HIRING AND LABOUR MARKET TIGHTNESS

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Abstract:
This paper analyses the hiring process of Dutch firms using individual data on filled vacancies. If more than one employee is hired, firms may choose between hiring all employees at once (instantaneous hiring) or hiring its employees over a longer period of time (gradual hiring). We find that about 56 percent of the employees are hired at once. Furthermore, we investigate the effect of an increase in labour market tightness (excess labour demand) on the costs and structure of hiring. Our estimates show that a tightening of the labour market 1) raises the costs of hiring; 2) prolongs the period of gradual hiring; 3) leads to a smaller probability of hiring all employees at once.

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1. Introduction

In the late 1980s, when data on individual firms and persons became available for empirical research, economists found evidence that decisions are taken infrequently. Changes in prices (Caplin and Spulber, 1987), labour (Hamermesh, 1989), and investment (Goms, 2001) occur in shocks with periods of doing-nothing in between. These shocks are smoothed out by aggregation, so that agents' micro-behaviour becomes indiscernible with macro data. These empirical findings had important implications for macro models. Representative agent models that were especially useful to describe linear decision processes became irrelevant. Propagation mechanisms were used to describe adjustment of prices (Beaulieu and Mattey, 1999), labour (Cabellero et al., 1997), and investment (Pindyck 1994). Aggregation issues received renewed attention (Cabellero, 1992).

Hamermesh and Pfann (1996) provide an overview of typologies of cost functions that underlie the movements in employment. The specification (or structure) of these functions has different implications for the way that labour adjusts. Non-convex adjustment costs lead to instantaneous (or lumpy) adjustment towards the optimal level. All employees are hired at once. On the other hand, convex adjustment costs result in gradual movements of labour, so that the inflow of employees into firms is smoothed out over a longer period. Empirical studies which "ran a horse race" between both models found evidence of both types of adjustment (Hamermesh, 1992; Rota, 1994). Cabellero et al. (1997) reject the quadratic cost of adjustment model and find that aggregate employment dynamics depend on the cross-sectional distribution of employment gaps. Cooper and Willis (2001) challenge these results and demonstrate that they may be caused by difficulties of measurement. Although the evidence points in the direction of instantaneous adjustment, it is not known why instantaneous adjustment is preferred to gradual adjustment.

Employment changes of firms are quite complex due to all types of worker turnover that is possible (Hamermesh et al., 1996). In this paper we focus on the inflow (or hiring) of new employees. The state of the labour market may affect the hiring of employees. In tight (slack) labour markets with excess demand (supply) of labour, employers are more (less) constrained by the scarcity of labour. They have to put more (less) effort in finding and recruiting new labour. Hence, an increase in excess labour demand leads to higher hiring costs of individual firms. Furthermore, it may affect the structure of the hiring costs and the shape of the hiring process. We investigate the three most important aspects of hiring, by addressing the following questions. How does a tightening of the labour market affect:

1) the structure of the hiring process?
2) the duration of gradual hiring?
3) the costs of hiring?

We use very detailed micro data on the hiring behaviour of Dutch firms. The data span over different regions over the years 1995-1999. The Dutch labour market tightened dramatically over this 5-year period, since the average unemployment rate decreased by 40% and the average vacancy rate more than doubled between 1995 and 1999. We observe individual firms filling multiple positions (searching for more applicants). In these cases we know the time that elapsed till the hiring of the first applicant and the time that elapsed till the hiring of the last applicant. The possession of this piece of information enables us to link hiring strategies of firms to labour market conditions. Our estimates show that in tight labour markets there is a higher probability of gradual hiring, an increase in the duration of gradual hiring, and an increase in hiring costs.

The set-up of this paper is as follows. Section 2 provides the theory on the process of hiring. Section 3 describes the data. Section 4 presents the estimates. Section 5 concludes.

2. Theory

One of the major issues of labour demand is how adjustment costs, like the costs of hiring and firing, influence the process of employment changes at firms. Here, we concentrate on the hiring of new workers. Our cost function has the following general form:

$$C_t = f(H_t) \tag{1}$$

where C is the total cost of hiring H workers. Subscript t refers to the t-th period. In (1) the role of duration of the vacancy is ignored. Only when workers are added to the workforce will firms incur some costs.

Studies have used different specifications of the cost function f(.); each leads to different patterns of hiring. First, the specification

$$f(H_t) = aH_t + c \tag{2}$$

contains a linear component in the number of hires and a fixed cost component c. Marginal costs are constant for each additional worker hired. The fixed cost component c indicates that scale effects play a role in the hiring process. For instance, a firm may lower its average hiring costs by using one advertisement for various vacancies.

