Smid (1991), Prins (1990).

These empirical findings show that the label 'involuntary absenteeism' is not correct from an organizational point of view: individual firms are able to reduce the level of involuntary absenteeism, whether this absenteeism is due to occupational causes or not.

A model of individual sickness behaviour

According to Prins (1990), the individual employee's ability to attend depends on several factors. An individual is confronted with a sequence of events and health-or work- related decisions he or she is to make (figure 1). This micro-model of sickness absence behaviour consists of seven different steps¹¹:

1. The *health status*. The individual's constitution and the 'supply' of health problems, ranging from minor ailments to serious disease, may be seen as the major determinant of an individual's general state of health. Three factors can be discerned which can influence the health status: personal conditions (age, sex, nationality, educational skills), living conditions (risky habits, nutrition, housing) and working conditions (occupational status, shift work, accidents risk, social relations, stress).
2. The *sickness tolerance threshold*. This standard defines whether and when the experience of symptoms makes the individual decide to assume the sick role with its role expectations (attempts to obtain diagnosis, treatment, and restoration of health).
3. Adoption of the *sick role* and its role expectations. The individual seeks and receives treatment to restore health or to stop the progression of disease.
4. The *absence tolerance threshold*. This standard on the scale ranging from slightly to seriously ill indicates when the individual (or his environment) considers himself released from the duty to attend work.
5. The *dependent patient role*. This status starts with reporting sick and is in some countries formalised by certification of the work incapacity through medical evaluation¹². In case of a high absence tolerance the individual may however decide to continue to attend work.
6. The *work resumption threshold*. This standard, comparable with absence tolerance threshold, indicates the conditions likely to terminate the dependent patient role and allow resumption of work. Alternatively the employee role is terminated and an other branch of social security may be entered.
7. Most spells of sickness absence are completed by *resumption of the employee role*. A very small minority of frequently or long term sick may (be forced to) substitute the dependent-patient role for a status as a disabled, unemployed or retired person.

According to figure 1, an individual employee has to make several decisions before reporting sick. Each of these decisions represents an opportunity for a firm to influence the employee's final decision. This corresponds with a classification of absenteeism measures that can be found in the managerial literature on this subject¹³. Absenteeism measures can be divided in monitoring, absenteeism support and precautionary measures¹⁴:

- Monitoring can take place during the application procedure (medical tests) and when an employee has reported sick. When an employee has reported sick the only goal of monitoring is to prevent voluntary absence. It is directed towards the work resumption threshold, and to a lesser extent to the absence tolerance threshold.

¹⁰ According to Bertera (1990) health promotion activities focusing on "smoking cessation, fitness, weight control, lipid control, stress management, and healthy back" (p.1101) result in less working days being lost due to illnesses not related to occupational causes.

¹¹ The description of these steps is quoted from Prins (1990).

¹² In the Netherlands this does not apply.

¹³ Versloot, van de Pol and Rozeman (1997b), Smid (1991).

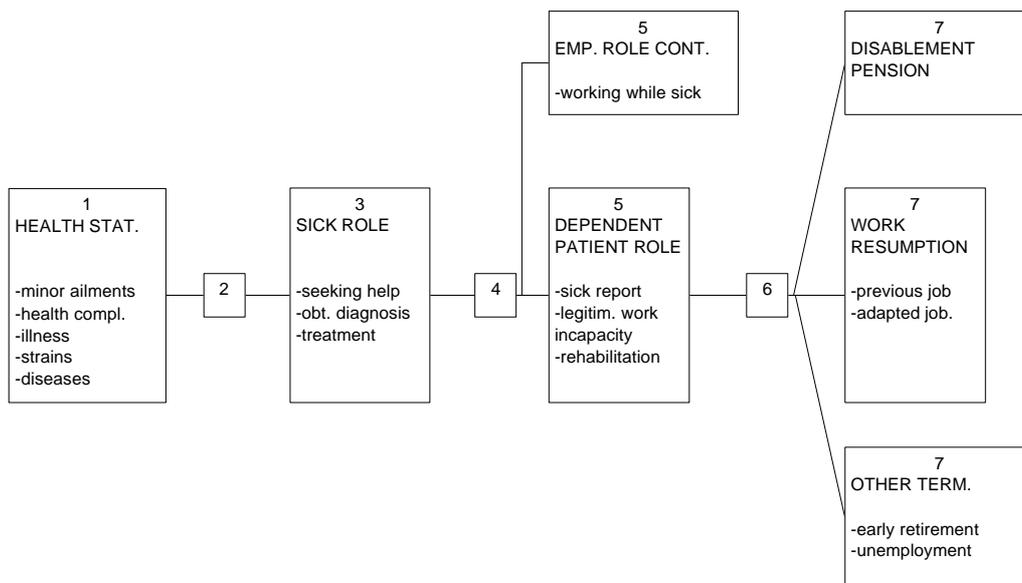
¹⁴ The links between the absenteeism measures and the micro-model of sickness absence behaviour were already implicitly mentioned by Prins (1990).

- Absenteeism support is concerned with a more social monitoring of sick employees, as compared with the rigid control practices associated with 'monitoring'. It implies a more positive attitude of the firm towards the employee. Absenteeism support is mainly directed towards the absence tolerance threshold and the work resumption threshold. If the absenteeism support strategy has a positive impact on the relation between the employer and the employees, it can also directly influence the health status of employees¹⁵.
- Precautionary measures aim directly at improving the health status of the employees by reforming the working conditions. Besides having a causal impact on the health status, working conditions can also exercise a conditional influence on the absence tolerance threshold¹⁶.

