

# **Impacts of income, health and work conditions on work leave.**

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### **Abstract**

The purpose of the present study is to analyse the effects of socio-demographic characteristics, income, health, and work characteristics on work status of individuals below the age of 67 when Old Age Pension is allowed. Work status is defined as either still working, temporary out of work, or permanently out for work for Post Employment Wage or Social Disability Pension. The paper studies the direct effects of work characteristics on work status as well as their impact as controls when the impacts of other characteristics are estimated. Determination of work status by determinants five years earlier is analysed, using a pooling of two waves of respondents from 1995 and 2000. Next, the effects of determinants in 1995 as well as the changes in the determinants from 1990 to 1995 on work status in 2000 are analysed. It is found that the levels of income and health impact job status while changes in income and health status do not. Regarding work characteristics, especially non-physical characteristics matter as expected, i.e. poor work conditions lead to higher probabilities of leaving work. The impact of physical work characteristics is only weak and partly of an unexpected nature, as there seems to be some evidence that those with the poorest conditions have less probabilities to leave work.

**JEL Classification:** C23, J14, J16, J26

**Keywords:** Work leave; retirement; health; income; work characteristics.

## 1. Introduction

Due to the current demographic transition in most European countries as a consequence of a combination of increasing length of life and low fertility rate the current balance between those with active and passive labour force status is changing. Thus, it has been estimated that the ratio of individuals of age 60+ years to working age individuals or younger (15-59 years) will increase from 24% to nearly 49% in the EU-15 from 2000 to 2020. (Morrow et al.,1999). This change presents a challenge for most welfare states as in most countries the public pension schemes are based on a pay-as-you go system, that is, pensions are paid out from current tax income. Therefore, policies have been directed to keep able persons longer on the labour market. A study of the relative importance of determinants for quitting the labour force is therefore of high importance for policy-making.

For the case of Denmark, exit from the labour market in the 1990s was possible through various income transfer systems. Among these were Old Age Pension (OAP, *folkepension*); Social Disability Pension (SDP, *førtidspension*); Transitional Benefit Programme (TBP, *overgangsydelse*); and Post Employment Wage (PEW, *efterløn*). Old Age Pension is a universal benefit to all from the age of 67 (65 from 2004). However, on average less than 20% of the population was active on the labour market until the age of receiving Old Age Pension (Weatherall, 2001). Retirement before the age of 67 is defined as ‘early retirement’ in the following.

According to the rules in force during the 1990s, SDP could be allowed to persons between 18 and 65 years when the ability to work was permanently lowered due to physical, psychic or social factors. The ability to work must be lowered by at least 50%, and the condition is considered as

permanent. SDP had three levels. The number of people receiving SDP increased from 250,000 to 266,000 in 2000. During the period 1990-1997 the number of persons who were allowed SDP fell by 26%, and in the late 1990s about 20,000 persons per year were allowed SDP. About 14% of those between 50 and 66 years received SDP in 2000, see Table 1.

PEW was introduced in 1979 as a measure to expand the existing unemployment insurance, and hence eligible beneficiaries were members of an unemployment insurance fund. The purpose was to give worn-out workers a possibility to withdraw earlier from work than at 67 years which the normal Old Age Pension scheme allowed. The compensation rate was 90% of the highest unemployment benefit rate (90 % of last earning, subject to a ceiling). This implies that the benefit level would be around 45% of the earlier wage income of a university graduate while 83% of the earlier wage income for a textile worker. The level was reduced 82 % of the unemployment benefit after 2,5 years (Danø et al., 2003). As the scheme became more popular than expected, the rules were changed in 1992 to limit the number of people applying for PEW. Thus it was required that applicants must have been members of an unemployment insurance fund for at least 20 years during the most recent 25 years. Moreover, members who postponed their application to the age of 63 were entitled to a higher compensation rate until the age of 67. Yet another reform in 1999 had the purpose to make employed stay longer in the work force, and the rules were changed for those who reached the age of 60 years by 1999 or later. While earlier rules had a low ceiling on the number of hours a recipient of PEW was allowed to work per year, the ceiling was abolished by the reform. In return, the PEW benefit was reduced by the full amount earned when working. In addition, if an employed stayed full time on the labour market for 2 years after receiving a certificate guaranteeing PEW benefits, a higher benefit was allowed until the age of 65 (Balslev et al., 2001).

(Table 1)

TBP was introduced in 1992 as an offer to persons who were long-term unemployed members of an unemployment insurance fund in the age group 55 – 59 years, and who would otherwise be eligible for PEW at the age of 60. It was a requirement that beneficiaries had been unemployed for at least 12 months during the last 15 months. From 1994 the scheme was expanded to those 50-54 years old. The benefit was 80 % of the highest unemployment benefit. The scheme was prolonged in 1993, but stopped in 1995 for new beneficiaries. As of 1996, 46,000 persons received transitional benefit. The total number of persons receiving PEW and TBP increased from 86,000 to 186,000 from 1990 to 2000, see table 1.

While the aforementioned schemes had the purpose to give older workers an incentive to keep out from the work force, other measures had the opposite purpose. Among these was “activation” which embraces rules to improve work-disabled individual’s ability to work and stay on the labour market. Other measures were subsidies to jobs on special terms (*flexjob*) and sheltered jobs (*skånejobs*).

