
**IMPACT OF ORGANIZATIONAL CHANGES AND RESULTING JOB STRESS ON
SOMATIZATION, BIOLOGY AND ABSENTEEISM**

Johnny R. J. Fontaine
Tamara Mascagni
Sarah Mangelschots
Katholieke Universiteit Leuven

France Kittel
Isabelle Godi
Université Libre de Bruxelles

Preface

The present project forms a direct continuation of the former DWTC/SSCT project on the relationships between work stressors and somatization and somatoform disorders in the framework of the program on “Protection of workers’ well-being 1999-2003”. Bringing together research and theorizing on work stress with research and theorizing on somatization and somatoform disorders, and demonstrating substantial relationships between the both, formed the innovation of the previous project. It had two main aims. First, demonstrating further the significant relationships between stress at work and somatization and somatoform disorders. Second, studying stress at work and subsequent somatization problems within the broader socio-economical context. More than ever before, organizations are pressured to reorganize, and cause thereby a lot of work stress. The initial ideas have resulted in a large-scale four-year research project with two research teams, one from the KULeuven under the direction of Prof. Dr. Fischler, and one from the ULB under the direction of Prof. Dr. Kittel.

Unfortunately, due to an early leave of members of the KULeuven, the project has gone through some difficult times, up to the point that the continuation and finishing of the project was in peril. During that time, the ULB-team has guaranteed the stability and continuation of the project. Later on, a new research team has been formed at the KULeuven, and has worked with enthusiasm in order to fulfill the promises of the project in close collaboration with the ULB-team.

The results from the present project further underline the importance of stressors at work for the psychosomatic well-being of employees. Moreover, by placing these phenomena in a broader socio-economical context, the responsibility of society at large becomes clearer, as well as the possible actions that can be taken by the government for prevention. The current report must be seen as a first integration of the broad range of findings from the present research project. In the near future, the valuable findings of the present project will be further elaborated and valorized by the two research teams.

Johnny R. J. Fontaine
Tamara Mascagni
Sarah Mangelschots
Katholieke Universiteit Leuven

France Kittel
Isabelle Godin
Université Libre de Bruxelles

I. Introduction

I.1. Context and general framework

During the last decades, working conditions and work environment have dramatically changed in most industrialized societies (Paoli, 1997, 2001). Economic structural and organizational changes have become more and more common, resulting in privatization, successive merging, downsizing, and even bankruptcies. Although the overall unemployment rate has remained relatively unchanged in the recent years in the European Region (International Labor Office, 2004), some economic sectors have particularly suffered from an increased unemployment rate. The structural and organizational changes have contributed to the phenomenon of 'casualisation of labor'. The present research project is situated against this context. It focuses on the increased levels of stress that are caused by these changes, and these have a negative impact on mental and physical well-being and lead to medical consumption and absenteeism among others.

I.2. Goals of the research

There were two overall aims behind the present project. One aim was to further develop the research on somatization (presence of medically unexplained somatic symptoms) or somatoform disorders (specific clusters of somatization symptoms, such as functional dyspepsia and irritable bowel syndrome) and stress. It is moreover supposed that stress is at least partially responsible for mental health problems. Mental health problems are highly prevalent in the general population and are associated with huge health care costs, high degrees of absenteeism, and with invalidity in the long run. A further development of this line of research was justified from both theoretical and societal perspectives, since it can contribute substantially to the early detection of job stress and its consequences on mental health. This can improve life quality of workers, and reduce health care costs by preventing health problems.

The second broad aim of the present project was to investigate how the major economical and organizational changes, such as merging, downsizing or privatization have an impact on the psychological and biological well-being of workers. Based on the stress literature, it is expected that these changes and related organizational instability lead to growing levels of job stress. Based on the preceding research, it is expected that these growing levels of job stress lead to growing levels of somatization, a whole range of health problems, and absenteeism.

These general aims have been translated into the four following specific aims: namely (1) to estimate the psychosocial health risks linked to objective and subjective working conditions in various companies in Belgium; (2) to create a preliminary data bank of the prevalence of somatization and/somatoform disorders in a population at work, relative to stressful working conditions; (3) to establish which particular psychosocial factors or dimensions are harmful for the individuals' mental health, taking into account interpersonal variability and various mediating variables; and (4) to study the "stress-health" issue in a dynamic and global perspective (in a prospective design).

II. Theoretical framework

II.1. General model

The present project is based on a general psycho-socio-biological model that sees the individual in relation to a particular socio-professional context and within a dynamic perspective. Within this model, *stressors* (both objective and subjective stressful working conditions) *mediated/moderated* by individual personality variables (neuroticism and alexithymia) and health behavior, can lead to *strain* (at the psychological [anxiety and depression] and somatoform level), and determine in the long run *stress outcomes* such as absenteeism and medical consumption.

For the objective stressors, the focus was on organizational change. Based upon a screening of the economic sectorial "instability", four companies were selected that differ gradually on this variable ranging from a very stable company (a hospital) to a very unstable company (from the tele communication sector).

The screening of the subjective stressors was based on the "Job-Demand-Control-Support" (JCD-S) model and the "Effort-Reward-Imbalance and Overcommitment" (ERI-O) model. According to the JCD-S model (Karasek 1979, 1985), high level of job demands (time pressure, work pace, deadlines), combined with a low level of job control (influence over own work, possibilities for learning new things or decision latitude) and low levels of social support can be considered as stressful working conditions. The ERI-O model (Siegrist 1990, 1997 and 1998) is complementary to the JCD-S model. In this model, chronic work-related stress is defined as non-reciprocity or imbalance between high efforts spent at work (extra hours, personal investment) and low rewards (esteem, promotion, respect, salary) received. Moreover, its effects are assumed to be strengthened by the work attitude of overcommitment or the inability to withdraw from work. Both stress models have demonstrated harmful effects of stress on physical and mental health (see for example Danna 1999, Van Der Doef 1998, and Godin et al., 2004).

Two personality traits were included as moderating variables, namely neuroticism and alexithymia. In the literature it is assumed that the extent to which people develop psychosomatic complaints in response to stressful working conditions depends on their personality characteristics. Especially people high in neuroticism and alexithymia are assumed to be particularly vulnerable to psychosomatic complaints. Moreover, it is assumed in the literature that especially neuroticism can cause spurious relationships between stressors and strains. It has been described as a general complaining factor, leading to both elevated scores on the subjective stressors and on the strain variables. Therefore, it is being advised in the literature to control for the levels of neuroticism when studying stressor-strain relationships (Brief et al., 1988; Payne, 1988; Mc Crae, 1990). Besides these personality traits, health behavior (tobacco smoking and alcohol consumption and dependence) was also included as a moderator variable.

Both more somatic and more psychological strains were studied in the present research. The somatic strains were functional dyspepsia and irritable bowel syndrome, two functional gastrointestinal disorders, and somatization and somatoform disorder, which focus on medically unexplained symptoms. The psychological strains were depression, anxiety, and chronic fatigue.

The stress outcomes of the present study were self-rated health, self-rated social impairment, medical consultation, psychotropic drug consumption, absenteeism, and presenteeism (working while feeling ill).

Besides the just described objective and subjective stressors, moderators and mediators, strains and stressor outcomes, which have been investigated throughout the whole study, each of the two research teams further elaborated the global model and studied additionally specific stressors and strains.

II.2. Specific focus of the KULeuven-team

The KULeuven team further elaborated on the subjective stressors and the strains. In addition to the JCD-S and the ERI-O model, the work stressors from the Leiden Quality of Work Questionnaire (LQWQ) and from the TRIPOD-model were included. Besides the JCD-S stressors, the LQWQ contains stressors from the Michigan model (van der Doef & Maes, 1999). Hereafter we will refer to these stressors as the LQWQ-model. While the JCD-S, the ERI-O, and the LQWQ-models focus on the job characteristics, the TRIPOD model focuses on organizational characteristics. The TRIPOD model was developed for identifying organizational characteristics that lead to an increased vulnerability for accidents at the work place (Wagenaar, Groeneweg, & Hudson, 1994). Recently, this model has been applied to stress research and offers an interesting new approach to work stressors (e.g. Akerboom & Maes, 2003).

Moreover, the psychological approach to measure somatization, which was used throughout the whole study, was complemented by the KULeuven-team by a psychiatric approach, which is better suited to arrive at

diagnostic decisions. The Specialist Patient Health Questionnaire (SPEC-PHQ), which is a self-report version of the PRIME-MD for diagnosing somatoform disorder (Spitzer, Kroenke, & Williams, 1999) was relied upon.

II.3. Specific focus of the ULB-team

The ULB-team focused on different subjective stressors and mediator variables. With respect to the subjective stressors, they focused on bullying, pressures from clients/patients and the interaction of stressors inside and outside the workplace (stressors outside work, social support outside work, and work-home interference). With respect to the mediator variables, they also took into account physical activity and coping.

III. Methodology

III.1. Sample

III.1.1. Selection of the organizations

We first build a contextual variable relying upon an index of economic sectorial "instability" of employment. Economic sectorial data available on employment and unemployment are used to compute this index. The purpose of this index is the production of an instrument easy to elaborate and to manipulate. This index guided the enterprises' selection to be included in the study.

The stability index was computed from two routine sources published on a regular base in Belgium: employment trends and unemployment trends, by economic activity branch (Office National de Sécurité Sociale) (Office National de l'Emploi, Stat Info.). A decrease in employment time trend along with an increase in unemployment is distinctive of an unstable economic sector. The combination of the two trends is at the base of the index construction. Details of this index construction were published in 2002 (Godin et al., 2002).

The categorization of the economic sectors from this index indicate for instance that health and education sectors could be classified as "stable", while construction, metallurgy, clothing industry appear clearly as "unstable" sectors. Services and administration occupy an intermediate position.

According to this index, four firms were selected: one stable (health sector), one unstable (telecommunication company) and two in an intermediate position (services).

The plan was to work with a multimethod approach, where self-reports, which are commonly used in stress research, are complemented by information from the organization (key informants), and by biological diagnosis and follow-up.

III.1.2. Key informants

Key informants were selected according to their function in the firm: heads of different departments, company's doctor, labor unions delegates, human resources...

Each respondent was supposed to be seen twice, in a one-year interval, corresponding to the two moments of measurement.

The practical organization (telephonic contacts to explain the aim and to obtain an appointment for an interview) as well as the interviews themselves and their re-transcription and analysis were performed by the ULB-team.

Table 1. Number of interviews with key informants in each firm

Firm	T1 (1 st measure)	T2 (2 nd measure)	Total
1	15	14	29
2	10	8	18
3	11	8	19
4	15	9	24
Total	51	35	90

III.1.3. Employees

The preparatory phase, done by the ULB-team, consisted of the construction of the databases of the participants. The initial database contained a list of all the workers in the firm together with some background information: name, address, age, sex, date of entry in the firm, level of occupation, and department. A second list was then made by anonymising this list and adding an identification number in order to guarantee confidentiality, but allowing follow-up.

All correspondence was provided with the logo of both universities. The name of the study ‘Somstress’ was created by the ULB in order to give some identification of the project to the workers. Both the KULeuven and the ULB-team were each responsible for administering this questionnaire to workers from two companies. The KULeuven was responsible for the most unstable and one intermediate company, and the ULB was responsible for the most stable and one intermediate company. A Dutch and a French version of the questionnaire has been made, since there were both Dutch and French speaking employees in all four companies. Each selected employee received the questionnaire in his or her own language by post, together with an explanatory letter and a return-envelop. An identification code was put on each questionnaire. Because of the prospective part of the study, it was not possible to collect the data anonymously. However, total confidentiality, especially with regard to the company, was guaranteed. Employees that did not respond in time were reminded by mail.

In 2000 – 2001 (first measure), 9634 workers were contacted in the 4 firms. Among them, 3803 answered to the questionnaire (global participation rate 40%). For the second measure, 2709 workers answered the questionnaire (global participation rate 37%). Participation to the two measures is provided in the next table:

Table 2 : Participation to the 2 measures (N)

Firm	Participated to measure 1 or measure 2	Participated to measure 1 only	Participated to measure 2 only	Participated to the two measures	1 st measure	2 nd measure
1	1340	458	333	549	1007	882
2	1046	340	225	481	821	706
3	657	204	161	292	496	453
4	1479	815	*	665	1479	665
total	4522	1817	720	1986	3803	2709

* In this enterprise, for the second measure, questionnaires were sent to the participants of the first measure only.

In order to see if there were some differences between workers who participated to the two measures and the ones who participated to the first measure only, we compared the socio-demographic characteristics of the respondents: mean age, gender, education, type of contract, marital status, as well as the subjective reported health status. We compared the subjective health status because reasons why people participated to the first measure only, could be due to sick leave at the second measure. Those indicators did not differ significantly.

III.2. Questionnaires

III.2.1. Key informants

The methods used for the data collection are semi-structured interviews with key informants in the 4 different firms.

The ULB-research team has conducted interviews with key informants in each firm (more than ten per firm) at each measurement time. The purpose was to investigate the working conditions, and more precisely, to assess the possible sources of stress as well as their potential differences among departments or functions. Data obtained by this information source is and will be further compared both with the firm's instability indicator developed at the beginning of the project and with self-reports of the workers (questionnaires).

We made up a questionnaire from three analysis grids and added some questions particular to our topic of interest. Those three basic documents were the "Vade Mecum du Conseil d'Entreprise" edited by a trade union (1), the "Canevas de prédiagnostic du stress en entreprise" done by our colleagues of the ULB and the UCL (2) and "Technologiediffusie in Vlaanderen" (Vlaams Technologie Observatorium, 1997).

Questions concerned productivity evolution, firm's stability, structural changes (at present and/or foreseen for the future), concurrence threat, market position, global stress assessment and possible stress induced by work insecurity, quality of information, rumors and workers' complaints.

Interviews were analyzed by qualitative methods. All interviews were retranscribed. Analysis grids were built according to the content of each investigated topic, for each enterprise separately. Distinct analyses were

performed for each measure, followed by the evolution analysis between the two measurements, globally and for each enterprise.

III.2.2. Employees

III.2.2.1. Truncus Communis

The self-administered questionnaire was constructed jointly by the KULeuven- and the ULB-team, consisting of items and scales referring to the following independent, intermediate and dependent variables:

Independent variables:

- Some *socio-demographic* variables such as age, gender, marital status, nationality, etc., as well as some *socio-professional* variables such as status within the company, contract type, etc.
- *Subjective experienced job stress* was measured by using items from several other questionnaires, combining two different job stress models. Thirty-six items are taken from the Job Content Questionnaire (JCQ; Karasek, 1985) and the Leiden Quality of Work Questionnaire (LQWQ; Maes et al., 1993). These items allow us to measure the situation of the employees on the three dimensions of the Job Demand-Control-Support-model (Karasek, 1979; Johnson et al., 1988). Three other items constitute the accessory Global Economy-dimension from Karasek. Subscales of the Karasek-model are: Psychological job demands, Physical exertion, Job control, Skill discretion, Decision authority, Skill utilization, Social support from colleagues, Social support from supervisor, Job insecurity, Job satisfaction, Global economy. Twenty-one items of the Effort-Reward-Imbalance-model (Siegrist et al., 1998) allow us to measure the dimensions Extrinsic and Intrinsic Effort, Extrinsic Reward and Work-related overcommitment

Intermediate variables:

- Two personality dimensions, proven to play a part in the development and evolution of psychological disorders as well as of somatization and somatoform disorders, were included, namely *neuroticism* and *alexithymia*. Therefore, the neuroticism dimension of the NEO-Five Factor Inventory (NEO-FFI; Costa et al., 1992) (12 items) and the subscale 'difficulty identifying feelings' of the Toronto Alexithymia Scale (TAS-20; Bagby et al., 1993) (7 items) were chosen.
- *Health behavior* was measured using three items questioning tobacco consumption and six items questioning alcohol use.

Dependent variables:

- *Somatization* concerns the number of medically unexplainable physical complaints experienced by a person. The somatization subscale of the Symptom Checklist 90-R (SCL-90-R; Arrindell et al., 1986, adapted from Derogatis, 1977), consisting of 12 items, was used.
- The diagnostic criteria for two gastrointestinal somatoform disorders, *functional dyspepsia* and *spastic colon (irritable bowel syndrome)* were translated into 9 and 10 questions respectively, in both cases followed by two items concerning the total duration of the complaints and the resulting physician consults. The presence of a severe organic disorder was questioned in order to exclude an organic cause of the experienced symptoms. Three items were included to measure the presence of such an organic disorder, the resulting consulting of a physician and the possibly ongoing treatment.
- *Health status*. The subjective experienced health or self-rated health (SRH) of the employee (2 items), as well as his or her weight and height – in order to calculate the Body Mass Index (BMI) – were questioned.
- *Anxiety* and *depression* were measured by use of the anxiety and depression subscales of the SCL-90-R (Arrindell et al., 1986, adapted from Derogatis, 1977).
- *Chronic Fatigue* was measured by the Verkorte VermoeidheidsVragenlijst (VVV; Vercoulen et al., 1999), which is constituted of 4 items.
- The *consulting of a physician* (2 items) and the use of drugs (4 items) were questioned in order to obtain information about the medical consumption of the employees.

- The degree in which the person experiences limitations in his or her *social functioning*, due to health complaints, was questioned using the social (dis)functioning subscale of the SF-36 (Social Functioning-36; Ware et al., 1992), 2 items.
- *Presenteeism* concerns the question if the person goes to work even though he or she is ill (1 item) and if so, for which reasons (9 items) (Saksvik, 1996).
- *Self-reported absenteeism*. The total number of days as well as the number of times an employee has been absent during the last 12 months have been asked in 3 questions.
- *Objective absenteeism*. Besides information reported by each respondent, the organizations were asked to provide a continuous record of absenteeism for each worker included in the study. Despite initial promises, only two of the four firms provided these data. The protocol for the requested information on absenteeism from the firms was organized and analyzed by the ULB team.

