The Effects of Age, Gender and Job Strain on Labour Market Outflow: An Exploratory Study

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Contents

Abstract

The objective of this study is to improve our understanding of the causes of replacement demand and labour market outflow. A better understanding of the factors that explain why workers flow out is needed for the Netherlands because this country is faced with a particularly high labour market outflow, reflected in a very low participation rate. In our investigation, we focus on different indicators of job strain, as well as variables such as age, gender and job level. We perform both univariate and multivariate regressions to find the effects of these variables on the net flows on the labour market. The regression results reveal that age, gender and (to a lesser extent) job level have the strongest connection with and effect on outflow. The regressions also show that job strain has hardly any noticeable effect on net flow.

1 Introduction

Between 1997 and 2002, replacement demand is expected to account for almost 65% of all job openings for school-leavers in the Netherlands (ROA, 1997). Replacement demand occurs because workers retire, become disabled or withdraw (temporarily) from the labour market. Determinants that may play a role, include job strain and institutional factors that affect the participation of workers, such as the participation of women in the labour market in the various stages of their lives (child rearing). The possible connection between job strain and disability outflow is especially relevant for the Netherlands, because the Netherlands show an extremely high disability rate (see De Jong, 1995). This is probably caused mainly by the generous disability insurance system in the Netherlands, rather than a poor overall health of Dutch workers (see Burkhauser et al., 1997).

So, in this paper we try to explore the various influences on labour market outflow. For this purpose we use data on the labour force that indicates the number of workers that leave the working population (by age and gender), and data on the occurrence of job strain. The strong points of the data are that it captures the entire scope of occupations in a typical labour market and that the information stems from individuals. The downside of the data set is that – at least for job strain data – it is static and hence no changes over time can be observed. The opportunity of examining the effects of prolonged exposure to factors that induce job strain is also lost because of this fact.

Section 2 of this paper gives a brief overview of literature concerning job stress and the differences in labour market participation between men and women and the respective age groups. Section 3 describes the data on the labour force and on job strain used in the remainder of the paper. It also gives an outline of the way the labour force data is prepared and adapted for the calculation of the outflow coefficients. Section 4 presents some stylized facts on the distribution of the various job strain indicators over the different occupations and the connection between the occurrence of these indicators and the average outflow. This is followed in section 5 by a description of the outflow model. The main regression results are presented in section 6. The regressions point again to differences in labour market outflow between men and women and also between different age groups. However, an influence of job strain cannot be demonstrated. The conclusions can be found in section 7.

2 Outflow Determinants Suggested by the Literature

To get an idea of the factors influencing outflow, let us look at one of the ‘results’ of outflow: participation. Differences in participation rates are obviously closely linked to differences in labour supply and labour market outflow, and it seems prudent to take these findings into account and use them in modelling labour market outflow. High/low outflow numbers are connected to a low/high participation rate. Groups on the labour market that exhibit a low participation rate, seem to be characterised by factors that induce either low inflow or high outflow, or both. Let us therefore begin by giving a brief description of the participation rates in the Netherlands and comment on the changes therein. We analysed the Dutch net participation rate of men and women, both separately and together, for the years 1987 to 1997. Net participation was defined here as the *working* population (workforce) aged 15 to 64 as a percentage of the *total* population aged 15 to 64.

We see a gradual rise in the participation rates over the years. This is especially true for the participation rate of Dutch women. They show a 47% participation at the end of the period under observation, compared to only 35% at the beginning in 1987. This constitutes a dramatic increase of around one third in only ten years. This means that the number of working women between the ages 15 and 64 has risen considerably in the Netherlands. The increased labour market participation for men is less pronounced; rising from 70% in 1987 to 74% in 1997. These two increases result in an overall increase in participation in the Netherlands of close to one fifth. Note here that although the participation rate of Dutch women increases significantly when measured in persons, it still falls behind the European average when measured in working hours. This is because over 50% of working women in the Netherlands work part time and in many cases only work 20 hours a week or less (see Haller et al., 1994; Van Doorne-Huiskes et al., 1995).

Several studies indicate differences in (temporary) outflow between genders, for instance Cuelenaere, Jetten and Van Kooten (1996). In their study of the risks of developing Repetitive Strain Injuries (RSI), Otten, Bongers and Houtman (1998) show that women also run a greater risk of developing RSI than men. But they do not comment on the question whether or not these injuries lead to disability. For other literature, (see Vlasblom 1998 and Vlasblom, De Grip and Van Loo 1998).

Apart from this look at the changes in participation and outflow by gender, we can also investigate Dutch participation rates for the different age groups. We see that the increased overall participation can be attributed mainly to the age groups 25-34, 35-44 and 45-54. Participation of the youngest age category, ages 15-24, remains more or less constant throughout the entire period, while the oldest category shows a minor increase. The observed rise in labour market participation for the three age groups in the middle, is closely linked to the reported increase in participation of women in the Netherlands. A growing number of women in these age groups remain in the labour force or re-enters the labour market after having left it to raise their children. Note that this is only an increase when measured in persons and that the effect is much less pronounced when measured in working hours. With respect to the elderly age group, ages 55-64, note that they can be divided into two separate groups: 55-59 and 60-64. These two groups show some noticeable differences. The former shows a steady increase of participation, from 37% in 1991 to 42% in 1997, whereas the latter shows a constant participation rate of 11% from 1991 onward. So the workers aged 55 to 59 increase their participation by 5% points, but those aged 60-64 do not change their rate at all.

All in all, the data and selected literature demonstrate the differences between men and women and also between the respective age groups when it comes to outflow behaviour and participation on the labour market in the Netherlands.

In recent years, a number of studies also dealt with occupation-specific strain and the effects – either mental or physical – on the worker. Most studies seem to focus more on the psychological effects than the physical effects. If stress becomes too great and people can no longer function properly, they leave the working population and have to rely on social security or disability insurance. In the Netherlands, this is a relatively large group. Statistics Netherlands (CBS) reports that on average around 615,000 persons per year receive this kind of social security. This number has remained more or less constant in recent years and represents a sizeable portion of the entire Dutch labour force. For example, for 1990 CBS gives 621,000 persons on disability insurance and a labour force of 6,063,000. This constitutes a disability percentage of little over 10%. The benefits paid to this group fluctuate around 13,000 million guilders per year. The Netherlands show some differences when it comes to disability compared to other countries. De Jong (1995) reports that the Netherlands are confronted with disability at least twice as much, and for those under the age of 60 disability prevalence rates are more than triple those in Germany, Sweden and the U.S. And not only is this group comparatively large, but also the average age of Dutch recipients of disability benefits is much lower.

What are the causes of disability and why is it higher in the Netherlands? Gaillard and Kompier (1993), quoting a study by Gründemann et al. (1991), state that in 1990 four out of five disabled workers claimed that work-related mental stress was (partly) to blame for their disablement. Of those who were declared disabled, 35% was of the opinion that they would not have become disabled if working conditions had been altered or if they had been given different work. Symonds et al. (1995) tested the effects of distributing a psychosocial pamphlet, designed to reduce avoidance behaviour, and showed that this successfully reduced extended absence from low back trouble. Note that there are other possible causes of disability. Non-occupation-related accidents, such as sports injuries or traffic accidents, can also lead to temporary or permanent disability. However, these considerations cannot explain the extremely low Dutch participation rates. Two possible explanations for this are put forward here. First of all, Kerkhofs et al. (1998) state that disability insurance schemes have in the past been used as an exit route for elderly workers (both healthy and unhealthy). This does not, however, explain the low participation rates of young women in the Netherlands. The second reason for the extremely low Dutch participation rates is given by Burkhauser et al. (1997). In his view, the low labour market participation is mainly caused by institutional factors, or more specifically, the generous disability insurance system used in the Netherlands compared to most other countries.

What connection is there between job circumstances and stress or even disability outflow? Kompier (1993) presents a table that shows the main causes of job-related stress. This table is given in a condensed form below.