The growing interest in retirement issues, together with improved access to individual data, has led to a large number of empirical studies of retirement, based on different models for individual choice. The methodology used is based either on reduced form models such as the duration model (Blau, 1994, Robert et al., 2004) and logistic regression type models (Meghir and Whitehouse, 1972) or structural models in a variety of forms, for example Berkovec and Stern (1991), Rust (1989, 1990), Rust and Phelan (1997), Gustman and Steinmeier (1986), Sickles and Taubman

(1986), and Stock and Wise (1990). The choices of model and method have been widely discussed in the literature without a final answer being found to the choice of model. It seems to be generally accepted that the evaluation of models should depend on their prediction performance, so that the choice of model merely should depend on the nature of the available data and the complexity and characteristics of the problems to be resolved. A major difference regarding data is between studies applying one-year cross-sectional data and those applying longitudinal data, the latter being able to infer causal relationships, while the former are only capable at inferring interrelationships among observed phenomena. Regarding methodology, the range is as broad as it might well be, spanning from simple descriptive analyses to highly complex and computationally demanding simulation studies.

Empirical studies of retirement behaviour include - apart from the above mentioned - Lumsdaine, Stock and Wise (1990), Pozzebon and Mitchell (1989), Vistnes (1994), Banks, Blundell, Disney and Emmerson (2002), Disney and Hawkes (2003), Banks and Casanova (2003). Even though these studies are highly different with respect to data, methodology and problems addressed, some common evidence occur. Financial circumstances are important; low education, singleness and poor health are associated with early retirement, and gender differences are found as females are found to have a higher preference for retirement. Further, gender differences are found with respect to importance of singleness status, as the preference for retirement is highest for single males. Regarding financial circumstances, there seem to be evidence of a U-shaped relationship, as the lowest wealth groups and the highest wealth group are less likely to work than those in the middle groups of the welfare distribution, and that those with private pension savings are more likely to retire.

For the case of Denmark, empirical studies include, among others, Pedersen and Smith (1992, 1995), Bingley and Lanot (1996), An et al. (2004), Danø, Ejrnæs and Husted (1998), Wetherall (2001) and Larsen and Gupta (2004). Wetherall's study of early retirement to SDP was based on a sample of the Danish population of age 18-66 years which was followed from 1990 to 1997. During the 1990s about 8% of the population received SDP, but the number of new pensioners per year fell by 20%. The probability of receiving SDP was found to increase by the following indicators according to register based information: having received social support in cash through a longer period the year before (> 75 % of the time), received sickness benefit in cash in a longer period the year before (> 75% of the time), long term unemployed during the previous year (> 75% of the time), yearly wage income below 150,000 DKK, no vocational education and more than 10 years of vocational experience, female gender, physical disease, psychic disease, had an accident, single without children, and over 50 years old. Among the most important self-reported reasons for receiving SDP were somatic disease, worn-out, injury, psychic disease, unemployment and waiting time (Wetherall, 2001).

Danø et al. (2003) studied early retirement decisions by men and women through the PEW exit. The study was based on a 10 percent sample of the adult Danish population for the years 1981-1999, and micro-econometric panel data methods were used. They formulated a structural model of individual decisions of labour supply and found a substantial difference in retirement pattern by men and women. Women appeared to value retirement higher than men and were willing to reduce their disposable income more than men. Health seemed to be a more important determinant of retirement for men than for women. They concluded that the value of the retirement decision of men is mainly determined by income and health while women's retirement is also affected by education and unemployment experience.

Larsen and Gupta (2004) used samples of older workers and retirees from a Danish panel survey from 1997-2002 which they merged to longitudinal register data. In their study they compared the role of subjective versus objective measures of health (diagnostic measures extracted from the national patient register) as determinants of retirement planning. It was expected that self-reported health would be biased due to a “justification bias” found in some earlier studies outside Denmark. They found that self-reported physical and mental health were important predictors of retirement planning, more so for men compared to women. Economic factors were found to be less important than health among both men and women for retirement planning. When comparing the subjective versus objective measures of health, they found no important difference and hence no support for the justification basis. In conclusion they found that self-reported health is both an important predictor of retirement planning and a valid measure of health.

To our knowledge, no studies have analysed the impact of work characteristics on work status or retirement decision. An obvious reason for this is lack of individual level information, as most of the previous studies are based on either available register data where information on working environment is not identifiable on the individual level, or on surveys of an ”omnibus” nature where detailed questions related to work characteristics were considered relatively less important.

The purpose of the present study is to analyse the effects of socio-demographic characteristics, income, health and workplace characteristics on retirement decision. The study specifically aims to investigate the direct effect of workplace characteristics on job status as well as their impact as controls when evaluating the impacts of other characteristics. According to previous evidence, it is hypothesised that the decision to quit labour force increases with low and high income, that low



health status increases the probability to leave labour force, and that females have a higher probability to leave the labour force. For the effect of age, it is hypothesised that elderly have a higher probability to leave for retirement purposes, while the younger as well as the elderly have a higher probability to be temporarily out of work, so that an U-shaped relation is present for age too. Education – measured by primary school degree as well as vocational education – is expected to reduce the probability to leave the labour force. Regarding work conditions, the data applied are detailed enough to allow for a distinction between physical and non-physical conditions. Due to the lack of previous evidence, the expectations regarding impact of working conditions are not very specific, but formulated in broad terms. It is expected that persons in manual jobs have a higher probability to leave work than white-collar workers due to a higher degree of worn out, and it is generally expected that problems related to physical or non-physical work conditions lead to a higher probability to leave.

