

# “Wage and compemsation inequality”

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## Wage and compensation inequality

### Abstract

Wages are not the only compensation for gainful employment. In particular, many employees also enjoy pension benefits and sickness benefit insurance. The paper compares the distribution of individuals' wage income to the distribution of labor compensation when important non-wage benefits are included. In the study for Sweden the focus is on pension benefits. The authors address the importance of earnings-related pensions for the distribution of labor compensation. The estimations are based on a representative sample of the Swedish adult population. It is found that inequality increases when compensation is considered instead of wage income, that there are differences between men and women and across socio-economic groups in the way benefits affect inequality. This is in agreement with earlier studies in the U.S. The results also indicate that defined contribution pension schemes are more equally distributed than defined benefit schemes. This might be of interest because pension systems are being modified in many parts of the world and many countries have swapped a defined benefit system for a defined contribution one.

**Keywords:** compensation inequality, defined benefit pension scheme, defined contribution pension scheme, non-wage benefits, pension benefits, wage inequality.

### Introduction

Wages are not the only compensation for gainful employment. Provision of non-wage benefits for workers is a widespread phenomenon and, in particular, many employees enjoy pension benefits and sickness benefits insurance. Yet, official statistics as well as research pay almost exclusive attention to wages alone. By adding to wage earnings the value of non-wage benefits, we gain a more complete measure of compensation for labor; a measure that is more relevant than wages when work incentive, job changes or job recruitment is in focus, or in the analysis of economic welfare.

According to the theory of compensating wage differentials, the correlation between wages and benefits is negative. But it has been difficult to find support in empirical studies for this theoretical standpoint (Rosen, 1986). And if the distribution of benefits is skewed toward high-income earners, this will elevate earnings inequality even if there are compensating wage differentials.

Few studies exist, the reason of this may be the lack of data. There may also be an interest on the labor market in keeping benefits hidden, since these may function as instruments for both wage drift and discrimination. In Sweden, which is the subject of this paper, it may also be a way of circumnavigating the solidarity wage policy.

The intent of this paper is to compare for Sweden the distribution of individuals' wage earnings with the distribution of labor compensation when important benefits are included. Special for Sweden is that benefits come mainly from two sources: social insurance covering all employees and occupational

insurance building on collective bargaining agreements between labor unions and employers' associations and covering practically all employees. They raise the level of total compensation and are important to high earners in particular, since most of the plans replace earnings above the capped ceiling in the social insurance scheme.

How much of inequality can be attributed to money wage and how much to benefits? Are there differences between men and women in the way the benefits affect inequality? Does the inequality structure of the benefits vary across socio-economic groups and between defined benefit and defined contribution schemes?

We examine some inequality measures. Here estimates for the Gini index, Ricci-Lindahl's equality measure are given as well as medians and decile ratios.

The article is organized as follows. Section 1 presents previous studies. Section 2 introduces institutional settings for Sweden. Section 3 describes our method. Sections 4 and 5 show estimations and data. Section 6 reports empirical results.

### 1. Previous studies

Studies based on U.S. data show an increase in earnings inequality when benefits are included in the wage measure. Bloom and Freeman (1992) examined the contribution of non-wage benefits to the growth in overall earnings inequality in the U.S. Their results indicated that sole focus on wage earnings understated inequality in the economy. Lazear and Rosen (1987) compared the distribution of individuals' wages to the distribution of their wage plus pension benefits by estimating "typical" workers' pension benefits. They found that pension benefits increased earnings inequality. Benedict and Shaw (1995) used individual-level pension information in their study of how occupational pension benefits affect the distribution of earned income in the U.S.

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Annual pension accrual values for each individual were obtained by calculating the expected present values of pension liabilities in year  $t$  and  $t - 1$ , and differencing them to get the annual accrual. Pensions increased annual earnings inequality by about three percent among all employed, and by 21 percent among unionized workers. They also found that public pensions strongly reduced inequality in the distribution of expected lifetime earnings. Pierce (2001) studied changes in compensation inequality from 1981 to 1997 in the United States. He found that compensation inequality increased by a greater amount than did wage inequality. This was also shown in Chung (2003). When benefits were accounted for compensation, inequality rose.

