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Wage Differences between Incumbents and External Candidates

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Abstract:

This paper compares the hourly wage of employees who change jobs within their firm with that of workers who are hired from other employers in the external labor market. We use a Dutch data set of about 45 thousand workers who are employed at 1,838 firms over in the years 1997 and 1998. We have the following empirical results: Workers who moved internally are in the higher segments of the wage distribution, relative to externally-hired workers. The difference in wage narrows a bit when we relate the workers with internal mobility to the hires who were previously employed with another firm (job-to-job movement). We find that the difference in wage between internal candidates and external candidates from other employers disappears if we correct for the workers' observable characteristics. The empirical results indicate that on average there is no substantial wage difference between workers who make a transition between jobs within their firm and comparable workers who make a transition between firms in the external labor market.

Keywords:

Internal labor markets; External labor markets; Wages; Hiring; Risky Workers

JEL-codes:

J23 ; J32 ; J63

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1. Introduction

Sorting of workers within labor markets is a complex phenomenon as workers may change jobs both between and within firms. An indication of sorting in the external labor market (between firms) is provided by Abowd et al. (1999), who show that high-productivity workers are matched with high-productivity firms. An indication of internal sorting (within firms) may be derived from Baker et al. (1994a,b). They find that the annual wage increase is higher for workers who change jobs within their firm than for workers who stayed in their jobs during this period. Furthermore, promotees have a higher probability to be promoted in the subsequent periods. The findings of Baker et al. (1994a,b) have spawned an important class of theoretical studies on hierarchical structures, pay and promotion policies within firms, which has recently been summarized by Gibbons and Waldman (1999a).

Firms may use employees' internal mobility as a mechanism for job reallocation, since they may create and destroy jobs through mobility within firms (Hassink, 1996). Furthermore, firms may use promotions to screen, sort, and stimulate employees whose productivity was uncertain at the time of hiring (Gibbons and Waldman, 1999b). In fact, the process of sorting workers among jobs involves the movement of workers within the boundary of the firm. The presence of an Internal Labor Market in large firms suggests that this allocative process is insulated from outside. However, longitudinal studies of firms' personnel data (Baker et al., 1994a,b; Treble et al., 2001) reveal that the insulation is far from complete. Internal Labor Markets show a high degree of permeability; in fact, substantial entry takes places at all hierarchical levels. This permeability will be perfect when external applicants and incumbents with otherwise equal characteristics receive the same hourly wage. In contrast, some theories on sorting and screening predict that the hourly wage differs between external and internal candidates because of imperfect information about the productivity of the external candidates.

This paper focuses on the hiring of workers. It empirically investigates whether firms pay incumbents differently from external applicants. Basically, the main difference between both sources of hiring is that the information about the hiree's productivity is more imperfect for external applicants than for incumbent workers. Thus, the variation of the expected productivity is higher for external applicants, *ceteris paribus*. This uncertainty may lead to a wage premium either for the incumbent or for the external candidate. The wage premium is defined as the

difference in wage between incumbents and external applicants, who have the same observable characteristics (Lazear, 1995).

Various theories give opposing predictions about the size of the wage premium. Theories of imperfect information (Greenwald, 1986; Chan, 1996) predict that firms will favor the incumbent when being confronted with the choice between internal and external candidates who have the same expected ability. Consequently, incumbent workers will receive a wage premium relative to external applicants who have the same observable characteristics. In contrast, Lazear (1995) posits that external applicants will get a wage premium, because firms appreciate variation in ability when hiring new workers. This taste for variation arises because while firms pay an average wage, variation in the ability of external candidates creates room for surprises. An external candidate who turns out to have exceptionally high productivity may thus surprise the firm. The difference between average wage and high productivity is the firm's gain.

Empirical evidence on the size of the wage premium of external candidates is almost absent. Burgess et al. (1998) investigated Lazear's theory. Although their estimates did not reject this theory, they could not fully address this issue, as they had no wage information available.

In this study we will use a Dutch employer-employee matched data set. It is derived from administrative personnel records in a broad range of firms from all economic sectors. By comparing the employment records in two years (1997 and 1998) we were able to detect workers' movements into and out of the firm. Furthermore, we were able to identify internal transitions using the definition above. According to the definition we apply in this paper, workers will experience an internal transition (or movement) when they change departments or job assignments within a certain period.

The empirical findings of this paper are the following: Workers who get promoted within firms are in the higher percentiles of the wage distribution, relative to workers who are hired from the external labor market. The difference in wage fully disappears, however, when we correct for observable characteristics of the workers. Incumbents and externally hired workers who were previously employed elsewhere receive on average the same hourly wage, *ceteris paribus*.

The structure of the paper is the following: Section 2 discusses the theories that we will test, Section 3 deals with the data set, and Section 4 presents the empirical findings. Section 5 offers concluding remarks.

2. Theory

The match between a worker and a job may be considered an experience good. That is the value of the match (for both parties, the worker and the firm) is not known before the match actually occurs. The surplus to be split (into wages and profits) is then uncertain a priori. After the match has been formed, both parties can observe the value of the match. Should it to be too low, both the firm and the worker have an interest in searching for better matches. The search for a better match may take place within the firm, through the mechanism of internal mobility, exploiting the possibilities offered by the Internal Labor Market (ILM). In this case the allocative process takes place in isolation.