Table 2.1
Main causes of job-related stress

Work content	too much work, too high a pace, too difficult, too easy, too monotonous, too much responsibility, too dangerous
Working conditions	harmful chemicals, noise, vibrating tools or equipment, insufficient lighting, radiation, temperature, draft, humidity, ventilation, bad posture, lack of aids or personal protection
Work regulations	working in shifts, low pay, lack of career opportunities, job security
Work relations	bad leadership, discrimination, sexual harassment, social isolation at work

Source: adapted from Kompier (1993)

Kompier also refers to Karasek and Theorell (1990), who define two job features which result in the occurrence of stress:
1. The demands of the job;
2. The number of regulatory options or 'controls'.

The first feature – the demands of the job – is the result of the occurrence of the causes mentioned under 'work content' in table 2.1. A job that includes more causes of job-related stress, is termed 'more demanding'. The second feature – controls – has to do with the worker's ability to regulate and control his or her work situation: adjust your pace, taking a break, change your working environment, et cetera. Coping with problems is made easier if one can influence one's work situation. Jobs with fewer possibilities to regulate or control are more demanding because this affects the worker's ability to cope with the causes of stress. Stress as a result of a lack of control options is present mainly in low-level jobs. These jobs are characterised by an imposed structure and pace, for instance working at a conveyor belt.

Houtman, Smulders and Bloemhoff (1993) also mention Karasek's 'job demands-control' model and identify a third stress risk dimension: the social interactions or relationships in the workplace. Having conflicts with colleagues is a significant contributor to work stress, while having social support from your fellow workers provides an important buffer against stress. Using the results of a survey done by Statistics Netherlands (CBS), Houtman, Smulders and Bloemhoff show three factors that are main contributors to work stress:
1. Work pace;
2. Uninteresting work (monotonous, few career opportunities, bad match between job and education);
3. Physical factors (hard work, dangerous work, noise).

Another unlikely indicator is suggested by Zijlstra, Schalk and Roe (1996), who note differences in job stress between so-called 'mental information workers' (i.e. workers that make greater use of new information technology, such as PCs, fax and e-mail) and nonmental information workers. They state: ‘Information technology leads to an increased independence of workers. That is to say that the individual worker is less bound by regulated working hours or a specific workplace, because of the freedom to work anywhere as a result of working with computers etc.’ Their results, however, point to an increase of job pressure and also a diminishing of social contacts at the workplace. They therefore conclude: ‘These factors point to a higher stress risk for mental information workers’. This measure of ‘information technology’ would therefore seem to be another means of clustering occupational classes with the same working conditions.

The participation data as well as the literature therefore point to four elements conducive to outflow: *work conditions*, the *level* of the job and the *age* and the *gender* of the worker.

3 Data and Methodology

In this section, we will present an overview of the data both on the size and composition of the labour force and on job strain. We will also describe the random coefficient model used to model the replacement demand or outflow.

Provided by the Dutch Labour Force Survey (EBB) of Statistics Netherlands (CBS) we have data concerning the number of people working, by occupational class. We distinguish 127 occupational classes for which the time series ranges from 1987 to 1995. This stock data is available for women and men separately, and is divided into 11 age cohorts, the first 10 of which each spans five years. The first age cohort ranges from age 15 to age 19, and the last one incorporates ages higher than or equal to 65.[1]

Using the aggregated stock data from the Dutch Labour Force Survey (EBB) of Statistics Netherlands (CBS), we can now group the data so that most of the mobility flows can be observed. The data is divided according to age and sex. This is expected to be sufficient to detect most of the mobility processes. After all, the flow into a certain occupational group consists mostly of young people, while the flow out consists mostly of older employees. By making a distinction according to sex, the exit and re-entrance (temporary or not) of women is also captured to a significant extent. (For more information, see Willems and De Grip, 1993.)

Adding the distinction ‘age’ breaks the stock data up into smaller parts; age cohorts giving rise to a cohort components method (see Shryock and Siegel, 1980), in which the cohort-change rates have to be derived. These rates refer to the number of workers of a certain age in a certain job at two specific points in time.

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1. For the first 3 age cohorts, it is assumed that there is no outflow. So the first 3 cohorts remain empty for all years of the data set.

The cohort-change rates can be written in symbols as:

$$P\ddot{y}_{a,j}^{t6t+1} = \frac{L_{a+1,j}^{t+1}}{L_{a,j}^{t}} \qquad (3.1)$$

where

$P\ddot{y}_{a,j}^{t6t+1}$ = cohort-change rate o f workers with job j of cohort ɑ at time t during period (t, t+1);

$L_{a,j}^{t}$ = number of workers with job j of cohort ɑ at time t.

In economic literature, it is common practice to speak of annual growth (inflow or outflow) rates instead of cohort-change rates:

$$f_{a,j}^{t6t+1} = \frac{L_{a+1,j}^{t+1}}{L_{a,j}^{t}} - 1 \qquad (3.2)$$

The previous expression gives the average annual net inflow or outflow rate of the workers in cohort ɑ with occupation j at time t during period (t, t+1). If the value is less than zero, it refers to a net outflow and if the value is greater than zero, it refers to a net inflow.

For each job and cohort we can derive such a cohort-change rate, or similarly the net inflow or outflow:

$$F_{a,j}^{t6t+1} = L_{a+1,j}^{t+1} - L_{a,j}^{t} = L_{a,j}^{t}(1 + f_{a,j}^{t6t+1}) - L_{a,j}^{t} \qquad (3.3)$$

which is the net inflow or outflow of workers with job j of cohort ɑ at time t during period (t, t+1).

Let us describe the statistical outflow model, that is to say, show how the data on the labour force is adapted. The preparation of the data by means of the statistical outflow model is based on the statistical outflow coefficients, which are cohort-specific and gender-specific. The net flow in age cohort ɑ of occupation j between times t and t+1 is modelled as:

$$f_{a,j}^{t6t+1} = f_{a}^{t6t+1} + \acute{a}_{a,j} + \mathring{a}_{a,j}^{t6t+1} \qquad (3.4)$$

where

f_{a}^{t6t+1} = average net flow in age cohort ɑ between period t and t+1 over all occupations;

$\acute{a}_{a,j}$ = coefficient to be estimated;

$\mathring{a}_{a,j}^{t6t+1}$ = error term.

This model can be estimated in the following form (move the average net flow to the left-hand side):

$$f_{a,j}^{t6t+1} - f_{a}^{t6t+1} = \acute{a}_{a,j} + \mathring{a}_{a,j}^{t6t+1} \qquad (3.5)$$

The equations for the different age cohorts ɑ can then be estimated simultaneously with the use of cohort dummies.

This model uses a very low aggregation level. There are two main objections to this approach. Firstly, there is the possibility of correlation between inflow and outflow rates for different cohorts within an occupation. This can be solved by specifying the model at the level of the job and then control for the cohort effect. The second objection is that a large number of occupations and cohorts leads to few observations for each cohort, which takes away from the explanatory power of the model. This second objection can be overcome in the following way.

Although we have different observations for each job, the sex-age pattern of the net flow coefficients would be similar for the various jobs. We will see this also in Section 4. For almost every occupation, there is outflow from the oldest cohorts and net inflow for the younger age groups. For women, we additionally see an outflow linked to the birth and fostering of children. These similar flow patterns can be incorporated into the model. One way to do this is by pooling the data over the occupations. This multiplies the number of observations for each cohort distinguished. It filters out the effect of ‘outliers’, but this pooling method has one important disadvantage, in that each occupation will have the same (average) flow coefficients. The variation between the various jobs is completely lost.

This problem can be overcome by specifying a so-called random coefficient model, popularized by Swamy (1970), which implies a systematic way of pooling the data. Such a model can be characterized by a position in between the pooling method and the detailed job-by-job model specification. In the random coefficient model, the parameters are the weighted average of the single job-by-job least squares estimation and the average pooled estimation. If the specific estimation is less reliable, more weight will be attributed to the average estimation, and if the specific estimation is very ‘sure’, the parameters will tend more towards these single estimates.

