Discrepancies between Supply and Demand and Adjustment Processes in the Labour Market

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Abstract. Changes in demand and supply in segments of the labour market will affect the labour market position of workers with an educational background in a related field of study. In one economic tradition such discrepancies between supply and demand are thought to lead to unemployment in the case of excess supply and to unfilled vacancies or skill shortages in the case of excess demand. The other neo-classical oriented tradition expects wage adjustments to take fully account of these labour market imbalances, leading to higher wages for studies with excess demand and lower wages in case of excess supply. In practice the labour market might, on the one hand, be more flexible than suggested by the first approach, but on the other hand adjustment might be incomplete and not only wages but also other aspects of the employment relationship might be affected by a friction between supply and demand. This study examines the relationship between discrepancies between labour demand and supply on the one hand and manifestations of these tensions in the labour market experience of school-leavers on the other hand. To investigate this relationship, a random coefficient model has been used, which allows for different adjustment processes for the various educational types, but still makes full use of all the information available in the data. The analyses provide insights about the importance of different adjustment processes and their complementarity and substitutability. We show that on average, supply surpluses lead to pressure to accept jobs at a level which is lower than the school-leavers educational level, jobs with relatively low wages, and jobs with part-time contracts. A direct link between supply surpluses and

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unemployment is only found for a few specific fields of study. Unemployment seems to occur mostly when school-leavers do not take temporary jobs or jobs below their educational level in case of excess supply.

1. Introduction

The labour market position of workers with an educational background in a certain field of study is affected by changes in supply and demand in that segment of the labour market. There are two traditions with very different ideas about such supply-demand imbalances. On the one hand — based on the assumption that there is no flexibility — discrepancies between supply and demand within a certain field of study are thought to lead to unemployment or unfilled vacancies. Examples of such studies can be found in the early literature on manpower requirements (see Blaug (1967) for a classical and Van Eijs (1994) for a recent overview), but also in literature concerning the relationship between sectoral shifts and unemployment (Lilien, 1982; Blanchard and Diamond, 1989; Hosios, 1994). On the other hand, based on the idea that wages will clear the market, in other studies such discrepancies are expected to result exclusively in wage changes. Examples within this second tradition are the returns to education literature (see Psacharopoulos, 1991), and much of the literature about skill biased technical change, in which a changing wage inequality is interpreted as a shift in demand and supply for different skill groups (Katz and Murphy, 1992; Berman *et al.*, 1994, 1998).

Since workers will in general try to avoid unemployment through changes in their job-seeking behaviour and employers will try to avoid open vacancies through adjustments in their recruiting strategies, it is hard to imagine that the labour market will not react to changes in supply and demand. This flexibility of the labour market is reflected, for example, in the observation that most types of education are represented in a range of occupations, rather than in one specific occupation (Borghans and Heijke, 1998). Freeman (1980) illustrates this flexibility by showing that the actual employment situation is affected by both demand and supply. On the other hand this does not immediately imply that all changes in supply and demand are fully and exclusively reflected in the wages. There is evidence that wages do not completely clear labour market imbalances (Kahn, 1997; Smith, 2000), and workers

and employers compete with other aspects of the employment contract to increase or decrease the attractiveness and thus the costs of the employment relationship. Borghans and Heijke (1995) and Borghans and Willems (1998) therefore suggest that the gap between demand and supply should not be interpreted as a prediction of future unemployment, but should be viewed upon as an indicator of the extent of the labour market adjustments that would be necessary to bring the market into a new equilibrium where supply equals demand.

The observation that the labour market might in reality be flexible, leads to the question of how discrepancies between supply and demand relate to the adjustment processes on the labour market. This study examines how these discrepancies reveal themselves, using several key indicators that characterize the labour market position of types of education such as wage movements, temporary or part-time jobs, jobs below the worker's educational level.

This study will show that unemployment for a particular educational category is in general not related to discrepancies between supply and demand. Layard and Nickell (1986) and Bean and Pissarides (1991) also fail to find any direct relationship between discrepancies at the occupational level and unemployment. However unemployment as a result of discrepancies between supply and demand may be important for some specific types of education. The analyses in this article will show that excess supply leads to lower wages, under-utilization of education, and 'involuntary' part-time jobs. If excess supply leads to unemployment, school-leavers within this field of study tend not to accept temporary jobs or jobs below their educational level. Furthermore, temporary jobs turn out to be a substitute for jobs outside or below the own field of study, as a way to adjust to unfavourable labour market situations.