In this respect, Lazear (1991) suggests that evaluation and internal mobility convey information. Workers are willing to be assessed because the assessment reveals the difference between the value of the current job and the outside option (which is unaffected by the assessment). Evaluations are more valuable at the beginning of the career before any form of firm-specific investment is made. In this framework, assessments and internal mobility would take place more often among young workers and workers with less firm-specific human capital (in other words with short tenure). Both characteristics tend to position externally hired workers in the lower part of the wage distribution.

When ILMs are well functioning and the firm is insulated from the external market, the process of internal mobility involves the comparison between incumbent workers only. However, if ILMs show a certain degree of permeability, then the process of internal mobility is further complicated by its interaction with external recruitment. In addition to the comparison among incumbent workers, firms must now extend the comparison to external candidates. It is then interesting to investigate the extent of the advantage (if any) retained by incumbent workers compared with external candidates.

Because of the lack of records on past performance, firms face uncertainty about the newly hired workers' ability (y). Thus, given a set of observable characteristics X :

$$(1) \quad \text{Var}(y^{\text{ex}} | X) > \text{Var}(y^{\text{ic}} | X)$$

The superscript “ic” refers to the incumbent and “ex” refers to the externally-hired worker. Our empirical question is what the difference is between the wage of the incumbent and newly-hired employees for employees having comparable ability.

$$(2) \quad E(w^{\text{ic}} | y) - E(w^{\text{ex}} | y)$$

Following terminology of Lazear (1995), we will refer to this difference (2) as the wage premium.

The empirical analysis may assess the relevance of two opposing groups of theories regarding how firms deal with imperfect information when hiring workers. On one hand, we distinguish between adverse selection by risk-averse firms (Greenwald, 1986), moral hazard of internal candidates (Chan, 1996); and on the other hand, firms’ taste for uncertainty (Lazear, 1995).

The first three theories imply that incumbents should be advantaged with respect to external candidates who have the same observable qualities. Screening and sorting theories spell out this advantage in the form of a positive wage premium. Externally hired workers earn, at first, a lower wage; if it becomes apparent that they are high productivity workers they are advanced to higher positions. Basically, the same happens when firms are risk averse (Greenwald, 1986).

Alternatively, internal candidates’ advantage may take the form of a preference; Chan (1996) argues that in this way firms may evade moral hazard of the internal candidates as they get a competitive handicap relative to the external candidates.

In contrast, external candidates may enjoy a wage premium according to Lazear (1995). The higher uncertainty in the assessment of external candidate’s productivity gives rise to the possibility that the hired candidate turns out to be more productive than expected at the time of hiring. This is especially true if the worker’s productivity at the firm presents a match-specific component. This match-specific component is unknown in the case of external candidates, but it is known (that is, firms have a better approximation of it) in the case of an internal candidate. The

presence of a firm-specific component of the match and the higher variance in the productivity distribution of externally hired workers generates an option value². In the presence of long-term contacts firms are willing to pay a wage premium to hire risky external workers.

When comparing the wages of internal and external candidates (equation (2)), one should be cautious in choosing internal and external candidates with the same abilities, that is who have the same comparable characteristics. External candidates are hired from different previous labor market positions, such as employment, unemployment, school, and from non-participation. The applicants' ability may in fact correlate with their status prior to being hired. More able workers may be employed; less able ones could be unemployed. In other words, the information on the previous labor market position of external hires may convey information on the candidates' ability. To correctly compute the wage premium in equation (2) one would ideally need paired internal external candidates with the same ability. To this end, we will focus on the comparison between workers who we believe be the most comparable to internal candidates, external hires who have experienced a job-to-job transition.

The next question that has to be addressed in order to have a proper comparison of both groups of candidates in equation (2) is how to validate the tenure component in the wage of the incumbent worker. There are various possibilities. One possibility is that the *ceteris paribus* condition could refer to all other observable features of the internal and external candidates, except for the tenure component of the internal candidate. Another possibility is that we take the wage of the incumbent, net of the tenure component in the wage. In our empirical analysis we apply the latter possibility.

3. Data

We make use of an employer-employee matched data set, derived from the Working Conditions Survey 1999 (hereafter abbreviated as AVO99) of the Dutch Ministry of Social Affairs and Employment (Venema and Faas, 1999). We have access to data of 1,851 Dutch organizations, which we will denote as firms. The data set is derived from administrative personnel records in a broad range of Dutch firms

² The option value arises because firms can let hired workers go who turn out to have a very bad match with the firm. The presence of probation period after which firms may release the worker in almost all Dutch labor contracts allows for this possibility.

from all economic sectors. There is no restriction on the size of the firms investigated. The data are gathered by means of a two-stage sample. In the first stage, a sample of firms is drawn, where the population of firms is stratified towards the economic sector. The sampling probability depends positively on firm size. In the second stage, within each firm a sample of employees is drawn. The sampling fraction of employees is negatively related to firm size.³

In our sample, the workers may be observed in October 1997 or October 1998. In what follows, we will refer to both moments as the years 1997 and 1998. Workers who stayed with the firm, as well as workers who had experienced an internal movement are observed twice, both in 1997 and in 1998. Employees who moved in (or out of) the firm during the year are observed at one of these moments only. Externally hired workers are observed in 1998 only. We know their previous labor market status.