What are the implications of the cost function (2) imply for the duration of the hiring process? It can be shown that all workers are hired together, which means that hiring is instantaneous. Due to scale effects, it does not pay off to spread out the hiring process over a longer period (Bertola,

1992, Hamermesh, 1995). There are periods of unchanged labour, which will be longer for higher cost parameters a and c. Furthermore, higher a and c increase the size of the employment shocks as well.

The second function that has been used in labour demand studies is the quadratic cost function

$$f(H_t) = bH_t^2 \tag{3}$$

which means that marginal hiring costs are a linear function of the number of workers hired. Because of this linearity, it is beneficial for firms not to hire all workers at the same moment. There is a period of adjustment between the last and the first worker hired. The length of this period depends on the size of the cost parameter b. If marginal hiring costs are higher, firms will wait longer to fill all vacancies. Hence, employment moves continuously between optimal levels. In sum, the choice of the hiring cost function, specification (2) versus (3), has important implications for the shape of the hiring process. Linear and fixed hiring costs lead to instantaneous hiring of all employees, whereas quadratic hiring costs result in gradual hiring over a longer period of time.

It has been generally accepted that a substantial fraction of labour adjustment is instantaneous at the firm level. However, these results refer to the levels of employment. Some studies find evidence of both gradual and shock-wise adjustment in net employment changes (Hamermesh, 1992, Rota, 1994). Hamermesh (1995) estimates lumpy costs of hiring based on information at the US firm-level. Unfortunately, he could not find any indication of lumpy costs of hiring. Abowd and Kramarz (1997) give direct estimates of a hiring cost function, using information on the number of hires and the hiring costs of French firms.

So far, we have concentrated on the demand side of the labour market only. Labour supply plays no role at all, implying that firms can recruit whoever they want, given the structure of their hiring cost function ((2) or (3)). If there are labour supply constraints it may be impossible to hire all employees instantaneously, however beneficial it may be to the firm. Hence, we claim that the degree of labour market tightness, $\theta 1$ ($0 \leq \theta 1 \leq 1$)), affects the structure of the hiring cost function

$$C_t = (1 - \theta 1)*(aH_t + c) + \theta 1\ bH_t^2 \tag{4}$$

For lower $\theta 1$, hiring is less thwarted by labour supply constraints, so that firms are more likely to hire all workers at once. In a tight labour market, firms are more likely to hire gradually. We will

test this prediction in Sub-section 4.1. Another implication of an increase in labour market tightness is that firms have to put more effort in finding suitable candidates, which prolongs the adjustment period. Furthermore it raises the costs of hiring. Both implications are investigated in Sub-sections 4.2 and 4.3.

Labour demand literature has investigated the impact of labour market tightness on the duration of employment adjustment only. There are no studies that relate tightness to the structure or the costs of labour adjustment. Burgess (1993) demonstrates (in some of his other studies as well) that a tightening of the labour market decreases the speed of labour adjustment towards its optimal value.

Tightness is a latent phenomenon for which we will apply various indicators. Often used variables are the regional unemployment and vacancy rates (e.g. Burgess (1993)). If local unemployment is relatively high or there are a few vacancies, it will be easier to find and select new employees. In our empirical analysis we will apply both indicators, which are really exogenous to individual firms Furthermore, time dummies may pick up tightening, because of the steady change of the unemployment and vacancy rates over the investigated period.

Labour demand studies have detected instantaneous employment adjustment by using monthly (or weekly) time-series data of firms. Intertemporal aggregation may contaminate these data, which may have serious consequences, since a gradual change within this period could be misinterpreted as an instantaneous change. Ideally, one would need daily information on the number of hires. We use a different type of data set that may render a more precise measure of immediate and gradual hiring. We make use of elapsed vacancy durations, of which the duration is measured in days.

Suppose a firm recruits at least two applicants for a homogenous function. Let $Vacdur_{min}$ be the duration at which the first applicant is hired and $Vacdur_{max}$ the duration at which the last applicant is hired. The type of hiring may be revealed by the difference between both durations

$$\begin{aligned} &Vacdur_{min} = Vacdur_{max} (= Vacdur_{shock}) && \text{then instantaneous hiring} \\ &Vacdur_{min} \neq Vacdur_{max} && \text{then gradual hiring} \end{aligned} \qquad (5)$$

The firm hires instantaneously only if the minimum and maximum durations are equal. It implies that the vacancy duration of instantaneous hiring is by definition within the range of the minimum and maximum duration of gradual hiring.

$$Vacdur_{min} \leq Vacdur_{shock} \leq Vacdur_{max} \qquad (6)$$

We will use (5) as our measure of instantaneous and gradual hiring in our empirical analysis.