## 2. Institutional setting for Sweden

We address the importance of earnings-related public and occupational pensions for the distribution of labor compensation. The private sector in Sweden serves as an object lesson. The conditions in 1995 and 2005 constitute the starting point.

Before 1998, the public pension was a defined benefit system. The annual pension was determined by 15 years of the highest covered earnings (earnings up to a ceiling); here, 30 years of work was necessary for full pension. Via pay-roll taxes levied on employers, these benefits were mainly financed on a pay-as-you-go basis.

In 1998, new Swedish pension legislation mandated a gradual transition from a public-defined benefit scheme to a public-defined contribution plan. The new earnings-related pension is a notional-defined contribution (NDC) system with a small funded component. The main part of the new system is the NDC component. The basic idea of a pay-as-you-go system based on defined contributions, NDC, is the same as in a conventional financial defined contribution (FDC) scheme. Contributions are recorded on individual accounts and the account values represent individuals' claims on future pension benefits. But contrary to an FDC scheme, annual contributions are used to finance current pension benefit obligations as in any pay-as-you-go scheme. The rate of return in the Swedish NDC scheme is determined by average wage growth. 16 percent of covered earnings is credited to the notional account. The remaining 2.5 percent of covered earnings is contributed to a self-invested personal pension (FDC scheme). The former defined-benefit system is gradually being phased out, so the new system covers individuals born from 1938 to 1953 only partly, while covering individuals born thereafter totally. During the transition period, benefits are paid from both systems; older people will have a larger share from the old system than younger people (Könberg et al., 2006).

Besides the state pension, practically all wage earners have a collective-agreement-regulated pension, which raises their total pension level. These added benefits are the result of negotiations between trade unions and employers associations and are entirely voluntary and independent of state authority. Everyone working for an employer who has signed a collective agreement – and thus not only union members – automatically has the coverage that has been agreed upon. Less than 10 percent of the total workforce works in companies that do not have such an agreement. Even most temporary and part-time employees have the right to collective agreement benefits. In 1996, the collective agreement pension of private blue-collar workers was changed from a defined benefit system to a defined contribution plan. Before then, the pension was calculated on an employee's three best annual covered earnings between the ages of 55 and 59, and 30 years of work was required for full pension.

In 1995, the collective agreement pension for private white-collar workers was a defined benefit system and remained so in 2005. The pension was determined of final wage and 30 years of work was necessary for full pension.

The contribution to the collective agreements pensions of private sector blue-collar workers is a fixed percentage of the total wage bill levied on employers, while for private sector white-collar workers the contribution is actuarially determined for each employee and levied on employers.

So, in 1995 all pension schemes were defined benefit. In principle, in 2005, all but the collective agreement pension for private white-collar workers were defined contribution schemes.

## 3. The method

Let us assume that the stipulated total benefit is what wage earners would opt for. As for Sweden, it is not at all unlikely. Even though a collective-agreement-regulated pension, besides the state pension, is not optional for wage earners and employers covered by the agreements, there is very low probability that trade unions and employers associations would negotiate on something not wanted by the majority. Many persons also choose to augment their pensions through private savings. So, it is unlikely that earnings-related pension benefits are higher than individuals would have chosen.

Given this assumption, the individual value of the benefit is what he/she has to pay for it on the market. We determine this as follows.

**3.1. What individuals pay.** Payroll taxes, which are levied as a fix percentage of the total wage bill, are mainly used to finance pensions. The distribution of

the burden of payroll taxes is a controversial issue. To varying degrees, the payroll tax burden can be shifted from those who bear formal responsibility for payment. This burden can be shifted backward onto wage earners, so that real wages are lower than they would be otherwise. Or payroll taxes can be shifted forward onto consumers in the form of higher prices. In small open economies, such as Sweden's, it is reasonable to assume that payroll taxes are largely shifted backward onto wage earners in the long term (Palmer and Palme (1989) show empirical support). Swedish companies strongly compete on international markets. In this way, they avoid being placed at a competitive disadvantage<sup>1</sup>.

Given this assumption, the burden of the payroll tax can be described as follows.

Let  $Y_{i,t}$  = individual  $i$ 's annual pre-tax wage income in specific year  $t$ ,  $q_t$  = the payroll tax for social security benefits in the year  $t$ .

