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Meer, Peter H. van der

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Bureaucracy, overschooling and credentials inflation

Peter H. van der Meer

SOM-theme A Primary processes within firms

Abstract

In this paper we investigate whether the amount and level of overschooling is higher in the private sector than in the public sector. We investigate differences in the rate of return on (over)schooling too. The idea is that within the public sector the wage and allocation process behaves more according to Thurow's job-competition model or according to the view of the credentialists whereas in the private sector the wage and allocation process behaves more according to the neo-classical human capital model. These differences should result in different wage equations which if added up can explain the mixed results of previous research. However, we could not find support for neither of these ideas in the Dutch Labour Supply Panel Study of the Dutch Institute for Labour Studies (OSA). Contrary to our expectations employees in the private sector were more often overschooled than those in the public sector, but the rate of return on overschooling is the same. This means that none of the investments in education is wasted and also that we have no substantial proof for credentials inflation as advocated by others. The increase in the rate of return on schooling since 1985 shows that investments in education have become even more rewarding.

Bureaucracy, overschooling and credentials inflation

1 Introduction

In the now longstanding research about overschooling we see consistently that overschooling is rewarding. Van der Meer and Glebbeek (2000) showed that in the Netherlands the rate of return on schooling, overschooling and underschooling increased between 1982 and 1998. And although the rate of return on overschooled years is less than the rate for adequately schooled years, it is still positive. It also is rewarding for those who are underschooled to increase their level of schooling. And although there is some disagreement about the exact amount of overschooling and about the estimated rate of return on the surplus years of schooling, it is a well-established fact that this surplus still pays off. These are the major results of wage equations specifically designed to test the job-competition model against the human capital model.

Another result was that both the job-competition model and the human capital model were outperformed by a matching model in explaining wages. However, although a mixed model gives the best empirical results a definitive theoretical explanation why such a model performs better has not yet been given. Several explanations are at hand of which some have been tested. None of these explanations takes into account that the wage and allocation processes differ between labour market segments.

The main question we try to answer in this paper is whether the mixed results of the wage equation can be explained by sector differences in the wage and allocation process. Thereby we would like to distinguish between the public and the private sector of the labour market. The idea is that within the public sector the wage and allocation process behaves more according to Thurow's job-competition model or according to the view of the credentialists whereas in the private sector the wage and allocation process behaves more according to the neo-classical human capital model. These differences should result in different wage equations which if added up can

explain the mixed results of previous research (i.e. Hartog, 2000; Groot and Maassen van den Brink, 2000; Van der Meer and Glebbeek, 2000).

The structure of this paper is as follows. In the next section we theorise about allocation processes on the labour market, making explicitly a distinction between the private, i.e. profit sector, and the public, not-for-profit sector. On basis of these theories we will draw two main hypotheses which will be tested further on in this paper. The first main hypothesis is about the differences between the private and the public sector with respect to the amount of overschooling and the wage equations, while the second main hypothesis relates to the changes over time. In section three we explicit our research methodology by describing the way in which we will test our hypotheses. In the fourth section we present the data and the measurement of the variables. In section five we present the results of the analyses and test our hypotheses. In the final section we discuss our results and summarise the paper.

2 Allocation of labour in the private and public sector

The research into overschooling on the labour market was inspired by the enormous increase in the educational level of the population. It was questioned whether the labour market could absorb this enormous increase and whether all workers and employees would and could use all the knowledge and skills they had acquired. In the Netherlands Conen and Huijgen (1980, 1983) pioneered research into the use and requirements of labour skills and knowledge. They came to the conclusion that the increase of human capital of the Dutch labour force was much more rapid than the increase of the required skills and knowledge. They stated that the Dutch labour force became overschooled and that some of the investments in education and schooling might be wasted i.e. was not productive in the labour market. Asselbergh a.o. (1998) repeated this research and came to the same conclusion.

This line of research was contested by labour market economists (cf. Hartog, 2000) who claimed that, according to human capital theory, the overschooled years were still productive and that therefore the education was not wasted. Following Sicherman (1991) they estimated wage equations which gave valuable insights. First

of all they showed that the overschooled years of the labour force were productive. That is the rate of return on overschooled years was positive. However, overschooled employees were not as productive as perfectly schooled employees were. That is the rate of return on overschooled years was less than on required years of schooling. Stated in other words, they found that of two employees performing on the same job the one with the highest level of education earned more and that of two employees with the same level of education the one performing on a lower job level earned less.

These results are contradicting both Thurow's job-competition model and the human capital theory. Thurow (1975) claimed that the productivity of an employee was dictated by his job. So an overeducated employee could be no more productive than a perfectly educated employee could and both should earn the same wages. The human capital theory (Becker, 1964) states that wages are solely dependent on the human capital of the employee and that in fact employees cannot be overschooled at all. It is only their human capital that counts.

Hartog (cf. 2000) proposed a matching model to account for these mixed results, which states that the productivity of an employee is both dependent on his human capital as well as on his job. It is the combination, the match of characteristics of job and employee that determines labour productivity. However, until now no further evidence to support this matching has been put forward.

A different explanation of the mixed results lies at hand. It is well known from sociological research that the labour market does not function as one big market as most economists suppose. Doeringer and Piore (1971) as well as Stinchcombe (1979) showed that the labour market can be divided into several segments, where allocation of labour is organised differently. Some segments behave more according to the 'ideal' competitive labour markets whereas other segments are not competitive at all. In their view a wage equation for the entire labour market is the result of an (weighted) addition of wage equations from the different segments. So it is conceivable that the mixed results by Hartog and others is the result of adding up markets which are ruled by Thurow's job-competition model and competitive markets where the human capital theory holds.