Besides this common core of questions, each team has developed a set of more specific questions, according to their own competence and interest.

III.2.2.2. KULeuven-team

- The KULeuven-team applied the Leiden Quality of Work Questionnaire (LQWQ), which consists of 65 items and measures 11 work stressors and job satisfaction (van der Doef & Maes, 1999).
- For operationalizing the TRIPOD –model, a new questionnaire was developed in Leiden by Simone Akerboom for this study. This questionnaire contains 47 and measures six work stressors, namely non-supportive work climate, problems with task communication, problems with allocation of personnel, lack of job skills, lack of training opportunities, and lack of maintenance equipment. This new questionnaire formed the basis for more recent research on the TRIPOD-model by the Leiden research team (e.g. Akerboom & Maes, 2003).
- For the psychiatric diagnoses of somatoform disorder, the Specialist Patient Health Questionnaire (SPEC-PHQ; Spitzer, Kroenke, & Williams, 1999) was relied upon.

III.2.2.3. ULB-team

The ULB-team, more involved in the measure of psychosocial environment, incorporated:

- Bullying at work by 2 dimensions (Isolation at work and Destabilization (lack of information), selected from Quine's questionnaire) (Quine, 1999) (7 items)
- Coping (adapted from the coping scale of Amirkhan) (Amirkhan, 1990) (9 items)
- Work-home interference (Kelloway, 1999) (6 items)
- Physical activity (WHO, 1987) (1 item)
- Stressors outside work (Klitzman, 1990) (9 items)
- Social support outside work (adapted from Dalgard, 1998) (4 items)
- Specific to the firm: stress due to pressure from clients/patients, due to patient's suffering, work characteristics identified by the respondents as the origin of health problems (12 items)

III.3 Analysis procedure

Since each of the two research teams has taken a different approach for analyzing the data, it was judged for the sake of readability that the analysis methods are discussed together with the specific results from each team.

IV. Results

IV.1. Results ULB-team

IV.1.1. Key informants

We will present the analysis of the questions related to the central issues of the research (at T1 and T2), namely:

1. evolution of productivity
2. predictable structural changes within the enterprise in the next years
3. evaluation of the firm's stability
4. stress evaluation (apart from job insecurity)
5. function and services/departments particularly exposed to stress

IV.1.1.1. Evolution of productivity

At time 1, across the 4 firms, there is a general agreement to report an increase in productivity¹ in the workplace, with no marked difference from one place to another. The opinions are less clear at T2, even though the majority of respondents report an increase in productivity. In the firm 3 only (insurance company) two respondents report a decline in productivity. Generally speaking, the productivity increase appears to be linked to a personnel reduction.

Table 3. Key informants' opinion on evolution of productivity

Firm	Key informants' opinion at T1		Key informants' opinion at T2	
	N:	opinion	N:	opinion
1	10:	increased	8 :	increased
	2:	unchanged	5:	unchanged
	2 :	reserved	1:	missing
	1:	missing		
2	10 :	increased	8 :	increased
3	9:	increased	2:	increased
	2:	decrease	2:	decreased
			2:	unchanged
			2:	missing
4	14:	increased	5:	increased
	1:	stable	1:	stable
			3:	missing

IV.1.1.2. Presumption of structural change

In the assumed most unstable environment and in the firm 2 (services), all respondents predict at T1 a structural change within the firm². Most of the key informants in firm 3 predict a structural change as well.

During the one-year interval, the firm 3 experienced an important structural change, but this does not exclude another forthcoming change for the key informants at T2. In firm 4, respondents to this question say that structural change is permanent; this explains all positive (valid) answers at T1 and T2.

¹ Answers to question: "What is the present productivity evolution in you firm compared to two years ago?", (possible answers: "Increased", "Stable", "Decreased")

² Answers to question: "According to you, are there any predictable structural changes within the enterprise in the next coming years?"

Table 4. Key informants' opinion on presumption of structural change

Firm	Key informant opinion at T1	Key informant opinion at T2
	N: opinion	N: opinion
1	8: yes 4: no 3: missing	4: yes 2: no 4: doesn't know 4: missing
2	9: yes 1: missing	6: yes 2: doesn't know
3	6: yes 2: probably 1: no 2: missing	5: done 1: probably 1: no 1: missing
4	15: yes	7: yes 2: missing

IV.1.1.3. Evaluation of the firms stability

The evaluation of the firm's (in)stability by the key informants allowed us to test our stability indicator constructed on the available statistics in this matter (see above). At time 1, the only negative appraisals of the stability are given in the firms 3 and 4, but the majority of respondents, in all firms, give a positive answer to this question. Some nuances have nevertheless to be brought. The trade unions spokespersons are more often pessimistic than the direction concerning the firm stability. In the telecommunication company, French-speaking respondents are more pessimistic concerning the firm's stability compared to the Dutch-speaking ones.

Table 5. Key informants' opinion on evaluation of the firm's stability

Firm	Key informant opinion at T1	Key informant opinion at T2
	N: opinion	N: opinion
1	9: stable or expansion 2: difficult position 4: missing	11: stable or expansion 1: difficult position 1: doesn't know 1: missing
2	10: stable or expansion	4: stable 2: unstable 2: hesitant
3	7: stable 4: decline	2: stable 2: decline 3: hesitant 1: missing
4	12: stable or expansion 1: decline 2: hesitant	4: stable or expansion 2: hesitant 3: missing

IV.1.1.4. Stress evaluation (apart from job insecurity)

Another important concern was to have an idea about the stress within the enterprise. This question was split into two sub-questions: stress induced to work insecurity and stress excluding work insecurity. It was asked to quote the stress on a scale going from 0 (absence of stress) up to 10 (maximum). For some respondents it was quite difficult to rate stress on such a scale, for that reason, they gave a qualitative evaluation (see table 6). This evaluation is globally stable in time. The quantitative evaluation shows a decline in firm 1 and a slight increase in the second firm.

Table 6. Key informants' opinion on stress evaluation

Firm	Key informant opinion at T1	Key informant opinion at T2
	N: opinion	N: opinion
1	8: mean=7.6/10 ³ 2: "no stress" 1: "important stress" 1: "permanent" 1: "not important" 2: missing	7: mean=6.4/10 1: "don't know" 1: "important" 1: "not important" 1: "exists" 3: missing
2	10: mean=6.7/10 ⁴	5: mean=7.5/10 2: "important" 1: "not important"
3	9: mean=5.7/10 ⁵ 1: "moderate"	6: mean=5/10 2: missing
4	12: mean=6.5/10 ⁶ 1: "exists" 1: "very important" 1: missing	6: mean=6.8/10 1: "exists" 2: missing

IV.1.1.5. Function and services/departments particularly exposed to stress

In the hospital, according to the key informants, the levels of the hierarchy most exposed to stress are the extreme points of the hierarchy: top managers and unskilled workers. Traditionally, emergency and surgery wards are particularly exposed to stress.

In the second firm, at time 1, there were no large differences between departments, but mainly between functions. The high stress occupations are the ones in contact with clients (direct contact or telephone) and managers. But at the second measure, stress appears to depend heavily on the departments, some of them being particularly exposed, because of their poor financial results, resulting in a high pressure on the workers.

In the third firm, at the first measure, the same comments could be applied as for the second firm: managers and people in contact with clients occupying the most exposed functions to stress. In terms of departments, production and damage services are cited frequently. During the period between the 2 measurements, there was an important restructuring in the firm, resulting in a sharp decrease in the number of agencies in the country. Technical sales department and agencies managers are consequently more exposed to stress.

In the last firm (telecommunication), at time 1, many different functions are cited by the key informants, but the most often ones are here again the extremes of the hierarchy line: top managers and client facing functions (here the less qualified workers). At time 2, for the key informants, the less qualified workers and middle management are the functions with the highest stress. In terms of services/departments: call centers and help desks are particularly at stress risk.

IV.1.1.6. Discussion

Data obtained by the interviews allowed us to validate the firms' selection obtained with our instability index developed at the beginning of the project (Godin et al., 2002). But the interviews provided also extra information that was impossible to obtain at a macro economic level. Each workplace has its own features and, according to the firm's history and evolution, stress is different across departments, services, function or hierarchical lines. It is also through those interviews that we were able to have information on specific useful information like: foreseen structural changes, rumors, quality of information or workers' (dis)satisfaction.

³ Range: T1: 5 – 10 T2: 3.5 - 8

⁴ Range: T1: 5 – 9 T2: 6 –9

⁵ Range: T1: 3.5 – 7 T2: 2.5 – 7.5

⁶ Range T1: 5.5 – 8 T2: 7.5 – 7.5

IV.1.2. Employees

IV.1.2.1. Analysis procedure

Cross-sectional data: For cross-sectional data, we used usual uni- and bivariate analysis. For cross tabulations, the significance level of 5% is used. In tables and graphs, level of statistical signification is illustrated as followed: $p < 0,05$ *, $p < 0,01$ ** , $p < 0,001$ *** ; Logistic regressions were performed for looking at the associations between socio economic variables and stress indicators

Prospective analysis: we make use of Mc Nemar tests for paired sample in order to test the evolution between the two measures (univariate analysis).

Identification of predictors on incidence of health outcomes was done by logistic regression. We first selected workers free of health problem at first point, in order to better understand the relation between exposure and the occurrence of the health problem. With this procedure, we take at T1 (time 1, first measure) the measure of socio economic variables and stress factors, and examine, at T2 (time 2, second measure) the incidence of health-related problems. This method is very conservative but can better identify the stress factors associated with health problems. For multivariate analysis, in each categorical variable, the lowest risk category was chosen as reference. Ten independent variables were introduced in the model.

Table 7. Reference categories for independent variables

Variables	Categories	Reference category	Variables	Categories	Reference category
Sex	Men	Men	Social support at work	Low	High
	Women			High	
Age	< 35 years	< 35 yrs	Imbalance (Siegrist)	No-no	No-no
	35-49 years			Yes-no	
	> 49 years			No-yes	
Education	Max. vocational	Superior		Yes-yes	
	Secondary		Overcommitment	No	No
	Superior			Yes	
Work instability	Firm 1	Firm 1	Globalization	No	Yes
	Firm 2			Yes	
	Firm 3		Job security⁷	Totally agree	Totally agree
	Firm 4			Agree	
Strain (Karasek)	No-no	No-no		Disagree	
	Yes-no			Totally disagree	
	No-yes				
	Yes-yes				

For the strain measurement of Karasek only, we used in this present report the non sex specific Belstress cut-off points of demands and control, in order to isolate the potential gender effect and gender differences. For social support at work (Karasek), imbalance and overcommitment (Siegrist) the same cut-offs were used as the ones we presented in previous reports.

In order to take into account the stress evolution between the two measures, two new variables were created, one for the Karasek model of stress and one for Siegrist's one. Those variables take simultaneously into account the individual measures of stress at point 1 and point 2. Each of those variables has 4 categories (see Table 8)

⁷ "My job security is good" 1. Totally disagree 2. Disagree 3. Agree 4. Totally agree

Table 8. Computation of new stress variables (stress evolution)

	Stress T1	Stress T2	Category in the new stress variable
Strain Karasek	No	No	No-no
	Yes	No	Yes-no
	No	Yes	No-yes
	Yes	Yes	Yes-yes
Stress Siegrist	No	No	No-no
	Yes	No	Yes-no
	No	Yes	No-yes
	Yes	Yes	Yes-yes

These variables could be understood as ordinal ones, the 1st category being the lowest risk (no stress at point 1, neither at point 2) the 4th representing the highest risk (stress at point 1 and 2, or permanent stress).

Mental health indicators were dichotomized as follows: Self-rated health was categorized as "poor health" (health rated as "very bad" "bad" or "average") and "good health" ("good" together with "very good"). The three mental health indicators derived from SCL-90 were dichotomized at the upper quartile of each score distribution. The same cut-off points were used for chronic fatigue, psychotropic drug consumption. For self-reported absenteeism we grouped the categories in order to have dichotomous variables. Absenteeism frequency is recoded into "3 sick leaves or more" and "less than 3 sick leaves" during the 12 months period preceding the questionnaire. Total absenteeism length is recoded in "less than 1 week" and "1 week or more". Long absence as "at least one long absence" (more than 2 consecutive weeks) and "no long absence".

The data analysis is mainly based on the longitudinal aspects, i.e. on the 1986 paired sample (participants to the two measures).

Some questions were asked only to workers of 2 enterprises – those investigated by the ULB-team - (1030 workers, paired sample). This is the case for bullying, work-home interference and stressors outside work, and specific questions to working conditions and specific questions on working conditions.

The following order of presentation of the results is used. We first looked at the evolution of the following components: work and non-work stressors, health indicators and health related behaviors.

The second step of the data analysis was to look at the relation between socio-economic and demographic variables and stress factors, at T1 and T2.

As a third step we then selected among the potential risk factors at work, those predicting best the incidence of health outcomes.

IV.1.2.2. Analysis approach

We examined the intern validity in the scales used in the self-administered questionnaires, with the following results (see Table 9):

Table 9. Scales' intern validity

Stress related Variables	Number of items	Cronbach's Alpha
Rewards (N=1986)	11	0.78
Efforts (N=1986)	5	0.68
Overcommitment (N=1986)	6	0.81
Bullying (N=994)	7	0.86
Problems outside work (N=980)	9	0.55
Health related variables		
Cage(N=1850)	4	0.69
Neuroticism (N=1986)	12	0.86
Depression (N=1986)	16	0.93
Anxiety (N=1986)	10	0.89
Somatization(N=1986)	12	0.89
Chronic fatigue (N=1986)	4	0.86

IV.1.2.2.a. Categories per variable/scale

Permanent stress (yes at T1 and yes at T2) computed from the Karasek model is more frequent in the women's group, and there is an obvious inverse gradient according to education. Even if young workers are more exposed to permanent stress than the older ones, statistical significance is not reached. Important differences are visible according to the work instability: permanent stress being much more common in the unstable environment.

IV.1.2.3. Evolution of work and non-work stressors

In each firm separately, as well as in the total sample, there is a noticeable stability in the stress factors evolution in the one-year interval (see Table 10). No observed differences are significant (Mc Nemar tests on paired samples) on the total sample. For a few indicators in particular workplaces only differences are more important: for the raising of low control in firm 1, the decline in high demands, high stress (Karasek) and overcommitment in firm 4 (all reaching statistical significance)

In the 2 measures, there is a constant higher prevalence of work stressors in the unstable firm (number 4). This is particularly clear for low control, strain, job dissatisfaction and threat from globalization (Karasek).

Table 10. Stress components evolution in the 4 firms (in %, n=1986)

	Firm 1		Firm 2		Firm 3		Firm 4		Total	
	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2
Low Control	24.3	27.9	27.4	29.9	34.2	32.9	43.6	42.1	32.9	33.9
High Demands	58.4	58.1	53.7	54.7	49.0	53.3	55.2	48.4	54.8	53.3
Strain	11.2	13.5	11.4	14.3	14.1	16.6	23.7	19.5	15.8	16.2
Low social support	45.4	48.5	50.9	54.6	64.2	64.4	53.7	53.7	52.3	54.1
Job dissatisfaction	19.7	16.8	15.3	18.1	27.9	22.8	28.1	26.6	22.7	21.3
Threat of globalization	8.5	8.8	20.4	18.9	58.0	55.5	81.4	80.4	43.1	42.1
Imbalance	20.5	22.8	24.6	26.5	30.5	26.5	26.1	24.8	24.9	24.8
Overcommitment	30.1	25.8	35.9	40.6	37.2	37.4	41.1	36.6	36.3	34.7

IV.1.2.4. Evolution of health indicators

Differences across firms and thus according work instability are clear. In the most unstable working environment the workers have the worst health indicators. The most striking differences are given by the negative self rated health and one week or more of absenteeism (see Table 11 and figure 1). The evolution of health indicators in each firm reaches statistical significance for a few indicators: increase in negative self-rated health in all firms except in the most stable one, and increase in absenteeism in firm 2 (≥ 1 spell) and in firm 4 (≥ 1 week absence). In the second firm, we also observe an important increase in the prevalence of chronic fatigue and psychotropic drug consumption.