If payroll tax did not exist, then individual  $i$ 's pre-tax wage income  $q_t \times Y_{i,t}$  would be higher. The payroll tax abolition increases the tax base for income taxation. If conditions are to otherwise remain the same, then the increase must be compensated for by a cut in the average rate of income tax.

Before "the change" individual  $i$ 's tax contribution is  $Y_{i,t} \times T_t$ , where  $T_t$  is the average rate of income tax.

After "the change" his or her tax contribution is  $Y_{i,t} \times T'_t + q_t \times Y_{i,t} \times \tau'(Y_{i,t})$ , where  $T'_t$  is the new average rate of income tax on the original income and  $\tau'(Y_{i,t})$  is the new marginal tax rate.

The individual's total tax contributions are to be the same "before" and "after":  $Y_{i,t} \times T_t = Y_{i,t} \times T'_t + q_t \times Y_{i,t} \times \tau'(Y_{i,t})$ .

We assume that  $T_t$  and  $\tau(Y_{i,t})$  change uniformly, so that  $T'_t = T_t / c$  and  $\tau'(Y_{i,t}) = \tau(Y_{i,t}) / c$ .

$\tau(Y_{i,t})$  is the original marginal tax rate.

Then the constant  $c$  is equal to:  $c = 1 + q_t \times \tau(Y_{i,t}) / T_t$ .

The net effect of payroll tax abolition on wage income is obtained by adding  $Y_{i,t} \times (T_t - T'_t / c) - \text{payroll tax burden after income tax reduction} - q_t \times Y_{i,t} \times (1 - [\tau(Y_{i,t}) / c]) - \text{payroll tax burden after net wage increases}$ .

The sum represents the burden of what individuals pay for public pension benefits.

<sup>1</sup> Competition in Sweden is not working satisfactorily. However, it has improved partly due to the arrival of foreign actors in the Swedish market. This will make it more difficult to shift the financial burden onto consumers.

The burden of the collective agreement contribution for a private sector blue-collar worker is equal to:

$$a_t \times Y_{i,t} \times [1 - \tau(Y_{i,t})/c],$$

and for a private sector white-collar worker equal to:

$$B_{i,t} \times [1 - \tau(Y_{i,t})/c],$$

where  $a_t$  is the contribution rate for private blue-collar workers and  $B_{i,t}$  is the actuarially determined contribution for the private white-collar worker  $i$ .

**3.2. The actuarially fair contribution.** The actuarially fair contribution ( $C_{i,t}$ ) for individual  $i$  in an earnings-related *defined benefit* pension scheme is equal to the annual accrual in the expected present value of his or her pension liabilities ( $P_{i,t}$ ), and is determined as follows.

Let  $L_{i,t}$  = individual  $i$ 's annual pension benefits earned up to year  $t$ ,  $A = A_{i,t}$  =  $i$ 's age at  $t$ ,  $D$  = maximal age,  $N$  = age at retirement,  $S_{A,N}$  = the probability of surviving from age  $A$  to age  $N$ , where  $S_{A,N}$  varies between men and women<sup>2</sup>, and  $r$  = the real rate of discount, then:

$$C_{i,t} = P_{i,t} = (L_{i,t} - L_{i,t-1}) \times S_{A,N} \times [1/(1+r)^{N-A}] \times \sum_{j=N}^D S_{N,j} \times [1/(1+r)^{j-N}]. \quad (1)$$

When the earnings-related pension is *defined contribution*, then

$$C_{i,t} = q_{P,t} \times Y_{i,t},$$

where  $q_{P,t}$  = the pension contribution

$$A_{i,t} < N$$

$$N = 65^3$$

$$r = 0.02^4$$

#### 4. Estimations

This section presents estimations of the study. We determine for  $t = 1995$ :

1. The distribution of current annual after-tax wage income,

$$Y_{i,t} \times (1 - T_{i,t}). \quad (2)$$

<sup>2</sup> Studies show that an individual's mortality risk depends on social position, so that persons in higher social classes have lower risk of premature death. One Swedish study from 1997 [SOU, 1997] shows that blue-collar workers, who have reached age 60, have a life expectancy that is 1.5 to 2 years shorter than white-collar workers of the same age. But differences between women and men are far greater than observed differences between social classes. When mortality risk is diversified only according to age and sex, then we overestimate pension premiums of blue-collar workers and underestimate those of white-collar workers.