The data set contains administrative information on age, various wage components, the weekly number of hours worked, gender, education (9 levels), complexity of the job (8 levels), economic sector (14 sectors), and firm size (number of employees). Due to this selection, information on some firms cannot be used as for these firms no information was gathered about the complexity of the job, education, and previous labor market status of the external hires.

The net sample we use contains information on 1,838 firms and 44,957 workers who are employed in these firms.

<Table 1>

Table 1 gives information on the various worker flows in our sample. Central to our analysis is the information on mobility within a firm. A worker is defined to have an internal transition (also denoted as internal mobility) when the worker changed in job assignment or changed department within the firm in the period October 1997 - October 1998. In this respect, the definition applied is the same as the

³ It is important to stress that the years used in the analysis are tight labor market years; in the period 1997 – 1998 the Dutch GDP grew at 4.3%, inflation was at 1.75%, employment raised by 3.7%, unfulfilled labor demand (the ratio of vacancies to employment) rose from 1.4% in 1997 to 2% in 1998, and unemployment fell from 5.5% in 1997 to 4.1% in 1998 (Netherlands Central Bureau of Statistics).

one used by the Dutch Labor Demand Panel from the OSA (Organization for Strategic Labor Market Research; Tilburg) that was used in Hassink (1996). All remaining workers who were employed with the firm both in 1997 and in 1998 are defined as stayers. The rate of workers with an internal transition during the year is 3.8 percent (relatively to all workers who were employed with the firm in 1997); 16.9 percent of the workers separated; the remaining 79.3 percent are workers who stay with their job during the year (see Table 1). When we distinguish the external hires by previous labor market status, hiring from other employers is the largest category (61.7 percent of the external hires).

<Table 2>

4. Empirical analysis

We first contrast the wage distribution of the internally mobile workers against the wage distribution of the workers who did not experience internal mobility (the stayers) or who were hired from the external labor market. The percentiles of the logarithm of the hourly wage (the wage actually earned by the workers in 1998) of these three distributions are compared in Table 2. Furthermore, it shows the wage distribution of the stayers and the workers with internal mobility in 1997.

It is clear that the wage distribution of the workers who experience internal mobility has improved compared with the wage distribution of the stayers between 1997 and 1998. The wage increase experienced by the workers with internal mobility must have been above the wage growth experienced by the group of the stayers. However, one can infer that the increase is slightly lower for the workers in the higher percentiles. For the workers with internal mobility the 10th percentile of the hourly wage increased by 15%, whereas for workers in the 90th percentile, the hourly wage increase by increased by 13%. For the stayers the corresponding increase at both centiles is 5%. The right-hand side panel of Table 2 further shows that the percentiles of the workers with internal mobility are above the percentiles of workers who were hired from other employers. This could be due, however, to tenure effects of the promotees.

<Tables 3, 4 and 5>

Next, we turn to the average wage premium of the incumbents relative to that of the externally hired workers. Thus, we investigate whether, after controlling for candidates' observable characteristics, externally hired workers earn a significantly higher wage than internally promoted workers in the same position. We estimated two wage equations, one for the sub-sample of incumbents (denoted by superscript ic) and one for the sub-sample of externally hired workers (denoted by superscript ex)

$$(3) \quad \ln(w_{ij}^{ic}) = \beta^{ic'} X_{ij}^{ic} + \gamma^{ic'} T_{ij}^{ic} + \varepsilon_{ij}^{ic}$$

where β^{ic} and γ^{ic} are vectors of parameters. ε is a stochastic error term. Subscripts i and j refer to the i -th firm and the j -th worker, respectively. In the sequel, b^{ic} is the estimate of β^k , $k = ic, ex$, and g^{ic} is the estimate of γ^{ic} . With the estimated parameters of equation (3), we determine the incumbents' value of the log hourly wage that we may expect given their observed characteristics X_{ij}^{ic} and T_{ij}^{ic}

$$(4) \quad \ln(\hat{w}_{ij}^{ic} | X_{ij}^{ic}, T_{ij}^{ic}) = b^{ic'} X_{ij}^{ic} + g^{ic'} T_{ij}^{ic}$$

as well as their expected log wage, given the observed characteristics (X_{ij}^{ic}), but net of tenure (T_{ij}^{ic}).

$$(5) \quad \ln(\hat{w}_{ij}^{ic} | X_{ij}^{ic}) = b^{ic'} X_{ij}^{ic}$$

Equation (5) corresponds to the extrapolated log hourly wage of the incumbent worker (backwards in time) that he would have received at the moment of being hired by the firm.