Table 11. Health indicators evolution across the different firms (in %, n=1986)

	Firm 1		Firm 2		Firm 3		Firm 4		Total	
	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2
Negative Subjective Health	17.2	17.3	21.0	28.5	19.2	27.2	34.9	40.8	24.3	29.3
Depression	26.0	21.5	22.0	24.4	20.3	20.6	26.5	27.6	24.3	24.1
Anxiety	23.0	18.6	26.6	27.1	18.9	19.0	27.1	27.4	24.6	23.7
Somatization	27.4	21.3	27.3	29.3	18.9	18.9	29.6	30.5	26.9	26.0
Absenteeism (≥ 1 spell)	51.0	50.7	60.0	65.2	56.2	56.3	66.2	68.0	59.1	60.9
Absenteeism (≥ 1 week)	20.6	22.5	24.6	26.8	29.0	30.3	39.6	44.0	29.2	30.2
Absenteeism (≥ 15 cons. days)	20.8	22.5	12.9	12.9	16.1	14.7	22.4	21.4	15.4	15.5
Chronic fatigue	26.6	23.6	28.3	31.8	26.1	31.5	28.4	30.4	27.5	29.0
Psychotropic drug consumption	22.8	24.5	19.6	23.1	15.5	17.9	25.6	27.0	21.9	23.9

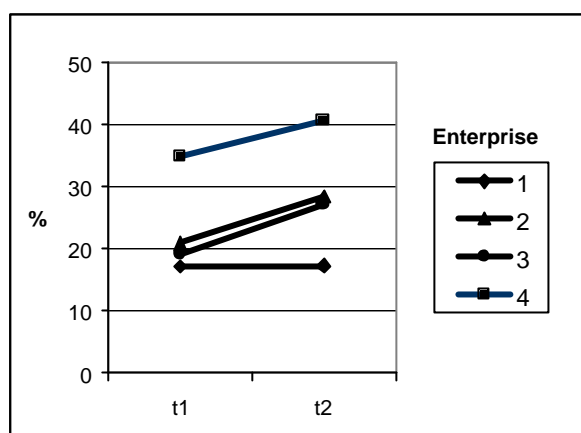


Figure 1. Negative self-rated health evolution (T1 and T2) and work instability

IV.1.2.5. Evolution of health related behaviors.

We have 2 health related indicators for the total sample, for the ULB firms we have added question physical activity during leisure time. As for stress factors and health indicators, health behaviors are very stable in time.

Table 12. Health related behaviors evolution (in %)

Health related behaviors	T1	T2	P value (Mc Nemar)
Smoking (N=1986)	22.8	22.8	n.s.
Alcohol addiction (N=1986)	10.0	11.8	*
Low sport activity (N=1030)	64.5	65.2	n.s.

IV.1.2.6. The relation between socio-economic and demographic variables and stress factors, at T1 and T2

As explained in the previous research reports, the 4 enterprises differ considerably in their stability: the most stable firm is Firm 1, the most unstable Firm 4. The 2 remaining ones being in an intermediate position, but the Firm 2 is more stable than the Firm 3 (see Table 13).

Table 13. Stress evolution and socio economic indicators (in %, n=1954)

Strain T1 T2 (Karasek)				
Sex (**)	no-no	yes-no	no-yes	yes-yes
Men	77.4	9.4	8.5	4.7
Women	71.7	8.7	10.8	8.8
Education (***)				
Max. vocational	69.7	10.8	11.1	8.4
Secondary	68.6	13.0	10.5	7.9
Sup non univ.	78.7	6.5	9.9	4.9
Univ.	93.0	1.8	3.1	2.2
Age (n.s.)				
18-34	77.0	6.6	8.3	8.1
35-49	73.7	10.3	9.8	6.2
50 and +	77.5	7.4	9.4	5.7
Firm (***)				
1	80.7	5.8	8.3	5.2
2	79.4	6.4	9.8	4.5
3	76.3	7.0	9.4	7.3
4	65.9	14.6	10.5	9.0

When the Siegrist model is used, we observe exactly the opposite results than with the model of Karasek, namely that a positive educational gradient is observed for stress. But the same results are observed as for the Karasek model of stress, when stress is crossed with firm instability: there is a regular gradient from the most stable workplace to the most unstable one.

Table 14. Stress evolution and socio economic indicators (in %, n=1954)

	Imbalance evolution T1 T2 (Siegrist)			
	no-no	yes-no	no-yes	yes-yes
Sex (n.s.)				
Men	64.7	10.4	8.8	16.2
Women	65.5	10.3	11.1	13.1
Education (**)				
Max. vocational	66.3	11.2	7.6	14.8
Secondary	69.9	8.5	6.6	15.1
Sup non univ.	62.4	11.4	13.3	12.9
Univ.	62.8	5.8	13.0	18.4
Age (n.s.)	ns			
18-34	67.9	11.4	9.9	10.8
35-49	63.7	9.9	10.3	16.2
50 et +	66.2	9.3	8.0	16.5
Firm (*)				
1	68.2	9.7	10.9	11.1
2	63.2	10.1	12.0	14.7
3	60.3	13.8	9.6	16.3
4	65.9	9.5	7.5	17.1

Adjusted measures of the relations between socio-economic and demographic predictors of stress factors are obtained by logistic regressions, at T1 and T2 (see Table 15).

Table 15. Socio-economic factors related to stress (T1 and T2): results from logistic regressions, O.R. (95% C.I.)

N=1986	Control		Demands		Strain	
	T1	T2	T1	T2	T1	T2
Sex	***	***	n.s.	n.s.	***	***
Men	1	1	1	1	1	1
Women	2.3 (1.8-3.0)	2.0 (1.6-2.6)			2.2 (1.6-3.0)	2,2 (1,6-3,0)
Education	***	***	n.s.	n.s.	***	***
Max. vocational	4.5 (2.7-7.2)	4.1 (2.6-6.4)			4.8 (2.3-10.1)	4,2 (2,2-8,2)
Secondary	3.3 (2.0-5.5)	3.0 (1.9-4.8)			4.6 (2.1-9.8)	3,2 (1,6-6,3)
Sec non univ.	2.5 (1.6-4.0)	2.2 (1.5-3.4)			2.4 (1.2-5.0)	2,6 (1,4-4,9)
University	1	1	1	1	1	1
Age	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.
18-34	1	1	1	1	1	1
35-49						
50+						
Work instability	***	***	n.s.	*	***	*
Firm 1	1	1	1	1	1	1
Firm 2	1.2 (0.9-1.6)	1.1 (0.8-1.5)		0.8 (0.6-1.1)	0.9 (0.6-1.4)	1,1 (0,8-1,6)
Firm 3	1.3 (0.9-1.9)	0.9 (0.6-1.4)		0.9 (0.6-1.3)	1.0 (0.6-1.6)	1,1 (0,7-1,7)
Firm 4	2.5 (1.5-3.5)	1.8 (1.3-2.5)		0.7 (0.5-0.9)	2.4 (1.6-3.6)	1,7 (1,1-2,5)

Each stress predictor is at this point considered as the dependent variable, and the socio-economic (gender, education, age, work instability) as independents. Among all, work instability determined by the firm emerges as

the most frequently related variable with high demands (Karasek). The threat of globalization at both T1 and T2 is amazingly high in the most unstable firm (see Table 16). Low education is principally a good predictor for low control (Karasek) and this makes the relationship between education and strain highly statistically significant. We suppose that when a socio-economic indicator is linked to strain, it is because of its link with low control (this is the case for sex, education and work instability). Being a woman increases the probability of having a low control job and the probability of high strain (Karasek). The link between work instability and threat of globalization is extremely important with the odds reaching 38 at T1 and 34 at T2 (see Table 16) .

Table 16. Socio-economic factors related to stress (T1 and T2) results from logistic regressions, O.R. (95% C.I.) (continued)

N=1986	Job dissatisfaction		Low social support		Globalization threat	
	T1	T2	T1	T2	T1	T2
Sex	n.s.	n.s.	n.s.	n.s.	n.s.	*
Men	1	1	1	1	1	1
Women						1.2 (1.0-1.5)
Education	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.
Max. vocational						
Secondary						
Sec.non university						
University	1	1	1	1	1	1
Age	n.s.	n.s.	***	***	**	*
18-34	1	1	1	1	1	1
35-49			2.1 (1.5-2.9)	1.9 (1.4-2.5)	1.5 (1.2-1.9)	1.3 (1.1-1.7)
50+			2.6 (1.7-3.9)	2.1 (1.4-3.2)	1.6 (1.2-2.2)	1.4 (1.0-2.0)
Work instability	**	***	***	***	***	***
Firm 1	1	1	1	1	1	1
Firm 2	0.8 (0.6-1.1)	1.2 (0.9-1.8)	2.6 (1.7-3.9)	2.3 (1.6-3.5)	1.3 (1.0-1.7)	1.4 (1.1-1.9)
Firm 3	1.6 (1.0-2.5)	1.9 (1.2-3.1)	13.6 (8.2-22.4)	10.9 (6.6-17.7)	2.7 (1.9-4.0)	2.7 (1.8-3.9)
Firm 4	1.5 (1.1-2.2)	2.3 (1.5-3.3)	38.2 (24.7-59.2)	33.8 (22.0-51.9)	1.6 (1.2-2.1)	1.6 (1.2-2.2)

Table 17. Socio-economic factors related to stress (T1 and T2) results from logistic regressions, O.R. (95% C.I.) (continued)

N=1986	Imbalance		Overcommitment	
	T1	T2	T1	T2
Sex	n.s.		n.s.	n.s.
Men	1	1	1	1
Women				
Education	n.s.	***	n.s.	**
Max vocational		0.4 (0.3-0.6)		0.6 (0.4-0.8)
Secondary		0.4 (0.3-0.7)		0.5 (0.3-0.8)
Sec non univ		0.7 (0.5-1.0)		0.6 (0.4-0.8)
University	1	1	1	1
Age	n.s.	*	***	*
18-34	1	1	1	1
35-49		1.5 (1.2-2.0)	1.5 (1.2-2.0)	1.4 (1.1-1.8)
50+		1.3 (0.9-2.0)	2.0 (1.4-2.8)	1.5 (1.1-2.2)
Work instability	*	**	**	***
Firm 1	1	1	1	1
Firm 2	1.3 (1.0-1.8)	1.5 (1.1-2.0)	1.4 (1.0-1.8)	2.1 (1.6-2.8)
Firm 3	2.0 (1.3-3.2)	2.2 (1.4-3.4)	1.7 (1.2-2.5)	1.9 (1.3-2.8)
Firm 4	1.5 (1.0-2.1)	1.7 (1.2-2.5)	1.8 (1.3-2.4)	1.7 (1.2-2.4)

IV.1.2.7. The relationships between the evolution in stressors and health

The measures of stress evolution are closely related to the health indicators, particularly with the Siegrist model. Statistical significance is reached for the association between stress evolution and all health indicators. A clear gradient show that workers being persistently exposed to stress have always the highest prevalence of health problems (see Figures 2 and 3).

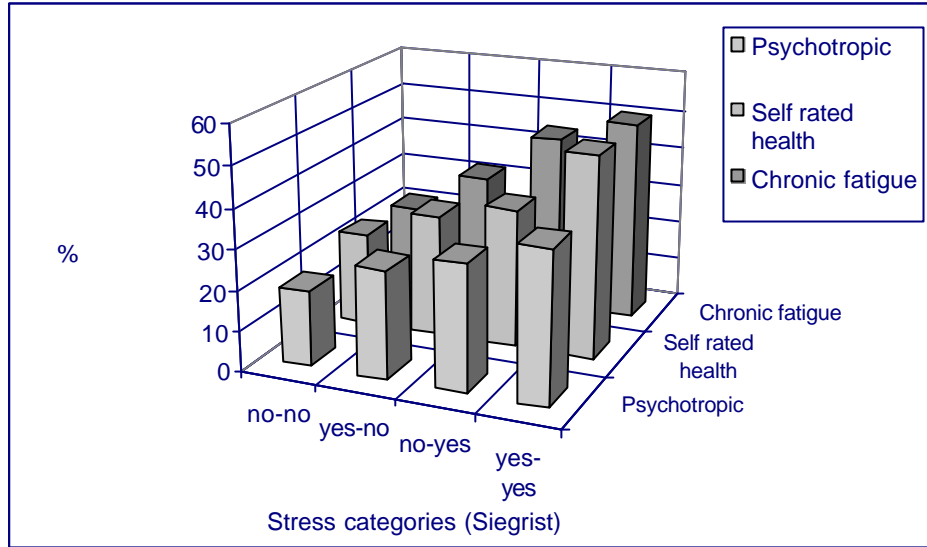


Figure 2. Stress evolution (Siegrist model) and impact on health (at T2)

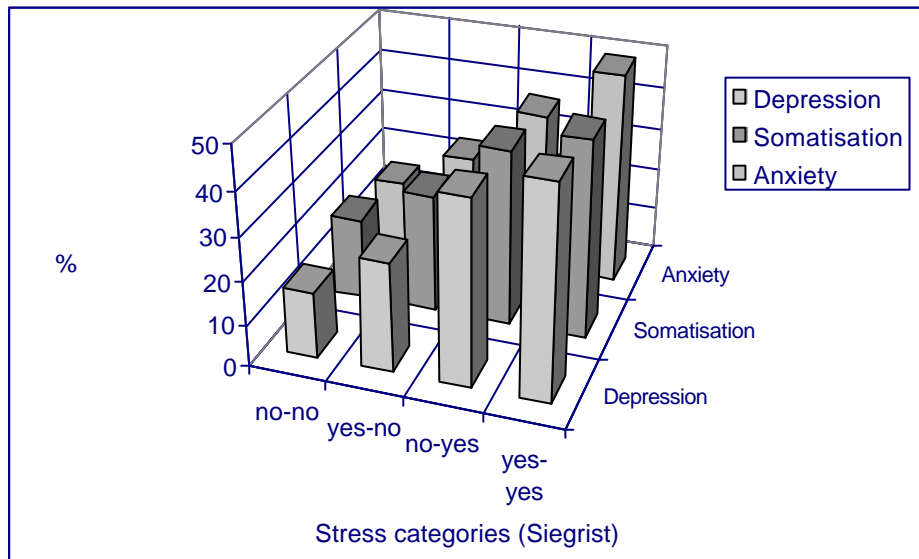


Figure 3. Stress evolution (Siegrist model) and impact on mental health (at T2)

IV.1.2.8. The measures specific to the ULB

Evolution of the specific measures (ULB), in %, n=1030

For the 2 enterprises of the ULB (firm 1 and firm 2), specific questions were asked to the respondents. Those questions cover the following dimensions:

- ✗ Bullying
- ✗ Home-work interference
- ✗ Problems outside work
- ✗ Social support outside work

✘ Specific questions concerning the work context, like: exposition to patient/client aggressiveness, working in uncomfortable position, working in an insecure work environment or how work can affect the worker's health.

For those specific variables of the ULB enterprises (firms 1 and 2), we notice the same relative stability between the 2 measures. There is however a significant increase in bullying prevalence as well as in the presence of problems outside work but an improvement in social support conditions outside work (see Table 18).

Table 18. Evolution of the specific measures to the ULB firms (in %, N=1030)

Exposition variable	T1	T2	p value (Mc Nemar)
Bullying	26.8	30.7	*
Work-home interference	27.6	30.1	n.s.
Problems outside work	20.9	25.6	*
Uncomfortable position	28.6	30.0	n.s.
Exposed to insecurity	9.2	7.4	n.s.
Exposed to aggressiveness	64.8	66.2	n.s.
Work is harmful for health	45.5	47.7	n.s.
Low social support outside work	43.6	33.4	***

The socio-economic and demographic determinants of the stress factors state that gender is always a risk factor for stress exposition and negative work characteristics (see Tables 19 and 20). The youngest age group is more exposed to aggressiveness from patients and clients; middle-aged workers are more concerned with work-home interference and declare more often that work is harmful for their health. Education is not really associated with those variables.

Table 19. Gender, stress exposition and negative work characteristics (in %, N=1030)

	T1				T2			
	Men	Women	Total	p value	Men	Women	Total	p value
Work-home interference	18.2	32.2	27.6	***	20.8	34.6	30.1	n.s.
Problems outside work	23.3	31.9	29.0	**	21.4	27.7	25.6	*
Uncomfortable position	20.2	32.7	28.6	***	20.2	34.8	30.0	***
No possibility unexpected day off	14.6	21.8	19.5	**	16.4	22.2	20.3	**
Aggressiveness from patients /clients	57.0	68.6	64.8	***	62.1	68.3	66.2	p=0.05
Work harmful for my health	36.9	49.7	45.5	***	38.0	52.4	47.7	***

Table 20. Age, stress exposition and negative work characteristics (in %, N=1030)

	T1					T2				
	18-34	35-49	50+	Total	p value	18-34	35-49	50+	Total	p value
Work-home interference	25.1	30.3	18.8	27.6	*	30.4	31.4	21.0	30.1	n.s.
Aggressiveness from patients/clients	68.0	65.1	53.0	64.8	*	73.4	64.4	55.4	66.2	**
Work harmful for my health	37.7	50.3	40.6	45.5	**	44.5	50.3	41.6	47.7	n.s.
Low social support outside work	13.9	22.5	22.8	19.9	**	6.5	5.1	7.4	5.7	**

IV.1.2.9. The specific condition of work overcommitment

As conceived by Siegrist, work overcommitment is a stress factor, measured on a scale comprising 6 items⁸. The next results illustrate cross sectional results of the 2 ULB enterprises at time 1. In this exploratory analysis, overcommitment seems to be highly related to other stress indicators and also to health dimensions (see Table

⁸ "I get easily overwhelmed by time pressures at work", "As soon as I get up in the morning, I start thinking about work problems", "When I get home, I can easily relax and 'switch off' work", "People close to me say I sacrifice too much for my work", "Work rarely lets me go, it is still on my mind when I go to bed", "If I postpone something, that I was supposed to do today, I'll have trouble sleeping at night".

21). Overcommitment increases gradually across age groups, going from 27% in the first age group (18-34 years), 35% in the second on (35-49 years) and reaching 41% among the eldest workers ($p < 0.001$). But it is not related to gender, education, or strain.

Table 21. Associations between overcommitment, stress factors and health outcomes, bivariate analysis at T1, 2 firms, T1 (in %, N=1030)

	Not overcommitted	Overcommitted
Job dissatisfaction (***)	13.0	27.0
Neuroticism (***)	18.6	41.3
Depression (***)	14.9	43.2
Anxiety (***)	15.0	44.9
Somatization (***)	19.2	44.1
Chronic fatigue (***)	19.0	44.3
Psychotropic drug consumption (***)	16.1	31.5

Bullied workers, workers feeling an important threat from globalization and the ones in the upper quartile of imbalance are much more in a situation of overcommitment than the other workers (see Table 22).