<sup>3</sup> 65 is the normal pension age.

<sup>4</sup> The rate of return in a pay-as-you-go scheme is determined by average wage growth. The average growth in Sweden in the past 100 years has remained constant at about 2 percent.

2. Given the assumptions above, the distribution of annual after-tax compensation,

$$Y_{i,t} \times (1 - T_{i,t}) + Y_{i,t} \times (T_t - T_t/c) + q_t \times Y_{i,t} \times [1 - \tau(Y_{i,t})/c] + a_t \times Y_{i,t} \times [1 - \tau(Y_{i,t})/c] - (C_{i,t,public} + C_{i,t,collective}) \times [1 - \tau(Y_{i,t})/c] \quad (3)$$

for private blue-collar workers and

$$Y_{i,t} \times (1 - T_{i,t}) + Y_{i,t} \times (T_t - T_t/c) + q_t \times Y_{i,t} \times [1 - \tau(Y_{i,t})/c] + B_{i,t} \times [1 - \tau(Y_{i,t})/c] - (C_{i,t,public} + B_{i,t}) \times [1 - \tau(Y_{i,t})/c] \quad (4)$$

for private white-collar workers

Also we determine for  $t = 2005$ :

1. The distribution of current annual after-tax wage income,

$$Y_{i,t} \times (1 - T_{i,t}). \quad (5)$$

2. The distribution of annual after-tax compensation,

$$Y_{i,t} \times (1 - T_{i,t}) + Y_{i,t} \times (T_t - T_t/c) + q_t \times Y_{i,t} \times [1 - \tau(Y_{i,t})/c] - C_{i,t,public} \times [1 - \tau(Y_{i,t})/c] \quad (6)$$

for private white-collar workers and blue-collar workers.

The actuarially determined public pension contribution is equal to:

$$C_{i,t,public} = z_i \times P_{i,t} + (1 - z_i) \times q_{P,t} \times y_{i,t}, \quad (7)$$

where  $z_i$  is the share of the old system according to transition rules and  $y_{i,t}$  are covered earnings<sup>1</sup>.

## 5. Data

For the analysis, apart from the public and collective agreement pension rules, we need data on individual lifetime earnings. Our estimations are based on a representative sample of the Swedish adult population 24-64 years old. More precisely, we employ the corresponding parts of the household income survey for 1995 and 2005 (Statistics Sweden). This survey is based on about 10 000 households yearly. Individuals are interviewed concerning labor market status, household structure and housing conditions. The total non-response rate for 1995 was about 25 percent and for 2005 about 31 percent. Differential non-response is accounted for by adjusted sampling weights. The interviews are supplemented by register data on wage income – in cash as reported to the tax

agency by employers, taxes, and other variables. In addition, the total income history of relevance for the pension system is known for each individual in the 1995 survey according to income data and data from the National Social Insurance Agency. To obtain income history up to 2005, the individuals in the 1995 survey were followed in the registers year by year. For the 2005 survey income history unfortunately is known back to 1995 only. Therefore the analysis for 2005 essentially is based on those remaining from the 1995 survey supplemented with younger cohorts and immigrants from the 2005 survey. Not all remaining from 1995 can be utilized, however, as we need to know their sector – private or public – and socio-economic class – blue- or white-collar – for 2005. For most individuals these data were obtained from the large surveys on wages and salaries (Statistics Sweden). The weights for the remaining sample were calibrated against population totals from the 2005 survey according to sector, socio-economic class, age, and gender.

## 6. Empirical results

In a couple of tables we compare the wage distributions. Let us first regard the differences between wage income and compensation. Only those in the private sector are considered. In Table 1 it is shown that the benefit raises the net wage with 9 percent on average. For private white-collar workers the increase is 6 percent in 1995 and 11 percent in 2005. For private blue-collar workers the increase is 11 percent 1995 and 9 percent 2005. This indicates that the pension reform might be to blue-collar workers' disadvantage. For male white-collar workers the increase is 10 percent 1995 and 12 percent 2005, but for male blue-collar workers 12 percent 1995 and 9 percent 2005. For female white-collar workers the increase is 3 percent 1995 and 8 percent 2005, but for female blue-collar workers 10 percent 1995 and 8 percent 2005.