These different types of absenteeism measures are known to have a different impact on absenteeism. According to Philipsen (1969, as mentioned by Prins) absenteeism support instead of monitoring is related to a relatively short duration of absences. Smid (1991) even mentioned a positive relation between monitoring and absenteeism. He further mentioned several studies which demonstrated that precautionary measures influence absenteeism more than monitoring and absenteeism support.

This paper focuses on involuntary absence. Since monitoring of absent employees is only concerned with voluntary absenteeism, this type of absenteeism measures will not be considered here¹⁷.

figure 1: a micro-model of sickness absence behaviour



source: Prins (1990).

A firm model on involuntary absence measures

Bosch and te Brake (1995) investigate involuntary absenteeism from an employers' perspective. They identify four steps within the decision process of a firm whether or not to take measures reducing involuntary absence:

1. *Signalling of risks.* A first step is that the management of a firm realises for how many employees the work can be stressful, both physically and psychic. When management is not aware of this, it is unlikely that measures will be undertaken to reduce involuntary absence due to occupational causes.

¹⁵ A better atmosphere at work can reduce strains.

¹⁶ Geurts (1994).

¹⁷ The possible relevance of medical testing during the application procedure for involuntary absence will not be investigated.

2. Next, a firm has to *recognise* that it can exert influence on the level of involuntary absence.
3. When a firm recognises the connection between working conditions and involuntary absenteeism, it can decide to *plan and implement measures* to improve these working conditions. A distinction can be made between absenteeism support and precautionary measures.
4. The final step comprises the *evaluation* of the measures that have been carried out: has the involuntary absenteeism diminished, and are adaptations of the measures necessary?

A positive relation between signalling and recognition is hypothesised. The higher the proportion of employees for whom the firm assesses the work can be stressful, the higher the probability the firm will be aware of the connection between working conditions and involuntary absenteeism. This connection is not always made. Prins (1990) has held an inquiry amongst personnel managers and physicians at Dutch, German and Belgian firms with 300 up to 1700 employees. He concluded that most companies think that the working conditions (for example physical and mental stress) are the main cause for involuntary absence. Versloot, van de Pol and Rozeman however mention a study according to which only 10% of all interviewed general and personnel managers thought that stress would cause absenteeism. According to this study, the majority of the managers don't see a connection between working conditions and involuntary absenteeism. No mention is made of the average firm size, but it seems likely that it mainly concerned SME enterprises¹⁸. This suggests the existence of a sizeclass-effect regarding the recognition of a firm's influence.

In this paper the firm model on involuntary absence measures¹⁹ will be augmented to include amongst others the firm size as an exogenous variable. This augmented model will be empirically tested.

Risk Inventory and Evaluation.

Since 1994 Dutch companies are obliged to pursue a programme on working conditions. This obligatory programme is known as the RI&E: Risk Inventory and Evaluation. The RI&E contains a large part of the firm model on involuntary absence measures. According to the RI&E-programme Dutch firms must make an inventory of the occupational risks for it's employees²⁰ (signalling), and draw up a programme on working conditions to reduce these risks (planning and implementation). After a while these programmes must be evaluated (evaluation). Compared with the firm model on involuntary absence measures only the recognition of the firm's influence is lacking; this cannot be imposed by legislation.

The aim of the RI&E is to stimulate firms to undertake measures to reduce the involuntary absence. So far it appears however that the RI&E is mainly carried out as a written exercise²¹. It is hypothesised that without recognition of the firm's influence, RI&E will have no impact on the involuntary absence.

3. Data

Inquiry setup

In order to empirically investigate the firm model on involuntary absence measures for SMEs an inquiry has been held among 900 Dutch firms with less than 200 employees. Firms from 6 different sectors have been approached (industry, construction, trade and catering, transport, financial and business services and other services), and a stratification has been made into 5 size classes (1-9 employees, 10-19, 20-49, 50-99 and

¹⁸ No stratification according to size class is mentioned. If indeed no stratification has been applied, most firms are SME's.

¹⁹ The label 'firm model of involuntary absence measures' is not by Bosch and te Brake, but by the author.

²⁰ This inventory must be made in co-operation with an independent institution. Emphasis is put on the physical risks, but psychic risks can also be part of this inventory.

²¹ Bosch en de Kok (1997).

100-199). The responding firms are in general proportionally divided over both sector and sizeclass²².

An important goal of the inquiry is to establish whether or not firms have taken measures to reduce involuntary absenteeism. In reality many different measures can be taken, which makes it difficult to ask for specific measures. Therefore only a distinction is made between precautionary measures and absenteeism support. The design of the inquiry makes it impossible to gather detailed information on the level of absenteeism within individual firms. Only a general indication of the total days lost due to both voluntary and involuntary absence is asked, by letting the respondent choose between 6 categories of absence levels.

Regarding the signalling of risks, firms were asked to estimate the number of employees whose work was considered stressful. A distinction was made between stress resulting from physical working conditions and resulting from psychic working conditions. Questions were asked concerning the general attention within the firm for work- and health-related topics, and the extent to which a firm made use of external organizations in the field of work- and health-related topics. Finally, several general characteristics of the firm were noted: the number of employees, the financial position, whether the firm falls under a collective labor agreement, whether the firm is a subsidiary of a larger organization and whether the firm is a member of a sectoral organization²³.

From the 900 firms that were approached, 609 reacted. From these 609 firms 27 turned out to have more than 200 employees, and were excluded from further analysis.

