

Organizational Change and Employee Stress

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Abstract

This article analyzes the relationship between organizational change and employee health. It illuminates the potentially negative outcomes of change at the level of the employee. In addition, it relates to the ongoing debate over how employees react to and respond to organizational change. I hypothesize that change increases the risk of negative stress, and I test this hypothesis using a comprehensive panel dataset of all stress-related medicine prescriptions for 92,860 employees working in 1,517 of the largest Danish organizations. The findings suggest that the risk of receiving stress-related medication increases significantly for employees at organizations that change, especially those that undergo broad simultaneous changes along several dimensions. Thus organizational changes are associated with significant risks of employee health problems. These effects are further explored with respect to employees at different hierarchical levels as well as at firms of different sizes and from different sectors.

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Introduction

A point of contention in the literature on organizational change is just how costly it is for organizations to change. It is often argued that the ability to change is a necessary characteristic of successful businesses. Some theories (e.g. Thompson (1967); Lawrence and Lorsch (1967); March (1981); Nelson and Winter (1982); DiMaggio and Powell (1983)) see organizations as relatively malleable when it comes to change and its internal consequences. Some have argued that organizations are able to successfully make radical and disruptive changes (Nadler and Tushman, 1989, 1990). Indeed others have stipulated that organizational routines can be structured so as to be particularly suitable for change (Feldman, 2000; Feldman and Pentland, 2003) and that change is a predictable and performance-enhancing outcome of environmental pressure (Zajac and Kraatz, 1993). Alternatively, organizational ecologists (Hannan and Freeman, 1977, 1984, 1989) and organizational scholars (Kotter, 1995) have argued that firms often fail when trying to transform their organization. Because organizations are inherently resistant to change, they argue that change is costly, complicated and risky.

Despite the extensiveness of this debate, nearly all of this literature has focused on the direct costs to organizations. Empirically, the outcomes studied have primarily been firm failure (Singh et al., 1986; Kelly and Amburgey, 1991; Haveman, 1992; Barnett and Freeman, 2001), market shares (Greve, 1999), and employee turnover (Cameron et al., 1987; Baron et al., 2001). While change may (or may not) have direct costs for organizations, the costs of change to employees are often not empirically considered in organizational research. Several theories of organizational behavior have stipulated that the emotional and psychological wellbeing of employees are potentially affected by organizational change. And since the micro-foundation of firm-level performance rests on the employees' productivity, it is imperative that we consider their emotional states. From an economic perspective, workplace conflicts and unrest can decrease labor productivity and lead to significant financial losses (Krueger and Mas, 2004; Mas, 2008). In addition, research from applied psychology has established that the satisfaction and productivity of employees are highly dependent on their mental health (Harter et al., 2002; Adler et al., 2006; Brenninkmeijer et al., 2008). Depression has been found not only to increase absenteeism but also to decrease both the focus and the productivity of employees in the workplace (Wang et al., 2004; Stewart et al., 2003). Ultimately, this underscores the importance of the individual-level effects of organizational change, effects which are potentially unforeseen by the firms themselves.

In light of a large-scale empirical study, this article moves the discussion towards the level

of the individual employee and their experiences with change. Most organizations are built on internal trust and reliability, where most employers count on the loyal and committed efforts of employees on the firm's behalf. Organizational changes – shifts in strategies or goals – can threaten these values. For example, a change in the ultimate goal of an organization might shift the internal distribution of resources between departments, require new skills or necessitate a comprehensive re-organization of employees. While such changes may entail beneficial effects for the organization and (at least in the outset) make sense for CEOs, at the level of the employee, it can result in frustration, uncertainty, distrust, and increased stress. The added costs do not simply imply that organizations should not change at all, but they do strongly suggest that firms should focus more on the (unforeseen) consequences of change, that they should more explicitly acknowledge the risks associated with organizational change at the level of individual employees. By focusing directly on potential outcomes at the level of the individual employee's health, this article seeks an even greater understanding of change than currently exists in the empirical literature on organizations and management.

Using differences-in-differences and individual fixed effects methods, I exploit an uncommonly rich panel dataset that combines a firm-level survey of organizational changes at 1,517 of the largest Danish firms with comprehensive medical histories of their 92,860 employees. I examine the *ex post* effects of changes in organizational features (in terms of both breadth and degree of change), on the likelihood that between 1996 through 2002 an employee received prescriptions for stress-related medications to treat insomnia, anxiety, or depression. The following were the dimensions of change targeted by the firms: increased effectiveness, increased cooperation and coordination across the organization, adapting to turbulent environments, adopting new products/services, enhanced skills/knowledge, and improved quality and customer service. Certainly some of these could be fundamental organizational features and mechanisms, but even if they are not, it could still be harmful for firms to seek change along several dimensions at the same time.

The advantage of this study lies in its use of unique objective data related to the otherwise sensitive issue of serious mental health problems. Most studies are based on self-reported surveys in single industries, single organizations or for single occupations. This study extends such research by studying these relationships for employees with a large sample of firms across a wide range of industries. The dependent variable (a dummy for the prescription of stress-related medication) is based on objective behavioral data obtained directly from Denmark's public health care system (via Statistics Denmark). These data enable me to explore change and its potential consequences more deeply than is usually possible. Certainly some level of employee stress is positive for the

productivity and alertness in the workplace, but when it is above a critical threshold, when conditions such as insomnia and depression emerge, stress can become a serious health issue for the individual and for the organization (Huff et al., 1992; Cooper, 1998; Karasek and Theorell, 1990). In this article, I study those cases in particular where the symptoms of stress are so severe that they require treatment with psychotropic medications.

In general, I find that change increases the probability of increased stress for employees. In particular, broad organizational changes can have potentially large negative outcomes. Employees of organizations that change across multiple dimensions at the same time display a significantly higher risk of developing negative stress (i.e., receiving prescriptions for stress-related conditions). Overall, these findings call for increased attention to the negative outcomes of organizational change that are experienced at the individual level. The results suggest that despite decades of focus on change management in managerial training, the average large Danish organization is unable to fully control these processes. There are many plausible explanations that stand to explain these negative effects on the level of employees (e.g. unfairness, injustice, breach of implicit contracts, failure to account for feedback effects etc.); however the present data does not allow me to for study the extent to which each of these mechanisms contributes to an explanation of these effects.

This study contributes to our understanding of organizational processes in the context of change by testing the consequences of organizational change on employees' probability of negative stress. The study also has broad implications for the management literature itself, as the issues investigated here are clearly relevant to the internal conditions of changing organizations. In light of the detail and objectivity of the data employed, the article provides a stronger link between organizational change and employee health. These issues reflect perennial debates in both organizational behavior and in applied psychology. And while the problematic relationship between change and emotions has already been established here, this article nonetheless contributes to these fields. Methodologically, the study employs behavioral data in a quasi-experimental design on a scale (across industries and occupations) that has rarely been used in these two fields.

It is certainly of general interest to society to better understand how a firm's organization influences its employees, or more specifically, how the decisions they make and the strategies they employ affect employee mental health. Firms, meanwhile, should also care about these questions as the productivity, motivation and loyalty of its employees highly depends on these same factors.

Disruptive effects of organizational change

Many organizational theories argue for the disruptive effects of organizational change. This holds especially for theories in organizational ecology (Hannan and Freeman, 1977, 1984, 1989). The argument here is that change can erode an organizations reliability and accountability, leading to frustration and confusion within the organization (Péli et al., 2000). A destabilized process follows that entails the significant costs of reshaping operations and realigning the organization. Moreover, during these periods of reorganization, firms risk missing opportunities that they are not aligned to exploit (Hannan et al., 2003a). It is argued that these disruptive effects tend to increase the hazard of firm exit and employee turnover due to employee dissatisfaction (Baron et al., 2001).

At the level of the employee, there are a number of possible explanations for these effects. In the field of organizational behavior, the relationship between organizational change and employee resistance is a large topic, where places additional focus on the importance of the negative emotions that can result from change (Sagie et al., 1985; Sagie and Koslowsky, 1994; Huy, 2002; Jimmieson et al., 2004; Kiefer, 2005). Increased employee stress levels is a frequent result of change when examined within applied and occupational psychology as well (Motowidlo et al., 1986; Judge et al., 1999; Terry and Jimmieson, 2003; Rafferty and Griffin, 2006; Hansson et al., 2008). This underscores the potentially negative effects of organizational change at the level of the employee. That said, there are several theories that offer more precise explanations of the mechanisms behind these effects. A few of them are reviewed here.