Table 1. Increase in after-tax wage by benefits for 1995 and 2005 for private employees 24-64 years, all workers percent

Private sector	The benefit's portion (%)		
	White-collar workers	Blue-collar workers	All
All 1995	6	11	9
All 2005	11	9	9
Men 1995	10	12	
Men 2005	12	9	
Women 1995	3	10	
Women 2005	8	8	

Note: Results based on 6152 and 3998 workers for 1995 and 2005, respectively.

Tables 2-8 show that inequality increases when after-tax compensation is considered instead of after-tax wage income. Inequality is measured by Gini coefficient.

<sup>1</sup> Those born in 1937 or earlier get their old-age pensions as per the old system. The new system will totally cover those born in 1954 or later. Those born between 1938 and 1953 will have one share from the old system and one from the new system; here, older people will have a larger share from the old system than younger people.

coefficients and Ricci-Lindahl coefficients<sup>1</sup>, the latter indicating the proportion of total income which has to be transferred from those above the median to those below the median if income is to be equal for all. The increase is relatively smaller in 2005 compared to 1995. It holds for blue-collar workers in particular. The result indicates that defined contribution schemes are more equally distributed than defined benefit schemes. Inequality is smaller for 2005 than for 1995, except for white-collar women. The general result is of interest because pension systems are being modified in many parts of the world and many countries have swapped a defined benefit system for a defined contribution one.

Table 2. The distribution of wage, after-tax wage and after-tax compensation for 1995 for private employees of 24-64 years (thousands SEK)

Income	Median	Decile ratios				Gini	Ricci-Lindahl
		6/4	7/3	8/2	9/1		
White-collar							
Wage	214	1.22	1.52	2.03	3.45	0.275	0.183
Net	147	1.20	1.45	1.88	3.03	0.238	0.161
Compensation	156	1.23	1.52	2.01	3.23	0.263	0.178
Blue-collar							
Wage	177	1.17	1.39	1.79	2.75	0.191	0.134
Net	120	1.17	1.39	1.79	2.68	0.185	0.131
Compensation	133	1.17	1.42	1.90	2.89	0.204	0.143

Note: Results based on 3503 white-collar and 2649 blue-collar.

Table 3. The distribution of wage, after-tax wage and after-tax compensation for 2005 for private employees of 24-64 years (thousands SEK)

Income	Median	Decile ratios				Gini	Ricci-Lindahl
		6/4	7/3	8/2	9/1		
White-collar							
Wage	313	1.24	1.54	2.04	3.52	0.278	0.186
Net	216	1.17	1.38	1.76	2.83	0.225	0.151
Compensation	239	1.21	1.43	1.84	2.97	0.240	0.163
Blue-collar							
Wage	249	1.16	1.39	1.87	3.34	0.207	0.143
Net	178	1.14	1.34	1.76	2.92	0.185	0.129
Compensation	194	1.14	1.36	1.80	3.08	0.194	0.134

Note: Results based on 2360 white-collar and 1638 blue-collar.

Table 4. The distribution of wage, after-tax wage and after-tax compensation for 1995 and 2005 for private employees of 24-64 years, white-collar men (thousands SEK)

Income	Median	Decile ratios				Gini	Ricci-Lindahl
		6/4	7/3	8/2	9/1		
1995							
Wage	245	1.20	1.46	1.91	3.12	0.264	0.175
Net	163	1.14	1.36	1.70	2.64	0.221	0.146
Compensation	180	1.16	1.43	1.80	2.74	0.240	0.159

<sup>1</sup> The Ricci-Schutz coefficient and Pietrat's measure are other labels.

2005							
Wage	359	1.22	1.48	1.90	2.72	0.253	0.169
Net	239	1.14	1.33	1.61	2.22	0.200	0.134
Compensation	268	1.16	1.39	1.72	2.38	0.215	0.145

Note: Results based on 2159 and 1312 men for 1995 and 2005, respectively.

