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Economic fluctuations and retirement of older employees

Daniel Hallberg

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Postal address: P O Box 513, 751 20 Uppsala
Visiting address: Kyrkogårdsgatan 6, Uppsala
Phone: +46 18 471 70 70
Fax: +46 18 471 70 71
ifau@ifau.uu.se
www.ifau.se

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Economic fluctuations and retirement of older employees*

by

Daniel Hallberg**

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Abstract

This paper studies the way in which labor market fluctuations affect the transition to early retirement among older employees in Sweden via the practice of negotiated pensions. The results indicate that downturns (upturns) in aggregated industry employment increases (decreases) the probability of early retirement. This result is driven by the public sector; in general the evidence is much weaker in the private sector. The results also suggest that the replacement levels immediately after early retirement are higher during declining as well as expanding industry employment. The results support an interpretation that 1) the employer and employee agreed on special early retirement pensions, and 2) that these were used in order to persuade older employees to quit voluntarily, but also that they worked to reward older employees.

Keywords: Retirement, fluctuating markets, buy-outs, demand for old workers.
JEL-codes: J21, J26, J23, J14.

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** The Institute for Future Studies and the Department of Economics, Uppsala University, email: daniel.hallberg@framtidsstudier.se. Institute for Future Studies, Box 591, 101 31 Stockholm, Sweden.

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1 Introduction

In common with many other parts of the industrialized world, Sweden has experienced a prolonged period of gradual decline in labor force participation rates among elderly (male) workers. Likely reasons for this may be found in a gradual expansion of social security systems, an increase in real incomes, and maybe also a change in the preferences for the work-leisure trade off. However, there have also been substantial short-run fluctuations in addition to the long-run trend. In the early 1990s, the labor force participation rate in the 60-64 age group declined quite rapidly (both for men and women), while, since 1996 until to the present day, the participation rate of this age group has in fact increased; in 2005, it was as high as in the late 1980s. It is quite possible that the later observations are due to changes in the business cycle. During the first half of the 1990s, Sweden experienced a substantial economic downturn that, in many respects, represented the biggest crisis since the 1930s. As a result, many sectors were restructured, many workers became unemployed, and a fair share of old workers embarked on permanent retirement before their normal retirement age. By the end of the 1990s, the situation changed and the economy recovered.

Economic studies that analyze the retirement decision are typically based on utility maximization for the individual, and the focus is mainly on the effects of changes in pensions and earnings on the decision to retire[1]. Commonly, utility (profit) maximization for the employer is ignored. The notion that employer aspects have a significant impact on retirement in addition to individual characteristics is not often considered in studies of this nature. It is nevertheless quite plausible that decisions about retirement are not solely taken by the worker, but may involve a joint decision on the part of the employee and the employer (for a survey of relevant literature see Section 2.1).

The present paper studies the effect of changes in aggregate residual employment (the deviation in aggregate employment from the long run trend) on the transition from work to early retirement. The aim of this paper is to explore an alternative explanation for retirement in addition to individual economic incentives, namely that the demand

[1] See e.g. Gruber and Wise (2004), Hurd (1990), and the references therein, or Hakola (2003), for a survey. Hallberg (2007) is a suvey of the labor supply and demand of the elderly with focus on Sweden.

side is important and needs to be taken into consideration when explaining retirement. An employer continuously faces economic fluctuations, and the work place is therefore constantly in a transformation and restructuring process that involves personnel changes. One plausible hypothesis is that declines (expansions) in macro employment will increase (decrease) the probability of early withdrawal from the labor market. One reasonable interpretation is that labor demand seems to have an important influence on early retirement behavior.[2] Moreover, more favorable compensation packages in times when aggregate employment is declining appear to indicate that employers are more motivated to persuade old workers to retire, since the formulation of a specific early retirement package may be a result of a negotiation. In the US, comparable retirement programs are known as early retirement windows, see Brown (2002). To further our understanding of whether employers offer higher pensions to encourage individuals to retire early, the second aim of this paper is to empirically examine the relationship between the observed pension replacement rate for recently retired persons and aggregate employment. The empirical part of the paper employs a large longitudinal income-register data set at the individual level for the period 1992-2000. These data are merged with macro-level data on aggregate employment.

This study focuses on how early withdrawal based on occupational pensions has been used to adjust employment in the 1990s. Early retirement can also be financed in other ways, usually by being granted a disability pension which normally is for health reasons. The reason for focusing on an early claim for an occupational pension is that this is primarily voluntary, and is not health-induced (as in the case of a disability pension). [3].

The rest of the paper is organized as follows. Previous research and relevant institutional background to early retirement in Sweden, with a particular focus on occupational

[2] Aggregate employment is a reasonably good indicator of employers' demand for labor, since it proxies for economic fluctuations. However, individuals may become discouraged in their job search by a decline in aggregate employment, so there may also be an impact on the supply of labor. The magnitude of this latter effect is presumably small compared to the former effect.

[3] Early claims for a public old age pension are very rare. See Section 2.3 for a description of the rules in Sweden, and Section 4.1 of this paper for an empirical description. For a further discussion and empirical description of alternative income security systems (unemployment insurance, sickness insurance, and disability insurance) which may, in practice, have been used as voluntary early retirement vehicles, see Wadensjö and Sjögren (2000), Palme and Svensson (2004) and Hallberg (2003).

pensions, is presented in Section 2. Section 3 presents the empirical model, specifications and the data. The empirical results are presented in Section 4. Section 5 contains concluding remarks.

2 Institutional setting and research background

2.1 Why sack the old?

One might wonder why employers find it economically sound to get rid of old employees. These workers should on the contrary be quite attractive as they possess long experience, knowledge, and a wide network of contacts. There might be both economic as well as social reasons. One driving factor that pushes elderly workers out of the labor market in Sweden might be that this category of employees is often associated with higher labor costs in relation to younger personnel and relative to productivity. A higher labor cost might arise because, e.g., older workers have high wages, sometimes higher pension premiums, and a higher expected absence due to illness.

In an economic downturn, the employer might thus see a chance to restructure the firm's labor force by getting rid of older workers, and thus minimizing labor costs. The employer might see long-run benefits in the restructuring of the age profile of the work force independently of current economic turbulence. Early retirement may also permit continued employment of younger staff members. The individual might, moreover, feel forced by social norms to make way for younger workers. In addition, this kind of settlement may also be more socially acceptable than a downright dismissal of an older employee.

In Sweden, the "first-in last-out" rule hinders such measures (see Section 2.3). In Sweden, employees with high seniority are protected by labor market legislation from being laid off in the event of redundancy (the "first-in last-out" rule). If he or she is laid off due to shortage of work, a worker also has the right of precedence in case of re-opening of similar jobs at their former employer. Therefore, in order to persuade some older employees to quit voluntarily, the employer and employee can agree upon a special early retirement pension (a so-called "buy-out") (see Section 2.3). Such private

agreements are possible within several of the occupational pension systems in Sweden (as agreed by the unions and employers' associations).

2.2 Research background

Firms' decisions to hire and lay off (offer early retirement to) older workers have received less attention until recently, mainly because of the lack of suitable data. Feldstein (1976, 1978), Topel (1984) and Hutchens (1999) are often mentioned as pioneers in introducing the concept of the employer's influence on the individual employee's retirement decision. The employee acts as in a labor supply model, and decides whether to retire, based on the attributes of the alternatives. To some extent, the employer can determine the alternatives' attributes. Some new papers (cf. Behaghel et al., 2005, Acemoglu and Angrist, 2001, and Hakola and Uusitalo, 2005) study how redundancy costs or hiring cutbacks targeted at specific groups (e.g. older workers) affect labor demand, and find evidence that changes in costs or regulations for certain kinds of labor affect the demand for such employees.

A recent example of work that is highly related to the present paper is Coile and Levine (2007), which examines how local unemployment affects retirement. They find that retirements only increase in response to an economic downturn when workers become eligible for social security, suggesting that retirement benefits might function as a sort of unemployment insurance. They make a distinction between the retirement decision and the claiming of social security benefits (which is not done in the present study), thus interpreting the results more in terms of labor supply responses to macro shocks rather than responses in the way employers vary the retirement options which the individual can choose. Another paper, however, which is less closely related but which also focuses on macro-level factors that influence retirement behavior is Coile and Levine's (2006) paper on how stock market fluctuations affect retirement behavior among older individuals via wealth shocks.

Eklöf and Hallberg (2004) find for Sweden that early retirees with withdrawals of occupational pension frequently faced better retirement options in terms of the

replacement rate than the standard agreement text seems to suggest. [4] Thus there seems to be room within the standard contracts for a negotiation of the pension levels. Eklöf and Hallberg (2006) estimate that the early retirement probabilities (into occupational pension schemes) would decrease by 10-30 percent if these favorable early retirement pensions were not applied. A natural extension to their work is to examine more deeply the causes for these pensions, in which periods and in sectors of the economy such pension supplements are paid, as in the present study.

Some authors (Wadensjö and Sjögren, 2000) conclude that early retirement packages became increasingly popular in Sweden during the 1990s, especially in the central government sector. In 1996, the central government in Sweden employed about 9 percent of the workforce, but accounted for about 35 percent of the total of some 52,000 individuals who were estimated to be early occupational pensioners (Landin, 1997). Eklöf and Hallberg (2006) estimate that for the period 1992-2000, 21 percent of all 60-64 year olds in the central government sector had an occupational pension as their main source of income. This was also frequent among employees in the local government sector and white collar workers in the private sector (with corresponding shares of 12 and 10 percent, respectively).