One reason for the problematic outcomes associated with change is that firms often fail to account for the highly unpredictable and stochastic feedback effects of their actions and decisions – actions with consequences and decisions with repercussions (Pfeffer, 1998, 2007; Hannan et al., 2003b). Employees are bound to react when firms do things that affect them directly. These reactions could manifest themselves as emotional distress. Pfeffer (1998) highlights a typically example observed in the literature of a firm with financial difficulties. Often the first reaction of such firms is often to cut the employee wages and benefits (i.e., either cutting existing levels or forgoing future increases). At first, this cost-cutting effort might help to balance the books, but it has two significant feedback effects. First and foremost, it increases the probability that employees will desire to leave, typically from the top end as the best employees have better alternative options. Second and less visibly to the management, the motivation and loyalty of the remaining employees is badly hurt. Employees may start caring less, behaving more passively and exerting less effort. Some might even try to hurt the firm itself by sabotaging it (Pfeffer, 2007).

Alternatively, feedback effects can also be referred to as process effects as defined by Barnett and Carroll (1995). These researchers divide the overall effects of organizational change into two types: content effects and process effects. Depending on the characteristics of the changes and the characteristics of the organization, both effects can be either beneficial or detrimental. Content effects refer to the differences in an organization's design before and after the change. They involve realigning the organization as well as adopting a new culture or structure. Whether these effects are positive or negative depends on how well the new design fits the firm's environment.

Process effects are more unpredictable because they encompass the behavioral effects caused by the process of change itself (Barnett and Carroll, 1995). Beneficial effects, for example, can entail Hawthorne effects (Landsberger, 1958), wherein overall productivity increases when managers monitor their employees more closely than they had previously. However, the detrimental effects of the change process are more interesting in this context. Barnett and Carroll (1995), as an example of negative process effects, highlight the new learning challenges faced by employees when operational procedures are changed. Altered status and power bases might lead to political squabbles between different factions in the organization. Change is also likely to influence the informal communication structure of a firm, leading potentially to a (partial) breakdown in information flows. From an employee's point of view, these effects generate uncertainty and fear about the future direction of the firm, and, in severe cases, this could lead some employees to leave or to develop mental problems. At a minimum, firms are likely to suffer from the diversion of employees' attention during these periods; the new processes and structures thus can detract from ongoing operations, leading to lower performance (either temporarily or permanently).

A central point in this literature is that, contrary to expectation, further interventions are often needed following the original changes (Hannan et al., 2003b). The period spent reorganizing a business may also reveal the need for further changes necessary to restore the organization to a fully functioning form. Decision-makers have limited foresight and consistently tend to underestimate the cost of change as well as the time needed for restructuring and realignment. Indeed, a consistent tendency among decision-makers towards over-optimism and bold forecasting has been confirmed by Kahneman and Lovallo (1993) and Sterman et al. (1997). And while the specific change may be reasonable at the outset, the actual process of implementing the change is likely to be highly stochastic (Barnett and Carroll, 1995; Hannan et al., 2003b).

Another potentially contributing factor in the negative emotional and psychological outcomes for employees of organizational change relates the effects of organizational change to violations of implicit psychological contracts. This common explanation for effects of organizational change

dates back to Argyris (1960), Levinson et al. (1962) and Schein (1965). Implicit contracts are defined as "... *expectations about the reciprocal obligations that compose an employee-organization exchange relationship*" (Morrison and Robinson, 1997, p. 228). Employees are likely to react emotionally when organizational actions affect such contracts. This could manifest as betrayal, anger, frustration, resentment, and decreased motivation (Robinson and Rousseau, 1994; Morrison and Robinson, 1997; Bartunek et al., 2006). Change can be associated with a violation of the contract because the employees must change their perceptions of what they can expect from their employer, and they may ultimately view this change as reflecting an unmet promise.

Recent research has, however, indicated that expectations and implicit contracts plays a smaller role in employer-employee relationships than had been assumed. Montes and Zweig (2009) found that employees care more about, what they actually get than what they expect or are promised. They also care about how they are treated in the organization relative to their peer, and if they are treated unfairly they will respond emotionally. This links the argument to the literatures on social comparison (Festinger, 1954) and organizational justice (Greenberg, 1990; Sheppard et al., 1992). The degree to which employees are resistant to and emotionally affected by organizational changes will depend on how justice and fairness is perceived in the organization (Cobb et al., 1995; Folger and Skarlicki, 1999). If organizational changes alter the power bases in the organizations, this could trigger emotions surrounding perceptions of unfairness and injustice among the affected employees. These emotions which are not only capable of generating resistance but more inward oriented emotional responses, such as anger, resentment and distress as well. These reactions are possible, even if changes are understandable and rational for the organization's perspective. Employees are familiar and adjusted to the current organizational structures and perceive them as being more legitimate (Morris and Raben, 1995). In addition, organizational change might not be fully understood or correctly interpreted at all levels of the organization increasing the uncertainty associated with the change itself. Often changes are initiated to advance the organization along several dimensions to increase the effectiveness of key processes and technological capabilities. In such situations, the employees might feel unfairly treated, obsolete and replaceable (Folger and Skarlicki, 1999).

To the degree that the change process involves increasing frustration, uncertainty, fear, and emotional insecurity, these theories attest that organizational changes can lead to increased employee stress. This is underlined still further by research that links organizational change with decreased job satisfaction and increased uncertainty (Rafferty and Griffin, 2006). Consequently, I hypothesize that:

H1: Organizational change increases the probability of negative employee stress.

Change is different from case to case and is likely to have diverse impacts. If organizational change is problematic, as argued in the literature presented here, it should be more problematic in organizations that try to change themselves across multiple dimensions simultaneously than in those that seek to implement smaller changes. In the literature, broader and more extensive changes have been presented as fundamental or core changes (Hannan and Freeman, 1984, 1989; Hannan et al., 2007). More employees stand to be effected when more central and core features of the organization are targeted. Fundamental structures and routines are more likely to be influenced when many dimensions are subject to change efforts. Small changes might be less harmful because the adjustment costs for individuals in such instances are relatively low. On the other hand, more radical changes might be relatively more harmful, as both the cost of adjusting and the time and effort necessary to implement these adjustments are significantly higher. These more radical efforts are also more likely to require further changes in the adjustment process. The negative effects of change should increase with the overall exposure to change among employees (Kelly and Amburgey, 1991; Amburgey et al., 1993). The broader the change, the more employees exposed to change.

Broader and more extensive changes could generate greater feedback effects as well as feelings of unfairness and injustice, which are harder to overcome for both employees and organizations. The broader the change, the more significant the perception of change is likely to be. Rafferty and Griffin (2006) argue that employee emotional response to change will be greater in cases of significant modifications to core organizational structures, as the perception of change is greater in such instances. As a consequence of these dynamics, broad changes to the organization are likely to be more problematic than more focused ones. If multiple dimensions of organizational life are affected, the costs to employees will be greater, because these changes are likely to involve more central and vital organizational routines. The higher the cost, the more likely changes will lead to frustrations, uncertainty and stress for employees. Consequently, I also hypothesize the following:

H2a: More extensive (degrees of) organizational changes increase the probability of negative employee stress compared to less extensive changes.

H2b: Broader organizational changes increase the probability of negative employee stress compared to relatively minor and narrower changes.

Data and methods

It is challenging to study the effects of organizational changes on the health of employees. Available public data for systematic quantitative studies of this relationship are limited. In addition, it is often difficult to access large-scale information on employees' mental conditions given the sensitivity of this information. On the other hand, it is also challenging to measure, characterize and compare organizational changes in large samples and across firms. Moreover, there are significant timing effects that should also be taken into account. First, organizational changes themselves need to be mapped. To reduce recall bias and increase the reliability of the information provided by CEOs, this should be done as close to the events as possible. Secondly, there is a latency period during which effects cannot be studied; immediately after a change related event has occurred information on the outcomes of such organizational changes are not yet available for firms or individuals.

I analyze the *ex post* effects of organizational changes on employees by exploiting three separate datasets. These datasets are linked together using firm identification numbers and social security numbers for individuals (both in anonymous forms). The nearly complete Danish system of social security numbers, with children automatically assigned a number at birth, enables accurate matching between individual level databases. Similarly, via the tax registers, all (legitimate) businesses have identification numbers that link them to their employees.

Measuring organizational change

For information on organizational change, I use a postal survey conducted by Statistics Denmark in the Winter of 2000/2001 and referred to as the DISKO2 survey; this was the second wave of surveys. The DISKO surveys are a line of innovation and organization surveys (for examples of articles using these data, see e.g., Laursen and Foss (2003) and Jensen et al. (2007)), where questions have been repeated, tested and revised across rounds. The surveys are inspired by questions used and described in the Organization for Economic Co-operation and Development's (OECD) Oslo Manual (OECD, 1997).

The DISKO2 questionnaire is 15 pages long (including a front-page letter describing the purposes and methodology of the survey) and includes questions concerning organization and management practices, innovation, the adoption of new technologies, personnel policy and firm performance. Most questions refer to firm strategies along these dimensions during the period from 1998 through 2000. It contains information from 2,162 Danish private sector firms where the

CEOs have completed the questionnaire. The sample frame consists of 6,975 firms, including all firms in Denmark with more than 25 employees and the 1,369 respondents of the first wave (the DISKO1 survey conducted in 1996/1997). The sample frame has been selected by Statistics Denmark to ensure that the total sample (the first wave of respondents plus the additional firms with 25+ employees) is representative of the Danish population of private sector firms. The response rate was 31 percent. Once observations with missing values for one or more of the relevant questions on organizational change had been dropped, the number of observations fell from 2,162 to 1,526 firms. There are no systematic differences in size, age or industry between the respondents with and without these missing values. Moreover, given the drop in the number of firms included in the study, I have been careful not to portray the results as representative of the population of Danish firms.