Table 5. The distribution of wage, after-tax wage and after-tax compensation for 1995 and 2005 for private employees of 24-64 years, white-collar women (thousands SEK)

Income	Median	Decile ratios				Gini	Ricci-Lindahl
		6/4	7/3	8/2	9/1		
1995							
Wage	175	1.16	1.41	1.86	3.04	0.234	0.156
Net	120	1.17	1.41	1.87	2.92	0.218	0.150
Compensation	123	1.19	1.42	1.86	3.14	0.235	0.159
2005							
Wage	263	1.18	1.50	2.06	3.63	0.271	0.182
Net	188	1.17	1.39	1.87	3.01	0.226	0.153
Compensation	203	1.13	1.47	1.91	3.23	0.240	0.160

Note: Results based on 1344 and 1048 women for 1995 and 2005, respectively.

Table 6. The distribution of wage, after-tax wage and after-tax compensation for 1995 and 2005 for private employees of 24-64 years, blue-collar men (thousands SEK)

Income	Median	Decile ratios				Gini	Ricci-Lindahl
		6/4	7/3	8/2	9/1		
1995							
Wage	190	1.11	1.26	1.49	2.18	0.161	0.109
Net	130	1.11	1.26	1.50	2.12	0.153	0.107
Compensation	145	1.12	1.28	1.54	2.38	0.170	0.115
2005							
Wage	267	1.13	1.27	1.55	2.57	0.177	0.122
Net	189	1.12	1.24	1.48	2.36	0.158	0.108
Compensation	205	1.19	1.26	1.51	2.51	0.167	0.114

Note: Results based on 1860 and 1176 men for 1995 and 2005, respectively.

Table 7. The distribution of wage, after-tax wage and after-tax compensation for 1995 and 2005 for private employees of 24-64 years, blue-collar women (thousands SEK)

Income	Median	Decile ratios				Gini	Ricci-Lindahl
		6/4	7/3	8/2	9/1		
1995							
Wage	132	1.22	1.47	1.91	2.77	0.201	0.144
Net	89	1.22	1.48	1.91	2.84	0.202	0.145
Compensation	98	1.22	1.46	1.94	3.04	0.215	0.154
2005							
Wage	199	1.22	1.56	2.40	3.72	0.239	0.171
Net	146	1.22	1.52	2.21	3.27	0.217	0.156
Compensation	157	1.21	1.54	2.20	3.25	0.222	0.161

Note: Results based on 789 and 462 women for 1995 and 2005, respectively.

Table 8. The distribution of wage, after-tax wage and after-tax compensation for 1995 and 2005 for private employees of 24-64 years, all workers (thousands SEK)

Income	Median	Decile ratios				Gini	Ricci-Lindahl
		6/4	7/3	8/2	9/1		
1995							
Wage	192	1.17	1.43	1.90	3.21	0.256	0.169
Net	131	1.18	1.42	1.84	2.98	0.228	0.154
Compensation	143	1.19	1.47	1.89	3.24	0.250	0.167
2005							
Wage	279	1.19	1.45	1.97	3.79	0.273	0.180
Net	198	1.16	1.36	1.72	3.06	0.225	0.150
Compensation	216	1.17	1.40	1.80	3.34	0.240	0.160

Note: Results based on 6152 and 3998 workers for 1995 and 2005, respectively.

It is possible though that the observed differences between 1995 and 2005 depend on differences in the working force between the two years. Employment increased by about 8 percent from 1995 to 2005. There are also differences in the composition of the working force as age cohorts differ in size both in the population as a whole, and for those employed.

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The effects of these differences are examined by a calibration of the weights for the 1995 sample to 2005 totals for classes and age groups. The benefits portions of labor compensation are about the same in this exercise, except for blue-collar women, where the difference between the years disappears. Concerning inequality, our calibration results in somewhat increased inequality for women and all income measures, the increase is the largest for blue-collar women and alternative net income with a Gini coefficient of 0.232 as compared to 0.215 in Table 7.

## Conclusions

We find that inequality increases when compensation is considered, that there are differences between men and women and across socio-economic groups in the way benefits affect inequality. Our results also indicate that defined contribution pension schemes are more equally distributed than defined benefit schemes. To sum up, the results indicate that wage only is a too narrow measure to describe the extent of inequality.