This is the more conceivable since Glebbeek (1993, p. 137) showed that the classification made by Stinchcombe also proved to be valid for the Netherlands. Van der Meer (1993), using different data, supported the view of Glebbeek. In this research some segments behaved more according to the standard economic version of the labour market while other segments did not so. Although according to the research referred to more than two sectors can be distinguished in this paper we restrict our selves to two sectors, a private and a public sector. The first reason for this restriction is to keep things as simple as possible at this stage. A second reason is that the distinction between the private and public sector is a very clear one, indeed. In the Netherlands almost all private organisations seek to make a profit in competition with each other, whereas most public sector organisations, including all educational and health care organisations operate on a not-for-profit basis.

2.1 Overschooling in the private sector

In the private sector it is to be expected that employers feel pressure from competitors and behave accordingly. This implies that an employee is paid according to his (marginal) productivity. Also overschooled years, if present, are paid according to this mechanism. If an employer does not pay for these productive characteristics of an employee he or she will try to find a new job at another employer who will pay for these extra years of schooling. At the other hand if an employer pays too much for the overschooled years of his employee a cheaper competitor will take over the market and put an end to this waste. Due to this competition we may expect that all human capital invested in is paid for and that accordingly the wage and allocation processes in the private sector can be explained by human capital theory.

Now, human capital theory says that persons invest in themselves to become more productive (Becker, 1964). This increase in productivity increases also (labour) earnings. Investment in primary, secondary and post secondary education increases future earnings. Persons invest in these types of education until the marginal costs of investment equals the marginal returns, or, to put it in other words, people maximise the net present value of their investment. A basic assumption of the theory is a competitive labour market where in equilibrium marginal productivity equals wages. According to human capital theory more able persons invest more in human capital

because they have lower costs of investment (Ben-Porath, 1967). Therefore they also will have higher earnings than less able people.

Besides investments in human capital before entering the labour market, employees will invest in human capital through on-the-job training. By gaining experience employees will increase their human capital and marginal productivity. This gain will be larger in the early stages of someone's career. Near retirement no further investments will be made because (extra) labour earnings will halt. There is simply no time left to recoup the investment.

Human capital theory explains earnings differential between persons by differences in human capital. Higher educated and more experienced employees will earn more than lower educated or less experienced employees will. The rate of return on education and experience is the result of the interplay between demand and supply on the labour market. In times of labour shortages the wages and rate of return on education will increase, inducing more persons to invest in human capital and to enter the labour market. In times of labour surpluses the rate of return on education will drop, refraining people to invest in human capital and to enter the labour market (Polachek and Siebert, 1993).

According to human capital theory there is no such thing as over- or underschooling. The amount of schooling necessary to perform well on the labour market is dependent on the relative supply and demand of educated employees. Differences in productivity and wages can be accounted for by differences in the amount of schooling and are independent from job characteristics, like years of schooling necessary to perform well in the job. Two persons with the same amount of human capital earn the same wages irrespective of the jobs they hold. If an amount of over- or underschooling could be measured this would have no effect on the rate of return on schooling. The rate of return on years of overschooling would be the same as the rate of return on underschooling and the rate of return on years of schooling necessary to the job (Sicherman, 1991; Oosterbeek, 1992). If employees have too little formal schooling for the job this can be compensated by experience. Also employees with too much formal schooling might have not enough experience. In human capital theory it is not only the amount of formal schooling that determines the

wage, it is the total amount of human capital that matters. Other types of human capital can compensate lack of one type of human capital. However the rate of return on schooling should not be affected by the amount of over- or underschooling.

On basis of these considerations we do not expect to find much employees that have too much formal schooling. The number of overschooled employees in the private sector will be relatively low. On the other hand those who are overschooled in the private sector will receive wages according to their attained human capital. We do not expect a large difference between the rate of return on overschooled years of employees and the rate of return on 'required' schooling. The first statement concerning the amount of overschooling can be contested, but the second statement is a hard prediction by the human capital theory. Rejection of this statement is a rejection of the human capital theory.

2.2 Overschooling in the public sector

Contrary to the private sector the public organisations do not compete with each other, at least not on a for-profit basis. These public organisations do not feel competitive pressure and can therefore allocate and reward their personnel in a different way. Two more or less competing allocation mechanisms could be applied; each leads towards different outcomes with regard to the rewards for overschooling. The first mechanism is Thurow's job-competition model, the second is allocation based on credentialism (Collins, 1979).

In contrast with human capital theory, the job-competition model (Thurow, 1975) states that productivity and wages depend on the jobs, not on the persons who hold these jobs. Persons are allocated over jobs according to their place in the labour queue. The place in this labour queue depends on the costs employers must make to train newly hired personnel to perform well. It is assumed that these training costs depend on the amount of schooling already obtained by the (potential) employee. Persons with a high amount of schooling are at the front of the queue while applicants with no or little schooling are at the tail-end. Persons with the highest amount of schooling get the most productive jobs. Persons with no or little schooling get no jobs or the least productive ones. According to this model a positive association between schooling and wages exists, too, but it is not necessary that two persons with the same

amount of schooling earn the same wages. Only when these two persons have the same kind of jobs they will receive the same wages.

According to the job-competition model overschooling can exist. In times when labour supply is abundant highly schooled employees will be hired in jobs that need less schooling, because they are at the top of the labour queue. Therefore it is possible that an employee has received more schooling than necessary to perform well in a job. This surplus of schooling can be obtained prior to the labour market or could be obtained in another job. Whatever the origin of overschooling, the job-competition model predicts that this overschooling will not be rewarded. Only the amount of schooling necessary to perform well on the job is rewarded. Because productivity and therefore the wage depends on the job overschooling is not rewarded. Overschooling does not increase productivity. The rate of return on overschooling should therefore be zero.

