

Mette Gørtz

## Early Retirement in the Day-Care Sector: The Role of Working Conditions



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Carries out and reports social science research of interest to the public sector and in particular to regions and local governments.

Mette Gørtz

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## Preface

This paper is part of a series of three independent papers which look into the role of work pressure for day-care teachers' labour-market situation. In this paper, we focus on day-care teachers' choice of early retirement. Another paper looks at teacher sickness absence. And the third paper focuses on teacher turnover. In all analyses, work pressures are measured by the child-to-teacher ratio.

I thank Nabanita Datta Gupta, Mona Larsen, Henrik Lindegaard Andersen and Thomas Lund for useful comments and suggestions. Finally, I am grateful for valuable inputs from an expert monitoring group from ministries, organisations and research institutions with particular knowledge of work environment and labour-market situation of day-care teachers.

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Mette Gørtz

June 2010

# Contents

<b>1</b>	<b>Introduction.....</b>	<b>8</b>
<b>2</b>	<b>Previous Evidence.....</b>	<b>9</b>
<b>3</b>	<b>Data.....</b>	<b>12</b>
<b>4</b>	<b>The Early Retirement (ERP) Scheme .....</b>	<b>13</b>
<b>5</b>	<b>The Child-to-Teacher Ratio .....</b>	<b>15</b>
<b>6</b>	<b>Empirical Approach.....</b>	<b>18</b>
<b>7</b>	<b>Results .....</b>	<b>22</b>
<b>8</b>	<b>Conclusion .....</b>	<b>28</b>
	<b>References .....</b>	<b>29</b>
	<b>Dansk sammenfatning .....</b>	<b>31</b>



## Summary

This paper studies the role of working conditions and health for elderly female day-care teachers' decision to enter early retirement pay (ERP). Entry into retirement is analysed in a duration framework that allows for unobserved heterogeneity in the baseline hazard. Data are from a Danish longitudinal data set based on administrative register records for 1997-2006 with information on labour-market career, family background, health care utilisation and employment status of a spouse. Work pressure is measured by the child-to-teacher ratio, which varies across municipalities and over time. Regressions in a duration model framework show that the child-to-teacher ratio has a small and significant effect on retirement after 2002 for preschool teachers with poor health. For preschool teachers with good or average health status and for nursery-care teachers in general, there is no significant relationship between the child-to-teacher ratio and early retirement (ERP). Day-care teachers whose spouses are retired or who have grandchildren have a significantly higher probability of choosing early retirement.

# 1 Introduction

The retirement age has been falling in many Western European countries over the last couple of decades. In the same period, the populations have experienced generally improving health, increasing longevity and, consequently, an ageing population. This development, which has potential impact on the public finances for decades ahead, poses a number of challenges for the welfare state.

The aim of this paper is to study the role of working conditions (measured by the child-to-teacher ratio), health status and spouse's retirement status for the decision to choose early retirement (ERP) in Denmark. Most previous studies that have examined the role of working conditions rely on subjective measures of work pressure, general job characteristics and health. This paper contributes to the literature on working conditions and retirement by using more objective measures of work pressure and health.

The paper focuses on female day-care teachers employed in the day-care sector. The main reason for this focus is that this allows us to exploit information on work pressure measured by the child-to-teacher ratio which is a relatively objective measure of the work pressure in this sector. The child-to-teacher ratio varies across municipalities and over time.

Another major interest in the previous literature is the role of health in the retirement decision. Previous studies have relied on self-reported measures of health which are subjective and potentially affected by justification bias. The present paper uses register data on health-care uptake and sickness periods to analyse how health status affects the retirement decision.

A very unique feature of the data is that we can identify the children who attend the institutions in our sample. This allows us to investigate whether family background of the children in day-care institutions has any impact on the retirement decision, for example if social problems in the child group enhance the work pressure of the employees in certain institutions prompting them to exit the labour market.

The analysis is performed in a duration framework which allows for unobserved heterogeneity in the baseline hazard through a piecewise constant hazard specification.

The paper finds some evidence of a positive effect of the child-to-teacher ratio on the probability of entering early retirement for preschool teachers with poor health, while the overall effect of the child-to-teacher ratio for nursery teachers and for healthy preschool teachers is insignificant.

## 2 Previous Evidence

There is a growing literature on the relationship between working conditions, health and retirement. Following Grossman's (1972) health capital model, work pressure potentially impacts health, and there has been substantial research interest in the (causal) relationship between health and retirement (and vice versa). There is now an increasing awareness of the idea that labour supply decisions may be affected by job characteristics other than the wage rate, such as general job amenities, job satisfaction etc. A number of empirical studies have examined whether job characteristics (broadly speaking) are important drivers for the decision to retire. Job characteristics have been measured by different methods. Some use survey information where recent retirees have stated their individual reason for retirement. Other studies use self-reported descriptions of work pressure. An individual line of research looks into how job satisfaction interacts with the labour supply decision. A common trait in studies relying on self-reported measures of job characteristics is that these measures are subjective by nature. Other studies use sector-specific evaluations of work pressure which may also be impacted by subjective beliefs and selection into different occupations. Below, I discuss some of the important empirical contributions from this literature.

Quinn (1978) presents statistical support for the hypothesis that individuals are more likely to retire from jobs with undesirable job attributes. His paper is based on data from the 1969 wave of the Retirement History Study (RHS). Based on 3-digit occupational and industrial categories of each person's current (or last) job and a list of job descriptions from the US Department of Labor, a detailed description of job characteristics has been developed. However, Quinn argues, the relationship is complicated: there is an important interaction with health status. Respondents who have a health condition limiting the amount of work they can do are much more sensitive to the job environment than those in good health. Quinn hypothesises that health and retirement income eligibility are more important, and that the effects of job characteristics must be analysed within a medical and economic framework.

Hurd & McGarry (1993) find that physical and mental job requirements have a rather small influence on prospective retirement, whereas measures of job flexibility and financial aspects of the job are important determinants. They use the first wave of the US Health and Retirement Study (HRS) to model the conditional probability of being retired at the age of 62 and 65, respectively, given full-time work at age  $t$ . The model of conditional probability of being retired is estimated as a linear regression on 38 dummy variables that define measures of job characteristics.

Gustman & Steinmeier (2000) construct a structural model of the retirement decision with job characteristics as one determinant of retirement using HRS 1992-2002 data. The model is solved using simulated method of moments. Their main finding is that minimum hour constraints, firm characteristics and job difficulty or stress have only limited implications for the retirement decision. French (2005) estimates a life-cycle model of labour supply, retirement and savings behaviour in which future wages and health status are uncertain. He uses the method of simulated moments to match life-cycle profiles of labour-force par-

ticipation, hours worked and assets that are estimated from the data to those that are generated by the model. French's method resembles the model in Gustman & Steinmeier (2000). An advantage of French's model is that it deliberately models the health stock of the individual.

Haider & Loughran (2001) analyse determinants of retirement using a simple OLS regression of the probability of being employed in one wave, given that the individual was employed in the previous wave. They use data from three US surveys; the Current Population Survey (CPS), the Health and Retirement Survey (HRS), and the AHEAD survey, which is also part of the HRS. They control for health status and individual and health characteristics. Their results indicate that job characteristics such as occupation and self-assessed stress level have no impact on labour-force transitions. However, they do find that non-pecuniary considerations play an important role in determining labour supply decisions of the elderly.