Inquiry results

Almost two out of every three firms claim their absence rate is below 5% (see table 1). A positive relation exists between the absence rate and the proportion of workers for whom the physical working conditions are considered to be stressful. In the case of the psychic working conditions no direct relation is found.

table 1: absence rates

absence (% days lost)	firms (%)
0-1	29
2-4	34
5-6	16
7-8	12
9-10	6
>=11	4

In table 2 results are presented for different sizeclasses. It is clear that some sizeclass effect is present. But it is also clear that recognition of the firm's influence (acknowledging that a connection exists between working conditions and absenteeism) is not a necessary condition for taking precautionary measures. This might be explained by the obligatory status of many precautionary measures (for example, wearing safety helmets on construction sites). Another explanation could be that many firms think no connection exists between current working conditions and current absenteeism, because of precautionary measures taken in the past.

12% of all firms claim that less than 5% of their employees have physically and/or psychic stressful working conditions. From these firms 26% have taken precautionary measures. 44% of all firms state that both physically and psychic more than 5% of their employees have stressful working conditions. From these firms, 60% have taken precautionary measures.

²² The sector 'other services' is an exception, since only 8% of all responding firms belong to this sector.

²³ The inquiry was done by telephone, and consisted of 69 questions. The original (Dutch) inquiry can be found in Bosch and de Kok (1997).

table 2: inquiry results by sizeclass

	1-9 empl.	10-99 empl.	100-199 empl	total
physically stressful working conditions ^a	21%	43%	48%	41%
psychic stressful working conditions ^a	23%	23%	28%	24%
connection between working conditions and absenteeism acknowledged ^b	9%	29%	57%	45%
absenteeism support in operation ^b	92%	96%	100%	96%
precautionary measures taken ^b	29%	53%	74%	52%

^a % of employees

^b % of firms

4. The model

In this section the firm model on involuntary absence measures will be augmented with several variables. Most of the variables of this augmented model are latent. A convenient method to formulate a model based on latent variables is the structural equations modelling approach. This implies that the model to be estimated will consist of two parts: a measurement model and a structural equations model. The measurement model deals with the measurement of the latent variables, based on several indicator variables. The structural equations model represents the causal relations between the latent variables. Both models will be discussed simultaneously.

Firstly the four steps of the firm model on involuntary absence measures will be operationalised²⁴. The first step is exogenous to the model, the following steps are endogenous. After that several variables will be discussed that are hypothesised to be relevant to this model. These include both endogenous and exogenous variables. At the end of this section figure 2 will show all the endogenous variables and the hypothesised relations between them.

The four steps of the firm model on involuntary absence measures

signalling of risks

Firms were asked for how many employees they estimated the working conditions to be stressful, both physically and psychic. Since no objective measure is available to assess for how many employees the work is in fact stressful, it is not possible to investigate to what extent firms estimate this accurately²⁵. This step will therefore be treated as exogenous to the model. Both variables (signalling physical stress and signalling psychic stress) will enter the model separately.

recognition of the firm's influence

Signalling of risks will have a positive impact on the recognition of a firm's influence. To establish the level of recognition firms were asked whether they thought a connection existed between the workload and absenteeism. Besides that it was asked whether physical or psychic complaints had been made more than once, and if so whether these complaints are work-related according to the firm.

planning and implementation of measures

The third step is defined by two latent variables: the planning and implementation of absenteeism support and the planning and implementation of precautionary measures. The level of absenteeism support was assessed by asking whether a firm was engaged in absenteeism support, whether absenteeism support had intensified during the last year and whether sick employees were questioned if their absence was related to the working conditions. This last indicator is based on the assumption that this question is mainly asked to set the employee at ease (and not to modify the working conditions).

²⁴ Theoretically, a fifth step could be introduced. Analogous to Prins' model this model should begin with the 'risk status' of a firm: the extent to which the working conditions influence the health status of the individual employees. It was however not feasible to objectively measure the risk status for all of the interviewed firms.

²⁵ Because of this, the relation between firm size and the proportion of workers for whom the working conditions are considered stressful will also not be investigated.

Two indicators are used to establish the level of precautionary measures. Firstly, firms were questioned whether they had actually taken precautionary measures. Besides that they were asked about plans to take precautionary actions that had not been executed.

Absenteeism support is in general more easy and less expensive to apply than taking precautionary measures (Versloot, van de Pol and Rozeman, 1997b). Therefore it can be expected that absenteeism support will be applied more often than precautionary measures. This is confirmed by the results of the inquiry. Also, absenteeism support primarily aims at reducing voluntary absenteeism. Because of this it is not clear how important the recognition of a firm's influence is in explaining absenteeism support. It is possible that a higher amount of risk signalling will increase the level of absenteeism support directly.

evaluation

A complete evaluation comprises both a judgement of the effectiveness of the measures that have been taken, and adjustments of the foregoing steps of the model. Only the first part of the evaluation process is present in the model that is discussed here. To establish the level of evaluation it was asked whether in general extra attention had been paid to work- and health-related topics, and if so if this extra attention had sorted any effects regarding the absenteeism. Firms also had to answer whether absenteeism support had been of influence on the absence levels. Apart from these indicators firms were questioned whether they thought precautionary measures had been of influence on the absence levels. This question could not be used as an indicator for evaluation, because of its almost perfect correlation with several other indicators.

If a firm recognises the connection between working conditions and absenteeism, it is likely to be able to plan and implement more effective measures. If this is so, a direct impact of the recognition of a firm's influence on the evaluation can exist.

