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MEMORANDUM

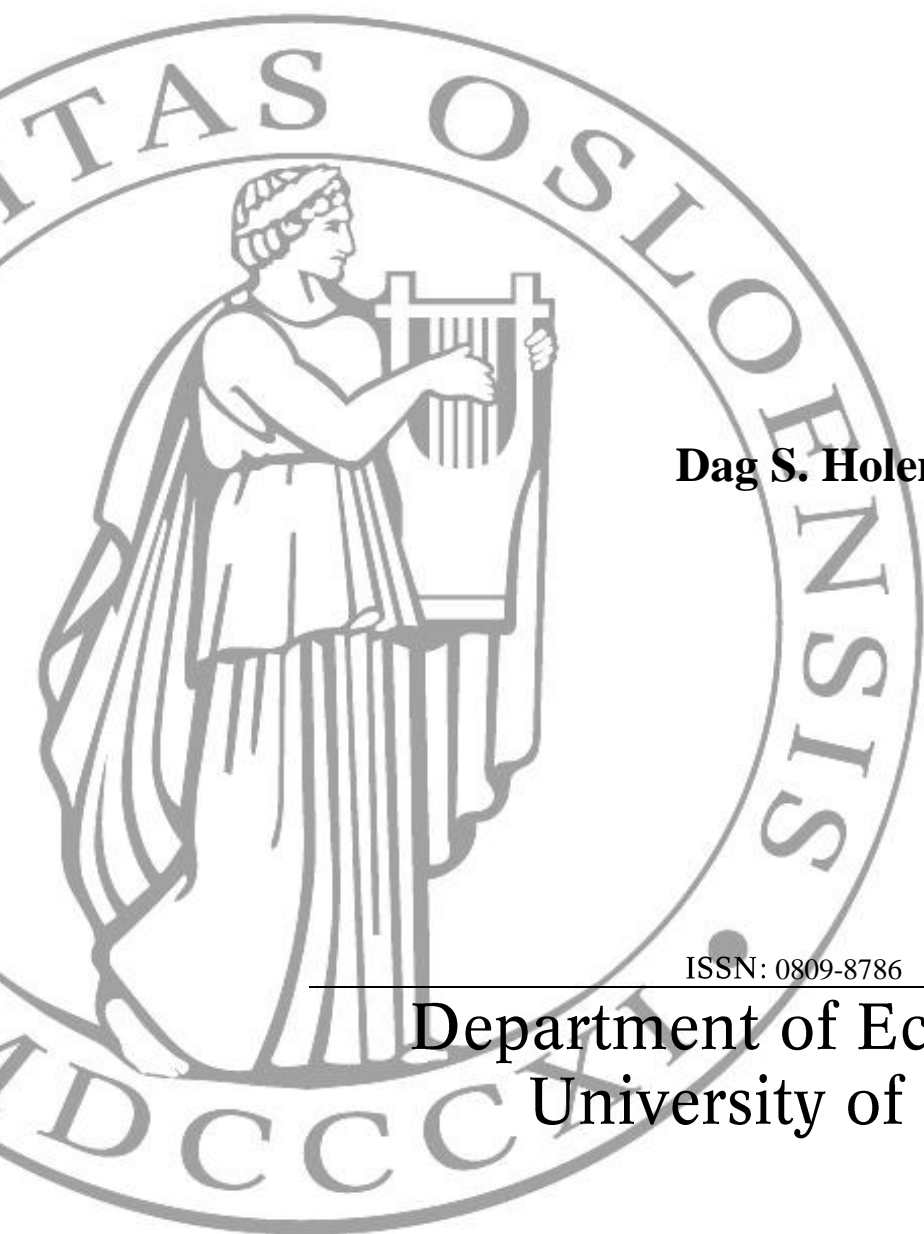
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It Ain't Necessarily So*

- A Cautionary Note Regarding Time Trends in Disability

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28.03.2007

Abstract

There are currently about 300,000 individuals receiving disability pension in Norway. A key question regarding the evolvement of the number of disabled workers is if the growth is related to the growth in the generosity of the pension system. This paper presents statistics on disability pensioners 1992-2001 and argues measurements of the generosity of the system has to be done with caution for several reasons. There is no clear link from the disablement process to the inflow of new disability pensioners. Further, I show that the ratio of disability pension to labor income vary with different definitions of the pension and income level.

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1 Introduction

Today, 11 percent of Norway's population between 18 and 67 are declared wholly or partly disabled and receive pensions accordingly.¹ The share has been around this level over a period of time, increasing in the 80s, decreasing in the early 90s and has been over 10 percent since 2001. One natural question in light of these "extreme high rates" (OECD (2007), p. 94) is whether the generosity of Norway's disability pension system can explain that such a large part of the non-elderly population is not working for health reasons. Another question is whether the gatekeeper function in the system makes it too easy to be awarded disability pension. This paper argues that we should be very careful when attempting to answer these questions and shows two, mostly overlooked, factors why we should be cautious of the results of such an attempt.

All advanced economies face a challenge of explaining the fact that a large part of their populations is not working, but living on benefits. There is no clear indication that health is the driving force behind this development: "Developments in sickness absence and disability benefit receipt over time are not related to trends in either objective or subjective health indicators" (OECD (2006), p. 46). Although some indicators of health point to worsened health, several others point the other way, making health a poor candidate to explain changes over time and differences between countries.

Policy makers and researchers have focused on economic incentives both as a source of explanation and as a way of reversing the development. "Make work pay" is a well used political slogan in many countries, e.g. Norway, UK and Sweden. Rules have been tightened, and strengthening the role of the gatekeeper function is a matter of interest in many reports. Empirical economic research on the subject tries to answer whether the generosity of the disability pension system has played a role in the development. Bound and Burkhauser (1999) point to the fact that the number of disability transfer recipients coincides with an increase in the generosity of publicly provided disability insurance. This relationship is studied in among others Parsons (1980a,b) and in Bowitz (1997). However, there are several problems with the empirical specifications, and cases that might be seen as a natural experiment have received some attention. Gruber (2000) is one such attempt, where a difference in difference estimator is used on Canadian data, utilizing a reform in

¹September 2006 (<http://nav.no/805324773.cms>)

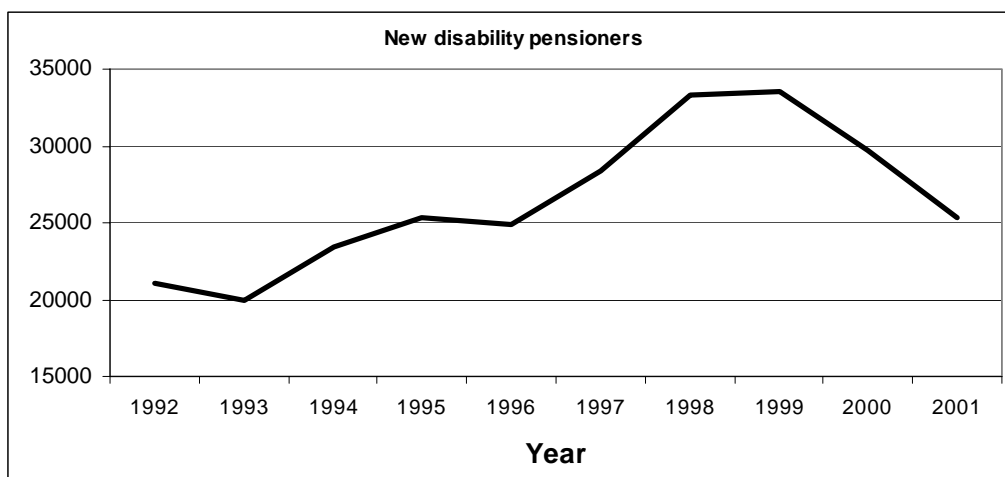


Figure 1: New Disability pensioners in Norway, 1992-2001. Source: NAV (2002)

the Canadian disability pension system that did not involve the region of Quebec.

Norway has a particular advantage of having extremely good micro data. In addition, the rules of the public disability pension system do not have a direct link from income at the time of disablement and the pension level. This creates individual variation in the data and allows us to look at the relationship between the probability to become a disability pensioner and the system's generosity, measured by the ratio of disability pension to the income level, at the individual level, without a natural experiment setting. This is done in Bratberg (1999).² Bratberg finds an effect of the economic incentives and Andreassen and Kornstad (2006) confirms his findings in a similar study.

This paper studies the inflow of new disability pensioners in Norway 1992-2001 shown in Figure 1. What can explain the time trends in disability? Two often proposed candidates are the generosity of the pension system and the strictness of the gatekeeper function in the pension system. During this period there have been adjustments in the pension systems in both these two aspects. Given these adjustments and the good microdata the case of Norway is apparently close to ideal setting for studying the effect of the system's generosity and the strictness of the gatekeeper function on the inflow of disability pensioners. The conclusions drawn from such an investigation would not only be relevant for Norwegian policy makers, but for all other countries struggling with the same challenges.

²Bratberg (1999) does not use the replacement ratio in itself, but the income level and the benefit level separately.

This paper argues that in spite of its apparent advantages, the case of Norway is in fact far from ideal.

This paper argues that two mostly overlooked factors complicate the picture. Firstly, it is not only the change in the system in itself that determines the generosity of the system. Changes in the characteristics of the population facing disability matters for the pension level. The Norwegian disability pension is not only determined by the income at the time of disablement. The entire income history, the age profile of the income history and the age when disabled matters for the pension level. If there for some reason is a shift in the underlying disablement process towards people becoming disabled at younger ages, this affects the average pension level and how generous the system is for the typical disability pensioner. We thus need to examine changes in how the pension system awards pension on the basis of the characteristics of the population. In particular, we need to examine how past income is reflected in the pension level. This paper argues that there is no straightforward way of examining the relationship between past income and the pension level. Secondly, in order to measure the effect of an institutional change on the inflow of disability pensioners, we need to pinpoint the time of disablement correctly. Becoming a disability pensioner is a lengthy process in Norway. It typically takes some time between the event that makes a person disabled and the time when he starts receiving disability pension. The time trends in the new disability pensioners may thus not be a good description of the time trends of the number of persons becoming disabled.

In order to illustrate these complications, this paper takes a closer look at the persons who started to receive disability pension in the period 1992-2001 and who were part of the active working force when becoming disabled. I present various measures of the components of the replacement ratios, income and the pension level, and show how these measures have developed over the ten year period. I then present three different measures of the replacement ratios, showing different patterns over time. Even though there are sign of the same gender specific patterns in the time trends for new disability pensioners and for some measures of the replacement ratio, other equally sensible measures show a completely different picture, illustrating the needs for caution when looking for possible explanations.

There are several reasons why we should be careful when examining the relationship

between income and observed pensions. Firstly, as argued in Holen (2007b), the public pension system is only part of the overall generosity. About half of Norway's population is covered by some occupational pension plan, often including a disability insurance plan. Using the individual variation caused by the public pension system thus can misspecify the actual generosity for the individual and lead to wrong conclusions. Secondly, as argued in Holen (2007a), if disability is to some extent foreseen, the rules of the public pension system has implications for work incentives, making the system's generosity partly endogenous for the individual. Both these factors make examinations of the generosity's impact of the growth in disability pensioners complicated. However, even when disregarding these factors, serious problems still remain. This paper focuses on the problems of measurement errors in two crucial variables needed to answer the question of the role of generosity. In order to correctly measure the impact of the system's generosity on the growth of disability pensioners, measuring the generosity and the timing of disablement correctly are of course important. This paper argues that neither of these elements is straightforward to measure and to ignore or overlook this fact can give misleading results on the role of the system's generosity.