The data to be applied is a Danish survey, made up of three waves, observed in 1990, 1995 and 2000. Bearing in mind the potentials as well as the restrictions of the data, two studies are performed. First, we analyse the effect on job status of determinants as measured five years earlier, using a pooling of two waves. Specifically, we select those who were in work in 1990 (1995) and analyse the effects of determinants as observed for 1990 (1995) on job status in 1995 (2000). Second, we analyse the effects of determinants in 1995 as well as of changes in determinants from 1990 to 1995 on job status in 2000, applying a sub-sample of those persons who were in work in both 1990 and 1995. To obtain an adequate categorisation of job status, we operate with four categories: Those who are still employed, those who are temporarily out of work (i.e. not retired), those who left for PEW (excluding TBP which was not included in the data), and those who left for SDP. Part 2 of the paper presents the methodology in some more

details, while the data are presented discussed in Part 3. The results obtained are presented in Part 4, and the study is rounded off by some general conclusions in Part 5.

## 2. Methodology.

In accordance with utility theory (see for example Siddiqui, 1997), the model to be applied is a multinomial logistic regression model (Long, 1997; Greene, 2003). The model specifies

$$(1) \quad p(y_i=m | \mathbf{x}_i) = \exp(\mathbf{x}_i\boldsymbol{\beta}_m) / \sum_{j=1..J} \exp(\mathbf{x}_i\boldsymbol{\beta}_j), \quad m=1 \dots J, \quad i=1, \dots, n$$

where  $\mathbf{x}_i$  is the vector of covariates for respondent  $i$ ,  $\boldsymbol{\beta}_m$  the coefficient vector for choice  $m$ , and  $J$  the number of choices, with the standardization  $\boldsymbol{\beta}_1 = \mathbf{0}$ , as the first choice is considered to serve as a reference choice. Throughout, we will apply a model with  $J=4$  choices (still employed, temporarily out, PEW retired, SDP retired) and report coefficients for the last three choices, so that ‘still employed’ is assumed to be the reference choice. Apart from the coefficients and their significances, we report Chi-Square (Wald type) tests for significance of each covariate and Chi-Square (Likelihood Ratio type) tests for joint significance of covariates measuring work characteristics.

As the data include three waves, two models are considered. The first model specifies job status at time  $t$  to be determined by characteristics at time  $t-5$  ( $t=1995, 2000$ ), i.e.

$$(2) \quad p(y_{it}=m | \mathbf{x}_{i,t-1}) = \exp(\mathbf{x}_{i,t-5}\boldsymbol{\beta}_m) / \sum_{j=1..J} \exp(\mathbf{x}_{i,t-5}\boldsymbol{\beta}_j), \quad m=1 \dots J, \quad i=1, \dots, n_t, \quad t=1995, 2000.$$

To account for structural differences between the 1995 and the 2000 cohort, a dummy for the

2000 cohort is included. The pooling of the two surveys is advantageous by making the most efficient use of the available data, as a maximal number of observations can be included in the regression. On the other hand, a disadvantage of the pooled regression is that it does not enable analyses of effects of changes in determinants.

The second model to be applied analyses the effect on job status in 2000 of determinants in 1995 as well as the change in determinants from 1990 to 1995. This model is on the form (1), with the extension that the changes of determinants are included in  $x_t$ . Opposed to the pooled regression, this model has the advantage of enabling analyses of the effects of changes in determinants. This advantage, however, comes at the cost of efficiency in exploitation of the available data, as a much smaller set of observations can be included in the regression.

The application of lagged characteristics in the analyses has at least two reasons. First, work characteristics must, per construction, be observed in lagged form, as they are registered only for those who are in work. Second, it facilitates a proper cause-response specification. Thus, the effect of income should naturally be specified on future planned work status. Third, problems related to endogeneity are – at least partly – circumvented. This especially covers the outstanding problem of endogeneity between health and work status as discussed by for example Kerkhof et al. (1999). On the other hand, endogeneity caused by common unobservable variables as pointed out by Siddiqui (1997) is not fully captured, if such relationships are of a permanent nature.

### **3. Data**

Data for the "Work Environment Cohort" were collected in three rounds in 1990, 1995 and 2000. 9700 persons from the age of 18 and above were randomly selected in 1990 from the Central

Person Register. In 1995 and 2000 additional 2124 young persons (18-22 years old) and 498 immigrants (23-69 years old who did not live in the country 5 years before) were added to the cohort. The 2000 study included a gross number of 12,322 persons of which 885 died or left the country during the 10 year period. Hence, 11,347 were selected for interview in 2000. A total of 8,937 persons were eligible for interview in all three rounds, and of these 5721 participated in all three rounds. Response rates were 90, 80 and 75% respectively in the three rounds. It should be noticed that there is no perfect correspondence between those who were on the labour market as either wage earner or self-employed in the three rounds for various reasons (young persons enter, older leave the labour market, and some left temporarily). Thus, only 2857 persons had the status of wage earners in all three rounds (Burr, 2002). The data were further supplied with register information from Statistics Denmark on income. Table 2 shows information on the total number of persons participating in each of these three waves subdivided according to participation in one, two or all three waves.

(table 2)

As described above, two analyses are performed. Data for a pooled multinomial logit are obtained by pooling those who were employed in 1990 (1995) and who participated in the survey five years later. The dependent variable is work status in 1995 (2000), coded with four non-overlapping levels (employed, temporarily out, PEW, SDP). The explanatory variables include a number of personal characteristics and workplace characteristics in 1990 (1995). Data for the second analysis measuring effect on job status in 2000 of 1995 determinants and 1990-1995 changes in determinants are obtained by selecting those who were in work in 1990 and 1995, and who participated in 2000. An overview of the variables used for the two analyses together with

descriptive statistics for the surveys applied is provided in Table 3.