The significant advantage of the DISKO surveys is that they can be linked to the Integrated Database for Labor Market Research (most commonly referred to by its Danish acronym, IDA) maintained by Statistics Denmark. IDA contains combined annual demographic information from the third week of November for all individuals, plants and firms in the Danish labor market from 1980-2003 (the last year in my current IDA sample). The data are gathered from the official registers of the Danish government, which (because of the extensive welfare system) records detailed information on each individual tied to their social security numbers. The database is internationally recognized and acknowledged as an invaluable resource for social science research (e.g., Albæk and Sørensen (1998), Sørensen (2007), and Sørensen and Sorenson (2007) for research based on the IDA). After merging the survey with the IDA, the sample consisted of 92,860 individuals employed in the 1,517 firms available from the DISKO2 survey. For this study, the number of firms drops from 1,526 to 1,517 as nine firms were missing one or more of the explanatory accounting variables introduced in the multivariate estimations.

I employed a conservative sampling procedure to select the employees for study. I only included individuals who have been employed in these firms for the entire period from 1998 through 2000. Newer employees may have been hired as a result of the organizational changes themselves and thus might fall outside the parameters of our theory. Although ideally one would begin by evaluating increased stress immediately following organizational change, the DISKO2 survey does not allow one to identify the precise date of change (only that it occurred between 1998 and 2000). Nonetheless, I have excluded individuals who left the firm before 2000, this strategy should produce conservative estimates of the effects of change.

Variables

Using this survey's questions on organizational change, I developed three variables representing different aspects of change in relation to my hypotheses. First, I used a simple dummy, *change*, based on Question 5 (p. 2) from the questionnaire: "*Has the firm carried out significant organizational changes during the period 1998-2000?*". This dummy tests Hypothesis 1.

Second, I generated two variables based on six questions regarding organization structures that had been subject to organizational change over the three-year period. These two variables were generated to test Hypothesis 2a and 2b, respectively. Based on the main question: "*Have the organizational changes primarily had as their objective to...?*" (Questions 6a-6f, p. 2), the respondents were asked to indicate the degree to which they had changed their organization in terms of the following six dimensions: increased effectiveness, increased cooperation and coordination across the organization, adaptation to turbulent environments, adoption of new products/services, enhanced skills/knowledge, and improved quality and customer service. The rating for each dimension is specified using a scale with four levels (ranging from 'to a large extent' to 'not at all'). The most popular dimension was increased effectiveness, indicated by a relatively large proportion (32 percent) of the firms in the sample. Correlations and the proportion of firms implementing changes along these dimensions are displayed in Table 1.

I used these ratings to create two different variables. First, I created a measure for the *degree of change*. This was the average score for the six dimensions of change (i.e. sum divided by 6), in which a value of three was given for respondents who indicated 'to a large extent', and a value of zero was for respondents who indicated 'not at all' (H2a). Second, the *breadth of change* pursued over this period was a variable indicating how many of a firm's six change dimensions had been targeted 'to a large extent' (H2b). A focus on multiple goals may increase the complexity of change within the organization as each of these goals incorporates a wide range of activities. Indeed, these two variables indicate the extent to which this is the case. It is interesting not only to assess how many of these dimension have been subject to change efforts but also which of these kinds of changes have had the greatest effect on an organization's stability. To assess this at a later stage, I included a dummy for each of these six dimensions to test each of their effects on stress.

Measuring stress

The measure of negative stress was prescriptions of stress-related medications to each employee before and after the window of change. This information comes from the Danish Medicines

Database (maintained by Statistics Denmark based on data from the Danish Medicines Agency). This database includes all medical prescriptions for the entire Danish population from 1995 to 2003.

Drug types are classified according to the Anatomical Therapeutic Chemical (ATC) classification system maintained by the World Health Organization Collaborating Centre for Drug Statistics Methodology in Oslo, Norway. Using ATC codes, the Danish Medicines Database has enabled me to select medications typically associated with symptoms of negative stress. Stress is an umbrella term that can refer to multiple conditions associated with living a life that is too stressful. Excessive stress activates the *hypothalamus-pituitary-adrenal axis*, which is likely to lead to depression (Checkley, 1996). Symptoms of excessive stress are commonly described as depression, anxiety, insomnia, tiredness, pain and, over the relatively longer term, blood pressure problems (Krantz et al., 2005; Rugulies et al., 2006).

Variables, advantages and limitations

I traced the prescriptions related to the treatment of insomnia, anxiety and depression. Using the relevant ATC-codes for these indications I examine two different types of medication.¹ Insomnia is treated with *benzodiazepine-related medications* for shorter-term cases and with *benzodiazepine derivatives* for longer-term cases (ATC: N05CF and N05BA, respectively). Anxiety and depression are treated with *selective serotonin re-uptake inhibitors* (ATC: N06AB). I use a dummy variable for *stress* as the dependent variable. This dummy variable takes the value of 1 if the individual has had at least one prescription for any of these drugs. This is my indicator of increased stress and frustration. I am not looking at separate effects for each group of drugs because individuals might respond differently to the same stressor.

All prescriptions contain social security numbers and are run through the public health system in Denmark, which adds to the accuracy of this source. Private medical insurance plays an increasing but still marginal role in the Danish health sector. In this respect, Denmark is an ideal country for studying these types of relationships because employment changes and economic health problems will not influence the ability of individuals to access medication or see a general physician. The former requires some payment from the patient, but the amount decreases as the number of prescriptions written increases. Additional public financial support is available for low-income

¹I am grateful for the assistance of Jimmi Nielsen, MD, for selecting the relevant prescriptions for shorter term conditions related to stress.

groups, while visits to a general physician are free of charge for all.

There are some important disadvantages that are worth highlighting with respect to the use of such data to identify stress. First, negative stress symptoms can be present for some time before an individual goes to see a physician. Thus, I cannot observe the symptoms of increased stress until the individual gets a prescription for one or more of these drugs. Additionally, some individuals might self-medicate, typically with alcohol, over-the-counter pain killers or recreational drugs. As a result, my approach is likely to underestimate the extent and effects of increased stress in these organizations because the dependent variable only captures the most severe cases, where increased stress leads to prescription drug use. There is also a risk of overestimation because the above symptoms can also result from factors not related to occupational stress, such as life and family circumstances, pre-existing medical conditions or a genetic predisposition. To at least partly adjust for this, I add controls for lagged negative stress among the focal individual's spouse and parents (mother and father, separately). These controls are dummy variables created in the same way as the dependent variable. In general, I do not have any reason to expect that these risks should vary greatly across the sample or correlate spuriously with organizational change.

An alternative approach to studying the health of individuals in organizations is to conduct surveys or interviews. These methods are challenging and difficult to structure because questions related to mental health are very sensitive. Interviewees could avoid directly answering the questions to hide a possible condition. Despite its disadvantages, using prescriptions to assess the mental health of individuals, especially in the context of serious personal conditions, such as insomnia, anxiety, and depression, is likely to provide more objective images of employee mental health.

Results

Figure 1 shows the actual percentage of employees receiving stress-related medication at different points in time as a simple comparison between the two groups of employees: those who are employed at firms with relatively low degrees of change and those who are employed at firms with high degrees of change (with values of zero and 1 for the *change* dummy). Please note that the values for both groups increase over time due to a clear time trend in the popularity of these particular types of drugs. This reflects a trend within the entire Danish population and is not specific to this particular sample of people. The window for change is January 1st, 1998 through December 31st, 2000. Pre-change observations encompass 1995, 1996 and 1997, while the post-

change observations span 2000, 2001, 2002, and 2003. Initially, there is little difference between the two groups. However, during 1998 and onwards, a clear and significant difference emerges between the two groups. A larger proportion of employees working in changing firms than those working in non-changing firms, receive one or more prescriptions. This offers an initial indication that change increases the probability of elevated stress. The difference between the two groups declines slightly in 2003, which suggests that the effects of the change have begun to lessen.

Multivariate analysis

Identification strategies

To analyze this situation further within a multivariate context, I used two identification strategies. After an initial set of plain logistic regressions, I employed organizational change as a treatment in a differences-in-differences approach to analyzing the response differences between treated and untreated employees. As a second strategy, I used individual fixed effects regressions to analyze the effect while controlling for unobserved heterogeneity by holding individuals constant. The last approach may be an important additional strategy, because such individual unobservables as genetic disposition and mental personality are also important predictors of increased stress. Both strategies required that I include multiple observations for each individual employee in the sample. The first observations are prior to the DISKO2 observation period, namely from 1996 and 1997.² I use 2000, 2001 and 2002 as the post-treatment observations. I exclude observations from 1998 and 1999 to produce a more conservative set-up where differences between firms (in terms of the timing of the introduction of change) are not permitted to influence the results. All standard errors are clustered at the firm level in the light of the concern that due to serial correlation induced by the larger number of observations of the same individual, standard errors are too small in differences-in-differences estimates (Bertrand et al., 2004, p. 271).