Further, in my sample of 190,015 individuals I find that the maximum observed number of years between disablement and the time of entry is 29 years. There are variations in this time interval over the ten year period studied. For example, while the men entering the disability pension system in 1992 on average were disabled 22 months before receiving disability pension, women entering in 1995 had on average 12 months longer time period between disablement and entry. It is important to consider the time a disabled person has to wait before he receives disability pension, before making statements regarding the generosity of the Norwegian disability pension system. In addition, short term variation in new disability pensioners can for this reason be a misleading guide to the underlying process of disablement. The problems of pinpointing the relevant time of becoming disabled also makes impacts of changes in the disability pension system hard to measure. A strengthening of the gatekeeper function may for example affect the inflow of new disability pensioners, but given the long time it takes for a person to be awarded disability pension, it is not clear when, and in what manner it can be expected to be seen in the disability pension register.

The rest of this paper is organized as follows. Section 2 presents the time trends in the official numbers of new disability pensioners, describes the most important changes in the institutional setting and presents the data. Section 3 presents descriptive statistics for variables regarding the generosity of the pension system: past income, the pension level and the ratio of pension to past income. Section 4 presents descriptive statistics on sample distribution over disablement, time of entry and the length of the period between these two events. Section 5 concludes.

2 Institutional change

Figure 1 in the previous section showed the number of new disability pensioners in the public pension system for the years 1992-2001, as reported by the National Insurance Agency (NAV). We see a fairly steady increase from 21,000 persons a year in 1992 to 33,000 in 1999, followed by a sharp decrease in the two next years to 25,000 persons in 2001. Neither changes in the age composition of the population, health measures or unemployment can explain this picture in full. A natural question to ask is then whether there have been changes in the institutional setting of the disability pension system that can explain this picture.

Over the 1992-2001-period there have been some institutional changes in the disability pension system. The specific changes are described in Appendix A. In sum the pension system has increased its redistributive feature over the period, gradually reducing the pension for persons with high income and stepwise increasing the minimum pension, with a ten percent increase in 1998 as the biggest step. The conditions for eligibility have been mostly sharpened, focusing on the underlying cause of disability to be of a medical nature and permanent. Lastly, it has become easier to combine disability pension with labor income. This has been partly done by allowing the possibility of putting the disability pension rights "on hold" while attempting to return to active working life for one year from 1994 and for three years in 1997. In addition, limit on income earned without the pension level being reduced has increased and pension was still awarded even though the degree of disablement was set below 50 percent.

The Norwegian pension system was designed in the 1960s and although there have been

a lot of adjustments since then, the main features remain basically the same. The system was designed on the basis of the surrounding economic conditions at the time. Norway has of course changed in many respects since the late 60's and the effect of the mechanisms of the system may change with the surrounding economic environment. The pension function is a kinked and capped function of the income measure in the pension system, with a minimum pension level. The pension measure is a rather complicated mapping of the entire income history between the age of 17 and the year before disablement, with a special importance on income in the last year, depending on the income profile over age and the age at disablement.³ The manner to which changes in income histories affect the pension level is thus not straightforward. Changes in the demographic structure, changes in female participation rates, changes in the average length of education and the share of the population with high education may all alter the income histories of the population and thus change the attractiveness of the pension system for the overall population. It is thus necessary to examine how changes in the characteristics of the population alter the workings of the pension system. In order to illustrate how the income histories of individuals affect the manner to which individual's income are reflected in the pension level, I present statistics of the persons actually disabled.

For the purpose of this paper, I need to restrict the sample in three respects. The data selection is described in detail in Appendix B. In short, I restrict the sample to disability pensioners where I can correctly identify the start of the period as disability pensioners. Further, I restrict my sample to individuals with sufficient income history, meaning at least five years of positive income and income above 1 G in the last three years. Lastly, I exclude individuals with missing observations in any of the key variables and individuals who were registered with an income above 20 G in all the three last years before disablement.

Figure 2 shows the sample distribution over time of entry. When comparing the time trends of my sample with the official numbers, we see that although the levels are different, the two time trends follow the same pattern. The correlation of the two series is 0.99.

³See Holen (2007a) for details.

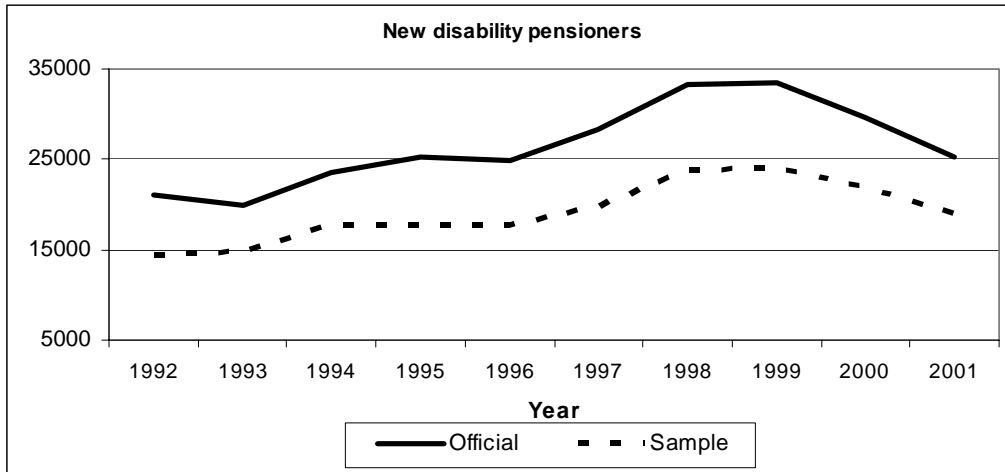


Figure 2: New Disability pensioners in Norway, official number and sample

3 Measuring generosity

In order to answer the question of whether the generosity of the disability pension system can explain the growth in disability pensioners, we need to define what we mean by the system's generosity and decide on a way to measure this definition of generosity. I focus on the replacement ratio as definition of generosity. The replacement ratio is defined as the ratio of the benefit level to income without benefit. Both of these factors need further definitions. Income can either reflect future or past income. I focus on past income in this paper, in order to examine in which way actual income is reflected in the benefit level. For many purposes, potential future income is the most relevant income measure for the replacement ratio. However, potential future income can not be observed and has to be estimated on the basis of observed individual characteristics and past income. I want to make my description as transparent as possible and concentrate on actually observed past income. Past income is not a precisely defined variable. Past income can be income at disablement, income in the last three years before disablement, average income up to disablement or any other measure of past income. Each measure has different relevance for the pension level and different implications for comparisons over time and between demographic groups. Further, actual observed pension may be a natural first choice for measurements of the benefit level. However, I argue that this is not the only relevant measure and perhaps not even the best one.

3.1 Income

Past income is what determines the pension level in the Norwegian public pension system, and is thus a necessary background variable in order to describe the pension level. The public pension system rules are complicated (see Holen (2007a) for an overview), but the average income in the last three years is given a special importance in the calculation of the pension level.

I use several measures of the level of past income in this paper: income in the three last years before disablement, denoted I_{T-i} , where T is the time of disablement and $i = 1, 2, 3$; the average income in the three last years before disablement, denoted I_3 ; the average income over all years with a strictly positive income, denoted I_M .⁴ As argued in Holen (2007a), pension can respond a great deal to changes in income before disablement. Income growth in the final years before disablement is thus interesting as well. Let

$$IG_{T-1} = \frac{I_{T-1} - I_{T-2}}{I_{T-2}} * 100$$
$$IG_{T-2} = \frac{I_{T-2} - I_{T-3}}{I_{T-3}} * 100$$

be the yearly growth in income at time $T - 1$ and at time $T - 2$, respectively, where T is disablement. Let AG be the average growth over the last three years.

Table 1 presents the sample mean and standard deviation of the different income measures before disablement for persons with the same time of entry, by year of entry. All these variables are measured before disablement and not before the time of entry.⁵ We see that the part of the sample that started receiving disability pension in 1998 scores the lowest in all five measures of the income level. Income in the three last years before disablement is humped shaped for all years of entry and income falls by 3.23 percent over the three last years on average. The persons that started receiving disability pension in 2001 scores the highest for all income measures, except for average income where the 1992-group has the highest measure. Tables 12 and 13 in Appendix D presents the statistics for women and men respectively.

The fall in income in the year before disablement can follow from disablement having an effect on the ability to work before the time when disablement is set. It can also

⁴All income is measured in G, the basic measuring unit in the public pension system. From May 1st 2006 it was set to 62,892 NOK, about 10,000 USD.

⁵See section 4 for the distinction between disablement and time of entry

Table 1: Income measures before time of disablement by year of entry and total

Entry	I_{T-1}	I_{T-2}	I_{T-3}	I_M	I_3	IG_{T-1}	IG_{T-2}	AG
1992	4.76	4.79	4.83	4.25	4.79	-3.22	-2.95	-3.08
	(1.91)	(1.93)	(1.99)	(1.80)	(1.85)	(29.02)	(27.95)	(18.39)
1993	4.79	4.83	4.80	4.23	4.81	-3.47	-1.95	-2.71
	(1.92)	(1.97)	(1.98)	(1.78)	(1.86)	(29.45)	(28.54)	(18.42)
1994	4.76	4.82	4.81	4.13	4.80	-4.33	-2.49	-3.41
	(1.96)	(1.98)	(2.03)	(1.77)	(1.88)	(31.86)	(31.79)	(20.56)
1995	4.71	4.76	4.75	4.05	4.74	-4.52	-2.88	-3.70
	(1.99)	(1.97)	(2.01)	(1.75)	(1.87)	(32.25)	(32.81)	(20.98)
1996	4.73	4.78	4.79	4.07	4.77	-4.55	-3.56	-4.06
	(1.99)	(2.01)	(2.01)	(1.73)	(1.88)	(34.32)	(32.70)	(21.37)
1997	4.72	4.77	4.77	4.06	4.75	-3.96	-2.67	-3.31
	(1.95)	(1.99)	(2.02)	(1.73)	(1.88)	(29.59)	(31.29)	(19.38)
1998	4.70	4.76	4.74	4.01	4.73	-4.28	-2.34	-3.31
	(1.97)	(1.99)	(2.02)	(1.70)	(1.89)	(29.99)	(30.05)	(19.24)
1999	4.75	4.78	4.78	4.01	4.77	-3.71	-2.60	-3.16
	(1.98)	(1.99)	(2.03)	(1.69)	(1.89)	(29.42)	(28.95)	(18.73)
2000	4.89	4.91	4.89	4.11	4.89	-3.60	-2.15	-2.88
	(2.02)	(2.04)	(2.05)	(1.72)	(1.93)	(30.25)	(29.81)	(19.10)
2001	4.97	5.02	4.98	4.17	4.99	-3.73	-1.66	-2.70
	(2.05)	(2.07)	(2.10)	(1.72)	(1.97)	(29.34)	(28.82)	(18.65)
Total	4.78	4.82	4.81	4.10	4.80	-3.95	-2.51	-3.23
	(1.98)	(2.00)	(2.03)	(1.74)	(1.90)	(30.55)	(30.32)	(19.50)

Note: Standard error in parenthesis

follow from individuals taking measures to avoid becoming disabled by reducing their labor supply. Unsuccessful measures like this can turn out to be very costly. A fall in income before disablement may reduce disability pension. However, this effect is only present for individuals without sufficiently many years with a high income, as argued in Holen (2007a). The fall in income may thus not necessarily be reflected in the pension level.

