The Prevalence and Role of Internal Labor Markets:
An empirical investigation

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Abstract
In this paper we use panel data on firms to investigate the prevalence and role of internal labor markets. We find that the internal mobility rate of employees is on average substantially smaller than the hiring rate of external workers. This is at odds with the theory of internal labor markets that predicts that internal mobility is more important than external mobility. Our empirical analysis focuses on the relationship between the quit rate and the internal mobility rate. Internal labor market theory predicts a negative correlation between quits and internal mobility since employers use internal mobility to prevent quits. Our estimates show the correlation is positive and that the negative impact of internal mobility on quits is very weak. From these results we conclude that internal labor markets are not very important within firms.

JEL-code: D21, J63
Keywords: internal labor market, internal mobility, quits, panel data.

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1. Introduction

Labor economists often invoke the existence of internal labor markets to explain anomalous behavior of workers and firms. An example is the insider-outsider theory that divides workers into incumbent employees and the excluded unemployed. However, internal labor market theory is not firmly based on optimizing behavior of workers and firms. It is rather a bundle of ideas aimed at explaining certain observed phenomena than a rigid theory that yields testable predictions.

Internal labor market theory stresses the importance of career paths within a firm. Positions form a job ladder and external hiring is concentrated at the bottom of the ladder. Job openings at higher positions are filled by internal mobility. The internal labor market theory hypothesizes that administrative rules rather than optimizing behavior govern the rate and direction of internal mobility (Doeringer and Piore, 1971). These rules lead to high employment stability and a relation between wages and jobs and not between wages and worker characteristics as predicted by the neoclassical theory of the firm (Creedy and Whitfield, 1988). Hence, the internal labor market theory belongs to the school of institutional economics.

This paper is a contribution to the small empirical literature on internal labor markets. We investigate the prevalence of internal labor markets by testing some obvious predictions of internal labor market theory. In our analysis we use panel data of Dutch firms which were surveyed in 1988 and 1990. We start by looking at some descriptive statistics. If there are internal labor markets, one would expect the internal mobility rate to be much larger than the (external) hiring rate. This is because a job opening at a higher position is filled on the internal labor market which may lead to a job opening at a lower position which is filled in the same way until the entry level is reached at which external hiring occurs. Hence, the internal labor market theory predicts that, except at the entry level, a job opening leads to multiple moves of employees and at most one instance of external hiring. However, in our data we find that per year on average 3.4% of the employees moves within the firm, while a number equal to 11.9% of the employees is hired on the external labor market.

We also investigate the relationship between internal mobility and quit rates. According to the theory of the internal labor market employers use internal mobility as an instrument to reduce turnover, so one would expect a negative
relationship between both flows of workers. However, we find that there is a positive correlation between these flows.

Together these two pieces of evidence indicate that internal labor markets are not important in Dutch firms. First, most job openings are filled by external hiring. This is only consistent with the existence of internal labor markets if most job openings occur at the entry level. Second, the positive relation between the quit rate and the internal mobility rate dominates. Hence, firms with a high level of internal mobility do not have lower quits. The internal labor market is not an effective instrument in reducing external turnover.

This paper is organized as follows. Section 2 discusses the theory of the internal labor market and gives a short overview of empirical research. Furthermore, a simple model of internal mobility and quits is presented. Section 3 describes the data that we used in our analysis. Section 4 gives the stylized facts on the relationship between internal mobility and external hiring. Section 5 presents the results of the analysis of the relationship between quits and internal mobility. Section 6 concludes.

2. Internal labor markets
2.1 Theory and empirical studies
By assumption, a firm with an internal labor market only hires at the bottom of the job ladder. Subsequently, new hires may be promoted to higher job levels. According to Doeringer and Piore (1971) this implies that there is more job mobility within firms than between firms. One specific type of mobility they stress is 'osmotic mobility' in which the nature of the tasks of a worker changes gradually. As a consequence, over a long period the type of work may change substantially. Of course, if this type of mobility is predominant, then conventional measures of internal mobility may be badly biased. However, an internal labor market conditions the reaction to more abrupt changes in the position of employees. A position change leads to a sequence of internal moves of employees until the bottom of the job ladder is reached. Only at that level an external hire occurs. Hence, the internal labor market theory predicts that the number of internal changes of position, i.e. the internal mobility flow, exceeds the number of external hires, i.e. the external mobility flow. Below, we test this prediction.
The main reason for an internal labor market is the creation of a durable relationship between workers and firms. Employers want to ensure that they have a stable and dedicated work force. By hiring workers at low-level 'ports-of-entry' and observing their behavior, firms minimize hiring costs. The observed productivity at low-level jobs is used to determine who stays and gets promoted to high-level jobs. So, most jobs are filled from the ranks of current employees. Once an investment is made in a worker, a firm finds it costly for workers to quit (Wachter and Wright, 1990). Therefore, they offer these employees an inside track on upper-level vacancies. If employees quit, they lose this privileged position. Thus, they are motivated to stay.