The second wage regression we estimated is for the sub-sample of the externally-hired workers. Evidently, this expression does not contain variables in tenure.

$$(6) \quad \ln(w_{ij}^{ex}) = \beta^{ex'} X_{ij}^{ex} + \varepsilon_{ij}^{ex}$$

Basically, equations (3) and (6) contain the same independent variables except for the tenure variable T in (3). Of course, we may use the estimates parameters (6) to determine the predicted wage of the external applicants.

$$(7) \quad \ln(\hat{w}_{ij}^{ex} | X_{ij}^{ex}) = b^{ex} X_{ij}^{ex}$$

The estimates of (6) may be used also to determine the predicted wage for the incumbents. We calculate the wage of incumbents as if they applied as an external candidate

$$(8) \quad \ln(\hat{w}_{ij}^{ic,ex} | X_{ij}^{ic}) = b^{ex} X_{ij}^{ic}$$

We define the wage premium of incumbents as the difference of equations (5) and (8).

$$(9) \quad b^{ic} X_{ij}^{ic} - b^{ex} X_{ij}^{ic}$$

Table 3 gives the descriptive statistics of the variables in equations (3) and (4). For some independent variables, incumbents and externally hired workers have different characteristics. Workers with internal mobility are on average two years older than workers who are hired from other employers.

Table 4 gives the estimated coefficients of the wage regression (equation (3)), for both a sub-sample of incumbents (Column 1) and a sub-sample of workers who stayed on the job (Column 4). Furthermore, it gives the estimated coefficients from equation (4), for a sub-sample of hirees from other employers (Column 2) as well as a sub-sample of all external hirees (Column 3). The latter column includes nine dummy variables on the source of external hiring. For all of the regressions reported in Table 4, the dependent variable is the logarithm of the hourly function wage in the end of 1998.

Unsurprisingly, Table 4 shows that the estimated coefficients on the dummy variables in tenure are rather large for workers who had internal mobility. It implies that the wage difference between equations (3) and (4) is rather substantial. The wage

tenure profile of the internally mobile workers appears to be steeper compared to the wage tenure profile characterizing the stayers.

The source of external hiring (third column) has a substantial impact on the wage. The average hourly wage of the long-term unemployed is about 8% lower than that of the school leavers (reference group for the source of external hiring), supposedly the group with the lowest hourly wage (other things equal). It suggests that long spells of unemployment substantially deteriorate workers' human capital. Furthermore, workers hired from non-participation earn on average more than comparable workers hired from short-term unemployed workers (10.5% versus 6.5%). Workers who experience job-to-job transitions earn an hourly wage 21.4% higher than the wage of a comparable school leaver.

Table 5 shows the wage premiums accruing to incumbents (with respect to external hires) for various groups of incumbent workers (and external hires). Using the estimated coefficients of equation (6) in Table 4 we computed the expected log wage for the externally-hired workers (equation (7)). The predicted wages are shown in the first column of Table 5. Furthermore, we calculated the expected log wage for the incumbents using equation (8). The latter is calculated as if the firm had hired them externally; these are presented in the second column of Table 5. Thus, we apply the estimated coefficients from the external candidates (b^{ex}) to the internal candidates' observed characteristics (X^{ic}) for the calculation of the incumbents' expected wage.

Next, we computed the predicted log wage of the incumbents using the estimated coefficients of equation (3), in which the tenure effect is included (based on equation (4)). This is reported in the third column of Table 5. Finally, the fourth column gives the predicted log wage, net of tenure (equation (5)).

The difference between the predicted log wage of the fourth column and the second column is the wage premium (equation (9)). A positive wage premium indicates that the same observable characteristics are rewarded better if observed on internally promoted candidates compared to external hires. In other words, comparing two similar workers the internal one (the less risky) is the preferred one and consequently earns a wage bonus. A positive wage bonus value would then show firms' aversion for risky workers, in contrast to what postulated in Lazear (1995). The crucial element in the comparison is the *ceteris paribus* condition. Workers must be expected to have the same ability.

Next, we discuss the reported wage premiums for the various groups of hired workers, in the attempt to better qualify the notion of the risky worker. First, we claim that firms perceive internal candidates to be less risky (compared to externally hirees) because of the availability of past employment records. In the first row we compare internal candidates with all external hirees, excluding hires from other employers. The wage premium for internal workers is 18.0%, which is the difference of 4.69 and 4.51. Although these externally hired workers seem to be much riskier than the incumbents, it is hard to compare both groups because the equal productivity assumption may fail to hold. Hence, in the second row we compare incumbents with the externally hired workers who were previously employed (5,190 workers). The difference now disappears, since the wage premium drops to zero. Internal workers appear to be somewhat insulated from the external market, but this insulation fails to protect them from the competition of workers hopping from job to job.

Then in rows three and four we compare young workers. Young workers tend to be more similar, and they did not have much work experience that may have differentiated them in their productivity level. The positive wage premium (13 percent for workers under 25 and 7 percent for workers with age under 23 years of age) shows that firms again seem to prefer incumbent workers to more risky external hirees, except when these come directly from other employers. However, the standard errors of these predictions are fairly large.

Next, we related the risk level of a worker to the difference between her educational level and the modal educational level in the function level to which she is promoted (or hired). Workers hired in a given function from other employers, and who have an educational level below the mode are regarded as risky. Interestingly, we see no significant difference when we compare these risky workers to incumbent worker whose educational level is below the mode (the corresponding wage premium is negative, -3.5%). Furthermore, the empirical evidence does not change when selecting a group of workers that are not extremely risky, the highly educated workers. However, the wage premium is extremely small, only 1 percent.