Other variables

RI&E

In the Netherlands the RI&E programme is compulsory since 1994. It is questionable whether the RI&E will sort the desired effects if a firm does not recognise it's influence. Within the firm model on involuntary absence measures attention is focused on the firm's attitude towards the RI&E. It is hypothesised that the recognition of the influence a firm can exert on the involuntary absence level will have a positive effect on the attitude towards the RI&E. A better attitude will in turn have a positive impact on the precautionary measures.

The measurement of the attitude towards the RI&E is dependent on the timing of the inquiry. Early 1995 the RI&E was already obligatory, but only 56% of all enterprises in the survey were aware of this. It is assumed that firms with a more positive attitude towards the RI&E are more likely to be aware of it's legal status, and more likely to have fully conducted the RI&E-programme. Given these assumptions three indicators are used to measure the attitude towards the RI&E. First, firms were asked whether they deemed an RI&E-programme to be important regarding the absence levels. Next, they were questioned if they thought the RI&E was obligatory for their company. Finally it was inquired if they had conducted an RI&E.

attention

An important catalyst for the recognition of a firm's influence is probably the attention that exists within a firm for work- and health-related topics in general. It is hypothesised that if more risks are signalled the attention will be higher, and a higher level of attention will prompt the recognition of a firm's influence. In order to measure the level of attention firms were asked whether they paid none, little, normal or much attention to work- and health-related topics. It was also questioned if a formal programme on working conditions existed.

Attention alone is no guarantee for the recognition of the firm's influence. Only if this attention is structured by forming social-medical teams or committees on safety and health, or by appealing to external expertise, is such an impact likely to occur. Hence it is hypothesised that attention will only indirectly have an impact on the recognition of the firm's influence, by way of the availability of internal and external expertise.

internal expertise

Internal expertise represents the importance that firms attach to the availability of internal expertise²⁶. It is measured by two indicators. The first one is based on a question who within the company were involved in work- and health-related topics. Bases on the answers, three levels of importance were constructed. A high level of importance stands for internally available experts on work- and health-related topics, the existence of a social-medical team or an occupational health and safety service. If these are not present but management, personnel department and/or employees council are involved in work- and health-related topics, a normal level of importance is assumed. In all other cases a low level of importance is assigned. To construct the second indicator firms were asked who were internally involved in the RI&E and/or absenteeism support. The same classification scheme was used to construct three levels of importance.

external expertise

The inquiry included questions whether firms were joined with an independent occupational health and safety service, and whether specific external expertise was invoked concerning absenteeism support and RI&E. These questions are used as indicators for the importance firms attach to the availability of external expertise.

Absenteeism support mainly concerns voluntary absenteeism. It is possible that internal and external expertise have a direct impact on absenteeism support, without the recognition of a firm's influence on the level of involuntary absence.

The attitude towards the RI&E-programme can also be influenced by the internal and external expertise. This is partially due to the indicators used to measure the RI&E-variable: a firm's knowledge about the obligatory status of the RI&E and whether an RI&E has been conducted.

usefulness

Two out of every three firms in the survey have reported to be joined with an independent occupational health and safety service. Only 66% of these firms thought that this joining had an impact on the level of absenteeism, and only 56% thought that the financial benefits outweighed the costs. The supposed usefulness of joining with an independent service probably depends on whether the measures that are taken to reduce the absence level are effective. It can be expected that the effectiveness of measures undertaken to reduce involuntary absenteeism has an impact on the assumed usefulness. Therefore, usefulness is also included in the model. The level of usefulness is measured by the questions whether the joining has an impact on the level of absenteeism and whether the financial benefits outweighs the costs.

Figure 2 pictures the variables that have been discussed so far, and the hypothesised relations between them. For convenience the variables representing the signalling of physical and psychic risks are combined, just as internal and external expertise.

Exogenous variables

So far, only two exogenous variables have been discussed: the signalling of physical and psychic health. Nine other exogenous variables are included in the model²⁷.

- firm size.
- CLA: whether a firm comes under a collective labor agreement.
- financial: a judgement of the firm's own financial position.
- subsidiary: whether the firm is a subsidiary of a larger organization.