The allocation of jobs in the internal labor market is determined by a set of administrative rules and procedures and not by economic variables. Wages are attached to jobs rather than to workers. This implies that the promotion rules within the firm determine the allocation of wages to workers. Therefore, the most important rules are the rules on entry and promotion. The rules for entry can vary according to conditions in the external labor market. The promotion rules reflect a compromise between seniority and ability as relevant criteria, where the suggestion is that the former is more acceptable to the worker and the latter to the employer (Creedy and Whitfield, 1988).

The internal labor market theory has not led to much empirical work by economists. The available empirical studies focus on one or a few elements of the internal labor market. Many of the studies merely classify firms or industrial sectors as having or not having an internal labor market on the basis of one or more criteria. The major classification criterium is low labor turnover. An early example of an empirical study is Alexander (1974) who introduces annual labor turnover as a criterium for an internal labor market in a firm or an industry. If annual labor turnover is less than 10%, then there is an internal labor market. Other studies, like for example Mace (1979) use a list of features like low turnover, entry ports and promotion ladders. An interesting attempt to investigate the internal labor market is the study by Baker, Gibbs and Holmstrom (1993), who analyze personnel records for all salaried management employees of a large U.S. firm over a period of 20 years. They conclude that although hiring is concentrated at the lower job levels, entry is important at all levels, suggesting that the emphasis given to ports of entry may be unwarranted.

Only a few studies present a statistical analysis of the relationship between
relevant internal labor market characteristics or use firm level data in their analysis. A rare example is Pfeffer and Cohen (1984) who use data on 309 firms with at least 100 employees in the San Francisco Bay Area. They construct a measure of the extent of the internal labor market using a large number of indicators. From regression equations with this measure as dependent variable they conclude that firms that rely on-the-job training and have a personnel department, score higher on the measure for an internal labor market. Firm size appears to have a significantly positive effect on the extent of the internal labor market if the personnel department is left out.

It is clear that most studies rely on rather indirect measures of the extent of internal labor markets and as a consequence tend to take the existence of such markets for granted. The results can hardly be interpreted as tests of the internal labor market theory.

2.2 Flows of workers and internal mobility

Internal mobility is one of the flows of workers determining the allocation of labor. Figure 1 shows the relationship between the number of jobs in two subsequent periods and the flows of workers to, from and within the firm. In period t there are $J_t$ jobs in the firm. In period $t+1$, $J_{D_{t+1}}$ jobs are destroyed while $J_{C_{t+1}}$ jobs are created. Obviously, employment increases if $J_{C_{t+1}} > J_{D_{t+1}}$, and decreases if $J_{D_{t+1}} > J_{C_{t+1}}$.

Workers may separate from a firm for different reasons: quit, lay-off or a transition out of the labor force (pension, disability). Figure 1 distinguishes separations by two origins: from existing jobs (X1) or from jobs which have been destroyed (X2). Workers on current jobs may move internally to other current jobs (IM1) or to newly created jobs (IM2). Workers who hold jobs that are destroyed may move internally to either surviving jobs (IM3) or to newly created jobs (IM4). Finally, there are flows of newly hired workers to newly created jobs (H1) or to positions left by workers (H2).

From figure 1 it is clear that many workers may flow in and out of the firm.

1 The figure is simplified by omitting vacant jobs.
or change jobs within the firm even if the total employment does not change much (Hamermesh et al., 1994). What does the internal labor market theory predict concerning these flows of workers?

Let us first consider the hiring decision of the employer who can choose between promoting an incumbent worker or hiring a new worker. Hence, we consider a vacant position at a higher level than an entry job where only workers from outside the firm are hired. As usual the employer compares the costs and benefits of the two options.

We assume that after additional training there is no difference in productivity between incumbent workers and workers who come from outside the firm. Of course, there will be a difference in the amount of training necessary to do the job, since the incumbent worker may already know the firm and the tasks connected to the job.

In his recruitment decision the employer compares the (expected) hiring costs of an external worker with the (expected) hiring costs of an internal worker on the assumption that he pays both the same wage. The worker with the lowest hiring costs will be chosen. The hiring costs are the sum of the search, screening and training costs. All these are lower for the internal candidate. Hence, the internal labor market theory predicts that higher level vacancies are filled by moving workers up the job ladder.

If the benefit to the firm of low turnover is large, then the firm may use the internal labor market to prevent quits of workers. Of course, this only works if it also is beneficial to the employees. In his decision to quit a worker balances the costs and benefits. The benefits consist of the higher wage to be earned elsewhere. The costs of a quit are the search costs and the loss of firm-specific human capital or more precisely, the loss of a career opportunity within the current firm. Therefore, the worker does not quit if the career prospects within the firm are sufficiently favourable.

We conclude that the internal labor market theory yields at least two testable predictions. First, in filling open positions the employer prefers internal job candidates. Second, if the employer is confronted with substantial turnover costs he tries to prevent quits by offering good career prospects within the firm. This implies that there is a negative correlation between quits and internal mobility. Below, we investigate the validity of both predictions. But first, we describe the data we use in our analysis.
3. The data

We use a unique data set, which is based on two subsequent surveys held in the Netherlands. The surveys sample organizations, which we refer to as firms. These firms are from all industries including government and education and have at least 10 employees. The sample is stratified according to area of economic activity and size of the firm (three classes: 10-49, 50-99, 100+ workers).