In order to improve the statistical reliability of the estimated coefficients at this low level of aggregation, we use the random coefficient method. In particular, it is assumed that the coefficients $\acute{a}_{a,j}$ are drawn from a normal distribution around zero.[2] After the estimation procedure, the statistical outflow coefficient for age cohort α of occupation j can be estimated as

$$\tilde{a}_{a,j}^{t6t+1} = \hat{a}_{a,j} + f_{a}^{t6t+1} \qquad (3.6)$$

The model can be estimated separately for men and women in order to obtain gender-specific statistical outflow coefficients. For an econometric description of random coefficient models, see Judge et al. (1982).

Apart from the net flow data, we also need information on job strain. Each year, CBS takes a sample of the Dutch working population, again for the Dutch Labour Force Survey (EBB), and asks whether or not they encounter one or more indicators of job strain during their work. There are 6 indicators available: noise, vibrating tools or equipment, the use of force, working in shifts, working under pressure of a deadline, and working with information technology (computers). In the survey, there are 4 possible answers: yes (often), yes (sometimes), no and sysmis (or: no answer given).[3] The results of the individual surveys are then aggregated by occupation, age cohort and gender, and average percentages for each answer are calculated. We focus on the results of the survey done in 1996. These are available by the same 127 occupational classes as were used for the net flow data. In this survey, no distinction is made between men and women. Another negative aspect is that the age classes used in this job strain part of the survey are not the same as the ones found in the replacement outflow data. Here we have 5 age classes, while in the outflow data we had 11 smaller cohorts. The job strain results are not only given by the 5 age classes separately but also for all 5 classes together.

Table A1 in the Appendix gives the percentage of workers that encountered the job strain indicator (i.e. replied ‘yes’ in the survey). This is done for all 6 indicators and based on the 5

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2. In fact, this is a restricted version of the random coefficient model: we set the common mean $\acute{a}_{a}$ equal to zero. This follows from the fact that the equations are estimated in deviations from the average net flow.

3. Answers ‘yes (often)’ and ‘yes (sometimes)’ are taken as one in the remainder of this paper.

age classes together. Looking at the percentages in table A1, there seems to be an apparent difference between, on the one hand, indicators 1 through 4, and indicators 5 and 6 on the other. For many occupations, high percentages for ‘deadline’ and ‘information technology’ coincide with low percentages for the four other indicators. Indicators 5 and 6 are related to inherently different occupations. Taking the average over the occupational classes leads to the percentages in table 3.1.

Table 3.1
Average percentages of workers (men and women) with job strain, by job strain indicator, 1996

Job strain indicator	%
Noise	22
Vibrations	12
Use of force	27
Working in shifts	9
Pressure of deadline	66
Information technology	63

Source: CBS/ROA

4 Stylized Facts

Using the data on job strain, we divide the 127 occupations into 3 main groups, in order to get an idea of the effects of occupation-specific job strain on net flow. One group of 42 with supposed high job strain, a second group of 43 with average/medium job strain, and a third group of 42 with low job strain. This is done for each of the job strain indicators and for each of the age classes (incl. the total). ‘High job strain’ is in this case defined as those 42 occupations with the highest percentage of workers that answered ‘yes’ when asked if they experienced that specific job strain indicator. High level job strain in this report therefore refers to *incidence* rather than *severity* of job strain. This distinction is particularly important if the job outflow were only to take place above a certain threshold level of severity of job strain. Another aspect not accounted for in this study is the *duration* of job strain. The EBB does not provide data on the duration of certain circumstances in the workplace.

Because for all age classes the same occupations are defined as a high, medium or low job strain occupations, we conclude that it is not necessary to make a classification for each age class separately. We base our occupational classification by level of job strain therefore on the data for the total (all age classes aggregated). The results for the 3 job strain levels are shown in table A2 in the appendix.

One thing that is clearly visible in table A2, is the fact that the different indicators do not lead to the same occupational classification. The first 4 indicators (noise, vibrations, force, and working in shifts) clearly form one group, while indicators 5 and 6 (pressure of a deadline and working with information technology) form the other. This division more or less follows the traditionally observed blue-collar/white-collar distinction.

We now apply the estimation part of the statistical outflow model for the ‘high’ and ‘low’ groups of occupations, based on the classifications in table A2. This is done for all job strain indicators. The average or ‘medium’ group of occupations is left out, and treated more or less as a buffer between the groups ‘high’ and ‘low’. Think of this buffer as a reference group with a high probability on indifferent results. The model gives as a result the 1016 outflow coefficients, for each occupational class and age cohort. These are then summed over the ‘high strain’ and ‘low strain’ groups of occupations. That is to say, they are summed over the 42 occupations within each of the two occupational groups and within each age cohort. For both occupational groups (high and low) a mean coefficient is then calculated. This is done for men and women separately. The resulting average net flow coefficients by age cohort and job strain indicator per occupational group are given in tables 4.1a and 4.1b. A negative value denotes net outflow.

Table 4.1a
Average net flow coefficients for occupational classes (men) by job strain level

Men		Age cohort							
Job strain indicator	level	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64
Noise	high	0.028	0.006	-0.007	-0.019	-0.015	-0.054	-0.285	-0.416
	low	0.082	0.036	-0.008	0.007	0.004	-0.017	-0.282	-0.364
Vibrations	high	0.026	0.006	-0.012	-0.014	-0.019	-0.048	-0.277	-0.394
	low	0.091	0.026	0.001	0.004	0.013	-0.031	-0.287	-0.353
Use of force	high	0.017	0.005	-0.010	-0.016	-0.024	-0.040	-0.268	-0.412
	low	0.110	0.036	0.004	0.010	0.019	-0.034	-0.287	-0.384
Working in shifts	high	0.024	0.005	-0.020	-0.007	-0.016	-0.032	-0.294	-0.370
	low	0.098	0.025	0.005	-0.002	0.011	-0.033	-0.289	-0.364
Pressure of deadline	high	0.128	0.055	0.000	0.010	0.018	-0.029	-0.270	-0.376
	low	0.019	0.009	-0.017	-0.007	-0.027	-0.039	-0.316	-0.418
Information technology	high	0.079	0.027	-0.006	0.000	0.004	-0.013	-0.301	-0.367
	low	0.011	0.010	-0.014	-0.012	-0.026	-0.046	-0.282	-0.420

Source: ROA

The tables also show the schism between blue-collar and white-collar occupations. For the blue-collar occupations (level ‘high’ for indicators 1 through 4), the tables show that workers leave the work force sooner. This means that for indicators 1 through 4, a higher level of job strain leads to net outflow in a *younger* age cohort than a lower level of job strain would.

Oddly, the opposite is true for the white-collar occupations. Indicators 5 and 6 with a high level of job strain seem to have lower or later outflow. People who work with computers or work under pressure of a deadline do not leave the workforce as early or in such great numbers as do those who do not work with computers or under pressure of a deadline. This unintuitive result may be explained by taking job level into account because people in high level jobs are assumed to have more regulatory options or controls.

Another observation is that outflow grows with time (age), i.e. more outflow in the later age cohorts. There is one exception: the first age cohort for women. This outflow is more or less what we would expect if we consider that women usually leave the workforce temporarily for child rearing purposes.