Friis et al. (2007) attempt to explain the incidence of Danish nurses' exit from the labour market to early retirement (Early Retirement Pay, ERP). Their study is based on a survey from 1993 of more than 5,000 nurses in their 50s who completed a questionnaire on health, lifestyle, working environment and socio-demographic factors. The survey information was combined with longitudinal register information on labour-market history, individual characteristics, family background etc. Generally, Friis et al. find that factors like low job influence, high workload and physical job demands only marginally increased the probability of retiring, while health, income, marital status, especially retirement status of a husband, etc. seem to be much stronger predictors of exit into early retirement. The authors remark that this result was contradictory to the general perception that the relatively early retirement age among nurses is due to a demanding physical working environment and high load of changing working hours. Perhaps surprisingly, the study found that nurses working fixed evening shifts or rotating working hours had a *higher* retirement age than nurses working day shifts.

Larsen (2008) examines the relationship between job satisfaction and early retirement (ERP) using data from a Danish longitudinal survey of the elderly. Her main focus in the paper is to find out whether women and men are affected differently by job characteristics. This is analysed in a pooled OLS analysis. In general, she finds that job demands lower the retirement age, while earnings, work-hour satisfaction and the opportunity to use skills on the job increase the retirement age. However, female workers are more sensitive to job demands – higher job demands are associated with a lower planned retirement age – and the opportunity of being able to organise own work seems to be more important for men than for women when planning their retirement age.

However, there is a risk that studies of the relationship between working conditions and retirement, where the measurement of working conditions is based on self-reported measures for work pressure, job satisfaction etc., may suffer from justification bias in much the same way as it has been argued for in the case of self-reported health, cf. Bound et al. (1999) and Kapteyn et al. (2009). Datta Gupta & Larsen (2009) compare the impact of self-reported health versus objective physician-reported health on retirement plans. They find that objective measures of health is a more accurate predictor of retirement plans, while the association

between self-reported health and planned retirement tends to lead to biased results. Datta Gupta & Larsen (2007, 2009) find that health is a strong predictor of retirement plans.

Danø, Ejrnæs & Husted (2005) formulate an option value model inspired by Stock and Wise which focuses on the value of retaining the option to retire at a later date. The model is tested on Danish data for singles entering early retirement (ERP). They find that income and health are important retirement determinants, but that there are substantial gender differences in the retirement pattern. Men's retirement decision is mainly influenced by income and health, whereas women's retirement decision is also affected by education and unemployment experience.

Working conditions and health status in themselves are also related. Fischer & Sousa-Poza (2009) find – in a study based on the German Socio-Economic Panel – that there is a positive link between job satisfaction (and changes over time therein) and subjective health measures (and changes over time) as well as more objective measures of health. Datta Gupta & Kristensen (2008) investigate whether a satisfactory work environment can promote employee health using data from Denmark, France and Spain. They find compelling evidence that a good perceived work environment is a highly significant determinant of worker health.

### 3 Data

The data set we employ for the empirical analysis is from a large micro panel based on administrative registers from Statistics Denmark. The population in the data is restricted to female day-care teachers who were employed in Danish preschools (*“børnehave”*) and nursery care (*“vuggestue”*) at the age of 59 sometime over the period 1995-2006.<sup>1</sup> We focus on individuals aged 60-64, as the early retirement programme, ERP, is available for people in this age group. The ERP is described in more detail in section 4.

The data set contains detailed information on labour-market status, i.e. for each year we know which institution/firm they were employed in, unemployment periods, retirement or other periods outside the labour force, and, from 2000, periods of long-term absence (more than two weeks) due to sickness. Moreover, we have information on the employees' use of health care, i.e. visits to general practitioner (GP), specialists, hospitalisation, main medical diagnoses etc. Our population consists of all female day-care teachers and day-care assistants. Managers at the institution level usually have a day-care teacher education and hence are usually included in the pedagogical staff in day care. The teachers (and assistants) are followed from they turn 60 (and are eligible for ERP) until they go on ERP or turn 65. The sample size is more than 10,000 observations over the period 1997-2006.

A unique feature of the data is the possibility to identify the children who are enrolled in the specific day-care centres. Due to data limitations, it was not possible for Statistics Denmark to connect all day-care institutions to one workplace. Approximately 53% of the day-care teachers are connected with their particular child group. Based on this subset of the data, we investigate whether the family background of the enrolled children has any impact on teacher turnover. This could be the case if for instance social problems among the children enrolled in specific day-care centres enhance the work pressure of the employees.

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<sup>1</sup> We focus on female day-care teachers, since more than 90% of trained day-care teachers approaching retirement are women.

## 4 The Early Retirement (ERP) Scheme

The paper analyses entry into the publicly financed Early Retirement (ERP – “*efterløn*”) Scheme. ERP was introduced in 1979 as a labour-market programme aimed at reducing unemployment by redistributing jobs from elderly employed salary-earners to younger unemployed. The ERP scheme was intended to facilitate early retirement for worn-out workers, who had been employed for a longer period in particularly physically and psychologically demanding jobs. The aim of the programme was to allow this group to retire without experiencing a large income drop.

Today, the official retirement age is 65 and hence candidates for ERP are dominated by the 60-64-year-olds; until 1998 the retirement age was 67, and the ERP scheme was available for 60-66-year-olds. In practice, ERP has reduced the pension age for a large part of the older labour force. Generally, for the whole population, the share of 60-66-year-olds on ERP has increased from the late 1970s to a level of around 45% in 2003. The popularity of the ERP scheme has prompted a number of changes in the system since the beginning of the 1990s; one reform in 1992 and another reform in 1999. The reform in 1999 aimed at making it more attractive for workers to postpone early retirement. Incentives were made to induce individuals to postpone retirement until the age of 62 instead of 60. Moreover, at the same time the normal pension age for ordinary public pensions was reduced from 67 to 65. This implied that the ERP has been available for age groups aged 60-64 after 1999. Thus, a reform took place during the period we investigate (1995-2006).

Until 1999, the basic amount of the ERP benefit was equivalent to unemployment benefits for the first 2.5 years on ERP and 81% of unemployment benefits for the following years. By mid-1999, a reform of the ERP took effect, changing the ERP rate to 91% of unemployment benefits if ERP is chosen at the age of 60 and 100% of unemployment benefits if ERP entry is postponed until the age of 62. Unemployment benefits amount to 90% of the final wage earned, subject to a ceiling. The maximum unemployment benefit was 22,700 Euro (170,040 DKK) per year in 2005. Thus, the ERP rate was 20,600 Euro if ERP was chosen at the age of 60 and 22,700 Euro if ERP was entered at 62 or older. ERP is generally more generous than disability pension which may explain why relatively few 60-64-year-olds enter the disability pension system. Less than 1% of the 60-66-year-olds entered disability pension in 2002, cf. Danish Economic Council (2005).

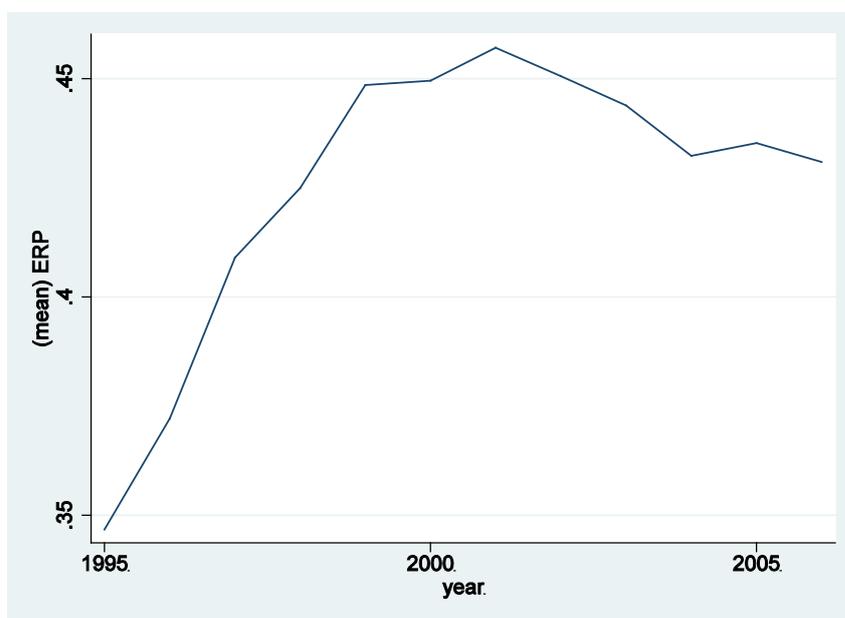
Eligibility for the ERP programme requires membership of an unemployment insurance scheme for a certain period of time. Until 1999, the required eligibility period was 20 years, and from mid-1999 the required membership period is 25 out of 30 years. Individuals on ERP are allowed to work for a maximum number of hours per year, but labour income is partially deducted from the ERP rate. Furthermore, private pensions are deducted in the ERP rate.