3. Data

Our set of data is derived from a survey by the Dutch Ministry of Social Affairs and Employment on the recruitment behaviour of Dutch firms. The survey entitled "How do Firms Recruit?" (in Dutch: "Hoe werven bedrijven?") is carried out by telephone every two months. The survey is not a panel however, because a new sample is randomly drawn each time. Each firm provides detailed information concerning all aspects of the hiring process of one function only. This function may consist of multiple homogenous jobs with the same job requirements (for instance with respect to the educational level). So, for one function we may observe various vacancies.

The sampling scheme may be characterized as a partial stock-flow sample. Firms from all economic sectors are selected randomly. Personnel responsible for recruitment is asked whether the final vacancy for some function had been filled in the two months prior to the interview.12 If there are multiple vacancies but some of them are still unfilled at the moment of inquiry, the firm will be left out of the sample. The duration of the filled vacancies may be longer than two months. If the firm has filled al the vacancies for the function, only the time span (in days) until the hiring of the first and the last worker is registered. We refer to these variables as the minimum and maximum vacancy duration, respectively. With respect to sampling, there are no limitations on the difference between both durations. Using the information on the minimum and maximum duration we determine whether the hiring is gradual or instantaneous (equation (5)). Instantaneous hiring is not undersampled, since the sample only includes functions for which the last vacancy had been filled during the last two months. So, no vacancies have remained unfilled for this function at the moment of inquiry. The probability of terminating a recruitment procedure in any of the sampling periods does not depend on the length of the recruitment procedure.

Our computations are based on two separate data sets (see Table 1). The first dataset spans the years 1995 through 1998. Our net sample consists of about 5742 firms that have provided all the relevant information. The location of these firms is known, so that we may take regional variation in unemployment and vacancy rates into account. This dataset will be used in Subsections 4.1 and 4.2. The second dataset, containing information on hiring costs of firms located in the southern province "Noord-Brabant" includes data from the years 1995 to 1999. This sample contains information on 1105 firms. The computations of Subsection 4.3 are based on this dataset. The cost variable in this second dataset is defined as the expenses the firm made in order to fill the

1 If the hiring process has been completed for several functions, one function is selected randomly by the firm. The firm provides detailed information about the hiring process for this function only.
2 A duration elapses when both parties have agreed about the labour contract.

vacancy. It explicitly does not attempt to estimate the value of time spent in screening and selecting applicants. The cost measure purely reflects search costs.

The Dutch labour market tightened substantially over the period 1995-1999. This is reflected by the steady decline of the Dutch unemployment rate from 8.5 percent in 1995 to 5.0 percent in 1999. The vacancy rate increased steadily from 0.9 percent in 1995 to 2.4 percent in 1999. See Table 2. Both rates will be used as proxy variables for the regional labour market tightness in Subsections 4.1 and 4.2.3 The regions are divided into 12 provinces, which is a good approximation of the search area for most of the applicants (see Gorter and Van Ours, 1994). In the regression analyses of Section 4, year dummies may reflect the steady tightening of the labour market for the period 1995-1999.

Table 3 shows the average vacancy duration for instantaneous adjustment, as well as the average minimum and maximum durations for gradual adjustment. The average vacancy durations increased for both types of adjustment during the period 1995-1998. On average there is instantaneous adjustment after 27 days. For gradual adjustment, the minimum and maximum duration are 23 days and 43 days, respectively. The table reflects identity (6), since the vacancy duration of immediate adjustment is within the range of gradual adjustment.

4. Empirical analysis

4.1 Structure of hiring

This subsection investigates the prevalence and causes of instantaneous adjustment. We concentrate on the 5742 firms that hired at least two employees. 3192 firms (56 percent) hired instantaneously (see Table 4). This number is remarkably low, given the analysis of Cooper and Willis (2001), who question the claim of Haltiwanger c.s. (1997) that all movements in employment are instantaneous. Our finding is in line with that of Hamermesh (1992) and Rota (1994), who find evidence of both gradual and instantaneous adjustment.

What determines the probability of instantaneous hiring? We estimate a Probit-model for which the dependent variable measures the structure of hiring (gradual hiring = 0; instantaneous hiring = 1). Basically, we are interested in the impact that labour market tightness has on the probability of instantaneous hiring. We approximate labour market tightness by the regional vacancy rate and the regional unemployment rate. The year dummies may reflect some of the impact of labour market tightness as well.

3 Not for the second dataset of Subsection 4.3, since it refers to one region only.

The regression equation contains various control variables. First, we have seven sector dummies. Second, we have six dummy variables reflecting the firm's requirements on the minimum educational level of the hired workers prior to the vacancy. Third, we have three dummy variables for the other workers' requirements: experience, type of contract (permanent or temporary), and maximum age. Fourth, we control for the (log) firm size and the hiring rate (as well as its square) to take scale effects into account. Table 4 shows the descriptive statistics of the variables used in the regression.