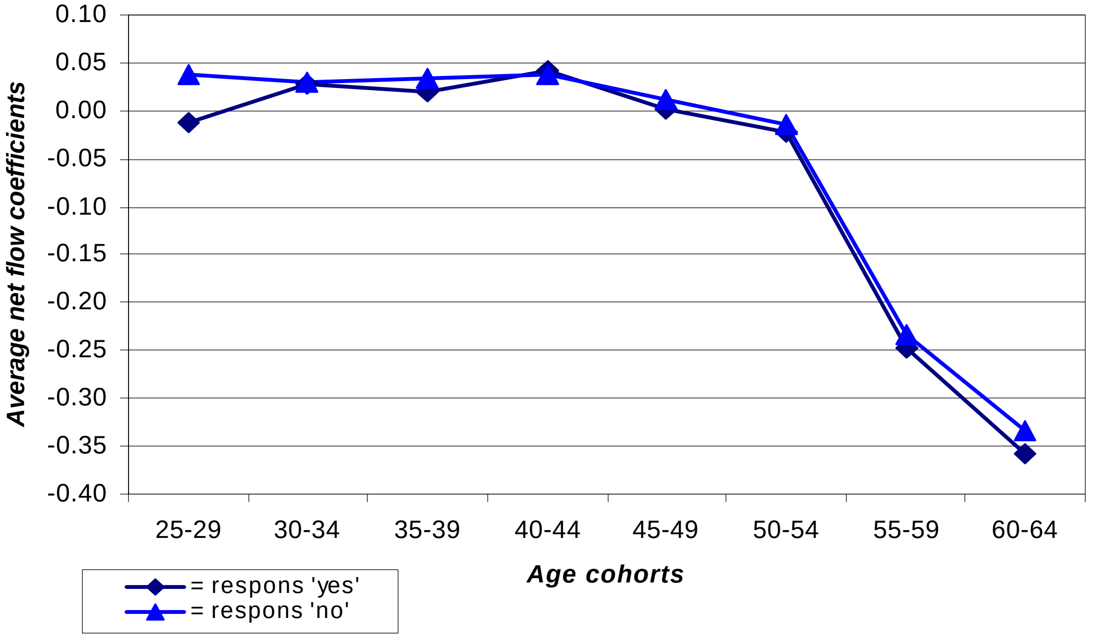
Table 4.1b
Average net flow coefficients for occupational classes (women) by job strain level

Women		Age cohort							
Job strain indicator	level	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64
Noise	high	-0.004	0.026	0.026	0.032	-0.011	0.011	-0.241	-0.315
	low	0.052	0.037	0.038	0.037	0.013	-0.012	-0.244	-0.362
Vibrations	high	-0.016	0.032	0.025	0.029	-0.020	-0.013	-0.245	-0.320
	low	0.034	0.035	0.035	0.038	0.012	-0.026	-0.241	-0.358
Use of force	high	-0.014	0.029	0.023	0.034	-0.001	-0.037	-0.236	-0.376
	low	0.083	0.043	0.040	0.037	0.022	0.000	-0.251	-0.338
Working in shifts	high	-0.013	0.027	0.021	0.041	0.002	-0.022	-0.247	-0.357
	low	0.038	0.030	0.034	0.038	0.012	-0.015	-0.233	-0.334
Pressure of deadline	high	0.113	0.048	0.035	0.039	0.015	-0.022	-0.268	-0.329
	low	-0.023	0.022	0.021	0.035	-0.008	-0.029	-0.240	-0.374
Information technology	high	0.021	0.036	0.026	0.039	0.014	-0.014	-0.197	-0.335
	low	-0.009	0.029	0.024	0.038	0.000	-0.040	-0.233	-0.377

Source: ROA

The results presented in tables 4.1a and 4.1b can also be shown in a graphical form. For example, figure 4.1 gives the graph for women and for the indicator ‘working in shifts’. In this example one can observe more clearly the pattern of higher outflow for the elderly, with exception of the first age class. Note also the fact that the line for those experiencing the job strain indicator is below the other line, indicating more outflow. This feature is also present for indicators 1 through 3. For indicators 5 and 6, the relative position of the two lines will typically be the other way around. The graphs for men will be comparable, apart from the outflow in the first age cohort.

Figure 4.1
Net flow by 'working in shifts' for women



5 Outflow Model

Previous results suggest that different indicators of job strain do affect the outflow coefficients. There also is a systematic distribution of outflow coefficients over the different age cohorts and the resulting outflow pattern differs by gender. In this section, we therefore propose an outflow model which explains outflow coefficients from the different aspects of job strain, allowing for different effects by gender and by age cohort.
Recall:

$$f_{a,j}^{t6t+1} = f_{a}^{t6t+1} + \acute{a}_{a,j} + \mathring{a}_{a,j}^{t6t+1} \qquad (3.5)$$

with statistical outflow coefficient

$$\tilde{a}_{a,j}^{t6t+1} = \acute{a}_{a,j} + f_{a}^{t6t+1} \qquad (5.1)$$

In our outflow model, we now try to explain the outflow coefficient for age cohort α of occupation j in period t from outflow-determinants, as follows:

$$\tilde{a}_{a,j}^{t6t+1} = x_{a,j}^{t6t+1}\ \hat{a}_{a,j} \qquad (5.2)$$

where

$x_{a,j}^{t6t+1}$ = row vector of outflow determinants

$\hat{a}_{a,j}$ = column vector of coefficients

The outflow determinants that we will focus on, are several aspects of job strain, job level, gender and age (cohort).

The outflow model can therefore be written as

$$f_{a,j}^{t6t+1} = x_{a,j}^{t}\ \hat{a}_{a,j} + \mathring{a}_{a,j}^{t6t+1} \tag{5.3}$$

Currently, there is no time series available for the six job strain variables. The outflow model will therefore have to be estimated by a two-step procedure. The first step is to estimate the outflow coefficients according to the random coefficient method of the statistical outflow model (see also the following subsection). The second step is to perform an OLS regression of the estimated statistical outflow coefficients on the cross-section observations for the determinants.

The first step of the two-step procedure is to estimate the net flow coefficients according to the random coefficient model of the statistical outflow model. This gives us the endogenous variable needed in our OLS regression: the net flow coefficients. We now assume these coefficients to be affected by several variables: gender, age, the level of the job, and job strain indicators. We introduce:

1 gender dummy	:	male=1, female=0
8 age cohort dummies	:	cohort=1, not=0
1 job level dummy	:	high level=1, low level=0.

An F-test *rejects* the hypothesis that the determinants/variables are *not* gender-specific and we will therefore only perform the regressions separately for men and women, i.e. we discard the gender dummy.[4]

4. We compare two models. The first is a model using all variables (cohorts, job strain indicators, job level) and a gender dummy. The second (restricted) model does not use a gender dummy, but takes all other variables to be gender-specific, i.e. doubles each variable into a male or female equivalent. The F-test then tests the hypothesis, whether or not you should use gender-specific variables.
F-test: $\ddot{e}_1$ = (restricted RSS - unrestricted RSS)/($J*\acute{o}^2$) = 1.901. Here $\ddot{e}_1$ follows a F-distribution with J (=15) and T-K (=2032-30=2002) degrees of freedom. A $\ddot{e}_1$ of 1.9 rejects the nullhypothesis (H_0 = variables are not gender-specific) at a 5%-level. So, we should use different models per gender and we do so in the remainder of this paper.

The fourth suggested determinant of net flow is job strain. The data (percentages) on job strain is not gender-specific, that is to say it is assumed that men and women experience the same job strain when performing the same tasks. A drawback of the data on job strain is that it is given for 5 age classes instead of the 8 age cohorts used by the statistical model. There is also an age class 6, which simply is the total of all 5 classes. Job strain data in class 6 therefore pertains to all ages ranging from 15 to 64. As before, we will use the data as given by age class 6.

The job strain indicators can be modelled as percentages or as dummies, which group together the occupations with similar (high/low) job strain occurrences. The two dummies are not each other's complements, because of the buffer group separating them. We will choose using the following dummies (based on the percentages of class 6):

6 low job strain dummies	:	low strain=1, not=0
6 high job strain dummies	:	high strain=1, not=0,

because the loss of information has no effect on the results.

6 Estimation Results

Univariate results using dummies based on non-differentiated job strain data

First, we present the results of univariate regressions for the different job strain indicators and job level excluded as an explanatory variable. We will only present the results for one job strain indicator here as an example. The results for ‘pressure of deadline’ are given in the following table. This table also shows the results of the regression *with* job level as an explanatory variable.

We see that fewer occurrences of job strain (level=low) have a negative sign for men as well as women. This negative sign means that encountering less job strain due to working with the pressures of a deadline coincides with negative net flow, i.e. outflow larger than inflow. More job strain (level=high) has a positive sign, denoting the fact that a high level of job strain coincides with positive net flow or inflow greater than outflow. This is similar to the results in tables 4.1a and 4.1b.