At the national level, around 2/3 of the individuals entering ERP enter directly from employment, whereas 20-30% were previously unemployed, cf. Danish Economic Council (2005). Women have been dominating the ERP take-up in the last decade, and women tend

to choose ERP earlier (age 60-61) than men. 90% of individuals on ERP are unskilled or skilled workers, whereas people with a medium or long further education have the lowest probability of ERP take-up (Danish Economic Council 2005). Figure 4.1 shows the share of women with an education as day-care teachers who were on early retirement pay in each year 1995-2006.

The paper focuses on trained day-care teachers who have completed a 3½-year pedagogical education. More than 90% of trained day-care workers above 55 are women, so for simplicity, the paper focuses on female day-care workers (teachers and assistants) only.

Figure 4.1 Share of 60-64-year-old female day-care teachers on ERP



Source: Own calculations based on register data.

In the analysis, special attention is paid to the role of health in prompting early retirement.

We define a dummy for poor health. People with poor health had been admitted to hospital for more than 3 days during the last year and/or had more than 10 visits to their GP and more than 5 visits to a medical specialist in somatic diseases or they had visited a psychiatric specialist. According to this definition, around 17% of our population are in poor health.

## 5 The Child-to-Teacher Ratio

Danish day-care institutions are directed at children aged  $\frac{1}{2}$ -6 years. Municipalities can organise their day-care institutions quite differently. Day-care institutions consist of day nursery (child minding), nursery care, preschool and age-integrated institutions. In some municipalities, the majority of day-care institutions are in the form of age-integrated institutions (for children aged  $\frac{1}{2}$ -6 years) where day nursery and preschool are combined in one institution. In other municipalities, the majority of children aged 3-6 are in traditional preschool. For the group of children aged  $\frac{1}{2}$ -3 years, some municipalities offer nursery-care openings, whereas other municipalities rely on municipal organised child minding.

Work pressure is measured by the child-to-teacher ratio, which is calculated at the municipal level. The child-to-teacher ratio varies across municipalities and over time. The advantage of measuring work pressure in this way is that the child-to-teacher ratio is a fairly objective measure of the work pressure compared to the more subjective measures discussed in section 2. The Danish public debate has recently focused a great deal on the child-to-teacher ratio in day care as an indicator of the quality of the work being done and of the working conditions in the day-care sector. In the following we take a closer look at the child-to-teacher ratio in day-care institutions across municipalities. The level of child-to-teacher ratio is measured as the number of children per full-time day-care employee who are occupied with child care (teachers and assisting teachers with pedagogical functions). Thus, staff occupied with kitchen duties, cleaning, maintenance, repair etc. are not part of the child-to-teacher ratio.

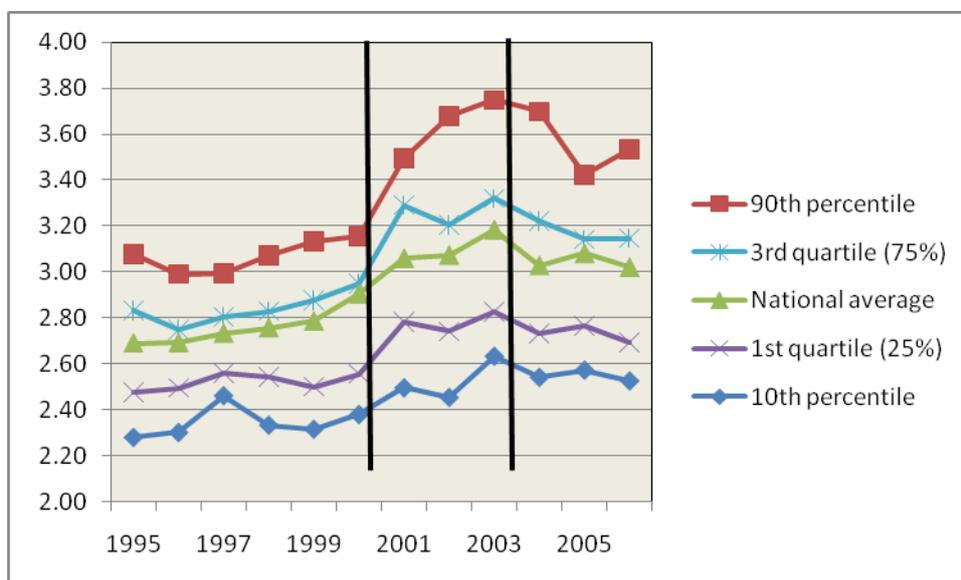
The number of children in day-care institutions at the municipal level is reported in the yearly day-care reports from Statistics Denmark ([www.statistikbanken.dk](http://www.statistikbanken.dk)). For 1995-2003, the number of both employees and number of children enrolled in day-care institutions were reported in March, while for 2004-2006, the reporting was carried out in September. The number of full-time employees in day-care institutions at the municipal level is also taken from Statistics Denmark ([www.statistikbanken.dk](http://www.statistikbanken.dk)). Between 2000 and 2001 there was a change in the way the number of employees were reported in the municipalities. Thus, the child-to-teacher ratio cannot necessarily be compared across the three periods, 1995-2000, 2001-2003 and 2004-2006. The information about staff resources is collected at a certain time every year. This number includes all teachers employed at a specific date and may hence include e.g. substitute teachers for teachers on maternity leave. This may lead to a downward bias in teacher resources. On the other hand, the information on teacher resources can also be affected by vacant positions, giving rise to a downward bias. Thus, there is some measurement error in the measurement of the child-to-teacher ratio.

The analyses focus on institutions that are either nursery care or preschools. Figures 5.1-5.2 depict the development and geographical variation in the child-to-teacher ratio over the period 1995-2006. Due to the changes in the measurement of children and teachers around 2000/2001 and 2003/2004, we split the period up into three sub-periods, 1995-2000, 2001-2003 and 2004-2006. On average, the child-to-teacher ratio in nursery homes was 3-3.5