Table 5 shows the estimated marginal effects of the Probit-regression for three specifications. In the first column, labour market tightness is picked up by year dummies only. The estimates indicate that the probability of instantaneous adjustment is 3.7 percent higher in 1995 than in 1998. It reflects the impact of tightening on the way firms hire their employees.

The second column of Table 5 includes the regional vacancy and unemployment rates. The probability of a shock is affected negatively by the regional labour market tightness. An increase of the regional vacancy rate with 1 percentage point decreases the probability of immediate hiring with 4.8 percentage points. The maximum variation of the vacancy rate is 2.3 percentage points during the period of sampling (see Table 4). It implies that the variation of the vacancy rate leads to a maximum change in the probability of about 11 percentage points. An increase of the unemployment rate with 1 percentage point increases the probability of instantaneous hiring with 1.8 percentage points. The unemployment rate has a maximum variation of 8 percentage points, so that the variation of the unemployment rate leads to a maximum change in the probability of 14.4 percentage points. This number is fairly large given the average probability of instantaneous hiring of 56 percent (Table 4).

The estimated coefficients on the year dummies suggest the specification of Column (2) leads to counterintuitive results, since it implicates that the probability of a shock increased by 6.2 percentage points from 1995 to 1998. The third column of Table 3 unravels the tightness further by including cross-effects in time and the regional vacancy and unemployment rates respectively. The vacancy rate, as well as its cross-effect with time, picks up all the effect of labour market tightness, since the unemployment rate variables have no effect on the probability of instantaneous adjustment. According to the estimates, a 1-percentage point increase of the vacancy rate decreases the probability of instantaneous adjustment by 11.1 percentage points. On top of that, there is an annual decrease of the effect by 5.2 percentage points. The estimated coefficients on the year dummies reflect the tightening of the labour market.

With respect to the number of hired workers, we find a non-linear impact on the probability of instantaneous hiring. We find a quadratic relationship between the number of hired workers and

the probability of immediate hiring. The estimates indicate that new employees will be hired in shocks for relatively small and large groups. The probability is lowest at an inflow of about 18 employees.

4.2 Duration of gradual hiring

This subsection focuses on the gradual inflow of workers, for which there is some time between the hiring of the first and last employee who enter the firm. Figures 1 and 2 show the distribution (in weeks) of the minimum and the maximum duration of gradual hiring, respectively. Obviously, the probability of starting with gradual hiring declines over time. On the other hand, the probability of finishing with a gradual hiring process has a small peak in the fifth week.

We investigate the determinants of the duration of gradual inflows. We construct the following dependent variable

$$\text{Dur} = \log(\text{Vacdur}_{\max} - \text{Vacdur}_{\min}) \qquad (7)$$

which is regressed on our set of explanatory variables. Because we have data from flow sampling this is equivalent to the estimation of a Weibull duration model (Lancaster, 1992). Table 6 shows the results, again the first column includes year dummies only. We find an increase of the year effect, the duration (Dur) is 18 percent higher in 1998 than in 1995, so that the tightening of the labour market prolonged the period of hiring. On the other hand, the coefficient on the regional vacancy and unemployment rates are not significantly different from zero at the 10-percent level.

Furthermore we find that (the log of) duration is linear to the (log of) number of hired employees. The coefficient implies that an increase in the number of hired workers with 10 percent leads to an increase in the duration (between the first and last worker hired) of 3.5 percent.

4.3 Costs of hiring

We give estimates of the cost equation. Table 7 gives the summarizing descriptive statistics of the variables used to estimate the hiring cost equation. About 17 percent of the filled vacancies have zero hiring costs. On average the total hiring costs are about 2500 guilders.4 The hiring costs per hired worker are about 1800 guilders. These numbers are roughly comparable to those found in Rota for Italy.

We regress the logarithm of the total hiring costs on the year dummies and the remaining control variables. As mentioned before, we cannot include regional tightness variables, because firms are

4 The exchange rate of one guilder is about 0.45 Euros.

inquired about hiring costs in one province only. However, the year dummies may pick up some of the regional labour market tightness. Table 8 presents the Tobit-estimates for all observations in the first column and for the multi-employee hires in the second column. The year dummies show clearly an increase in the hiring costs over the period. The first column implicates that the hiring costs are about 55 percent lower in 1995 than in 1999. The second column indicates that for hiring costs are about 80 percent lower in 1995 than in 1999 for firms that hired at least two employees.