Table 6.2 on the next page gives the univariate regression results (in sign and significance) for all 6 job strain indicators. The estimates of the cohort dummies are left out for reasons of clarity. What can we conclude on the basis of the results shown in table 6.2? Let us begin by looking at the results of the regressions for men. The regression without job level as an explanatory variable shows again the difference between the first four job strain indicators and the last two. A high level of noise, vibrating tools, the use of force, or working in shifts coincides with negative net flow, i.e. outflow greater than inflow. The opposite holds for high levels of time pressure and working with information technology. As before, we attribute this result to the level of the job. We assume that most of the people who said that they worked with deadlines or computers were also the ones having a high level job. Jobs at a higher level provide more *regulatory options* (‘controls’) and therefore the means of dealing with job stress due to, for instance, working with deadlines. If this is in fact the case, then the introduction of a job level variable should reverse the signs of job strain indicators 5 (and 6). The job level variable is a dummy, with 1=high level and 0=low level. We expect job level to have a positive sign, meaning that having a high level job is linked to inflow greater than outflow. No change in sign of job strain indicators 5 and 6 is observed when the regression is performed with job level as an extra explanatory variable. Job level is not even significantly different from 0 for ‘pressure of a deadline’. The only signs that change are those of high levels in the use of force and working in shifts, but not significantly. Despite the lack of impact of job level, we should note that this variable is nevertheless significant in four out of six regressions.

Table 6.1
OLS regression results for indicator 5 (pressure of deadline), with and without job level[1]

Model		without job level		with job level	
Variable	denoting/level	men	women	men	women
Cohort 1	25-29	0.083648*	0.028584*	0.082478*	0.025607*
Cohort 2	30-34	0.026330*	0.028892*	0.025160*	0.025915*
Cohort 3	35-39	-0.023228*	0.019657*	-0.024398*	0.016680
Cohort 4	40-44	0.009649	0.017911*	0.008479	0.014934
Cohort 5	45-49	-0.033346*	-0.022198*	-0.034516*	-0.025175*
Cohort 6	50-54	-0.017843*	-0.033339*	-0.019013*	-0.036316*
Cohort 7	55-59	-0.294346*	-0.135315*	-0.295516*	-0.138292*
Cohort 8	60-64	-0.324531*	-0.269648*	-0.325701*	-0.272625*
Pressure of deadline	low	-0.011124*	-0.023392*	-0.010588*	-0.022028*
Pressure of deadline	high	0.017171*	0.009986	0.015804*	0.006508
Job level	high	-	-	0.002960	0.007530

1) * = statistically significant at 5% significance level

The separate regressions for women give different results. They have a less favourable ‘goodness of fit’ than the separate regressions for men and some of the resulting signs are not what we would expect intuitively. This occurs three times: for a high level of noise and for both high and low levels of the indicator ‘vibrating tools’. For noise, the estimate is even significantly different from zero. It is not clear what causes these results or how they should be interpreted. Adding the job level variable does not change the sign of any job strain indicator at either level. For women, job level is significantly different from zero (with the expected sign) for three out of six regressions.

Table 6.2

Effects of an increase in job strain on the net flow, results of univariate regressions for all job strain indicators, using dummies based on non-differentiated job strain data , with and without job level[1]

Model		without job level		with job level	
Variable	level	men	women	men	women
Noise	low	positive	positive	positive	positive
Noise	high	negative	positive*	negative	positive*
Job level	high	-	-	positive*	positive*
Vibrating tools	low	positive	negative	positive	negative
Vibrating tools	high	negative*	positive	negative	positive*
Job level	high	-	-	positive*	positive*
Use of force	low	positive*	positive	positive*	positive
Use of force	high	negative	negative*	positive	negative
Job level	high	-	-	positive	positive
Working in shifts	low	positive*	positive	positive*	positive
Working in shifts	high	negative	negative	positive	negative
Job level	high	-	-	positive*	positive*
Pressure of deadline	low	negative*	negative*	negative*	negative*
Pressure of deadline	high	positive*	positive	positive*	positive
Job level	high	-	-	positive	positive
Inform. technology	low	negative*	negative*	negative	negative
Inform. technology	high	positive	positive	positive	positive
Job level	high	-	-	positive*	positive

1) * = statistically significant at 5% significance level

The univariate regressions of this subsection have also been performed using dummies based on the differentiated data. That is to say, use different data – and therefore different dummies – per age class. The use of non-differentiated data instead of differentiated data results in only very few and very minor changes in sign and significance. The same goes for the use of the original percentages (either differentiated or not) instead of dummies. In each instance, the division between the first 4 indicators and the last 2, is observed and the addition of job level as a variable shows again a positive sign and significance in most cases.[5]

5. For more detailed information on these regressions and their outcomes, as well as regression results that are left out in the remainder of this paper, the reader is referred to the authors.

Multivariate results using dummies based on non-differentiated job strain data

So far, we performed the regressions separately for all job strain indicators. Now we will model all job strain indicators *simultaneously*. The job strain dummies are again constructed on the basis of data from class 6 (non-differentiated). Tables 6.3 and 6.4 again show the results for men and women separately, with and without job level as an explanatory variable.

Table 6.3
OLS regression results multivariately for all job strain indicators, using dummies based on class 6 data, without job level[1]

Variable	denotes/level	men	women
Cohort 1	25-29	0.077841*	0.017679
Cohort 2	30-34	0.020524*	0.017987
Cohort 3	35-39	-0.029035*	0.008752
Cohort 4	40-44	0.003843	0.007006
Cohort 5	45-49	-0.039153*	-0.033103
Cohort 6	50-54	-0.023650*	-0.044244*
Cohort 7	55-59	-0.300153*	-0.146220*
Cohort 8	60-64	-0.330338*	-0.280553*
Noise	low	-0.002100	0.006630
Noise	high	-0.000515	0.022379*
Vibrating tools	low	0.000846	-0.022121*
Vibrating tools	high	-0.003572	0.015374
Use of force	low	0.004885	0.015217
Use of force	high	0.003260	-0.016676
Working in shifts	low	0.009947	0.007532
Working in shifts	high	0.005519	-0.002462
Pressure of deadline	low	-0.009376	-0.024140*
Pressure of deadline	high	0.018450*	0.007793
Inform. technology	low	-0.000001	0.002829
Inform. technology	high	-0.003739	0.007214

1) * = statistically significant at 5% significance level

In what way are the results of the multivariate regression different from the results of the univariate regressions? For men, we see different signs for low level noise and for high level use of force, working in shifts, and information technology. In this multivariate regression, working with computers does lead to net outflow for men (has a negative sign), albeit insignificantly, but low level information technology is also linked to net outflow for men (its sign has not changed). For women, there is only one sign different when compared to the univariate regressions: low level information technology has become positive. This result is not very strong either, since high level information technology is also positive and neither is significant. Multivariate regression has fewer statistically significant job strain indicators than the univariate regressions.

Table 6.4
OLS regression results multivariately for all job strain indicators, using dummies based on class 6 data, with job level[1]

Variable	denotes/level	men	women
Gender	male	-	-
Cohort 1	25-29	0.077148*	0.015009
Cohort 2	30-34	0.019830*	0.015317
Cohort 3	35-39	-0.029728*	0.006083
Cohort 4	40-44	0.003149	0.004337
Cohort 5	45-49	-0.039846*	-0.035772*
Cohort 6	50-54	-0.024343*	-0.046913*
Cohort 7	55-59	-0.300846*	-0.148890*
Cohort 8	60-64	-0.331031*	-0.283222*
Job level	high	0.001168	0.004498
Noise	low	-0.002131	0.006513
Noise	high	-0.000529	0.022324*
Vibrating tools	low	0.000849	-0.022108*
Vibrating tools	high	-0.003494	0.015672
Use of force	low	0.004855	0.015100
Use of force	high	0.003553	-0.015550
Working in shifts	low	0.009757	0.006801
Working in shifts	high	0.005801	-0.001377
Pressure of deadline	low	-0.009314	-0.023900*
Pressure of deadline	high	0.018129*	0.006560
Inform. technology	low	0.000135	0.003353
Inform. technology	high	-0.003636	0.007613

1) * = statistically significant at 5% significance level

This concludes the results of the multivariate regression without job level. In table 6.4, the results are shown of regressions using job level as an additional explanatory variable. Job level has a positive sign when added to the model. Adding job level changes the sign of low level information technology for men from negative to positive, making this more in line with our intuition. For women, there are no signs reversed as a result of to the addition of the job level variable. When we compare the results with those of the univariate regressions when they were performed including job level, we see for men changes for low level noise and information technology and high level information technology and for women for low level information technology. Not all sign changes are changes for the better. Some signs change from intuitively correct or expected to unexpected. However none of the changed signs is statistically significant.