Table 22. Associations between overcommitment, bullying, threat from global economy and imbalance, bivariate analysis, 2 firms, T1 (in %, N=1030)

Bullying (***)	Overcommitted
Not bullied	28.0
Bullied	46.5
Threat from global economy (***)	
No	30.4
Yes	47.9
Imbalance (***)	
No	24.4
Yes	63.2

The complex relationships between socio economic factors, stress factors, working conditions could be illustrated with one health outcome, i.e. depression. The association between stress factors and these mental health indicators is probably mediated by intermediate factors, such as bullying and job dissatisfaction, and also by overcommitment. It appears clearly that "depressed" workers are the ones in the "risk" categories for unfavourable working conditions, like low social support at work, imbalance, job dissatisfaction; they feel threatened from global economy and are more bullied at work. They are also more often in a situation of overcommitment. This set of negative conditions will be taken simultaneously in logistic regression and presented below (see Figure 4).

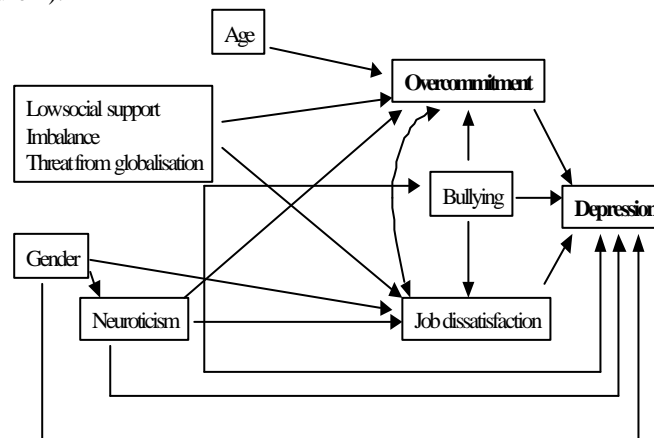


Figure 4. Relations between socio demographic variables, work characteristics, overcommitment and depression

IV.1.2.10. Prospective results of stress evolution and health outcomes

We have conducted multivariate analyses (logistic regression) in order to study which are the socio-economic and demographic factors as well as the stress factors that best predict the incidence of our health indicators.

For this, we have selected at T1 the workers without the concerned health problem. We took the measurement of the socio-economic and demographic variables at T1 as well as the work stressors. For the stress measures we have introduced the 2 models (Karasek and Siegrist), taking into account their time evolution. The dependent variables are the health problems at T2.

The independent variables are: negative self-rated health, depression, anxiety, somatization, psychotropic drug consumption, chronic fatigue, presenteeism and three measures of self-reported absenteeism (more than 8 days of absence between the 2 measures, 3 spells or more, and at least one long absence, defined as more than 2 consecutive weeks).

Stress evolution and health outcomes: *prospective results*

The results of the analyses indicate that among the socio-economic and demographic characteristics, sex (being a woman) and a low level of education are the best socio-demographic predictors of incidence of health problems. Age is only kept by the model for "presenteeism" and at least 3 spells of sick leave, the youngest age group reporting more presenteeism and is more often absent from work because of health problems.

Concerning the stressors, imbalance is the best predictor, being kept by the model for each health indicator, except for one absenteeism measure (3 spells or more).

The chronic stress exposure measurement shows an important gradient for all the health indicators. People who are exposed to stress (ERI model) both at time 1 and time 2 are the ones who show the highest prevalence of health problems. The range of the O.R. goes from 1.9 to 4.1.

Our initial hypothesis stipulated that in an unstable work environment people experienced an additional stress and, as such, this can be considered as a supplementary risk factor for the workers' health and well-being. This hypothesis could be principally verified for absenteeism, reaching its highest prevalence in the most unstable workplace. In contrast, it is the stable workplace that the odds for presenteeism are the highest. We have to keep in mind this particular workplace: in hospitals being absent could jeopardize the good functioning of services.

Job insecurity and threat of losing job because of globalization are risk factors for negative self-rated health. Job insecurity represents also a risk factor for anxiety.

Table 23. Stress evolution and health outcomes: prospective results, O.R. and 95% C.I. (n=1498)

n=1498	Negative SRH	Depression	Anxiety	Somatization	Psychotropic drug cons.	Chron. fatigue	Presenteeism	>= 8 days abs	>=3abs	>= Abs. 15 days
Sex Women	ns	** 2.0 (1.3-3.0)	** 1.8 (1.2-2.7)	** 1.8 (1.2-2.7)	ns	*** 2.6 (1.8-3.8)	**	ns	ns	*** 2.0 (1.4-3.0)
Age 35-49 50 et +	ns	ns	ns	ns	ns	ns	** 0.7 (0.4-1.3) 0.3 (0.1-0.6)	ns	* 0.6 (0.4-1.0) 0.4 (0.2-0.8)	ns
Education Max voc Sec Sup	ns	ns	ns	*** 3.8 (1.8-7.7) 2.6 (1.2-5.5) 1.4 (0.7-2.8)	* 3.8 (1.6-8.7) 2.9 (1.2-7.1) 2.5 (1.1-5.3)	ns	ns	** 3.9 (1.9-7.7) 2.1 (1.0-4.4) 2.2 (1.2-4.1)	*** 3.9 (1.7-8.9) 1.7 (0.7-4.2) 1.5 (0.7-3.3)	* 2.4 (1.2-4.9) 1.6 (0.7-3.4) 1.4 (0.7-2.7)
Work instability Firm B Firm C Firm D	** 2.2 (1.3-3.5) 1.2 (0.6-2.5) 1.6 (0.9-3.0)	ns	ns	* 1.3 (0.8-2.2) 0.5 (0.2-0.9) 1.1 (0.6-1.9)	ns	** 2.0 (1.3-3.2) 3.3 (1.7-6.5) 2.5 (1.4-4.3)	** 0.6 (0.3-1.2) 0.3 (0.1-0.8) 0.2 (0.1-0.4)	*** 1.3 (0.8-2.1) 0.7 (0.4-1.3) 2.2 (1.3-3.9)	* 1.4 (0.8-2.5) 0.4 (0.2-1.0) 1.0 (0.5-2.1)	** 1.3 (0.8-2.1) 1.4 (0.7-2.6) 2.4 (1.4-4.0)
Strain Yes-no No-yes Yes-yes	ns	* 1.6 (0.9-2.9) 2.3 (1.4-3.9) 1.2 (0.6-2.6)	ns	ns	ns	ns	ns	ns	ns	ns
Social support Low	ns	ns	ns	ns	ns	ns	ns	ns	* 1.6 (1.1-2.4)	ns
Imbalance Yes-no No-yes Yes-yes	*** 0.7 (0.4-1.3) 1.9 (1.2-3.0) 2.9 (1.9-4.4)	*** 1.2 (0.6-2.3) 3.5 (2.1-5.7) 3.6 (2.3-5.7)	*** 0.9 (0.5-1.9) 2.7 (1.6-4.6) 3.0 (1.8-5.0)	*** 1.7 (0.9-3.1) 3.5 (2.1-5.9) 3.3 (2.0-5.3)	** 1.3 (0.7-2.6) 2.9 (1.7-4.9) 2.4 (1.4-4.0)	*** 1.7 (1.0-3.0) 2.9 (1.8-4.8) 4.1 (2.7-6.3)	* 1.5 (0.7-3.7) 1.4 (0.6-3.1) 4.1 (1.6-10.5)	** 1.5 (0.8-2.6) 1.4 (0.8-2.4) 2.4 (1.5-3.9)	ns	* 1.5 (0.9-2.5) 1.7 (1.1-2.8) 1.9 (1.2-2.9)
Overcommit. Yes	ns	*** 1.2 (0.6-2.3)	*** 2.2 (1.5-3.3)	ns	ns	ns	ns	ns	ns	ns
Globalization Yes	** 1.8 (1.2-2.7)	ns	ns	ns	ns	ns	ns	ns	ns	ns
Job insecurity Not agree at all Not agree Agree	* 2.6 (1.2-5.6) 1.4 (0.8-2.5) 2.0 (1.2-3.7)	ns	** 0.9 (0.3-2.6) 2.3 (1.2-4.3) 1.3 (0.7-2.2)	ns	ns	ns	ns	ns	ns	ns

IV.1.2.11. Absenteeism reported by enterprise and individual: a validation study

The individual accordance between self-reported and enterprise-reported absenteeism for the first enterprise at time 1 by the exactly corresponding category is estimated by a Kappa of .325, which is considered as rather weak (see table 24).

Table 24. Comparison of the frequency of absenteeism by the enterprise and the individual (Enterprise 1–T1)

FREQUENCY ABSENCES	Enterprise (N=921) %	Questionnaire (N=921) %
0	42.4	46.7
1	28.9	27.7
2	13.0	11.8
3	8.5	5.8
4	3.5	1.8
5	2.2	2.1
6	0.8	0.7
7	0.5	0.3
≥8	0.1	3.1

The obtained kappa is of .325, which can be considered as average of quality.

But of course this criteria is very demanding, therefore 2 other analyses have been performed.

The first consists in the next one (see Table 25): For the categories of frequency of absence given by the enterprise the following percentages of agreement are reached if one category higher or lower is taken for the questionnaires:

Table 25. Distribution of absenteeism by enterprise and individual with +/- 1 category (enterprise 1 – T1)

Frequency of absences (N=921)		
Enterprise	Questionnaire	
Category	Category +/- 1	%
0	0-1	93
1	0-1-2	89.1
2	1-2-3	80.5
3	2-3-4	61.9
4	3-4-5	43.0
5	4-5-6	25.7
6	5-6-7	11.4
7	6-7-8	9.7
≥8	7-8	23.5

This evidences that the agreement is quite good for the first categories and only for 4 absences and more the exactitude of the self-report diminishes.

A third approach was used looking for the linear regression between the two continuous variables. The scatter plot indicates a quite good agreement. The Pearson $r=0.788$, which gives a r^2 of 62% which is very satisfactory.

The same analyses were performed for enterprise 1 at T2 and for the other enterprise both T1 at T2, the other two enterprises having no absence data recorded by the enterprise by means of informatics.

The following two tables concern Time 2.

Table 26. Comparison of the frequency of absenteeism by the enterprise and the individual (Enterprise 1 – T2)

FREQUENCY ABSENCES	Enterprise (N=698) %	Questionnaire (N=698) %
0	46.2	48.7
1	25.9	27.1
2	14.6	12.6
3	6.0	3.6
4	4.0	1.9
5	1.9	1.4
6	0.4	1.3
7	0.6	1.1
≥8	0.3	2.3

The percentages of agreement in table 3 as can be seen are very similar, with a very slight underestimation by the individuals.

The Kappa is of .429, which is considered as average of quality also.

Table 27. Distribution of absenteeism by enterprise and individual with +/-1 category (enterprise 1 – T2)

Frequency of absences (N= 698)		
Enterprise	Questionnaire	
Category	Category +/- 1	%
0	0-1	96.0
1	0-1-2	91.7
2	1-2-3	76.5
3	2-3-4	57.1
4	3-4-5	35.7
5	4-5-6	46.2
6	5-6-7	0.0
7	6-7-8	25.0
≥8	7-8	50.0

Again when a broader criterion is used for the first 4 categories, the distribution of the accordance (see Table 27) is quite good.

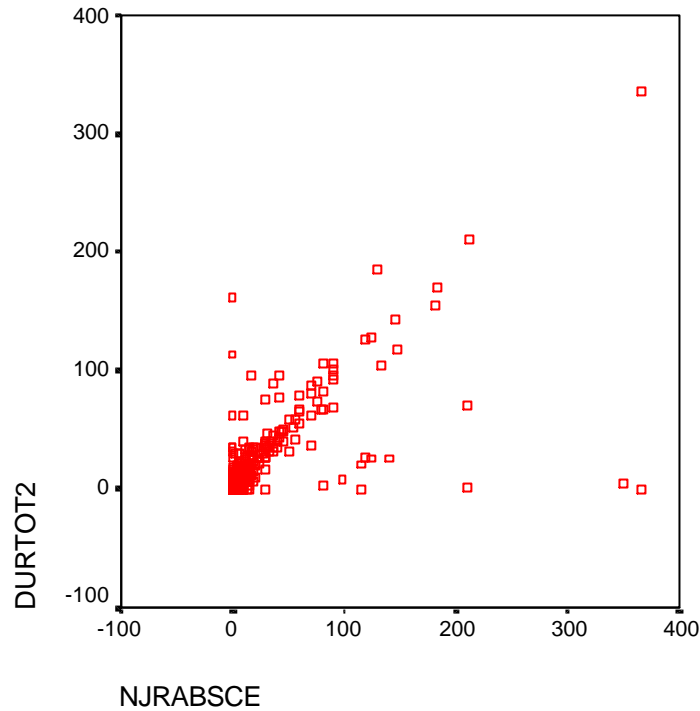


Figure 5. Scatter plot of absenteeism recorded by enterprise 1 and the individual questionnaire at T2

The correlation coefficient is of .682 and thus the r^2 of 46.5%. is somewhat lower than for time1 but is still rather good.

The following results concern the enterprise 4 at time 1 (see Tables 28-29, figure 6) and T2 (see Tables 30-31, figure 7)

Table 28. Comparison of the frequency of absenteeism by the enterprise and the individual (Enterprise 4 – T1)

FREQUENCY ABSENCES	Enterprise (N=1353) %	Questionnaire (N=1353) %
0	28.4	32.2
1	23.8	26.8
2	15.2	15.4
3	10.5	8.9
4	7.4	5.1
5	6.1	3.8
6	2.6	1.6
7	2.3	0.7
≥8	3.8	5.3

Table 4 presents the result for the other enterprise (enterprise 4) at Time 1. The percentages are very close between the percentages given by the workers and the enterprise The Kappa is only of .325 though.

Table 29. Frequency of absenteeism by enterprise and individual with +/- 1 category (enterprise 4 – T1)

Frequency of absences (N=1353)		
Enterprise	Questionnaire	
Category	Category +/- 1	%
0	0-1	93.0
1	0-1-2	89.1
2	1-2-3	80.5
3	2-3-4	61.9
4	3-4-5	43.0
5	4-5-6	25.7
6	5-6-7	11.4
7	6-7-8	29.1
≥8	7-8	23.5

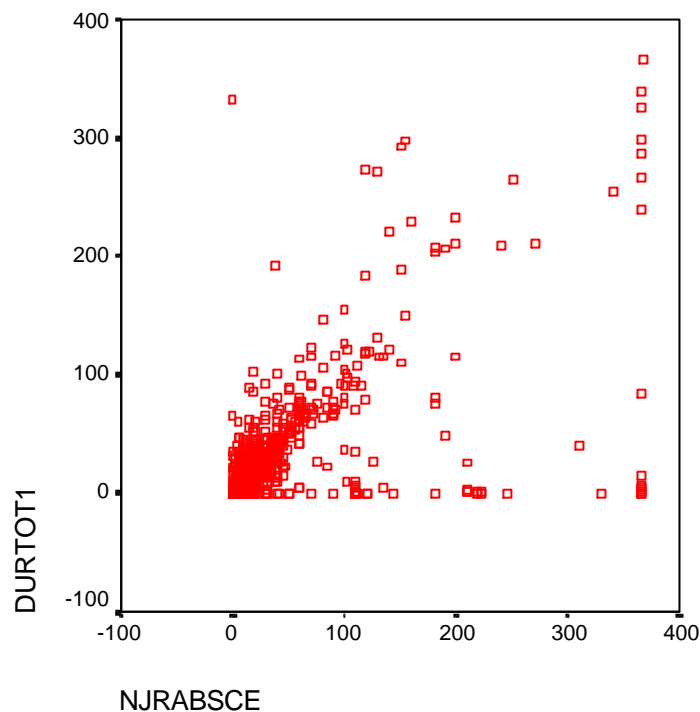


Figure 6. Scatter plot of absenteeism recorded by enterprise 4 and the individual questionnaire at T1

The correlation coefficient is of .604 and the R^2 of 36.4%.

Table 30. Comparison of the frequency of absenteeism by the enterprise and the individual (Enterprise 4 – T2)

FREQUENCY ABSENCES	Enterprise (N=605) %	Questionnaire (N=605) %
0	27.7	31.9
1	22.9	27.8
2	17.0	17.4
3	13.1	9.8
4	6.8	4.5
5	3.5	2.0
6	3.3	1.5
7	2.1	0.7
≥8	3.5	4.6

The obtained Kappa is of .349 which is relatively low.

Table 31. Frequency of absenteeism by enterprise and individual with +/-1 category (enterprise 4 – T2)

Frequency of absences		
Enterprise	Questionnaire	
Category	Category +/- 1	%
0	0-1	96.4
1	0-1-2	66.9
2	1-2-3	46.6
3	2-3-4	33.0
4	3-4-5	17.1
5	4-5-6	19.1
6	5-6-7	5.0
7	6-7-8	30.8
≥8	7-8	19.1

The percentages of agreement again are satisfactory for the first categories, afterwards the precision diminishes.