(table 3)

Health was defined from the familiar five-level Self-Assessed Health (SAH) question. We applied the 15D coding of the health levels derived by Lauridsen et al. (2004).

#### **4. Results**

Table 4 presents the multinomial logit regression of work status explained by characteristics five years earlier. The regression is based on a data set obtained by pooling the 3853 respondents who were working in 1990 and for whom work status were known in 1995 with the 3773 respondents who were working in 1995 and for whom work status were known in 2000.

(table 4)

The first part of the table presents the model including only health and socio-demographic characteristics, while the second part further includes workplace characteristics. Regarding effects of health and socio-demographic conditions, the results are largely unaffected by inclusion of workplace characteristics, showing that interactions between the former and the latter are only marginal. Negative impacts of health are found on the probabilities for being temporarily out of work as well as leaving for PEW and SDP. This confirms the expectation that people in good health have a higher probability to stay in work. Significant and non-linear effects of age are further found, as the probability to be temporarily out of work is lowest around an age of 41.3, so that the probability is higher for the younger and the elder. A similar peak around the age of 35 is

found for PEW. Keeping in mind that this opportunity is only available for those elder than 60, this is merely an indication that the probability to leave for PEW is accelerating with age rather than increasing linearly. The probability to leave for SDP is seen to be maximal around an age of 58.8 and reduced for the younger and the elderly. For the elderly, this may be explained with the presence of alternative retirement forms, while the lower probability for the younger is related to their relatively better working abilities. For income, a negative top is found for the probabilities to be temporarily out of work and leaving for SDP, thus indicating that these probabilities are decelerating rather than falling linearly with income. For PEW, a top is found around an income between 190.000 DKK and 230.000 DKK. This indicates that the probability to leave for PEW is highest for those with an intermediate income and lowest for those with high and low incomes. These results for income seem to confirm the expectation that the lowest and the highest wealth groups are less likely to work than those in the middle groups, but also illustrate that the reasons for being out of work are different for these two groups. As expected, females have significantly higher probabilities for being temporarily out of work as well as leaving for PEW and SDP. Number of years in school – 8-9 years as well as 10-12 years compared to 7 years or less - reduces the probability to leave for SDP, but does not impact the probabilities to leave work temporarily or for PEW. Medium vocational education reduces the probability to leave for SDP, but does not impact the probabilities to leave temporarily or for PEW. Long vocational education does not seem to have any effect. These effects are in accordance with the expectations.

Turning next to the influence of non-physical workplace characteristics, the Chi-Squares for the single variables indicate that several of them significantly impact work status. This is especially the case for being white-collar and union member ( $p < 0.01$ ), but also for influence on decisions, job satisfaction and learning new on job ( $p < 0.05$ ) and partly for being public employed, having

supportive colleagues and fearing for ability to get new job ( $p < 0.1$ ). In accordance with the expectations, being white-collar reduces the probability to leave temporarily or for SDP, while no significant effect is found for PEW. Alike effects are found for being public employed, but this is only significant for being temporarily out of work. Being a union member reduces the probability to leave for PEW, but increases the probability to leave for SDP. The latter effect may be explained by better knowledge about the SDP opportunities, which union members may possess. Concentration and self-decision do not seem to impact work status significantly. Having influence on decisions significantly reduces the probability to be temporarily out of work, but does not impact the probabilities to leave for PEW or SDP. Having a routine job does not affect work status. Having an alternating job increases the probability to leave for PEW, but this effect is very weak. Job satisfaction significantly reduces the probability to leave work temporarily as well as for PEW and SDP. Learning new on job significantly reduces the probability to leave work temporarily. Having an isolated work does not significantly affect work status, while communication with colleagues slightly reduces the probability to leave for PEW. Having supportive colleagues significantly reduces the probabilities to leave temporarily or for SDP, while having supportive seniors reduces the probability to leave for SDP. Fear of being unemployed or fear of job to be moved is unrelated to work status, while fear of being able to have a new job is significantly and positively related to later being temporarily out of work.

Regarding the physical workplace characteristics, the Chi-Squares of the single variables indicate that only exertion to hand vibrations is significant ( $p < 0.05$ ). Turning to the detailed effects, only a few significant impacts are found. Hours per week significantly reduces the probability to leave for PEW, which indicates that this opportunity is used to a higher extent by those with part-time employment. Using PC or being exerted to loud noise does not significantly affect work status.

Being exerted to hand vibrations affects the probabilities to leave work positively, and significantly so for PEW. Varying temperatures do not have significant impacts, while a positive but weakly significant effect is found for cold on the probability to leave work temporarily. A negative but weakly significant effect is found of exertion to bad light on the probability to leave for PEW. Finally, exertion to passive smoke, work accidents, sitting work positions, bend body and physically demanding work do not have significant impacts on work status.

To summarise, workplace characteristics only interact marginally with health and socio-demographic characteristics in the determination of work status. This implies that the effects of the latter can be properly evaluated without necessarily adjusting for workplace characteristics. Regarding the effects of workplace characteristics on job status, it is mainly non-physical characteristics which are significant, while the impacts of physical characteristics are only weak. Especially important non-physical workplace characteristics are being white-collar, being union member, influence on decisions, job satisfaction and learning new on work. The only physical workplace characteristics which seem to be of some importance are number of working hours and exertion to hand vibrations.

The results of the model for work status in 2000 explained by characteristics in 1995 and changes in characteristics from 1990 to 1995 are collected in Table 5. The multinomial logit regression is based on the 3073 respondents for whom work status in 2000 and determinants in 1990 and 1995 were known.