We therefore expect to find more overschooled employees in the public sector than in the private sector. However, contrary to the private sector this overschooling is not rewarded in the public sector. This is a hard prediction by the job-competition model.

With respect to the rewards for overschooling the credentialists come to a different conclusion. Just as in Thurow's job-competition model the credentialists expect public sector employees to be overeducated more often than in the private sector. Employees are hired on basis of their credentials of which their education is the most important. Credentials and thereby education is seen as a positional good (Hirsch, 1976) which should be paid for. These credentials are a prerequisite to the job (Collins, 1979). The more education the better it is for the organisation, whether these credentials are directly productive or not. In contrast with the job-competition model the credentialists expect that the credentials of the public sector employees will be rewarded. These rewards could even surpass the marginal productivity of these employees. If this were true the rate of return on overschooled years would be higher for public sector employees than for employees in the private sector.

2.3 The rewards of overschooling and their consequences

So with regard to the incidence and amount of overschooling we expect that this will prevail in the public sector. Our first main hypothesis with regard to the rate of return, or the rewards to, overschooling, is divided into three subtheses of which two compete directly with each other. Firstly we expect that the rate of return on overschooling in the private sector will be (almost) the same as the rate of return to the required schooling. Secondly we expect that, according to the job-competition model, the rate of return on overschooling in the public sector will be much lower than in the private sector. Stated in other words we expect the rate of return to overschooling in the public sector to be zero or at least substantial lower than the rate of return to required schooling in the private sector. The opposing hypothesis elaborated on the credentialist's ideas is that the rate of return on overschooling in the public sector is higher than in the private sector. This implies that the credentialists expect the rate of return on overschooling to be higher than the rate of return on required schooling, in the public sector. If the first hypothesis finds support by the data this implies that also the rate of return to required schooling will be higher in the public sector.

If the just stated theses are true, changes in overschooling and in the rate of return on overschooled years in the overall labour market could, at least partially, be explained by shifts in the shares of the public and private sectors. This is the second main hypothesis we want to test. If the private sector has grown, in terms of jobs, more rapidly than the public sector then overschooling should have diminished and the rate of return on overschooling should be more in accordance with the rate of return on required schooling. If the public sector has grown more rapidly we might observe the opposite. The results also indicate whether market expansion, i.e. by privatising public services, helps to improve allocation on the labour market.

3 Research methodology

In order to test the hypotheses, outlined in the previous section, the amount of overschooling has to be measured and its effect on wages has to be established. To measure overschooling the required amount of schooling for a job has to be established. Out of the four theoretically possible methods we choose to measure overschooling with the help of job analysis. Job experts establish the level of schooling, which is necessary to perform well on the job, which is compared to the attained schooling of the employee. The job analysis presupposes a one to one relationship between level of schooling and job level. In practice various methods of job analysis are used. A famous source for this type of information is the dictionary of occupational titles (DOT) in the United States (Miller et.al. 1980). In the Netherlands Huijgen provided a key to code occupations into seven job levels, the ARBI-code (Conen et.al., 1983).

Given the possibilities of our data this is the most valid method we can use. Of what is known from studies about the validity of measures of overschooling the job analysis method is quite valid and not outperformed by other methods. An overview of methods measuring overschooling can be found in Halaby (1994), Groot and Maassen van den Brink (2000) and Hartog (2000).

To estimate the rate of return on schooling and overschooling the following regression, estimated with ordinary least squares, has become standard (Hartog, 2000).

$$\ln w = \gamma_0 + \gamma_1 r + \gamma_2 s^o + \gamma_3 s^u + \beta X + \varepsilon$$

with w = hourly wages

r = required schooling

s^o = attained schooling minus required schooling if attained schooling is greater than required schooling

$s^o = 0$ else

s^u = required schooling minus attained schooling if attained schooling is less than required schooling

$s^u = 0$ else

X = control variables

ε = error term

$\gamma_0, \gamma_1, \gamma_2, \gamma_3, \beta$ = parameters to be estimated

If $\gamma_1 = \gamma_2 = -\gamma_3$ we have the Mincerian human capital wage equation¹. The wage depends only on attained schooling, that is only on employee characteristics and every year of schooling gives the same rate of return. No negative effects of over- or underschooling exist. We expect to find this result for the private sector. This would support our first subthesis.

If $\gamma_2 = \gamma_3 = 0$ only the required level of schooling has an effect on the wage. This confirms the job-competition model of Thurow (1975) and would support our second subthesis concerning the rate of return on overschooling in the public sector. On the other hand if in the public sector $\gamma_2 > \gamma_1$ or $\gamma_{\text{public}} > \gamma_{\text{private}}$ we have found support for our third subthesis. Than the credentialists explain the wage and allocation processes in the public sector best.

Until now most studies (cf. Hartog, 2000), incorporating the entire labour market, have found $\gamma_1 > \gamma_2 > -\gamma_3 > 0$. The rate of return on required schooling is highest, followed by the rate of return on overschooling, that is higher than the reward for underschooling. This implies that overqualified employees receive a lower return on their last year of schooling than employees with the required amount of schooling. The penalty on underschooling is higher than the penalty on overschooling.

As stated in the previous section this mixed result can be explained by different wage and allocation processes in the public and private sector. If our first two hypotheses are confirmed we will find the 'common' result for the entire labour market. This 'common' result is than the weighted average of the rate of returns for the public and private sector. The weights equal the share in the (active) labour force. Changes in these shares can explain changes in the differences between the rate of return on required schooling and overschooling. If the share of the private

sector increases the difference between the rates of return in the overall labour market should decrease, while they increase when the share of the public sector grows.