Again the multivariate regressions of this subsection have also been performed using dummies based on the differentiated job strain data (differentiated by age cohort). The use of non-differentiated data instead of differentiated data this time results in quite a few but very minor changes in sign. This occurs mostly in the regressions for men. Most of the reversed signs are not statistically significant. The addition of job level as a variable again shows a positive sign. As before in the multivariate regression, however, the estimated coefficient is not significantly different from 0. The use of the original percentages (either differentiated or not) instead of dummies, again not reported here, also makes very little difference indeed.

Multivariate results using percentages based on differentiated job strain data

We have so far performed regressions univariately (job strain indicators separately) and multivariately (simultaneously for all job strain indicators). We could also combine some of the job strain indicators and form one or two new job strain indicators. In this subsection, we will test two such combinations. Here we will also depart from our dummy approach and use the original percentages of the Dutch Labour Force Survey (EBB). Furthermore, we will differentiate this data. Instead of using the data of class 6 (the total of all 5 age classes), we will in this subsection use different job strain data per age class.

Because of the differences in size between the age classes of the job strain data and the age cohorts of the model, i.e. age classes spanning either 5 or 10 years, we assign the data of:

class 1	to	cohort 1
class 2	to	cohorts 2 and 3
class 3	to	cohorts 4 and 5
class 4	to	cohorts 6 and 7
class 5	to	cohort 8.

As was stated above, we will look at two new job strain indicators by combining several indicators. The new variables are constructed simply by taking the average of the percentages of the indicators which are to be combined.

The first combination that we consider is provided by the suggested blue-collar/white-collar division observed in the graphs: combine indicators 1 through 4 (i.e. noise, vibrating tools, use of force, and working in shifts) and 5 and 6 (i.e. pressure of deadline and information technology) to make two new indicators. The results (with and without job level) are given in table 6.5.

The estimated model with combined indicators 1-4 and 5-6 fit reasonably well, showing insignificance for cohorts 2 and 4 and for indicators 1-4 (all for the regression for men only). In the regressions without job level as a variable, we see that pressure of deadline combined with working with information technology (indicators 5,6) has a significantly positive sign for both men and women. So, working with a combination of these job strain indicators has a positive effect on net flow, i.e. reduces the outflow compared to the inflow, which was not expected. The results are not so strong for the combined indicator made up of the first 4 job strain indicators. Only for women is it significant. But it has an unexpected positive sign. This result therefore does not show the expected higher outflow due to physically taxing work. For men, the sign is indeed negative, but not significantly so. Adding job level as an explanatory variable has the greatest effect in the regression for women. This effect is however more an effect on the size of the estimated coefficient, than on the signs of coefficients of the job strain indicators. The only two sign changes are not significant.

Table 6.5
Regressions for men and women with job strain indicators 1-4 and 5-6 combined, with and without job level[1]

		Without job level		with job level	
Variable	denotes	men	women	men	women
Cohort 1	25-29	0.061949*	-0.028979*	0.059224*	-0.036772*
Cohort 2	30-34	0.002019	-0.032894*	-0.000277	-0.039461*
Cohort 3	35-39	-0.047539*	-0.042129*	-0.049835*	-0.048696*
Cohort 4	40-44	-0.014542	-0.043185*	-0.016769	-0.049553*
Cohort 5	45-49	-0.057537*	-0.083294*	-0.059764*	-0.089662*
Cohort 6	50-54	-0.039904*	-0.090008*	-0.042303*	-0.096871*
Cohort 7	55-59	-0.316407*	-0.191985*	-0.318807*	-0.198848*
Cohort 8	60-64	-0.344176*	-0.320798*	-0.346682*	-0.327965*
Job level	high	-	-	0.008095	0.023152*
Indicators 1-4	blue collar	-0.000106	0.062999*	0.011266	0.095522*
Indicators 5,6	white collar	0.039235*	0.068747*	0.033750*	0.053060*

1) * = statistically significant at 5% significance level

A second combination of job strain indicators is 3 and 4 together and 1, 2, 5 and 6 together. For the results of the regressions with this grouping (with and without job level), see table 6.6. Define job strain indicator 3-4 as the new blue-collar work indicator and indicator 1-2-5-6 as the new white-collar work indicator. The new white-collar indicator again has an unexpected positive sign which is significant for all four regressions in table 6.8. Adding job level does not change this sign. This confirms once again the idea that the sign of this indicator is not due to ignoring the level of the job. Job level does not seem to add vital information, since it does not change the signs of the newly constructed job strain indicators in the theoretically expected direction and since it is itself not significantly different from zero.

Table 6.6
Regressions for men and women with job strain indicators 3-4 and 1-2-5-6 combined, with and without job level[1]

		Without job level		with job level	
Variable	denotes	men	women	men	women
Cohort 1	25-29	0.069031*	-0.028957*	0.063649*	-0.034910*
Cohort 2	30-34	0.009457	-0.033942*	0.004526	-0.039397*
Cohort 3	35-39	-0.040101*	-0.043177*	-0.045032*	-0.048631*
Cohort 4	40-44	-0.007335	-0.044658*	-0.012096	-0.049924*
Cohort 5	45-49	-0.050330*	-0.084767*	-0.055091*	-0.090033*
Cohort 6	50-54	-0.033486*	-0.091675*	-0.038209*	-0.096900*
Cohort 7	55-59	-0.309989*	-0.193652*	-0.314712*	-0.198876*
Cohort 8	60-64	-0.339148*	-0.323644*	-0.343532*	-0.328493*
Job level	high	-	-	0.009678	0.010705
Indicators 3,4	blue collar	-0.027755*	-0.023007	-0.010349	-0.003753
Indicators 1,2,5,6	white collar	0.057005*	0.148781*	0.049851*	0.140868*

1) * = statistically significant at 5% significance level

7 Conclusions

In the next few years, most job openings for school-leavers in the Netherlands are expected to arise from replacement demand as a result of labour market outflow. The need to understand labour market outflow is also especially great because of the very low participation rate. Different indicators of job strain affect the outflow coefficients and there also appears to be a systematic pattern of outflow coefficients with respect to age, gender and job level.

The unavailability of time series data on job strain forced us to use a two-step procedure, while of the three determinants age, gender and job strain, only age and gender turned out to be significant in affecting the net flow coefficients. That is to say, we found that the variables were gender-specific and the cohort variables were significantly different from zero (this holds especially for the later cohorts, i.e. the older workers). These results are consistent with both our intuition and the literature. The job strain indicators were on average not statistically significant, with the exception of indicator 5, pressure of deadline. The job strain indicators were only significant in univariate regressions, but several times the signs of the job strain indicators were in contradiction with our earlier findings.

Moreover, the possibility of an omitted variable bias makes these results less reliable. Note that we could have used the ‘no’ percentages also, making it easier to compare ‘dummy results’ with ‘percentage results’. Using only the ‘yes (often)’ percentages instead of the sum of the ‘yes (often)’ and ‘yes (sometimes)’ percentages, might also be an useful variation, but this last variation leads to similar results (not reported in this paper).

On the basis of these results, we conclude that age and gender are the main determinants of outflow, whereas job strain provides little additional information. This conclusion is valid for all categories: either dummies or percentages, with or without job level as an explanatory variable, and for either level of job strain.