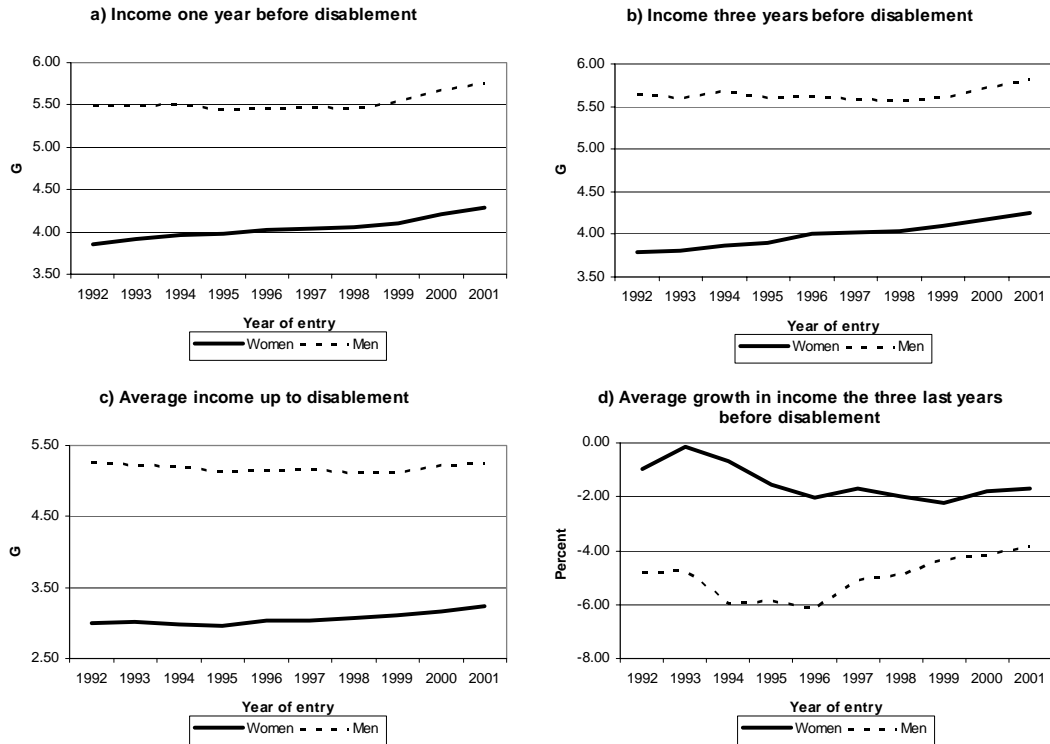


Figure 3: Time trends in measures of income before disablement

Figure 3 show the time trends for income in the last year before disablement (a), average income up to disablement (b), average income in the last three years before disablement (c) and average income growth in the last three years before disablement (d). We see that the income levels not surprisingly are higher for men. While income for women has been steadily increasing during this period, income for men was fairly constant until 1998 and increasing since that. The time trends in the average growth in income over the last three years before disablement shows the most distinct differences between women and men. Income falls for both genders up to disablement, but less so for women. The difference has narrowed over the period, in particular since 1994.

Holen (2007a) shows how a fall in income just before disablement can reduce the pension level to a various degree, depending on the income history. The effects of the changes in the income measure on the pension level are thus not straightforward. Therefore, having the statistics of the income measures in mind, I now turn to describing the pension levels in the next subsection.

3.2 The pension level

Even the pension level can be defined and measured in different ways, with different implications for comparisons over time. Actual yearly pension at the time of entry is reported as Pension. This includes an addition to the pension for persons supporting children (a fixed amount per child) or spouse. Pension without this addition is reported as "Pure pension". The pure pension depends on previous income only and has a maximum. Before the pension reform in 1992 the maximum was 4.4986 G. In the pension system after the reform, the maximum is 3.94 G. Persons who had an income for at least 20 years before 1992 can potentially get a pension of 4.4986 G even though they retire after the pension reform in 1992. The average degree of disablement at first registration is reported as "Degree of disablement". Disability pension is only awarded for an initial degree of disablement of 50 or higher and paid out as a proportion to this degree.⁶ The degree of disablement is not fixed but can change over time. The share of the sample that has been registered as having changed the degree of disablement, and thus the pension level, since the first registration is reported as "Change share". The reported "Adjusted pension" is found by dividing the pure pension by the degree of disablement and is what the pension level would be if the person were 100 percent disabled, excluding additions for supporting a spouse or children. My motivation for adjusting the pure pension level and not the actual pension level is that the addition in pension for supporting children under the age of 18 or a spouse does not depend on the degree of disablement and is of a temporary nature: children will eventually turn 18 and additions for supporting a spouse are phased out if the spouse has an income above 1 G or receives an old age or disability pension. The reported "Min. share" is the share of the sample, for each year of entry that received the minimum pension.

Table 2 reports the pension measures by year of entry. We see that excluding the additional pension for supporting children or a spouse reduces the pension level by 0.2-0.3 G. 1992 is the year with the highest levels of pension for Pension and Pure Pension.

⁶Persons earning more than 1 G (0.5G before 1997) when receiving disability pension will have their degree of disablement re-evaluated. Since 1997 they keep their disability pension as long as their degree of disablement is not below 20 percent. There have been experiments with disability pension being granted for persons with a degree of disablement lower than 50 percent, but later than the period studied here.

The additions in pension for supporting children or spouse do not vary with the degree of disablement.

Table 2: Pension levels and degree of disablement by time of entry

Year of entry	Pension	Pure pension	Adj. pension	Disab. degree	Change share	Age	Min. share
1992	2.29 (0.87)	2.26 (0.85)	2.57 (0.71)	87.28 (20.95)	0.17	54.89 (9.31)	0.10
1993	2.27 (0.87)	2.24 (0.85)	2.58 (0.70)	86.44 (22.04)	0.19	54.00 (9.44)	0.10
1994	2.24 (0.87)	2.22 (0.85)	2.59 (0.70)	85.08 (22.24)	0.21	52.16 (9.90)	0.09
1995	2.21 (0.86)	2.19 (0.84)	2.58 (0.71)	84.71 (22.03)	0.21	51.52 (10.09)	0.10
1996	2.21 (0.87)	2.19 (0.85)	2.58 (0.71)	84.64 (21.90)	0.21	51.81 (9.90)	0.09
1997	2.22 (0.86)	2.20 (0.85)	2.59 (0.71)	84.66 (21.91)	0.20	51.86 (9.78)	0.09
1998	2.18 (0.85)	2.16 (0.83)	2.56 (0.69)	84.35 (22.06)	0.19	51.96 (9.64)	0.11
1999	2.17 (0.84)	2.14 (0.82)	2.54 (0.68)	84.16 (22.19)	0.16	51.82 (9.49)	0.13
2000	2.20 (0.86)	2.17 (0.84)	2.58 (0.68)	84.05 (22.19)	0.14	52.28 (9.20)	0.11
2001	2.21 (0.86)	2.19 (0.84)	2.60 (0.68)	83.92 (22.26)	0.11	52.72 (8.93)	0.10
Total	2.21 (0.86)	2.19 (0.84)	2.58 (0.70)	84.79 (22.03)	0.18	52.39 (9.62)	0.10 (0.30)

Note: Standard deviation in parenthesis

However, the disablement degree when first registered is falling over time. Adjusting the pension level for this fact makes 2001 the year with the highest pension. Looking at the Change share-column, that is the share of the sample that have changed the degree of disablement at least once in this ten year period, we see that this share is falling at the end

of the observation period, not surprisingly given the shorter time period the late entries have had for the degree of disablement to change. It is thus likely that the observed Change-shares would increase if the observation period was longer. For the first part of the period there is a strong negative correlation between the degree of disablement and the share that has changed this degree.

This leads me to conclude that groups with a lower value of the degree of disablement at first registration are likely to increase this value over time and that groups with an initial high value of degree of disablement are more likely to remain at this high level. Adjusting the pension level for the degree of disablement is then a good idea since it can be viewed as representing the long term pension level of the group. Comparing the first and the last registered degree of disablement for the part of the sample, we see that 62 percent have a degree at last registration higher than at first registration, while only 4 percent have a lower degree at the end of the observed period. The remaining 34 percent are back at their original level at the end of the observation period.

We see that the average age of the new disability pensioners follows an almost U-shaped pattern over time, with the highest age in 1992 and an age over three years less in 1995. The share of new disability pensioners with a minimum pension has varied between 9 and 13 percent over time, with 1999 as the year with the highest share. Tables 14 and 15 in Appendix D show the pension measures for women and men, respectively.

Figure 4 shows the gender specific time trends in the observed pension level (a), the pure pension level (b), the adjusted pension level (c), the degree of disablement (d), the share of the sample that have changed the degree of disablement during the observed period (e) and the share of the sample that receives a minimum pension (f).

The upward sloping income for women seen in Figure 3a and 3b is not reflected in the pension or pure pension level. However, we see that the adjusted pension is upward sloping, more so for women than men. The adjusted level is upward sloping for both genders. This is because of the downward sloping degree of disablement for both genders. Adjusting for the degree of disablement not only increases the levels and decreases the gender differences, but changes the slope as well. A sign that it is relevant to adjust the pension level in this manner can be seen in Figure 4e. While the degree of disablement is 8-11 percentage points higher for men than for women, the share that changes the

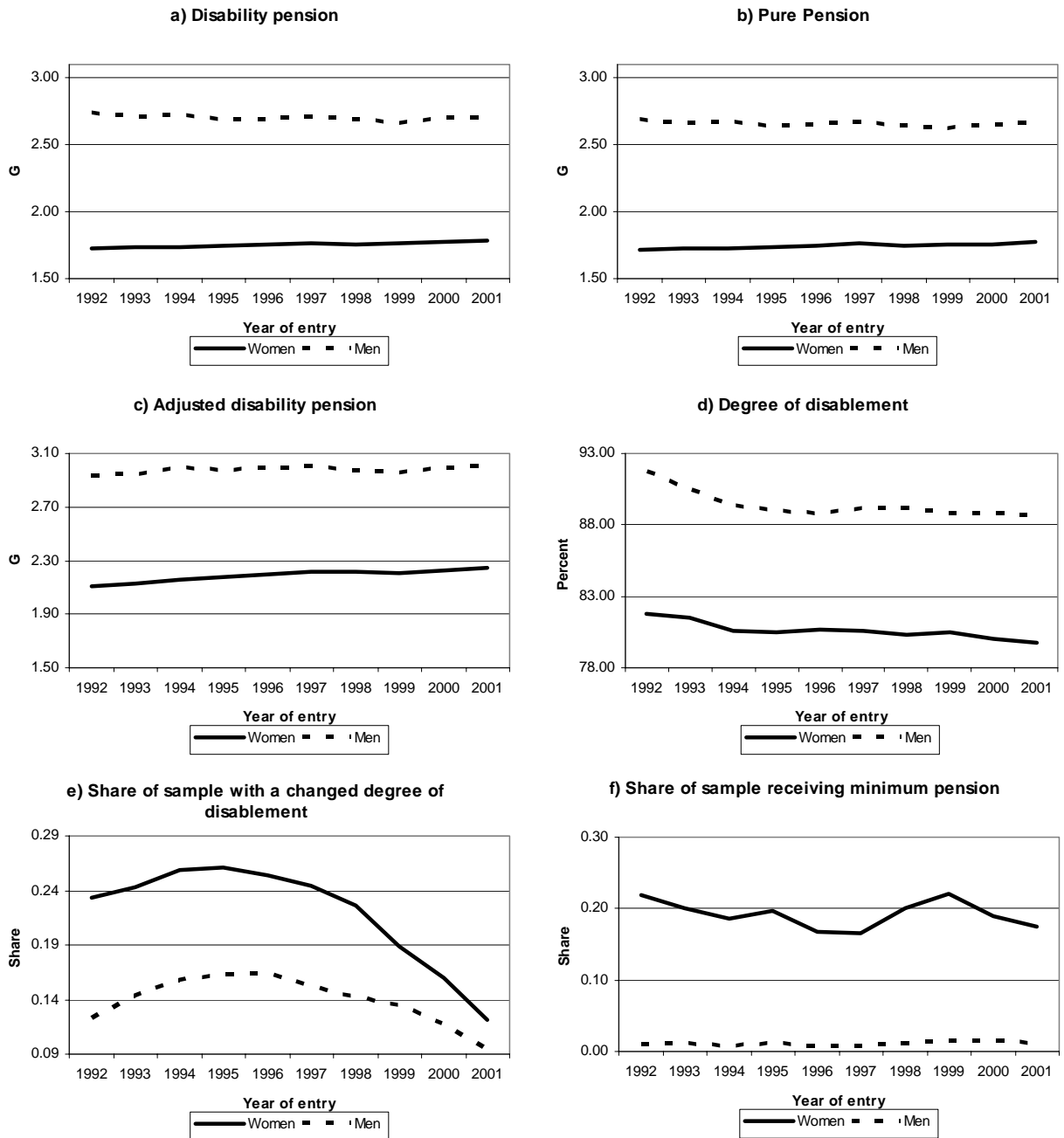


Figure 4: Time trends in measures of disability pension and degree of disablement

degree of disablement is up to ten percentage points higher for women. A sign that the disablement degree is most likely to change upwards can be found when comparing the first and the last registered disablement degree in the observation period. For both women and men 62 percent of the ones that have changed their disablement degree are registered with a higher degree at the end of the observation period than originally. 5 percent of the men and 3 percent of the women are registered with a lower degree than originally.