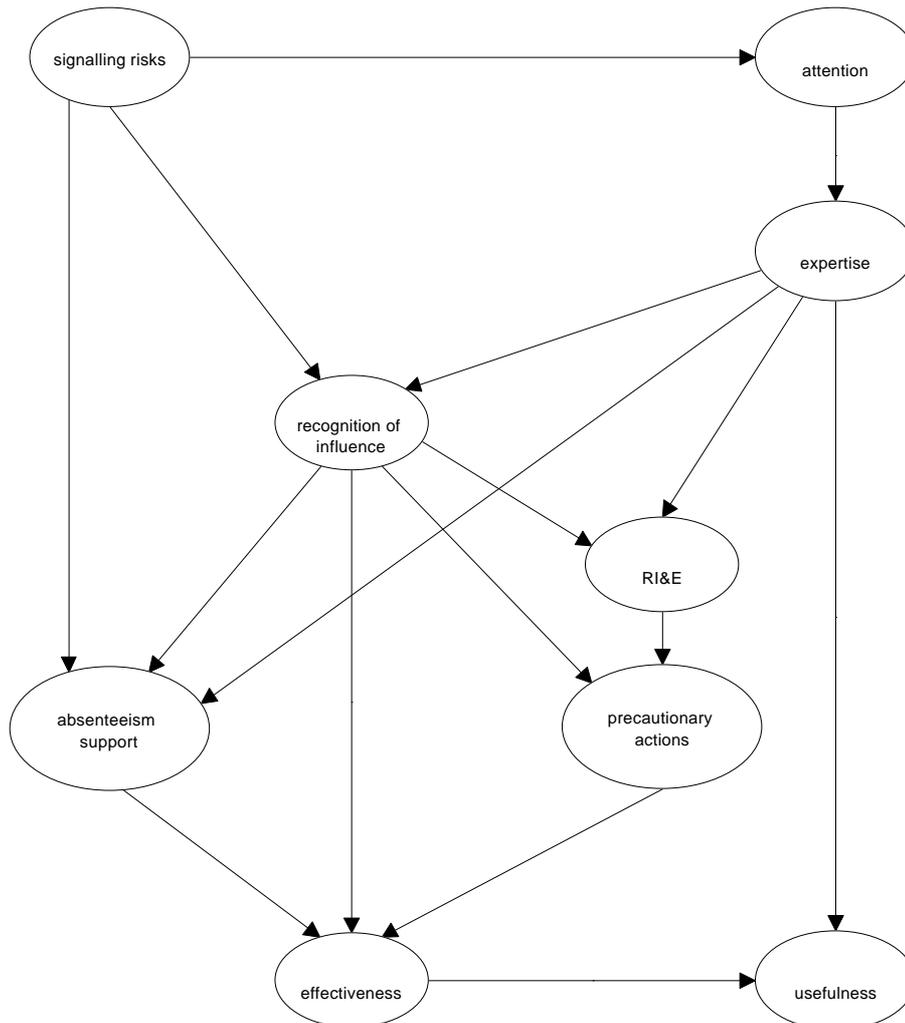
²⁶ It was not possible to measure the competence of the available internal and external expertise.

²⁷ None of the exogenous variables are latent.

- sector: whether the firm is joined with a sectoral organization.
- EC: whether a firm as an employees council.
- DP: whether discussions of progress are regularly (at least once a month) held.
- services, transport: two sector dummies, which can be relevant for all endogenous variables²⁸.

A priori some ideas on the relations of these exogenous variables regarding the firm model on involuntary absence measures existed. These were however not well grounded. Therefore no specific hypotheses are formulated: all possible relations will be estimated.

figure 2: a firm model on involuntary absence measures



^a 'signalling risks' stands for two variables: signalling physical stress and signalling psychic stress.

^b 'expertise' stands for two variables: internal expertise and external expertise.

^c the arrows indicate hypothesised causal relations.

^d except 'signalling risks', all variables depicted in this figure are latent and endogenous.

5. Analysis

Since all the exogenous variables are directly measurable, no exogenous measurement model has to be estimated. The endogenous measurement model and structural equations model have been estimated using LISREL 7. The main results of this

²⁸ A model has been estimated with dummies for all sectors; only the services and transport dummies had any impact.

estimation will be dealt with in the next section; central to this section is the estimation procedure itself.

The method of estimation

analysis of the correlation structure

Within LISREL both the covariances and the correlations between the indicators can be used to base the calculations upon. The use of correlations is recommended if the indicators have an arbitrary scale. Since most indicators are nominal or ordinal, correlations have been used.

maximum likelihood

Because most indicators are nominal or ordinal, the standard Pearson correlations should not be used. Instead, polychoric correlations can be calculated. To calculate these correlations, it is assumed that each indicator is in itself an indicator for a multnormally distributed latent variable. The polychoric correlations are the correlations between these underlying latent variables²⁹. For obtaining consistent estimation results it is necessary to estimate the model by weighted least squares, the weights being determined by the covariances between the polychoric correlations. At least 1500 observations are necessary to calculate these weights for the model under investigation³⁰. Since somewhat less than 600 valid observations are available, no WLS estimation is possible. Instead, a maximum likelihood estimation procedure is used. One of the implications is that the estimated t-values are not (asymptotically) consistent.

biased parameter estimates

Because of the relatively small survey sample the polychoric correlation matrix is not positive definite. To estimate the model a ridge constant has to be used³¹. A ridge constant of 1 is needed to create a positive definite correlation matrix. The consequence of using a ridge constant is that the parameter estimates are no longer unbiased, but the mean squared error will become smaller.

The selection of the final model

selection based on t-statistics and chi-squared values

As a starting-point the complete model as discussed in the previous section has been estimated. This model contains many parameters, especially regarding the relations between the exogenous and the endogenous results: all 90 possible relations are included, emphasising the explorative nature of this model. Next the estimated t-statistics and chi-squared values have been used to reduce the number of parameters. The t-statistics are not consistently estimated. It is therefore not correct to state that a parameter is insignificant at a 95% level if the t-statistic is less than 1.96. It appears that for this model the t-statistics are underestimated when a ridge constant is used³². Based on this notion it was decided to drop a relation from the model if the t-statistic was smaller than 0.5, and to accept it in the model if it was at least 2. For estimated t-values within the range 0.5 - 2 (a small minority) the chi-square statistic was used³³.

²⁹ Jöreskog and Sörbom, p.192.

³⁰ Asymptotic variances and covariances of estimated correlations are not computed unless the listwise sample size is at least $1.5k(k+1)$, with k the number of indicators. With 31 indicators this results in 1488 observations; see Jöreskog and Sörbom (1986), pp.2-8.

³¹ A constant that is added up to the diagonal of the polychoric correlation matrix. This ridge constant is automatically calculated by LISREL 7.

³² A simplified version of the model has been estimated, for which the addition of a ridge constant was not necessary. Next, this model was re-estimated using a ridge constant of 1. A comparison of the estimated t-statistics resulted in this crude rule-of-thumb.