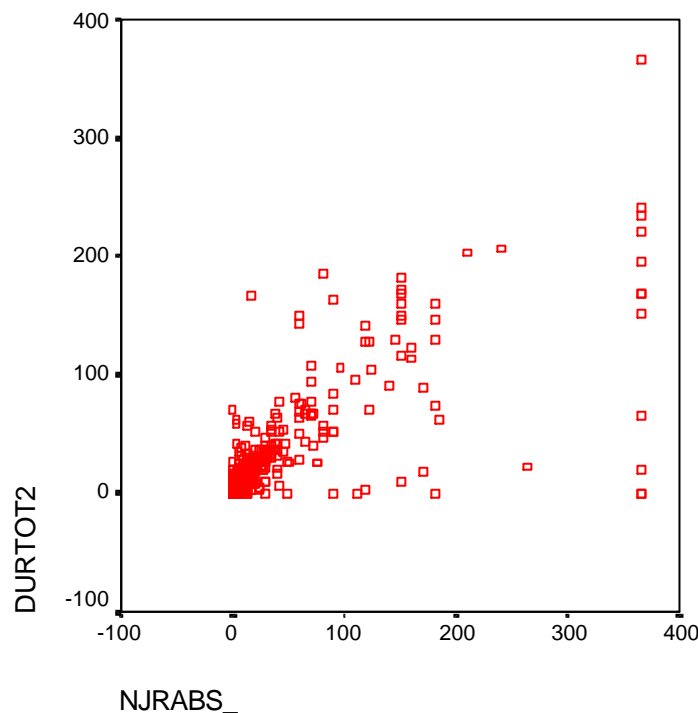


Figure 7. Scatter plot of absenteeism recorded by enterprise 4 and the individual questionnaire at T2

The correlation coefficient is of .751 and the r^2 of 56.4%.

Discussion. Overall the findings are average when one considers the comparison of the distribution of absenteeism reported by the enterprise and the workers, with a strict criterion of one to one category, and even with a more tolerant criterion of one to one +/- one category. The Kappa's or measures of agreement are or average or relatively low for both enterprises at both times of measurement. The direction goes along with what was expected in the sense that workers have the tendency to underscore their absences. But the results obtained with the linear regressions of the values of absenteeism taken as absolute, continuous numbers is much more favorable and allows us altogether to consider the absences reported by the workers as relatively valid and reliable data.

IV.1.2.12. Discussion

Our results allow us to confirm our initial hypothesis. The workers group exposed to cumulative work stress in terms of the effort-reward imbalance model exhibit an elevated risk of poor mental health at second measurement, compared to the reference group without work-related stress at both occasions and without mental health problems at first measurement.

No consistent associations are observed for the demand-control-support model in multivariate analysis. Findings are adjusted for relevant confounders and result from a conservative strategy of analysis. Interestingly, associations of effort-reward imbalance are not reduced when adjusted for contextual variables.

Somstress is the first study applying Effort-Reward Imbalance to a large cohort of employees in Belgium. In recent analysis, satisfactory psychometric properties of the Belgian Effort – Reward Imbalance Questionnaire and good comparability of the scale properties with those from other European studies were documented (Siegrist et al., 2004). Regarding the demand-control-support model, conclusions from longitudinal analysis are less evident. There is now convincing evidence that the two models measure different aspects of a stressful psychosocial work environment and that they contribute independently to the estimation of health risks.

A strong inverse educational gradient of cumulative job strain is observed, whereas cumulative effort-reward imbalance is highest in the group with highest educational attainment. This may be interpreted in terms of measurement overlap, indicating that job strain acts as an indirect measure of education or socio-economic position. Low job control in particular was shown to be related to low socio-economic status. When adjustment for educational attainment is made in multivariate analysis of this study, associations of job strain with mental health almost disappear.

We have chosen for a statistical analysis that is conservative. This may run the risk of underestimating the associations. Indeed, for the prospective analysis the group of employees with mental health problems at T1 was excluded. It may well be that this group suffered from previous work stress and that controlling for caseness attenuates the association under study.

In summary, 4 main conclusions can be drawn:

1. While using the Karasek model, permanent stress is more common among women than men, in the most unstable work environments and in low educational levels.
2. When the Siegrist model of stress is used, the highest proportion of permanent stress is also found in the most unstable environment. But opposed to the Karasek model high level of education is an additional risk. Those two first conclusions confirm our initial hypothesis stating that stress is linked to the work stability and to the threat from global economy.
3. Bivariate data analysis shows a clear relation between work instability and poor health indicators. After adjustment for socio economic variables and stress factors, the prospective results reveal that this relation remains significant for chronic fatigue and long absences.
4. Multivariate analysis highlights the importance of education and gender in the onset of health problems and the important role played by imbalance.

The results of the Somstress survey open new perspectives and suggestions for future researches. Some promising dimensions deserve to be more investigated. Particularly the interference between stress at work and outside work, the spillover and crossover dimensions of stress, in a gender perspective. Violence, bullying and discrimination at work could be further studied and explored.

IV.2. Results KULeuven-team

There were two specific foci for the KULeuven-team. First, there was a focus on both more medical and more psychiatric forms of somatization, namely functional dyspepsia, irritable bowel syndrome and somatoform disorder. Functional dyspepsia and irritable bowel syndromes are two gastrointestinal disorders that have received the last decade increasing attention from a medical perspective (e.g. Drossman et al., 2000). They are functional disorders: functional irregularities are observed without there being a clear identifiable disease causing the symptoms. There is increasing empirical evidence that these disorders are the result of brain-gut interactions (Wood, Alpers, & Andrews, 2000). They therefore form an interesting focus within a research on the impact of stressors at work. It has been investigated in the present research to which extent the symptoms related to these functional disorders occur in a working population, and are sensitive to stressors at work. A second focus was on the comparisons of various stress models in prediction psychosomatic well-being of employees. Besides the scales from the JCD-S-model (the standard model in stress research) and the ERI-model (the rising model in stress research) scales of the LQWQ and the TRIPOD-model have been included in the KULeuven part of the research. In the KULeuven part of the project, the various stress models will be compared on their predictive power of strains.

It might be noted that for some of the analyses an additional fifth sample with two measurement moments is included. This sample stems from the study on which the present project was based, namely from the project PS/03 of the DWTC/SSTC. Since important stressor scales and measures for psychosomatic well-being are the same in the preceding study, including those data assures more robust results. In the preceding study, no information was available about the ERI-O model and about globalization threat. The data from the previous study stem from a different branch of the most unstable firm in the present study. At the first measurement moment 2034 workers responded to the questionnaire of which 68.4% men. Of these 2034, 1173 workers (69.0% men) responded again to the questionnaire after one year.

We will start with investigating the prevalence of functional dyspepsia, irritable bowel syndrome, somatoform disorders, somatization, depression, and anxiety. Then, we will look at the psychometric properties of the responses to the symptoms for FD and IBS. Furthermore, we will investigate how these symptoms relate to other measures of psychosomatic well-being, namely depression, anxiety, somatization and fatigue. Moreover, the four latter measures for psychosomatic well-being will be taken as point of reference for interpreting the relationships of FD-symptoms and IBS-symptoms with outcome variables, personality characteristics, and work stressors, which will be discussed subsequently. We will end with a presentation of the relationships of FD, IBS, psychosomatic well-being indicators, personality, and stressors with organizational stability, sex, age, language group, and socio-professional group.

IV.2.1. Prevalence of somatoform disorders, depression, and anxiety

One of the four main goals of the present research project was “to create a preliminary data bank of the prevalence of somatization and somatoform disorders in a population at work”. In all firms, respondents rated the items of the SCL-somatization, depression and anxiety scale, and the symptoms of functional dyspepsia and irritable bowel syndrome. Moreover, in the firms investigated by the KULeuven team, the respondents rated the symptoms for somatoform disorder from the SPEC-PHQ. Since prevalence can be best investigated with an as large dataset as possible and since the questionnaires on somatization and somatoform disorders have also been included in the preceding study, which formed the direct basis for the current research project, the data from that study have also been included in the current analyses.

Method

While the answers to the questionnaires give information about gradual differences between respondents, the investigation of the prevalence of somatization and somatoform disorders requires selecting a cutoff in order to categorize respondents in one of two categories, namely the absence or presence of a somatization or somatoform disorder diagnosis. We have relied as much as possible on the current literature on somatization and somatoform disorders in order to select the same or comparable criteria.

For the diagnosis of functional dyspepsia and irritable bowel syndrome, we have relied on the ROME-II criteria (Drossman et al., 2000) as much as possible. These are currently authoritative criteria for the diagnosis of these somatoform conditions. Unfortunately, when the questions for the current instrument were constructed, the ROME-I criteria, which are the precursor of the ROME-II criteria, were in use. Therefore, our categorization cannot completely match the current ROME-II criteria. For both functional dyspepsia and the irritable bowel

syndrome both key and supportive symptoms were included in the questionnaire. For studying the prevalence, only the key symptoms are used for diagnosis.

For functional dyspepsia, the diagnostic criteria are the following: “At least 12 weeks, which need not be consecutive, in the preceding 12 months of: (1) Persistent or recurrent dyspepsia (pain or discomfort centered in the upper abdomen); (2) no evidence of organic disease (including at upper endoscopy) that is likely to explain the symptoms; and (3) no evidence that dyspepsia is exclusively relieved by defecation or associated with the onset of a change in stool frequency or stool form (i.e. not irritable bowel)” (Drossman et al., 2000; p306). Since it is very difficult to ask respondents in a questionnaire study to estimate the presence of very specific symptoms over the course of a whole year, respondents were only asked to think about the last three months. This time frame is advised by the ROME-task force for studying FD/IBS via questionnaire research (Drossman et al., 2000). The implication, however, is the underestimation of the prevalence of these conditions. The first criterion is operationalized by the first and the second question of the functional dyspepsia scale. For each respondent that answered a 3 or a 4 on the first or the second question functional dyspepsia was diagnosed. Since the respondents did not undergo a medical examination, asking respondents to describe the diseases they suffer from approached the second criterion. All respondents that reported non-functional stomach and bowel diseases, or liver disorders, or cancer, or a currently grave infection were removed from the analyses. The third criterion was not operationalized. Although irritable bowel symptoms were asked for, we do not know whether these symptoms occur at the same moment, and can thus be expected to cause the functional dyspepsia symptoms. Thus, in comparison to the ROME-II criteria, some overestimation can be expected with respect to the prevalence of FD the last three months.

For the irritable bowel syndrome, the criteria are the following: “At least 12 weeks are more, which need not be consecutive, in the preceding 12 months of abdominal discomfort or pain that has two out of three features: (1) relieved with defecation; and/or, (2) onset associated with a change in frequency of stool; and/or, (3) onset associated with a change in form (appearance) of stool” (Drossman et al., 2000; p360). As with Functional Dyspepsia, the timeframe consisted of the last three months. All three criteria were operationalized in the first four questions of the IBS questionnaire, however, not completely independent of one another. Namely question three and four ask for diarrhea and constipation at the same time, so they refer both to criteria 2 and 3. Since it could not be determined on the basis of the responses whether criterion 2 and 3 occurred jointly or not, in the present study IBS was diagnosed if criteria one and two, or criteria one and three occurred together. This criterion is somewhat more restrictive than the current ROME-II-criteria.

Somatization, depression, and anxiety were measured by means of the somatization, depression, and anxiety scale of the SCL-90, respectively. This scale was not developed to make psychiatric diagnoses. It rather treats somatization, depression, and anxiety as dimensions on which respondents can vary. Luckily, we can rely on a recent and rather extensive study in the Belgian population on the prevalence of somatization, depression and anxiety with the SCL-90 scales (Demarest et al., 2002). For the sake of comparability, we will use the same cutoffs as were used in that study. There, a respondent was diagnosed as somatizing, depressed, or anxious respectively, if the average score across the items of the scales was above the scale mean, namely above 3 on a scale from 1 to 5.

For diagnosing a multi-somatoform disorder with the SPEC-PHQ, we followed as much the criteria proposed by Kroenke, Spitzer, deGruy, Hahn, Linzer, Williams, Brody, and Davis (1997), namely (1) at least 3 of the 14 somatic symptoms should be present the last month (the 15th symptom, menstrual cramps, was not included in order to use the same criteria for men and women), (2) at least one of the symptoms should be present for at least two years, (3) all respondents reporting a non-functional medical disease were removed, and (4) the symptoms should cause social or personal discomfort or disfunctioning. The two other criteria of Kroenke et al. (1997), namely that the symptoms should not fit better another psychiatric diagnosis, and that they should not be produced intentionally, are very difficult to investigate by means of a questionnaire approach, and are therefore not taken into account. Since criterion 2 was not present in the previous study, the data from the previous study were not included for the estimation of the prevalence of the multi-somatoform disorder.

Results

By means of bivariate contingency tables, the relationships of each of the somatization disorders, depression, and anxiety with sex, age, profession status, language group, and firm have been investigated (see Table 32). Moreover, each of these relationships are tested by means of a Chi² on significance. More sophisticated analyses, controlling for the various effects are being described elsewhere in this report.

In the current research, the prevalence of FD is rather low in comparison to what is reported in the literature. About 25% of the population reports chronic or recurrent pain or discomfort in the epigastrium or upper abdomen (Talley & Stanghellini, 2000). In the current sample, the prevalence of about only one fifth of the number.

For irritable bowel syndrome, the prevalence is in line with what is found in Western countries: between 10 and 20% are found to fit the criteria of IBS (Thompson & Longstreth, 2000). In the current study, it is about 18%. For somatization, depression, and anxiety, the prevalence stays far below what was found in the previous large scale research in Belgium (Demarest et al., 2002). There, about 8% was diagnosed as somatizer on basis of the same scale and the same criteria as we used here, while here only about 6.75% met the criteria. Based on the same study, the prevalence for depression was estimated on 9% and for anxiety on 6%, which is much higher than the 3.5% and 3.1% prevalence in the current study. Also for the multi-somatoform disorder, the prevalence is modest in the current research (about 2.55%).

Functional dyspepsia, irritable bowel syndrome, SCL-somatization and SCL-anxiety are more prevalent among females than among males. For SCL-depression and SPEC-somatoform disorder, the same tendencies were observed, although the differences in prevalence between males and females did not reach significance.

Only for FD and SCL-somatization at time 1 the difference in prevalence was significant between the age categories. However, the direction of the effect is not consistent: FD is more prevalent among the younger age category, while SCL-somatization is more prevalent among the older age category.

Professional level was significantly related to the prevalence of FD, IBS, and SCL-somatization. Across the four conditions, the managers had the lowest prevalence. However, the ordering between blue- en white-collars was not consistent.

There were no replicable effects of language group on any of the diagnoses.

The organizations, though, did differ significantly from one another. It is surprising that there is a tendency for the third company to have a high prevalence and for the second company to have a low prevalence for most of the psychosomatic conditions.

Discussion

Except for IBS, the somatoform disorders, depression, and anxiety are much less prevalent than what is found in community research. While for FD this could have been an artifact of the procedure (different studies operationalize the criteria somewhat differently), no such explanation is adequate for the prevalences found with the SCL-scales. These scales have been coded in the same way as a recent large-scale community research in Belgium. Each of these three scales point to a lower prevalence of somatization, depression, and anxiety than in the Belgian population. For possible explanations of these findings, the reader is further referred to the general discussion.

Before continuing, we want to draw the attention to the fact that for the remaining analyses focused on the relationships of psychosomatic complaints with work stressors and personality among others, we have opted to work with scale scores. Scale scores allow for a much finer differentiation between respondents than the absence/presence categorization which was used here to study the prevalence of the psychosomatic conditions.

Table 32. The prevalence (percentages) of Functional Dyspepsia, Irritable Bowel Syndrome, Somatization PHQ, Somatization, Depression and Anxiety SCL

	FD		IBS		SOM SPEC		SOM SCL		DEP SCL		ANG SCL	
	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2
N	5431	2456	5334	2426	1616	755	5258	2285	5258	2285	5258	2285
Overall	5.82	5.78	17.62	18.55	2.88	2.20	2.61	2.93	3.58	3.54	2.95	3.28
Sex												
Male	4.21****	4.12****	12.30****	12.26****	2.52	1.69	1.87****	2.02**	3.09	3.06	2.35**	2.39**
Female	8.00	7.97	25.24	27.08	3.99	3.93	3.65	4.25	4.07	4.14	3.65	4.56
Age												
18-34	6.90*	6.64	17.68	20.10	3.79	3.62	1.65**	2.20	3.23	3.15	2.00	2.52
35-50	5.13	6.00	17.46	18.33	2.20	2.02	3.11	3.32	3.80	3.68	3.35	3.82
50+	5.68	3.17	19.32	17.15	4.07	1.77	2.97	3.00	3.53	3.86	3.90	2.58
Working level												
Blue	5.21	6.33*	16.60****	15.97****	3.49	0.00	3.82*	2.37**	4.78	5.21	3.06	3.79
White	6.06	6.78	19.77	20.97	3.11	3.00	2.74	3.83	3.83	3.97	3.28	3.90
Manag	5.38	3.76	13.45	13.39	1.86	1.42	1.71	1.30	2.78	2.27	2.14	1.94
Language												
Dutch	4.79**	5.21	17.80	18.21	3.52	1.86	2.16	2.74	3.76	3.75	2.64	3.57
French	6.72	6.29	17.39	18.85	1.94	2.79	3.01	3.10	3.41	3.36	3.23	3.02
Company												
1 (a)	5.02***	5.49	16.60***	20.85**	-	-	2.77**	3.55**	4.61	5.10*	3.59*	4.95*
1 (b)	4.59	4.42	15.52	17.95	3.12	1.33	2.55	2.48	3.94	4.00	2.87	3.05
2	5.70	5.20	15.49	10.27	2.64	4.05	0.67	1.49	0.67	3.70	0.67	4.00
3	8.79	8.30	21.10	20.53	-	-	4.37	5.29	3.44	3.37	3.31	3.37
4	6.65	5.94	20.59	18.76	-	-	1.81	1.78	2.37	2.22	2.48	2.22

Note. All results are based on bivariate analyses. * $p < .05$, ** $p < .10$, *** $p < .001$, **** $p < .0001$

IV.2.2. Internal structure of the Functional Dyspepsia and Irritable Bowel Syndrome symptoms

For diagnosing functional dyspepsia and irritable bowel syndrome a new questionnaire was constructed for the present research that operationalized the ROME-I and ROME-II criteria. Since it was a new questionnaire, the validity of the questionnaire still had to be established. In the current section, we focus on the internal structure of the questionnaire. The question here is whether the responses of the respondents empirically confirm the distinction between FD and IBS symptoms. This question is especially relevant since we know that scales probing for somatic complaints, such as the SCL-somatization scale, tend to be unidimensional.