Certain comments should be made with regards to the data. The flow data used in this study is net flow data. It is our assumption that gross flow data, making a clear distinction between inflow and outflow, would correspond better with job strain data. With regard to the job strain data, it should again be noted that it says nothing about the *severity* of the job strain, but that it is instead only a measure of the *incidences/occurrences* of job strain. This distinction is particularly important if the job outflow only takes place above a certain threshold level of severity of job strain. Another aspect not accounted for in this study, is the *duration* of job strain. That is to say, the time an individual worker is subjected to a certain (indicator of) job strain.

A (micro) data set, better suited to the needs of an investigation into the connection between job strain and labour outflow, may very well yield different results.

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Appendix

Table A1
Percentage of workers (men and women) with job strain, by occupational class and job strain indicator, 1996

Occupational class	noise	vibrations	force	shifts	deadline	IT
Primary school teachers	33	-	10	-	48	46
Teachers of science, medical, hotel and catering subjects (2nd and 3rd degree)	-	-	-	-	54	56
Teachers of science, medical, hotel and catering subjects (1st degree and UE)	-	-	-	-	74	76
Agricultural and technical teachers (2nd and 3rd degree)	35	-	-	-	56	64
Agricultural and technical teachers (1st degree and UE)	-	-	-	-	-	-
Teachers of economic and administrative subjects (2nd and 3rd degree)	-	-	-	-	-	73
Teachers of economic and administrative subjects (1st degree and UE)	-	-	-	-	68	90
Language and arts teachers	27	-	-	-	53	32
Language teachers (1st degree and UE)	-	-	-	-	69	50
Teachers of social, psychological subjects (2nd and 3rd degree)	-	-	-	-	-	-
Teachers of social subjects (1st degree and UE)	-	-	-	-	-	-
2nd and 3rd degree teachers no specialisation	-	-	-	-	56	54
1st degree teachers, no specialisation	-	-	-	-	-	-
Pedagogical staff	-	-	-	-	84	84
Educational scientists and pedagogues	-	-	-	-	76	82
Driving instructors	-	-	-	-	-	-
Swimming instructors	-	-	-	-	-	-
Sports instructors	-	-	-	-	-	-
Interpreters, translators and writers	-	-	-	-	73	79
Library assistants	-	-	25	-	51	93
Librarians	-	-	-	-	51	96
Graphic designers	-	-	-	-	83	95
Artists	16	-	21	-	77	57
Pastoral workers	-	-	-	-	-	-
Theologians	-	-	-	-	-	-
Journalists	-	-	-	-	87	94
Linguists	-	-	-	-	83	91
Agricultural auxiliary workers	-	-	-	-	-	-
Agricultural workers	30	39	72	-	36	7
Skilled agricultural workers	-	-	-	-	-	-
Environmental hygienists and agricultural representatives	-	-	-	-	65	81
Agricultural scientists	-	-	-	-	-	100
Agricultural machine drivers and fishermen	51	58	64	-	63	-
Agricultural managers	31	38	66	-	67	40
Production workers	52	30	61	21	51	18
Laboratory assistants	-	-	-	-	-	-
Laboratory workers	-	-	-	-	56	88
Technical analysts	-	-	-	-	54	93
Physicists	-	-	-	-	70	97

Table A1 (continued)
Percentage of workers (men and women) with job strain, by occupational class and job strain indicator, 1996

Occupational class	noise	vibrations	force	shifts	deadline	IT
Caretakers	21	21	45	-	40	29
Heads of technical service departments	-	-	-	-	69	66
Mechanical engineers	-	-	-	-	84	91
Construction workers	52	58	85	-	49	3
Contractors and fitters	46	55	67	-	60	26
Architects and construction project manager	18	-	-	-	83	83
Civil engineers	-	-	-	-	87	90
Civil engineering workers	57	80	84	-	44	-
Skilled civil engineering workers	49	39	40	-	57	30
Civil engineering designers and project leaders	-	-	-	-	79	82
Metalworkers	72	55	69	19	52	20
Welders and bench fitters	64	52	58	17	57	32
Metal-processing managers	-	-	-	-	-	-
Assembly-line workers	44	46	66	26	54	-
Mechanics	60	53	66	16	60	39
Mechanical engineering designers and heads of technical service departments	25	-	-	-	75	88
Electronical engineers	-	-	37	-	60	81
Fitters and electronic product controllers	33	43	47	-	54	41
Electrical engineers	42	42	54	8	62	42
Electrotechnical designers and managers	-	-	-	-	71	98
Electrical engineers	-	-	-	-	72	93
Printing industry production workers	36	-	29	36	72	56
Skilled printing workers	48	17	39	24	68	48
Mechanical operators	60	26	64	42	54	26
Process operators	67	27	49	67	67	73
Process technicians.	-	-	-	-	61	85
Material scientists	-	-	-	-	77	89
Textile workers	46	33	57	-	56	-
Cobblers and tailors	-	-	-	-	81	-
Loaders and unloaders	30	16	75	14	50	29
Drivers	24	12	59	18	59	7
Ship's officers and conductors	56	-	37	49	67	69
Pilots, ship captains and transport directors	35	-	-	-	77	86
Stewards	56	-	69	-	91	-
Nursing aids and student nurses	-	-	90	55	73	-
Nurses and medical assistants	11	6	59	34	71	50
Therapists and nurses	9	-	59	20	69	45
Physicians	-	-	11	-	83	69
Pharmacy assistants medical laboratory staff	-	14	16	-	59	76
Medical analysts	-	-	-	-	64	91
Pharmacists	-	-	-	-	87	93
Department heads in care institutions	-	-	-	-	66	71
Office assistants, packers and door-to-door salesmen	43	10	50	12	46	19
Auxiliary administrative assistants	-	-	-	-	-	68
Managers	-	-	-	-	90	88
Economists	-	-	-	-	87	96
Production planners	16	-	13	10	74	88

Table A1 (continued)
Percentage of workers (men and women) with job strain, by occupational class and job strain indicator, 1996

Occupational class	noise	vibrations	force	shifts	deadline	IT
Organisational consultants	-	-	-	-	77	94
Organisational experts	-	-	-	-	86	95
Receptionists and administrative employees	10	-	11	7	52	87
Accountants and secretaries	7	-	6	-	61	96
Assistant accountants	-	-	-	-	74	97
Accountants	-	-	-	-	87	98
Insurance brokers	-	-	-	-	65	88
Purchasing clerks	7	-	9	2	64	86
Commercial staff	6	-	5	-	77	91
Technical and commercial employees	-	-	-	-	62	58
Technical and administrative staff	-	-	-	-	75	91
Legal and tax office employees	-	-	-	-	64	95
Legal staff and higher civil servants	-	-	-	-	85	93
Lawyers	-	-	-	-	81	92
Administrative transport employees	-	-	-	-	77	88
Managers	12	-	-	-	86	82
Managing directors	6	-	6	-	85	76
Medical secretaries	-	-	-	-	60	99
Programmers	-	-	-	-	67	100
Systems analysts	-	-	-	-	82	99
Information scientists	-	-	-	-	78	100
Technical systems analysts	-	-	-	-	85	99
Activity supervisors and employment intermediaries	15	-	27	11	48	55
Socio-cultural workers	10	-	8	-	71	81
Social counsellors and heads of personnel	-	-	-	-	80	80
Social-science staff	-	-	-	-	85	100
Social researchers	-	-	-	-	75	84
Shelf stockers	-	-	61	-	42	-
Cleaning staff	17	11	56	8	42	-
Sales assistants	10	4	44	4	39	27
Shopkeepers	8	5	49	-	58	56
Auxiliary catering and service workers	19	5	58	13	54	6
Home nursing personnel	10	-	86	44	75	10
Catering personnel	23	4	61	20	57	14
Pub and snackbar owners	-	-	51	-	72	-
Catering managers	23	-	39	19	59	42
Bakers and butchers	38	-	80	-	73	-
Trainee policemen, soldiers and assistant security personnel	23	13	25	46	43	62
Policemen, police officers and security employees	22	-	28	43	69	91
Police inspectors and senior officers	-	-	-	-	90	92
Firemen	-	-	-	-	-	-