(table 5)



Regarding the effects of levels of health and socio-demographic characteristics, these are mainly in accordance with the results from the pooled study. Being in good health in 1995 has a significantly negative effect on the probabilities to leave work temporarily or for PEW in 2000, no significant effect is seen for SDP. Opposed to this, health changes from 1990 to 1995 do not significantly affect work status in 2000. As an – although not significant - detail, it may be noticed that the effect of health on the probability to leave for SDP rather seems to be related to health changes than to level of health, i.e. SDP seems to be caused by sudden worsening of health status rather than by health status itself. This seems quite plausible as SDP were designed for those who are exerted to reductions in working abilities. For age, a peak is found around an age of 35 for the probability to be temporarily out of workforce, indicating that this probability is highest for younger and elderly individuals. For the probability to leave for PEW, the peak around an age of 29.5 is rather an indication of an accelerating effect of age on this probability. For SDP, the top around an age of 53 years indicate that the probability to leave for SDP is lowest for the younger and elderly. These effects of the age level are in correspondence with those obtained for the pooled study. Regarding the level of income, the probability to leave temporarily exerts a negative top, which indicates a decelerating effect of income on this probability. The top around an income of 210.000 DKK for PEW indicates that the probability to leave work for this option is lowest for those with low and high income, while the peak around 450.000 DKK for the probability to leave for SDP indicates that this probability is merely decelerating with income level. Again, these effects are in accordance with those reported for the pooled study. Opposed to these significant effects, changes in income from 1990 to 1995 do not seem to influence work status in 2000. The higher probabilities for females to leave for any of the options which were obtained in the pooled study are confirmed, but the effect is not significant for PEW. The effects of school and education are also confirmed, although only the negative impact of medium vocational

education on the probability to leave for SDP is significant.

Regarding non-physical work characteristics, the Chi-Squares indicate that several of these are significant. This is the case for the 1995 levels of being white collar, being union member, fear for move of job, and partly for being public employed, having influence on decisions and communication with colleagues. For the changes in determinants from 1990 to 1995, significant impacts are indicated by the Chi-Squares for union membership, requirement of concentration, having supportive colleagues and fearing move of job. Being white-collar significantly reduce the probabilities to leave work temporarily and to SDP, while changing status to be white-collar significantly reduces the probability to leave for PEW. Being public employed reduces the probability to leave for SDP, while changing to public employment reduces the probability to leave for PEW. Being a union member increases the probability to leave for SDP, while becoming a member of a union between 1990 and 1995 reduces this probability. Another significant effect of becoming a union member is that the probability to leave for PEW increases, presumably because the admittance to PEW is linked to membership of an Unemployment Insurance Fund, which in turn is frequently in practice linked to union membership. Increasing request of concentration has significantly positive effects on leaving work temporarily or for SDP. Having a high level of self decision on work increases the probability to leave for PEW. Influence on decisions significantly reduces the probability to leave temporarily, but increasing influence seems to have a positive (although marginally significant) effect on this probability. Having a routine job does not affect work status, but increasing routine seems to affect the probability to leave for PEW negatively. This effect is relatively strong ( $p < 0.05$ ), but it is not quite intuitive. A potential explanation is that increasing routine may lead to less stress and thus to less desire of leaving work. Neither level nor change in having an alternating job seems to impact work status

significantly. Job satisfaction has a weak negative impact on the probability to leave work temporarily ( $p < 0.1$ ), but change in job satisfaction does not exert any influence. Learning new has a weak negative effect on the probability to leave for PEW ( $p < 0.1$ ), while no effects are caused by change in this variable. Working isolated reduces the probabilities to leave, and the effects are significant for leaving temporarily and for PEW. Opposed to these, the influences of increasing isolation are positive, even though the effect is only weakly significant for PEW ( $p < 0.1$ ). Having communicative colleagues reduces the probabilities to leave work, but the effect is significant only for the SDP alternative, while the changes in this variable do not have significant effects on work status. Neither supportive colleagues nor the change in this variable have any significant effects. Having supportive seniors significantly reduces the probability to leave for SDP, while a change to having supportive seniors reduces the probability to leave for PEW. Fear of unemployment and fear of having new job do not exert any level or change effects on work status. Fearing move of job significantly increases the probabilities to leave for PEW as well as SDP, but if this fear occurred recently, then these effects are significantly reduced.

Turning to the physical workplace characteristics, there is some further evidence of influence than for the pooled study. The Chi-Squares indicate significant influence on work status in 2000 by levels in 1995 of exertion to cold, bad light and physically demanding work ( $p < 0.05$ ), while a weak effect is found by bend body ( $p < 0.1$ ). Regarding changes in characteristics from 1990 to 1995, the Chi-Squares only indicate significance of bend body ( $p < 0.01$ ). Considering the effects for the single choices, no significant effects are found for working hours, using PC or exertion to loud noise or hand vibrations. Exertion to varying temperatures has a weak positive effect on the probability to leave for PEW ( $p < 0.1$ ). Exertion to cold significantly reduces the probability to leave for PEW, while increasing exertion to cold reduces the probability to leave for SDP. These

effects, which are not as expected, seem to indicate that people with the poorest work conditions are those who are least equipped with opportunities for leaving work. An alike negative effect – and with an equivalent potential explanation – is seen for exertion to bad light on the probability to leave for PEW, although this effect is partly outperformed by a positive effect of increased exertion to bad light. No significant effects are found from exertion to passive smoke or sitting positions. For work accidents, a weak negative effect of the change is found on the probability to leave temporarily ( $p < 0.1$ ). This implies that a recent work accident reduces the risk of losing job. Exertion to bend body significantly reduces the probability to leave for SDP, while a recent increase in this exertion has a positive effect of approximately same magnitude. Having a physically demanding work increases the probability to leave for SDP, but this effect is partly outperformed if the physical demand occurred recently.