5 Conclusions

We have provided evidence of the impact of labour market conditions on various important aspects of the hiring process. In a tight labour market:

- hiring becomes more expensive;
- there is a prolonged period of adjustment towards the optimal level;
- the probability of hiring all employees instantaneously becomes smaller.

The labour market thus affects the hiring behaviour of individual firms.

Instantaneous adjustment implies that firms wait until they have enough vacancies so that they can benefit from scale effects by hiring all employees at once. Our estimation results indicate that firms do not necessarily get the type of adjustment they wish. Due to a lack of supply of employees firms have to search harder before they get the right (number of) employees. It reduces the probability of instantaneous hiring. In other words, the specification of the adjustment cost function depends on the state of the labour market. Consequently, with procyclical frictions in the labour market, the nature of adjustment varies over time. In a slack labour market, shock-wise adjustment of labour may dominate. In a tight market, labour moves gradually towards the optimal value.

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Table 1 - The sample

	Data set 1 **No hiring cost available**	**Data set 2** **Hiring costs**
≥1 hired worker	17368 firms	1105 firms
average number of applicants	9.2 applicants	8.3 applicants
> 1 hired worker	6593 firms	371 firms
average number of hired workers	4.9 workers	3.4 workers
average number of applicants	6.0 applicants	5.4 applicants
Cases with all explanatory variables	5742 firms	362 firms
Years	1995 -1998	1995 - 1999
Regions	All (12) provinces	Noord-Brabant

Table 2 – Dutch unemployment and vacancy rates (1995-1999)

Year	Unemployment rate (%)			Vacancy rate (%)		
	Average	**Minimum**	**Maximum**	**Average**	**Minimum**	**Maximum**
1995	8.46	7.05	11.01	0.93	0.45	1.36
1996	8.08	6.67	9.57	1.01	0.51	1.41
1997	7.39	5.96	11.84	1.33	0.51	1.99
1998	6.41	5.03	9.48	1.83	0.67	2.72
1999	5.00	3.82	7.95	2.38	0.82	3.73

Source: Netherlands Central Bureau of Statistics

Table 3 - Average vacancy duration (in days) by type of adjustment (1995 – 1998)

Year	Gradual Minimum Vacancy duration	Shock Vacancy duration	Gradual Maximum vacancy duration
1995	20.7	22.9	38.7
1996	21.4	24.4	39.2
1997	23.9	28.2	44.5
1998	24.9	33.2	48.4
1995-1998	22.8	27.0	42.9

a) Number of observations: 5742.

Table 4 - Descriptive statistics – Data set 1 (at least 2 employees hired)

Variable	Mean	Standard deviation	Minimum	Maximum
Hiring process:				
Shock (gradual hiring = 0; instantaneous hiring=1)	0.56	0.50	0	1
Minimum Vacancy Duration (days)	25.15	32.78	0	500
Maximum Vacancy Duration (days)	34.05	40.97	0	720
Firm size (employees)	201.14	346.86	2	5500
Number of hires (employees)	4.69	6.98	2	140
Sector:				
Dummy Manufacturing	0.016	0.36	0	1
Dummy Public Utilities	0.00	0.04	0	1
Dummy Construction	0.13	0.34	0	1
Dummy Trade	0.21	0.41	0	1
Dummy Transport	0.09	0.29	0	1
Dummy Banking	0.11	0.31	0	1
Dummy Community services	0.30	0.46	0	1
Job requirements for education:				
Dummy primary general	0.13	0.34	0	1
Dummy primary vocation	0.29	0.45	0	1
Dummy secondary general, lower	0.07	0.26	0	1
Dummy secondary general, higher	0.03	0.16	0	1
Dummy intermediate vocation	0.27	0.45	0	1
Dummy higher vocation	0.18	0.38	0	1
Dummy university	0.02	0.15	0	1
Other job requirements:				
Dummy Experience	0.61	0.49	0	1
Dummy Permanent contract	0.67	0.47	0	1
Dummy Maximum age	0.18	0.38	0	1
Year:				
Dummy 1995	0.27	0.45	0	1
Dummy 1996	0.19	0.39	0	1
Dummy 1997	0.32	0.47	0	1
Dummy 1998	0.22	0.41	0	1
Regional tightness:				
Regional Vacancy rate	1.18	0.50	0.5	2.7
Regional Unemployment rate	6.81	1.54	3.9	11.9
Number of observations	5742			

Table 5 – Probit-regression (dependent variable is 1 if instantaneous adjustment)