Each survey uses two questionnaires. The first questionnaire concerns qualitative characteristics and financial data. The second questionnaire gathers administrative information about the firm. The response to the second questionnaire is 75-80 percent of the response to the first one.

In 1988 the sample consisted of 2041 firms, in 1990 of 2017 firms. The surveys were set up as a panel, but a large number of the 1988 firms did not cooperate in 1990, had a substantial change in activities or experienced a merger. The gross panel sample consists of 1168 firms. If we remove those firms for which we do not know quits or internal mobility we have an intermediate sample of 444 firms. After removing those firms which do not provide essential information for our empirical analysis a net sample of 158 panel firms remains. Figure 2 is based on data of 1158 firms for 1990.

The definitions of the main variables in our analysis are presented in Appendix 1. Employment is measured as the number of employees in December 1988 (1990) irrespective of the number of hours they worked. Workers with temporary contracts shorter than one year are excluded in the sample. The number of quits is measured as the number of annual voluntary separations other than into retirement or early retirement. Internal mobility is measured as the annual number of employees who change function and/or department within the firm.

Table 1 shows that there are many firms in our sample which experience no internal mobility or quits in one or both years. Only 45 of the 158 firms have both a positive internal mobility and quits in both years.

*table 1 about here*

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2 On average, the fraction of workers with a temporary contract shorter than one year is 9% of the total number of employees.
In our empirical analysis both quits and internal mobility are calculated as rates in which the number of employees at the beginning of the year is used as a denominator. We denote the quit and internal mobility rate by $q$ and $im$, respectively.

We performed several checks of the potential selectivity of the net sample. First, we investigated to which extent our main dependent variables, the quit and internal mobility rates are affected by the selection. The average quit rate is 0.071 in the gross sample and 0.056 in the net panel sample. The average internal mobility rate is about the same in both samples, 0.032. Second, we checked whether the means of a number of (explanatory) variables differed between the net and gross sample. We did not find significant differences. Third, a comparison of the fraction of firms with zero quits or zero internal mobility in the intermediate sample of 444 firms with the fraction in the net sample of 158 firms did not show a substantial difference. We take this as evidence that selection bias is not an important problem in our sample.

4. Internal mobility and external hiring: stylized facts

The first testable prediction which can be derived from the internal labor market theory is that employers prefer current employees to external candidates. This implies that the internal mobility rate is larger than the external hiring rate.

Our data contain information on this prediction. For each firm, if there had been any internal mobility, hiring or separation of workers during the year, information on the most recent worker in these flows was registered. The respondent of the firm reported whether the worker came from a destroyed or existing job (in case of X and IM), or whether the worker went to a (newly) created job or existing job (in case of H and X). Aggregation of the worker information over the firms gives estimates of the relevant fractions, which after multiplication with H, X or IM gives the size of each of the subflows.

*figure 2 about here*
Figure 2 gives the estimates. It appears that in 1990 2.6% of the existing jobs were destroyed. New jobs were created at a rate equal to 4.4% of the existing jobs. Jobs which were destroyed mainly caused workers to leave the firm (1.9%). A small number of these workers moved to an existing job within the firm (0.4%) or to a newly created job (0.3%). Newly created jobs were mainly taken by externally hired workers (3.2%). Some of these jobs were taken by incumbent workers (0.9%). The inflow and outflow of workers mainly involved flows to and from existing jobs. Internal mobility between existing jobs was small (1.8%).

The total flow of workers to jobs was 15.3% of which 11.9% involved external hiring and 3.4% internal mobility. So, the probability that an internal candidate filled a vacancy was about 22%. Hence, it appears that the hiring rate of workers through internal channels was relatively small compared to the hiring rate of workers from outside the firm. This result suggests that it is easier for a worker to get a job in a different firm than to get promotion in the current firm. This is a first indication that internal labor markets may not be very important within firms.

5. The correlation between quits and internal mobility
The second testable prediction that can be derived from the internal labor market theory is that employers try to prevent quits by offering career prospects within the firm. This implies that there is a negative correlation between the quit and internal mobility rates.

We start our investigation by looking at simple correlations between quit and internal mobility rates.

3Underlying figure 2 is the identity $H - X = J^C - J^P$. $H - X$ equals 1.8, but the raw estimates of the flows implied $J^C - J^P = 2.6$. To obtain the identity we adjusted $H1$ and $X2$ by adding $\delta_1 H1$ and $\delta_2 X2$, respectively. The optimal weights $\delta_i$ are those that minimize the quadratic loss function $\delta_1^2 + \delta_2^2$, subject to $(1 + \delta_1)H1 - (1 + \delta_2)X2 = H - X + IM3 - IM4$.

4 According to internal labour market theory the allocation of jobs is determined by rules and procedures. However, only 22% of the firms in our sample use formal procedures when it comes to career planning. This is additional evidence that internal labour markets are not very important within firms.
Table 2 presents correlations between quit and internal mobility rates for both the intermediate sample of 444 firms and the net sample of 158 firms. There are some, but unimportant, differences between the samples, except for the correlation in which is corrected for firm specific effects. We concentrate on the correlations in the net sample. Table 2 shows that the intertemporal correlation of quit rates (0.493) is larger than the intertemporal correlation of internal mobility rates (0.173). This suggests that quit rates are more stable than internal mobility rates. The average correlation coefficient between quit and internal mobility rates is 0.173. If we correct for firm specific effects we find a much lower but still positive correlation coefficient of 0.069. For the intermediate sample the coefficient has a larger value of 0.133.