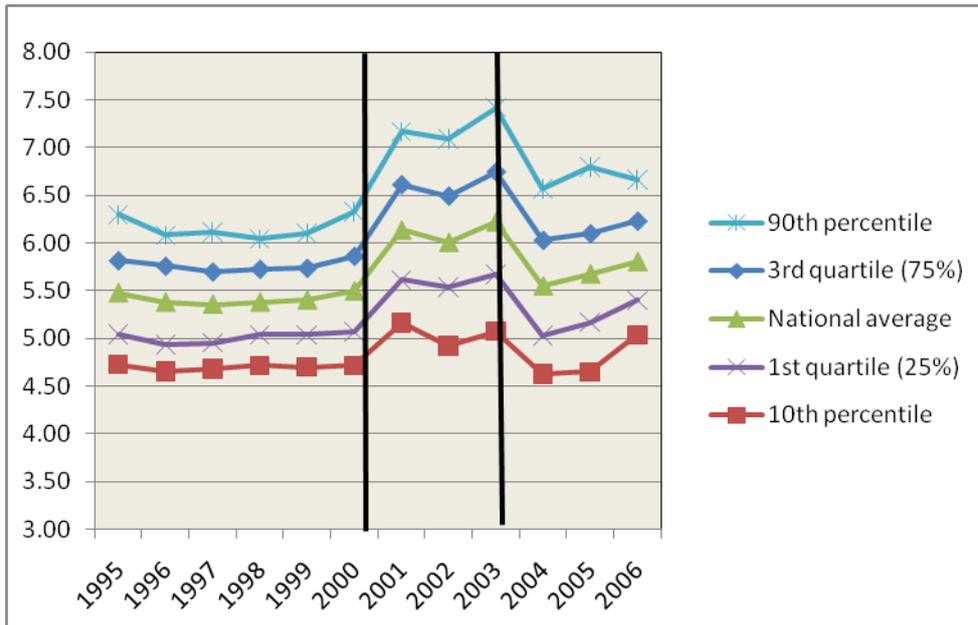
children per teacher or assistant teacher over the period 2001-2006, see figure 5.1. In preschool (i.e. institutions for children aged 3-6 years), the child-to-teacher ratio was 6-7 children per pedagogical employee over the period of 2001-2006, see figure 5.2. Generally, municipalities have a fairly constant child-to-teacher ratio over time.

Child minding and age-integrated institutions are disregarded in the analyses. Age-integrated institutions have been excluded since they serve both infants below 3 years of age and preschool children aged 3-6. Thus, variation over municipalities and over time in the child-to-teacher ratio of age-integrated institutions may arise as a result of variation in the age distribution of the children in a given year or across municipalities. Moreover, there are no figures for child-to-teacher ratio in child minding. Consequently, the empirical analysis focuses on day nursery (children aged ½ up till 3) and preschool (children aged 3-6).

**Figure 5.1 Child-to-teacher ratio in nurseries, 1995-2006**



**Figure 5.2 Child-to-teacher ratio in preschool, 1995-2006**



Source for figures 5.1 & 5.2: Statistics Denmark and own calculations.

Note for figures 5.1 & 5.2: The child-to-teacher ratio cannot necessarily be compared across the three periods, 1995-2000, 2001-2003 and 2004-2006.

Work pressure for day-care teachers may not only depend on the number of children, but also on the pedagogical challenges in the child group. It is possible that children's parental background has implications for the work pressure in the day-care institution. On the one hand, a high proportion of disadvantaged children might induce more sickness among staff (directly or through selection). On the other hand, a high proportion of disadvantaged children might promote dedication to work and attract teachers with a high level of devotion to and engagement in their work. Both of these explanations might be at work simultaneously, and the direction of the net effect is mainly an empirical question. Our prior is that family background is important for children's social abilities and thereby their educational attainment. We hypothesise that social problems in the child group enhance the work pressure and the work environment and consequently (potentially) may prompt early retirement. Our data allow us to investigate possible effects of children's parental background on retirement by introducing two indicators which capture the family background of the children in the institution. One indicator for child background is the share of children with ethnic background other than Danish. The other indicator is the share of children in the institution whose parents have only a short or no education. When there are two parents in the household, it is the highest educational level among the two parents which counts as the parent educational level.

## 6 Empirical Approach

As explained in section 4, until 1998, the retirement age for public pensions (“folkepension”) was 67, and ERP was available for age groups 60-66. The ERP reform which took effect in 1999 reduced the ordinary pension age to 65 and narrowed the age period for ERP to 60-64. Thus, for the whole period of interest, ERP has generally been available for age groups 60-64, and, for the main part of the group studied here, is contingent on two decades of contributions to an unemployment insurance fund. As in Danø et al. (2005), ERP is regarded as the only general “route” to voluntary early retirement for this age group. For individuals aged 60-64(66), there is one other main early exit option, namely the Social Disability Pension (“før-tidspension”). However, granting of a Social Disability Pension requires that social workers in the local municipality declare that the individual is unable to work either because of health reasons or social reasons, and this declaration requires detailed attestation from medical doctors, specialists etc. According to Danø et al. (2005), among the group of persons who retired early, almost 94% retired on early-retirement pay, whereas 4% retired on a social pension and around 2% on other retirement schemes. Thus, in this study of retirement patterns for the 60-64-year-olds, we disregard disability pension.

The retirement choice is modelled as a discrete choice between participating in the labour force or retiring with ERP when individuals are aged 60-64. The model estimates the probability of entering early retirement for female day-care teachers between 60 and 64 years of age. The analysis focuses on women aged 60-64 who were employed as day-care teachers (in nursery care or preschool) at the age of 59. These individuals are followed until they exit employment to enter early retirement pay (ERP). Individuals are censored at the age of 65 (the ordinary public pension age from 1999 and onwards).

For the majority of individuals entering ERP, being on ERP is considered an absorbing state (until transition to ordinary public pension at 65/67). The duration framework (right-censored at usual retirement age 65 for early retirement) is well suited for this type of analysis, since it specifically accounts for the fact that retirement is an absorbing state (no return, in praxis). The duration model can be formulated to accommodate fixed effects. The duration  $T$  of the period from a day-care teacher becomes eligible for ERP (turns 60) until she exits employment and chooses ERP (exits employment) is characterised by a hazard function which is assumed to be a function of a finite-dimensional vector of observed covariates,  $X$ , and unobserved heterogeneity,  $\mu$ . Many of the covariates that are considered being relevant for the choice of ERP are time variant, e.g. child-to-teacher ratio, health status and spouse’s retirement status. Information on ERP take-up as well as key explanatory variables and controls are measured on a yearly basis. Since ERP has built-in incentives to choose retirement at specific ages (with the main purpose of postponing early retirement), a piecewise constant hazard model in discrete time is specified.

Female day-care teachers working in nursery care or preschool at the age of 59 are followed from the year they turn 60 until they turn 65. At the end of this observation period, they will either still be working (censored duration) or will have chosen ERP sometime dur-

ing this period (completed duration). The probability of retiring at each time period,  $t$ , is defined by the discrete-time hazard rate as:

$$h_{it} = P(T_i = t | T_i \geq t; X_{it})$$

$X_{it}$  is a vector of covariates that may vary with time (but is assumed time invariant within a time interval), and  $T_i$  is a discrete random variable representing the time at which the end of the spell occurs. The conditional probability of observing a specific event history of someone completing a spell between the beginning of period  $\tau$  and period  $s$  (which is either the end of our observation period or the time of retirement if the person retires within the period observed) is:

$$prob(T_i = t | T_i > \tau) = h_{it+\tau} \prod_{t=\tau}^{\tau+s-1} (1 - h_{it}) = (h_{it+\tau} / (1 - h_{it+\tau})) \prod_{t=\tau}^{\tau+s} (1 - h_{it})$$

We define  $y_{it}=0$  for “stayers”, i.e. those who work for all spell periods. For “exiters”, i.e. those who retire at some point during the observation period,  $y_{it}=0$  for all periods working and  $y_{it}=1$  at exit (retirement). Consequently,  $y_{it}=1$  for maximum one period per individual (observations one year after retirement are discarded from the data set). The likelihood function is specified as:

$$\log L = \sum_{i=1}^N \sum_{t=\tau}^{\tau+s} y_{it} \log (h_{it} / (1 - h_{it})) + \sum_{i=1}^N \sum_{t=\tau}^{\tau+s} \log (1 - h_{it})$$