However if the credentialistic view of the public sector is confirmed we are unable to explain the ‘common’ results found by others. A weighted average of the rates of return from the human capital model and the credentialistic model do not converge to the overall result. If the credentialists are right the findings for the entire labour market would confer to the human capital model, with rates of return somewhere between those from the private sector and those from the public sector, or we would see a higher rate of return on overschooling than for required schooling. With what we know so far from research done in a variety of countries, this is highly unlikely. However if the credentialists view is supported we have an even more complicated puzzle in explaining the wage setting and allocation on the labour market.

By comparing these estimates for a number of years we can infer if and how the rate of return has changed, and how this is influenced by the shift in the shares of the public and private sectors. Therefore it is necessary to estimate the same models for several years, using the same (control) variables. This would provide us with an answer to our research question.

4 Data and measurement

We have one main data source: the OSA Labour Supply Panel Study². Of this panel study we have access to the surveys held in 1985, 1986, 1988, 1994, 1996 and 1998. This gives us estimates of the incidence and amount of over- and underschooling during a period of thirteen years. These data give us a unique opportunity to analyse the rate of return and change in rate of return on schooling and to compare the private with the public sector. Because each wave of the panel study is a random sample of the Dutch active labour force, it also gives us the opportunity to investigate the effects of the shift in shares of the private and public sector.

Although the OSA-survey is a panel study we do not use this characteristic. Each wave is treated as a separate cross-section. In each wave almost the same

number of persons were contacted. The sample sizes do not differ significantly between the waves of the OSA panel study. Additional sampling combats attrition in the OSA panel study. More information about the OSA-labour supply surveys can be found in OSA (1989) and OSA (1997).

As mentioned in the previous section the level of required schooling is measured with the job analysis method. In this study we use the coding of Huijgen (see Conen et.al., 1983). Huijgen distinguishes seven different job levels. The information used to code a job into one of these seven levels are the minimum schooling requirements, the necessary amount of on-the-job training and the level of discretion. The lowest job level consists of jobs for which no formal education is required, on-the-job training is minimal and employees have no or minimal discretion over their tasks. The highest job level requires scientific training. We use a key that makes it possible to recode the four-digit job classification into Huijgen's job levels. We convert these job levels into necessary years of effective schooling, which we compare with the attained years of effective schooling.

The highest attained level of education is converted into the effective years of schooling. Each diploma or level of schooling is measured as the minimum years of schooling necessary to obtain this diploma. This results in five levels of six, nine, twelve, fifteen and seventeen years of schooling. Although small differences between the surveys in the questions concerning the level of education exist the effective years of schooling can be measured in a consistent way.

The match between required and attained level of schooling is shown in table 1. Everyone working on the lowest two job levels but who has more than six years of schooling (primary education) is regarded as overschooled. Employees working on job level three require nine years of schooling; employees working on job level four require twelve years of schooling and employees on job level five require fifteen years of schooling. All employees working on job levels six and seven are regarded as underschooled if they have not obtained a university degree.

Table 1. The theoretical match between educational level and job level (0 perfect match, - underschooled, + overschooled)

Job level	Years of schooling				
	6	9	12	15	17
1	0	+	+	+	+
2	0	+	+	+	+
3	-	0	+	+	+
4	-	-	0	+	+
5	-	-	-	0	+
6	-	-	-	-	0
7	-	-	-	-	0

Source: Asselberghs et.al. 1998, p. 17

Weekly, monthly and four weekly after-tax incomes are translated into hourly wages. In the Netherlands after tax income, as specified on the wage slips and received on bank accounts, is much better known than before-tax income. Therefore most surveys ask after-tax income. More importantly after-tax income allows us to estimate the private rate of return on schooling (Hartog and Oosterbeek, 1988), the effect we are interested in.

The distinction between the private and public sector is based on the information contained in the 1978 standard industrial code from Statistics Netherlands. This code is based on the international SIC. Measured in a crude way all employees working in a sector of which the first digit is a 9 (nine) can be seen as working in the public sector. The main reason is that in the Netherlands all employees in health care and education receive their wages directly from the government or from government controlled agencies. However for this research we developed a more sophisticated classification, following Glebbeek (1993, p.112). Included in the public sector are those organisations that do not feel pressure from competition. It means that besides the government we include the utility sector and private not-for-profit organisations³.

As control variables we use number of years spend in the labour market. Because we do not have exact measures in each wave, we approximate these years as age minus years of attained schooling. We also include its square to control for non-linear effects. Furthermore we control for being a married or non-married man or woman. As a third control we use the natural logarithm of weekly hours worked.

Included in the analyses are those persons who are in paid employment⁴. Self-employed and other persons in the labour market are excluded. We also restrict the sample to those persons who worked a minimum of twelve hours per week. This restriction conforms to the norms of the common Dutch definition of persons active in the labour market. Finally we restrict the analysis to those persons who answered all the relevant questions (list-wise deletion).

5 Results

In an earlier paper (Van der Meer and Glebbeek, 2000) we described the trends in attained, required and overschooling for the entire Dutch Labour market. In the presentation and discussion of our new results we will refer to this paper. The results presented here might differ slightly from the results in Van der Meer and Glebbeek (2000). Due to missing answers on the question where someone works the number of persons included in the analysis differs somewhat. Especially in the 1986 questionnaire we have a lot of missings on industrial sector. However, including industrial sector in the analysis has not led to significant changes in the results.

In tables 2 to 4 you can find the results of our analysis. In table 2 we report the required and attained years of schooling while in table 3 we present the results on the amount and incidence of overschooling in the labour market as a whole and in the private and public sector separately. In table 4 we report the rate of return on overschooling. The tables provide the information necessary to test our hypotheses.