Variable	Marginal effect	t-value	Marginal effect	t-value	Marginal effect	t-value
Economic Sector:[a]						
Dummy Manufacturing	0.076	0.48	0.085	0.54	0.085	0.54
Dummy Construction	0.050	0.31	0.061	0.38	0.060	0.37
Dummy Trade	0.048	0.30	0.064	0.40	0.063	0.40
Dummy Transport	0.069	0.44	0.086	0.54	0.087	0.55
Dummy Banking	0.036	0.22	0.047	0.29	0.046	0.29
Dummy Community services	0.078	0.49	0.089	0.56	0.090	0.57
Job requirements for education:[b]						
Dummy primary general	0.059	1.25	0.058	1.21	0.058	1.21
Dummy primary vocation	0.047	1.03	0.046	0.99	0.047	1.03
Dummy secondary general, lower	-0.022	-0.43	-0.023	-0.44	-0.021	-0.42
Dummy secondary general, higher	0.059	1.03	0.062	1.06	0.065	1.11
Dummy intermediate vocation	-0.016	-0.35	-0.018	-0.40	-0.017	-0.37
Dummy higher vocation	-0.045	-0.99	-0.044	-0.95	-0.043	-0.93
Other job requirements:						
Dummy Experience	-0.007	-0.49	-0.008	-0.52	-0.007	-0.50
Dummy Permanent contract	-0.045	-3.03	-0.04	-2.72	-0.039	-2.66
Dummy Maximum age	-0.042	-2.25	-0.043	-2.31	-0.043	-2.30
Year:[c]						
Dummy 1995	0.037	1.94	-0.062	-2.03	0.336	1.63
Dummy 1996	0.014	0.68	-0.07	-2.48	0.197	1.47
Dummy 1997	0.028	1.52	-0.024	-1.08	0.115	1.69
Log(firm size)	-0.004	-0.69	-0.002	-0.44	-0.003	-0.47
Log(Hires)	-0.347	-9.32	-0.348	-9.32	-0.348	-9.33
Log^2(Hires)	0.060	6.06	0.060	6.06	0.060	6.08
Regional Tightness:						
Regional Vacancy rate	-		-0.048	-2.43	-0.111	-3.22
Regional Unemployment rate	-		0.018	2.22	0.009	0.91
t*Regional Vacancy rate [d]	-		-		-0.052	-2.29
t*Regional Unemployment rate [d]	-		-		-0.012	-1.46
Number of observations	5742		5742		5742	

a) Public Utilities: reference group.
b) University degree: reference group.
c) 1998: reference year.
d) t = 1 for 1995.

Figure 1 – Minimum vacancy duration (in weeks) of gradual adjustment (N = 2550)

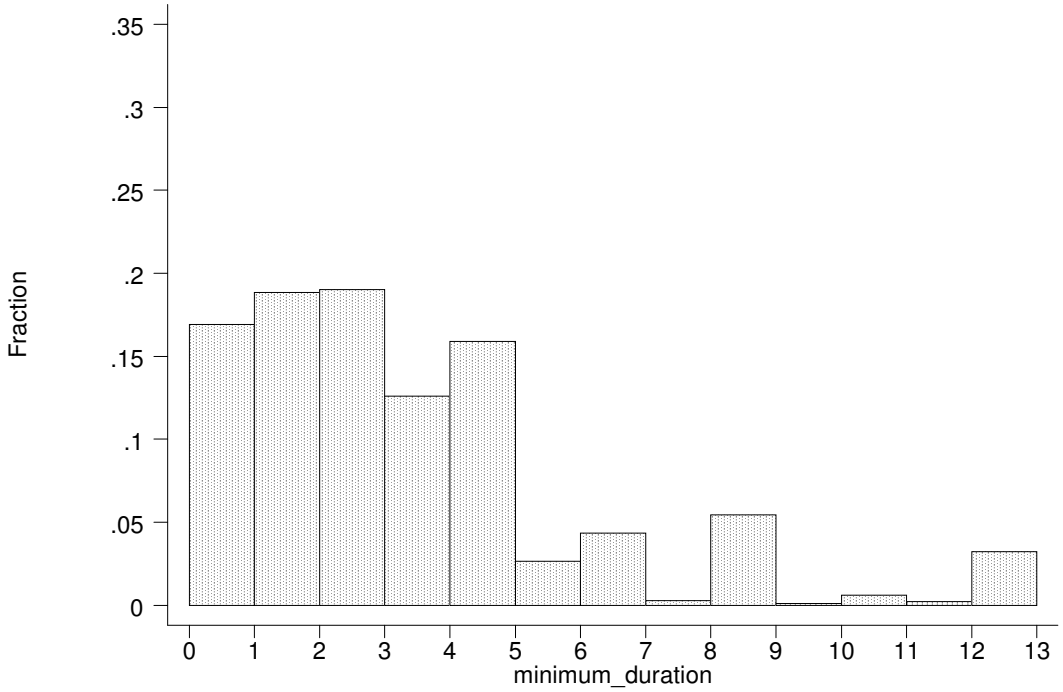

Figure 2 – Maximum vacancy duration (in weeks) of gradual adjustment (N = 2550)