The hazard rate,  $h_{it}$ , is specified using a complementary log-log (clog-log) function (the discrete-time counterpart of the continuous-time proportional hazard model), see Jones et al. (2007). The specification of the hazard rate allows for unobserved heterogeneity (frailty). Failure to control for unobserved heterogeneity can cause spurious negative duration dependence since those with a higher hazard rate tend to exit first, cf. Van den Berg (2001). The hazard rate is specified as:

$$h_{it} = 1 - \exp (-\exp (ctr_{it-1}\alpha + X_{it-1}\beta + \theta_i(t) + year(t) + \mu_i))$$

$ctr_{it-1}$  is the child-to-teacher ratio,  $X_{it-1}$  includes personal characteristics, health condition, workplace characteristics and municipal characteristics, size of institution etc., and  $\mu_i$  is the unobserved heterogeneity (frailty) parameter, which summarises the impact of omitted variables on the hazard rate.  $\mu_i$  is usually assumed to follow some parametric form like e.g. a Gamma distribution or a Normal distribution. Unobserved heterogeneity (or frailty) then enters as a multiplicative term in the baseline hazard function. It is a crucial assumption that unobserved heterogeneity is distributed independently of  $X$  and  $t$ . When taking logs of the hazard function, the unobserved heterogeneity term is integrated out. To ensure a piecewise constant baseline hazard specification, a dummy variable to represent each of the discrete time periods,  $\theta_i(t)$ , is entered in the hazard function (this corresponds to including age dummies, as hazard rates are assumed to be constant within each year of age due to the different incentives in the ERP programme at different age levels).

Primary parameters of interest are related to working conditions and health. Regarding working conditions, we focus on the effects of the child-to-teacher ratio and the size of the institution. Especially the child-to-teacher ratio measures the work pressure in the institution. As illustrated in section 5, there is considerable variation in the child-to-teacher ratio across municipalities and over time. We hypothesise that the size of the institution (measured by number of employees in the institution) may impact the flexibility in the institution's work practices. Larger institutions may e.g. be able to implement senior policies and give elderly employees special and less stressful tasks. On the other hand, larger institutions may be more noisy and stressful, and teachers in large workplaces may feel less responsible for the future development in their institution if they leave for retirement.

The previous literature on retirement has highlighted the role of health in the retirement decision, see section 2. Using the information in the data set on health care take-up allows us to investigate the impact of health status. Furthermore, it is possible to investigate whether interactions of health status and working conditions have any impact.

A third factor which is potentially important for couples' retirement decision is the spouse's employment status. A recent study by An, Christensen & Datta Gupta (2004) based on data of Danish couples gives evidence that spouses coordinate their retirement behaviour. We control for having a partner and the partner's retirement status.

Compared to previous studies of working conditions and retirement, our study has the advantage that it looks at only one sector, so possible effects are not mixed up with sectoral/industry effects, and we have a fairly homogeneous workforce. Moreover, compared to survey questions like "does your job require physical effort" or "is your job stressful", our measure of work pressure is more objective. This also implies that a possible correlation between working conditions and retirement does not reflect justification bias, i.e. that individuals who retired or plan to retire feel that they should justify this choice by answering that they could not live up to the work pressure.

Apart from working conditions, health and retirement status of spouse, the regressions control for gender, marital status, number of grandchildren, the hourly net wage rate and tenure at the individual level and firm-level characteristics. Moreover, we can control for the composition of children's parental background, i.e. the fraction of single parents, the fraction of immigrants and the fraction of children whose parents have no education beyond primary school.

The 1999-ERP reform altered the conditions for entering ERP. We use yearly dummies to take account of common shocks to the propensity to choose ERP.

### **Identification of Causal Effects**

There are two potential sources of endogeneity. The first source of endogeneity stems from the fact that day-care teachers may initially have selected into municipalities based on the child-to-teacher ratio. Hence, municipalities with favourable working conditions like e.g. the child-to-teacher ratio may have been able to attract teachers with better qualifications, better health, more energy and devotion to work, more experience etc. If this group of teachers tends to retire later than teachers with less attractive job-market attributes, a possible posi-

tive correlation between the child-to-teacher ratio and retirement might in fact reflect that teachers employed in municipalities with a high child-to-teacher ratio (high work pressure) are more often the type of teachers who have a relatively lower preference for their job and higher preferences for leisure.

The crucial question here is whether employers can reveal whether a potential new employee is the “early-retirement type” at the time of the job interview. Given the age of the employees in this analysis, the median seniority is 13 years and the median work experience is 25 years. Consequently, more than half of the elderly employees in day care approaching retirement were hired for their present job in the middle of their 40s, and around one out of four have been employed in the same municipality or institution for more than 20 years. Even though the child-to-teacher ratio is fairly constant over the decade we are analysing here, it is likely that the general working conditions were somewhat different when most of the personnel were hired. Moreover, it is somewhat questionable that employers were able to observe whether a potential employee is likely to retire early at the time of recruitment. Therefore, it seems fair to question whether selection is an important problem in this context. Still, a positive relationship between the child-to-teacher ratio and retirement may partly reflect a causal relationship and partly be due to selectivity. In this case, the parameter estimate of the effect of the child-to-teacher ratio may be biased upwards and identify an *upper bound* for the “true” causal relationship between the child-to-teacher ratio and retirement. This argument is inspired by a similar argumentation in Manski & Pepper (2000).

Since the hazard function allows for frailty (unobserved heterogeneity), the issue of unobserved characteristics (e.g. preferences for leisure) is to a certain extent addressed in the duration framework, although it is not possible to allow for correlation between the unobserved individual factor and explanatory variables like e.g. the child-to-teacher ratio.

A second form of endogeneity arises if municipalities which experience a high (aggregate) rate of early retirement respond by reducing the child-to-teacher ratio to hold on to elderly employees or to accommodate new, young and inexperienced employees in the sector. This would imply a negative correlation between retirement and the child-to-teacher ratio. However, the model for individual retirement choice hypothesises a positive correlation in the sense that a high child-to-teacher ratio encourages day-care teachers to retire earlier (increase retirement). Thus, *if* we find a positive and significant relationship between child-to-teacher ratio and retirement, despite the possibility of municipalities’ counteractive measures to reduce retirement and stimulate recruiting, it seems fair to assume that the positive and significant relationship found is a *lower bound* for the causal effect of the child-to-teacher ratio on retirement.

## 7 Results

Estimations for the time period 1997-2006 are performed on a sample of around 10,800 yearly observations of female day-care teachers of which around  $\frac{1}{4}$  are employed in nursery care, while  $\frac{3}{4}$  were employed in preschool at the age of 59. Descriptive statistics of the data set are shown in table 7.1.

Tables 7.2 & 7.3 present the estimation results for models (1)-(6). The child-to-teacher ratio is lagged one period. Model (1) (in table 7.2) and model (4) (in table 7.3) include the lagged child-to-teacher ratio and 5 explanatory variables with interactions. The lagged child-to-teacher ratio is interacted with dummies for the time periods 2002-2006 and 2005-2006, respectively. Each of these interaction effects are then interacted with a dummy for preschool. This leads to six explanatory variables reflecting the effects of the child-to-teacher ratio.

In models (2)-(3) and (5)-(6) we also control for health. We include a dummy for whether the individual was in poor health lagged one year; see section 4.

Estimations are performed using a piecewise constant baseline hazard duration framework. The estimations were performed allowing for unobserved heterogeneity (frailty) in the hazard specification.<sup>2</sup> Significance of the frailty term was tested using the likelihood ratio test. The frailty term is generally significantly different from 0.