When studying the post-change effects, a differences-in-differences approach allows me to account for the mental condition of employees in the years prior to the survey. However, endogeneity remains a concern because the differences-in-differences approach rests on the assumption that the treatment (i.e. organizational change) is exogenous. The same concern holds for the individual fixed effects models. In this study, an alternative explanation might be that some types of firms change while other types do not. Employees might be experiencing increased stress in firms that

²I am not including observations from 1995 because I do not have medical prescription information for 1994, which are required for the parents and spouse variables introduced in Table 3.

are poor performers in the first place and are (desperately) trying to change to regain momentum. This could mean that employees develop mental health problems because their firms are poor performers and not because their firms are changing. To adjust for this possible confounding effect of performance on stress, I added three different performance variables to all the estimations. The best performance variables at my disposal were growth in value added, growth in turnover and employment growth (in percentages from the past to the present year). Because each variable provided different information about a firm's performance nor are they highly correlated with each other, I will use all three variables in the models.

In preliminary t-tests, no significant difference between changing and non-changing firms was found for growth in value added and growth in turnover: however there was a significant difference between firms in terms of employment growth. That said, this change was not in the expected direction. It seems that changing firms experienced significantly higher employment growth rates than non-changing firms. I will discuss this finding below.

Controls

A number of additional observable factors that could influence the likelihood of increased stress were controlled for. Variations in these dimensions across firms could influence the results if they were associated with the probability of change. First, as likely predictors of stress, age and gender were controlled for. Second, the number of children in each of three different age groups (logged) and a dummy for whether the individual was married were also controlled for. Third, I control for the position of the individual in the firm by including dummy variables for CEOs, managers and other white-collar employees, omitting the category of blue-collar employees. Fourth, career differences were controlled for including measures for years of firm tenure and current wages (both logged). Fifth, I controlled for firm differences using the logged value of firm age and two dummies for firm size (50-99 employees and 100+ employees, leaving firms smaller than 50 employees as the omitted category). Finally, 1-digit SIC industry dummies were added to control for industry effects and year dummies to control for time effects. I remained neutral about the direction of most of these effects, but I included them as controls to ensure that I would not confound differences in these dimensions when assessing the impact of organizational changes on the likelihood of increased individual stress.

Table 2 presents summary statistics for the year 2000 for all variables on the individual level. On average, 4.8 percent of the individuals were on stress medication in 2000, and 64 percent of

individuals were employed in an organization that had changed from between 1998 and 2000. The *breadth of change* covers, on average, 1.8 of the six different dimensions.

Logit estimations

The initial empirical multivariate analyses were conducted with logit models on the level of the individual for observations after the change window (i.e., observations for 2000 and 2000-2002, respectively). Table 3 presents models with a dummy for stress-related prescriptions as the dependent variable.³ The first three models (1-3) present logit models for the year 2000 only. Model 1 contains the dummy variable, *change*, which is significant and positive (confirming H1). Similarly, in Models 2 and 3, where *degree of change* and *breadth of change* (respectively), are indicators of change, positive and significant effects of change on the probability of stress were found (thus, confirming H2a and H2b). This means that a significant outcome of change is a greater likelihood of negative stress. This is also the pattern evident when observations for the years 2001 and 2002 are included in the sample (Model 4-6 with unreported year dummies). Significant and positive effects on stress were found for *change*, *degree of change* and *breadth of change*. As expected, by including information that is further from the change window, the magnitude of the effects was slightly lower. Similar models that included observations from 2003 (unreported) were also estimated; these models revealed even lower effects of change. This suggests that the risk of increased stress decreases over time.

To absorb any confounding effects of performance on change, performance was controlled for in all the regressions. Two performance variables (*turnover growth* and *employment growth*) had significant effects on stress, but their inclusion did not influence the effect of change on stress. Employees in firms with high growth in turnover were less likely to get stress-related medications, while employees in growing firms were more likely to get this medication.

These results suggest that there is a direct relationship between the extent of organizational changes in a firm and the prescription of stress-related medications among its employees. And while the results are quite clear (see Table 3), there remains a chance that an omitted variable correlated with change that is driving the results. Therefore, a differences-in-differences specification was conducted, where observations prior to change were added to the analysis.

³In the interest of space, I do not report on control variables. The full tables are available upon request.

Differences-in-differences and individual fixed effects estimations

Table 4 reports the results of the differences-in-differences estimations (Models 7-9). The variable *Post* was added to the dataset and takes the value of 1 for 2000-2002 and zero for 1996 and 1997. This variable in turn was employed to create interaction variables with the three change variables (change, degree of change, and breadth of change) to find the differences-in-differences estimators. These interaction variables revealed how changes (relative to circumstances without change) affect the probability of negative stress. The *Post* variable was omitted because it was fully absorbed by the year dummies. The main effect of the three change indicators revealed whether there were any differences between changing and non-changing firms in 1996 and 1997 (prior to the change window).

Models 7-9 directly replicated the regressions from Table 3, yet with the differences-in-differences approach and thus now includes information about individuals from the year before the change window (i.e. 1996 and 1997). A positive and significant effect was found for all three change variables. The estimates were slightly higher than the plain logit estimates. Thus, the estimated effects of change were further substantiated with a differences-in-differences approach. In addition, this showed that change significantly influences the likelihood of receiving stress-related medications when an individual is employed in an organization that changes. The *breadth of change* indicator was highly significant and positive. This suggests that the more dimensions targeted for organizational change, the more likely it is that employees will receive prescriptions for insomnia, anxiety, and depression. The controls for performance were insignificant. The main effects of the change indicators were all insignificant and small, suggesting that there is no significant difference between employees in changing and non-changing firms, in terms of the risk of increased stress. This further ensures that an unobserved difference between firms is not predicting both stress and change simultaneously. Additionally, firm dummies were added to the differences-in-differences in unreported regressions as a test of robustness. This did not influence the magnitudes of the estimates.

These findings were tested again in Table 5 using individual fixed effects (using conditional logistic regression). Please note that this method adds some restrictions to the observations included. The number of observations is reduced considerably because fixed-effects on individuals requires variation in the dependent variable. This means that any individuals receiving stress-prescriptions during the entire period and those that never received a prescription were automatically dropped from the analysis. Models 11-13 present the conditional logistic regressions. These findings are

in line with the previous estimations. On average, and within individuals, change has a significant and positive effect on stress in the post-change period. The *change* dummy was considerably larger in this specification. Even after controlling for time using year dummies, there was an increased risk of receiving stress-related medication after organizational change. The result for *degree of change* and *breadth of change* were also positive and significant. The controls for performance were insignificant. These findings suggest that when holding the individual constant and thus controlling for unobserved heterogeneity, the effect of organizational change on stress was consistent with the differences-in-differences estimates.⁴

In summary, these findings establish that broad changes have a significant impact on the health of the individual. It is not simply a question of changes or no changes, but also a question of the breadth and magnitude of change. This is the most robust effect and it shows that in the post-change period, simultaneous changes along multiple dimensions have negative effects on the mental health of employees. In unreported estimations, the effects were tested individually for years following the changes. It was found that the estimated effect was larger in 2000 (closest to organizational change), yet it remained significant in 2001 and 2002 as well. Two years after the change window, the positive effects of organizational change on the probability of receiving stress-related medications were observed.

While we would expect CEOs to be a valid source for information on change initiative and their overall corporate targets, it is worthwhile to consider alternative sources of information. Unfortunately, the survey has not been retested with evidence from external sources. However, a fraction of the CEOs have given their permission and allowed the survey to be sent to one of their employees. This yielded an additional 426 responses from employees (one per firm). To ensure that the above results were robust, Tables 3 and 4 were re-estimated with information from these 426 employees. The direction of the effects of change was identical to the CEOs responses. These findings also suggest that stress increases with organizational change. The magnitudes of the effects were largely the same, but given the larger standard errors less stable. In relying on another source of information, these results indicate that the findings presented above are indeed robust. However, there is no information about how the employees were chosen by the CEOs, nor any information on the position held by these employees.

⁴I have re-estimated the differences-in-differences regressions from Table 4 on the reduced set of individuals that are included in the individual fixed effects regressions. The estimates of *change*, *degree of change* and *breadth of change* were larger than the original differences-in-differences regressions (Table 4), but remarkably similar to the individual fixed effects regressions (Table 5).