Source: CBS/ROA

Table A2
Occupational job strain level, by job strain indicator, 1996

Occupational class	noise	vibrations	force	shifts	deadline	IT
Primary school teachers	high	low	medium	low	low	low
Teachers of science, medical, hotel and catering subjects (2nd and 3rd degree)	high	medium	low	low	low	medium
Teachers of science, medical, hotel and catering subjects (1st degree and UE)	medium	medium	low	low	medium	medium
Agricultural and technical teachers (2nd and 3rd degree)	high	high	medium	low	low	medium
Agricultural and technical teachers (1st degree and UE)	medium	low	low	low	medium	high
Teachers of economic and administrative subjects (2nd and 3rd degree)	medium	low	low	low	medium	medium
Teachers of economic and administrative subjects (1st degree and UE)	low	low	low	low	medium	high
Language and arts teachers	high	medium	medium	low	low	low
Language teachers (1st degree and UE)	medium	low	low	low	medium	medium
Teachers of social, psychological subjects (2nd and 3rd degree)	high	low	high	low	low	low
Teachers of social subjects (1st degree and UE)	medium	low	low	low	medium	medium
2nd and 3rd degree teachers no specialisation	high	medium	medium	low	low	medium
1st degree teachers, no specialisation	high	high	medium	low	high	medium
Pedagogical staff	low	low	low	low	high	medium
Educational scientists and pedagogues	low	low	low	low	high	medium
Driving instructors	low	medium	low	medium	low	low
Swimming instructors	high	medium	medium	high	low	low
Sports instructors	high	medium	high	medium	low	low
Interpreters, translators and writers	low	low	low	high	medium	medium
Library assistants	low	low	medium	medium	low	high
Librarians	low	low	medium	low	low	high
Graphic designers	low	low	low	low	high	high
Artists	medium	medium	medium	medium	high	medium
Pastoral workers	low	low	low	low	high	medium
Theologians	low	low	low	low	medium	medium
Journalists	low	low	low	medium	high	high
Linguists	low	medium	medium	medium	high	high
Agricultural auxiliary workers	medium	medium	high	low	low	low
Agricultural workers	high	high	high	medium	low	low
Skilled agricultural workers	medium	high	high	medium	low	low
Environmental hygienists and agricultural representatives	low	medium	medium	low	medium	medium
Agricultural scientists	medium	medium	medium	low	high	high
Agricultural machine drivers and fishermen	high	high	high	medium	medium	low
Agricultural managers	high	high	high	low	medium	low
Production workers	high	high	high	high	low	low
Laboratory assistants	high	high	high	high	medium	medium
Laboratory workers	medium	high	medium	high	low	high
Technical analysts	medium	high	medium	medium	low	high
Physicists	low	medium	low	medium	medium	high
Caretakers	medium	high	high	high	low	low
Heads of technical service departments	high	high	medium	low	medium	medium
Mechanical engineers	medium	medium	low	medium	high	high
Construction workers	high	high	high	medium	low	low

Contractors and fitters	high	high	high	medium	medium	low

Table A2 (continued)
Occupational job strain level, by job strain indicator, 1996

Occupational class	noise	vibrations	force	shifts	deadline	IT
Architects and construction project manager	medium	medium	medium	medium	high	medium
Civil engineers	low	low	low	low	high	high
Civil engineering workers	high	high	high	medium	low	low
Skilled civil engineering workers	high	high	high	medium	low	low
Civil engineering designers and project leaders	high	medium	medium	medium	high	medium
Metalworkers	high	high	high	high	low	low
Welders and bench fitters	high	high	high	high	low	low
Metal-processing managers	medium	high	medium	medium	low	medium
Assembly-line workers	high	high	high	high	low	low
Mechanics	high	high	high	high	medium	low
Mechanical engineering designers and heads of technical service departments	high	high	medium	medium	high	high
Electronical engineers	medium	high	medium	high	medium	medium
Fitters and electronic product controllers	high	high	high	high	low	low
Electrical engineers	high	high	high	high	medium	low
Electrotechnical designers and managers	medium	high	medium	low	medium	high
Electrical engineers	low	medium	low	low	medium	high
Printing industry production workers	high	high	medium	high	medium	medium
Skilled printing workers	high	high	high	high	medium	low
Mechanical operators	high	high	high	high	low	low
Process operators	high	high	high	high	medium	medium
Process technicians.	high	medium	medium	medium	medium	medium
Material scientists	medium	medium	medium	medium	high	high
Textile workers	high	high	high	medium	low	low
Cobblers and tailors	high	high	medium	medium	high	low
Loaders and unloaders	high	high	high	high	low	low
Drivers	medium	high	high	high	medium	low
Ship's officers and conductors	high	high	medium	high	medium	medium
Pilots, ship captains and transport directors	high	medium	medium	high	high	medium
Stewards	high	medium	high	high	high	low
Nursing aids and student nurses	medium	low	high	high	medium	low
Nurses and medical assistants	medium	medium	high	high	medium	medium
Therapists and nurses	low	medium	high	high	medium	low
Physicians	medium	medium	medium	medium	high	medium
Pharmacy assistants medical laboratory staff	medium	high	medium	high	low	medium
Medical analysts	medium	high	medium	high	medium	high
Pharmacists	low	medium	low	medium	high	medium
Department heads in care institutions	low	low	medium	medium	medium	medium
Office assistants, packers and door-to-door salesmen	high	medium	high	high	low	low
Auxiliary administrative assistants	high	medium	medium	low	low	medium
Managers	medium	medium	medium	medium	high	high
Economists	low	low	low	low	high	high
Production planners	medium	medium	medium	high	high	high
Organisational consultants	medium	medium	low	medium	high	high
Organisational experts	low	low	low	low	high	high
Receptionists and administrative employees	low	medium	medium	medium	low	high
Accountants and secretaries	low	low	low	low	medium	high
Assistant accountants	low	low	low	low	high	high
Accountants	low	low	low	low	high	high

Insurance brokers	medium	low	low	low	medium	high
Purchasing clerks	low	low	medium	medium	medium	medium

Table A2 (continued)
Occupational job strain level, by job strain indicator, 1996

Occupational class	noise	vibrations	force	shifts	deadline	IT
Commercial staff	low	low	low	low	high	high
Technical and commercial employees	medium	medium	medium	medium	medium	medium
Technical and administrative staff	medium	low	low	low	high	high
Legal and tax office employees	low	low	low	medium	medium	high
Legal staff and higher civil servants	low	low	low	medium	high	high
Lawyers	low	low	low	low	high	high
Administrative transport employees	medium	medium	medium	high	high	high
Managers	medium	medium	low	medium	high	medium
Managing directors	low	low	low	medium	high	medium
Medical secretaries	medium	low	low	low	medium	high
Programmers	low	low	low	high	medium	high
Systems analysts	low	low	low	low	high	high
Information scientists	low	low	low	low	high	high
Technical systems analysts	medium	medium	low	medium	high	high
Activity supervisors and employment intermediaries	medium	medium	medium	high	low	medium
Socio-cultural workers	low	low	medium	medium	medium	medium
Social counsellors and heads of personnel	low	low	low	medium	high	medium
Social-science staff	low	low	low	low	high	high
Social researchers	low	low	low	low	high	medium
Shelf stockers	low	low	high	high	low	low
Cleaning staff	medium	high	high	medium	low	low
Sales assistants	low	medium	high	medium	low	low
Shopkeepers	low	medium	high	medium	low	medium
Auxiliary catering and service workers	medium	medium	high	high	low	low
Home nursing personnel	low	low	high	high	high	low
Catering personnel	medium	medium	high	high	low	low
Pub and snackbar owners	medium	low	high	high	medium	low
Catering managers	medium	medium	high	high	low	low
Bakers and butchers	high	high	high	high	medium	low
Trainee policemen, soldiers and assistant security personnel	medium	high	medium	high	low	medium
Policemen, police officers and security employees	medium	medium	medium	high	medium	high
Police inspectors and senior officers	medium	medium	medium	medium	high	high
Firemen	high	high	high	high	medium	medium

Source: ROA