Model (1) and (4) control for presence of partner, gross household (equivalent) income, local (municipality of residence) unemployment rate and time dummies. Furthermore, we control for compensation rate and a dummy for missing compensation rate. The compensation rate reflects the relationship between the ERP rate and labour-market related income (lagged). The calculation of the compensation rate follows Larsen & Datta Gupta (2004). Model (2) and (4) adds controls for lagged health status, child-to-teacher ratio variables interacted with the dummy for poor health, the number of grandchildren, ln experience and the share of trained teachers at the institutional level, retirement status of partner etc. Model (3) and (6) also control for workplace characteristics, i.e. the share of trained day-care teachers at the institution and social background of the children in the institution measured by the share of parents with immigrant background and the share of children in the institution where the parents had little or no education beyond primary school. Models (4)-(6) repeat models (1)-(3), but add the size of the institution measured by the (lagged) number of employees (averaged over each municipality) as well as (lagged) size of institution interacted with a dummy for the period post 2002 (due to the change in the measurement of number of employees in 2001).

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<sup>2</sup> Estimations were performed in Stata using the `pgmhaz8` estimation procedure which assumes Gamma-distributed unobserved heterogeneity, see Jenkins (1995) and <http://www.iser.essex.ac.uk/iser/teaching/module-ec968>.

**Table 7.1 Summary statistics (nursery care and preschools)**

	Mean	Std. Dev.	Min	Max
Child-to-teacher ratio	4.867	1.382	1.610	11.320
Size of institution	9.988	2.782	2.600	33.200
Dummy poor health	0.177		0.000	1.000
Dummy partner	0.764		0.000	1.000
Partner retired	0.342		0.000	1.000
Unemployment rate	5.737	1.943	2.200	14.800
Trained teacher	0.457		0.000	1.000
In experience	3.048	0.493	0.068	3.761
Number of grandchildren	2.276	2.034	0.000	12.000
Share of teachers in institution	0.390		0.000	1.000
Share immigrant parents	0.090		0.000	1.000
Share parents with short education	0.216		0.000	1.000
Dummy preschool	0.751		0.000	1.000
Compensation rate	0.633	0.243	0.218	1.497
Missing compensation rate	0.118		0.000	1.000

The baseline child-to-teacher ratio parameter estimate corresponds to the effect for nursery care for the period 1997-2001. This parameter is not significant. The five following variables in table 7.2 reflect the child-to-teacher ratio interacted with time periods, i.e. post 2002 and post 2005, and interaction with the dummy for preschool. These five interaction variables are not significant. Models (2)-(3) and (5)-(6) also include controls for health status and interactions between child-to-teacher ratio and health. The interaction between the child-to-teacher ratio and health is statistically significant after 2002. Hence, there is a positive and significant relationship between the child-to-teacher ratio and early retirement if one has poor health, indicating that a higher work pressure (more children per teacher) prompts earlier retirement for teachers with poor health, i.e. teachers with many contacts to the health care system. The joint significance of the group of child-to-teacher ratio variables is tested by a Chi2 test (last row in the tables), which shows that the combined child-to-teacher variables are significant or marginally significant in most specifications which also include interactions with health. Hence, workers with poor health are more sensitive to the child-to-teacher ratio than other workers, more so for preschool teachers.

Having a partner has a positive and strong impact on the probability of early retirement, especially if the partner is already retired. Thus, couples seem to coordinate their retirement. This finding is consistent with An, Christensen & Datta Gupta (2004). We control for age by controlling for age dummies in the stepwise function. Moreover, we control for experience, which has a positive and strongly significant effect on retirement.

Overall, we control for the compensation rate, i.e. the relationship between the ERP rate and income prior to retirement. A dummy is included to indicate when the compensation rate is missing. The compensation rate has a statistically significant impact on the probability to

choose ERP, suggesting that the economic side plays an important role when selecting into early retirement. The dummy for missing compensation rate is insignificant.

In models (3) and (6) we control for institution characteristics as the share of trained teachers in the institution and characteristics of the parents of the children in the analysis. The parameter estimates suggest that early retirement is lower if the share of trained personnel is higher. Moreover, we find that the share of immigrant parents is insignificant, while the share of parents with no or short education seems to affect retirement significantly in a positive direction. This is evidence in favour of the notion that not only the size, but also the composition of the child group has implications for the probability of early retirement.

Models (4)-(6) also control for the size of the institution as measured by number of employees. Institution size does not seem to impact the probability of choosing early retirement. One may speculate that employees at large day-care institutions may feel more alienated from daily decisions and priorities at the workplace and feel less responsible for making ends meet at their workplace. Thus, the size of the institution does not seem to have a positive impact on the probability of retirement. On the one hand, one might expect that larger institutions with many children and employees may create a noisier atmosphere than institutions with fewer children and employees. Evidence from a previous Danish survey on work environment suggests that more than half of the Danish day-care institutions suffered from a noise level above the threshold limit of 80 dB set up by the *Arbejdstilsynet*.<sup>3</sup> Excessive noise is known to be a source of stress, which may impact both children and the employees and cause illness and even early retirement. Moreover, there may be a tendency that the individual feeling of responsibility is more prevalent in smaller firms where each employee feels that her effort is important for carrying out the tasks at hand. These arguments are in favour of a positive relationship between size of institution and early retirement. On the other hand, large institutions may have more flexibility with regard to reallocating elderly employees from stressful to less demanding tasks. This flexibility may not be as prevalent for small institutions. The insignificant parameter estimate for size of institution might reflect that a number of different institution size effects cancel out.

As expected, the unemployment rate is positively correlated with the probability of going on early retirement, meaning that a higher local unemployment rate prompts early retirement.

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<sup>3</sup> According to the Danish Working Environment Authority's (*Arbejdstilsynet*) regulation, employers should provide hearing protection if the noise level surpasses 80 dB, while it is illegal to make employees work in an environment with a noise pollution of more than 85 dB without hearing protection.

**Table 7.2 Estimation, probability of retirement**

	Model 1		Model 2		Model 3	
	b	t	b	t	b	t
<b>Child/teacher ratio</b>						
Child/teacher ratio baseline	0.048	(0.36)	-0.02	(0.12)	-0.281	(1.45)
C/t post02	0.041	(0.29)	0.107	(0.67)	0.247	(1.38)
C/t post05	-0.004	(0.03)	0.002	(0.01)	-0.033	(0.18)
C/t*preschool	-0.006	(0.05)	0.042	(0.31)	0.236	(1.46)
C/t*preschool*post02	-0.058	(0.76)	-0.099	(1.10)	-0.171*	(1.69)
C/t*preschool*post05	0.01	(0.15)	-0.026	(0.32)	-0.032	(0.31)
C/t * poor health			0.015	(0.08)	0.088	(0.46)
C/t*poor health*post02			0.163*	(1.81)	0.151	(1.62)
C/t*poor health*post05			-0.445	(1.22)	-0.196	(0.53)
C/t*poor health			-0.06	(0.56)	-0.088	(0.79)
C/t*poor health*preschool*post02			-0.138	(1.48)	-0.149	(1.57)
C/t*poor health*preschool*post05			0.501	(1.35)	0.344	(0.91)
<b>Individual characteristics</b>						
Dummy preschool	0.113	(0.34)	0.189	(0.47)	-0.105	(0.24)
Poor health			0.219	(0.46)	0.122	(0.25)
Dummy partner	0.367***	(5.09)	0.180**	(2.30)		
Partner retired			0.526***	(7.64)	0.472***	(7.46)
Unemployment rate	0.065***	(4.55)	0.062***	(3.65)	0.030*	(1.75)
Dummy teacher	-0.083*	(1.77)	0.081	(1.37)	0.065	(1.08)
Experience	0.493***	(7.71)	0.891***	(9.64)	0.745***	(8.27)
Number of grandchildren	0.039***	(3.35)	0.046***	(3.19)	0.028**	(2.03)
Compensation rate			-1.328***	(7.55)	1.046***	(6.60)
Comp rate missing			0.031	(0.32)	0.056	(0.51)
<b>Institution characteristics</b>						
Share teachers					-0.786***	(2.96)
Sh immigrant par					-0.14	(0.55)
Sh no edu par					0.466*	(1.78)
Constant	3.062***	(6.78)	-5.061***	(8.49)	-3.342***	(5.24)
Time dummies	Yes		Yes		Yes	
Duration specification function	Step		Step		Step	
In var gamma	-2.004	(1.56)	-0.508	(1.63)	-1.774**	(2.31)
Number of observations	7068		7068		4686	
Log likelihood	-4448		-4351		-2898	
Joint Chi2 test, all child-to-teacher parameters, p-value	0.573		0.073		0.024	

Note: Control for time dummies and age dummies (for piecewise constant hazards).

p<0.10; \*\* p<0.05; \*\*\* p>0.01.