Method

Unlike the responses to the FD symptoms, which were scored on a 4-point Likert scale, the respondents scored the IBS symptoms dichotomously. The latter responses did not meet the criteria for applying a classical factor analysis. However, optimal scaling principal component analysis can be applied on these data. The difference with classical factor analysis is that the items are assumed to be measured on an ordinal (or even nominal) measurement level. As a classical factor analysis, optimal scaling principal component analysis produces a matrix with factor loadings, which can be interpreted in the same way.

The internal structure was analyzed for the Dutch- and the French-speaking sample separately at the two moments of measurement.

Except for two items, namely items A5 and A6, none of the other items make a distinction between diarrhea or constipation predominant complaints. For the sake of consistency, A5 and A6 have been recoded into one single item probing deviations in the frequency of stool. After this recoding, both the FD- and the IBS-scale contained nine items.

Results

The scree test clearly indicated a two-dimensional structure. This structure accounted for 45.9% at moment 1 (N = 2353) and for 48.5% at moment 2 (N = 1069) of the optimally scaled total variance in the Dutch-speaking sample, and for 45.3% at moment 1 (N = 2777) and for 48.1% at moment 2 (N = 1507) in the French-speaking sample. A VARIMAX-rotation of the structure clearly revealed the theoretically expected structure, with the IBS-symptoms loading highest on the IBS-component and the FD-symptoms loading on the FD-component. This was the case in all four samples (see Table 33).

Table 33. IBS and FD component loadings per language group and moment of measurement

Medical symptom	Dutch				French			
	IBS1	FD1	IBS2	FD2	IBS1	FD1	IBS2	FD2
Abdominal discomfort with constipation or diarrhea	<u>.77</u>	.14	<u>.80</u>	.20	<u>.76</u>	.18	<u>.77</u>	.20
Abdominal discomfort relieved with defecation	<u>.72</u>	.12	<u>.72</u>	.16	<u>.69</u>	.12	<u>.71</u>	.12
Abdominal pain with constipation or diarrhea	<u>.72</u>	.12	<u>.74</u>	.23	<u>.70</u>	.21	<u>.76</u>	.18
Difficult stool	<u>.72</u>	.16	<u>.70</u>	.20	<u>.68</u>	.15	<u>.70</u>	.14
Abdominal pain relieved with defecation	<u>.69</u>	.12	<u>.73</u>	.19	<u>.69</u>	.14	<u>.72</u>	.10
Bloating	<u>.68</u>	.27	<u>.59</u>	.39	<u>.64</u>	.29	<u>.60</u>	.33
Change in type of stool	<u>.60</u>	.17	<u>.68</u>	.20	<u>.62</u>	.16	<u>.60</u>	.23
More than 3 stool a day or less than 3 stools a week	<u>.54</u>	.12	<u>.53</u>	.12	<u>.54</u>	.12	<u>.58</u>	.13
Passage of mucus	<u>.32</u>	.18	<u>.30</u>	.14	<u>.36</u>	.12	<u>.49</u>	.07
Nausea	-.00	<u>.72</u>	.16	<u>.59</u>	.15	<u>.63</u>	.10	<u>.68</u>
Discomfort in the upper abdomen	.21	<u>.70</u>	.27	<u>.72</u>	.15	<u>.74</u>	.16	<u>.75</u>
Vomiting	-.05	<u>.66</u>	.08	<u>.43</u>	.04	<u>.51</u>	.05	<u>.59</u>
Pain in the upper abdomen	.24	<u>.65</u>	.29	<u>.68</u>	.19	<u>.74</u>	.19	<u>.74</u>
Bloating in the upper abdomen	.38	<u>.65</u>	.28	<u>.74</u>	.34	<u>.68</u>	.31	<u>.69</u>
Fullness	.26	<u>.63</u>	.19	<u>.76</u>	.26	<u>.62</u>	.28	<u>.65</u>
Burning feeling in the upper abdomen	.15	<u>.63</u>	.22	<u>.64</u>	.11	<u>.71</u>	.09	<u>.70</u>
Early satiety	.24	<u>.54</u>	.14	<u>.68</u>	.21	<u>.56</u>	.19	<u>.61</u>
Belching	.19	<u>.50</u>	.19	<u>.54</u>	.20	<u>.51</u>	.12	<u>.52</u>

Based on this information, it was decided to make scales for FD- and IBS-symptoms. The FD-scale was computed as the average score across the nine FD-symptoms, and ranged from 0 (no complaints at all) to 4 (unbearable burden for all symptoms). The IBS-scale consisted of the sum of the nine symptoms, and thus ranged from 0 (no symptoms) to 9 (all symptoms). At all measurement moments and in the two language groups these scales had an adequate internal consistency (Cronbach's Alpha ranged from .82 to .86). At the two moments of measurement, these two scales were substantially related ($r = .56$).

Discussion

The internal structure analyses and the reliability coefficients support the quality of the new FD- and IBS-scale. As theoretically expected, the FD- and the IBS-symptoms each have their highest loading on the predicted factor across the two language groups and the two moments of measurement. Thus, also a questionnaire approach applied in a working population reveals two related but differentiated somatic conditions. Moreover, the reliability coefficients are satisfactory from a psychometric point of view. The scale scores will further be used as operationalizations for the degree of FD- and IBS-symptomatology.

IV.2.3. Relationships with psychosomatic well-being

Since FD and IBS are functional conditions presumably caused and intensified by life stressors via brain-gut interactions, it is predicted that the extent to which these conditions are present is substantially related to other indicators of psychosomatic unwell-being. In the present study, somatization (SCL), anxiety (SCL), depression (SCL), and chronic fatigue have been investigated in the four firms and can be related to FD and IBS.

Method

At each of the two measurement moments, the FD- and the IBS-scales have been correlated to the measures of psychosomatic unwell-being across the four firms and the across the data from the previous research project. All subjects with missing values have been deleted pairwise.

Results

All correlations range from .38 to .64 (see Table 34). Both FD and IBS correlate highest with somatization, then with anxiety and depression, and then with fatigue. At the two measurement moments, the correlations are higher for FD than for IBS, and at the second measurement moment than at the first one.

Table 34. Pearson correlations between FD, IBS, and four indicators of psychosomatic unwell-being

	FD		IBS	
	T1	T2	T1	T2
SCL-somatization	.58	.64	.49	.52
SCL-anxiety	.45	.54	.40	.44
SCL-depression	.43	.52	.39	.43
Fatigue	.41	.44	.38	.39

Note. At T1 5170 <= N <= 5292, at T2 2510 <= N <= 2643.

Discussion

As expected, there are substantial relationships between FD, IBS, and other indicators of psychosomatic unwell-being. Moreover, the correlations are highest for somatization, which seems to indicate that these medical conditions form specific manifestations of a tendency to experience psychological stress in a somatic way. Moreover, these findings form a first empirical justification of including these medical conditions in research on stress at work.

IV.2.4. Psychosomatic unwell-being and its relationships with social functioning, medical consultation, and absenteeism

In the present section, we focus our attention on to how the diverse forms of psychosomatic unwell-being investigated in the present study, predict impaired social functioning, medical consultation, and absenteeism. Hereby, we investigate to which extent psychosomatic unwell-being has not only effects for the individual, but for his or her environment, firm, and for society at large (via medical consumption and reliance on social security system).

Method

For investigating the extent to which psychosomatic unwell-being (SCL-somatization, SCL-anxiety, SCL-depression, fatigue, FD and IBS) predict impaired social functioning, medical consultation, and absenteeism bivariate regression analyses have been performed. For the psychosomatic scales, the lowest possible score was zero, meaning that no symptoms at all were reported. Thus, the intercept of the regression models refers to the expected impaired social functioning, medical consultation, and absenteeism when no symptoms at all were reported. Impaired social functioning was measured by averaging the two items of the SF-scale (see method). Medical consultation was measured by summing the total number of consultations at the general practitioner and

the specialist. Absenteeism was measured by taking the total days of self-reported absenteeism the last 12 months.

Results

All bivariate regression analyses significantly predicted the outcome variables at a significance level of .01. As can be seen in Tables 35 to 37, the SCL-scales predict best the outcome variables. FD and IBS predict these least well, and the predictive power for fatigue lies in between. Impaired social functioning is best predicted by depression, while medical consultation and absenteeism is best predicted by somatization. In general, impaired social functioning can be predicted substantially ($.14 \leq R^2 \leq .36$) and medical consultation moderately ($.05 \leq R^2 \leq .13$). For absenteeism, the predictive power is limited ($.01 \leq R^2 \leq .05$). Despite the limited predictive power, pointing to a large unexplained variation in absenteeism by these indicators of psychosomatic unwell-being, an increase of one scale point on the SCL-depression scale leads to a predicted increase of about 10 days absenteeism during the last 12 months.

Table 35. Regression analyses with Social Functioning as criterion and FD, IBS, SCL-depression, SCL-anxiety, SCL-somatization, and fatigue as predictors at time 1 and time 2

	A T1	B T1	β T1	R^2 T1	A T2	B T2	β T2	R^2 T2
SCLDEP	1.51	.93	.60	.36	1.60	.97	.63	.40
SCLSOM	1.47	.93	.57	.32	1.57	.90	.55	.30
SCLANG	1.57	.90	.56	.31	1.69	.90	.55	.30
FATIGUE	1.15	.32	.54	.30	1.21	.33	.56	.31
FD	1.61	1.05	.42	.17	1.73	1.02	.41	.16
IBS	1.71	.15	.37	.14	1.81	.14	.35	.12

Note. At T1 5304 \leq N \leq 5557, at T2 1985 \leq N \leq 2067.

Table 36. Regression analyses with Number of Visits Medical Doctor as criterion and FD, IBS, SCL-depression, SCL-anxiety, SCL-somatization, and fatigue as predictors at time 1 and time 2

	A T1	B T1	β T1	R^2 T1	A T2	B T2	β T2	R^2 T2
SCLSOM	2.66	3.93	.36	.13	2.83	3.70	.36	.13
SCLDEP	3.19	3.22	.31	.10	3.52	2.78	.29	.09
SCLANG	3.27	3.37	.31	.10	3.70	2.79	.27	.07
FATIGUE	2.07	1.03	.26	.07	2.05	1.09	.30	.09
FD	3.36	3.98	.23	.06	3.37	4.28	.28	.08
IBS	3.67	.60	.22	.05	3.62	.63	.26	.07

Note. At T1 5132 \leq N \leq 5372, at T2 1885 \leq N \leq 1962.

Table 37. Regression analyses with days of Self-Reported Absenteeism as criterion and FD, IBS, SCL-depression, SCL-anxiety, SCL-somatization, and fatigue as predictors at time 1 and time 2

	A T1	B T1	β T1	R^2 T1	A T2	B T2	β T2	R^2 T2
SCLSOM	7.35	9.57	.22	.05	6.20	10.54	.23	.05
SCLDEP	8.50	8.66	.21	.04	6.93	10.38	.24	.06
SCLANG	9.46	7.61	.18	.03	8.16	8.95	.20	.04
FATIGUE	5.33	2.58	.17	.03	4.16	2.89	.18	.03
FD	9.44	7.31	.12	.02	7.82	10.57	.16	.05
IBS	10.43	1.00	.10	.01	8.88	1.46	.14	.02

Note. At T1 2807 \leq N \leq 2915, at T2 1739 \leq N \leq 1819.

Discussion

All indicators of psychosomatic unwell-being can significantly predict the three outcome variables. This finding justifies the focus on these indicators when studying the processes by which stressors at work can lead to these outcome variables.

It has to be noted that the size of the predictive power for FD and IBS was smaller than for somatization. A possible explanation for this finding is that both FD and IBS focus on one specific type of somatic complaints, namely those focused on stomach and bowel functioning, while the focus of the SCL-somatization scale is very broad.

The results with the self-reported absenteeism have to be interpreted with care. A large proportion did not answer the total number of absenteeism days, so that one can question the generalization of these results.

IV.2.5. Work stressors and lack of psychosomatic well-being

Now that we have shown that FD and IBS relate to other general indicators of psychosomatic unwell-being, and that they relate to important outcome measures such as impairment, medical consultation, and absenteeism, we now turn our attention to the question whether and to which extent FD, IBS, and the general indicators of psychosomatic unwell-being are sensitive to stressful job characteristics.

For FD and IBS, the present study forms the first large scale study investigating whether and how these medical conditions are sensitive to work stressors. In the FD/IBS literature, the focus is mainly on life stressors, such as abuse. However, as functional conditions following from brain-gut interactions, it can also be expected that they can result from more common work stressors.

A contribution of especially the KULeuven part lies in the comparison of four different stress models, namely the JCD-S-model, the ERI-model, the LQWQ-model, which forms an extended version of the JCD-S-model, and the TRIPOD-model. Three very different theoretical backgrounds underlie these four models. The JCD-S- and the LQWQ-model mainly focus on the characteristics that are specific to the job, and focuses on work control, work demands, and social support. The ERI-model is based on sociological social exchange theory, and predicts strain as a result of an imbalance in the social exchange. Although the TRIPOD-model was developed in 1994 by Wagenaar, Groeneweg, and Hudson, and focuses on how organizational characteristics form vulnerability factors for accidents, it is only very recently that this model has been applied to account for strain at work (Akerboom & Maes, 2003). In the present section, we investigate how good each of these models can predict psychosomatic unwell-being. Furthermore, we want to know how good psychosomatic unwell-being can be predicted by combining the stressors from all these models together. Moreover, two of these models can be conceptualized as interaction models, namely the JCD-S- and the ERI-model. According to the JCD-S-model, the aversive impact of high job demands can be buffered by high job control and high social support. The authors that developed the ERI-model, operationalize ERI by computing the ratio of efforts and rewards, and thus focus on the interaction between these two terms. Based on the large samples of the present study, it is tested whether taking into account these interactions adds to the predictive power of these two models.

Finally, because of its longitudinal nature – each respondent was asked to collaborate a second time after one year – it was possible to investigate to which extent a change in stressors has led to a change in psychosomatic unwell-being. The advantage of this longitudinal approach is that it can offer much stronger support for causal relationships between stressors and strains. One of the most important alternative explanations for cross-sectional relationships between stressors and strains form the personality traits. For instance, respondents high on neuroticism are hypothesized to complain both more about their working conditions (stressors) and about a lack of physical and mental well-being (strains). However, the relationships between changes in stressors with changes in strains are far less likely to be accounted by such personality characteristics.

Method

The JCD-S-model was included in all firms investigated in the present and the previous project, and was investigated on the total sample. The LQWQ- and the TRIPOD-model was investigated in all firms screened by the KULeuven-team in the present and the previous research project. The ERI-model was included in all firms investigated in the present research project. Thus, only the firms investigated by the KULeuven-team in the present research project were screened on the stressors from all four models.

The investigation of the predictive power of the four stress models was done by means of multiple regression models, with the work stressors being the predictors and the psychosomatic unwell-being variables the criteria. With these analyses, however, we were faced with the problem of empirical overlap between the items and scales of the four stress models. Although these models stem from three very different theoretical models, their operationalizations are not independent. For instance, there is an overlap between the demands of the JCD-S-model and the efforts of the ERI-model. Another example is the overlap between the social support of the JCD-S-model, the reward of the ERI-model, and the work climate of the TRIPOD-model. This overlap is problematic for comparing stressors from these models. It causes multicollinearity, and thereby unreliability of the regression weights. Even more problematic, however, is that it leads to uninterpretable regression weights if all models are combined. A regression weight represents the impact of a predictor on the criterion when holding all other predictors constant. However, when there is empirical overlap between one predictor and other predictors, it becomes unclear to what the weight precisely refers to. Therefore, we have followed a two-step procedure. We have first focused on the overall predictive value of the stress models (the R^2), which is not affected by multicollinearity nor by empirical overlap. Then, we have worked with bivariate correlations between the individual stressors from each of the models and the criteria.

We have investigated to which extent a change in each of the stressors across the two measurement moments lead to a change in psychosomatic unwell-being. This was done by computing partial correlations between pairs of stressors and unwell-being indicators at time 2, controlled for their level at time 1.

Finally, it has to be noted that all stressors have been scored in such a way that the higher the score on the stressor, the higher the predicted level of unwell-being.

Results

Comparison of the stress models. At the two moments of measurement, each of the four stress models contributes significantly and substantially to the prediction of each of the indicators of unwell-being (see Table 38), with R^2 ranging from .043 up to .264). It can also be seen that SCL-depression is best predicted by the stressors and the IBS is least well predicted by them. There is no agreement between the two measurement moments about which stress model does predict the strains best. At moment one, the ERI outperforms the JCD-S and the TRIPOD model (see Table 38). A time two, however, the TRIPOD-model clearly outperforms the three other models (see Table 38). It can also be seen that at measurement moment two, the predictive power is higher for all regression analyses. Furthermore, the four models are not merely interchangeable. In most cases, the overall model implies a substantial improvement in comparison to each of the specific stress models. Another interesting finding is that the models including interaction terms for the JCD-S- and the ERI-model do not lead at all to a substantial increase of the predictive value of these models at none of the two measurement moments.