A few concluding remarks regarding effects on work status of levels versus changes in determinants are relevant. Regarding health and income, it was found that levels matter but not changes. For non-physical work characteristics, the effects were mostly as expected and correspond to intuition. The effects of physical work characteristics, on the other hand, are weaker and somewhat more mixed. Some of the effects reported seem to indicate that those with the poorest physical work conditions are those who are least endowed with opportunities to leave work. Finally, some of the effects were contra-signed, i.e. the level and the change of these characteristics had opposite signed effects on probabilities to leave work, so that the effects of the 1995 level of the characteristics are more or less outperformed if a change occurred in the characteristics between 1990 and 1995.

## **5. Conclusion**

The impact of work conditions on probabilities to leave work, as well as the modifying effects of accounting for work conditions when analysing effects of other characteristics, were analysed. Results obtained regarding effects of other characteristics, including health, income, age and gender, were found to be unaffected by inclusion of work conditions as controls.

Regarding direct effects of work conditions on probabilities to leave work, it was found that job characteristics as well as their change over time mattered for probabilities to leave. It was further found that especially non-physical work conditions influenced. Among these, being white-collar, union membership, having supportive seniors and fear of job move were especially important factors. For physical work conditions, evidences of impact on probabilities to leave were relatively weak. Some of these even indicated that those with the poorest working conditions have lower probabilities to leave work. This may be due to a lower endowment among those with the poorest jobs of abilities to leave work.

For non-work characteristics, evidence of previous studies were largely confirmed, but also enhanced. It was confirmed that being in good health reduces all probabilities to leave work, while changes in health over time did not show significant effect. It should, though, be mentioned that there seemed to be some indication that the probability to leave work for SDP were impacted by recent health changes rather than by health status. Even though this indication was not significant, it is in correspondence with the intentions behind the SDP arrangement. Income exerted decreasing impacts on the probabilities to leave work temporarily or for SDP. A U-shaped income relation was found for PEW, as those with the lowest and highest income had the lowest probability to leave for PEW. Thus, the ability to benefit from the PEW arrangement seems to be

relatively low among the low-income groups. No effects on probabilities to leave work were found of changes in income. Regarding effects of age, the probability to leave for PEW increased with age, which is – per definition – not surprising. Of more relevance, U-shaped relations were found for age, as the probability to leave temporarily were highest for the younger and the elderly, while the probability to leave for SDP were lowest for these groups. It was further confirmed that females showed higher probabilities to leave work temporarily as well as for PEW and SDP. Finally, it was confirmed that school and education reduced the probability to leave work.

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**Table 1. Recipients of PEW and TBP benefits and SDP 1990 - 2000 by age group.**

Percentage of the age group

Age	PEW and TBP		SDP	
	1990	1999	1990	1999
<b>Total</b>	<b>11</b>	<b>17</b>	<b>21</b>	<b>17</b>
50-54 years	.	1	11	10
55-59 years	.	6	18	15
60-62 years	17	31	26	21
63-66 years	35	57	36	30
Total population				
50-64 years	783,905	1,095,046	783,906	1,095,046

PEW: Post Employment Wage; TBP: Transitory Benefit Programme; SDP: Social Disability Pension.

Source: Statistics Denmark (2001, 2005)

**Table 2. Number of participants in the 1990, 1995 and 2000 waves.**

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		1990 :	
		Yes	No
1995: Yes	2000:Yes	5721	282
	2000: No	1099	157
1995: No	2000: Yes	627	120
	2000: No	630	294

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**Table 3. Variables applied for the study.**