In table 2 we see that for the Dutch labour market as a whole the level of required and attained schooling increased between 1985 and 1998. The level of required schooling increased from 11.1 years to 12.0 years. In this 13-year period the

level of required schooling grew on average with 0.6 per cent per year. In the same period the attained level of schooling of the working labour force grew from 11.3 to 12.3 years of schooling, averaging a growth of 0.65 per cent per year. So on average the attained level of schooling grew faster than the required level of schooling. This is a slightly different picture than we presented in Van der Meer and Glebbeek (2000). The difference is explained by the difference in base year. The difference in growth rate between required and attained schooling could mean that in this period the incidence and amount of overschooling has increased.

However if we look at the private and public sector separately we see a slightly different picture. First of all we see that in every year the level of required and attained schooling is higher in the public sector than in the private sector. In 1985 the level of required schooling in the private sector was 10.4 years whereas in the public sector this level was 12.0 years. In 1998 the difference in years of required schooling between the public and the private sector has grown to 2.3 years. The difference in rate of growth can explain this increase. The required level of schooling grew in the private sector with 0.43 per cent per year and in the public sector with 0.78 per cent per year. Despite the already high level of required schooling in the public sector it grew faster than in the private sector. Until 1998 we did not yet see a ceiling effect within the public sector.

Within the 13-year period the difference in the level of attained schooling of the employees in the private and public sector declined. In 1985 the difference was 1.7 years of effective schooling whereas in 1998 this difference was 1.4 years. In this period the level of attained schooling grew in the private sector from 10.6 with 0.76 per cent per year to 11.7 year. In the same period the level of attained schooling in the public sector grew with 0.48 per cent per year to 13.1 year.

So in the private sector the level of attained schooling grew faster than the level of required schooling whereas in the public sector the reverse was the case. On the basis of these statistics one would expect that the incidence and amount of overschooling in the private sector will have increased and in the public sector will have decreased. In the same time the share in the labour force of public sector

employees was quite stable at 42 per cent, so from these statistics the overall development is hard to predict.

At first sight these developments contradict our first statement which read that in the public sector the amount of overschooling would be higher than in the private sector. Although we have not yet looked at the incidence and amount of overschooling yet, the developments in required and attained schooling suggest at least that the gap between the public and private sector has become smaller. The statistics presented in tables 3a through 3c might make us wiser.

The percentage of employees in the Dutch labour market who are overschooled did not increase between 1985 and 1998 as can be seen in table 3a. One can even say that between 1986 and 1998 the percentage overschooled had a slight tendency to drop to just below one third. This despite the differences in development between required and attained schooling. The mean years of overschooling shows the same trend. It seems to be quite stable around 1.40 years and if a trend can be established it is a falling one since 1986. Because the mean years of overschooling include the employees who are not overschooled this average is sensitive to the number of overschooled. A drop in the percentage overschooled should result in a drop of the mean years of overschooling. Therefore we looked at the mean years of overschooling of the overschooled, too. The mean years of overschooling of the overschooled is stable as well. It does not show a trend at all, which means that the mismatch of those persons who are overschooled did not increase or decrease. Persons who are overschooled have on average 4.2 years too much schooling for their job.

The picture for the underschooled is almost the mirrorside of the overschooled. In 1998 around one third of the employees does not have enough formal schooling to perform their job. Most likely this lack of formal schooling is compensated by experience and on-the-job training. And although the incidence of underschooling seems to have increased since 1985, no clear trend is visible in the amount of underschooling. This fluctuated between 3.9 and 3.3 years of schooling. The amount of underschooling was higher in 1998 and 1996 than in 1994, but was highest in 1985. Although the Dutch labour market has become more tight since

1985, especially for the higher educated this is not reflected in an increase in the amount of underschooling.

Differences in over- and underschooling between the public and private sector can be found after studying tables 3b and 3c. In table 3b the incidence and amount of over- and underschooling for the private sector is reported whereas table 3c contains the results for the public sector. Surprisingly, we find a higher percentage overschooled in the private sector than in the public sector. Therefore the mean years of overschooling in the private sector is higher than in the public sector, too. Also when we look at the overschooled we see that the mean years of overschooling in the private sector is higher than in the public sector. In 1998 the mean overschooled years in the private sector are 4.34 and only 3.87 in the public sector. The difference between the percentage overschooled is even more striking. In the private sector we find in 1998 40 per cent of the employees to be overschooled. In the public sector only 24 per cent is overschooled. This certainly refutes our first hypothesis, which stated that according to both the job-competition model and the credentialists, the amount and incidence of overschooling would be higher in the public sector than in the private sector.

We can give two reasons for these results. Firstly, because the level of required schooling is higher in the public sector than in the private sector it is more difficult to become overschooled in the public sector than in the private sector. It is some kind of ceiling effect. If the required level of schooling is close to the ceiling almost no one can be overschooled. Secondly, if on the other hand the human capital theory holds for the private sector the amount and incidence of overschooling is not that important. What counts is the productivity and the wages paid to the overschooled. The overschooled in the private sector do not have an incentive to find a more suitable job, because they already receive wages according to their level of schooling. In the public sector the overschooled are not rewarded and this provides an incentive to the overschooled to find a more suitable job. For this we have to look at the results of the wage analyses. However before we pay attention to these results we first want to look at the underschooled in the public and private sector.