Effects from different dimensions of change

It seems natural to investigate whether particular types of change have more or less significant effects on the probability of receiving stress-related medications. A main effect as well as an interaction effect with *Post* was added for each of the six dimensions targeted (with a 'to a large extent' response) in the differences-in-differences (Model 10, Table 4) and individual fixed effects estimations (Model 14, Table 5). Both specifications revealed that increased cooperation/coordination had significant and harmful effects on employees. In the differences-in-differences specification, the main effect of this dimension is negative and significant. This means that (with regard to this dimension) employees in firms that change were less likely to receive stress-related medications in the pre-change period. This suggests that some types of change are more harmful than others, but, given that *breadth of change* has a strong effect on the probability of increased negative stress, these differences do not appear to be driving the overall findings. What remains important is not only the dimensions changed simultaneously that have an overall effect on employees.

It is remarkable, after controlling for other factors, cooperation/coordination stands out as being the strongest factor. This potentially raises a concern that at least part of the strong overall results may have been driven by this one dimension. To test this concern, Tables 3 and 4 have been re-estimated leaving this dimension out of the recalculated values of *degree of change* and *breadth of change*. The results were identical to those presented above.

Effects for different sectors, firm size groups and employees

In the following section, I examined whether certain types of firms (sector and size) were more or less likely to experience problems (at the employee level). If, as these findings suggest, negative outcomes were the typical consequences of organizations that tried to change multiple dimensions at the same time, it is possible that organizations within some industries are more affected by these consequences than those from other industries. Organizations could be part of industrial populations where conditions, competition, or innovative demands are changing rapidly. Under such conditions, broad organizational adjustments might be more frequent than in industries within environments that are more settled. To investigate this further, I have split the sample into three broad sectors: services (including trade and financial services), modern manufacturing (including software and consultancy), and traditional manufacturing (including construction). Differences-in-differences regressions for these sectors are presented in Table 6. Change appears to be most problematic for services and trade. The estimates for the three change variables were larger and

only significant for services. There are some interesting differences between these sectors in terms of dimensions of change. Cooperation and coordination only had significant and positive effects on stress in services. These models were also tested by industry using individual fixed effects specifications (unreported but available upon request). Overall, these produce largely the same results, yet with respect to the types of changes, several differences emerged in the comparison to the differences-in-differences approach. A significant positive effect of enhancing skill and knowledge was found for traditional manufacturing. In addition, in services and in traditional manufacturing firms, cooperation and coordination has a positive and significant effect on stress. I will discuss these findings below.

Size is typically included as an important explanation of whether change is problematic. This was investigated by splitting the sample into three size groups: firms with fewer than 100 employees, firms with between 100 and 299 employees, and firms with 300+ employees (see Table 7). There appears to be a non-linear effect of size on the effects of the change dummy on stress where employees in both the smallest and the largest firms are relatively more affected by change. Changing to increase coordination and cooperation had significant and positive effects for small and large firms as well.

I also sought to determine whether certain types of employees were at more or at less risk, when change was implemented. This was tested by splitting the sample into different groups according to occupation (e.g., blue-collar, white-collar, management or CEO). Regressions for blue- and white-collar individuals are presented in Table 8 and for management and CEOs in Table 9. Thus it was observed that change overall has less harmful effects on white collar, management and CEOs. Examining these groups using individual fixed effects suggested that *breadth of change* had large positive effects on management as well as on blue-collar employees. In addition to these regressions, effects were estimated with respect to two firm tenure groups (those with more than 5 years of tenure in 1998 and those with less than 5 years of tenure in 1998). There were no differences between the two groups.

Discussion

In this article, I have extended a macro level literature on organizational change to the level of the individual employee. With support of other theories, I argue that organizational change leads to increased stress levels for employees. I show empirically that there are significant risks of increased stress within an organization if firms seek to their organizations along multiple dimensions

simultaneously. Employees are more likely to receive stress-related medication prescriptions for insomnia, anxiety, and depression if they are employed in organizations undergoing this type of change.

This psychological impact is problematic for firms as employees are likely to be less productive or alert under such conditions, which could in turn lead to an increase in their number of days absent. In periods that follow changes, where employees are suffering from mental health problems following changes, organizations are already in the midst of a realignment process. However, because mental health problems could increase turnover as well as reduce the employees' focus and commitment, such problems stand to prolong the realignment process itself. Increased turnover can be problematic for an organization because it is associated with increased recruiting costs and, perhaps more importantly, it entails the cost of retraining new employees, who typically are not able to fully replace old employees from the first day. Consequently, because they do not have a fully functional organization, firms stand to miss potentially rewarding opportunities.

Given the characteristics of the Danish labor market, the results of this research are surprising. In terms of job migration, the Danish labor market is one of the most flexible labor markets in Europe (Albæk and Sørensen, 1998; Sørensen and Sorenson, 2007). The annual employment turnover is high, at least in part because of the opportunity for many employers and employees to terminate their contracts. This works relatively well because there is a social safety net that provides support for workers during periods when they do not have a job, whether they quit their own job or not (although such cases are associated with a short period without compensation). In addition, the period studied in the article falls during a significant economic upturn, where unemployment was reduced from 10.4 percent (in 1995) to 5.2 percent (in 2002) (according to official statistics from Statistics Denmark). That said, even under these more fortunate economic circumstances, it is remarkable to see stress emerging from firm-specific actions. Indeed, the level of outside options available for employees was at its highest and general economic welfare was increasing.

An important implication of this research suggests that broad changes increase the probability that employees will receive stress-related medications. At the same time, I found that a particular type of change were especially harmful. That is, change implemented to increase coordination and cooperation across the firm had significant and positive effects on stress. This type of change is likely to have had a broad range of consequences for employees at all levels because it implies increasing linkages and adding communication channels between different and previously less integrated parts of the organization. Such change highlights the need for new levels of internal

control. This could lead both to altered sources of authority and to changes (or increases) in the number and characteristics of the individuals with whom an employee needs to coordinate and communicate. This adjustment to new schemes is likely to be difficult because it involves a period of overlap between old and new patterns with ample potential for confusion, frustration and lost productivity.

In general, employees might view changes as being a threat to their future at the firm, as change itself might signal dissatisfaction with the current model. Because of the altered balance in the firm, change might be interpreted as a first step in the layoff of certain types of employees. Related studies have found significant effects on commitment of actual or expected layoffs for both the employees affected and for those that remain (Brockner et al., 1987); this remains true in case of emotional survivor guilt (Brockner et al., 1986), self-esteem (Brockner et al., 1993), sick leave (Vahtera et al., 1997), and absenteeism (Kivimäki et al., 2000). Firms tend to overlook these consequences of change. Although it may be indubitably rational to improve coordination or to change the organization's status quo, there will likely be significant costs along the way to full implementation.

The effects of change are, on average, negative and harmful for employee mental health. However, when different groups were examined, a more complicated picture emerged. With respect to the cooperation and coordination dimension of change, change along this dimension is more harmful to employees at larger firms. For larger firms, increased coordination entails a more problematic realignment processes. In addition, with respect to particular sectors at stake, the negative effects of increased coordination efforts are exacerbated for services and modern manufacturing firms. Alternatively, within the traditional manufacturing sector, a negative effect of enhancing knowledge and skills was found (with individual fixed effects only). This sector is likely constituted by more stable and settled industries, where skill-enhancing changes are likely to be more disruptive. Overall, blue-collar workers are generally more at risk and more at risk with respect to changes along the cooperation and coordination dimension. CEOs are also significantly affected by changes along this dimension.

In a comparison of the pre-change performance of changing firms to more stable ones, it was found that growing firms were more likely to change. In a few regressions, there was a significant and positive effect of employment growth on stress. This suggests that adding significantly more employees to an organization increases the need for organizational restructuring and change. This is an interesting finding because, intuitively, the reverse may be plausible as well. One might have expected that in an effort to regain momentum, poor performing firms are more likely to

change. Instead, employees evidence increased stress levels following periods in which many new colleagues enter the organization. The employees might feel threatened by their new colleagues, as their addition alters the internal balance. Growing firms might also need to realign their structures to accommodate the larger organization. This might increase the need for altered cooperation and coordination patterns, which were found to be a problematic dimension. That said, employees might be much more likely to recover from increased stress in situations where the firm is changing as a result of positive performance. This could imply that despite the cost for existing employees, change might be good for organizations.

The significant unanswered question of this study is whether a firm should be recommended to avoid change. This study find that, on average, firms increase the probability of negative stress-levels for their employees by broadly changing their organizational form. However, the study also shows that change is relatively less problematic under some circumstances and for some firms. It was found that some dimensions of change were less harmful than others. Thus a key will be to find a combination and balance of changes that will minimize the negative effects. The most popular type of change is targeted towards increased effectiveness. This type of change was not found to be particularly harmful in itself (after controlling for other dimensions). However, if it is implemented along with changes in a large number of the other dimensions, it can become problematic. This finding stresses the importance of reducing the complexity of change. Complexity will most likely increase if multiple dimensions are targeted. The ability to change an organization is critical in many settings. This study stresses the importance of identifying the potential negative effects of change on employees so that firms can anticipate and intercede to reduce them.