There are two obvious objections against the use of simple correlation coefficients to investigate the relationship between quits and internal mobility. First, there are many firms with a zero quit and/or internal mobility rate. Second, the correlation coefficient does not account for changes in the environment of the firm. Therefore, we need an appropriate statistical model.

5.1 The Statistical Model
In obtaining an estimate of the correlation between the quit and internal mobility rate we must take account of:

a. the substantial fraction of firms with a zero quit and/or internal mobility rate;

b. firm-specific effects;

c. changes in the environment of the firm.

To deal with a. we use a Tobit formulation. We take account of b. through the inclusion of a random firm effect, \( \mu_i \). This is important because we want to distinguish between reactions to permanent differences in the internal mobility rate and reaction to random shocks in this rate. Finally, we deal with c. by including time varying regressors.

The index \( k \) refers to the dependent variables. The indices \( i,j \) refer to firms and \( s,t \) refer to time periods. \( N \) and \( T \) are the cross-section dimension and time dimension, respectively. The dependent variables are the quit \( (y_{1it}; k=1) \) and internal mobility \( (y_{2it}; k=2) \) rate. The model is
(1a) \[ y^*_{1it} = \beta_1 x_{it} + \mu_{1i} + \varepsilon_{1it} \]

(1b) \[ y^*_{2it} = \beta_2 x_{it} + \mu_{2i} + \varepsilon_{2it} \]

for \( i,j = 1,\ldots,N \) and \( t,s = 1,\ldots,T \),

in which:

\[ E(\mu_{ki}) = 0 \]
\[ E(\varepsilon_{kit}) = 0 \]
\[ E(\mu_{1i}\mu_{2i}) = 0 \]
\[ E(\varepsilon_{1i}\varepsilon_{2i}) = \delta_{ij}\delta_{ks}\sigma_{12} \]
\[ E(\mu_{ki}^2) = \tau_k^2 \]
\[ E(\varepsilon_{kit}^2) = \sigma_k^2 \]

and:

(1c) \[ y_{kit} = \max (y^*_{kit},0) \]

In the sequel we omit the subscript \( i \). Moreover, for ease of exposition we take \( T=2 \). Because the \( \varepsilon_{ki} \) are uncorrelated over time we derive the likelihood function by first conditioning on \( \mu_1 \) and \( \mu_2 \) and subsequently marginalizing with respect to these random variables. Define

(2) \[ I_{ki} = I(y^*_{ki} > 0) \]

The contribution of an individual firm to the likelihood is

\[^5 \delta_{ij} \text{ and } \delta_{ks} \text{ are Kronecker delta's.}\]

\[^6 \text{This is essentially the Tobit version of the simultaneous Probit model with random intercept used by Sickles and Taubman (1986). We could allow for a nonzero correlation between } \mu_{1i} \text{ and } \mu_{2i}, \text{ because if } T=2 \text{ we can identify } \tau_{12} \text{ from} \]

\[ E(\mu_1 + \varepsilon_{1i})(\mu_2 + \varepsilon_{2i}) = \tau_{12} \]

and, hence we have

\[ \sigma_{12} = E((\mu_1 + \varepsilon_{1i})(\mu_2 + \varepsilon_{2i})) - \tau_{12} \]

In other words, the relevant covariances are identified.
\[
(3) \sum_{\infty}^{\infty} \int_{-\infty}^{\infty} \prod_{i=1}^{T} \left[ \phi_2 \left( \frac{y_{1t} - \beta_1 x_i - \mu_1}{\sigma_1}, \frac{y_{2t} - \beta_2 x_i - \mu_2}{\sigma_2} ; \rho_\epsilon \right) \right] I_{1t} I_{2t} \\
\times \left[ \Phi_1 \left( \frac{-\beta_1 x_i - \mu_1 - \rho_\epsilon \frac{\sigma_1}{\sigma_2} (y_{2t} - \beta_2 x_i - \mu_2)}{\sigma_1(1 - \rho_\epsilon^2)^{1/2}} \right) \right] \phi_1 \left( \frac{y_{1t} - \beta_1 x_i - \mu_1}{\sigma_1} \right) I_{1t}(1 - I_{2t}) \\
\times \left[ \Phi_1 \left( \frac{-\beta_2 x_i - \mu_2 - \rho_\epsilon \frac{\sigma_2}{\sigma_1} (y_{1t} - \beta_1 x_i - \mu_1)}{\sigma_2(1 - \rho_\epsilon^2)^{1/2}} \right) \right] \phi_1 \left( \frac{y_{2t} - \beta_2 x_i - \mu_2}{\sigma_2} \right) I_{2t}(1 - I_{1t}) \\
\times \Phi_2 \left( \frac{-\beta_1 x_i - \mu_1, -\beta_2 x_i - \mu_2 ; \rho_\epsilon}{} \right) (1 - I_{1t})(1 - I_{2t}) \\
\times \phi_1 \left( \frac{\mu_1}{\tau_1} \right) \phi_1 \left( \frac{\mu_2}{\tau_2} \right) d\mu_1 d\mu_2
\]

with
\[
(4) \rho_\epsilon = \frac{\sigma_{12}}{\sigma_1 \sigma_2}
\]

and \( \phi_1(.) \), \( \Phi_1(.) \) (\( \phi_2(\cdot;\cdot;\rho) \), \( \Phi_2(\cdot;\cdot;\rho) \)) the univariate (bivariate) Normal p.d.f and c.d.f., respectively.