Looking at the public and private sector we do not see a difference in the incidence of underschooling. In both sectors on average about one third of the employees are underschooled. However the amount of underschooling seems to be slightly less in the public sector than in the private sector. Reversing our first hypothesis, which predicts more overschooling in the public than in the private sector, we should find less underschooling in the public sector than in the private sector. This hardly is, if at all, the case. Also in this respect we do not find support for our first hypothesis about the difference in overschooling between the sectors.

We present the most important results⁵ for the various wage equations in tables 4a, 4b and 4c. In each of these tables we present three different equations, which makes it possible to see if the human capital model, the job-competition model or the credentialistic view of the labour market holds within one of the sectors. In table 4a we present the results for the entire Dutch labour market. These results do not differ from our earlier findings (Van der Meer and Glebbeek, 2000). We see that a mixed model, thus including required, over- and underschooling, fits the data best. This holds for every year. Furthermore we see an increase in the rate of return on all kinds of schooling. The rewards for required schooling as well as those for over- and underschooling has increased, reflecting the increasing demand for labour in the Netherlands. On average the rate of return on schooling is 7 per cent in 1998, compared to 5 per cent in 1985. To see whether this increase is influenced by shifts in shares of the public and private sector we first have to look at differences between these sectors themselves. They are reported in tables 4b and 4c.

As in the entire Dutch labour market we see an increase in the rate of return on schooling in the private sector. The rate increased from 4.3 per cent in 1985 to just above 7 per cent in 1998. At first sight this is the same as for the entire labour market. If we look at each of the three different models we estimated we see that also in the private sector the combined model, including required, over- and underschooling fits best to the data.

This refutes our second hypothesis regarding the rate of return in the private sector. We expected to find that the model according to the human capital theory would fit the data best. However, we do not find this. The rate of return on over- and

underschooled years is less than on required schooling. The difference amounts to almost one third. The results from the private sector seem not to differ from the entire Dutch labour market, suggesting that there also will be no differences between the public and private sector. However this still has to be tested. At this point we can say that the expectations with regard to the effects of changes in share of the public sector are not justified.

Looking at the public sector, see table 4c, we see that the rewards to attained schooling is fairly stable around 6 per cent. The increase we find for the entire market and in the private sector is not repeated in the public sector. However as in the private sector the mixed model fits best the data. This means at least that Thurow's job-competition model is rejected as mechanism that regulates the allocation and wage process in the public sector. Neither the rewards to overschooling nor the rewards to underschooling are nil. So our only rescue now is the credentialistic hypothesis.

For the credentialistic view to hold at least the rate of return on overschooling should be higher in the public sector than in the private sector. We also stipulated that if this holds it is very likely that also the rate of return on required schooling, in the mixed model, or on attained schooling should be higher in the public sector than in the private sector. Comparing table 4b to table 4c again we cannot corroborate our hypothesis. Although the results for the early 1980's look promising we see that in later years the differences between the public and private sector disappear and even start to become contrary to the expectations. Whereas in 1985 the rate of return on attained and overschooling seems to be higher in the public than in the private sector the situation seems to be reversed in 1996 and 1998.

A formal test on these differences reveals that only in a few years the public and private sector show significant differences in the rate of return on schooling. In 1985 and 1986 the rewards for required and the punishment for underschooling are higher in the public than in the private sector, but the rate of return on overschooling is the same. 1988 and 1994 reveal no differences at all, whereas in 1996 the rate of return on required and underschooling is higher in the private sector than in the public sector. Again the rate of return on the overschooled years is the same for both sectors. In 1998 the rewards for all kinds of schooling are the same in both sectors. So, with

these results in hand we must also reject the view of the credentialists. In not even one single year is the rate of return on overschooling higher in the public sector than in the private sector. 1986 came closest with a t-value of 1.94 ($p=0.052$). The trend also is contrary to the expectations of the credentialists. The public sector showed in the eighties a higher reward for schooling than the private sector, in the nineties this was reversed.

Overlooking our results we must conclude that none of our hypotheses is confirmed by the data. This also means that we cannot explain the changes in the rate of return on required, over- and underschooling by changes in the shares of the public and private sector in the Dutch labour market. We do not even have to look at the changes in these shares. In our samples the proportion of public sector employees varied between 39.5 per cent in 1986 and 44.6 per cent in 1998. As mentioned earlier the share of public sector workers is rather stable than declining. Sector differences and changes herein do not provide an answer to our main question.

6 Summary and discussion

In this paper we investigated if we could explain the differences in rewards between required schooling on the one hand and over- and underschooling on the other hand (Hartog, 2000; Groot and Maassen van den Brink, 2000; Van der Meer and Glebbeek, 2000) by differences in the private and public sector. We also tried to explain the recent trend in the rewards for this schooling by changes in the shares of the public and private sector. The underlying idea is that within a bureaucracy, as the public sector, workers and employees are more often overschooled and suffer from credentials inflation while workers and employees in the private sector are rewarded according to their productivity. We proposed the idea that the wage and allocation processes in the private sector would behave more according to the human capital theory while in the public sector these processes would behave more according to Thurow's job-competition model or to the ideas put forward by the credentialists. However, we could not find support for neither of these ideas in the Dutch Labour

Supply Panel Study of the Dutch Institute for Labour Studies (OSA). All the hypotheses we proposed were rejected by the data. This came not entirely as a surprise. Given the 'common' results for the entire labour market it was not to be expected that the credentialistic view would hold.

We found some differences between the sectors with regard to the level of required schooling of the jobs and the level of attained schooling of the employees and also differences in the incidence and amount of overschooling. These differences, however, were opposite our expectations. Employees in the private sector were more often overschooled than the ones in the public sector. We could not find differences in the rewards for overschooling, the proof of the pudding. Neither is the rate of return on overschooling smaller in the public sector than in the private sector, as predicted by the job-competition model, nor the other way around as predicted by the credentialists. We also did not find proof for the human capital theory that predicts that the rewards for required and overschooling is the same. Also in the private sector the mixed model produces the best fit. So we are not able to explain the mixed results found for the entire labour market.