The difference in the share of persons receiving the minimum pension is striking. For men, the share has been stable at a low level, around one percent. For women the share is much higher, between 17 and 23 percent, and varying over the period. The big increase in the minimum pension in 1998 not only increased the minimum pension, but also effectively increased the maximum level of pension rights for becoming a disability pensioner. The spike in female minimum pensioners fits well with this fact.

Holen (2007a) shows that the importance of the income in the three last years before disablement for the pension level varies with the income profile over time. The size of the pension depends on the amount of years of earning an income of 1 G or more (up to 40 years) and the 20 years with the highest income. A weaker income history in the sense that there are fewer years with an income over 1 G and many years with low income makes pension lower for a given current income. The labor participation rate of women has increased in Norway over time.⁷ It may be reasonable to assume that the women with a late year of entry on average are younger than the women entering early in the period and thus have been active in the labor force for more years yielding a pension wise more robust income history.

This subsection has provided descriptive statistics of different pension level measures over age, gender and time of entry. One major point is that the actual pension level at the start of the disability spell is not the only way, perhaps not the best way, of measuring the average pension level. In my sample there are a total of 17.76 percent who have changed their degree of disablement over the period and thus changing the pension level as well. One should therefore take care when defining the pension level for empirical studies. Another major point is the loose link between income at the time of retirement and the

⁷See Bech-Moen (2006) for a data description of gender specific changes in hours worked in the market in Norway 1971-2000.

pension level. The coefficient of correlation between the time series of income in the year before disablement and adjusted pension is 0.92 for women and only 0.39 for men. This follows partly from the redistributive features of the pension system in combination of the higher income levels for men, but also from the way the pension level is determined from past income. For persons with a long history of income at high levels, income just before disablement does not affect the pension level that much. For person with a "weaker" income history, income in the final years before disablement is very important for the pension level. The relationships between the pension level and different measures of past income are explored in the next subsection.

3.3 Replacement ratios

The last two subsection discussed different measurements of the income level and the pension level, the two components of the replacement ratios. In this subsection, I restrict myself to only one measure of the pension level, Adjusted pension, which I argue is a good measure of the long term pension level. Using the adjusted pension level, I then show how the replacement ratios, as a measure of the system's generosity, varies with the three different income measures described in section 3.1.

The replacement ratio is then defined in the three following ways:

$$\begin{aligned} RR_1 &= \frac{D}{I_{T-1}} \\ RR_M &= \frac{D}{I_M} \\ RR_3 &= \frac{D}{I_3}, \end{aligned}$$

where D is the pension level, excluding additions for supporting children or a spouse, adjusted for the degree of disablement, I_{T-1} is income in the year before disablement, I_M is the average income in all years with positive income and I_3 is average income in the last three years before disablement.

The mean and standard deviations of the three replacement ratios by year of entry are given in Table 3. Aggregated over women and men, we have $RR_M > RR_1 > RR_3$ for all years of entry. The pension system is thus most generous when comparing the pension level with average lifetime income and the least generous when comparing to average income in the last three years. Interestingly, when looking at women and men

separately this is only true for women. For men, the system is at the most generous when comparing the pension level to the income level in the last year before disablement. That the RR_1 -measure is highest for men has to do with the large average fall in income just before disablement and that the response in the pension level to this fall is moderate due to the fact that men on average has a more robust income history.

Table 3: Replacement ratios by time of entry

		Total			Women			Men		
Entry		RR_1	RR_M	RR_3	RR_1	RR_M	RR_3	RR_1	RR_M	RR_3
1992	mean	0.60	0.67	0.58	0.60	0.78	0.60	0.59	0.58	0.56
	std	(0.24)	(0.23)	(0.18)	(0.23)	(0.28)	(0.20)	(0.25)	(0.13)	(0.16)
1993	mean	0.59	0.67	0.58	0.59	0.78	0.59	0.60	0.59	0.57
	std	(0.24)	(0.23)	(0.18)	(0.22)	(0.28)	(0.19)	(0.25)	(0.13)	(0.17)
1994	mean	0.60	0.70	0.58	0.59	0.8	0.59	0.61	0.60	0.57
	std	(0.25)	(0.24)	(0.18)	(0.21)	(0.28)	(0.18)	(0.29)	(0.13)	(0.17)
1995	mean	0.61	0.71	0.59	0.60	0.80	0.59	0.62	0.61	0.58
	std	(0.26)	(0.24)	(0.19)	(0.23)	(0.27)	(0.19)	(0.29)	(0.13)	(0.18)
1996	mean	0.61	0.70	0.59	0.60	0.79	0.59	0.62	0.61	0.58
	std	(0.25)	(0.23)	(0.19)	(0.23)	(0.27)	(0.19)	(0.28)	(0.13)	(0.19)
1997	mean	0.61	0.71	0.59	0.60	0.79	0.59	0.62	0.61	0.59
	std	(0.25)	(0.23)	(0.19)	(0.22)	(0.27)	(0.18)	(0.29)	(0.13)	(0.20)
1998	mean	0.61	0.71	0.59	0.60	0.79	0.59	0.62	0.61	0.59
	std	(0.26)	(0.24)	(0.2)	(0.23)	(0.27)	(0.19)	(0.29)	(0.14)	(0.20)
1999	mean	0.60	0.70	0.58	0.59	0.78	0.58	0.61	0.61	0.58
	std	(0.26)	(0.23)	(0.20)	(0.23)	(0.26)	(0.19)	(0.29)	(0.14)	(0.20)
2000	mean	0.59	0.69	0.57	0.58	0.76	0.57	0.60	0.60	0.57
	std	(0.25)	(0.22)	(0.19)	(0.22)	(0.24)	(0.18)	(0.28)	(0.14)	(0.20)
2001	mean	0.58	0.68	0.57	0.57	0.75	0.56	0.59	0.61	0.57
	std	(0.25)	(0.21)	(0.19)	(0.22)	(0.24)	(0.18)	(0.27)	(0.14)	(0.20)
Total	mean	0.60	0.69	0.58	0.59	0.78	0.58	0.61	0.60	0.58
	std	(0.25)	(0.23)	(0.19)	(0.23)	(0.27)	(0.19)	(0.28)	(0.14)	(0.19)

All rates peak in the 1995-1998 period for men. For women, RR_M peaks earlier and RR_3 falls over the period. The three replacement rates are at the lowest in 2001 for women and in 1992 for men. When comparing each replacement ratio across genders, we see that RR_1 is higher for men than for women, while RR_M is higher for women. The third replacement ratio, the ratio of pension to average income the last three years, RR_3 , is higher for women at the first five years of the period, but higher for men in the last year.

Figure 5 shows the time trends in yearly growth in income one year before disablement (a), the ratio of adjusted pension to income in the last year before disablement, RR_1 , (b), the ratio of adjusted pension to average income up to disablement, RR_M , (c) and the ratio of adjusted pension to average income in the three last years before disablement, RR_3 , (d). When measuring the pension level relative to average income up to disablement (Figure 5c), the replacement ratio for men is slightly increasing over the period. For women on the other hand, this replacement ratio was increasing up to 1995 and then falling for the rest of the period. When measuring the disability pension relative to income in the last year and the average income in the three last years before disablement, the replacement ratios for men are humped shaped over the period, increasing to a maximum in 1997 and sharply decreasing through the remaining period. For women, these two measures of the replacement ratios, RR_1 and RR_3 , are basically falling over the period, but with two spikes, in 1995 and 1998. The minimum pension was increased in both of these years, but in 1994 and 1997 as well. A fall in income in the last year before disablement need not affect the pension level too much. If this is the case, a fall in income will increase RR_1 , but not RR_3 and RR_M to the same extent. We see that women has a lower drop in income than men and that Figures 5b and 5c show about the same level and trend for women, this is not the case for men. The difference in RR_1 and RR_3 for men is reduced in the end of the period, where the decrease in income is relatively low. The time trend in RR_1 can thus be explained by the time trend in the fall in income before disablement combined with the fact that men on average have income histories where a fall in income does not lead to a subsequently fall in pension.

The Norwegian pension system has redistributive features, giving more weight to income at low levels. Further, the minimum pension level and additions for supporting

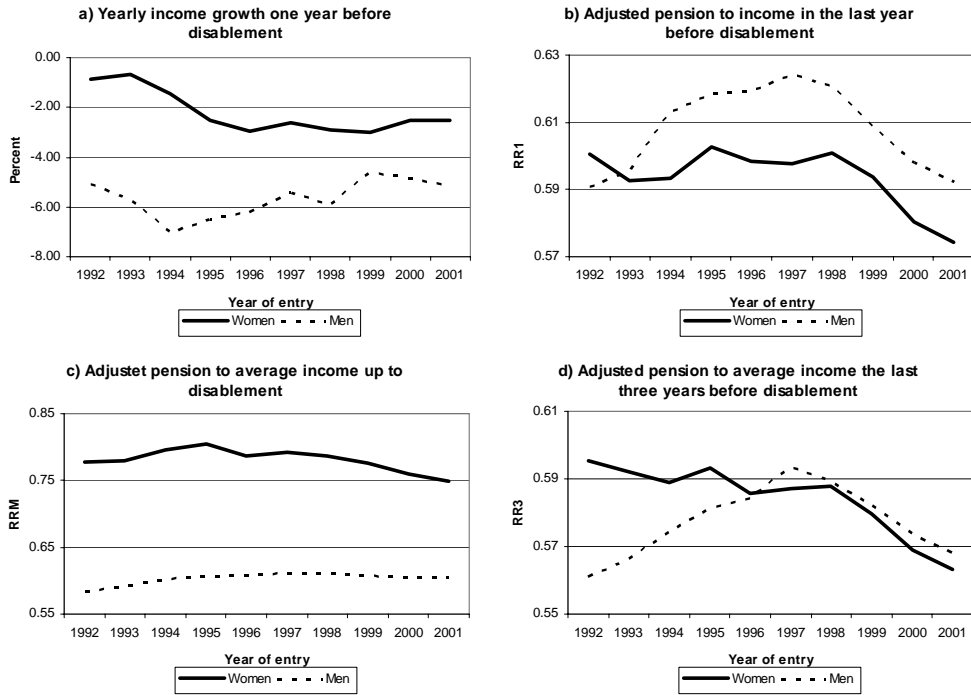


Figure 5: Time trends in income growth and three measures of the replacement ratio

children or spouse makes the pension level high relative to income for low levels, as documented by Fevang and Røed (2006). The replacement ratios thus depend on the income level. In particular it is interesting to document the measures of the replacement ratios for the part of the sample that receives the minimum pension level. Table 4 shows the mean and standard deviation of the three replacement ratios for the persons receiving minimum pension in the sample.

For women all three replacement ratios are almost stable or slightly humped shaped over the period. The minimum pension is on average somewhat below 70 percent of the income in the last year and the average over the last three years. The minimum pension makes up about 90 percent of the average lifetime income up to disablement. The replacement ratios are varying more for men, not surprisingly given the low frequencies of minimum pensioners among men. There is no sign of the 10 percent increase in the minimum pension in 1998. The effect of that increase is not just that the pension was increased for all that previously would receive the minimum pension. More people with high income was now included in the minimum pension, contributing to a decrease in the measures of the replacement ratios.