Finally, since Lazear (1995) seems to suggest that the taste for risky workers should be stronger in growing firms we repeat the exercise splitting the sample according to firms' size change. Again the wage premium is not significantly different from zero.

All considered, the evidence does not appear to support the notion that firms appreciate the option value derived from the hiring of risky (external) workers. Neither is there strong evidence that incumbents receive higher salaries, relative to the external applicants

5. Conclusion

The permeability of the internal labor market begs the question of whether, and if so to what extent, are external hires different from workers experiencing internal mobility. At the end of the day, employers possess less specific information on external workers' ability and may treat the external candidate differently in response to it.

In this paper, we have further characterized the relationship between wages and internal mobility (defined as a change in job assignment or change in department) over the wage distribution using a large administrative data set of Dutch workers.

Workers' mobility appears to be characterized by the following empirical regularities: Worker turnover into firms generally takes place at the lower end of the wage distribution. Despite the higher level of turnover at lower wages, there appears to be consistent mobility into firms along the entire wage distribution.

The difference in the wage that we observe between workers who are hired from other firms and the incumbent workers fully disappears after controlling for their observed characteristics. Furthermore, we investigated the extent of the advantage held by the incumbent worker with respect to external hires. It appears that employers do not appreciate the option value attached to the hiring risky (external) workers as postulated by Lazear (1995). Nor do we find empirical evidence for theories of Greenwald (1986) and Chan (1996). For most of the groups of workers we observe that the difference in the wage between the internal candidates and the external candidates from other employers disappears if we correct for the workers' observable characteristics. This empirical result underlines the permeability of internal labor markets. Incumbent workers and externally hired workers are treated equally with respect to the hourly wage they receive.

References

- Abowd, J.M., Kramarz, F. and D. Margolis (1999), "High Wage Workers and High Wage Firms," *Econometrica*, pp. 251-334.
- Baker, G., M. Gibbs and B. Holmstrom (1994a), "The Internal Economics of the Firm: Evidence From Personnel Data," *Quarterly Journal of Economics*, 109, pp. 881-919.
- Baker, G., M. Gibbs and B. Holmstrom (1994b), "The Wage Policy of a Firm," *Quarterly Journal of Economics*, 109, pp. 921-955.
- Burgess, S.M., J.I. Lane and D. Stevens (1998), "Hiring Risky Workers: Some Evidence," *Journal of Economics and Management Strategy*, 7 (4), pp. 669-676.
- Chan, W. (1996), "External Recruitment versus Internal Promotion," *Journal of Labor Economics*, vol 14, pp. 555- 570.
- Gibbons, R. and M. Waldman (1999a) "Careers in Organizations," in Ashenfelter and Card (eds): *Handbook of Labor Economics*, Vol. 3b, pp. 2373-2437.
- Gibbons, R. and M. Waldman (1999b), "A Theory of Wage and Promotion Dynamics Inside Firms," *Quarterly Journal of Economics*.
- Greenwald, B. (1986), "Adverse Selection in the Labour Market," *Review of Economic Studies*, 53, pp. 325-347.
- Hassink, W.H.J. (1996), "An Empirical Note on Job Turnover and Internal Mobility of Workers," *Economics Letters*, 51, pp. 338-344.
- Lazear E.P. (1991) "Labor economics and the psychology of organizations" *Journal of Economic Perspectives*, 5, 89-110.
- Lazear, E.P. (1995), "Hiring Risky Workers," NBER Working Paper #5334.
- Treble, J., Gamen, E. Van, Bridges, S. and Barmby, T. (2001) "The Internal Economics of the Firm: Further Evidence from Personnel Data," *Labour Economics*, 8, pp. 531-552.
- Venema, P.M and Faas, A. (1999) "Arbeidsvoorwaardenontwikkelingen in 1998 een onderzoek van de Arbeidsinspectie naar gerealiseerde loonontwikkelingen, extra uitkeringen en afdrachtverminderingen," Dutch Ministry of Social Affairs and Employment, The Hague.

Table 1 – Internal mobility and External hiring; number of employees

Information from 1998		
Type of worker flow	Number of employees	Percentage of total flow
Internal mobility	1,668	3.7
External hiring	8,418	18.7
Stay	34,871	77.6
Total	44,957	100.0
<u>Previous labor market status:</u>		
School leaver	908	10.8
Non-participation	347	4.1
Unemployment (short term)	303	3.6
Unemployment (long term)	76	0.9
From other employer	5,190	61.7
Sickness (long period)	24	0.3
Temporary (oproep)	94	1.1
Previously employed with agency of temporary workers	668	7.9
Employed with agency of temporary workers	169	2.0
Unknown	639	7.6
Total external hiring	8,418	100.0

Source: Dutch Labor Inspection, AVO99.