Adjustment of the workforce in a fluctuating market might involve “recalls”, that is, rehiring of recently laid off staff that possesses high tenure status in the company, and temporary job contracts. Idson and Valletta (1996) find that, in the US, tenure (which usually correlates with age) increases recall probability, but this effect is reduced by sectoral employment decline to a large extent. Labor market arrangements offering job security are thus less binding in fluctuating markets. In Sweden, however there is a “last-in last-out” rule that is supposed to protect senior workers from dismissal, thus making it a less straightforward to translate Idson and Valletta’s (1996) results for the US into a Swedish context. However, Holmlund and Storrie (2002) argue that, as a result of the economic downturn, temporary jobs became much more frequent in Sweden during the 1990s.

[4] According to Eklöf and Hallberg (2004), there seems to be a spread in realized pension replacements of those that took an early exit via occupational pension that was unaccounted for in the standard agreements.

2.3 Institutional setting

The Swedish income-security system provides several sources of income which can be used to finance early labor market withdrawal: public old-age pension, occupational old-age pension, unemployment insurance, sickness insurance, and disability insurance. This analysis focuses on early retirement via the old age pension system, in particular early retirement options via the occupational old-age pension systems. Relevant for the study are also job security agreements and job protection legislation in Sweden. As the empirical analysis is limited to 1992-2000, we focus on the systems in effect during this time period.

2.3.1 The public old-age pension

During the 1990s, Sweden's national old-age pension consisted of a basic component and a supplementary component. All Swedish citizens and all persons residing in Sweden were entitled to the basic pension. It provided roughly the same amount regardless of previous earnings, but was reduced if the individual had resided in Sweden for less than 40 years or had a Swedish work history less than 30 years.[5] The supplementary component was determined by the individual's earnings history, and constituted 60 percent of the average income below the social security income ceiling during the 15 years with the highest earnings. The normal retirement age was 65. It was possible to claim old-age pension early, starting at the age of 60 (the age was raised to 61 in 1998), or postpone receipt until the age of 70. Early withdrawal reduced such pensions by an actuarial adjustment of 0.5 percent per month. It was also possible to claim early part-time retirement pension (abolished by the end of 2000).

2.3.2 Occupational pensions

Central agreements for occupational pension are mandatory for approximately 95 percent of the labor market. There are basically four different occupational pension plans, covering different areas of the labor market: blue-collar workers in the private

[5] Most benefits in the Swedish social security system, but also including the occupational pensions, are price indexed by a so-called "base amount" (BA). Until 1999, the BA was determined for one year at a time by the Swedish Parliament, closely following the consumer price index. Since 1999, the BA was renamed the "price base amount", and has since been linked fully to consumer price movements. In 1999 1 BA was 36,400 SEK, or approximately 3,900 Euro.

sector, white-collar workers in the private sector, central government employees, and local government employees. Although there are some important differences between the sector-specific agreements, the way in which benefits are defined is fairly similar. The usual case is to define benefits as a function of previous sector-specific earnings, the years of service, and the age of retirement. The aim of occupational pensions is to compensate income losses above the social security ceiling that the national public pension system does not cover. For that reason, the occupational pension benefit rates are fairly low (about 10%) in the income intervals in which the public pension system applies.

The pension qualifying income is a key variable in determining pension entitlements in the occupational pension system. With minor variations across labor market sectors, this is a function of the earnings a period of years before retirement and number of years of service within the relevant labor market sector. The pension entitlements are proportionately reduced if the number of years of service is less than 30.

With the exception of occupational pensions for blue-collar workers in the private sector prior to 1996, the occupational pension can also be claimed early from the age of 60.[6] There is an actuarial adjustment of the same magnitude as for early receipt of public old-age pension. The compensation levels before the normal retirement age may, however, be sufficiently high to support early retirement without simultaneously claiming a public pension. It is also noteworthy that significant groups in the Swedish labor market, particularly in the state and local government sectors, have a lower mandatory retirement age via their occupation pension plan that gives them the right to claim a pension without the actuarial adjustment due to early withdrawal. As a result, employees in such occupations collect a full-time occupational pension until they reach the mandatory retirement age in the national old-age pension system.

[6] In 1996 the STP plan was renegotiated and became SAF-LO, which is a defined contribution (DC) plan. The earliest withdrawal is now possible at the age of 55 (according to transition rules the earliest withdrawal age is at the age of 60). SAF-LO is flexible as regards the period of payment - it can take the form of a life-long annuity or may be paid for a shorter period. There were also changes in occupational pensions for local government employees during the study period. A new pension agreement for local government employees (PFA-98) was negotiated in 1998. Compared to the previous system, it is organized along the lines of a defined contribution (DC) plan.

2.3.2.1 Early retirement pension by individual agreements

Within the agreements for white collar workers in the private, state, and local government sectors, it is possible for employers and employees to enter into individual agreements with more favorable replacement rates if the employee agrees to leave his or her employment early. As mentioned Sweden has relatively strong labor market protection for elderly worker. This *early retirement pension* can be used as a tool for the employer to persuade the employee to leave his or her employment before normal retirement age, which usually means that the employer gives the employee stronger incentives to retire than stipulated in the terms of standard agreements.

The exact terms of an early retirement pension contract are unknown. Each contract is, in principle, negotiable and may therefore be individually designed, although employers have been known to make uniform offers to a group of employees (cf. Fölster, et al., 2001). Presumably, one condition in the early retirement pension is that the individual is not "punished" later in life for early retirement. Hence, the early retirement pensions compensate for future losses in pension benefit levels after the normal pension age of 65 as a result of early withdrawal.

From the viewpoint of a specific business operation there may be several logical explanations as to why early retirement pension solutions are economically favorable instead of continued employment (cf. SOU, 2004). Compared to wage payments, pensions are usually are lower, with a lower payroll tax, and are company tax-deductible (below the cap, up to about 80 percent of previous earnings). In addition, the employer has to pay pension premiums which are related to wages, and, in some pension schemes, also to the employee's age, which makes premiums particularly high for older workers. The individual, on the other hand, might value paid leisure time. Furthermore, in the case of high income earners with incomes above the cap who pay central government tax, work incentives are weak, because the implicit tax on continued earnings is high (see Palme and Svensson, 2003, for a calculation of pension wealth accruals).

2.3.3 Job security agreements

In addition, in the central government sector there is a job security agreement (*Trygghetsavtalet)* which gives an employee a special pension (*pensionsersättning*) in case of dismissal due to redundancy. Usually the employee has to be at least 60 of age,

although in special cases the rules also provide for a pension as early as 55 (e.g., for regular officers). This special pension may be granted even though dismissal was not due to a redundancy situation. The conditions are then that this person must be aged 60, voluntarily accept retirement, and that a younger person can be offered continued employment. [7] In other parts of the Swedish labor market there are more general arrangements in the case of dismissal due to redundancy, but they are less favorable for older workers, in comparison with the state sector.[8]

2.3.4 Employment protection

In Sweden employees are granted employment protection through legislation (*law of security of employment, LAS*). The rules stipulate, among other things, that dismissal can only be made on grounds of fact. This means that only matters that hinders the employee to carry out the assignments for which he or she is hired to do may be considered as "grounds of fact" for dismissal. However, the employer must first find try to find alternative tasks for the employee, or, in case of sickness, first provide with substantial rehabilitation for the employee. The law also stipulates the "last-in last-out" rule, which specify the order of priority in case of dismissal. Seniority years after age 45 is double counted, hence strengthening the protection of older individuals.

The law is compulsory. It is however possible for employers and employees to enter into other, less binding, terms trough collective agreements. There is a series of exceptions to the "last-in last-out" rule, and it may furthermore be set aside via settlements with the local union. During period of notice and nine months ahead, the dismissed has a right of precedence to re-employment with the same company in case of a new vacancy. It is up to the individual and not the union to claim this right.[9]

[7] According to Nyman and Valck (2006), the cost of these pension payments in the state sector alone amounted to SEK 1.7 billion (180 million Euro) annually in 2000-2005. They claim that although the granting of new early pensions are forecasted to decline the cost will remain high for a several years a head.

[8] For instance, in the SAF-PTK plan, the analogue is *Trygghetsrådet*. Before 2004, it replaced income losses for a 30-month period for workers aged 60-64 who became unemployed due to redundancy. See Sjögren-Lindquist and Wadensjö (2005) for details of the rules.

[9] However, this rule is not always followed in practice, particularly not in the case of older workers. Ulander-Wänman (2005) studies applications of this principle. A reoccurring argument for not re-hiring a person with right of precedence was that he or she did not comply with the job qualifications required.

3 Empirical identification strategy and data

3.1 Empirical model

In the typical retirement study, the focus is on the interpretation of economic incentives in a more or less structural model. This is however not the prime interest here. Rather, we would like to establish *if* there is a link between aggregate employment, and thus indirectly to labor demand, and individual retirement choices. We would also like to assess whether employers act via extra pensions to persuade old workers to retire. This can be the case if we observe higher pensions and more retirements in times when aggregate employment is below the normal level, and thus demand is low.