³³ The chi-square statistic is normally used to assess the overall fit of the model. However, this statistic only has a chi-square distribution if the estimations are based on a covariance matrix. The estimations of this model are based on a correlation matrix, so the chi-square value cannot be used to assess the overall model fit. Changes in the chi-square statistic due to nested changes in the parameters to be estimated still have a chi-squared distribution. It is thus possible to test whether the model fit changes significantly if several parameters are left out.

a two-step selection procedure

Based on these selection criteria, the final model has been selected in two steps. The first step was focused on the specification of the endogenous measurement model. Confirmative factor analyses have been conducted, resulting in the indicators as presented in the previous section.

In the second step the complete structural equations model has been estimated. The discriminant validity of the latent variables has been checked by examining the correlations between them. A correlation of .94 was found between internal expertise and RI&E; none of the other correlations exceeded .85. The high correlation between internal expertise and RI&E is consistent with the theory as described in this paper: apparently the importance that firms attach to the availability of internal expertise has a very strong impact on the attitude towards the RI&E. Therefore no latent variables have been removed from the model.

The overall model fit can be characterised by several statistics; the three most commonly used are reported in table 3. According to these statistics, the final model is not rejected.

table 3: goodness of fit statistics

Statistic	value
standardised RMR (root mean squared residual)	0.036
GFI (goodness of fit index)	0.95
AFGI (adjusted goodness of fit index)	0.93

Robustness of the estimations

The results appear to be quite robust, despite the use of polychoric correlations, the inconsistent estimation of the t-statistics³⁴ and the biasedness of the parameter estimates. This can be concluded from several examinations.

First, a simple model was tested consisting of only the 4 steps (6 variables) from the model by Bosch and te Brake (1995). No ridge constant was needed to estimate this model. The four-step model was not rejected, which is consistent with the results from the final model. Next, this model has been re-estimated using a ridge constant of 1. This had a clear impact on the parameter estimates³⁵, but the rank order remained the same. Also, in both estimations the same parameters had high and low t-values. Apparently, the addition of the ridge constant does not alter the conclusions on which parameters don't matter and which parameters matter the most.

Secondly, an extra latent variable was added to the model, which was supposed not to be related to the other variables. This variable represented the monitoring of sick employees. The inclusion of this variable didn't alter the results of the model much. The relations that were selected in the model without monitoring were also present in the model with monitoring. Monitoring itself was only related to evaluation (the correlation between these two latent variables was 0.94). This might be explained by assuming that evaluation in effect measures the assumed effectiveness of measures to reduce *voluntary* absenteeism. This point will be elaborated in the next section.

6. The estimation results

The estimation results that are presented here are standardised³⁶. For the estimation results between the endogenous variables this implies that a higher parameter estimate represents a stronger relationship. For the relations between the exogenous and the endogenous model variables, and for the endogenous measurement model the interpretation of the results is more complicated. Most indicators for the exogenous variables are binary, and the standardisation makes the interpretation difficult: it is not clear how much for example the variable 'sector' will increase if a firm decides to become member of a sectoral organization. Also, it is not likely that becoming a member

³⁴ Due to the maximum-likelihood procedure.

³⁵ The largest relative change being a reduction in a parameter estimate from 0.27 to 0.11.

³⁶ Both the indicators and latent variables have been transformed into variables with a mean value of zero and a variance of one.

of a sectoral organization will increase the standardised variable 'sector' in the same amount as installing an employee counsel will raise the value of the standardised variable 'EC'. Conclusions based on the relations between the standardised model variables are therefore hard to translate in terms of the underlying indicator variables.

The endogenous measurement model

The standardised parameter estimates of the endogenous measurement model are presented in table 4. In the first column the latent variable is indicated and the second column contains all the indicator variables. In the third column the number of possible answers for each indicator is reported, and whether the variable is binary (bin), nominal (nom) or ordinal (ord).

table 4: endogenous measurement model

latent variable	indicator	measure- ment level	parameter estimate ^a	R ² ^b
attention	• attention for work- and health-related topics	ord(4)	0.54	0.15
	• programme on working conditions present	ord(3)	0.74	0.28
internal expertise	• internal expertise on work- and health-related topics	ord(3)	0.50	0.19
	• internal expertise on absenteeism support and/or RI&E	ord(3)	0.61	0.14
external expertise	• joined with occupational health and safety service	bin	0.79	0.31
	• external expertise invoked concerning absenteeism support and /or RI&E	bin	0.70	0.24
recognition of influence	• relation between physical complaints and working conditions	ord(3)	0.77	0.30
	• relation between psychic complaints and working conditions	ord(3)	0.57	0.17
	• relation between working conditions and absenteeism	bin	0.81	0.33
RI&E	• risk inventory conducted	bin	0.58	0.16
	• knowledge of obligatory status of RI&E	bin	0.71	0.25
	• RI&E important for reducing absence levels	bin	0.66	0.21
absenteeism support	• performing absenteeism support	bin	0.84	0.36
	• absenteeism support intensified	bin	0.89	0.39
	• asking whether working conditions are cause of absence	ord(3)	0.53	0.14
precautionary measures	• precautionary measures taken	bin	1.10	0.60
	• plans for precautionary measures exist	ord(3)	0.91	0.41
evaluation	• extra attention for work- and health-related topics is effective	bin	0.80	0.32
	• absenteeism support is effective	bin	0.93	0.42
useful	• financial benefits of joining occupational health and safety service exceed the costs	bin	0.93	0.43
	• joining occupational health and safety service has impact on absence levels	bin	0.85	0.36

^a no t-statistics are reported, since these are estimated inconsistently. Also no t-statistics regarding the structural equations model will be mentioned.