Table 4: Replacement ratios by time of entry, minimum pension

Entry	Total			Women			Men		
	RR_1	RR_M	RR_3	RR_1	RR_M	RR_3	RR_1	RR_M	RR_3
1992	0.69	0.93	0.69	0.68	0.93	0.68	0.86	0.91	0.81
	(0.25)	(0.33)	(0.22)	(0.24)	(0.33)	(0.21)	(0.35)	(0.30)	(0.27)
1993	0.69	0.93	0.69	0.68	0.94	0.68	0.78	0.87	0.76
	(0.26)	(0.34)	(0.23)	(0.25)	(0.34)	(0.22)	(0.36)	(0.31)	(0.30)
1994	0.69	0.95	0.69	0.68	0.95	0.68	0.80	0.89	0.72
	(0.24)	(0.33)	(0.21)	(0.23)	(0.33)	(0.20)	(0.33)	(0.32)	(0.23)
1995	0.70	0.94	0.69	0.69	0.95	0.69	0.79	0.81	0.67
	(0.25)	(0.33)	(0.21)	(0.24)	(0.33)	(0.20)	(0.44)	(0.32)	(0.26)
1996	0.71	0.94	0.69	0.70	0.94	0.68	0.84	0.90	0.79
	(0.27)	(0.35)	(0.23)	(0.26)	(0.35)	(0.22)	(0.52)	(0.33)	(0.45)
1997	0.70	0.94	0.68	0.69	0.94	0.68	0.84	0.88	0.77
	(0.25)	(0.36)	(0.21)	(0.24)	(0.36)	(0.21)	(0.37)	(0.32)	(0.30)
1998	0.70	0.92	0.68	0.69	0.93	0.68	0.80	0.82	0.72
	(0.27)	(0.35)	(0.22)	(0.26)	(0.35)	(0.22)	(0.37)	(0.31)	(0.29)
1999	0.69	0.90	0.67	0.68	0.91	0.66	0.80	0.83	0.75
	(0.26)	(0.34)	(0.22)	(0.25)	(0.34)	(0.21)	(0.39)	(0.35)	(0.34)
2000	0.66	0.88	0.65	0.66	0.89	0.65	0.77	0.84	0.73
	(0.26)	(0.33)	(0.22)	(0.25)	(0.33)	(0.21)	(0.39)	(0.40)	(0.33)
2001	0.66	0.88	0.65	0.66	0.88	0.64	0.77	0.88	0.72
	(0.26)	(0.32)	(0.22)	(0.25)	(0.31)	(0.21)	(0.39)	(0.34)	(0.31)
Total	0.69	0.92	0.67	0.68	0.92	0.67	0.80	0.85	0.74
	(0.26)	(0.34)	(0.22)	(0.25)	(0.34)	(0.21)	(0.39)	(0.34)	(0.31)

Note: Standard deviation in parenthesis

Evaluating the generosity of the pension system can not be done in a clear cut way. The pension level depends not only of income at the time of disablement, but also on the degree of disablement, the number of children one is supporting, the income history up to disablement and the age at disablement. The ratio of pension to income before

disablement thus varies across time, age, gender, income and what is meant by income before disablement. One should carefully take these matters into consideration before passing judgments about the generosity of the pension system, and when incorporating a measure of the generosity into a model of the economic incentives of disability retirement.

4 The timing of inflow

The last section showed how measurements of the system's generosity are highly dependent on how the components of the generosity measure are defined. This is of course problematic when examining whether the generosity affects the growth in disability pensioners. One might think that measuring the growth in disability pensioners is less problematic. This section argues that such is not the case. For comparisons over time, it is of course extremely important that disablement is correctly pinpointed in time. However, to correctly pinpoint the time of disablement is no simple task. It typically takes time to become a disability pensioner. A person that starts receiving disability pension at a particular point in time has normally spent several years in the welfare system after he became disabled. For example, increased focus on limiting the number of disability pensioners can have an effect, but possibly at the expense of people spending a longer time period before eventually being awarded disability pension.

4.1 Time of entry

The time of entry is set as the first year the person is registered with a disability pension. Table 5 shows the number of persons in my sample, in total numbers and in percentage points of the sample, by year of entry, as well as the sample distribution of men by time of entry. I also present my sample's share of Norway's total population aged 25-67. The male share of the total population has been almost constant around 50.7 percent over the period. However, the sample share of men is decreasing from a highpoint of 55.6 percent in 1992 to a low point of 44.7 in 1999, with a increase up to 46.7 percent in 2001.

The years 1998 and 1999 stand out as peak years in the sample. On average, 0.77 percent of the total population enters the sample each year, peaking at 0.95 percent in 1998 and 1999 and with a low at 0.62 percent in 1992 and 1993. We see the same pattern

Table 5: Time of entry

Year of entry	Individuals	Percent of sample	Sample share of total population	Male share of sample
1992	14,411	7.58	0.62	55.64
1993	14,702	7.74	0.62	55.41
1994	17,642	9.28	0.74	51.65
1995	17,669	9.30	0.73	49.90
1996	17,557	9.24	0.72	48.89
1997	19,777	10.41	0.80	47.74
1998	23,665	12.45	0.95	46.00
1999	23,835	12.54	0.95	44.74
2000	21,877	11.51	0.86	46.08
2001	18,880	9.94	0.74	46.71
Total	190,015	100.00	0.77*	49.27*

Note: * average over the period

when looking at women and men separately, in Table 16 in Appendix D.

Looking at the time of entry, we see variations over time with the years 1998 and 1999 as peak years and a falling trend in the last two years. However, the time of entry shows only one part of the picture of the disablement process. Typically it takes some time from the person is unable to work to the time of the first disability pension. The next subsection presents the sample distribution over disablement and the length of the period between disablement and the time of entry, which I call In-between-period.

4.2 Disablement and In-between-period (IBP)

This subsection describes sample distribution of disablement and the number of months between disablement and the time of entry, called In-between-period (IBP).

Table 6 shows the number of persons, the share of the sample and the male share of the sample in percentage points by year of disablement as well as the sample's share of Norway's total population aged 25-67. The first thing to notice is simply the length of the

period. For persons who first started to receive disability pension in the period 1992-2001, the registered first disablement goes all the way back to 1972. This is in fact the earliest possible disablement, as income registers go back to 1967 and as I impose an income criterion of having at least five years of positive registered income before disablement. The latest time of entry is 2001 and the largest possible length of the period between disablement and the time of entry is thus 29 years. Over 90 percent of the sample is disabled in the period 1990-2000 though.

The years 1996 and 1997 are peak years both within the sample and as sample share of the population, in contrast to 1998 and 1999 for the time of entry presented in Table 5. Very few are disabled in 2001, indicating that few receive disability pension in the same year as disablement is declared. Remember that the cut off point regarding the time of entry is 1992. The fact that 1991 is a local maximum indicates that having the time of entry one year later than disablement is not uncommon.

While the male share of the population has been fairly constant around 50.7 since 1991, the sample share of men has been falling from 1991 to 1997.⁸ Since 1997 it has been increasing. The corresponding table for women and men separately is presented in the Appendix D as Table 17. In short, they show the same pattern, but the distribution for women is more concentrated around the years 1996-1999.

I measure the time from disablement to entry in the number of months between the two events and label this period as In-between-period, IBP. The contents of this IBP typically involves long term sick leave and medical and vocational rehabilitation, but are not handled here (see Fevang and Røed (2006) for a discussion of the benefit history of persons starting their disability pension spell in 2002). Table 7 shows the mean and standard deviation of the length of IBP for the whole sample, women, men and for nine age groups. It takes 28 months on average between disablement and entry and on average longer for women than men. The length of IBP is humped shaped over age groups. The two groups becoming disabled between 33 and 42 years have almost four years between disablement and entry, while the youngest and oldest groups only have 17 months between the two events. The IBP has not been constant over time though. Except for the two youngest and oldest groups, the IBPs are humped shaped over time, peaking in 1994-1996.

⁸Appendix C describes the age distribution of the sample.

Table 6: Time of disablement

Year of disablement	Total	Percent of sample	Sample share of population	Male share of sample
1972-1979	243	0.13	0.01	51.44
1980	95	0.05	0.00	48.42
1981	144	0.08	0.01	54.86
1982	208	0.11	0.01	56.25
1983	294	0.15	0.01	53.40
1984	389	0.20	0.02	53.98
1985	624	0.33	0.03	46.96
1986	1,078	0.57	0.05	48.42
1987	1,806	0.95	0.08	47.67
1988	3,294	1.73	0.15	50.64
1989	5,650	2.97	0.25	49.06
1990	9,574	5.04	0.42	48.91
1991	18,629	9.80	0.81	53.41
1992	16,289	8.57	0.70	53.31
1993	14,899	7.84	0.63	50.90
1994	15,150	7.97	0.64	49.16
1995	17,010	8.95	0.70	46.65
1996	19,257	10.13	0.79	46.09
1997	20,625	10.85	0.84	45.40
1998	18,719	9.85	0.75	45.75
1999	16,240	8.55	0.65	48.05
2000	9,382	4.94	0.37	49.23
2001	416	0.22	0.02	49.76
Total	190,015	100.00	0.34*	48.72

Note: * Average over the period

It is worth stressing the quantitative importance of the variation in IBP. Aggregated over the whole sample, the IBP varies between 23 months in 1992 and 33 months in 1995, a difference of almost a year. The difference between persons becoming disabled in 1993

Table 7: Average In-between-period in months by age group and year of entry

Age	Year of entry										Total
	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	
25-27	16.0	12.7	18.1	19.4	14.0	13.7	20.4	20.2	15.8	19.4	17.8
	(6.3)	(7.3)	(8.0)	(9.1)	(2.7)	(4.6)	(7.8)	(8.1)	(8.5)	(4.4)	(7.6)
28-32	33.4	34.0	39.5	38.4	40.7	38.8	34.6	37.1	38.4	34.7	37.3
	(18.3)	(16.5)	(20.2)	(20.2)	(22.2)	(20.8)	(18.2)	(20.2)	(20.2)	(18.3)	(19.9)
33-37	40.2	44.8	49.6	50.2	49.3	49.3	47.6	44.7	43.4	42.6	46.5
	(26.1)	(26.5)	(27.7)	(27.5)	(30.1)	(31.8)	(30.8)	(30.2)	(30.4)	(28.3)	(29.5)
38-42	42.9	45.7	48.6	51.3	49.0	50.3	47.0	44.0	41.1	42.7	46.4
	(28.8)	(29.8)	(30.2)	(30.7)	(31.9)	(35.7)	(35.9)	(34.1)	(31.8)	(32.4)	(32.8)
43-47	37.2	41.2	45.7	46.5	47.3	43.6	40.6	39.6	36.8	38.0	41.7
	(28.0)	(29.0)	(28.0)	(30.1)	(32.4)	(34.1)	(32.8)	(33.0)	(30.3)	(29.7)	(31.3)
48-52	32.2	36.9	41.2	41.1	39.0	37.2	33.7	31.6	30.6	31.6	28.3
	(23.8)	(25.8)	(27.0)	(28.2)	(27.9)	(29.3)	(28.7)	(27.5)	(27.1)	(25.5)	(23.9)
53-58	24.4	29.6	33.2	33.9	31.0	29.5	27.9	26.8	25.1	25.4	28.3
	(17.7)	(22.5)	(23.2)	(24.6)	(25.1)	(25.5)	(25.1)	(25.8)	(22.5)	(20.8)	(23.9)
59-62	18.9	22.3	24.5	24.0	22.6	22.3	20.5	19.9	18.5	19.6	21.1
	(16.0)	(17.4)	(17.0)	(19.2)	(18.5)	(19.9)	(19.6)	(18.3)	(17.1)	(16.8)	(18.2)
63-67	15.3	18.0	19.9	18.5	18.0	18.2	16.8	16.9	15.9	16.6	17.4
	(12.0)	(14.0)	(15.3)	(13.0)	(16.3)	(16.3)	(13.4)	(17.6)	(13.6)	(14.8)	(14.7)
Women	24.1	28.9	33.6	33.9	31.8	30.8	28.4	27.6	25.8	26.1	29.0
	(20.6)	(23.4)	(24.8)	(26.1)	(26.2)	(27.2)	(25.7)	(25.5)	(22.9)	(22.4)	(24.9)
Men	22.4	26.3	30.7	31.4	30.5	29.8	27.9	26.9	25.1	25.4	27.7
	(20.3)	(22.1)	(24.2)	(25.6)	(26.9)	(27.7)	(27.4)	(27.4)	(25.4)	(23.9)	(25.5)
Total	23.2	27.4	32.1	32.7	31.2	30.3	28.2	27.3	25.5	25.8	28.4
	(20.4)	(22.7)	(24.5)	(25.9)	(26.6)	(27.5)	(26.5)	(26.4)	(24.1)	(23.1)	(25.2)

Note: standard deviation in parenthesis

at an age between 25 and 27 years, and persons becoming disabled in 1995 becoming disabled at an age between 38 and 42 years, was almost 40 months.