3.1.1 Transitions from work into retirement

The empirical strategy is simple, in that we compare differences in retirement behavior arising from the fact that individuals are assigned different outcomes of (industry-level) labor demand. Given the nature of the aggregate demand – it is exogenous – and the quality of the data, we argue that it is likely that we are identifying a casual relationship between labor demand and individual retirement. The first question is addressed by estimating the retirement hazard in the following form:

$$y_{aijt} = \beta_1' X_{ijt} + \varphi_a + \gamma Z_{jt} + \theta_j + \upsilon_t + \varepsilon_{aijt}, \qquad (1)$$

where y_{aijt}=1 if individual *i* aged *a* affiliated to industry *j* in time *t* retires, and 0 in other cases. The retirement decision is thus treated as a discrete dichotomous choice. We assume retirement is terminal, thereby neglecting possible mobility between sectors or other types of non-retirement. The retirement hazard is a function of individual (and potentially household) characteristics X_{ijt}, an age-specific effect φ_a, the aggregate labor demand Z_{jt} (defined so that if Z_{jt}<0 then labor demand is low, otherwise it is high), an industry fixed effect θ_j, a time-specific fixed effect υ_t, and an idiosyncratic shock ε_{aijt} with $E\left(\varepsilon_{aijt}\right)=0$.

Equation (1) is applied to all observations where $y_{a-1,i,j,t-1} = 0$. By including age-specific effects (the φ:s), the relationship can effectively be understood as a discrete-time proportional hazard model, where the φ:s can be understood as the baseline hazard. The key parameter of interest is γ. If retirement is made prematurely (post-poned) in downturns (upturns) in aggregate labor demand, then γ <0.

We simplify by estimating (1) as a linear probability model (LPM). The parameter estimates may then be interpreted as marginal effects. Further, a probit or a logit will be inconsistent if there is heteroscedastic error structure.[10] Since the dependent variable is a dichotomous variable, the usual standard errors will be severely biased. Therefore heteroskedasticity-robust standard errors are used instead.

Presumably ε_{aijt} contains an unobserved individual (time-invariant) effect that influences retirement and covariates. These could be, e.g., health status, productivity, or personal attitudes towards retirement. [11] Such effects may bias the estimate of γ unless they are removed. However, it is not straight-forward how to interpret, estimate, and remove a fixed effect in the present setting.

3.1.2 The employment residual: aggregate labor demand

In this study, the labor demand is measured as the residual in the aggregate employment, defined as follows. The difficulty lies in determining the long run trend in employment. We go about this by expressing the log of employment in industry *j* at time *t*, $\ln e_{jt}$, as a polynomial in *t*, $g_j(t)$, a constant, and a residual component Z_{jt}:

$$\ln e_{jt} = \alpha_j + g_j(t) + Z_{jt}. \qquad (2)$$

The residual, Z_{jt}, will be positive if there is an expansion and negative if there is a decline vis-à-vis the trend. We predict the residual employment from (2) as the ordinary

[10] Probit estimates with and without random individual effects gave, nonetheless, mostly, the same qualitative results.
[11] Unobserved time-variant effects may also bias the model. The fact that one cannot control for unobserved time-variant effects might affect how we see an industry (or a company), as the mere composition of workers in an industry (or company) might change how it function, and, in extension, a determinant for aggregate labor demand. There may be network effects (in a company or in another type of network) that over time accelerate or decelerate employees' preferences for retirement (social norm formation).

least square (OLS) residual, $\widehat{Z}_{jt}$. This variable can then be used in (1) in place of the true Z_{jt} in (1). [12] Note that each industry is assumed to have its own trend. This means that some of the period-effect will be captured by the employment residual. Notice also that the choice of $g_j(t)$ is more or less arbitrary, but may be important for the results, since it – naturally – will influence the employment residual. To examine the robustness of the results in the empirical analysis, it will be assumed that $g_j(t)$ is either quadratic or linear in *t*.

As will be described the estimation samples for (1) and (2) differ. While estimation of (1) is locked to the period over which micro data are available, estimation of (2) is not. In the present case the micro data is for 1992-2000 (see Section 3.2), which was, as described in the introduction, characterized by a major downturn in the economy. From 1992 to 2000, the employment was largely rising from a record low level (non-employment reached its highest peak in 1993). For the identification of the effect of interest, it is important that the trend, and thus the key regressor, is estimated over a long period, which covers both upturns and downturns in the economy. If not, the trend will not represent 'normal employment'.

For this reason we use data from a longer period, between 1987 and 2004 (see Section 3.3), for the estimation of the time trend (2), hence including a relatively balanced period that spans both economic upturns (the late 1980s and the turn of the millennium) and downturns (the start and middle of the 1990s). It is therefore likely that the variation in the residual employment measure is measuring what we really want.

3.1.3 Realized pension attributes for early retirees

The second question we would like to address is whether pensions are "boosted" in declining regimes of sectoral employment. As mentioned, one way of persuading older employees to quit voluntarily is for the employer and the older employee to agree on a special early retirement pension (a "buy-out"). A priori we cannot know to what extent benefits are negotiable and thus may diverge from the standard contracts in practice.

[12] However, since the predicted residual is a generated regressor, the covariance matrix has to be adjusted accordingly (cf. Wooldrige, 2006). For simplicity this has not been done.

The usual assumption in the literature in the field is, however, that all benefits follow the standard formula. Eklöf and Hallberg (2004, 2006) show, nevertheless, that there is a spread in realized occupational pension benefits.

One way of examining this question is to examine the group of employees that took an early retirement via the occupational pension in the following regression model:

$$\ln P_{ijt} = \alpha_2 + \beta_2 X_{ijt} + \gamma_p Z_{jt} + \beta_w \ln W_{ijt} + \varepsilon_{2ijt} \qquad (3)$$

where P_{ijt} is the first (full) year of pension benefit for an individual i who has retired early with occupational pension, W_{ijt} is the pension qualifying income, X_{ijt} is a vector of covariates, and ε_{2ijt} is an error term with zero expectation. Zjt is as before the labor demand in industry j at time t, which is again the employment residual is a proxy for. As mentioned above, the pension qualifying income is crucial for the calculation of pension benefit level in the occupational pension agreement. In principle, we would expect W_{ijt} to explain the major part of the variation in pension benefits. Note that it is important to control for time period, labor market sector (type of occupational plan), education level, and industry. This is done via X_{ijt}. These control at lest partly for the fact that there are sub-agreements within the four major agreements for some occupational groups and that some agreements have changed during the period.

If $\gamma_p < 0$, then individuals who retired in declining markets received a higher pension benefit, given their pension qualifying income. This could be because employers offered "buy-outs" - pension supplements - to induce employees to accept retirement.
It is also possible for some companies and time periods that $\gamma_p > 0$. Those employers with good economic circumstances may regard extra pensions as rewards to senior employees. These pensions may be costly but the employer can afford them just because economic conditions are relatively favorable. Note that, the above specification is elaborated in the empirical analysis to allow for a nonlinear relationship between the pension benefit level and labor demand.

It might also be – however less likely so – that individuals with high pension replacements ratios are more frequently inclined to retire in a declining or an expanding

market than others. In order to determine which interpretation is more plausible we would ideally need to observe individuals entering into retirement more than once and in more than one regime of sectoral employment. However, since very few ever return to the labor market after old age retirement this is hardly ever possible.

Also one may to some extent consider W_{ijt} and Z_{jt} as jointly determined by the prevailing economic situation, i.e., wages and pension qualifying income are a function of Z_{jt}. Since we do not control for this mechanism, the partial effect of Z_{jt} on $\ln P_{ijt}$ would be biased towards zero. Hence, with this reasoning, if we find empirical evidence of a direct effect, i.e., if $\gamma_p \neq 0$, it is likely that the true effect is bigger. However, if anything we believe that the demand effect via W_{ijt} is probably small, at least when markets are declining. Then cutbacks are more likely to realize in personnel reductions than wage cuts.

3.2 Micro data

Data from The Longitudinal INdividual DAta set (LINDA) are used. LINDA is a large micro-data set drawn from income registers and population censuses.[13] It consists of a large panel of individuals - about 300,000 individuals annually or about 3 percent of the population - which is representative of the Swedish population from 1960 and onwards. The data base also contains information on all family members for a sampled individual, as long as they remain in the household. In this paper, only sampled individual are used. The sample is limited to the 59-67 age group (for some of the description the age group 50-70 will be used though) in the years 1992-2000.[14] As usual, it is often difficult to classify self-employed individuals in terms of work or retirement (according to our definitions) due to tax legislation rules. To avoid these "income declaration problems", individuals who had an income from active business operations during the study period are excluded.

Because administrative register data such as LINDA contain no direct information on individual retirement status there is an issue regarding how to identify labor market

[13] For more information about LINDA, see Edin and Fredriksson (2000).
[14] Age is recorded on December 31 each year.

status when using these data. In this analysis, individuals are classified as out of work in year *t* if work income in *t* is less than 1 basic amount (BA) and work income is not the major source of income (in 1999, 1 BA was SEK 36,400, or approximately 3,900 Euro). To simplify, we aggregate income into the following six categories: Work, unemployment (UI), sickness and disability (SI+DI), public old-age pension (OAP), occupational old-age pension (OCCUP), and capital incomes and transfers (OTHER).[15] Which income category (except work) the individual used for early withdrawal is determined by the maximum income source in the year in which the individual had a work income of less than 1 BA (i.e., year *t*).