**Table 7.3 Estimation, probability of retirement, with control for institution size**

	Model 4		Model 5		Model 6	
	b	t	b	t	b	t
<b>Child/teacher ratio</b>						
Child/teacher ratio baseline	0.034	(0.22)	0.078	(0.53)	-0.237	(1.19)
C/t post02	0.116	(0.72)	0.056	(0.37)	0.255	(1.41)
C/t post05	-0.017	(0.12)	0.014	(0.10)	-0.02	(0.11)
C/t*preschool	0.014	(0.10)	-0.009	(0.08)	0.207	(1.27)
C/t*preschool*post02	-0.106	(1.22)	-0.06	(0.72)	-0.171*	(1.66)
C/t*preschool*post05	0.011	(0.14)	-0.021	(0.29)	-0.038	(0.38)
C/t * poor health			-0.026	(0.16)	0.085	(0.44)
C/t*poor health*post02			0.162*	(1.94)	0.155*	(1.65)
C/t*poor health*post05			-0.487	(1.39)	-0.181	(0.49)
C/t*poor health			-0.035	(0.36)	-0.088	(0.78)
C/t*poor health*preschool*post02			-0.135	(1.58)	-0.155	(1.61)
C/t*poor health*preschool*post05			0.529	(1.48)	0.33	(0.87)
<b>Individual characteristics</b>						
Dummy preschool	0.201	(0.50)	0.251	(0.72)	0.048	(0.11)
Poor health			0.308	(0.71)	0.14	(0.29)
Dummy partner	0.421***	(5.12)	0.183***	(2.67)	0.175**	(2.17)
Partner retired			0.455***	(7.21)	0.419***	(6.31)
Unemployment rate	0.069***	(3.99)	0.063***	(4.23)	0.031*	(1.80)
Dummy teacher	0.058	(0.98)	-0.07	(1.41)	0.066	(1.08)
Experience	0.899***	(9.44)	0.510***	(7.94)	0.756***	(8.18)
Number of grandchildren	0.051***	(3.52)	0.036***	(2.98)	0.027*	(1.94)
Compensation rate	1.329***	(7.25)			1.020***	(6.36)
Comp rate missing	0.045	(0.46)			0.058	(0.52)
<b>Institution characteristics</b>						
Size of inst	0.02	(0.80)	0.023	(1.02)	0.024	(0.93)
Instsize*p02	0.005	(0.17)	0.006	(0.22)	0.004	(0.12)
Share teachers					-0.821***	(3.05)
Sh immigrant par					-0.08	(0.31)
Sh no edu par					0.415	(1.56)
Constant	5.475***	(7.53)	-3.569***	(5.90)	-3.914***	(5.07)
Time dummies	Yes		Yes		Yes	
Function	Step		Step		Step	
In var gamma	-0.478	(1.42)	-1.424**	(2.20)	-1.660**	(2.32)
Number of observations	7068		7068		4686	
Log likelihood	-4398		-4397		-2894	
Joint Chi2 test, all child-to-teacher parameters, p-value	0.525		0.069		0.053	

Note: Control for time dummies and age dummies (for piecewise constant hazards).

\* p<0.10; \*\* p<0.05; \*\*\* p>0.01.

In order to ease the interpretation of the large number of child-to-teacher interaction variables and get a clearer picture of the total effect of a change in the child-to-teacher ratio in different time periods, for nursery care versus preschool, and for teachers with normal versus poor health, table 7.4 presents the changes in the hazard rate based on combined parameter estimates from model 2 (table 7.2). These parameters are calculated by adding relevant parameter estimates of the child-to-teacher ratio parameter estimates and interaction variables and translation from parameter estimates to percentage changes in hazard rates. P-values for the joint Chi2 significance test are shown below the parameter estimates.

We find that a difference in the child-to-teacher ratio by 1 has a positive and significant effect on the hazard rate (the probability) for early retirement (ERP) for preschool teachers who had a poor health status one year before retirement (after 2002). We do not find any significant relationship for nursery teachers and we do not find any significant relations for preschool teachers with normal health. Thus, the overall result suggests that a higher child-to-teacher ratio enhances the risk of going on ERP for preschool teachers with a poor health condition by 1% for 2002-2004 and by 4% for 2005-2006, whereas teachers with normal or good health do not seem to be sensitive to the child-to-teacher ratio when choosing ERP.

**Table 7.4 Percentage difference in hazard if difference in child-to-teacher ratio of 1**

	Nursery care		Preschool	
	Normal health	Poor health	Normal health	Poor health
1997-2001	2.0% (p=0.901)	-0.5% (p=0.991)	2.2% (p=0.914)	-2.2% (p=0.705)
2002-2004	9.1% (p=0.750)	30.4% (p=0.319)	3.0% (p=0.579)	1.1% ** (p=0.027)
2005-2006	9.3% (p=0.858)	-16.3% (p=0.334)	0.6% (p=0.456)	4.3% * (p=0.073)

Note: Combined effects based on parameter estimates from model 2.

Chi2 test of joint significance of combined parameters, p-values in parentheses.

\* signifies statistical significance: \* p<0.10; \*\* p<0.05; \*\*\* p>0.01.

## 8 Conclusion

This paper investigates the determinants of early retirement for Danish day-care workers. Our main interest is in examining the importance of work pressure for the decision to choose early retirement. Work pressure is mentioned by the child-to-teacher ratio, which is comparable across municipalities and over time. The child-to-teacher ratio is a fairly objective measure of work pressure. The paper contributes to the literature on the relationship between work pressure and retirement by using objective information about work pressure. Another advantage to the paper is that we are able to examine the importance of other types of work pressure as e.g. the social background of the children cared for in each institution. Hence, we can examine the importance of not only the number of children per teacher, but also the pedagogical challenges related to social background of the children in institutions.

We find a positive and significant effect of the child-to-teacher ratio on retirement for preschool teachers with poor health. Hence, when poor health is interacted with the child-to-teacher ratio, we find a positive and significant effect of the child-to-teacher ratio, suggesting that ERP may serve as an alternative to disability pension for teachers above 60 years of age.

Moreover, we find that other institution characteristics are important in determining the probability of early retirement. Thus, the probability of choosing early retirement is lower if the share of trained teachers is higher. Children's social background and the social challenges in the institution also seem important: we find a positive and significant relationship between the proportion of children having parents with no or short education and the teachers' hazard rate for retirement.

The estimation results suggest that day-care workers coordinate their retirement decision with their spouse. This result confirms prior findings, cf. An, Christensen and Datta Gupta (2004). Thus, day-care teachers whose husbands are retired have a significantly higher probability of choosing early retirement. Finally, the number of grandchildren is important for the probability of early retirement. This suggests that grandmothers retire early to take care of their grandchildren and help out their children.