The structure of this study is as follows. In Section 2 the theoretical and estimation approach of this paper are explained. Section 3 describes the data. Section 4 discusses the empirical findings and Section 5 concludes.

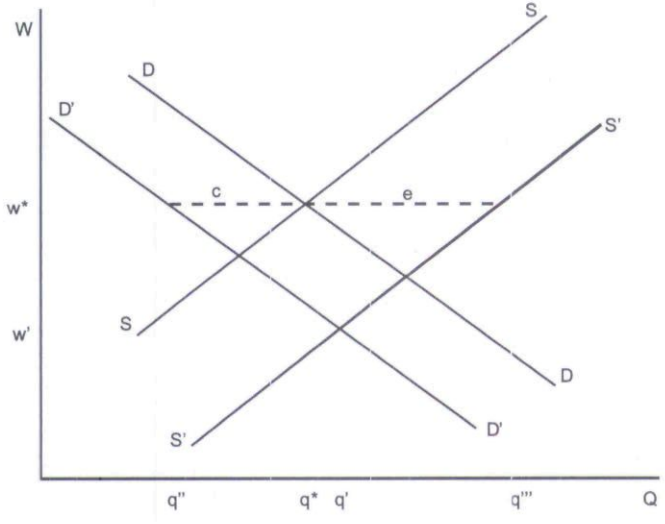
2. Estimating adjustment processes on the labour market

The labour market position of people with a certain educational background can be though of as the equilibrium between supply

and demand for this field of study as depicted in Figure 1. With S representing the initial supply curve and D representing the demand curve, the equilibrium wage equals w^* and employment equals q^*. When changes in the supply and demand occur, a discrepancy between supply and demand will occur given the former equilibrium wages. In the figure the supply curve shifts forward to S' increasing supply at wage w^* with e and the demand curve shifts backward to D', diminishing demand at wage w^* with c. Such a hypothetical gap $c+e$ between supply and demand can be regarded upon as an indication of the change needed to equalize supply and demand again, as argued by Borghans and Heijke (1995) and Borghans and Willems (1998).[1]

Actually, it is on the one hand hard to imagine that workers (or unemployed) and employers do not react to the shifts in supply and demand. In the case of excess supply it is likely that workers will try to get a job by accepting job offers they would not have considered earlier. Employers on the other hand might try to gain from excess supply by offering less favourable contracts, while in case of shortages they might compete for workers by improving the terms of the employment contract. On the other hand, one might raise doubts about whether all the frictions will be solved and

Figure 1. Discrepancies between demand and supply for a certain type of education in the labour market

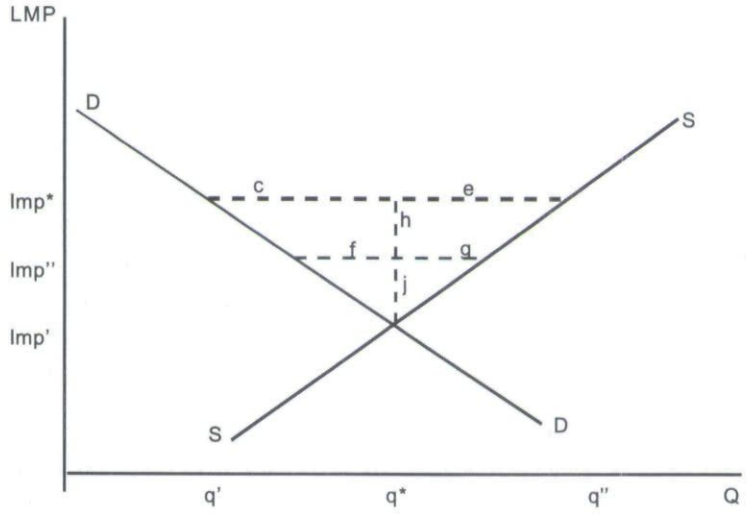


moreover, it is unlikely that all adjustments are exclusively made via wages. There is ample literature suggesting that workers accept jobs at lower skill levels and changes in the employment contract might not only involve wages, but also contract duration, working hours etc.