The likelihood function is obtained by multiplying the contributions of the firms in the sample. The estimates reported below are MLE's obtained by maximizing this likelihood function.

5.2 Explanatory variables

To account for changes in the environment of the firm and observed differences in firm characteristics we introduce a number of (time varying) regressors. We include explanatory variables which we expect to be important determinants of either quit or internal mobility rates or both.

Although quits and internal mobility originate from an interaction between employer and employee we take the perspective of the employee when discussing possible determinants of quits and the perspective of the employer when discussing internal mobility.
The decision of the worker to start looking for a new job outside the firm originates from a cost-benefit analysis. Therefore, individual characteristics like the age of the worker may be important. Young workers easily change jobs at different employers because the costs in terms of loss of firm specific human capital are low and potential benefits are high because the remaining working life is long. Many studies indicate that job mobility falls as age rises. Furthermore, it may matter whether a worker has a parttime or a full time job. Parttime workers may have a large quit rate since they have invested less in firm-specific capital. If the fraction of workers on sickness leave is rather large, then this may indicate the response of workers to bad working conditions which stimulates quits. Potential loss of firm specific human capital is the start-up period, the time spent on the job necessary to become productive. The presence of educational facilities may increase the general human capital of the workers which stimulates quits. Finally, if the wage of the workers is high compared to other firms within the same sector, then workers are less inclined to quit.

From the perspective of the employer internal mobility is determined by the cost involved. The age of the workers may have a positive effect on internal mobility because younger workers have less job-specific human capital and therefore loose less human capital when they move internally. An employer will benefit longer from a full time worker compared to a parttime worker. Hence the fraction of parttime workers is expected to have a negative impact on internal mobility. We expect a negative impact of the fraction of workers on sickness leave, because a large rate makes it is more difficult to have internal mobility. A longer starting up period reduces internal mobility, because of the loss of job specific human capital. The presence of educational facilities will stimulate internal mobility, since the costs involved will be reduced. We also expect a positive influence of the size of the firm. If more jobs are present, reallocating workers within the firm becomes easier. Finally, a higher wage relative to other jobs within the same sector, indicates the policy of a firm to have more internal mobility. Appendix 1 provides definitions of the variables.

Table 3 presents the averages of the variables in the panel dataset of 158
firms. The average annual quit rate is 5.6%. The average annual internal mobility rate is 3.2%, and consists of 3 components: a change of function, (1.7%), a change of department (0.6%) or both (0.9%). About 30% of the workers is younger than 30 years. The share of parttime workers is 17%, the fraction of workers on sickness leave is 8%. About 22% of the firms has a starting up period longer than 300 days, while 24% of the workers had some on the job training during the year. The average number of employees per firm is 108.

5.3 Estimation results
Tables 4A and 4B present the estimation results of two bivariate Tobit regressions. The first estimate concerns a pooled regression, i.e. all firms have the same intercept. The second estimate allows for firm-specific effects.

table 4A,B about here

The results of the Likelihood-ratio test on a change of the coefficients and (co)variances between both years (Pesaran et al., 1985) indicate that the bivariate Tobit regressions can be pooled over both years. From tables 4A,B it appears that for the quit rate and the internal mobility rate there is little difference between the estimated coefficients of the first and second column.

We find a significant effect on the quit rate of the share of young workers and the dummy variable for the year 1990. Quit rates at the firm level are positively influenced by the share of young workers. Apart from that, there is an autonomous growth of the quit rate. This autonomous growth probably reflects improved labor market conditions. For the internal mobility rate the estimates indicate that the share of young workers has a positive influence on internal mobility, while firms with educational facilities have more internal mobility than firms without these facilities. The fraction of workers on sickness leave has a negative impact (significant at 10% level). Large firms have more internal mobility than small firms.

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7 The test statistic $\chi$ is constructed as $2(L_{98} + L_{90} - L_{98+90})$, where $L_t$ is the maximized log-likelihood value of year $t$. Under $H_0$ (equal coefficients and (co)variances) is $\chi$ asymptotically $\chi^2_{k+1}$, where $k$ is the number of estimated parameters.
Furthermore, in the internal mobility equation the standard error of the unobserved firm-specific effect is insignificant. The firm-specific effect of the quit equation is non negligible. It captures one third of the total variation of the error term. After introduction of the firm specific effects, the correlation term in the error structure drops slightly from 0.159 to 0.152. So even after introduction of explanatory variables and firm specific effects, the correlation between quits and internal mobility is still positive and significant.