Table 2 – Percentiles of the logarithm of the hourly function wage (by type of worker flow; 1998)

Percentiles	1997		1998			
	Stayers	Internal mobility	Stayers	Hiring		Internal mobility
				All	From other employers	
(bottom) 1%	3.45	3.54	3.64	3.12	3.57	3.86
5%	4.09	4.03	4.16	3.54	4.08	4.23
10%	4.21	4.19	4.26	3.87	4.19	4.34
25%	4.39	4.38	4.44	4.22	4.34	4.51
50%	4.58	4.59	4.63	4.42	4.54	4.72
75%	4.82	4.85	4.87	4.66	4.79	5.01
90%	5.11	5.16	5.16	4.96	5.09	5.29
95%	5.30	5.35	5.35	5.18	5.29	5.48
(top) 99%	5.63	5.62	5.67	5.54	5.61	5.81
Number of observations	34,871	1,668	34,871	8,418	5,190	1,668

Source: Dutch Labor Inspection, AVO99.

Table 3 – Descriptive statistics 1998

	Stayers		Hiring				Internal mobility	
			All		From other employers			
	Mean	St. dev.	Mean	St. dev.	Mean	St. dev.	Mean	St. dev.
Hourly wage (guilders)	114.53	49.07	92.21	46.14	105.78	48.94	128.91	68.67
Hourly wage (logs)	4.67	0.38	4.42	0.46	4.58	0.38	4.77	0.39
Gender (female=1;male=0)	0.32	0.47	0.39	0.49	0.34	0.47	0.28	0.45
Number of hours (weekly)	34.06	9.13	32.43	11.04	35.16	8.34	36.76	5.69
Tenure (years)	10.11	8.77	0.00		0.00		7.01	7.06
Age (years)	39.37	10.44	30.55	9.22	32.13	8.38	34.24	9.11
<u>Economic sector:</u>								
Agriculture	0.01	0.10	0.01	0.11	0.01	0.11	0.00	0.06
Mining	0.01	0.08	0.01	0.07	0.01	0.09	0.01	0.08
Manufacturing	0.28	0.45	0.23	0.42	0.22	0.42	0.22	0.42
Public utilities	0.02	0.14	0.01	0.10	0.01	0.10	0.01	0.11
Construction	0.07	0.25	0.06	0.23	0.06	0.24	0.06	0.23
Repair, trade	0.14	0.35	0.16	0.37	0.15	0.36	0.16	0.37
Hotels and restaurants	0.01	0.12	0.03	0.18	0.02	0.15	0.01	0.11
Transport, storage, communication	0.07	0.25	0.08	0.27	0.10	0.30	0.10	0.30
Financial	0.03	0.17	0.03	0.17	0.03	0.18	0.05	0.21
Business services	0.11	0.31	0.17	0.37	0.15	0.36	0.14	0.34
Government, social insurance	0.12	0.32	0.09	0.29	0.11	0.31	0.12	0.32
Education	0.01	0.10	0.01	0.09	0.01	0.09	0.00	0.06
Health	0.08	0.27	0.07	0.26	0.07	0.25	0.07	0.26
Culture	0.04	0.21	0.04	0.20	0.04	0.21	0.04	0.19
<u>Education:</u>								
1	0.05	0.22	0.05	0.22	0.03	0.17	0.01	0.12
2	0.10	0.30	0.12	0.33	0.10	0.30	0.07	0.26
3	0.32	0.47	0.27	0.44	0.27	0.44	0.22	0.42

	4	0.08	0.26	0.09	0.29	0.10	0.29	0.10	0.30
	5	0.22	0.41	0.19	0.39	0.22	0.41	0.26	0.44
	6	0.13	0.33	0.14	0.35	0.17	0.38	0.22	0.42
	7	0.04	0.19	0.05	0.22	0.06	0.24	0.07	0.26
	8	0.00	0.03	0.00	0.05	0.00	0.03	0.00	0.04
	9	0.07	0.26	0.09	0.28	0.05	0.21	0.03	0.18
<u>Job complexity:</u>									
	1	0.34	0.47	0.29	0.46	0.28	0.45	0.25	0.44
	2	0.17	0.37	0.17	0.38	0.19	0.39	0.19	0.39
	3	0.02	0.15	0.03	0.18	0.04	0.19	0.05	0.23
	4	0.08	0.28	0.11	0.32	0.12	0.32	0.12	0.33
	5	0.28	0.45	0.31	0.46	0.28	0.45	0.19	0.39
	6	0.02	0.13	0.02	0.14	0.02	0.15	0.01	0.12
	7	0.09	0.28	0.04	0.20	0.06	0.25	0.17	0.38
	8	0.00	0.07	0.01	0.08	0.01	0.08	0.00	0.06
<u>Firm size:</u>									
	1 - 4 employees	0.02	0.14	0.02	0.15	0.02	0.14	0.00	0.06
	5 - 9 employees	0.04	0.19	0.05	0.21	0.04	0.20	0.02	0.14
	10 - 19 employees	0.08	0.28	0.10	0.29	0.09	0.28	0.04	0.21
	20 - 49 employees	0.13	0.34	0.17	0.38	0.17	0.37	0.12	0.33
	50 - 99 employees	0.16	0.37	0.17	0.38	0.18	0.38	0.16	0.37
	100 - 199 employees	0.19	0.39	0.16	0.37	0.17	0.38	0.20	0.40
	200 - 499 employees	0.18	0.39	0.17	0.37	0.17	0.38	0.21	0.41
	>= 500 employees	0.19	0.39	0.17	0.37	0.16	0.37	0.25	0.43
	Number of observations	34871		8418		5190		1668	

Source: Dutch Labor Inspection, AVO99.