The advantage of this research lies in the level of detail of its data. They cover multiple industries and types of organizations as well as detailed objective information on the health of employees over time. However, there are some weaknesses that should also be recognized. A potential limitation of this study (due to limitations in the data) is the inability to observe past changes in the history of these firms. Many researchers argue that the effects of change are likely to be different in firms that have already made several changes in the past (Kelly and Amburgey, 1991; Amburgey et al., 1993; van de Ven and Poole, 1995). Changes of the same type as those made previously are not likely to have as severe of an effect as changes that have never been experienced before. This is especially problematic in this study as it is based on the assumption that firms are equal at the outset. Thus, whether there is a difference among the firms with respect to their history remains an unanswered question. Consequently, further research on the mental health outcomes of organizational change should address the firm's own history of changes. However, it should be

noted here that the effects did not disappear with the inclusion of firm dummies. In addition, one limitation of this study (along with many other similar ones) is that change is hard to measure and much less specify precisely across firms and industries. In this article, the different dimensions examined are at times overlapping and difficult to distinguish from each other. Varying degrees of change along these dimensions, with varying potentials for disruption, are potentially measured with same score, yet they stand to have different meanings in different industries or for different responding CEOs. In studies of employees' mental responses to organizational change, it would be highly relevant to be able to empirically consider the speed and scope of change itself in greater detail (Weick and Quinn, 1999).

The literature in organizational ecology has argued that changes in the core fundamental features of an organization have its greatest effect on organizational instability (Hannan and Freeman, 1977, 1984). This entails a disruption of key routines, habits and structures widely used in an organization. Ideally, the survey used here should provide more detailed information on this dimension in order to link employee stress to core organizational changes. It is a limitation of this survey that there is very little information on the organizational structure at the outset. This makes it difficult to assess whether changes in the above six dimensions are really changes to core features. That said, this was probably a sacrifice taken to ensure that the survey could be answered by diverse organizations. It is plausible that organizations scoring high values in *degree of change* or *breadth of change* are indeed altering core features as these scores imply that multiple dimensions are targeted at the same time. If an organization vigorously launches initiatives to become more effective, more innovative, to increase skills and to improve coordination/cooperation all at the same time, changes in core features of the organization involving central routines may be involved. However, these types of changes when characterized individually are incremental and adaptive changes that are not considered radical or largely disruptive in the literature (Nadler and Tushman, 1989, 1990; Roach and Bednar, 1997; Kleiner and Corrigan, 2007). Given that the methods used here provide no information on what a 'high extent' means for a specific organization, it is not possible to rule out alternative explanations. Consequently, I do not claim that *degree of change* or *breadth of change* are measures of core fundamental change. One could argue that broad changes to these dimensions have strong significant effects because they expose more people in the organization to change. If these are not measures of core change, the results of this study are even more remarkable as they would show that employees are emotionally affected even by incremental change – so strongly that they seek out prescriptions for stress-related medications.

Despite these limitations and the approaches necessary for future research, these findings nev-

ertheless illustrate that while academics, consultants and managers have focused for decades on the management of change, the average firm is unable to fully control the change process without significant negative consequences. Organizational changes are associated with significant risks of negative stress. This calls for new ways of thinking about change processes and about how to manage them.

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Figures

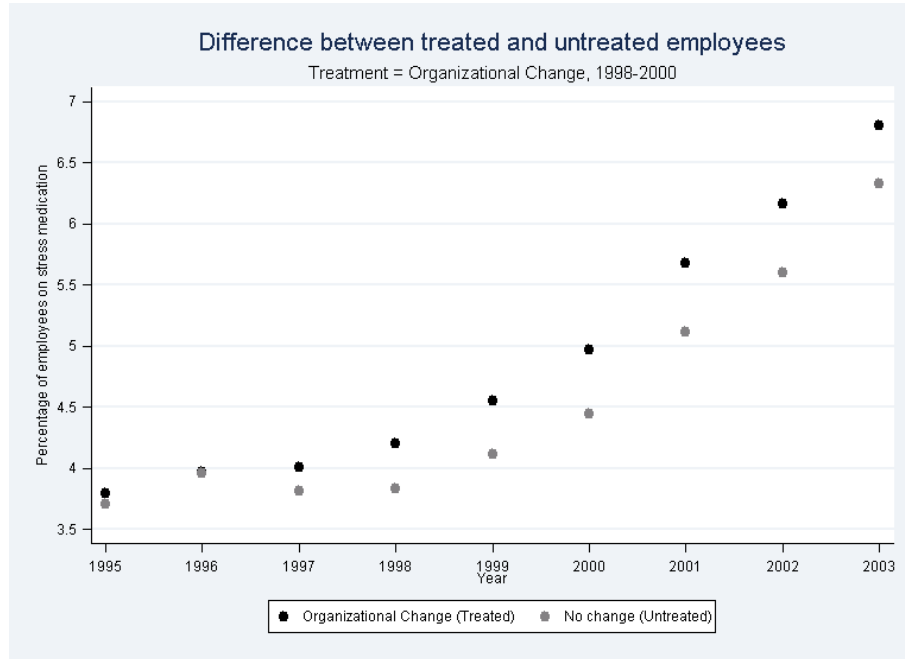


Figure 1: Percentage of employees on stress medication

Tables

Table 1: Correlation between types of organizational change

Variables	Proportion	1	2	3	4	5	6
1. Effectiveness	31.98	1.000					
2. Cooperation/coordination	23.33	0.509	1.000				
3. Adaptation/turbulence	20.45	0.492	0.481	1.000			
4. New products/services	12.58	0.348	0.374	0.429	1.000		
5. Enhance skills/knowledge	12.65	0.352	0.415	0.443	0.551	1.000	
6. Quality and customer service	23.98	0.586	0.459	0.495	0.429	0.447	1.000

Note: Proportion is equal to the percentage of firms which target the specific dimension to a large degree.

Table 2: Summary statistics, 2000

Variable	Mean	Std. Dev.	Min.	Max.
Stress t	0.048	0.213	0	1
Change	0.637	0.481	0	1
Degree of Change	1.427	1.151	0	3
Breadth of Change	1.834	1.889	0	6
Age	40.46	10.45	20	59
Men	0.679	0.467	0	1
Ln Children 0-5 yrs	0.166	0.339	0	1.609
Ln Children 6-13 yrs	0.208	0.382	0	1.792
Ln Children 14-17 yrs	0.091	0.246	0	1.386
Married	0.568	0.495	0	1
Spouse stress $t-1$	0.044	0.204	0	1
Mother stress $t-1$	0.106	0.308	0	1
Father stress $t-1$	0.058	0.234	0	1
Ln Firm Tenure	2.100	0.616	0.693	3.091
Ln Wage	12.47	0.525	0	15.47
CEO	0.044	0.205	0	1
Management	0.076	0.265	0	1
White collar	0.143	0.350	0	1
Blue collar	0.689	0.463	0	1
Firm Size, 50-99 employees	0.150	0.357	0	1
Firm Size, 100+ employees	0.708	0.455	0	1
Ln Firm Age	3.207	0.786	1.386	4.673
Turnover, percentage growth	0.052	0.323	-15.92	3.925
Value added, percentage growth	0.032	0.301	-15.91	2.732
Employment, percentage growth	0.020	0.290	-1.576	2.962
N	92,860			

Table 3: Estimated Probability of Negative Stress

	Stress in 2000			Stress in 2000-2002		
	(1)	(2)	(3)	(4)	(5)	(6)
Change	0.087** [0.039]			0.067** [0.033]		
Degree of Change		0.041** [0.016]			0.032** [0.014]	
Breadth of Change			0.022** [0.009]			0.017** [0.008]
Turnover, percentage growth	-0.022 [0.067]	-0.020 [0.068]	-0.018 [0.069]	-0.010** [0.005]	-0.010** [0.005]	-0.010** [0.005]
Value added, percentage growth	0.025 [0.075]	0.030 [0.077]	0.030 [0.077]	0.005 [0.009]	0.006 [0.009]	0.006 [0.008]
Employment, percentage growth	0.153** [0.063]	0.141** [0.060]	0.137** [0.059]	0.081** [0.035]	0.080** [0.035]	0.076** [0.034]
Constant	-3.279*** [0.311]	-3.286*** [0.311]	-3.280*** [0.313]	-3.605*** [0.116]	-3.611*** [0.117]	-3.603*** [0.117]
Pseudo R^2	0.05	0.05	0.05	0.05	0.05	0.05
Log-likelihood	-16,864	-16,863	-16,864	-52,232	-52,229	-52,231
Observations	92,860	92,860	92,860	263,902	263,902	263,902

Standard errors are clustered at the level of the firm and reported in brackets.