LINDA contains annual data. Therefore, we cannot perfectly observe the timing of outcomes as we cannot distinguish between part-of-the-year effects and part-time effects. One approach is to study 3-year panels. Year *t*-2 the individual is checked as relevant or not for the retirement decision (i.e., has labor income above 1 BA). Year *t*-1 is regarded as the transition or decision year, while the outcome is observed in *t*. The income records in *t*-1 are not used. The aggregate labor demand that is the appropriate covariate in (1) is therefore that in *t*-1. Hence, in estimation, aggregate labor demand is lagged.

A further reason to lag aggregate labor demand is that otherwise it is functionally related to the individual choice. If the individual is a subgroup of the aggregate we would, by construction, get a negative correlation between the aggregate and the individual outcome. However, even without lagging, this is presumably a minor problem because in our case the aggregate labor demand measure relies on employment in age groups 16-64, not just individuals near old age retirement. Further, the labor demand measure relies on a different data source (see below).

We must hence observe the same individual for at least three consecutive and uninterrupted periods, in which the classification has to be 'working' in the first period.

[15] The exact definitions of these six categories are given in the appendix, Table A1. See the discussion in Hallberg (2003) who uses the same data and makes a comparison of some different retirement definitions. The same source briefly describes the incidence of contemporaneous combinations of income sources. Further, see Hakola (2003) for a discussion of the subjective concept of retirement.

A few data imputations were necessary. As described in the institutional background the affiliation to labor market sector, and thus the type of occupational pension agreement, is vital in the analysis. For some groups register information can be used directly to code sector affiliation since it was directly coded in the data. Labor market membership for the privately employed had to be imputed, however, since, white and blue collar workers were coded in the same category.[16] The pension qualifying income was estimated as the mean of the previous five years of annual taxable income as long as the individual is working. For the first years in the panel the microdata was backed back in time so that the mean relies on five years for all. Once individuals retire and start claiming pension, qualification for pension entitlements ends. Therefore, the estimate on qualifying income was "frozen" (not updated) for preceding data years after the first year occupational pension was observed being claimed. We assume furthermore that all employees have full earnings history. This may potentially bias the pension qualifying income upwards for groups with less than full earnings history (e.g. women). This means in turn that the replacement rate (i.e. the pension divided by the qualifying income) will be biased downwards for these groups.[17]

3.3 Macro data

Data on industry-specific employment are available from the labor force surveys (Statistics Sweden). These data include all age groups between 16 and 64. In this study, the data is annual for the period 1987-2004. In most cases, two-digit (sometimes three-digit), SNI-code level data were used. [18] For some industries, the data were aggregated, presumably because they were small, while for others a three-digit SNI-code level was

[16] First we determine affiliation by examining the source of occupational pension once retired, which directly lead to the type of occupational pension agreement. (A few individuals had multiple claims from more than one occupational pension source. These were dropped.) For central and local public-sector employees who did not retire within the data panel, register information can be used directly to code sector affiliation. For private employees – who could belong to either the white or blue collar private sector – and who did not retire within the micro data window it was not possible to use register information since, as mentioned, white and blue collar workers were coded in the same category. Therefore predictions from a logit equation were used, with taxable income, gender, education, and industry, and interactions, as explanatory variables. The logit equation was estimated for privately employed individuals who were observed to retire. The imputation was then the predictions from this model including a stochastic term. The share of correct predictions was about 75 percent.

[17] Further, taxable income includes other income than what is relevant for occupational pension entitlements in the current sector, for instance, the earned income from another labor market sector.

[18] SNI is based on the European Community, NACE (Classification of Economic Activities in the European Community) standard. SNI is primarily classified on the basis of activity, which means that a company or a place of work can have several SNI-codes.

used (e.g., for *Health and social work*, code 85, which is divided into *Human health activities and Veterinary activities*, code 851 and *Social work activities with and without accommodation*, code 853). Altogether, 71 industries were included.

In the appendix, Table A2, the number of individual-year observations in the estimation sample is given, by industry and collective agreement. There is also information on the aggregation of industries, i.e., from which subgroups industries were aggregated. For the most part, there are overlaps, so that most types of collective agreements are represented in all industries, but this is not always the case. It may be noted that a large part of the individual-year observations for local government employees are classified in only a few (but big!) industries. For other labor market sectors, there is much more variation in the industry affiliation.

4 Empirical results

4.1 General pattern of the data

4.1.1 Income categories by age

In Table 1, Panel A, the distribution over income categories is shown for the age group 50-70 using the above definition. It may be noted, as expected, that the proportion of individuals with work income as their maximum source of income falls dramatically by age; from 82 percent at the age of 50 to 28 percent at the age of 64. At the age of 65, transitions from work – and also from the other income categories presented here – are mainly to national old age pension. After the age of 65, less than 2 percent retain a work status. It is also evident from data that occupational pension constitutes a significant path into early retirement. As the table shows, this route becomes increasingly important around the age of 60, and reaches its highest proportion (18 percent) at the age of 64. Closer inspection shows that occupational pension is persistent before the age of 65 (very few return to work or utilize another benefit).

Nevertheless, the proportion that depends either on disability insurance (DI), sickness benefits after the 14th day (SI), and unemployment benefits (UI), is superior in size. It increases from about 14 percent at the age of 50 to about 40 percent at the age of 64.

The largest group consists of recipients of DI or SI, and the major part of this increase is inflow to DI. An investigation of the data shows that practically no DI recipients ever return to work. It also shows that the probability of re-employment of an unemployed older worker falls in line with age. However, unemployment does not constitute the same type of permanent state until the "normal" retirement age of 65, since unemployed individuals opt for early retirement before their 65th birthday (the disqualification age for these insurances is in the month of the 65th birthday).

Table 1 Income categories by age, 1992-2000, percent, maximum source of income

Panel A. Stock

Age	Work	Disability ins./sickness ins.	Unempl. insurance	Public old age pension	Occup. pension	Other	Total	Obs.
50	82.35	8.87	4.85	0.00	0.04	3.88	100.00	34598
51	81.83	9.83	4.67	0.00	0.04	3.63	100.00	33861
52	81.04	10.55	4.61	0.00	0.05	3.75	100.00	32768
53	80.19	11.46	4.45	0.00	0.07	3.84	100.00	31710
54	79.30	12.40	4.41	0.00	0.08	3.81	100.00	30431
55	77.63	13.63	4.50	0.00	0.16	4.07	100.00	28959
56	75.27	15.11	4.68	0.00	0.54	4.39	100.00	27510
57	72.71	16.94	4.80	0.00	0.88	4.67	100.00	25942
58	69.66	19.07	5.16	0.00	1.31	4.80	100.00	24673
59	65.63	21.79	5.28	0.00	2.11	5.19	100.00	23658
60	60.22	24.62	5.49	0.24	3.80	5.63	100.00	23083
61	51.49	27.80	5.51	0.97	8.07	6.16	100.00	22663
62	45.02	30.81	5.58	1.69	10.32	6.57	100.00	22316
63	37.21	34.16	5.65	2.41	13.32	7.25	100.00	22022
64	28.00	33.86	5.93	6.15	18.00	8.07	100.00	21907
65	14.40	0.94	2.56	65.65	9.51	6.94	100.00	21868
66	1.89	0.00	0.00	90.17	1.13	6.81	100.00	21930
67	1.42	0.00	0.00	90.20	1.04	7.34	100.00	22196
68	1.16	0.00	0.00	90.05	0.98	7.81	100.00	22491
69	0.81	0.00	0.00	89.91	0.98	8.29	100.00	22623
70	0.66	0.00	0.00	89.94	0.89	8.51	100.00	22811

Panel B. Outflows from work (income category in t given Work in t-1)

Age	Total outflow from work	Disability ins./sickness ins.	Unempl. insurance	Public old age pension	Occup. pension	Other	Obs.
51	5.43	2.66	2.23	0.00	0.02	0.52	26128
52	5.67	2.77	2.28	0.00	0.02	0.60	25229
53	5.62	2.75	2.26	0.00	0.03	0.57	24032
54	6.02	3.15	2.19	0.00	0.06	0.62	22896
55	6.55	3.43	2.30	0.00	0.14	0.69	21451
56	7.71	3.95	2.46	0.00	0.56	0.74	20080
57	8.32	4.25	2.61	0.00	0.71	0.76	18323
58	9.45	4.85	2.84	0.00	0.95	0.81	16894
59	11.26	5.66	3.08	0.00	1.68	0.84	15501
60	14.48	6.64	3.66	0.12	3.06	1.01	14319
61	21.46	7.67	3.62	0.75	8.21	1.21	13059
62	22.25	8.31	4.20	1.29	7.33	1.11	11139
63	27.26	8.90	4.31	1.94	10.60	1.52	9699
64	36.83	7.97	6.22	3.29	17.53	1.82	8333
65	57.35	1.27	2.89	45.54	6.17	1.48	6403
66	92.28	0.00	0.00	89.09	1.65	1.54	4548
67	78.2	0.00	0.00	70.07	4.76	3.37	1156
68	75.92	0.00	0.00	67.89	4.91	3.12	897
69	78.64	0.14	0.00	70.61	4.35	3.54	735
70	80.07	0.00	0.00	72.71	4.25	3.10	612

Note. Includes only the four major sectors. Income categories are defined in the appendix, Table A1.