The reduced form estimates demonstrate the dominance of the positive correlation between the quit rate and the internal mobility rate. The estimates of a structural model in which both rates are allowed to influence each other directly confirm these results (see Appendix 2): there is only a weak and insignificant negative influence of internal mobility on quits. The estimates lead to the impression that the positive correlation between quits and internal mobility is induced by the positive impact from quits on internal mobility. Workers only change jobs within a firm if jobs has become vacant, which may be originated by a quit. The positive correlation is a second indication that internal labour markets are not very prevalent.

6. Conclusions
In this paper we investigate the prevalence of internal labor markets by testing two obvious predictions from the internal labor market theory. The first prediction refers to the importance of career paths within firms. If a job opening occurs it is filled on the internal labor market, creating a job opening at a lower level, which is filled in the same way until the entry level is reached at which external hiring occurs. Therefore, except at the entry level, a job opening leads to a vacancy chain, multiple internal moves and at most one instance of external hiring. The second prediction refers to the main reason for the existence of internal labor markets. Employers try to prevent quits by offering good career prospects within the firm, introducing a negative correlation between quits and internal mobility.

We use data on firms to investigate both predictions. We find that the level of internal mobility is rather small compared to the number of newly hired workers. This suggests that newly hired workers fill vacancies directly without a preceding vacancy chain. Taking account of the panel character of our data set, we find a positive correlation between quit and internal mobility rates.
This suggests that internal mobility is not used as an instrument to reduce quits. From these results, we conclude that employers do not use internal labor markets as a tool in the management of the work force.
References


Appendix 1 Definition of Variables

L "How many workers were employed in your organization in December 1988 (1990) (no temporary workers). This concerns the number of employees irrespective of the number of hours worked". In the 1988 wave the same question is asked for the number of workers in December 1986. The numbers of employees in December 1987 and December 1989 are constructed by means of the hires (H) and the outflow (X) of employees in the next year: \( L_{t+1} = L_t - H_t + X_t \).

H "How many employees entered your organization in 1988 (1990), including employees with a probationary period, excluding employees with a temporary contract shorter than one year?"

X "How many employees left your organization in 1988 (1990), excluding employees with a temporary contract shorter than one year." X is divided into the number of employees who left the organization for the following reasons:
- pension, early retirement, death;
- outflow because of disability;
- firing;
- quit;
- end of temporary contract with a duration > one year.

IM "How many employees changed function and/or changed department within the organization?"

W The weighted average monthly gross wage in the organization at the time of the survey. The employer is asked to distinguish the salary levels of the employees in three equal groups. For each group, the maximum wage and the minimum wage are registered. The average wage is constructed as

\[ \Sigma_i \left( \frac{L_i}{L} \right)^* (w_{\text{min}}^i + w_{\text{max}}^i)/2, \]

where \( w_{\text{min}} \) and \( w_{\text{max}} \) are the minimum and maximum wage level, respectively. L is the number of employees in each group, which is also reported by the organization. In the analysis, the wage relatively to the average sectoral wage is used, denoted as small \( w \).

Age 15-29 Fraction of employees younger than 30 years
Parttime Fraction of parttime employees in December of each year
Illness Average fraction of employees absent due to illness.
Course Fraction of employees attending internal and/or external course.
Start-up Fraction of employees with a start-up period longer than 300 days.
D90 Dummy variable which has a value of 0 in 1988 and a value of 1 in 1990.
Appendix 2 Estimates of a structural model of quits and internal mobility

The advantage of a structural model is that a distinction can be made between the impact of internal mobility on the workers’ quit decision and the impact of quits on the internal mobility decision of the employer. The former relationship predicts a positive coefficient, but the latter relationship implies a negative coefficient. Identifying variables are those which affect either the costs of quits or the costs of internal mobility, but not both. It is not easy to come up with identifying variables. Therefore, the results in table A1 are just a first pass to generate estimates of the structural model.

In order to identify the structural model, we assume that the firm-size has no direct impact on the costs of quits, as perceived by the workers. The size of the firm is a proxy for the presence of an internal labor market. Obviously, in our case the internal mobility equation already performs this role.

The parameters \( \xi \) of the structural model follow from the reduced form parameters \( \eta \) by imposing restrictions:

\[
\eta = \Lambda(\xi)
\]

A consistent estimate of \( \xi \) can be obtained by the minimum distance method (Chamberlain, 1984) for which

\[
S = (\hat{\eta} - \Lambda(\hat{\xi}))'A(\hat{\eta} - \Lambda(\hat{\xi}))
\]

must be minimized over \( \xi \). \( A \) is a weighting matrix and \( \hat{\eta} \) the reduced form maximum likelihood estimator of \( \eta \). \( A = \text{var}(\hat{\eta})^{-1} \) gives an efficient estimator of \( \xi \).

Table A1 presents the estimation results of the structural model. It shows that the positive impact of internal mobility on quits is much larger than the negative impact of internal mobility on quits. In the quit equation, age and the year dummy are significant at the 5% level. In the internal mobility equation, quits, the fraction of parttime employees, the fraction of employees on sickness leave, the fraction of employees on courses, the size of the firm and the year dummy have a significant impact on internal mobility.