The long time it takes from disablement to being awarded disability pension, and the

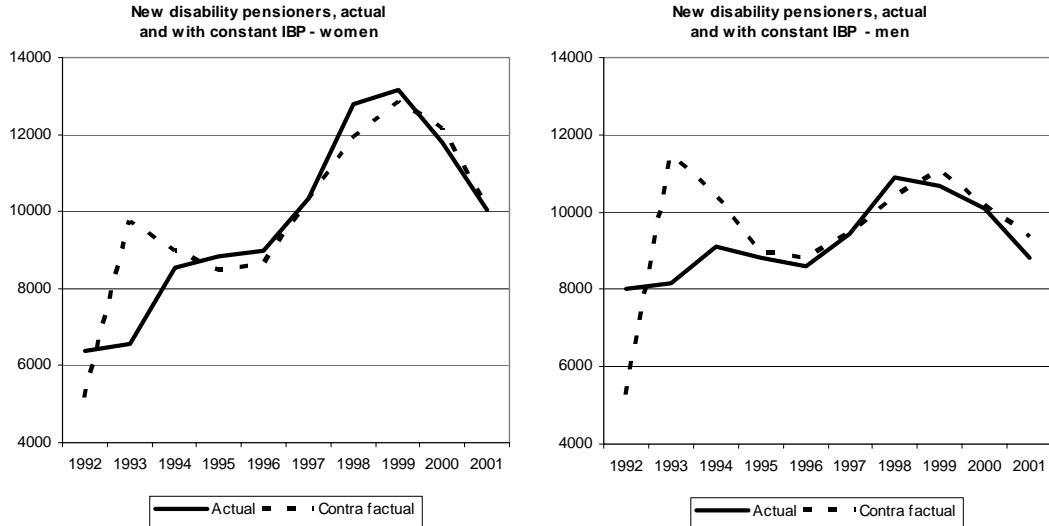


Figure 6: Actual and contra factual time trends in disability, women (a) and men (b)

variation in this time, complicates analysis of time trends in disablement a great deal. Both changes in the institutional setting and changes in the surrounding economic and demographic environment as well as the underlying changes in the disablement process will be seen as variation of the inflow of disability pensioners with various time lags. Successful reform of the pension system, i.e. a reform that limits the inflow, may seem to have no effect in the short run. Similarly, a reform may seem successful in the short run may in reality just increase the hold up in the system.

The impact of the variation in the time between disablement and entry on the number of new disability pensioners is worth looking into in more detail. Figure 6 compares the actual number of new disability pensioners with a contra factual number. The contra factual number is found by imposing the average IBP in 2001 for women and men, 26 and 24 months respectively, for all the persons in the sample. This stretches the entry period to 1974-2004. The number of person with a time of entry between 1992 and 2001 is thus smaller in the contra factual time series than in the actual one. For comparison, I rescale the contra factual time series to match the actual one in the middle of the period, in 1997.

We see that the effect is largest in the beginning of the period, where there would have been a much higher inflow given a shorter IBP. A constant IBP would decrease the

inflow in 1995-1996 and 1998-1999 for women. For men, the time series change less, but the 1998 inflow would have been somewhat smaller and the 1999-2001 inflow somewhat larger. The variations in IBP can therefore not explain much of the increase in the late 90's, but might contribute to explaining why the inflow was so low in the early 90s.

I conclude this section by stressing the importance of looking at disablement when evaluating the number of new disability pensioners. The dynamics of disablement are the basis for the development of new disability pensioners, but the time it takes before people becoming disabled vary with age and time. Changes in the dynamics in the disablement process may thus take some time before it shows in the statistics of disability pensioners. Further, political pressure and awareness of the consequences of an increase in the number of disability pensioners may increase the rehabilitation efforts. If the efforts are unsuccessful the only consequence is an increase in the time spent between becoming disabled and starting to receive disability pension. The number of new disability pensioners may thus decrease in the short run, when in reality the only difference is an increased hold up in the process.

5 Conclusion

This paper is a word of caution to researchers and policy makers, trying to explain or remedy the time trends in the share of the population receiving disability pension. Over 300,000 persons receive disability pensions in Norway today and we need to understand why 11 percent of the population between 18 and 67 years are seemingly unable to support themselves through working. One might wonder if the disability pension system is partly a part of the problem, causing people that otherwise would manage to work to claim disability pension. If so, the economic incentives for claiming disability pension and the gatekeeper function in the system may explain the high share of the population receiving disability pension.

What we want to explain is the time trends in the number of new disability pensioners over the period 1992-2001. Figure 7a, shows the gender specific number of new disability pensioners by the year they first started receiving disability pension and thus were registered in the disablement register. These trends are clearly upward sloping up to 1998 and

falling from 1999. The number of new female disability pensioners overturned the male number in 1995 and the time trends for women are more pronounced over the whole time period. When attempting to explain such a picture, one might want to "round up the usual suspects", so to speak. One might tend to think that this has to have something to do with economic incentives. It has either become more attractive to apply for disability pension or easier to be granted such a pension. Over this period there have been some changes in the design of the pension system that can affect both the attractiveness and how easy it is to be let into the system. Figure 7 further shows some suggested candidates for explaining the inflow of new disability pensioners: the share of the inflow receiving a minimum pension (b), the three measures of the replacement ratio (c-e) and the average number of months between disablement and entry (f). Further candidates are institutional changes, causing the generosity of the system to change or the strictness of the gatekeeper function.

The point of this paper is not to explain the time trends in disability, but rather to point out that although one might find one data series that seems to explain the variation, there might be several other measurements of the same variable that is not consistent with data. Further, one need to be aware of the fact that the inflow of new disability pensioners is not a representation of the time trends in disability. If we wish to understand the driving forces of the process behind disability, the time series of new disability pensioners is perhaps not the ideal time series to study. The mechanisms of the pension system, with its sick leave and rehabilitation period, may hide the underlying dynamics of disablement. In the demanding world of empirical research it can sometimes be tempting to stop searching for explanations when the results are "good", i.e. that the theoretical explanation yields empirical implications consistent with data. The consistency with data of course depends on how the data is measured, which can be done in several ways, each with an a priori sensible foundation. This paper exemplifies that we should take care not to hastily jump to conclusions when the question apparently is successfully answered.

In conclusion, I stress the factors that in my opinion are important to consider before concluding on what the causes of the growth in disability pensioners are, as a sort of check list for future research and evaluations of past research:

One needs to consider the time between disablement and entry into the pension sys-

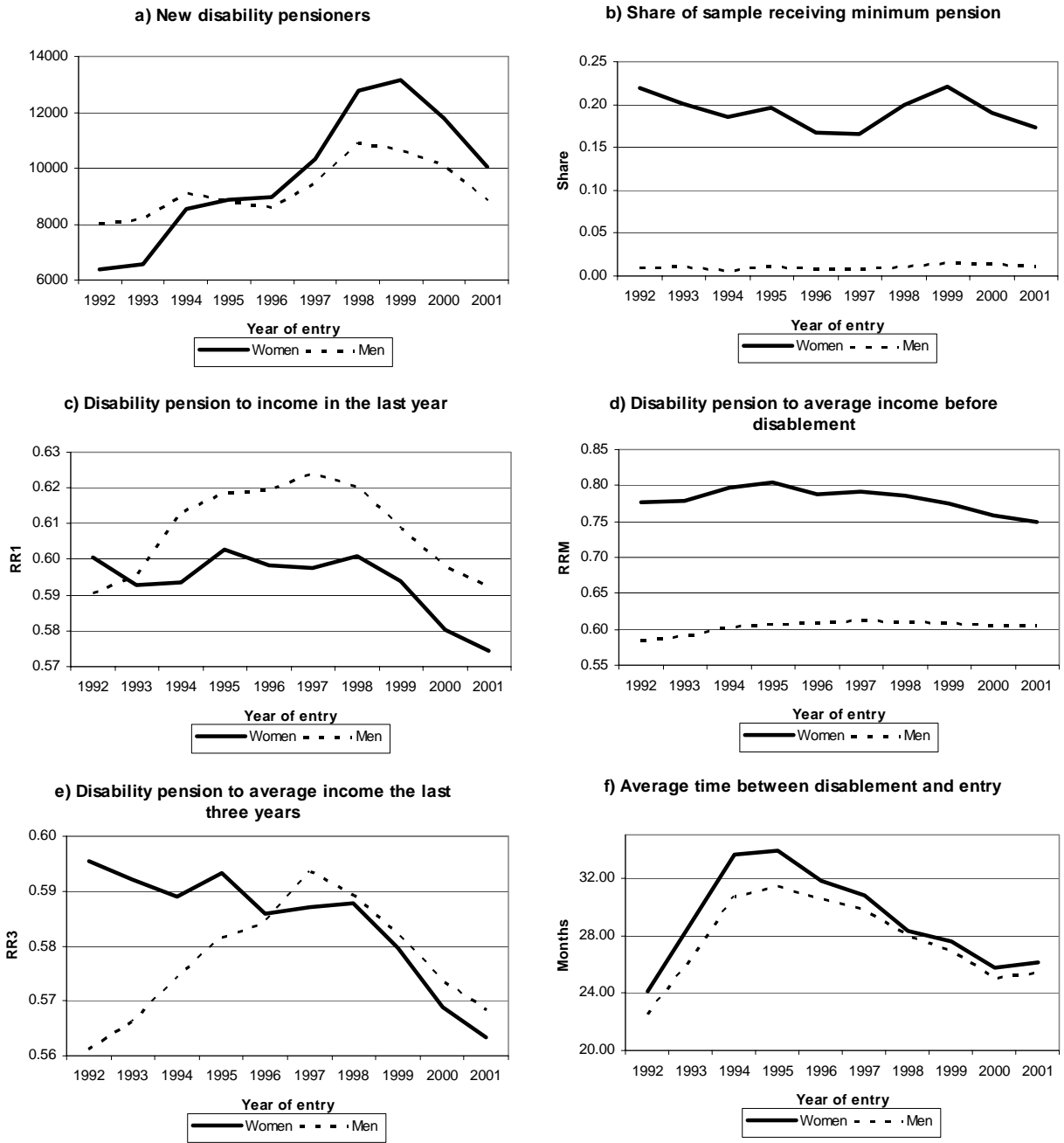


Figure 7: New disability pensioners in Norway (a) and some candidates for explanation

tem. Short term variation in inflow does not necessarily reflect variation in the disablement process. The pension level varies over time for the individual disability pensioner, depending on household characteristics and the degree of disablement. One thus needs to consider the pension measure relevant for the particular question of interest. It is further important to consider the way income affects the pension level. Variations in the income histories of the population have implications for the extent to which income in the final years before disablement affects pension. This has potential implications for the behavior of individuals worrying about possible disablement in the near future and can through this affect the dynamics of the inflow of disability pensioners. Measures of the replacement ratios involves both measures of income and of pension. The replacement ratios are thus very sensitive to the particular definitions of the relevant variables. All these factors complicate the issue of explaining time trends in disability. Ignoring them can lead to conclusions about the process that, although apparently consistent with data, do not follow from the underlying dynamics of disablement.