The (gross) outflow probabilities from work to the other states are presented in Panel B. We may note a gradual increase in the total outflow from work between the age of 51 and 61 - from 5 percent to 21 percent. [19] In the following age groups, outflow from work increases dramatically until it reaches a peak at the age of 66 (9 out of 10 who are still working at the age of 65 exit work before the age of 66). The outflow from work to an occupational pension is highest in the 61-65 age groups - between 6 and 18 percent on average for the four major agreements. In comparison, very few people exit early by claiming early receipt of the national old age pension. It may be noted that 4-5 percent of workers who retire after the age of 65 are classified as occupational pensioners.

[19] Note that the first year serves as a qualifying period for these calculations, as individuals must be working to be qualified for transitions. Moreover age is measured in the second year of each two-year panel, *and* on December 31. This means, assuming that the average birthday is June 30, that *the average transition age* is obtained by subtracting 1½ years from the age concerned.

4.1.2 Aggregate labor demand

Next, our labor gap measure is presented in a number of different ways. First we exemplify how the measure of the employment fluctuation is constructed. Figure 1 illustrates employment (in logs), a quadratic trend, and a linear trend in a single industry (*Transport and storage*, code 60-63). This industry is by no means representative, but serves the purpose.

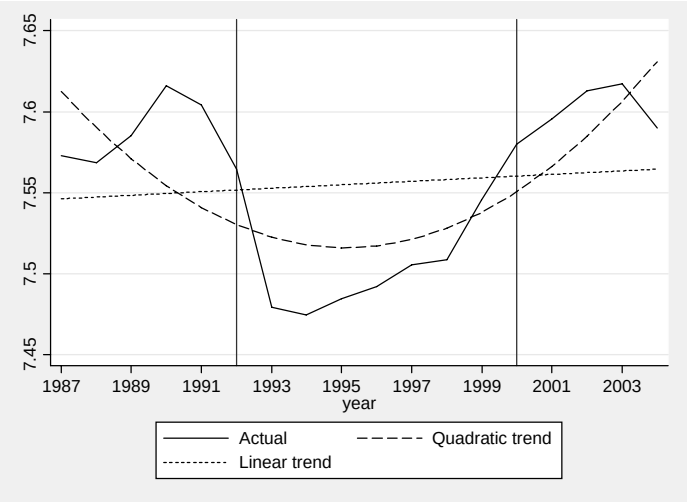

Figure 1 Annual employment (in logs) in an industry (60-63 transport and storage), a linear and a quadratic trend (estimated by OLS), 1987-2004.

In the middle period, 1992-2000, indicated by two vertical lines, is our study period for the retirement decision. Over this period there were quite large swings in employment. As can be seen for this particularly industry, the employment gap measure (i.e. the vertical distance between actual and predicted employment, either from the linear or quadratic trends) bears a close resemblance to the general market conditions for the period. As mentioned earlier, there is no a priori way of determining how the trend should be constructed, and it may be noted that (for this industry) the quadratic trend vis-à-vis the linear trend results in different sizes (and sometimes different signs) for the employment gap.

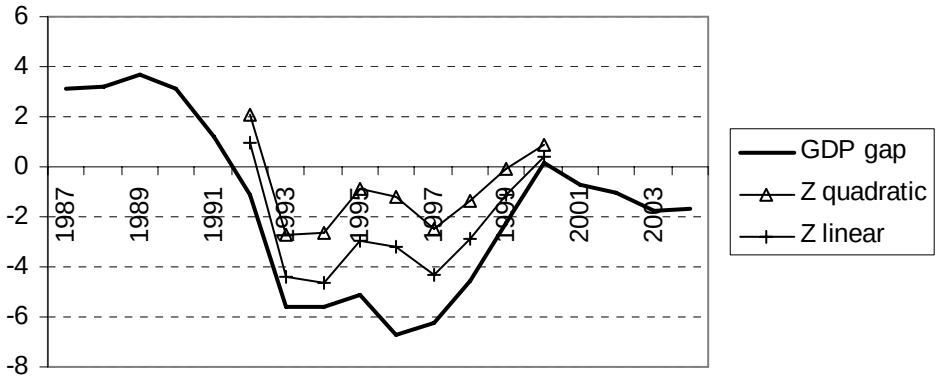

Figure 2 GDP gap (percent of potential GDP), and residual employment ($\widehat{Z}_{jt}$) with a) a quadratic and b) a linear time trend, annual (weighted) mean

(Source: GDP-gap is annual mean of quarterly data, taken from National Institute of economic research, 2006, *www.konj.se*)

We can conclude that our measure of the labor demand clearly seems comparable with the GDP gap (GDP as a percentage of potential GDP), shown in Figure 2 (borrowed from the National Institute of Economic Research, 2006), which is an alternative and perhaps more generally used definition of the business cycle. Although our simple measures (one with a quadratic trend and the other with a linear trend) seem to present roughly the same picture of the economic turbulence of the period they also, however, suggest a quicker recovery than the GDP gap measure. It is also clear that the exact levels are different, but this is perhaps what we should expect.[20] Notice that the sizes of our measures differ depending on whether we employ a linear or a quadratic time trend, but it is what we should expect, since the quadratic trend by construction will render a smaller residual compared to the linear one (cf. Figure 1). (However, one should keep in mind the different scale when interpreting the marginal effects.) In the following, we discuss results focusing on the quadratic trend, however, since separate analyses using the two resulting employment gap measures showed that the choice of measure only had a minor impact on qualitative interpretation of the final results.

[20] A number of explanations for this seem reasonable, e.g., our measure relies on employment alone, while the GDP gap includes, for instance, consumption, investments, etc. The specification of the trend is moreover different. Note that the GDP gap measure is the annual mean of quarterly data.

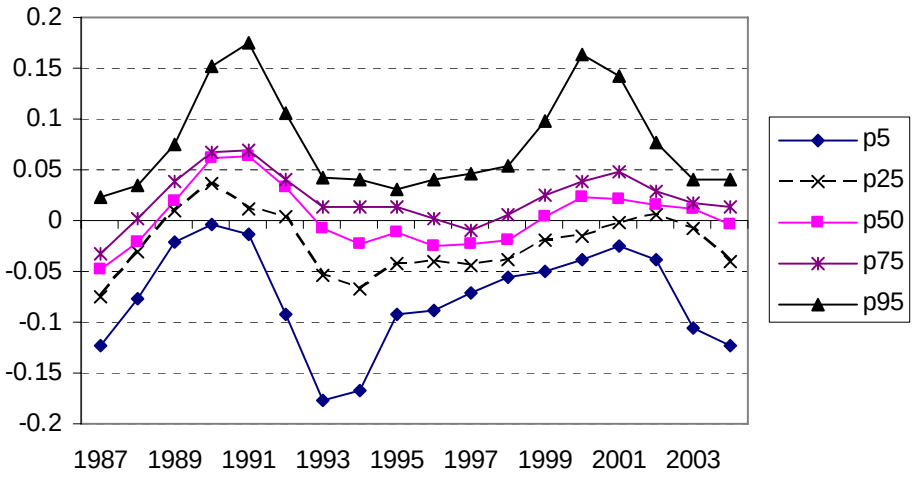

Figure 3 Percentile values of the employment gap on industry level (Z_{jt}), 1987-2004, weighted by industry employment

Thus it seems that the chosen measure of the labor demand relatively well captures the market conditions of the period. Also, when looking at the residual employment measure (using a quadratic time trend) in more depth by studying the distribution across industries, one can conclude that there, importantly, is a large variation between industries. The distribution of the residual employment across industries, by year, is presented in Figure 3.[21] The large variation between industries is in this figure quite striking: In 1994, in the depth of the depression, the median employment gap was about -2 percent (i.e., in 50 percent of industries, employment was 2 percent below the trend or lower). In the same year the employment gap at the 5th and the 95th percentiles spanned from about -17 percent to about +4 percent. As a result, it may be concluded that there were industries that were hit very badly by the depression, as well as industries that seem to have managed relatively well (in terms of employment).

[21] These data are weighted by industry employment.