How bad are these results? How should we interpret these? Well in our view we are not that unhappy with the rejection of these hypotheses. First of all it means that neither the human capital theory, the job-competition model nor the credentialist hypothesis is confirmed. In the search for an explanation of the wage setting and allocation process on the labour market we have to find other models. One such model is the matching model proposed by Hartog (2000) to explain the differences in rates of return on required and overschooling. As in our earlier paper (Van der Meer and Glebbeek, 2000) the matching model outperforms both the human capital theory and the job-competition model. However, other alternatives could be found in efficiency wages, insider-outsider models or other models elaborated on microeconomic or rational choice theory. Albeit these models have to be elaborated to explain the stylised facts.

Secondly it means that all the investments, both privately and publicly, in education and formal schooling are not wasted. We have no substantial proof for credentials inflation as advocated by others (Asselbergh a.o., 1998; Conen a.o., 1983;

Wolbers, 1998), not even in the public sector. If workers and employees have more schooling than necessary to do their job well, they get paid and recoup their investment. The increase in the rate of return on schooling shows that the investments in education even have become more rewarding, despite the enormous increase in the level of schooling in the Dutch labour market.

An alternative explanation for our findings might be that because of budget cuts in the public sector and because of the threat or preparation for privatisation the public sector was forced to become more efficient and more alike the private sector. So the difference in wages and allocation between the public and private sector have disappeared. This is supported by the differences in the rate of return on schooling in the mid-eighties, which disappeared later on. However, because of the growth of the service sector, also within the private sector, it might be argued that the private sector has become more alike the public sector. Both in public and in private services the (marginal) labour productivity is difficult to measure and it is therefore difficult to set wages according to productivity. So for one reason or another the two sectors have converged towards each other.

Notes

¹ The wage equation which has become the standard in labour economics which was first proposed by Mincer (1974)

² OSA is short for Organisatie voor Strategisch Arbeidsmarktonderzoek (Institute for Labour Studies)

³ The private sector contains the codes of the Dutch 'Standaard Bedrijfsindeling': 011, 012, 014, 015, 030, 120, 126, 191, 193, 199, 200-374, 376-394, 399, 510-689, 692, 699, 722, 723, 730-732, 741, 742, 751-763, 803, 810-824, 832-859, 929, 935-937, 956, 980, 982-985, 990, 991. The public sector contains the codes: 020, 110, 375, 395, 400-4999, 710, 721, 724, 770, 831, 901-907, 910-913, 919, 920-928, 931-934, 938, 939, 940-955, 957-959, 969, 970-979, 981, 989.

⁴ We selected those persons who at the time of the interview were in paid employment (Dutch in loondienst). As usual elsewhere unemployed and self-employed are left out of the analysis.

⁵ Upon request the full results are available from the author.

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Tables

Table 2. The mean years of required and attained schooling for the entire Dutch labour market and for the private and public sector for six different years

Total	1985	1986	1988	1994	1996	1998
Required schooling	11.1	10.9	11.2	11.5	11.6	12.0
Attained schooling	11.3	11.3	11.5	11.9	11.8	12.3
N	1831	1781	1883	1926	2102	1945
Private sector						
Required schooling	10.4	10.2	10.3	10.6	10.7	11.0
Attained schooling	10.6	10.6	10.9	11.3	11.2	11.7
N	1076	1077	1089	1112	1240	1077
Public sector						
Required schooling	12.0*	12.0*	12.4*	12.8*	12.8*	13.3*
Attained schooling	12.3*	12.3*	12.4*	12.7*	12.6*	13.1*
N	755	704	794	814	862	868

Source: OSA, own calculations.

* Differs significantly from the private sector

Table 3a. The incidence and amount of over- and underschooling in the *Dutch* labour market for six different years

	1985	1986	1988	1994	1996	1998
Percentage overschooled	32.7	34.8	33.7	33.6	33.4	32.9
Mean years of overschooling	1.39	1.46	1.41	1.39	1.39	1.38
Mean years of overschooling of the overschooled	4.23	4.20	4.18	4.14	4.14	4.19
Percentage underschooled	30.6	28.6	30.9	31.8	33.1	33.0
Mean years of underschooling	1.20	1.10	1.08	1.04	1.21	1.12
Mean years of underschooling of the underschooled	3.91	3.83	3.50	3.29	3.64	3.38
Number of cases	1831	1781	1883	1926	2102	1945

Source: OSA, own calculations.

Table 3b. The incidence and amount of over- and underschooling in the *private* labour market for six different years

	1985	1986	1988	1994	1996	1998
Percentage overschooled	34.4	36.8	37.3	39.8	38.9	40.4
Mean years of overschooling	1.46	1.58	1.63	1.73	1.67	1.75
Mean years of overschooling of the overschooled	4.25	4.30	4.36	4.34	4.29	4.34
Percentage underschooled	31.7	29.5	29.1	30.0	32.8	32.6
Mean years of underschooling	1.30	1.17	1.06	1.04	1.24	1.13
Mean years of underschooling of the underschooled	4.10	3.95	3.65	3.47	3.79	3.47
Number of cases	1076	1077	1089	1112	1240	1077

Source: OSA, own calculations.