Table 38. Percentage of variance accounted for the psychosomatic unwell-being scales by JCD-S, JCD-S-I, ERI, ERI-I, LQWQ, TRIPOD, and stress models jointly at time 1 and time 2

	JCD-S		JCD-S-I		ERI		ERI-I		LQWQ		TRIPOD		ALL	
	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2
SCLDEP	12.1	14.3	12.5	16.0	16.2	18.2	16.3	18.4	14.7	23.6	9.9	26.4	21.5	29.5
SCLSOM	9.9	12.7	10.4	14.1	12.5	13.8	12.7	14.1	15.2	21.5	9.6	22.8	21.7	27.4
SCLANG	10.2	11.5	10.6	13.5	12.2	13.8	12.4	14.0	12.8	21.2	7.2	24.0	17.0	26.3
FATIGUE	10.1	12.2	10.2	12.4	12.9	13.0	12.9	13.0	12.8	16.5	9.1	20.4	20.5	23.8
FD	4.3	5.4	4.6	6.0	5.3	5.8	5.4	6.1	6.9	11.9	6.1	15.1	13.1	22.8
IBS	4.6	4.9	4.7	5.5	4.5	4.4	4.5	4.5	6.6	9.6	4.7	11.9	11.3	21.4

Note. JCD-S-I and ERI-I: models with interaction terms included, At T1 1660 ≤ N ≤ 5462, at T2 572 ≤ N ≤ 2647.

Bivariate and partial relationships between stressors and psychosomatic unwell-being indicators. Because of the large sample sizes, almost all bivariate correlations are statistically significant (see Table 39). They range from a meager .03 up to .44. Now, we will focus on the most important results from each of the stress models.

The most surprising finding from the JCD-S-model is that the stressor “lack of control” is less strongly related to psychosomatic unwell-being than the other two stressors. It is surprising since the job control is the most important dimension of the model: it is even hypothesized to buffer the negative impact of job demands. Moreover, it might be noted that lack of social support is the most important predictor.

The results with the LQWQ-model throw in an interesting light on the previous findings. Besides specific stressors, it mainly offers a more extended operationalization of the JCD-S-model. The “lack of control” stressor is further split up in three dimensions, namely lack of decision authority, lack of task control, and lack of skill discretion. Here it becomes clear that it is only the lack of skill discretion dimensions that is poorly related to the health indicators. The other two facets are much more important. Furthermore, it comes to the fore that lack of social support from the supervisor has much more negative impact than lack of social support from colleagues. The most important stressor from the LQWQ prediction health outcomes is role ambiguity.

In the ERI-model “lack of rewards”, and especially the “lack of esteem reward”, is related more strongly to the outcomes than the “efforts”.

For the TRIPOD-model, the most important predictor is “non-supportive working climate”. The most surprising finding here is the spectacular increase in predictive power of the TRIPOD-stressors from the first to the second moment of measurement. Some correlations more than double in size.

Finally, almost all partial correlations remain significant, and can be as high as .31. Thus, changes in work stressors the preceding year do lead to changes in self-rated physical and mental health.

Table 39. Bivariate and partial correlations between stressors and indicators for psychosomatic unwell-being

	FD			IBS			Depression			Anxiety			Somatizatoin			Fatigue			Mean		
	T1	T2	P	T1	T2	P	T1	T2	P	T1	T2	P	T1	T2	P	T1	T2	P	T1	T2	P
JCD-S																					
Lack of social support	.14	.17	.15	.13	.12	.07	.27	.32	.25	.23	.26	.22	.22	.27	.20	.22	.25	.18	.20	.23	.18
Demands	.14	.16	.08	.14	.15	.07	.19	.22	.16	.21	.23	.18	.20	.24	.17	.22	.26	.17	.18	.21	.14
Lack of control	.12	.11	.08	.13	.13	.05	.21	.19	.13	.17	.14	.12	.18	.17	.10	.16	.15	.10	.16	.15	.10
ERI																					
Lack of rewards	.19	.19	.12	.19	.18	.10	.39	.39	.28	.32	.33	.25	.33	.34	.22	.31	.31	.20	.29	.29	.19
Lack of esteem reward	.18	.19	.12	.17	.16	.12	.36	.38	.29	.29	.31	.25	.29	.31	.22	.30	.30	.22	.27	.28	.20
Lack of promotion & job security	.20	.18	.10	.19	.17	.07	.35	.34	.23	.30	.28	.20	.32	.31	.19	.31	.29	.15	.28	.26	.16
Efforts	.15	.16	.08	.11	.11	.08	.15	.20	.15	.17	.20	.15	.16	.19	.15	.21	.21	.17	.16	.18	.13
LQWQ																					
Role ambiguity	.12	.20	.15	.12	.17	.11	.21	.31	.22	.17	.27	.21	.15	.24	.17	.20	.28	.17	.16	.25	.17
Lack of social support supervisor	.15	.16	.11	.14	.11	.04	.26	.30	.23	.22	.25	.21	.22	.25	.18	.22	.23	.16	.20	.22	.16
Lack of decision authority	.17	.23	.17	.16	.20	.11	.26	.32	.21	.23	.28	.18	.26	.26	.12	.22	.22	.13	.22	.25	.15
Lack of task control	.17	.21	.12	.17	.19	.05	.24	.28	.22	.24	.28	.21	.27	.30	.15	.20	.21	.12	.22	.25	.14
Work and time pressure	.14	.16	.08	.14	.15	.07	.19	.22	.16	.21	.23	.18	.20	.24	.17	.22	.26	.17	.18	.21	.14
Lack of social support colleague	.06	.12	.12	.06	.09	.09	.16	.20	.16	.13	.16	.12	.11	.17	.13	.12	.16	.12	.11	.15	.12
Physical exertion	.10	.12	.13	.10	.10	.10	.11	.13	.12	.11	.16	.12	.20	.24	.17	.05	.08	.10	.11	.14	.12
Job insecurity	.08	.10	.09	.09	.11	.07	.19	.22	.14	.18	.19	.12	.17	.18	.10	.13	.15	.09	.14	.16	.10
Hazardous exposure	.07	.12	.10	.06	.11	.08	.09	.14	.11	.09	.17	.12	.16	.22	.11	.03	.07	.08	.08	.14	.10
Lack of skill discretion	.07	.07	.05	.09	.09	.02	.14	.09	.06	.10	.07	.05	.11	.09	.04	.09	.09	.06	.10	.08	.05
TRIPOD																					
Non-supportive work climate	.13	.28	.19	.10	.23	.15	.19	.44	.31	.16	.41	.31	.16	.36	.26	.19	.32	.24	.16	.34	.24
Problems with task communication	.18	.34	.20	.16	.29	.16	.24	.42	.27	.21	.39	.26	.24	.41	.22	.24	.39	.26	.21	.37	.23
Problems with allocation of personnel	.17	.29	.20	.17	.27	.17	.20	.35	.23	.17	.36	.26	.20	.36	.22	.20	.35	.25	.19	.33	.22
Lack of job skills	.15	.27	.18	.12	.28	.16	.19	.37	.22	.16	.37	.25	.17	.36	.19	.20	.36	.24	.17	.34	.21
Lack of training opportunities	.15	.19	.10	.14	.20	.13	.22	.28	.20	.18	.25	.18	.21	.26	.17	.19	.23	.16	.18	.24	.16
Lack of maintenance equipment	.17	.28	.14	.14	.25	.15	.19	.28	.13	.17	.30	.14	.22	.31	.12	.17	.27	.17	.18	.28	.14
Rest																					
Globalization	.04	.08	.06	.04	.10	.05	.17	.18	.05	.16	.18	.09	.16	.20	.10	.09	.12	.08	.11	.14	.07
Job dissatisfaction	.18	.17	.12	.17	.16	.07	.34	.34	.22	.28	.29	.19	.28	.29	.17	.31	.30	.19	.26	.26	.16
Lack of meaning of work	.09	.19	.18	.10	.11	.05	.19	.27	.23	.15	.24	.21	.14	.21	.16	.19	.21	.15	.14	.21	.16

Note. At T1 3358<= N <=5574, at T2 1220<= N <=2738.

Discussion

An important observation is that each of the four stress models contributes significantly and substantially to the prediction of psychosomatic unwell-being. Furthermore, detailed analyses with each of the stressors from the four models revealed that all are significantly related to psychosomatic unwell-being. Moreover, jointly these four models account for between 11% and 29.5% in the indicators of psychosomatic unwell-being. All these findings convey a clear message; stress at work is not the result from a single or even a few work stressors. There are a variety of stressors that each contribute to the physical and psychological strain, and should be included in the study in order to get a fuller understanding of the effects of working conditions on physical and mental health and. Thus, this study invites us to combine a focus on specific job characteristics with an organizational focus, and to combine a more psychological with a more sociological perspective.

Both for the JCD-S and for the ERI-model, we found that the interaction formulation of these models had barely a higher predictive value than a simple additive formulation. This finding was already extensively reported in the literature for the JCD-S-model (van der Doef & Maes, 1998), but it is the first time that this was found for the ERI-model. Thus, the strains are a result of an additive combination of the stressors.

Across the four models, there is a tendency for scales measuring a lack of social support to be the most strongly related to work strains. Thus, more than the direct demands or efforts required by the job, it is the lack of support and esteem from one's colleagues, and especially from one's supervisor, that predict psychosomatic unwell-being. More fine-grained conclusions are difficult to be made on the basis of the present results because of the empirical overlap between the items from the various scales. Given the fact that we find significant and substantial predictions for each of the models, and given the fact that we also identified overlap in the operationalization, the present study calls for both a theoretically and empirically integration of the four models. Only on the basis of such integration, it will be possible to investigate the relative importance of each of the (non-overlapping) stressors. One promising basis for integrating the various stress models is the appraisal emotion theory. According to this approach emotion processes are triggered because emotion relevant appraisals have been made. The work stressors can be seen as emotion relevant appraisals that are specific for the workplace.

Another finding deserving comment is that the predictive value of each of the stress models increases the second measurement moment, with a surprising increase especially for the LQWQ and the TRIPOD-model. One possible post hoc explanation for this finding could be that respondents somehow start thinking about the questions they have been responding to. This could lead to more well-considered responses the second moment of measurement. Another possible explanation is that it are especially the more conscientious respondents that do respond the second measurement moment. Less conscientious respondents are probably more put off by the length of the survey. This could have lead to an increase in the reliability, and thus the validity of the second measurement moment. This seems to point to the fact that single cross-sectional designs, which are most common in stress research, probably underestimate the size of the impact of stressors on physical and mental health.

One of the most important findings here are the results from the partial correlations. Even after controlling for the level of the stressor and the strain variable at the first moment of measurement, pairs of stressors and strains remain substantially correlated at the second measurement moment. This means that a change in stressor across the past 12 months leads to a change in strain. This forms important evidence for the causal interpretation of the relationship between stressors and strains. While it is still possible in a cross-sectional design to argue that the relationships are the result of stable third variable that is responsible for both the score on the stressors and the strains, such as personality traits, no such account can be given for the partial correlations.

IV.2.6. Work stressors and their relationships with work-related attitudes and personality traits

Two personality traits (neuroticism and alexithymia) and two work-related attitudes (inability to withdraw from work and need for approval) have been included in the present study. In the literature two important hypotheses are formulated with respect to the personality traits. On the one hand, especially neuroticism is assumed to partially explain the relationships between strains and stressors. People high on neuroticism would complain both more about their working conditions and about a lack of psychosomatic well-being. Therefore it is advised in the literature to control the relationships between strains and stressors for neuroticism. On the other hand, these personality variables are assumed to play the role of moderators. People high on these traits are assumed to be more susceptible to developing strain in response to the work stressors.

The work-related attitudes of inability to withdraw from work and need for approval come from the ERI-model of Siegrist and Peter (1998). In that model a distinction is made between the efforts demanded by the job, or extrinsic efforts, which we already analyzed and discussed, and work-related attitudes that orient a person intrinsically on one's work, also called intrinsic efforts. Especially workers with an inability to withdraw from work and a high need for approval by others, are assumed to be susceptible for experiencing effort reward imbalance.

For both the personality traits and the work-related attitudes it is hypothesized that they are strongly related to the strains, and that they account for or moderate the relationships between stressors and strains. In both cases, the assumption is that both are more or less stable orientations that precede the stressors and subsequent strains. Because of the longitudinal design, we test this assumption.

Method

Bivariate Pearson correlations are used for investigating the relationships between the personality characteristics and the strains. For investigating the stability of the measurements for the personality traits and the work-related attitudes, partial correlations have been computed between these measurements and the stressors at time 2 controlled for time 1. For neuroticism and alexithymia also the data from the previous research project have been included.

Results

Both the personality and attitude measures correlate significantly and substantially (ranging from .22 to .66) with all measures of psychosomatic well-being (see Table 40). On average, neuroticism correlates the highest with these scales, and the Need for Approval the lowest. Moreover, there is an interesting pattern with the neuroticism-scale correlating substantially higher with depression, anxiety and somatization than the TAS, while no such effects are found for FD, IBS and SCL-somatization.

Table 40. Bivariate correlations between personality measures, work-related attitudes, and indicators of psychosomatic unwell-being

	TAS1	TAS2	NEO1	NEO2	NFA1	NFA2	IWW1	IWW2
FD	.36	.41	.37	.42	.23	.26	.25	.27
IBS	.33	.37	.34	.39	.21	.24	.22	.27
SCLDEP	.55	.53	.67	.66	.29	.32	.41	.43
SCLANG	.51	.51	.60	.60	.29	.32	.41	.41
SCLSOM	.48	.51	.50	.50	.28	.30	.35	.35
FATIGUE	.44	.42	.52	.54	.26	.27	.35	.34

Note. At T1 3376<= N <=5543, at T2 1943<= N <=2818.

Partial correlations between the trait and work-related attitude measurements and the stressors at time 2 controlled for time 1 (see Table 41) are substantial, and are about as high as for the strains. This especially holds for neuroticism and for inability to withdraw from work. Thus, a change in work stressors the past 12 months also leads to a change in the position on the neuroticism, alexithymia, inability to withdraw from work, and need for approval scales.

Discussion

As predicted by the literature neuroticism, alexithymia, inability to withdraw from work and need for approval are substantially related to the strains. However, the partial correlations demonstrate that these measurements are not only measuring stable characteristics of the person, but that they are also state-sensitive. This means that these scales measure to some extent the strains resulting from the work stressors. This sheds a whole new light on the practice advised in the literature of controlling stressor-strain relationships for neuroticism. By applying this control the effects of work stressors are underestimated. Moreover, the state-sensitiveness of these measurements makes them unsuitable as moderator variables, since they confound antecedents with consequences.

Table 41. Partial correlations between stressors, work-related attitudes and personality variables at time 2 controlled for time 1

	<u>NEO</u>	<u>TAS</u>	<u>NFA</u>	<u>IWW</u>
JCD-S				
Lack of Control	.13	.10	-.04	.02
Demands	.10	.08	.19	.26
Lack of Social Support	.18	.14	.08	.21
ERI				
Lack of rewards	.26	.19	.10	.23
Lack of esteem reward	.25	.18	.12	.25
Lack of promotion & job security	.21	.17	.11	.21
Efforts	.11	.08	.21	.30
LQWQ				
Lack of skill discretion	.09	.07	-.07	-.04
Lack of decision authority	.18	.14	.03	.11
Lack of task control	.17	.11	-.01	.08
Work and time pressure	.10	.08	.19	.26
Job insecurity	.13	.10	.01	.07
Lack of social support supervisor	.14	.10	.07	.20
Lack of social support colleague	.15	.13	.05	.13
Role ambiguity	.21	.14	-.01	.11
Physical exertion	.09	.10	.05	.12
Hazardous exposure	.11	.12	.07	.09
TRIPOD				
Problems with allocation of personnel	.18	.14	.15	.24
Problems with task communication	.20	.19	.18	.26
Non-supportive work climate	.31	.23	.10	.19
Lack of job skills	.23	.25	.15	.24
Lack of training opportunities	.15	.08	.03	.13
Lack of maintenance equipment	.13	.10	.21	.27
Rest				
Globalization	.10	.07	.08	.09
Job dissatisfaction	.20	.13	.08	.19
Lack of meaning of work	.22	.14	.01	.06

Note. 636 <= N <= 2284.

IV.2.7. Stressors, strains, and their relationships with organizational change, socio-demographic and socio-professional variables

In the previous sections, we have demonstrated that the strains are related to both stressors and the stress outcome variables. Moreover, we have demonstrated that the personality measurements and the work-related attitudes are not alone related to the strains, but are also state-sensitive. The question now remains whether the stressors, the personality measurements, the work-related attitudes, and the strains are sensitive to organizational change. Selecting four firms that differed in the pressure they experienced for organizational change operationalized this variable. The impact of organizational change was investigated by controlling for the socio-professional and socio-demographic (sex, age, and language) variables.