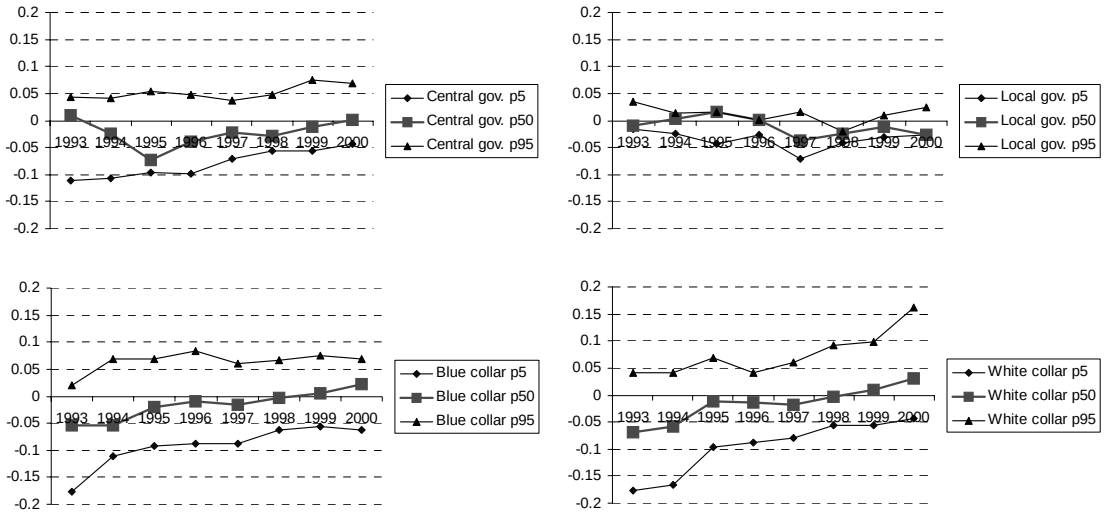

Figure 4 Residual employment (Z_{jt}) in four labor markets sectors, weighted, only individual-year observations in risk group (i.e., working in *t-1*)

We now turn to the micro data, which are available for the period 1992-2000, and compare the employment gap by the four major types of collective agreements (private, blue and white collar workers, central government and local government employees). These types show up in varying degrees in different industries (as noted, again, by the cross tabulation of the number of individual-year observations for SNI-coding and collective agreement in the appendix, Table A2). The business cycle is therefore, to some extent, different for the different sectors of the labor market. Figure 4 illustrates this in more detail. It presents the 5th, 50th, and the 95th percentile values of the business cycle measure during the micro data period. Note that these percentile values, unlike those in Figure 3, represent individuals (in the risk group) and not industries.[22]

A few points are worth noting. First, there is, again, a large variation (as measured by the 95th- 5th percentile range) in the employment gap outcome between individuals in the same collective agreement. This is particularly the case for privately employed persons, but also for central government employees. For individuals in the local government sector, however, the 95th- 5th percentile range in the employment gap is relatively small. This is, as noted above, a result of the fact that such employees are

[22] As only the risk group is included here, the first observation year is the second year of micro data.

concentrated in a rather small number of industries. Second, one can see a notable difference between the public and the private sectors in that the employment gap develops differently over time. Among private-sector employees there was a more or less continuous increase between 1993-2000 in the 50th percentile, while among state employees the median first decreased in 1993-1995, and then increased in the period thereafter. Among individuals employed in the local government sector, the variation over time is smaller, and furthermore the drop seems to occur relatively late in the sample, in 1997.

We now turn to the following set of graphs, which compares the group which decided to retire with an occupational pension and the group that continued working, with respect to the employment gap measure. These figures will give a first indication if the raw data support our hypothesis that aggregate labor demand has an impact on early retirement. If declining markets imply that older workers retire at a higher rate, then the residual employment should be more negative for those who left work compared with those that stayed.

The relationship between the aggregate employment gap and early retirement via the occupational pension shows the expected sign in the public sector, but not in the private sector before 1996. We expect to find no significant difference in the employment gap for blue collar workers since, before 1996, blue collar workers had no access to an occupational pension before the age of 65 as their agreement did not permit early withdrawal then. [23] We may therefore want to divide the sample into one period for the early 1990s and one containing the later part.

In Figure 5, the sample is divided into the period before and after 1996. It shows that, before 1996, we have the "wrong" sign for the difference in the private sector, while, in the period thereafter, the sign is as expected for blue collar workers. One explanation, of course, might be the new occupational pension plan implemented in 1996 for blue collar workers. A tightening of the eligibility rules for disability insurance might also have contributed, as more employees would then (have to) choose routes out of the labor

[23] Note that sector affiliation within the private sector had to be predicted on the basis of a probability model. This imputation might therefore introduce errors: observations of early withdrawal of occupational pension income among blue collar workers might be due to white collar workers being wrongly coded as blue collar workers.

force other than disability insurance, for instance an occupational pension. In the public sector, the data suggest that we have the expected sign for the difference throughout the period (although insignificant in the initial part of the period).

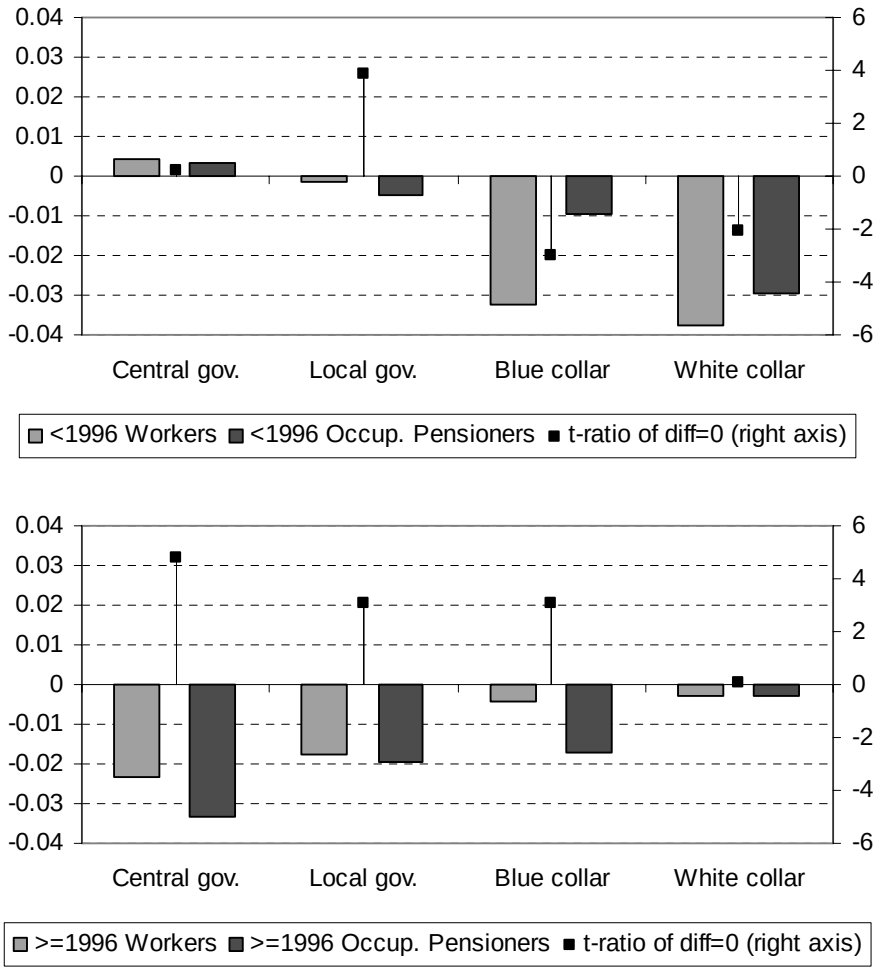

Figure 5 Employment gap (mean) for workers and recent occupational pensioners (conditional on work in previous period), and t-ratio of the difference in means, by labor market sector and time period

It is likely that these observations correspond to economic trends in the different sectors during the period. In the initial stages of the crisis - before 1996 - employment in the private sector mostly declined as a result of the bad times, while the public sector reacted relatively little in terms of retiring elderly workers. However, when government budget deficits finally became too alarming, they resulted in large cutbacks in employment in the public sector, which were partly achieved by means of early retirements.

4.2 Regression analysis

4.2.1 Retirement probability

In the former section we saw that the descriptive analysis, on the whole, support the hypothesis that individuals who retired early via an occupational pension to a greater extent were employed in industries that faced more severe economic turbulence in terms of declining employment, compared to individuals who instead continued working. There seems to be differences between different occupational pension plans and between different years. Next we continue the analysis by examining retirement outcomes in a multivariate analysis to control for differences in individual characteristics, industry, etc., to see if these may explain observed outcomes.

The main results are summarized in Table 2, which presents the key parameters of the LPM model. In this table, each cell presents estimates from a separate regression. In specification A in the first row, we let the employment gap have different effects over labor market sectors but the same effect over the whole period within each sector. The estimates support the impression given by the previous figures. Hence, we find a pattern of negative and significant effects for occupational pensioners in the central and local government sectors, where occupational pension usage is more accentuated in declining markets. Partly, this might be due to the fact that the utilization of occupational pensions as an early retirement vehicle is highly developed in the central and local government sectors, but small among the white and, particularly, among blue collar workers in the private sector. This is supported by the differences in the estimated age fixed effects from the same specification, which are presented in Table 3.

Table 2 Retirement probabilities by labor market sector, specifications A, B, and C

		Central gov. empl.	Local gov. empl.	Blue collar workers	White collar workers
A)	Z(t-1)	-0.181***	-0.203**	-0.016	0.035
	Obs.	10013	27801	19169	22285
B)	Z(t-1)*I(year<=1996)	-0.115**	-0.254**	0.002	0.042
	Z(t-1)*I(year>1996)	-0.336***	-0.141	-0.045*	0.026
	Obs.	10013	27801	19169	22285
C)	Z(t-1)*I(year<=1996)	-0.116**	-0.245**	0.002	0.044
	Z(t-1)*I(year>1996)	-0.331***	-0.148	-0.044*	0.019
	controls for municipality	Yes	Yes	Yes	Yes
	Obs.	10013	27801	19169	22285

Note. * p<.1; ** p<.05; *** p<.01. Robust standard errors. Includes ages 59-67. All specifications include gender-specific controls for pension qualifying income, age fixed effects, year fixed effects and industry-specific fixed effects. Generated labor demand variable (Z), derivations from quadratic trend.