Table 3c. The incidence and amount of over- and underschooling in the *public* labour market for six different years

	1985	1986	1988	1994	1996	1998
Percentage overschooled	30.5	31.8	28.7	25.2	25.6	23.5
Mean years of overschooling	1.28	1.28	1.11	0.93	0.98	0.91
Mean years of overschooling of the overschooled	4.20	4.02	3.86	3.69	3.83	3.87
Percentage underschooled	29.1	27.3	33.3	34.2	33.5	33.4
Mean years of underschooling	1.05	0.99	1.11	1.05	1.15	1.10
Mean years of underschooling of the underschooled	3.61	3.64	3.33	3.06	3.43	3.28
Number of cases	755	704	794	814	862	868

Source: OSA, own calculations.

Table 4a. The rate of return of attained, required, over- and underschooling in the *Dutch* labour market for six different years, (|t-values|). Results from OLS-regressions on ln (wage) with controls for experience, experience square, marital status times gender and ln(hours worked).

	1985	1986	1988	1994	1996	1998
Model 1						
Attained schooling	0.050 (25.6)	0.051 (24.6)	0.054 (24.7)	0.068 (29.6)	0.065 (27.1)	0.070 (24.5)
Adj. R ²	0.43	0.45	0.46	0.52	0.49	0.43
s.e. estimate	0.25	0.26	0.28	0.25	0.28	0.30
Model 2						
Required schooling	0.036 (22.9)	0.038 (23.3)	0.044 (27.7)	0.041 (27.7)	0.040 (24.7)	0.041 (23.2)
Adj. R ²	0.40	0.43	0.49	0.50	0.46	0.41
s.e. estimate	0.25	0.26	0.27	0.26	0.29	0.30
Model 3						
Required schooling	0.058 (29.5)	0.060 (28.7)	0.063 (30.0)	0.070 (31.8)	0.069 (29.3)	0.073 (26.1)
Overschooling	0.035 (11.5)	0.039 (12.2)	0.034 (9.96)	0.045 (12.6)	0.045 (11.5)	0.049 (11.0)
Underschooling	-0.038 (11.9)	-0.031 (9.11)	-0.028 (7.64)	-0.045 (11.6)	-0.047 (12.4)	-0.047 (10.5)
Adj. R ²	0.48	0.50	0.54	0.57	0.52	0.47
s.e. estimate	0.24	0.24	0.26	0.24	0.27	0.29
Number of cases	1831	1781	1883	1926	2102	1945

Source: OSA, own calculations.

Table 4b. The rate of return of attained, required, over- and underschooling in the *private* labour market for six different years, (|t-values|). Results from OLS-regressions on ln (wage) with controls for experience, experience square, marital status times gender and ln(hours worked).

	1985	1986	1988	1994	1996	1998
Model 1						
Attained schooling	0.043 (15.1)	0.043 (14.4)	0.052 (16.7)	0.064 (19.3)	0.070 (21.2)	0.072 (16.7)
Adj. R ²	0.40	0.41	0.48	0.52	0.54	0.44
s.e. estimate	0.26	0.27	0.29	0.26	0.28	0.31
Model 2						
Required schooling	0.030 (14.0)	0.032 (14.7)	0.043 (18.7)	0.037 (18.0)	0.036 (17.1)	0.038 (15.6)
Adj. R ²	0.38	0.42	0.50	0.50	0.49	0.43
s.e. estimate	0.26	0.27	0.28	0.26	0.29	0.32
Model 3						
Required schooling	0.052 (17.7)	0.052 (17.1)	0.064 (20.8)	0.068 (21.3)	0.075 (23.2)	0.076 (18.0)
Overschooling	0.032 (7.97)	0.035 (8.36)	0.036 (8.42)	0.048 (10.6)	0.052 (11.0)	0.050 (8.46)
Underschooling	-0.031 (6.74)	-0.022 (4.49)	-0.027 (5.03)	-0.040 (6.98)	-0.057 (11.0)	-0.053 (7.66)
Adj. R ²	0.44	0.47	0.54	0.56	0.57	0.49
s.e. estimate	0.25	0.26	0.27	0.25	0.27	0.30
Number of cases	1076	1077	1089	1112	1240	1077

Source: OSA, own calculations.

Table 4c. The rate of return of attained, required, over- and underschooling in the *public* labour market for six different years, (|t-values|). Results from OLS-regressions on ln (wage) with controls for experience, experience square, marital status times gender and ln(hours worked).

	1985	1986	1988	1994	1996	1998
Model 1						
Attained schooling	0.057 (19.4)	0.059 (18.9)	0.054 (16.8)	0.065 (19.7)	0.059 (15.0)	0.063 (15.3)
Adj. R ²	0.48	0.49	0.43	0.48	0.36	0.33
s.e. estimate	0.22	0.23	0.26	0.23	0.28	0.27
Model 2						
Required schooling	0.038 (16.5)	0.039 (16.0)	0.044 (18.7)	0.043 (18.2)	0.042 (15.3)	0.039 (13.9)
Adj. R ²	0.43	0.43	0.47	0.46	0.37	0.31
s.e. estimate	0.24	0.24	0.25	0.24	0.28	0.28
Model 3						
Required schooling	0.064 (21.7)	0.066 (21.3)	0.062 (19.5)	0.067 (20.2)	0.064 (16.3)	0.070 (16.7)
Overschooling	0.041 (8.80)	0.048 (9.60)	0.031 (5.36)	0.040 (6.32)	0.037 (5.27)	0.051 (7.39)
Underschooling	-0.043 (9.36)	-0.038 (7.91)	-0.031 (6.09)	-0.047 (8.45)	-0.037 (6.32)	-0.041 (6.93)
Adj. R ²	0.53	0.54	0.51	0.52	0.41	0.38
s.e. estimate	0.21	0.22	0.24	0.22	0.27	0.26
Number of cases	755	704	794	814	862	868

Source: OSA, own calculations.