Method

Regression analyses were performed with firm (organizational change), sex, age, language group and socio-professional group as independent variables. Where possible, the data from the previous research project were included in the analyses. For the present analyses, the data from the previous research project were treated as being from a different firm (in reality they were from the same firm as the most unstable firm in the current study, but from a different plant). All independent variables were dummy coded. The reference category is the male Dutch-speaking white-collar worker of the middle age category in the most changing company of the current study. All weights in the regression analyses refer to this category. The organizational change variable was recoded into four dummy variables, the first variable (B1) referring to the data from the previous study, the second variable (B2) referring to the rather unstable firm, the third variable (B3) referring to the rather stable firm, and the fourth variable (B4) referring to the most stable firm. Sex was recoded into one dummy variable (G1) referring to the women. Language was recoded into one dummy variable (L1) referring to the French-

speaking respondents. Socio-professional class was recoded into two dummy variables, namely P1 referring to the blue collars and P2 referring to the managers. Age was recoded into two dummy variables, namely A1 referring to the younger workers and A2 referring to the older workers.

Results

As can be seen in Table 42, organizational change is related to work stressors. The strongest relationship is with globalization treat, which decreases with the stability of the firm. Also the stressors Lack of Control, Lack of Rewards, and especially Lack of Esteem reward, decrease with the stability of the firm. However, an unpredicted inverse effect was found for job demands and effort. The two most stable organizations scored highest on these dimensions.

With respect to the strains, we observe that functional dyspepsia and irritable bowel syndrome do not differ significantly between the firms. Somatization, depression, anxiety, and fatigue are scored lower in the most stable firm in comparison to the least stable firm. However, for the two intermediate firms, the relationships are not in the predicted order, and it has to be noted that the effects are rather small. Moreover we do find less alexithymia and less overcommitment in the most stable firm.

Apart from less demands, physical exertion, and hazardous exposure, females tend to be higher on all stressors and strain scales than males.

For language there is a counter intuitive finding. French-speaking respondents tend to score lower on the stressor scales and on inability to withdraw from work, but tend to complain more about a lack of psychosomatic well-being.

Overall the younger age group tends to score lower on all strain and stressor scales.

Except for demands, efforts, work and time pressure, role ambiguity, and inability to withdraw from work management tend to score lower on stress and strain scales than white collars, while for blue collars the reverse tends to be true.

Discussion

On the one hand, organizational change is related to increased levels of treat from globalization, of lack of control, and lack of rewards, as predicted. However, on the other hand the more stable firms in the present research turn out to also have a heavier workload than the less stable firms. This is an unexpected difference between the four firms. Moreover, this difference probably accounts for the fact that the effects of organizational change are rather moderate. The effects of the decreased levels of control and rewards are possibly partially compensated by lower levels of workload in the present study.

Besides the effects of organizational change, also the socio-demographic and socio-professional variables turn out to play an important role. Especially women and blue-collar workers are at risk to both work stressors and subsequent strains. These two categories would deserve more focused attention in the future.

Table 42. Regression analyses of background variables on stressors, personality traits, work-related attitudes, and strains

	B1	B2	B3	B4	S1	L1	P1	P2	A1	A2	R ²
Strains											
Functional dyspepsia					.11	.10					3.6
Irritable bowel syndrome					.21			-.07			5.3
SCL-somatization		-.06		-.08	.18	.08	.06	-.10	-.12		6.0
SCL-anxiety	.05	-.04		-.05	.11			-.07	-.11		2.8
SCL-depression		-.05	-.06	-.07	.13	.06		-.05	-.08		3.0
Chronic Fatigue				-.06	.20	.07	.04				4.3
Personality traits											
Neuroticism	-.05	-.04	-.05		.16			-.12			5.1
Alexithymia		-.05	-.05	-.08	.04		.04	-.11			2.8
Work-related attitudes											
Need for approval					.09	.17			-.11	-.08	4.8
Overcommitment				-.08		-.07		.05	-.25	-.14	5.4
JCD-S-model											
Lack of control	-.06	-.05	-.12	-.14	.13		.05	-.31			15.8
Demands			.05	.05	.04	-.17		.09			3.9
Lack of Social Support		.08	.04			-.10			-.12		2.8
ERI-model											
Efforts	x	.06	.17	.20	-.10			.14			7.1
Lack of Rewards	x		-.14	-.20	.05	-.08		-.11	-.06		8.5
Lack of Esteem reward	x					-.09		-.06	-.09		1.8
Lack of promotion and job security	x		-.13	-.17	.06			-.17	-.10		7.9
LQWQ											
Lack of skill discretion			x	X	.13			-.30			11.4
Lack of decision authority	-.10	-.06	x	X	.11	-.06		-.31	-.06		14.7
Lack of task control	-.14	-.19	x	X	.11		.06	-.22			12.4
Work and time pressure			x	X		-.17		.11		.06	5.0
Job insecurity	.09		x	X	.10	-.13		-.09			3.9
Lack of social support supervisor	-.06	.09	x	X	.05	-.08			-.08		2.7
Lack of social support colleague		.05	x	x		-.14			-.10		2.5
Role ambiguity			x	x			-.05	.06			1.1
Physical exertion	-.11	-.15	x	x	-.06	-.04	.33	-.21	-.08		25.8
Hazardous exposure	-.07	-.18	x	x	-.12		.26	-.20	-.11		22.2
TRIPOD											
Problems with allocation of personnel	-.14	-.06	x	x	-.06			-.06			3.7
Problems with task communication	.13	-.14	x	x							5.2
Non-supportive work climate	.43		x	x							17.5
lack of job skills	.19	-.16	x	x							8.6
Lack of training opportunities	.10	.13	x	x		.04	.08	-.11			3.5
Lack of maintenance equipment	-.07	-.17	x	x	-.11	.10	.09				8.0
Globalization	x	-.12	-.47	-.59				-.07	-.12		41.7

Note. Only standardized weights are reported if statistically significant. X means that the variable could not be included in the analyses because the scale was not applied in that sample. 3633 <= N <= 5638.

V. General discussion

In this general discussion, we first comment on how the current four-year project has achieved the four specific goals that were put forward at the beginning. Then, we focus on the scientific contributions and the following advises for governmental policy. We conclude with a discussion of the limitations of the study, and the future research perspectives that follow from its findings.

V.1. Results in the light of the goals

The current four-year project has given rise to an important amount of specific research questions and findings. At the end of this report, it is useful to discuss how these specific findings meet the four basic goals that were set forward at the beginning of the research.

The first broad goal was ‘to estimate the psychosocial health risks linked to objective and subjective working conditions in various companies in Belgium’. The key focus for this goal was to investigate to which extent organizational changes have a direct or an indirect negative impact on the psychosomatic well-being of workers. Selecting four companies that differed considerably from one another with respect to the instability of their economic environment, operationalized organizational changes. One stable, one unstable, and two firms holding intermediate positions were selected. Organizational change operationalized in this way, clearly demonstrated its influence on stressful working conditions, which in their turn had a negative impact on well-being and health. However, it has to be noted that the direct impact of organizational change on the indicators of psychosomatic well-being was only moderate. Functional dyspepsia and irritable bowel syndrome did not differ significantly between the four organizations. For those indicators that did differ (namely somatization, depression, anxiety and fatigue), only the differences between the most and the last stable firm were systematically in the expected direction. The results for the two firms having an intermediate position on organizational change dimension were less consistent. A possible explanation for this finding is that although the workers of the most stable firm scored lower on the stressors lack of control, lack of rewards, and especially on globalization threat (as had to be expected on the basis of the selection criteria of these firms), they also scored higher on the stressors demands and efforts. Thus, the workload was heavier in the more stable than in the less stable firms, probably due to their type of work. This might have reduced the overall effect of organizational change.

The second goal was to create a preliminary data bank of the prevalence of somatization and/somatoform disorders in a population at work, relative to stressful working conditions. The main finding is that the prevalences of functional dyspepsia, somatization, somatoform disorder, and also of anxiety and depression are lower in the present working samples than in the general population. One possible explanation is the so-called ‘healthy worker effect’ whereby paid work forms a protective factor for psychosomatic complaints, even if one works under the pressure of organizational change. Another possible explanation is that people that are vulnerable to or suffer from psychosomatic conditions are more easily dismissed than others, so that these conditions are as a consequence less prevalent among a working population. Still another explanation could be that respondents were reluctant to all their psychosomatic symptoms. Since the current study was a longitudinal research, there was no anonymity. Although confidentiality was and is guaranteed, some workers were anxious that their company would learn about their answers.

The third goal was to establish which particular psychosocial factors or dimensions are harmful for the individuals' mental health, taking into account interpersonal variability and various mediating variables. Across the whole study, two different stress models were compared, namely the Job-Demand-Control-Support model (JDC-S) from Karasek and the Effort-Reward Imbalance and Overcommitment model (ERI-O) from Siegrist. Moreover in the KULeuven part of the study, two additional stress models were included, namely the LQWQ, which is derived from the JDC-S model, and the TRIPOD model. The conclusions of these comparisons are unequivocal: each stress model has a unique contribution to the prediction of psychosomatic well-being at the workplace. Moreover, jointly these four stress models account for up to 30% of psychosomatic well-being, and thus we can conclude to a substantial impact of the work stressors. Together with the fact that each of the stress models have a unique contribution, the present results form a strong case for the interpretation that it is the accumulation of a range of work stressors that produces serious effects on psychosomatic well-being.

The fourth and last goal was to study the "stress-health" issue in a dynamic and global perspective (in a prospective design). The longitudinal design with two moments of measurement allowed us to justify the genuine impact for work stressors on psychosomatic well-being. With a longitudinal design the interpretation of observed relationships in terms of causal mechanisms is far less liable to alternative interpretations than with a cross-sectional design. In the present study, changes in work stressors across the two moments of measurement have been related to changes in psychosomatic well-being with different analyses strategies (for instance by only

looking at those respondents not reporting psychosomatic complaints at the first measurement moment, or by partialling out the variability of the first measurement moment). Each time, substantial relationships could be identified between changes in work stressors and changes in psychosomatic well-being.

V.2. Scientific contributions

A first innovative aspect of the present study was to complement the self-reports of workers via questionnaires with interviews with key-informants. This allowed us to have a better insight into and a more global view on the productivity, the foreseen structural change, the stability, the global job stress within the diverse services and functions of the four firms.

A second innovative aspect of the present study lies in its focus on somatization and somatoform disorders in the context of work stress. It is the first study in which functional dyspepsia and irritable bowel syndrome have been studied in a working population on such a large scale. Moreover, it is the first time that it has been demonstrated that these somatic conditions are sensitive to work stressors. Most stress studies up to now have primarily focused on physical health. They still deserve to be conducted, but there is certainly a need to develop and study more psychosomatic problems and mental health issues.

A third innovation of the present study is the comparison of various stress models. It is the first time that the JDC-S, the LQWQ, the ERI-O, and the TRIPOD model were applied in a Belgian working population concurrently, in one study. It was demonstrated that each of these models had an additional predictive value for psychosomatic well-being. Moreover, mobbing, stress from being in contact with clients /patients (the higher tolerance for their violence is seen by some authors as a plague or silent epidemic), and the interference of professional with the private life sphere have been investigated next to the stress models, and are shown to have an additional aversive impact on psychosomatic well-being. Moreover, we might expect that workers will be exposed increasingly with these difficult working conditions the coming years because of further globalization, increased flexibility, the uncertain and changing economic environment – particularly in Europe with the opening to new members in a close future – and the rapid process modifications,.

A fifth innovation of the present study, is the demonstration of the state sensitivity of two personality measures, namely for neuroticism and for alexithymia. This is a very important finding since it is advised in the literature to control for these personality variables when investigating the impact of work stressors on psychosomatic well-being. Our finding, that these personality measures do not only measure stable personality traits, but are also sensitive to state effects, has major consequences for this practice. Because of the state effects, controlling for these personality characteristics causes a substantial underestimation of the impact of work stressors on psychosomatic well-being.

A last innovation was the comparison of self-reported absenteeism by the worker and absenteeism as it was recorded by the firm. Although differences emerged, both showed acceptable congruence.

V.3. Advises for governmental (mental) health policy

The present study has demonstrated that organizational changes are related to decreased levels of control and job rewards, which in their turn lead to a decrease of psychosomatic well-being and self-reported health and to an increase in, medical consumption and absenteeism.

Since all these consequences do not only imply serious costs for the individual worker, but also for the organizations, and the society at large, there is an important task for public health policy. On the one hand, public policy could focus on accompanying measures for organizations which are under pressure for organizational change in order to minimize the decrease in control and rewards brought about by these organizational changes. On the other hand, public policy should focus also on individual level, to support workers in their stress coping. One possible way is to offer these workers at risk training opportunities in order to increase their coping capacities with stressful working conditions. Such a preventive approach could prevent much of the psychosomatic conditions caused by these organizational changes.

Besides the global effects of stressful working conditions on psychosomatic well-being, important inequalities appeared between men and women, and between blue and white collars. More than for men, the professional and the private demands add up to a higher burden for women. Also less educationally and professionally trained workers are more susceptible to work stressors and their consequences. Special attention of public health policy for these subgroups can be justified on the basis of the present findings.

Finally, in our study we were confronted with a lack of systematic structuring of the absenteeism records from the firms. The absenteeism records for the firms, however, offer one of the most important direct sources of information for guiding public policy and taking appropriate measures to help workers to recover their wellbeing and enterprises their efficacy. Therefore, we strongly advise the setup of a systematic standardized information system for absenteeism registration by the federal government.

V.4. Limitations of the present research project

While the strength of the current research project is that it has investigated a variety of possible stressors and psychosomatic complaints in a longitudinal perspective, its major limitation lies in the samples that have been investigated. Blue collars were rather underrepresented in the present study. Since we found that both most stressors and psychosomatic conditions were more prevalent among blue collars than among white collars and managers, it is probable that the impact of organizational changes in general are underestimated on the basis of the present study. Furthermore, the four firms studied all come from the service sector. It remains a question to which extent the findings from this sector can be generalized to other sectors. Moreover, only four firms could be investigated within the framework of the current project. Unavoidably, the specific characteristics of these four firms had an impact on the results, and probably implied an underestimation of the impact of organizational changes. For instance, one of the firms that was selected because of its intermediate position on the organizational change variable, did undergo an important reorganization during the course of the study, probably causing an additional source of stress. Another example is that the most stable firms turned out to be more characterized by heavy workload.

V.5. Future perspectives

The findings, difficulties and limitations of the present study open the following future research perspectives. First, it has been found that each of the stress models has its own unique contribution in the prediction of psychosomatic well-being. One problem we encountered, however, was that although these stress models start from different concepts, they work with partially overlapping operationalizations. Thus, the present study calls for developing an integrative framework of work stressors that overcomes the problem of overlapping operationalizations. One promising approach for systematizing the variety of stressors identified by the different stress models forms the appraisal emotion theory. An impetus for systematizing the variety of stressors within this framework was initiated at the end of the present project, and would be interesting to pursue in the future. Second, there are good theoretical reasons to expect that specific personality characteristics play an important role in the relationships between work stressors and psychosomatic conditions. However, the present study unequivocally demonstrated that the often-used measures for these personality characteristics are state dependent, and thus confound the impact of personality traits with state effects. It would be interesting for future research to disentangle state and trait effects. Third, it would be advisable for future research on somatization and somatoform conditions to include medical examination, since it is only after medical examination that a medical cause for the complaints can be excluded. Forth, it would be worthwhile for future research to investigate whether the prevalence of psychosomatic conditions is indeed lower in the working than in the general population, and if confirmed, which mechanisms confirm this difference. One possible way to do this is to compare the evolution of psychosomatic conditions between a group of unemployed people that remain unemployed and a group of unemployed that start working. If having paid work has a preventive function, then psychosomatic conditions should decrease in the latter group. Fifth, the findings suggest that migrant workers will be especially susceptible to increased levels of work stressors and their consequences physical and mental health. They not only (mainly) belong to the blue-collar work force, but also have also to deal with discrimination and the difficulties associated with acculturation. Unfortunately, existing stress research has taken scant interest in this group. They deserve much more attention in the future from both scientific and public mental health perspectives. Sixth, with its focus on organizational change, the present study changed the focus from specific job characteristics, which is the default focus in most stress research, to characteristics at the organizational level. This new focus allows situating work stress within a broader socio-economical context. In order to get a better view on the socio-economical context factors that determine work stress, it is advised to take more organizational characteristics into account when studying work stress, such as organizational climate and culture. Moreover, such an approach does also call for a different research design, where more organizations are sampled and less respondents per organization.. Finally, the present results call for the set up of health promotion programs to enhance workers' well-being.

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VII. Appendices

VII.1. Results dissemination

1. Kittel, F., De Brouwer, C., De Gucht, V., Fischler, B., & Godin I. *Design of a Belgian stress / well-being at work study – the Somstress research project*. ESF (European Science Foundation) – Social variations in Health expectancy in Europe – working group II: Health effects of stressful environments in adult life. The interaction of biological and psychosocial factors, London, March 20, 2000.
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25. Godin, I., Siegrist, J., Fontaine, J., & Kittel, F. *Long-term exposure to effort-reward imbalance and incidence on worker's mental health* abstract submitted to the 8th International Congress of Behavioural Medicine, Mainz, Allemagne, 25-28 août 2004.

VII.2. Submitted papers

1. Godin, I., Kittel, F., Coppieters, Y., Fontaine, J. R. J., & Siegrist, J. Cumulative work stress exposure and mental health: prospective evidence from the Somstress Study . *Paper submitted to the Scandinavian Journal of Work, Environment & Health*.

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For more informations:

Madame E. Bourgeois
Belgian Science Policy
rue de la science 8 Wetenschapstraat
Bruxelles 1000 Brussel
Tel.: + 32-2-238.34.94
Fax.: + 32-2-230.59.12
E-mail: boug@belspo.be
Internet: <http://www.belspo.be>

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