^b the adjusted R² is presented.

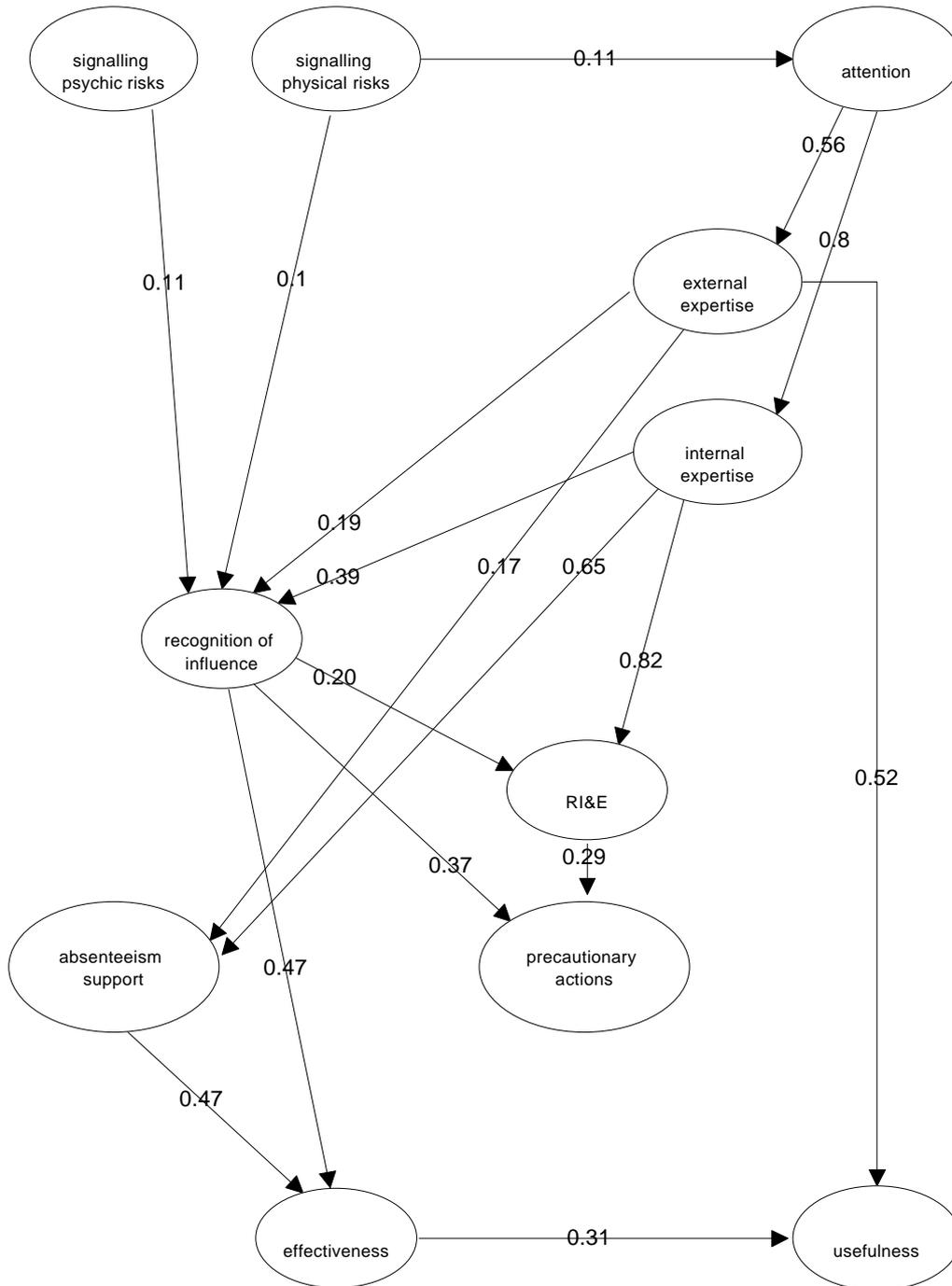
The structural equations model

The main estimation results are presented in figure 3 and table 5. Figure 3 represents the hypothesised relations between the endogenous variables (and the signalling of risks) that are supported by the data. In table 5 the relations between the exogenous and endogenous variables are shown.

From figure 3 it is clear that the results are in principle in accordance with the firm model on involuntary absence measures. The signalling of risks has an impact on the recognition of a firm's influence, which in it's turn influences the planning and implementation of precautionary measures. Finally, the evaluation process depends directly and indirectly on all the foregoing steps.

In the remainder of this section the estimated relations will be dealt with more specifically.

figure 3: the estimated relations between the endogenous variables and the signalling of risks



^a no t-statistics are reported, since these are estimated inconsistently.

^b the reported parameter estimates depict relations between the standardised variables.

recognition of the firm's influence

According to figure 3 the recognition of the connection between working conditions and absenteeism plays a central role in the firm model on involuntary absence measures. The recognition of a firm's influence is an important link between the planning and implementation of precautionary measures on the one hand and the following variables on the other hand:

- The assumed proportion of employees for whom the physical working conditions are stressful.
- The assumed proportion of employees for whom the psychic working conditions are stressful.
- The internal expertise.
- The external expertise.