These results tell us that the down-sizing that occurred in the public sector in the 1990s was to some extent achieved by adjusting the employment of older workers. They thus confirm that older employees were given the opportunity to obtain an occupational pension when layoffs were necessary. Early retirement benefits, including job security agreements effectively subsidized workforce reductions. In the private sector, on the other hand, the reductions (expansions) seem to have been carried out in a way that is not systematically linked to our employment gap measure. It might be that, in the private sector, aggregate employment shocks affect employment in other age groups (i.e., those younger than 58 years of age) rather than the employment of older workers. In addition, labor force reductions might have been implemented via other channels than occupational pensions.

Above we noted that the effects seemed to differ in the samples before 1996 and after 1996. In an alternative estimation, specification B, also shown in Table 2, we investigate whether this difference in effects remains when we control for other variables. The results are pretty much in line with Figure 5. The results indicate that the largest effect is found among the central government employees in the post-1996 period and among local government employees in the pre-1997 period. For blue collar workers in the private sector, the estimates suggest that there was a small negative effect of aggregate employment on early retirement in the later period from 1997 to 2000. It is however relatively small and only significant at the 10 percent level.

Table 3 Age fixed effects (extract of estimates taken from specification A, Table 2), LPM of retirement with occupational pension, by labor market sector

Variable	Central gov. empl.	Local gov. empl.	Blue collar workers	White collar workers
age59 (ref.)				
age60	0.008	0.007***	0.002	0.008***
age61	0.121***	0.057***	0.007***	0.035***
age62	0.076***	0.050***	0.009***	0.030***
age63	0.067***	0.087***	0.011***	0.046***
age64	0.112***	0.268***	0.012***	0.057***
age65	0.047***	0.064***	0.006***	0.036***
age66	-0.004	0.001	-0.001	0.010**
age67	0.044**	0.008	-0.003**	0.014*
Obs.	10013	27801	19169	22285

Note. * p<.1; ** p<.05; *** p<.01. Robust standard errors. See Table 2 for notes.

It is possible that employment reductions are centered in a few distinct geographical locations. The driving factor causing early retirement might then be linked to the economic circumstances at the local level rather than at the industry level. According to the estimates in specification C, shown in the last row of Table 2, however, the results are not sensitive to including controls for municipality.

Another set of estimates, presented in Table 4 and Table 5, shows that the findings seem robust against other alternative specifications. These estimates represent a common effect independently of age group and of labor market sector. First, in Table 4, results with the quadratic time trend specification are shown. As can be noted we obtain the expected negative and significant effect in all specifications. The quantitative result vary w.r.t. how ambitiously we specified the model. Whether or not year-specific controls are included in the model has a quite large influence on the size, but not the sign of the key results (cf. col. 3 and 4). This could be expected, as there is substantial variation in the employment gap over time that is common for almost all industries (as shown in Figure 3). An exclusion of period fixed effects implies that this variation is allowed to influence the estimated effect. Also, holding industry constant has a substantial influence. Second, as the results presented in Table 5 show, there is practically very little change in the results if we use a linear trend instead of a quadratic one. We get a smaller

coefficient estimate, but, as mentioned, this is because scales differ between the measures with the quadratic time trend vis-à-vis the linear one. [24]

Correlation within industries over time may cause interdependence that the usual robust (unclustered) standard errors do not account for. By instead using standard errors adjusted for intra-group (cluster) correlation, presented in brackets in Table 4 and Table 5, we find that the significance levels become lower. This could be expected if there is autocorrelation in employment within industries. Nevertheless, for most specifications, the key parameter remains significant at the 10 or 5 percent level.

Table 4 Linear probability model estimates with quadratic time trend

	(1)	(2)	(3)	(4)
Z(t-1)	-0.040	-0.063	-0.074	-0.046
	0.014***	0.014***	0.014***	0.015***
	[0.038]	[0.034]*	[0.034]**	[0.025]*
Age dummies	Yes	Yes	Yes	Yes
Industry-specific fixed effects		Yes	Yes	Yes
By-gender control for qualifying income			Yes	Yes
Education dummies			Yes	Yes
Labor market sector control			Yes	Yes
Year dummies				Yes
Obs.	79268	79268	79268	79268

Note. * p<.1; ** p<.05; *** p<.01. Robust standard errors presented in italics. Adjusted standard errors for intra-group (cluster) correlation in brackets. Includes ages 59-67. See Table 2 for notes.

[24] Introducing controls for local unemployment at the county level in the specification changes inference very little (not shown). Probit models (with or without random effects) reproduce almost identical qualitative inference compared with the LPM.

Table 5 Linear probability model estimates with linear time trend

	(5)	(6)	(7)	(8)
Z(t-1)	0.006	-0.064	-0.074	-0.044
	0.012	0.014***	0.014***	0.015***
	[0.048]	[0.035]*	[0.036]**	[0.025]*
Age dummies	Yes	Yes	Yes	Yes
Industry-specific fixed effects		Yes	Yes	Yes
By-gender control for qualifying income			Yes	Yes
Education dummies			Yes	Yes
Labor market sector control			Yes	Yes
Year dummies				Yes
Obs.	79268	79268	79268	79268

Note. * p<.1; ** p<.05; *** p<.01. Robust standard errors presented in italics. Adjusted standard errors for intra-group (cluster) correlation in brackets. Includes ages 59-67. Generated business cycle variable (Z), derivations from linear trend.

How much of the observed retirement is a result of the variations in the aggregate labor demand during the period? One way to quantify this is to multiply the slope coefficient from the LPM with a real change in the employment gap, say 5 percent, judging from previous figures. One can then conclude that this employment gap corresponds to about 1 percentage point, or about 12 percent, of the retirement hazard for the older employees aged 59-67 in the central and local government sectors.

4.2.2 Realized pensions in declining markets

The other question we wanted to investigate was whether there is a "cyclical premium" in the realized pensions of early retirees – which could be an indication that employers reduce staff by making favorable pension offers to induce early retirement via this pension system.

The estimates are presented in Table 6 and Table 7. As we have found that the marginal effects of employment gap fluctuations differ before and after 1996, we have estimated separate models for the two time periods.[25] According to the estimates in the specification where we control for education, year, labor market sector, and industry, there seems to be a nonlinear V-shaped (or U-shaped) relationship between employment

[25] Standard errors adjusted for intra-group (cluster) correlation within industries changes inference very little.

gap fluctuations and the pension level. Note that we control for the pension qualifying income and that only occupational pension benefits is included in the dependent variable. The benefit level is hence higher when the residual employment is negative, but there is also a slightly higher pension level when the residual employment is positive (all compared to "normal times", i.e., close to 'zero' residual employment). For 1993-1996 (see Table 6), the cyclical premium becomes insignificant if we control for labor market sector and industry, meaning that the variation is explained by differences between types of collective agreement and industries rather than by variation in the employment gap. For the period 1996-2000 (see Table 7), however, the cyclic premium effects remain significant when these controls are carried out.

The premium estimates linked to a change in the employment gap of -0.05 are indicated in the bottom line of the table. These suggest that pensions (in relation to pension qualifying income) are inflated by around 8 percent for negative employment gap changes, compared to times when the deviation in aggregate industry employment from to the trend is close to zero. The effect is symmetric; the effect linked to a positive change in the employment gap of +0.05 is 7 percent.

Hence, the conclusion is that increased pensions may have been used to make individuals accept early retirement in "bad" times. In "good times" the evidence of increased pensions might indicate that these function as rewards (without increasing retirements) to senior employees in companies with a booming economy. These may arise because, e.g., employees (that would retire anyway) expect extra pensions and that employers feel they can reward their employees. An alternative explanation is that as wages grow more rapidly in "good times" so does the expected future pension burden for the employer. This was especially true for the defined benefit schemes in the occupational pension plans of the period.

The usual assumption that pensions follow the standard formula stipulated in the prevailing contracts might therefore be questioned. The reason is that pensions are subject to negotiations between employers and employees, something which is not often pointed out in the literature; the extent to which this happens has never been estimated before.

Finally, the point estimate of the elasticity of the pension qualifying income on pensions (i.e. the slope coefficient of ln*W*) lies in the expected range in all specifications, i.e., just under unity. It may be noted that a scatter plot of the dependent variable and ln*W* suggests that the pension qualifying income explains the major part of the variation in the pension benefit.