Variable / Definition	Mean			
	Pooled model 1995 <sup>(1)</sup> 2000 <sup>(2)</sup> (n=3853) (n=3773)		2000 model Level <sup>(3)</sup> Change <sup>(4)</sup> (n=3073)	
Status - Employed (reference)	0.82	0.85	0.85	
- Temp. out of work	0.13	0.06	0.06	
- PEW	0.02	0.04	0.04	
- SDP	0.03	0.05	0.05	
Health - SAH coded by 15D	0.94	0.94	0.94	-0.006
Income - personal, excl. tax/interests (100.000 DKK, 1995 prices, index 1990=1.103)	1.14	1.31	1.32	0.274
Age	37.07	40.37	36.36	
Female (Yes=1 / No=0)	0.48	0.48	0.46	
School 8-9 years (Y/N)	0.61	0.62	0.62	
School 10-12 years (Y/N)	0.24	0.27	0.25	
Short voc.ed. (Y/N)	0.09	0.10	0.09	
Medium voc.ed. (Y/N)	0.17	0.17	0.17	
Long voc.ed. (Y/N)	0.07	0.09	0.08	
<u>Non-physical work characteristics:</u>				
White collar (Y/N)	0.65	0.67	0.67	0.004
Public employed (Y/N)	0.37	0.38	0.38	0.005
Union member (Y/N)	0.86	0.90	0.91	0.044
Concentration required on work (Y/N)	0.74	0.74	0.74	-0.007
Self decision on work (Y/N)	0.82	0.88	0.88	0.052
Influence on decisions (Y/N)	0.84	0.86	0.86	0.008
Routine work (Y/N)	0.35	0.32	0.32	-0.022
Alternate work (Y/N)	0.84	0.85	0.86	0.009
Satisfied with work (Y/N)	0.94	0.94	0.94	-0.005
Learning new on work (Y/N)	0.74	0.79	0.78	0.017
Working isolated (Y/N)	0.26	0.25	0.25	-0.001
Communicates with colleagues (Y/N)	0.71	0.70	0.70	-0.025
Supportive colleagues (Y/N)	0.84	0.87	0.86	0.010
Supportive senior (Y/N)	0.70	0.75	0.75	0.043
Fear unemployment (Y/N)	0.29	0.17	0.16	-0.135
Fear move of job (Y/N)	0.16	0.13	0.14	-0.035
Fear having new job (Y/N)	0.30	0.25	0.26	-0.021
<u>Physical work characteristics:</u>				
Hours per week (number)	36.06	37.08	37.01	0.771
Using PC (Y/N)	0.26	0.50	0.51	0.232
Exerted to work acc. within last 5 years (Y/N)	0.06	0.04	0.05	-0.013
Exerted to cold more than half time (Y/N)	0.10	0.08	0.08	-0.019
Ex. to loud noise more than h.t. (Y/N)	0.16	0.18	0.18	0.020
Ex. to hand vibrations more than h.t. (Y/N)	0.02	0.02	0.02	0.007
Ex. to varying temperatures more than h.t. (Y/N)	0.12	0.12	0.12	-0.002
Ex. to bad light more than h.t. (Y/N)	0.09	0.09	0.09	0.001
Ex. to passive smoke more than h.t. (Y/N)	0.19	0.14	0.14	-0.045
Ex. to sitting positions more than h.t. (Y/N)	0.50	0.52	0.53	0.019
Ex. to bend body positions more than h.t. (Y/N)	0.29	0.16	0.15	-0.131
Ex. to phys. demanding work more than h.t. (Y/N)	0.07	0.05	0.05	-0.016

Notes.

- (1) Means for STATUS in 1995 and for the remaining variables in 1990.
- (2) Means for STATUS in 2000 and for the remaining variables in 1995.
- (3) Means for STATUS in 2000 and for the remaining variables in 1995.
- (4) Means for changes in variables from 1990 to 1995.

**Table 4. Effects of characteristics (1990 / 1995) on work status five years later (1995 / 2000).**

	Without workplace characteristics				With workplace characteristics			
	Temp.Out	PEW	SDP	ChiSq.	Temp.Out	PEW	SDP	ChiSq.
Intercept	14.21***	12.74***	-705.90***	305.11***	14.44***	13.72***	-759.60***	283.00***
Year 2000	-0.26***	1.29***	0.47*	28.99***	-0.26***	1.29***	0.47*	28.99***
Health	-6.39***	-8.89***	-4.00***	160.53***	-6.40***	-8.96***	-4.52***	155.60***
Age	-0.33***	-0.63***	24.38***	234.95***	-0.33***	-0.61***	26.24***	218.96***
Age**2	0.004***	0.009***	-0.207***	261.66***	0.004***	0.009***	-0.223***	242.42***
Income	-0.70***	0.52	-0.59**	25.33***	-0.60***	1.15	-0.75***	21.65***
Income**2	-0.17**	-0.14	-0.07	8.13**	-0.16**	-0.25	-0.05	6.86*
Female	1.03***	0.80***	0.68***	133.23***	1.03***	0.50*	0.83***	104.26***
School (8-9)	0.02	0.06	-0.41*	4.49	0.07	0.06	-0.55**	6.72*
School (10-12)	0.13	0.47	-0.85*	7.15*	0.21	0.46	-1.09**	9.52**
Short voc. ed.	0.01	-0.56	-0.62	2.66	0.06	-0.64	-0.74	3.65
Medium voc. ed.	-0.02	-0.03	-0.81***	7.00*	0.13	-0.18	-1.03***	10.60**
Long voc. ed.	0.27	-0.17	0.35	2.87	0.38*	-0.44	0.36	5.32
<u>Work characteristics:</u>								
<u>Non-physical:</u>								
White collar					-0.33***	0.27	-0.55**	13.71***
Public employed					-0.21**	0.27	-0.23	7.46*
Union member					0.02	-0.60*	1.53***	18.59***
Concentrate					0.06	0.22	0.42	2.84
Self dec.					0.07	-0.11	0.06	1.71
Influence dec.					-0.35***	0.15	-0.02	11.62**
Routine					0.06	0.33	-0.002	2.06
Alternating					0.08	0.75*	0.38	4.46
Satisfied with work					-0.35**	-0.80*	-1.01*	8.86**
Learn new					-0.26***	0.01	0.27	8.48**
Work isolated					-0.08	-0.37	-0.04	2.34
Communic. coll.					-0.001	-0.43*	-0.05	2.95
Supportive coll.					-0.24**	-0.14	-0.51*	6.34*
Supportive senior					0.10	0.01	-0.53**	6.01
Fear unempl.					0.12	-0.01	0.01	1.66
Fear move job					0.01	0.38	0.23	1.57
Fear new job					0.19**	-0.34	-0.24	7.50*
<u>Physical:</u>								
Hour per week					-0.01	-0.03**	-0.01	4.81
Use PC					-0.05	-0.29	-0.17	1.53
Loud noise					-0.004	0.27	0.53	3.02
Hand vibr.					0.34	1.78***	1.37	8.29**
Varying temp.					-0.04	-0.11	-0.08	0.22
Cold					0.27*	-0.54	-0.35	5.87
Bad light					-0.17	-0.99*	-0.75	5.89
Passive smoke					0.12	0.09	0.14	1.55
Work acc.					0.06	0.64	-0.86	5.65
Sitting					-0.04	-0.002	-0.24	1.19
Bend body					0.10	-0.09	-0.14	1.40
Physical demand.					-0.01	0.004	-0.40	0.72
Top/peak of:								
Age	41.3 (peak)	35.0 (peak)	58.8 (top)		41.3 (peak)	33.9 (peak)	58.8 (top)	
Income	-2.1 (top)	1.9 (top)	-4.2 (top)		-1.9 (top)	2.3 (top)	-7.5 (top)	
Log Likelihood			-2792.17				-2712.16	
LR test for workplace characteristics				160.02 (df=87)***				

Note. Significance indicated by \*\*\*(1 percent), \*\*(5 percent), \*(10 percent).