It therefore seems to be most appropriate to interpret the hypothetical discrepancy between supply and demand as an indicator of the tension between supply and demand that either will lead to unemployment/vacancies or to other changes in the labour market position reflected in wages, contract duration, working hours and the contents of the job. This leads to the empirical question how discrepancies between supply and demand are revealed at the labour market. One would expect, however, that all the adjustments will, in the case of a surplus of workers with a certain educational background, be at the expense of suppliers whereas the demanders will benefit. The gap therefore remains an adequate indicator of labour market prospects, in the widest sense.

This approach to the labour market adjustment process is reflected in Figure 2. First on the vertical axes this figure depicts the Labour Market Position (LMP) in general rather than wages solely. If there is an excess supply of $c+e$, the LMP should decrease with $h+j$ to *lmp'* to bring back a situation of equilibrium.

Figure 2. Process of adjustment in the labour market



Secondly however, the hypothetical discrepancy between supply and demand $c+e$ at lmp^* might be dissolved only partially (with h), leaving some room for unemployment (or open vacancies). In the figure the labour market position will be lmp'' rather than lmp' and unemployment will equal $f+g$. The empirical question resulting from this is how much of this initial hypothetical gap will be dissolved in the adjustment process and what kind of aspects of the employment contract are included in the labour market position.

Supply and demand curves can be distinguished in theory, but can not be observed directly. In order to investigate the relationship between the hypothetical discrepancy between demand and supply an adequate proxy for shifts in these curves is needed. Following Katz and Murphy (1992) we utilize the changes in occupational employment to estimate changes in demand per field of study. So we assume that if the labour market position would not change, the demand for each type of education within an occupation equals a constant fraction of the total demand in that occupation. If the employment for a certain occupation grows, the demand for the various types of education represented in this occupational field rises proportionally. The demand at the initial lmp^* at time t after shifts in the demand curve at time $t = 1$ is therefore determined by the following equation:[2]

$$D_j^{t+1} = \hat{e}_{.j}^{t+1} = \sum_i \frac{e_{ij}^t}{e_{i.}^t} \cdot e_{i.}^{t+1} \qquad [1]$$

where:

e_{ij}^t = number of workers in occupation i with education j in period t
$e_{i.}^t$ = total number of workers in occupation i in period t
$\hat{e}_{.j}^{t+1}$ = estimated number of workers in education i in period $t+1$ at lmp^*
D_j^{t+1} = demand for type of education j in period $t+1$.

Supply of workers with education j in period $t+1$ (S_j^{t+1}) can simply be determined as the sum of the work force with this education ($e_{.j}^{t+1}$) and the number of people unemployed with this education (u_j^{t+1}), assuming that it is not possible for people to change their educational background in the short term, and that nobody will withdraw because of the labour market conditions. We assume that, apart from the people in the work force, only the

short-termed unemployed can be treated as a source of supply which is able to compete with others in the labour market. The equations for demand and supply together result in the gap between the demand for and the supply of labour for each type of education:

$$\begin{aligned} GAP_j^{t+1} &= D_j^{t+1} - S_j^{t+1} \\ &= \hat{e}_{.j}^{t+1} - (e_{.j}^{t+1} + u_j^{t+1}) \end{aligned} \qquad [2]$$

where:

GAP_j^{t+1} = gap between labour demand and supply for type of education j in period $t+1$

The gap between supply and demand will cause changes in several facets of the labour market position. The relation between the gap and seven key indicators on the labour market position present in the school-leavers data is given by the following equations:

$$\begin{aligned} unemployment_{jt} &= \beta_j^U gap_{jt} + \varepsilon_{jt}^U \\ hourly\ earnings_{jt} &= \beta_j^H gap_{jt} + \varepsilon_{jt}^H \\ monthly\ earnings_{jt} &= \beta_j^M gap_{jt} + \varepsilon_{jt}^M \\ job\ level_{jt} &= \beta_j^L gap_{jt} + \varepsilon_{jt}^L \\ required\ branch\ of\ study_{jt} &= \beta_j^B gap_{jt} + \varepsilon_{jt}^B \\ temporary\ job_{jt} &= \beta_j^T gap_{jt} + \varepsilon_{jt}^T \\ part\text{-}time\ job_{jt} &= \beta_j^P gap_{jt} + \varepsilon_{jt}^P \end{aligned} \qquad [3]$$

Constant terms have been excluded from the model since the data are centred round the mean of all observations at a certain educational level. In other words it is assumed that the constant term for each indicator, i.e. its level when the gap is zero, is equal for every type of education at a given level.