Significance levels: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: The sample includes all individuals employed in the focal firm during the period from 1998 to at least 2000. The dependent variable takes the value of 1 if the individual received one or more prescriptions for stress-related medication. All regressions include unreported controls for age, gender, marital status, number of children in each of three age groups (logged), stress of parents and spouse, firm tenure (logged), wage (logged), occupation level, firm size (two dummies), firm age (logged) and 1-digit SIC industry dummies. In addition, Models 4-6 include unreported year dummies. All regressions are logistic regressions.

Table 4: Probability of Negative Stress: Differences-in-Differences

	Stress in 1996, 1997, 2000, 2001, 2002			
	(7)	(8)	(9)	(10)
Change	-0.005 [0.050]			
Post x Change	0.072* [0.038]			
Degree of Change		0.006 [0.020]		
Post x Degree		0.026* [0.015]		
Breadth of Change			-0.007 [0.009]	
Post x Breadth			0.023*** [0.007]	
Effectiveness				0.066 [0.055]
Cooperation/coordination				-0.118** [0.048]
Adaptation/turbulence				0.060 [0.056]
New products/services				-0.091 [0.061]
Enhance skills/knowledge				-0.033 [0.054]
Quality and customer service				0.044 [0.051]
Post x Effectiveness				-0.025 [0.040]
Post x Cooperation/coordination				0.137*** [0.039]
Post x Adaptation/turbulence				-0.012 [0.039]
Post x New products/services				0.031 [0.048]
Post x Enhance skills/knowledge				0.021 [0.044]
Post x Quality and customer service				-0.003 [0.042]
Turnover, percentage growth	-0.006 [0.004]	-0.006 [0.004]	-0.006 [0.004]	-0.006 [0.005]
Value added, percentage growth	0.006 [0.008]	0.007 [0.008]	0.007 [0.008]	0.006 [0.008]
Employment, percentage growth	0.052 [0.032]	0.050 [0.031]	0.047 [0.032]	0.055* [0.030]
Constant	-4.252*** [0.096]	-4.262*** [0.096]	-4.250*** [0.094]	-4.255*** [0.098]
Pseudo R^2	0.06	0.06	0.06	0.06
Log-likelihood	-79,185	-79,183	-79,184	-79,163
Observations	436,310	436,310	436,310	436,310

Standard errors are clustered at the level of the firm and reported in brackets.

Significance levels: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: The sample includes all individuals employed in the focal firm during the period from 1998 to at least 2000. POST takes a value of 1 for the years 2000-2002 and a value of zero otherwise. The differences-in-differences estimators are the interaction effects between POST and the change variables. The POST main effect is dropped from the regressions due to the inclusion of year dummies. The dependent variable takes the value of 1 if the individual received one or more prescriptions for stress-related medication.

All regressions include unreported controls for age, gender, marital status, number of children in each of three age groups (logged), stress of parents and spouse, firm tenure (logged), wage (logged), occupation level, firm size (two dummies), firm age (logged), year dummies, and 1-digit SIC industry dummies. All regressions are logistic regressions.

Table 5: Probability of Negative Stress: Individual Fixed Effects Estimates

	Stress in 1996, 1997, 2000, 2001, 2002			
	(11)	(12)	(13)	(14)
Post x Change	0.125** [0.060]			
Post x Degree		0.051** [0.025]		
Post x Breadth			0.039*** [0.013]	
Post x Effectiveness				-0.026 [0.060]
Post x Co-operation/coordination				0.194*** [0.062]
Post x Adaptation/turbulence				0.019 [0.058]
Post x New products/services				-0.013 [0.087]
Post x Enhance skills/knowledge				0.081 [0.086]
Post x Quality and customer service				-0.007 [0.071]
Turnover, percentage growth	-0.006 [0.005]	-0.006 [0.005]	-0.006 [0.005]	-0.008 [0.005]
Value added, percentage growth	0.011 [0.018]	0.011 [0.018]	0.011 [0.018]	0.012 [0.017]
Employment, percentage growth	-0.002 [0.040]	-0.005 [0.041]	-0.005 [0.041]	0.010 [0.040]
Pseudo R^2	0.03	0.03	0.03	0.03
Log-likelihood	-16478	-16478	-16476	-16470
Observations	46,128	46,128	46,128	46,128

Standard errors are clustered at the level of the firm and reported in brackets.

Significance levels: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: The sample includes all individuals employed in the focal firm during the period from 1998 to at least 2000. POST takes a value of 1 for the years 2000-2002 and a value of zero otherwise. The POST main effect is dropped from the regressions due to the inclusion of year dummies. The main effects of change and dimensions of change are dropped in the fixed effects models because fixed effects require variation within individuals over time. Similarly, variation is required for the dependent variable. This means that individuals with $depvar = 0$ or $depvar = 1$ for the entire period are automatically dropped from the analysis. The dependent variable takes the value of 1 if the individual received one or more prescriptions for stress-related medication. All regressions include unreported controls for marital status, number of children in each of three age groups (logged), stress of parents and spouse, wage (logged), occupation level, firm size (two dummies), firm age (logged) and year dummies. All regressions are conditional logistic regressions conditioned on the individual.

Table 6: Probability of Negative Stress: Differences-in-Differences Estimates by Sector

	Stress in 1996, 1997, 2000, 2001, 2002											
	Modern manufacturing		Traditional manufacturing		Services and trade							
	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)	(25)	(26)
Post x Change	-0.003 [0.078]				0.045 [0.052]				0.137** [0.054]			
Post x Degree		0.011 [0.031]				0.018 [0.022]				0.050** [0.023]		
Post x Breadth			0.015 [0.019]				0.016 [0.011]				0.043*** [0.014]	
Post x Effect				-0.124 [0.103]				-0.002 [0.048]				0.041 [0.083]
Post x Coop/coor				0.046 [0.091]				0.041 [0.057]				0.232*** [0.075]
Post x Adapt/turbo				-0.123 [0.143]				-0.051 [0.046]				-0.039 [0.073]
Post x Prod/serv				0.168 [0.133]				-0.058 [0.070]				0.138 [0.095]
Post x Skills/knowl				0.098 [0.106]				0.102 [0.066]				-0.056 [0.091]
Post x Quality/cust				0.098 [0.112]				0.065 [0.056]				-0.030 [0.084]
Turnover, growth	0.049 [0.090]	0.045 [0.090]	0.044 [0.091]	0.050 [0.092]	-0.010 [0.008]	-0.010 [0.008]	-0.009 [0.008]	-0.007 [0.008]	0.025 [0.024]	0.025 [0.024]	0.024 [0.024]	0.022 [0.021]
Value added, growth	-0.053 [0.092]	-0.048 [0.093]	-0.048 [0.093]	-0.056 [0.094]	0.016 [0.017]	0.016 [0.016]	0.015 [0.017]	0.014 [0.017]	-0.004 [0.022]	-0.005 [0.022]	-0.005 [0.022]	-0.001 [0.019]
Employment, growth	-0.052 [0.053]	-0.051 [0.054]	-0.052 [0.055]	-0.040 [0.059]	0.044 [0.060]	0.041 [0.059]	0.031 [0.061]	0.060 [0.057]	0.083** [0.042]	0.079* [0.043]	0.079* [0.043]	0.086** [0.043]
Constant	-4.320*** [0.399]	-4.314*** [0.411]	-4.265*** [0.383]	-4.352*** [0.393]	-4.136*** [0.147]	-4.133*** [0.144]	-4.113*** [0.139]	-4.137*** [0.141]	-4.448*** [0.129]	-4.457*** [0.130]	-4.458*** [0.130]	-4.435*** [0.138]
Pseudo R ²	0.06	0.06	0.06	0.06	0.05	0.05	0.05	0.05	0.07	0.07	0.07	0.07
Log-likelihood	-8,802	-8,802	-8,802	-8,792	-43,981	-43,981	-43,987	-43,967	-26,341	-26,342	-26,340	-26,324
Observations	45,620	45,620	45,620	45,620	234,209	234,209	234,209	234,209	156,481	156,481	156,481	156,481

Standard errors are clustered at the level of the firm and reported in brackets.

Significance levels: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: The sample includes all individuals employed in the focal firm during the period from 1998 to at least 2000. POST takes a value of 1 for the years 2000-2002 and a value of zero otherwise. The differences-in-differences estimators are the interaction effects between POST and the change variables. The POST main effect is dropped from the regressions due to the inclusion of year dummies. The dependent variable takes the value of 1 if the individual received one or more prescriptions for stress-related medication. All regressions include unreported controls for age, gender, marital status, number of children in each of three age groups (logged), stress of parents and spouse, firm tenure (logged), wage (logged), occupation level, firm size (two dummies), firm age (logged) and year dummies. All regressions are logistic regressions.