Our estimation results of the structural model are in line with those of the reduced form models. Both the negative influence of quits on internal mobility and the positive influence of internal mobility on quits are rather weak.
Figure 1 Jobs and workers in the firm in periods $t$ and $t+1$

\[ J_t \]

\[ J_{t+1} \]

Stocks

$J = \text{jobs}$

Flows

$H_1 = \text{hires to (newly) created jobs}$

$H_2 = \text{hires to existing jobs}$

$X_1 = \text{outflow from existing jobs}$

$X_2 = \text{outflow from destroyed jobs}$

$IM_1 = \text{internal mobility between existing jobs}$

$IM_2 = \text{internal mobility from existing jobs to (newly) created jobs}$

$IM_3 = \text{internal mobility from destroyed jobs to existing jobs}$

$IM_4 = \text{internal mobility from destroyed jobs to (newly) created jobs}$

$J_c = \text{(newly) created jobs}$

$J_d = \text{destroyed jobs}$
Figure 2 Estimated size of stocks and flows in the Dutch firms: 1990 (%)

1989

1990

1990

1989

100.0

4.4 : 97.4 : 2.6 

1.8 

0.9 

0.3 

3.2 : 8.7

8.2

1.9

20
Table 1  *Quits and Internal Mobility, 1988 and 1990, number of firms*

<table>
<thead>
<tr>
<th></th>
<th>Q = 0, IM = 0</th>
<th>Q = 0, IM &gt; 0</th>
<th>Q &gt; 0, IM = 0</th>
<th>Q &gt; 0, IM &gt; 0</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1988</td>
<td>5</td>
<td>0</td>
<td>2</td>
<td>7</td>
<td>14</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>0</td>
<td>7</td>
<td>4</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>2</td>
<td>30</td>
<td>21</td>
<td>57</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>3</td>
<td>26</td>
<td>45</td>
<td>75</td>
</tr>
<tr>
<td>Total</td>
<td>11</td>
<td>5</td>
<td>65</td>
<td>77</td>
<td>158</td>
</tr>
</tbody>
</table>

Table 2  *Correlations q and im*

<table>
<thead>
<tr>
<th>Correlations</th>
<th>Intermediate sample</th>
<th>Net sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>q_{98}, q_{90}</td>
<td>0.372</td>
<td>0.493</td>
</tr>
<tr>
<td>im_{98}, im_{90}</td>
<td>0.193</td>
<td>0.173</td>
</tr>
<tr>
<td>q_{98}, im_{48}</td>
<td>0.163</td>
<td>0.215</td>
</tr>
<tr>
<td>q_{90}, im_{50}</td>
<td>0.123</td>
<td>0.151</td>
</tr>
<tr>
<td>q_{i1}, im_{i}</td>
<td>0.135</td>
<td>0.173</td>
</tr>
<tr>
<td>q_{i1} - q_{i1} im_{i}</td>
<td>0.133</td>
<td>0.069</td>
</tr>
<tr>
<td>Number of firms</td>
<td>444</td>
<td>158</td>
</tr>
</tbody>
</table>
Table 3 **Means of the variables**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean (standard deviation)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Endogenous variables</strong></td>
<td></td>
</tr>
<tr>
<td>q</td>
<td>0.056 (0.05)</td>
</tr>
<tr>
<td>im</td>
<td>0.032 (0.04)</td>
</tr>
<tr>
<td>change of function</td>
<td>0.017 (0.03)</td>
</tr>
<tr>
<td>change of department</td>
<td>0.006 (0.02)</td>
</tr>
<tr>
<td>change of function and department</td>
<td>0.009 (0.02)</td>
</tr>
<tr>
<td><strong>Personnel characteristics</strong></td>
<td></td>
</tr>
<tr>
<td>Age 15-29</td>
<td>0.298 (0.17)</td>
</tr>
<tr>
<td>Part-time</td>
<td>0.167 (0.19)</td>
</tr>
<tr>
<td><strong>Working conditions</strong></td>
<td></td>
</tr>
<tr>
<td>Illness</td>
<td>0.079 (0.04)</td>
</tr>
<tr>
<td><strong>Adjustment costs</strong></td>
<td></td>
</tr>
<tr>
<td>Start-up</td>
<td>0.215 (0.41)</td>
</tr>
<tr>
<td>Course</td>
<td>0.242 (0.24)</td>
</tr>
<tr>
<td><strong>Firm characteristics</strong></td>
<td></td>
</tr>
<tr>
<td>$L_{t-1}$</td>
<td>1.08 (0.99)</td>
</tr>
<tr>
<td>$w_t$</td>
<td>0.99 (0.15)</td>
</tr>
</tbody>
</table>

**Number of observations**

$N*T = 316$

---

a) 5 firms are not included in the net sample because they contain an outlier in one of the variables (1 outlier for q, 1 for im, 1 for $L$, 2 for $w$). In the net sample maximum q and im are 0.30 and 0.22 respectively. For the intermediate sample, we applied the same selection criterion for the endogenous variables (q < 0.35 and im < 0.35), which resulted in an exclusion of 15 firms.
### Table 4: Estimation results bivariate Tobit regression