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Appendix A: Institutional change

There was a reform in 1992 that lowered the pension for all, in particular for persons with higher than average income.⁹ The reform is being phased in, with the old system having a potential effect for all individuals who have earned an income prior to 1992. Further, the minimum pension level has been increased four times in this period, in 1994, 1995, 1997 and 1998, for different types of pensioners and to a various degree. The most important adjustment was in 1998, when the minimum pension was increased by 12,000 NOK a year, about a ten percent increase in the minimum pension.

There have been several changes in the regulations and the practice of the pension system. Some of the changes were meant to limit the possibility of entry to disability pension and the financial attractiveness of the pension system, and others were meant to make the system more flexible for persons trying to return to active work and can be seen as increasing the attractiveness of receiving disability pension.

The condition that disability was caused by a medical problem and was of a permanent nature was introduced by regulation in 1991, overturned by The National Insurance Court in 1994 and introduced by law in 1995. In 1994 the possibility of suspending the disability pension for one year while attempting to return to active working life was introduced and extended to three years in 1997. In 1997 the public disability pension was reduced if the person was receiving a retirement package in the form of pension ("gavepensjon") from the past employer, in order to avoid the use of disability pension as a source of finance for downsizing measures. The demands for having gone through rehabilitation were strengthened in 2000. The age limit was raised from 16 to 18 years in 1998 and the medical demand for receiving guaranteed minimum pension for young disabled was sharpened.

Before 1997 the degree of disablement, and the pension level subsequently, was re-evaluated if the person was earning over 0.5 G.¹⁰ The degree of disablement was reduced as income increased beyond this level until passing 50 percent when disability pension no

⁹The impact of income above 6 G, about 380,000 NOK or 60,000 USD in 2006, on the income measure in the pension system was reduced after the 1992-reform.

¹⁰G is the basic measuring unit in the public pension system. From May 1st 2006 it was set to 62,892 NOK, about 10,000 USD.

longer were granted. In 1997 this threshold was increased to 1 G, conditioned on that the person had been receiving disability pension for at least a year, and one did not lose the right to disability pension before the degree of disablement was below 20 percent.

Appendix B: Data selection

There are a total of 492,149 individuals in the disability pension register in the 1992-2001 period but not all are relevant for this paper. I restrict my sample in three respects. The first has to do with correctly identifying the start of the period of receiving disability pension. One focus in this paper is the time between disablement and the time when the person first receives disability pension, the so called time of entry. I then need to know the time of entry into the state of receiving disability pension. There is no detailed information about the time of entry before 1992. Persons who were already registered as disabled when the register was developed are assigned with a time of entry in December 1991. These are excluded from the analysis in this paper. As an extra precaution, I exclude persons who are registered as receiving disability pension in January 1992 as well.

The second type of restriction has to do with work history. I wish to focus on persons who were in the active labor force when disabled in order to examine the ratio of pre-disablement income and the pension level. For this reason I restrict the sample to persons who had an income of at least 1 G in all last three years before disablement, who have at least five years with a strictly positive income during their working life before disablement and who became disabled after the age of 24.

The third type of restriction is of a technical nature. Persons with missing observations on year of birth, year of disablement or gender are excluded. Some persons in the dataset are registered as disabled before the year of birth or after the time of entry. Observations with such inconsistencies are also excluded. Further, persons are registered as disability pension recipients in a particular month only if he is in the register at the 28th in that month. This procedure excludes persons who are disability pensioners for less than one month, which are very few. Lastly, in order to avoid extreme observations on income to affect the results, I restrict the sample to persons who has an income below 20 G in all three of the last years before disablement.

Table 8 lists the criteria for the sample collection conditional of not being registered in December 1991 or January 1992, and the percentage of individuals who fail these tests and thus are excluded from the sample. The income criteria are the main reasons for exclusions. Conditional of meeting all the other criteria, 13.8% of the individuals fail to meet the criteria that income is at least 1G in the last three years.

Table 8: The fail percentage by sample criteria, conditional on entry after January 1992

Criteria	Percentage of observations that fail
Registered at the 28th in at least one month	0.8
Disabled after the age of 24	8.8
Information on year of disablement	0.4
Information on year of birth	1.4
Information on sex	1.5
Consistent year of disablement	1.4
Five years of positive income	10.4
Income at least 1 G in three last years	23.6
Income below 20 G in three last years	0.2
Total observations in full sample	251,556
Total observations that meet all criteria	190,015

I only allow for one time of entry per person. If a person is registered in the system and then leaves and re-enters at a later year for some reason, I do not register this person with a time of entry in the latter year. Since registration begins in January 1992, persons who have temporarily left the system before January 1992 and re-entered are registered as newcomers.

Appendix C: Age distribution

There have been changes in the demographic structure of the inflow into disability pension during my observation period. Table 9 presents the sample divided into nine five-year age groups and presents the sample share of Norway's total population by age group and year of entry. The most distinctive age group is the oldest one, which has a falling share of the population over time. One explanation for this is that the use of early retirement for other reasons than disability has increased over this period, following both an increase of the share of the population who has early retirement as an option and a lowering of the lower age limit of early retirement towards 62.¹¹ Another reason may be that over this time period, persons are becoming disabled at a lower age. The youngest group has a constant level of almost zero over the period. All seven middle groups peak in the years 1998 and 1999 and are basically showing a humped shaped pattern over the period.

Table 9: Share of total population in respective age group by year of entry

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	Av.
25-27	0.00	0.00	0.00	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.00
28-32	0.04	0.04	0.07	0.08	0.07	0.08	0.09	0.09	0.08	0.06	0.07
33-37	0.12	0.13	0.20	0.23	0.21	0.23	0.27	0.28	0.23	0.17	0.21
38-42	0.22	0.22	0.36	0.37	0.38	0.41	0.48	0.48	0.39	0.32	0.36
43-47	0.36	0.42	0.58	0.59	0.56	0.62	0.73	0.74	0.64	0.49	0.57
48-52	0.61	0.66	0.92	0.94	0.88	1.00	1.21	1.20	1.07	0.87	0.93
53-58	1.16	1.23	1.51	1.48	1.45	1.60	1.84	1.89	1.69	1.48	1.53
59-62	2.11	2.12	2.34	2.30	2.39	2.61	3.09	3.08	2.97	2.56	2.56
63-67	2.39	2.27	2.26	2.06	2.01	2.22	2.59	2.34	2.03	1.75	2.19

Many of these features are common when looking at men and women separately. Tables 10 and 11 show the sample share of the population by age groups and year of entry for women and men separately. These changes in demographics are important to have in mind when studying time trends in disablement. Changes in demographic structure have implications for the income history of the new disabled and subsequently the pension

¹¹See Røed and Haugen (2003) and Hernæs et al (2000) for two studies on early retirement in Norway. Zhiang (2004) studies retirement in a household setting.

level, illustrating the importance of carefully studying in what way the pension system assigns pension to new disability pensioners.

Table 10: Share of total population in respective age group by year of entry, women

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	Av.
25-27	0.00	0.00	0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00
28-32	0.04	0.04	0.06	0.09	0.07	0.09	0.10	0.11	0.09	0.06	0.08
33-37	0.10	0.12	0.20	0.24	0.22	0.26	0.31	0.34	0.28	0.19	0.23
38-42	0.22	0.22	0.41	0.43	0.42	0.44	0.55	0.57	0.44	0.37	0.41
43-47	0.40	0.46	0.67	0.69	0.64	0.72	0.89	0.90	0.76	0.58	0.67
48-52	0.68	0.72	1.00	1.06	1.05	1.21	1.48	1.47	1.30	1.03	1.10
53-58	1.16	1.23	1.54	1.55	1.56	1.77	2.14	2.22	1.95	1.65	1.68
59-62	1.64	1.63	1.97	2.06	2.20	2.52	3.03	3.09	2.91	2.59	2.37
63-67	1.80	1.73	1.88	1.72	1.75	1.95	2.36	2.19	1.89	1.61	1.89

Table 11: Share of total population in respective age group by year of entry, men

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	Av.
25-27	0.00	0.00	0.00	0.01	0.00	0.00	0.01	0.01	0.01	0.00	0.00
28-32	0.05	0.05	0.08	0.07	0.06	0.07	0.08	0.07	0.07	0.05	0.06
33-37	0.14	0.14	0.20	0.22	0.21	0.20	0.24	0.21	0.18	0.14	0.19
38-42	0.21	0.22	0.31	0.32	0.33	0.38	0.41	0.39	0.34	0.27	0.32
43-47	0.33	0.39	0.50	0.49	0.47	0.53	0.58	0.58	0.51	0.40	0.48
48-52	0.55	0.60	0.83	0.81	0.72	0.81	0.95	0.93	0.85	0.71	0.78
53-58	1.16	1.23	1.47	1.42	1.34	1.43	1.54	1.57	1.44	1.32	1.39
59-62	2.59	2.63	2.72	2.55	2.59	2.70	3.15	3.06	3.02	2.54	2.75
63-67	3.04	2.87	2.68	2.43	2.30	2.52	2.84	2.49	2.18	1.90	2.52

Given the variation in the number of years between disablement and the time of entry, it matters at which time we measure age. Two persons aged 55 at the time of entry have not necessarily become disabled at the same age. Table 18 and Table 19 in Appendix D show the age distributions, where age is measured at disablement and time of entry, respectively, in percentage points of the total sample by year of entry.

Appendix D: Tables

Table 12: Income measures before time of disablement by year of entry and total, women

Entry	I_{T-1}	I_{T-2}	I_{T-3}	I_M	I_3	IG_{T-1}	IG_{T-2}	AG
1992	3.85	3.81	3.79	2.99	3.82	-0.88	-1.04	-0.96
	(1.43)	(1.43)	(1.46)	(1.19)	(1.38)	(21.10)	(23.50)	(14.33)
1993	3.92	3.88	3.81	3.01	3.87	-0.67	0.34	-0.17
	(1.46)	(1.45)	(1.47)	(1.19)	(1.40)	(21.01)	(22.25)	(13.98)
1994	3.97	3.95	3.87	2.97	3.93	-1.46	0.14	-0.66
	(1.48)	(1.47)	(1.50)	(1.16)	(1.41)	(22.35)	(23.02)	(14.77)
1995	3.97	3.97	3.91	2.96	3.95	-2.54	-0.54	-1.54
	(1.55)	(1.52)	(1.54)	(1.16)	(1.45)	(26.38)	(27.02)	(17.30)
1996	4.03	4.05	4.00	3.03	4.03	-2.96	-1.09	-2.03
	(1.54)	(1.56)	(1.56)	(1.16)	(1.47)	(27.71)	(25.22)	(16.86)
1997	4.04	4.06	4.02	3.04	4.04	-2.59	-0.79	-1.69
	(1.46)	(1.48)	(1.51)	(1.13)	(1.41)	(23.13)	(24.13)	(15.00)
1998	4.06	4.08	4.04	3.06	4.06	-2.90	-1.03	-1.97
	(1.54)	(1.54)	(1.54)	(1.14)	(1.46)	(24.76)	(23.66)	(15.60)
1999	4.11	4.13	4.10	3.10	4.11	-2.99	-1.42	-2.21
	(1.53)	(1.54)	(1.56)	(1.16)	(1.47)	(26.11)	(24.90)	(16.63)
2000	4.20	4.21	4.17	3.16	4.20	-2.54	-1.01	-1.78
	(1.54)	(1.54)	(1.55)	(1.13)	(1.47)	(24.14)	(25.61)	(16.03)
2001	4.29	4.30	4.26	3.24	4.28	-2.51	-0.88	-1.70
	(1.56)	(1.55)	(1.57)	(1.16)	(1.49)	(23.83)	(24.86)	(15.82)
Total	4.06	4.07	4.02	3.07	4.05	-2.36	-0.81	-1.58
	(1.52)	(1.52)	(1.54)	(1.16)	(1.45)	(24.40)	(24.56)	(15.80)