## References

- An, M.Y., B.J. Christensen & N. Datta Gupta (2004): Multivariate mixed proportional hazard modelling of the joint retirement of married couples. *Journal of Applied Econometrics*, 19: 687-704.
- Bound, J.; M. Schoenbaum, T.R. Stinebrinckner & T. Waidman (1999): The dynamic effects of health on the labor force transitions of older workers. *Labour Economics*, 6: 179-202.
- Danish Economic Council (2005): *Efterløn. Dansk Økonomi, spring 2005*, chapter IV (in Danish).
- Danø, A.M.; M. Ejrnæs & L. Husted (2005): Do single women value early retirement more than single men? *Labour Economics*, 12: 47-71.
- Datta Gupta, N. & N. Kristensen (2008): Work environment satisfactions and employee health: panel evidence from Denmark, France and Spain, 1994-2001. *European Journal of Health Economics*, 9: 51-61.
- Datta Gupta, N. & M. Larsen (2007): Health shocks and retirement: the role of welfare institutions. *European Journal on Ageing*, 4: 183-190.
- Datta Gupta, N. & M. Larsen (forthcoming): The impact of health on individual retirement plans: self-reported versus diagnostic measures. *Health Economics*, early view 2009.
- Fischer, J.A.V. & A. Sousa-Poza (2009): Does job satisfaction improve the health of workers? New evidence using panel data and objective measures of health. *Health Economics*, 18: 71-89.
- French, E. (2005): The Effects of Health, Wealth, and Wages on Labour Supply and Retirement Behaviour. *Review of Economic Studies*, 72: 395-427.
- Friis, K.; O. Ekholm, Y.A. Hundrup, E. Obel & M. Grønbaek (2007): Influence of health, lifestyle, working conditions, and sociodemography on early retirement among nurses: The Danish Nurse Cohort Study. *Scandinavian Journal of Public Health*, 35: 23-30.
- Grossman, M. (1972): On the Concept of Health Capital and the Demand for Health. *Journal of Political Economy*, 80(2): 223-255.
- Gustman, A.L. & T.L. Steinmeier (2000): Retirement in dual-career families: a structural model. *Journal of Labor Economics*, 18(3): 503-545.
- Haider, S. & D. Loughran (2010): Elderly Labor Supply: Work or Play? RAND. Labor and Population Program. In K. Christensen & B. Schneider (eds.): *Workplace Flexibility:*

*Realigning 20th Century Jobs to a 21st Century Workforce*. Cornell University Press, Ithaca, NY.

Hurd, M.D. & K. McGarry (1993): *The Relationship Between Job Characteristics and Retirement*. NBER Working Paper No. 4458.

Jenkins, S.P. (1995): Easy ways to estimate discrete time duration models. *Oxford Bulletin of Economics and Statistics*, 57(1): 129-138.

Jones, A.M.; N. Rice, T. Bago d'Uva & S. Balia (2007): *Applied Health Economics*. Routledge, NY.

Kapteyn, A.; J. Smith & A. van Soest (2009): *Work Disability, Work, and Justification Bias in Europe and the U.S.* MMRC Working Paper, No. 2009-207. Michigan Retirement Research Center.

Larsen, M. (2008): Does Quality of Work Life Affect Men and Women's Retirement Planning Differently? *Applied Research in Quality of Life*, 2008(3): 23-42.

Larsen, M. & N. Datta Gupta (2004): *The Impact of Health on Individual Retirement Plans: a Panel Analysis comparing Selfreported versus Diagnostic Measures*. Working Paper 04-7. Department of Economics, Aarhus School of Business.

Manski, C.F. & J.V. Pepper (2000): Monotone Instrumental Variables: With an Application to the Returns to Schooling. *Econometrica*, 68(4): 997-1010.

Quinn, J.F. (1978): Job Characteristics and Early Retirement. *Industrial Relations*, 17(3): 315-323.

Van den Berg, G. (2001): Duration Models: Specification, Identification and Multiple Durations. In J.J. Heckman & E. Leamer (eds.): *Handbook of econometrics*, 5: 3381-3460. North-Holland, Amsterdam.

# Dansk sammenfatning

Mette Gørtz

## Efterløn i daginstitutionssektoren: Arbejdsforholdenes betydning

Denne artikel ser på, hvad arbejdspress og helbred betyder for beslutningen om at gå på efterløn. Der fokuseres på kvindelige pædagoger i daginstitutionerne, fordi normeringerne på daginstitutionsområdet er et godt mål for arbejdspresset. Overgangen til efterløn analyseres i en varighedsmodel, der beskriver varigheden, fra en ansat er fyldt 60 år, til personen fylder 65 år. Der er valgt en version af varighedsmodellen, der tager højde for uobserveret heterogenitet i den grundlæggende hazard-rate. Der tages ikke særskilt højde for eventuelle selektionsproblemer i denne analyse, idet det vurderes, at der ikke synes at være tungtvejende argumenter for, at medarbejdere med en særlig tilbøjelighed for at lade sig pensionere tidligt er ansat i kommuner med enten særligt lave eller særligt høje normeringer.

Data stammer fra et registerdatasæt med oplysninger om arbejdsmarkedstilknytning, familiebaggrund og anvendelsen af sundhedssystemet. Arbejdspresset er målt ved normeringen, dvs. antal børn pr. pædagogisk medarbejder. Normeringerne varierer på tværs af kommuner og over tid.

Analyserne peger på, at normeringer har en lille, men signifikant effekt på sandsynligheden for at gå på efterløn for børnehavepædagoger, der har et svagt helbred. For denne gruppe er sandsynligheden for at gå på efterløn 1-4 procentpoint højere, hvis normeringen indebærer et ekstra barn pr. ansat. Derimod kan der ikke påvises en statistisk signifikant sammenhæng mellem normeringer og tilgang til efterløn for børnehavepædagoger med godt helbred eller for ansatte i vuggestuer.

En række andre faktorer ser ud til at have en statistisk signifikant betydning for tilbøjeligheden for at vælge efterløn for den undersøgte gruppe af kvindelige pædagoger i daginstitutionssektoren. Hvis ægtefællen er pensioneret, er sandsynligheden for at gå på efterløn omkring 50% højere. Ligeledes har antallet af børnebørn stor betydning for, om kvindelige pædagoger vælger at gå på efterløn. De kollegiale forhold på arbejdspladsen ser også ud til at have betydning for tilbagetrækningen; og der er en højere andel af uddannede pædagoger på arbejdspladsen forbundet med en lavere sandsynlighed for at gå på efterløn. Endelig har kompensationsraten, dvs. forholdet mellem efterlønsatsen og arbejdsindkomsten før tilbagetrækning, en statistisk signifikant betydning for sandsynligheden for at gå på efterløn.



## Early Retirement in the Day-Care Sector: The Role of Working Conditions

This paper studies the role of working conditions and health for elderly female day-care teachers' decision to enter early retirement pay (ERP). Entry into retirement is analysed in a duration framework that allows for unobserved heterogeneity in the baseline hazard. Data are from a Danish longitudinal data set based on administrative register records for 1997-2006 with information on labour-market career, family background, health-care utilisation and employment status of a spouse. Work pressure is measured by the child-to-teacher ratio, which varies across municipalities and over time. Regressions in a duration model framework show that the child-to-teacher ratio has a small and significant effect on retirement after 2002 for preschool teachers with poor health. For preschool teachers with good or average health status and for nursery-care teachers in general, there is no significant relationship between the child-to-teacher ratio and early retirement (ERP). Day-care teachers whose spouses are retired or who have grandchildren have a significantly higher probability of choosing early retirement.