<table>
<thead>
<tr>
<th></th>
<th>pooled sample estimates</th>
<th>random effect estimates</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Quit rate</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age 15-29</td>
<td>0.142 (7.61)**</td>
<td>0.132 (6.61)**</td>
</tr>
<tr>
<td>Parttime</td>
<td>0.033 (2.09)**</td>
<td>0.027 (1.63)</td>
</tr>
<tr>
<td>Illness</td>
<td>0.092 (1.11)</td>
<td>0.113 (1.32)</td>
</tr>
<tr>
<td>Start-up</td>
<td>-0.001 (0.13)</td>
<td>0.001 (0.08)</td>
</tr>
<tr>
<td>Course</td>
<td>0.011 (0.86)</td>
<td>0.006 (0.45)</td>
</tr>
<tr>
<td>L_{t-1}</td>
<td>-0.002 (0.69)</td>
<td>-0.002 (0.61)</td>
</tr>
<tr>
<td>w</td>
<td>0.003 (0.17)</td>
<td>0.001 (0.06)</td>
</tr>
<tr>
<td>D90</td>
<td>0.011 (1.83)*</td>
<td>0.017 (3.56)**</td>
</tr>
<tr>
<td>CONSTANT</td>
<td>-0.012 (0.52)</td>
<td>-0.001 (0.38)</td>
</tr>
<tr>
<td>$\sigma_1$</td>
<td>0.051 (22.78)**</td>
<td>0.041 (16.44)**</td>
</tr>
<tr>
<td>$\tau_1$</td>
<td></td>
<td>0.029 (7.96)**</td>
</tr>
</tbody>
</table>

|                |                         |                         |
| **Internal mobility rate** |                         |                         |
| Age 15-29      | 0.071 (2.63)**          | 0.070 (2.53)**          |
| Parttime       | -0.036 (1.51)           | -0.035 (1.43)           |
| Illness        | -0.219 (1.72)*          | -0.214 (1.65)*          |
| Start-up       | -0.003 (0.32)           | -0.003 (0.31)           |
| Course         | 0.067 (3.83)**          | 0.065 (3.63)**          |
| L_{t-1}        | 0.016 (3.70)**          | 0.016 (3.60)**          |
| w              | 0.008 (0.27)            | 0.009 (0.30)            |
| D90            | -0.010 (1.19)           | -0.009 (1.10)           |
| CONSTANT       | -0.028 (0.85)           | -0.003 (0.88)           |
| $\sigma_2$    | 0.068 (16.87)**         | 0.065 (13.00)**         |
| $\tau_2$      |                         | 0.019 (1.56)            |

|                |                         |                         |
| $\rho_{k+1}$  | 0.159 (2.54)**          | -                       |
| $\rho_k$      |                         | 0.152 (2.07)**          |
| $X^2_{(20)}$  | 17.9                    | -                       |
| $N*T$         | 316                     | 316                     |

* Statistically significant from zero at the 10% level.
** Statistically significant from zero at the 5% level.
a) absolute t-value in parenthesis, $N*T$ is the number of observations used to estimate and test the model; $\sigma_k$, $k=1,2$, is the standard error of the regression; $\tau_k$, $k=1,2$, is the standard error of the firm-specific random intercept; $\rho_{k+1}$ and $\rho_k$ are correlation coefficients in the error structure; $X^2$ is a likelihood-ratio test of a change of the parameters, with 20 degrees of freedom.
Table A1  Estimation results structural model$^a$  

<table>
<thead>
<tr>
<th></th>
<th>$q_t$</th>
<th>$im_t$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$im$</td>
<td>-0.131 (0.84)</td>
<td>0.564 (1.47)</td>
</tr>
<tr>
<td>$q$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age 15-29</td>
<td>0.142 (7.86)**</td>
<td>-0.005 (0.08)</td>
</tr>
<tr>
<td>Parttime</td>
<td>0.023 (1.64)</td>
<td>-0.050 (2.43)**</td>
</tr>
<tr>
<td>Illness</td>
<td>0.085 (1.28)</td>
<td>-0.277 (2.65)**</td>
</tr>
<tr>
<td>Start-up</td>
<td>0.0002 (0.03)</td>
<td>-0.004 (0.46)</td>
</tr>
<tr>
<td>Course</td>
<td>0.014 (1.01)</td>
<td>0.062 (4.68)**</td>
</tr>
<tr>
<td>$L_{\mu t}$</td>
<td>0.002 (0.16)</td>
<td>0.017 (4.86)**</td>
</tr>
<tr>
<td>$w$</td>
<td>0.002 (0.16)</td>
<td>0.008 (0.38)</td>
</tr>
<tr>
<td>D90</td>
<td>0.016 (4.13)**</td>
<td>-0.019 (2.14)**</td>
</tr>
<tr>
<td>CONSTANT</td>
<td>-0.001 (0.72)</td>
<td>-0.002 (1.00)</td>
</tr>
</tbody>
</table>

$^{*}$ Statistically significant from zero at the 10% level.

$^{**}$ Statistically significant from zero at the 5% level.

$a)$ absolute t-value in parenthesis, N*T is the number of observations used to estimate the model; $\sigma$ is the standard error of the regression; $\tau$ is the standard error of the firm-specific random intercept.