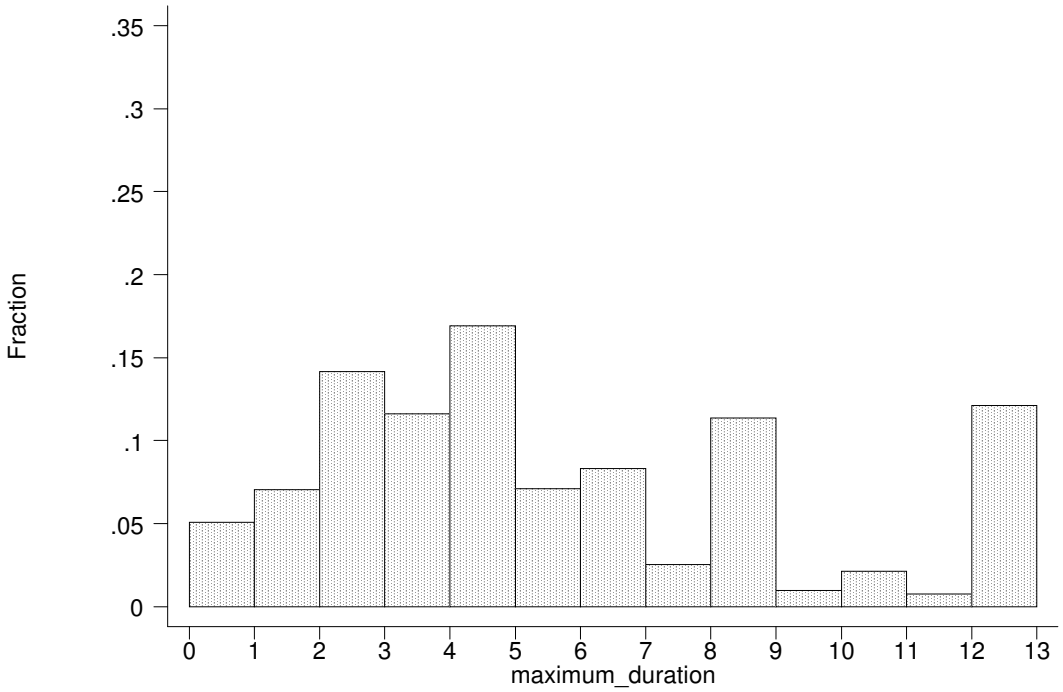

Table 6 – Regression estimates for gradual hiring; dependent variable: (log) Duration between last and first employee hired (equation (7))

Variable	Coefficient	t-value	Coefficient	t-value
Economic Sector:[a]				
Dummy Manufacturing	0.170	0.42	0.424	-0.25
Dummy Construction	0.098	0.24	0.243	-0.01
Dummy Trade	0.059	0.15	0.147	-0.52
Dummy Transport	0.072	0.18	0.177	-0.31
Dummy Banking	0.226	0.56	0.563	1.46
Dummy Community services	0.068	0.17	0.167	-0.45
Job requirements for education:[b]				
Dummy primary general	-0.949	-7.30	-6.547	-7.32
Dummy primary vocation	-0.849	-6.86	-7.652	-6.92
Dummy secondary general, lower	-0.950	-7.02	-5.578	-7.01
Dummy secondary general, higher	-0.757	-4.62	-3.653	-4.64
Dummy intermediate vocation	-0.597	-4.94	-4.107	-4.97
Dummy higher vocation	-0.496	-4.05	0.386	-4.08
Other job requirements:				
Dummy Experience	0.048	1.20	1.571	1.17
Dummy Permanent contract	0.151	3.79	-3.050	3.79
Dummy Maximum age	0.062	1.27	-2.504	1.29
Year:[c]				
Dummy 1995	-0.180	-3.49	-1.488	-1.49
Dummy 1996	-0.165	-2.96	-1.651	-1.65
Dummy 1997	-0.079	-1.62	-0.970	-0.96
Log(firm size)	0.043	2.79	2.703	2.77
Log(Hires)	0.322	3.43	3.430	3.46
Log^2(Hires)	-0.030	-1.23	-1.211	-1.24
Regional Tightness:				
Regional Vacancy rate	-		-0.511	-0.5
Regional Unemployment rate	-		-1.079	-1.08
Constant	2.582	5.97	5.891	11.45
Adjusted R2	0.096		0.095	
Number of observations	2550		2550	

a) Public Utilities: reference group.
b) University degree: reference group.
c) 1998: reference year.