**Table 4 – Wage regression for Internal mobility, Hiring from other employer, All external hiring; Stayer (equations (4) and (5));
Dependent variable: log(hourly wage in 1998)**

Independent variable	Internal mobility		Hiring from other employer		External hiring		Stayers	
	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value
<u>Age: a)</u>								
< 20 year	-0.657	-3.96	-0.736	-8.86	-0.714	-12.01	-0.762	-49.19
20 – 29 year	-0.281	-1.75	-0.286	-3.51	-0.215	-3.63	-0.201	-14.84
30 – 39 year	-0.119	-0.74	-0.117	-1.43	-0.052	-0.88	-0.058	-4.36
40 – 49 year	-0.050	-0.31	-0.041	-0.50	0.005	0.08	-0.007	-0.52
>= 50 year	-0.027	-0.16	0.004	0.04	0.025	0.42	0.023	1.73
<u>Economic sector b)</u>								
Agriculture	0.101	1.04	0.031	0.90	0.033	1.21	0.026	2.04
Mining	0.209	2.92	0.065	1.66	0.063	1.65	0.072	4.92
Manufacturing	0.021	0.67	-0.016	-0.94	-0.020	-1.34	-0.009	-1.55
Public utilities	0.130	2.18	0.161	4.63	0.122	4.06	0.162	16.12
Construction	0.058	1.53	0.038	1.81	0.019	1.06	0.031	4.35
Repair, trade	-0.049	-1.46	-0.064	-3.56	-0.094	-6.19	-0.050	-7.80
Hotels and restaurants	-0.014	-0.24	-0.015	-0.56	-0.031	-1.55	-0.022	-1.98
Transport, storage, communication	0.069	2.02	-0.025	-1.35	-0.029	-1.80	0.011	1.55
Financial	0.102	2.54	0.023	0.96	0.007	0.34	0.024	2.84
Business services	-0.015	-0.45	-0.040	-2.28	-0.034	-2.30	-0.024	-3.68
Government, social insurance	0.106	3.06	0.090	4.67	0.113	6.86	0.116	17.61
Education	-0.023	-0.25	-0.015	-0.41	-0.047	-1.48	-0.003	-0.22
Health	0.030	0.81	0.046	2.25	0.051	3.03	0.059	8.45
<u>Number of employees: c)</u>								
1 – 4 employees	0.063	0.67	-0.054	-2.19	-0.047	-2.45	-0.061	-7.08
5 – 9 employees	-0.077	-1.79	-0.059	-3.18	-0.056	-3.79	-0.054	-8.10
10 - 19 employees	0.007	0.24	-0.026	-1.81	-0.007	-0.64	-0.037	-7.32

20 - 49 employees		-0.004	-0.20	-0.029	-2.35	0.000	-0.02	-0.013	-2.93
50 - 99 employees		0.024	1.26	-0.005	-0.41	-0.003	-0.32	-0.007	-1.74
100 - 199 employees		-0.021	-1.17	-0.027	-2.27	-0.008	-0.81	-0.017	-4.53
200 - 499 employees		-0.052	-2.99	-0.027	-2.35	-0.005	-0.57	-0.015	-3.85
<u>Job complexity: d)</u>									
	1	-0.315	-3.35	-0.113	-2.66	-0.253	-7.76	-0.165	-10.02
	2	-0.306	-3.25	-0.072	-1.70	-0.223	-6.88	-0.089	-5.43
	3	-0.334	-3.48	-0.065	-1.46	-0.195	-5.55	-0.053	-2.97
	4	-0.223	-2.35	-0.051	-1.19	-0.218	-6.61	-0.076	-4.54
	5	-0.337	-3.58	-0.095	-2.24	-0.247	-7.66	-0.159	-9.72
	6	-0.335	-3.22	0.024	0.53	-0.108	-2.95	-0.040	-2.21
	7	-0.110	-1.17	0.208	4.77	0.091	2.64	0.118	7.08
Dummy gender (woman = 1)		-0.105	-7.23	-0.087	-10.90	-0.068	-10.66	-0.107	-34.81
<u>Education: e)</u>									
	2	0.048	0.95	0.045	2.15	0.050	3.45	0.088	13.77
	3	0.048	1.03	0.095	4.93	0.095	7.09	0.120	21.56
	4	0.220	4.43	0.225	10.40	0.200	12.84	0.240	35.02
	5	0.242	5.13	0.243	12.14	0.226	15.86	0.283	48.04
	6	0.519	10.82	0.480	23.09	0.425	28.17	0.520	80.65
	7	0.667	13.12	0.631	27.03	0.566	31.41	0.717	87.67
	8	0.080	0.57	-0.090	-0.94	-0.014	-0.28	0.070	1.96
	9	0.154	2.81	0.113	4.82	0.101	6.64	0.112	16.57
Ln(number of hours worked)		0.073	3.25	0.063	7.17	0.068	12.82	0.049	16.44
<u>Tenure: f)</u>									
2 years		0.030	1.51					0.023	4.60
3 years		0.057	2.61					0.047	8.72
4 years		0.074	3.02					0.055	9.45
5 years		0.076	2.88					0.061	10.13
6 years		0.123	4.73					0.070	12.11