Table 7: Probability of Negative Stress: Differences-in-Differences Estimates by Firm Size

	Stress in 1996, 1997, 2000, 2001, 2002											
	Less than 100 employees			Between 100-299 employees			300+ employees					
	(27)	(28)	(29)	(30)	(31)	(32)	(33)	(34)	(35)	(36)	(37)	(38)
Post x Change	0.097* [0.052]				0.029 [0.057]				0.095 [0.067]			
Post x Degree		0.031 [0.022]				0.031 [0.024]				0.024 [0.028]		
Post x Breadth			0.022 [0.014]				0.026* [0.014]				0.024** [0.011]	
Post x Effect				0.030 [0.076]				-0.070 [0.069]				0.007 [0.060]
Post x Coop/coor				0.146* [0.078]				0.073 [0.090]				0.150*** [0.056]
Post x Adapt/turbu				-0.050 [0.085]				0.000 [0.079]				-0.025 [0.053]
Post x Prod/serv				0.003 [0.092]				0.056 [0.113]				0.052 [0.071]
Post x Skills/knowl				0.091 [0.098]				0.014 [0.105]				0.007 [0.054]
Post x Quality/cust				-0.074 [0.082]				0.094 [0.071]				-0.031 [0.068]
Turnover, growth	-0.005 [0.029]	-0.005 [0.029]	-0.006 [0.029]	-0.010 [0.028]	-0.014 [0.017]	-0.013 [0.017]	-0.015 [0.017]	-0.011 [0.016]	-0.007 [0.008]	-0.006 [0.008]	-0.006 [0.008]	-0.004 [0.009]
Value added, growth	-0.001 [0.028]	-0.001 [0.028]	-0.000 [0.028]	0.002 [0.028]	0.001 [0.010]	0.002 [0.010]	0.003 [0.010]	0.002 [0.010]	0.016 [0.011]	0.017 [0.011]	0.015 [0.012]	0.010 [0.013]
Employment, growth	0.070 [0.047]	0.069 [0.047]	0.069 [0.047]	0.073 [0.047]	0.082 [0.052]	0.080 [0.052]	0.081 [0.052]	0.078 [0.050]	0.006 [0.060]	0.006 [0.060]	0.003 [0.060]	0.012 [0.063]
Constant	-4.427*** [0.184]	-4.429*** [0.184]	-4.429*** [0.183]	-4.417*** [0.183]	-4.113*** [0.220]	-4.093*** [0.218]	-4.046*** [0.217]	-4.047*** [0.214]	-4.212*** [0.154]	-4.249*** [0.157]	-4.224*** [0.143]	-4.254*** [0.166]
Pseudo R ²	0.06	0.06	0.06	0.06	0.05	0.05	0.05	0.05	0.06	0.06	0.06	0.06
Log-likelihood	-22.627	-22.628	-22.628	-22.619	-19.482	-19.480	-19.483	-19.475	-35.403	-35.403	-35.403	-35.385
Observations	135,632	135,632	135,632	135,632	105,822	105,822	105,822	105,822	186,875	186,875	186,875	186,875

Standard errors are clustered at the level of the firm and reported in brackets.

Significance levels: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: The sample includes all individuals employed in the focal firm during the period from 1998 to at least 2000. POST takes a value of 1 for the years 2000-2002 and a value of zero otherwise. The differences-in-differences estimators are the interaction effects between POST and the change variables. The POST main effect is dropped from the regressions due to the inclusion of year dummies. The dependent variable takes the value of 1 if the individual received one or more prescriptions for stress-related medication. All regressions include unreported controls for age, gender, marital status, number of children in each of three age groups (logged), stress of parents and spouse, firm tenure (logged), wage (logged), occupation level, firm age (logged), year dummies, and 1-digit SIC industry dummies. All regressions are logistic regressions.

Table 8: Probability of Negative Stress: Differences-in-Differences Estimates by Occupation

	Stress in 1996, 1997, 2000, 2001, 2002							
	Blue				White, excl. CEOs and management			
	(39)	(40)	(41)	(42)	(43)	(44)	(45)	(46)
Post x Change	0.087* [0.045]				0.050 [0.072]			
Post x Degree		0.037** [0.019]				0.008 [0.029]		
Post x Breadth			0.028*** [0.009]				0.008 [0.018]	
Post x Effect				-0.009 [0.049]				0.024 [0.080]
Post x Coop/coor				0.129*** [0.047]				0.074 [0.090]
Post x Adapt/turbu				0.002 [0.048]				-0.025 [0.074]
Post x Prod/serv				0.088 [0.064]				-0.078 [0.115]
Post x Skills/knowl				0.000 [0.058]				-0.002 [0.096]
Post x Quality/cust				-0.026 [0.053]				0.027 [0.092]
Turnover, growth	-0.004 [0.005]	-0.003 [0.005]	-0.003 [0.005]	-0.003 [0.006]	-0.007 [0.009]	-0.007 [0.009]	-0.006 [0.009]	-0.004 [0.010]
Value added, growth	0.012 [0.010]	0.013 [0.010]	0.013 [0.010]	0.012 [0.010]	0.003 [0.018]	0.002 [0.018]	0.001 [0.018]	-0.004 [0.018]
Employment, growth	0.040 [0.040]	0.039 [0.040]	0.035 [0.040]	0.047 [0.038]	0.037 [0.057]	0.033 [0.056]	0.030 [0.057]	0.028 [0.063]
Constant	-4.032*** [0.112]	-4.040*** [0.113]	-4.033*** [0.110]	-4.049*** [0.117]	-5.371*** [0.280]	-5.373*** [0.279]	-5.356*** [0.277]	-5.336*** [0.283]
Pseudo R^2	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
Log-likelihood	-55,715	-55,711	-55,712	-55,696	-11,728	-11,727	-11,726	-11,716
Observations	306,259	306,259	306,259	306,259	61,851	61,851	61,851	61,851

Standard errors are clustered at the level of the firm and reported in brackets.

Significance levels: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: The sample includes all individuals employed in the focal firm during the period from 1998 to at least 2000. POST takes a value of 1 for the years 2000-2002 and a value of zero otherwise. The differences-in-differences estimators are the interaction effects between POST and the change variables. The POST main effect is dropped from the regressions due to the inclusion of year dummies. The dependent variable takes the value of 1 if the individual received one or more prescriptions for stress-related medication. All regressions include unreported controls for age, gender, marital status, number of children in each of three age groups (logged), stress of parents and spouse, firm tenure (logged), wage (logged), firm size (two dummies), firm age (logged), year dummies, and 1-digit SIC industry dummies. All regressions are logistic regressions.

Table 9: Probability of Negative Stress: Differences-in-Differences Estimates by Occupation, continued

	Stress in 1996, 1997, 2000, 2001, 2002							
	Management				CEOs			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Post x Change	-0.145 [0.148]				0.104 [0.118]			
Post x Degree		-0.056 [0.058]				0.001 [0.050]		
Post x Breadth			0.005 [0.031]				-0.007 [0.030]	
Post x Effect				-0.068 [0.121]				-0.017 [0.113]
Post x Coop/coor				0.178 [0.136]				0.329*** [0.127]
Post x Adapt/turbu				-0.197 [0.126]				-0.061 [0.134]
Post x Prod/serv				-0.026 [0.186]				-0.264 [0.161]
Post x Skills/knowl				0.125 [0.167]				0.101 [0.159]
Post x Quality/cust				0.007 [0.158]				-0.180 [0.125]
Turnover, growth	-0.008 [0.016]	-0.009 [0.016]	-0.008 [0.016]	-0.012 [0.016]	-0.007 [0.022]	-0.007 [0.022]	-0.007 [0.022]	-0.023 [0.024]
Value added, growth	0.003 [0.019]	0.005 [0.019]	0.006 [0.019]	0.007 [0.019]	0.022 [0.033]	0.022 [0.033]	0.022 [0.033]	0.033 [0.035]
Employment, growth	0.056 [0.079]	0.061 [0.079]	0.057 [0.081]	0.083 [0.088]	0.164* [0.091]	0.157* [0.092]	0.153* [0.092]	0.136 [0.094]
Constant	-4.639*** [0.450]	-4.660*** [0.438]	-4.561*** [0.413]	-4.587*** [0.442]	-4.064*** [0.498]	-4.079*** [0.499]	-4.071*** [0.499]	-4.139*** [0.503]
Pseudo R^2	0.05	0.05	0.05	0.05	0.04	0.04	0.04	0.04
Log-likelihood	-5,092	-5,091	-5,093	-5,088	-4,090	-4,092	-4,093	-4,080
Observations	33,348	33,348	33,348	33,348	20,000	20,000	20,000	20,000

Standard errors are clustered at the level of the firm and reported in brackets.

Significance levels: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: The sample includes all individuals employed in the focal firm during the period from 1998 to at least 2000. POST takes a value of 1 for the years 2000-2002 and a value of zero otherwise. The differences-in-differences estimators are the interaction effects between POST and the change variables. The POST main effect is dropped from the regressions due to the inclusion of year dummies. The dependent variable takes the value of 1 if the individual received one or more prescriptions for stress-related medication. All regressions include unreported controls for age, gender, marital status, number of children in each of three age groups (logged), stress of parents and spouse, firm tenure (logged), wage (logged), firm size (two dummies), firm age (logged), year dummies, and 1-digit SIC industry dummies. All regressions are logistic regressions.