**Table 5. Effects of characteristics (1995) and changes in characteristics (1990-95) on work status (2000).**

	Temporarily Out		PEW		SDP		Chi-Squares	
	Level	Change	Level	Change	Level	Change	Level	Change
Intercept	9.04***		8.23*		-947.70***		66.10***	
Health	-4.34**	0.85	-6.93**	-2.02	1.53	-3.42	10.97**	1.14
Age	-0.28***		-0.59***		36.39***		79.74***	
Age**2	0.004***		0.010		-0.339		99.39***	
Income	-0.39	-0.18	1.59	0.22	-2.51***	0.49	19.56***	1.92
Income**2	-0.07		-0.38		0.28***		13.32**	
Female	1.06***		0.26		1.82***		34.11***	
School (8-9)	0.08		-0.13		-0.59		2.02	
School (10-12)	0.01		0.22		-0.03		0.20	
Short voc. ed.	0.28		-0.78		-0.50		3.26	
Medium voc. ed.	-0.29		-0.33		-1.73***		10.09**	
Long voc. ed.	-0.18		-0.52		0.48		1.40	
<u>Workp characteristics:</u>								
<u>Non-physical:</u>								
White collar	-0.65**	-0.01	0.61	-0.82*	-1.35**	0.86	13.38***	5.84
Public employed	-0.21	-0.12	0.49	-1.04*	-0.78*	-0.76	7.36*	3.41
Union member	-0.08	0.45*	-0.87	-0.02	3.19***	-2.67***	14.94***	11.67***
Concentrate	-0.09	0.33*	-0.02	0.11	-0.66	1.23**	1.21	8.35**
Self dec.	0.39	0.23	1.38*	-0.42	-0.37	0.46	5.67	2.48
Influence dec.	-0.62**	0.35*	0.28	0.34	1.14	0.17	7.62*	3.17
Routine	-0.03	0.01	0.50	-0.69**	-0.13	-0.26	1.55	3.87
Alternate	0.32	0.06	0.17	0.61	0.20	-0.69	5.42	1.67
Satisf. with work	-0.76*	0.16	-1.39	0.81	-0.003	-1.95	1.14	4.10
Learning new	-0.29	0.10	-0.88*	0.46	0.14	0.03	5.53	5.22
Working isolated	-0.59**	0.38	-0.96*	0.69*	-0.49	0.11	4.96	1.94
Communic. coll.	-0.45	0.13	-0.17	-0.03	-1.07*	0.55	7.02*	5.06
Supportive coll.	-0.35	-0.07	-0.65	0.30	-0.48	-0.49	2.74	0.73
Supportive senior	-0.01	-0.09	0.53	-1.04***	-1.10*	0.03	5.79	8.92**
Fear unempl.	0.01	0.21	-0.80	0.50	-0.61	0.04	1.87	2.86
Fear move job	0.02	0.001	1.41**	-0.99***	2.22**	-1.98***	9.88**	15.45***
Fear new job	0.19	-0.09	-0.03	-0.14	0.41	-0.66	1.29	2.72
<u>Physical:</u>								
Hour per week	-0.01	0.01	-0.01	-0.03	0.001	-0.02	0.83	2.63
Use PC	0.02	-0.07	-0.05	-0.42	0.01	0.76	0.03	4.01
Loud noise	-0.003	0.05	0.36	0.46	-0.48	0.56	1.24	1.21
Hand vibr.	-0.35	-0.18	0.08	0.01	1.33	-0.01	0.71	1.02
Varying temp.	-0.50	0.43	1.14*	-0.28	1.29	0.29	6.22	3.06
Cold	0.10	0.16	-3.39***	0.15	-0.01	-1.67**	7.88**	5.81
Bad light	0.46	-0.23	-2.45**	1.40*	-1.05	0.73	8.98**	5.05
Passive smoke	0.19	-0.24	-0.30	-0.09	-0.60	0.18	1.43	1.73
Work acc.	0.69	-0.55*	1.18	-0.06	0.14	-0.30	3.93	3.73
Sitting	-0.02	-0.08	-0.18	0.22	-0.22	-0.78	0.30	2.97
Bend body	0.25	-0.08	-0.24	-0.51	-1.65**	1.68***	6.69*	13.53***
Physical demand.	-0.43	-0.21	0.64	-0.83	3.22***	-1.89*	8.15**	4.67
Top/peak of:								
Age	35.0 (peak)		29.5 (peak)		53.7 (top)			
Income	-1.6 (top)		2.1 (top)		4.5 (peak)			
Log Likelihood	-934.25		Log Likelihood without work characteristics		-1066.51			
Likelihood Ratio test for workplace characteristics					264.52 (df=87)***			

Note. Significance indicated by \*\*\*(1 percent), \*\*(5 percent), \*(10 percent).