7 years	0.102	3.67			0.091	15.67		
8 years	0.137	4.80			0.091	15.31		
9 years	0.143	4.60			0.099	15.12		
10 years	0.125	3.63			0.109	16.18		
11 years	0.171	4.33			0.107	15.11		
12 years	0.131	3.15			0.107	15.33		
13 years	0.164	3.77			0.108	14.09		
14 years	0.025	0.46			0.106	11.73		
15 years	0.110	1.85			0.115	11.68		
16 years	0.113	1.93			0.139	13.99		
17 years	0.191	4.04			0.125	13.26		
18 years	0.157	2.67			0.123	14.90		
19 years	0.043	0.71			0.105	11.87		
>= 20 years	0.176	6.11			0.129	26.09		
<u>Previous labor market status: g)</u>								
Non-participation					0.105	6.11		
Unemployment (short term)					0.065	3.80		
Unemployment (long term)					-0.083	-2.79		
From other employer					0.214	21.10		
Sickness (long period)					0.255	5.06		
Temporary (oproep)					-0.046	-1.69		
Previously employed with agency of temporary workers					0.125	9.20		
Employed with agency of temporary workers					0.041	1.90		
Unknown source of hiring					0.074	5.37		
Constant	4.624	22.24	4.458	45.45	4.311	59.51	4.417	181.82
Sigma	0.223		0.229		0.241		0.210	
R2	0.688		0.648		0.726		0.689	
Number of observations	1668		5190		8418		34871	

Source: Dutch Labor Inspection, AVO99.

- a) Reference category: Older than 60 years.
- b) Reference category: Culture.
- c) Reference category: ≥ 500 employees.
- d) Reference category: Complexity of the job level 8.
- e) Reference category: Educational level 1.
- f) Reference category: tenure of 1 year.
- g) Reference category: School leaver.

Table 5 – Predicted log(hourly function wage), 1998, for various sources of hiring and sub-samples of internal mobility (using the estimated coefficients of Table 4)

External hiring (various sources)	Internal mobility (various sub-samples)	Predicted dependent variable: Ln(hourly function wage, 1998)				Number of cases of external hiring	Number of cases of internal hiring
		Estimated coefficients of external hiring (eq (6))		Estimated coefficients of internal mobility (eq (3))			
		Prediction: $b_{ex}\chi_{ex}$ (eq (7))	Prediction: $b_{ex}\chi_{ic}$ (eq (8))	Prediction: $b_{ic}\chi_{ic} + g_{ic}\tau_{ic}$ (eq (4))	Prediction: $b_{ic}\chi_{ic}$ (eq (5))		
<u>Source of external hires:</u>							
- All external hiring, excluded previously employed	- All internal mobility	4.16 (0.03)	4.51 (0.03)	4.77 (0.04)	4.69 (0.04)	3228	1668
- Previously employed	- All internal mobility	4.58 (0.02)	4.70 (0.02)	4.77 (0.04)	4.69 (0.04)	5190	1668
- Schoolleaver; - Age ≤ 25 year	- Age ≤ 25 year; - Tenure ≤ 2 year	3.88 (0.05)	4.18 (0.06)	4.31 (0.08)	4.31 (0.08)	809	161
- Schoolleaver; - Age ≤ 23 year	- Age ≤ 23 year; - Tenure ≤ 2 year	3.80 (0.05)	4.10 (0.05)	4.18 (0.10)	4.17 (0.10)	714	102
<u>Undereducation (relatively to function):</u>							
- Previously employed; - Educational level too low (relatively to function)	- Educational level too low (relatively to function)	4.41 (0.03)	4.57 (0.04)	4.62 (0.06)	4.54 (0.06)	1740	487
<u>Education:</u>							
- Previously employed; - Highly educated;	- Highly educated	4.88 (0.04)	4.97 (0.04)	5.06 (0.09)	4.99 (0.08)	1470	553

<u>Employment growth of firm:</u>							
- Declining employment (empl. 1998 < empl. 1997); - Previously employed	- Declining employment (empl. 1998 < empl. 1997)	4.61 (0.04)	4.70 (0.04)	4.77 (0.07)	4.66 (0.06)	1275	517
- Increasing employment (empl. 1998 > empl. 1997); - Previously employed	- Increasing employment (empl. 1998 > empl. 1997)	4.57 (0.02)	4.69 (0.02)	4.78 (0.05)	4.70 (0.05)	3527	1035
- Rapidly increasing employment (annual employment growth ≥ 5%); - Previously employed	- Rapidly increasing employment (annual employment growth ≥ 5%)	4.55 (0.03)	4.67 (0.03)	4.78 (0.06)	4.70 (0.06)	2255	585

Source: Dutch Labor Inspection, AVO99.

a) Standard error of predicted value between parentheses.