Table 6 Estimates of occupational pension benefits; new early occupational pensioners 59-64, 1993-1995

Variable	(1)	(2)	(3)	(4)	(5)
lnW	0.922***	0.928***	0.943***	0.941***	0.973***
	0.045	0.042	0.036	0.035	0.029
I(Z<0)	0.019	0.004	0.009	0.018	0.015
	0.034	0.026	0.024	0.024	0.024
Z	0.399	0.638	0.823*	1.042**	0.926**
	0.610	0.453	0.390	0.330	0.324
Z* I(Z<0)	-0.755	-1.457*	-1.876***	-2.040***	-1.756***
	0.939	0.582	0.524	0.473	0.449
Education dummies	Yes	Yes	Yes	Yes	
Year dummies	Yes	Yes	Yes		
Sector dummies	Yes	Yes			
Industry dummies	Yes				
Obs.	1069	1069	1069	1069	1069
R^2	0.714	0.694	0.693	0.691	0.688
Implied effect on dependent variable of a change in Z					
from 0 to -0.05	0.037	0.045	0.062*	0.068**	0.057*
	[0.322]	[0.099]	[0.010]	[0.004]	[0.011]
from 0 to +0.05	0.012	0.032	0.041	0.052**	0.046**
	[0.513]	[0.159]	[0.035]	[0.002]	[0.004]

Note. Dependent variable is the logarithm of occupational pension benefits. Robust standard errors in italics. * p<0.05; ** p<0.01; *** p<0.001. P-values in brackets. Sample restricted to age 59-64. Only observations where occupational pension was the maximum income in the current period and work income was the maximum income in the previous period are included.

Table 7 Estimates of occupational pension benefits; new early occupational pensioners 59-64, 1996-2000

Variable	(1)	(2)	(3)	(4)	(5)
lnW	0.857***	0.870***	0.933***	0.933***	0.952***
	0.024	0.024	0.018	0.018	0.017
I(Z<0)	0.031	0.038	0.041	0.044*	0.042
	0.024	0.023	0.024	0.022	0.022
Z	1.356**	1.548**	2.353***	2.315***	2.133***
	0.458	0.552	0.571	0.534	0.519
Z* I(Z<0)	-2.319**	-1.969**	-2.921***	-2.876***	-2.681***
	0.759	0.639	0.632	0.604	0.576
Education dummies	X	X	X	X	
Year dummies	X	X	X		
Sector dummies	X	X			
Industry dummies	X				
Obs.	2094	2094	2094	2094	2094
R^2	0.684	0.663	0.656	0.656	0.654
Implied effect on dependent variable of a change in Z					
from 0 to -0.05	0.079**	0.059**	0.070**	0.072***	0.070***
	[0.001]	[0.007]	[0.001]	[0.000]	[0.000]
from 0 to +0.05	0.068**	0.077**	0.118***	0.116***	0.107***
	[0.003]	[0.005]	[0.000]	[0.000]	[0.000]

Note. See Table 6.

5 Summary

This paper addresses the importance of demand side factors in the retirement decision. The aim of this study is to investigate employers' influence on older wage-earners' propensity to opt for early retirement rather than continued employment. The empirical strategy is to use deviations in aggregate employment from the long run trend, measured at the industry level, as the key variable of interest in a reduced form retirement model of micro retirement behavior.

The empirical results indicate that the probability of claiming early retirement via an occupational pension is affected by declining sectoral employment, since more people will enter into early retirement when markets are declining. One reasonable interpretation is that labor demand has an important influence on early retirement behavior. Industry fluctuations in employment provides considerable (and presumably) exogenous variation, both between and within industries, and this identifies the effect. The effect is pronounced in the public sector, and in the late 1990s. The down-sizing that occurred in

the public sector in the 1990s was, to some extent, achieved by adjusting the employment of older workers.

As employers may offer relatively favorable early retirement offers to induce retirement, we have also examined the relationship between pension replacement rates and industry employment. We find empirical evidence suggesting that employers behave in this way: The realized pension replacement rates were more favorable during declining markets than during normal markets. But the evidence also point at a significant premium being paid out in expanding markets, which might be explained as rewards to senior employees in good times.

Of course, there may be a rationale for restructuring the labor force via such early retirements if the supply is not met by demand (for example for special skills). From the viewpoint of society as a whole, however, early retirement offers made to healthy and productive individuals constitute a considerable cost since they result in production losses and, in most cases, the permanent loss of valuable labor resources. From a business and individual perspective, however, there may nonetheless be several logical explanations as to why early retirement pension solutions are financially more advantageous than continued employment. Ready access to early retirement benefits and various job security agreements help employers in this respect, since they effectively subsidize workforce reductions, without employers baring the full cost of such reductions. However, for the economy as a whole it is doubtful whether this is a good practice considering that the early retirement offers were most common in the public sector and hence, in the end, paid for by the tax payers.

A discussion of work incentives among older employees must include not only the weak work incentives of the individual but also the high labor costs of older workers, since they give employers incentives to retire old workers via favorable pension offers.

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Appendix

Tabell A 1 Income types (jointly amounting to total income)

Path abbreviation	Income type	Definition
1. WORK	Work	Work earnings, net of sickness insurance, parents' allowance, unemployment allowance, unemployment compensation, care allowance.
2. DI+SI	Disability pension	Disability pension
	Sickness insurance benefits	Sickness insurance benefits; tax-free and taxable sickness benefit, maternity allowance, disease carrier allowance and sick pay guarantee allowance. From the 15th sick day. (Since 1992, the first two weeks of a sickness period have been paid by the employer.)
3. UI	Unemployment insurance benefits	Unemployment insurance benefits; unemployment benefit fund (A-kassa), ALU, KAS, daily allowance and training allowance (dagpenning and utbildningsbidrag) in labor market training programs.
4. OAP	Public old age pension	Old age pension
	Partial pension	Public partial pension
5. OCCP	Occupational pension	Occupational pensions. Blue collar workers, white collar workers, central government, government-owned companies (only 1994-1999), local government, and individually negotiated occupational pensions.
6. OTHER	Private pension	Private pension; sum of private pension insurance/taxable life annuity
	Passive business	Income from passive business; includes income from private firms and from trading companies
	Capital	Capital income; from banks, shares, bonds and other valuable papers
	Transfer payments, social assistance and other benefits.	Transfer payments and benefits; includes housing allowance for families with children, the supplement for pensioners, the special complement for pensioners, and the complementary supplement for pensioners, and social assistance.

Note: OCCP also includes special pension payments from the *Trygghetsrådet*, for example, as mentioned in Section 2.

Tabell A 2 The number of individual-year observations by industry and collective agreement, and aggregation rule of two-digit level SNI-codes

	Collective agreement					
Industry (SNI-code)	Central gov.	Local gov.	Blue collar private sector	White collar private sector	Total	Aggr.Rule
1	36	31	730	471	1268	1
2	200	2	365	410	977	2
5	0	0	7	20	27	5
10	6	0	13	10	29	10-14
11	6	0	1	2	9	10-14
13	152	0	30	220	402	10-14
14	4	3	110	131	248	10-14
15	79	0	1963	2060	4102	15+16
16	0	0	0	88	88	15+16
17	11	7	545	222	785	17-19
18	164	2	264	117	547	17-19
19	0	0	48	53	101	17-19
20	27	8	1486	734	2255	20
21	276	18	1145	1886	3325	21
22	160	26	1700	2199	4085	22
23	2	0	0	175	177	23+24
24	49	15	507	1481	2052	23+24
25	6	0	782	642	1430	25
26	27	0	867	694	1588	26
27	121	0	1052	1576	2749	27
28	1248	6	3449	1616	6319	28
29	370	41	2409	4121	6941	29
30	28	0	92	136	256	30-33
31	182	1	545	1050	1778	30-33
32	141	0	379	1176	1696	30-33
33	47	17	219	1132	1415	30-33
34	15	13	776	2805	3609	34+35
35	324	0	322	904	1550	34+35
36	393	10	920	556	1879	36+37
37	0	0	22	32	54	36+37
40	349	1061	93	587	2090	40+41
41	0	42	0	4	46	40+41
451	4	14	558	253	829	45.1+45.2 +45.5
452	1317	238	3233	2580	7368	45.1+45.2 +45.5
453	30	36	1573	1530	3169	45.3+45.4
454	2	22	705	482	1211	45.3+45.4
455	0	0	55	42	97	45.1+45.2 +45.5
50	3	18	978	2635	3634	50
51	96	58	1841	9228	11223	51
521	8	16	3787	1284	5095	52.1
522	278	17	432	143	870	52.2-5
523	1479	13	82	90	1664	52.2-5
524	18	4	3488	1537	5047	52.2-5
525	0	0	48	39	87	52.2-5
526	0	2	150	131	283	52.6

	Collective agreement					
Industry (SNI-code)	Central gov.	Local gov.	Blue collar private sector	White collar private sector	Total	Aggr.Rule
527	0	0	95	61	156	52.7
55	39	39	1322	1029	2429	55
60	1107	922	3213	1646	6888	60-63
61	57	10	0	414	481	60-63
62	1	3	25	564	593	60-63
63	564	458	381	1478	2881	60-63
64	4807	15	272	524	5618	64
65	700	49	1350	2437	4536	65+67.1
66	45	12	805	1043	1905	66+67.2
671	18	0	67	150	235	65+67.1
672	0	0	28	126	154	66+67.2
70	188	1555	1556	1760	5059	70
71	6	1	181	171	359	71
72	144	33	0	1656	1833	72
73	1176	2	65	613	1856	73
74	2122	260	1677	9020	13079	74
75	12072	1307	147	171	13697	75+99
80	3186	6542	142	2047	11917	80
851	222	22431	103	2755	25511	85.1+85.2
852	7	0	0	31	38	85.1+85.2
853	414	51946	314	1784	54458	853
90	0	133	156	145	434	90
91	177	2062	724	3051	6014	91
92	815	273	571	1605	3264	92
93	7	101	336	379	823	93
99	0	0	0	19	19	75+99
Total	35532	89895	51301	81963	258691	

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