Table 7 – Descriptive Statistics of data set 2

Variable	Average	Standard Deviation	Minimum	Maximum
Hiring process:				
Total hiring costs (guilders)	2477.07	5465.17	1	60000
Total hiring costs per hired worker (guilders)	1814.40	4121.59	0.20	50000
Minimum Vacancy Duration (days)	29.94	43.54	0	550
Maximum Vacancy Duration (days)	10.32	24.69	0	300
Firm size (employees)	61.14	127.71	1	1500
Number of hires (employees)	1.79	2.41	1	45
Sector:				
Dummy Manufacturing	0.14	0.35	0	1
Dummy Public Utilities	0.00	0.04	0	1
Dummy Construction	0.10	0.30	0	1
Dummy Trade	0.21	0.41	0	1
Dummy Transport	0.12	0.33	0	1
Dummy Banking	0.11	0.32	0	1
Dummy Community services	0.31	0.46	0	1
Job requirements for education:				
Dummy primary general	0.16	0.36	0	1
Dummy primary vocation	0.21	0.41	0	1
Dummy secondary general, lower	0.08	0.27	0	1
Dummy secondary general, higher	0.04	0.20	0	1
Dummy intermediate vocation	0.29	0.46	0	1
Dummy higher vocation	0.21	0.41	0	1
Dummy university	0.02	0.14	0	1
Other job requirements:				
Dummy Experience	0.61	0.49	0	1
Dummy Permanent contract	0.77	0.42	0	1
Dummy Maximum age	0.15	0.36	0	1
Year:				
Dummy 1995	0.18	0.38	0	1
Dummy 1996	0.25	0.44	0	1
Dummy 1997	0.07	0.26	0	1
Dummy 1998	0.23	0.42	0	1
Dummy 1999	0.26	0.44	0	1
Number of observations	1105			

Table 8 – Tobit cost regressions; dependent: log(Total Hiring Costs)

Variable	Coefficient	t-value	Coefficient	t-value
	All employees		At least two employees	
Economic Sector:a)				
Dummy Manufacturing	-0.480	-0.22	-	
Dummy Construction	-1.416	-0.65	-2.023	-3.05
Dummy Trade	-1.950	-0.90	-1.452	-2.37
Dummy Transport	-0.928	-0.43	-0.940	-1.54
Dummy Banking	-0.117	-0.05	0.589	0.79
Dummy Community services	-1.365	-0.63	-0.837	-1.37
Job requirements for education:b)				
Dummy primary general	-1.690	-2.30	3.272	-2.47
Dummy primary vocation	-0.563	-0.78	-1.487	-1.12
Dummy secondary general, lower	-0.001	0.00	-2.015	-1.44
Dummy secondary general, higher	0.129	0.16	-0.656	-0.41
Dummy intermediate vocation	0.810	1.16	-1.018	-0.79
Dummy higher vocation	0.357	0.51	-1.180	-0.91
Other job requirements:				
Dummy Experience	0.270	1.30	0.313	0.93
Dummy Permanent contract	1.230	5.17	1.542	4.51
Dummy Maximum age	0.887	3.30	0.509	1.10
Year:c)				
Dummy 1995	-0.549	-1.89	-0.800	-1.71
Dummy 1996	-0.624	-2.36	-0.776	-1.84
Dummy 1997	-0.466	-1.19	-0.669	-1.12
Dummy 1998	-0.508	-1.91	-0.609	-1.48
Log(firm size)	0.649	8.57	0.456	3.39
Log(Hires)	0.544	1.50	1.539	1.44
Log2(Hires)	0.145	0.83	-0.096	-0.30
Constant	3.438	1.48	4.518	2.79
Pseudo R^2	0.054		0.071	
Number of observations	1105		362	

a) Public Utilities: reference group (in first column); Manufacturing: reference group (second column).
b) University degree: reference group.
c) 1999: reference year.

Appendix - The questionnaire

Number of similar openings (last two month):
Number of identical vacancies posted in the last two months

Hiring costs:
The expenditure of the firm on the vacancy

Educational requirements:
Minimum educational level required is

- *university*: university level;
- *hbo*: higher vocational level;
- *mbo*: secondary vocational level;
- *havo/vwo*: secondary general higher level;
- *mavo*: secondary general lower level;
- *vbo*: primary vocational level;
- *lo*: primary general.

Job requirements:
Experience: Dummy variable = 1 if working experience was required

Permanent contract: Dummy variable = 1 if hiring regarded permanent positions

Maximum age: Dummy variable = 1 if maximum age was required

Year: Year of the survey

Firm size: Number of employees of the firm