The influence on precautionary measures is both direct and indirect, since it has a positive influence on the firm's attitude towards the RI&E. A more positive attitude towards the RI&E has a stimulating effect on precautionary actions. The hypothesised relation between recognition and absenteeism support is not supported by the data. Larger firms are more likely to see a connection between working conditions and absenteeism than small firms, all things being equal. Also being a subsidiary of a larger organization has a positive impact on the recognition³⁷.

attention

The attention for work- and health-related topics is partially determined by the assumed work load. As a larger part of the work force is thought to have physically stressful working conditions, more attention to these subjects is being paid. No relation has however been found between psychic working conditions and attention. The level of attention depends furthermore on several exogenous variables. Larger firms and firms that are a subsidiary of a larger organization pay more attention to work- and health-related topics than smaller and independent firms. Also, the presence of an employees council and discussions of progress have a positive impact on the attention. Finally, collective labor agreements are associated with more attention.

From figure 3 it is clear that even if a firm doesn't recognise its influence on the involuntary absence level, paying attention to work- and health-related topics can still result in precautionary measures and absenteeism support being planned and implemented.

table 5: the estimated relations between exogenous and endogenous variables.

	firm size	CLA	financial	sub-sidiary	sector	EC	DP	services	trade
attention	0.29 ^b	0.26 ^b		0.15 ^b		0.40 ^b	0.20 ^b		
int. expertise									
ext. expertise					0.11				
recognition	0.14 ^b			0.15 ^b					
RI&E					0.15 ^b				
absenteeism support									0.08
precautionary measures								-0.10 ^b	
evaluation				0.09	0.15 ^b				
usefulness									

^a no t-statistics are reported, since these are estimated inconsistently. All the parameter estimates that are presented have a t-statistic larger than 1.

^b t-statistic > 2.

expertise

Attention for work- and health-related topics can result in the need for internal and external expertise on these subjects. If the internal expertise is considered to be important and/or external expertise is appealed to, this will have a positive impact on the following variables:

- Recognition of a firm's influence.
- Absenteeism support.
- RI&E. Only the internal expertise has a direct effect on the RI&E. The impact of the external expertise is indirect, by influencing the recognition.
- Usefulness. Not surprisingly, the availability of external expertise has a positive effect on the assumed usefulness of joining with an independent occupational health and safety service. The internal expertise has an impact on absenteeism

³⁷ There is no strong correlation between firm size and being part of a larger organization.

support, which in its turn influences the evaluation and thus the usefulness. So, internal expertise indirectly exerts some influence on the assumed usefulness.

precautionary measures

The planning and implementation of precautionary measures depends on only two variables directly:

- The attitude towards the RI&E.
- The recognition of a firm's influence.

This illustrates the importance of the attitude towards the RI&E-programme regarding the planning and implementation of precautionary measures. Also a sectoral effect exists: firms from service sectors are less inclined to take precautionary measures, other things being equal.

absenteeism support

Absenteeism support depends on less variables than was expected. The signalling of psychic risks and the recognition of a firm's influence have no influence whatsoever on absenteeism support, and the signalling of physical risks only indirectly. The external and especially the internal expertise are the only variables that directly exert influence on the absenteeism support. Only one exogenous variable is related to absenteeism support: firms from the trade sector are more likely to conduct absenteeism support.

These results suggest that absenteeism support is almost completely directed towards voluntary absence.

evaluation

The evaluation of the absenteeism support and precautionary measures does depend on the absenteeism support, but not on the precautionary measures. This might imply that precautionary measures are less effective than absenteeism support; this contradicts the research mentioned in the first section. Another explanation is that firms don't notice the effects of precautionary measures. If precautionary measures only sort effect on the long term, this might not be noticed directly. The most likely explanation is however that the latent variable 'evaluation' is not measures accurately. In section 3 it was mentioned that no questions regarding the effectiveness of precautionary measures could be used as indicators. A question concerned with the effectiveness of absenteeism support is however used as an indicator. Apparently, the variable evaluation is really measuring the effectiveness of the absenteeism support.

The evaluation is also influenced by recognition: firms that recognise the connection between working conditions and absenteeism can plan and implement their measures more effectively. All things being equal, being a subsidiary of a larger organization and being member of a sectoral organization results in a higher evaluation-level.

firm size

Firm size has a direct impact on the attention for work- and health-related topics, and on the recognition of the firm's influence. The second step of the firm model on involuntary absence measures is clearly influenced by the number of employees. The relation between recognition of the firm's influence and the planning and implementation of precautionary measures does however not depend on the firm size.

7. Final remarks

According to previous research firms are able to influence the level of involuntary absenteeism. A firm model on involuntary absence measures has been developed and tested for SMEs. In this model four stages can be distinguished regarding the decision whether or not to take measures reducing involuntary absence: signalling of risks, recognition of a firm's influence on involuntary absenteeism, planning and implementing measures, and evaluation of those measures. This model is supported by the empirical analysis.

Smaller firms tend to take less precautionary measures. This firm size effect is limited to the second step of the firm model on involuntary absence measures. Smaller firms have less attention for work- and health-related topics. There is also a direct negative firm size effect on the recognition of the firm's influence. The relation between recognition of the firm's influence and the planning and implementation of precautionary measures does however not depend on the firm size.

Another conclusion is that monitoring and absenteeism support are considered not to be relevant for involuntary absenteeism: only precautionary measures are associated with involuntary absenteeism.

The conclusions of the empirical part of this paper cannot be generalised easily to other countries. According to Prins firms in different countries can have different sickness absence strategies³⁸. This can affect the parameter estimates. Also, the estimation procedure is not without difficulties. Although the results appear to be quite robust, the estimates are biased, and the model selection procedures can be improved upon. These problems can be tackled in future research, but it is unlikely that this will affect the main conclusions of this paper.

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³⁸ Prins (1990), p.187.