Note: Standard deviation in parenthesis

Table 13: Income measures before time of disablement by year of entry, men

Entry	I_{T-1}	I_{T-2}	I_{T-3}	I_M	I_3	IG_{T-1}	IG_{T-2}	AG
1992	5.49	5.57	5.65	5.26	5.57	-5.08	-4.48	-4.78
	(1.93)	(1.92)	(1.97)	(1.55)	(1.81)	(33.93)	(30.97)	(20.91)
1993	5.48	5.60	5.61	5.22	5.56	-5.73	-3.78	-4.76
	(1.97)	(2.00)	(1.98)	(1.55)	(1.84)	(34.63)	(32.62)	(21.11)
1994	5.51	5.63	5.68	5.20	5.61	-7.01	-4.96	-5.99
	(2.07)	(2.04)	(2.07)	(1.55)	(1.90)	(38.50)	(38.06)	(24.50)
1995	5.45	5.54	5.60	5.14	5.53	-6.51	-5.24	-5.87
	(2.10)	(2.05)	(2.07)	(1.54)	(1.92)	(37.13)	(37.60)	(23.91)
1996	5.45	5.55	5.62	5.15	5.54	-6.22	-6.15	-6.18
	(2.14)	(2.13)	(2.09)	(1.56)	(1.96)	(40.03)	(38.85)	(25.07)
1997	5.47	5.55	5.59	5.17	5.54	-5.44	-4.73	-5.09
	(2.14)	(2.17)	(2.18)	(1.59)	(2.01)	(35.27)	(37.49)	(23.11)
1998	5.46	5.56	5.57	5.12	5.53	-5.90	-3.88	-4.89
	(2.15)	(2.16)	(2.19)	(1.58)	(2.03)	(35.09)	(36.08)	(22.68)
1999	5.54	5.58	5.61	5.12	5.57	-4.60	-4.06	-4.33
	(2.17)	(2.18)	(2.22)	(1.58)	(2.04)	(33.03)	(33.22)	(20.98)
2000	5.68	5.73	5.72	5.22	5.71	-4.85	-3.48	-4.16
	(2.22)	(2.24)	(2.23)	(1.62)	(2.09)	(36.07)	(34.02)	(22.09)
2001	5.75	5.84	5.81	5.24	5.80	-5.13	-2.55	-3.84
	(2.26)	(2.28)	(2.30)	(1.64)	(2.14)	(34.53)	(32.73)	(21.37)
Total	5.53	5.61	5.64	5.18	5.60	-5.63	-4.31	-4.97
	(2.12)	(2.13)	(2.14)	(1.58)	(1.98)	(35.83)	(35.30)	(22.62)

Note: Standard deviation in parenthesis

Table 14: Pension levels and degree of disablement by time of entry, women

Year of entry	Pension	Pure pension	Adj. pension	Disab. degree	Change share	Av. age	Min. share
1992	1.72 (0.66)	1.72 (0.66)	2.11 (0.59)	81.73 (22.75)	0.23	53.95 (9.34)	0.22
1993	1.74 (0.68)	1.73 (0.67)	2.13 (0.60)	81.45 (23.94)	0.24	53.07 (9.48)	0.20
1994	1.74 (0.67)	1.73 (0.67)	2.16 (0.59)	80.56 (23.43)	0.26	51.30 (9.89)	0.19
1995	1.74 (0.66)	1.73 (0.66)	2.18 (0.61)	80.51 (23.01)	0.26	50.64 (10.08)	0.20
1996	1.76 (0.68)	1.75 (0.67)	2.20 (0.62)	80.68 (22.76)	0.25	51.13 (9.77)	0.17
1997	1.77 (0.66)	1.76 (0.65)	2.22 (0.60)	80.60 (22.86)	0.24	51.24 (9.62)	0.17
1998	1.76 (0.66)	1.75 (0.65)	2.21 (0.60)	80.29 (23.01)	0.23	51.37 (9.49)	0.20
1999	1.77 (0.65)	1.75 (0.64)	2.21 (0.58)	80.46 (23.08)	0.19	51.17 (9.43)	0.22
2000	1.77 (0.66)	1.76 (0.65)	2.22 (0.58)	80.03 (23.15)	0.16	51.69 (9.12)	0.19
2001	1.78 (0.66)	1.77 (0.66)	2.25 (0.58)	79.74 (23.22)	0.12	52.22 (8.87)	0.17
Total	1.76 (0.66)	1.75 (0.66)	2.20 (0.59)	80.51 (23.11)	0.21 (0.41)	51.64 (9.53)	0.19

Note: Standard deviation in parenthesis

Table 15: Pension levels and degree of disablement by time of entry, men

Year of entry	Pension	Pure pension	Adj. pension	Disab. degree	Change share	Av. age	Min. share
1992	2.74 (0.75)	2.69 (0.73)	2.94 (0.56)	91.70 (18.22)	0.12	55.64 (9.22)	0.01
1993	2.70 (0.76)	2.66 (0.74)	2.94 (0.55)	90.46 (19.48)	0.14	54.75 (9.34)	0.01
1994	2.71 (0.77)	2.67 (0.76)	2.99 (0.55)	89.31 (20.16)	0.16	52.97 (9.85)	0.01
1995	2.69 (0.78)	2.64 (0.76)	2.98 (0.56)	88.94 (20.14)	0.16	52.40 (10.02)	0.01
1996	2.69 (0.79)	2.65 (0.77)	2.99 (0.57)	88.77 (20.14)	0.16	52.51 (9.98)	0.01
1997	2.71 (0.79)	2.67 (0.77)	3.01 (0.57)	89.10 (19.88)	0.15	52.53 (9.92)	0.01
1998	2.68 (0.78)	2.64 (0.77)	2.97 (0.56)	89.12 (19.86)	0.14	52.66 (9.76)	0.01
1999	2.66 (0.79)	2.62 (0.77)	2.96 (0.55)	88.72 (20.13)	0.13	52.62 (9.49)	0.02
2000	2.70 (0.80)	2.65 (0.78)	2.99 (0.55)	88.76 (20.01)	0.12	52.97 (9.24)	0.01
2001	2.70 (0.79)	2.66 (0.78)	3.01 (0.55)	88.70 (20.08)	0.10	53.30 (8.95)	0.01
Total	2.70 (0.78)	2.65 (0.76)	2.98 (0.56)	89.30 (19.86)	0.14	53.17 (9.64)	0.01

Note: Standard deviation in parenthesis

Table 16: Time of entry, women and men

Year of entry	Women			Men		
	Total	Percent of sample	Sample share of population	Total	Percent of sample	Sample share of population
1992	6,392	6.56	0.56	8,019	8.66	0.68
1993	6,556	6.73	0.56	8,146	8.80	0.68
1994	8,530	8.75	0.73	9,112	9.84	0.76
1995	8,852	9.08	0.74	8,817	9.53	0.72
1996	8,974	9.21	0.75	8,583	9.27	0.69
1997	10,336	10.61	0.85	9,441	10.20	0.76
1998	12,780	13.11	1.04	10,885	11.76	0.86
1999	13,171	13.52	1.06	10,664	11.52	0.84
2000	11,796	12.10	0.94	10,081	10.89	0.78
2001	10,062	10.33	0.80	8,818	9.53	0.68
Total	97,449	100.00	0.80*	92,566	100.00	0.75*

Note: * average over the period

Table 17: Time of disablement, women and men

Year of entry	Women			Men		
	Total	Percent of sample	Sample share of population	Total	Percent of sample	Sample share of population
1972-1979	118	0.12	0.01	125	0.14	0.01
1980	49	0.05	0.00	46	0.05	0.00
1981	65	0.07	0.01	79	0.09	0.01
1982	91	0.09	0.01	117	0.13	0.01
1983	137	0.14	0.01	157	0.17	0.01
1984	179	0.18	0.02	210	0.23	0.02
1985	331	0.34	0.03	293	0.32	0.03
1986	556	0.57	0.05	522	0.56	0.05
1987	945	0.97	0.08	861	0.93	0.08
1988	1,626	1.67	0.15	1,668	1.80	0.15
1989	2,878	2.95	0.26	2,772	2.99	0.24
1990	4,891	5.02	0.43	4,683	5.06	0.41
1991	8,679	8.91	0.76	9,950	10.75	0.85
1992	7,605	7.80	0.66	8,684	9.38	0.74
1993	7,316	7.51	0.63	7,583	8.19	0.64
1994	7,703	7.90	0.66	7,447	8.05	0.62
1995	9,074	9.31	0.76	7,936	8.57	0.65
1996	10,381	10.65	0.86	8,876	9.59	0.72
1997	11,262	11.56	0.93	9,363	10.11	0.75
1998	10,155	10.42	0.83	8,564	9.25	0.68
1999	8,436	8.66	0.68	7,804	8.43	0.61
2000	4,763	4.89	0.38	4,619	4.99	0.36
2001	209	0.21	0.02	207	0.22	0.02
Total	97,449	100.00	0.36	92,566	100.00	0.33

Table 18: Sample distribution over age at time of disablement by year of entry

Age	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	Av.
25-27	0.72	0.80	1.18	1.45	1.29	1.36	1.40	1.33	1.19	0.97	1.20
28-32	2.16	2.42	3.53	3.99	3.46	3.62	3.43	3.40	2.88	2.48	3.18
33-37	3.73	4.07	5.22	5.97	6.29	5.44	5.05	5.23	4.78	4.54	5.07
38-42	5.88	6.68	8.44	8.68	8.07	8.02	7.84	7.54	7.05	6.39	7.50
43-47	8.67	10.03	12.28	12.60	11.88	11.41	11.08	10.86	10.56	9.84	10.97
48-52	10.76	11.92	13.71	14.64	14.67	15.81	16.54	17.50	16.43	16.08	15.12
53-58	16.56	17.13	17.23	16.70	17.98	18.77	18.60	20.02	21.68	23.53	19.01
59-62	28.41	27.58	23.61	22.58	23.18	22.95	24.20	23.77	26.07	26.67	24.76
63-67	23.10	19.36	14.79	13.39	13.18	12.63	11.87	10.35	9.35	9.51	13.20
Av. age	56.78	56.29	54.08	54.24	54.40	54.35	54.31	54.10	54.39	54.86	54.74

Table 19: Sample distribution over age at time of entry by year of entry

Age	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	Av.
25-27	0.06	0.05	0.06	0.08	0.03	0.04	0.09	0.05	0.05	0.05	0.06
28-32	0.96	0.96	1.32	1.52	1.28	1.38	1.30	1.35	1.29	1.05	1.26
33-37	2.64	2.82	3.64	4.18	3.92	3.77	3.78	3.94	3.58	3.08	3.58
38-42	4.55	4.53	6.29	6.64	6.76	6.52	6.43	6.41	5.73	5.47	6.01
43-47	7.89	8.99	10.03	10.10	9.59	9.56	9.46	9.62	9.14	8.22	9.30
48-52	10.09	11.43	14.52	15.71	15.41	15.74	15.84	15.18	14.66	13.81	14.46
53-58	15.39	16.49	17.17	17.57	18.12	18.98	19.45	21.77	22.46	23.59	19.40
59-62	26.79	25.76	23.43	23.03	24.53	24.45	25.03	25.21	27.54	28.91	25.48
63-67	31.62	28.98	23.51	21.16	20.36	19.56	18.61	16.46	15.54	15.83	20.45
Av. age	54.89	54.00	52.16	51.52	51.81	51.86	51.96	51.82	52.28	52.72	52.39