One of the important problems encountered in examining the effects of a forecast gap on the various aspects of the labour market position of school-leavers is that, at a low level of aggregation, there is insufficient time-series data. The straightforward way to solve this problem is by pooling the various types

of education, to increase the number of observations on which the estimations are based. This requires the assumption, however, that all types of education react in the same way, which obscures an important aspect of labour market dynamics.[3]

In order to avoid pooling over educational types, the random coefficient model is used in this study to examine the influence of the gap on the various aspects of the labour market situation. In the random coefficient model, introduced by Swamy (1970, 1971), a compromise is made between the pooling of data and the estimation of individual equations, based on the accuracy of the estimation results.

For each educational type the following equation is estimated:

$$y_{ajt} = x_{jt}\beta_{aj} + \varepsilon_{ajt} \qquad [4]$$

In this equation y_{ajt} stands for the value of labour market indicator $a \in \{u, ..., p\}$ for educational type j at time t, and x_{jt} is the gap between demand and supply for this type of education. This gap does not, of course, depend on a. In this model the parameter β_{aj} is independent of time, which implies that the influence of the gap on the selected indicators is constant over time. Furthermore, ε_{ajt} might correlate with other error terms ε_{ajt} if $a \neq a'$.

Using the notations $\beta_j = (\beta_j^U, ..., \beta_j^P)'$ and $y_{jt} = (y_j^U, ..., y_j^P)'$, it is possible to write equation [4] as:

$$y_{it} = (x_{jt} \otimes I)\beta_j + \varepsilon_{jt} \qquad [5]$$

Estimating this model by ordinary least squares (OLS) for each aspect a separately results in parameter estimates for each educational type. These estimates will diverge because the actual values of the estimates differ, and because the error terms differ. Therefore first, one might regard the parameters of specific types of education as being drawn from a distribution of possible values of the parameters:

$$\beta_j = \overline{\beta} + \mu_j \qquad [6]$$

where:

$\overline{\beta}$ = the mean parameter for all educational types
μ_j = the difference from the mean parameter per educational type j

assuming $E[\mu_j] = 0$, $E[\mu_j \mu_j'] = \Delta$ and $E[\mu_j \mu_k'] = 0$ for $j \neq k$.

Second, because of estimation errors, the estimated value of the parameter can be indicated by:

$$\hat{\beta}_j = \beta_j + \eta_j \qquad [7]$$

where:

$\hat{\beta}_j$ = the estimated parameter for educational type j
η_j = the difference from the real parameter per educational type j

assuming $E[\eta_j] = 0$, $E[\eta_j \eta_j'] = \sigma_j^2 (X_j' X_j)^{-1}$ and $E[\eta_j \eta_k'] = 0$ for $j \neq k$.

Substituting the former equation into the latter equation gives:

$$\hat{\beta}_j = \overline{\beta} + \mu_j + \eta_j \qquad [8]$$

This implies that the dispersion of the parameter estimations is caused by the dispersion of the parameters between types of education and the standard errors of the individual OLS estimations.

For each educational type, the OLS estimations are the best linear unbiased estimations (BLUE), but in order to minimise the mean square errors (MSE) over all types of education, these OLS estimations can be improved (Swamy, 1970). This is done by determining the weighted average of the OLS estimations and $\overline{\beta}$. The optimal weight depends on the dispersion of the parameters over the educational types and the standard error of the OLS estimations. This implies that $\hat{\beta}_j$ is determined on the basis of the following estimator:

$$\hat{\beta}_j = (\Delta^{-1} + \Sigma_j^{-1})^{-1} (\Sigma_j^{-1} b_j + \Delta^{-1} \hat{\overline{\beta}}) \qquad [9]$$

where:

$$\Sigma_j = \begin{pmatrix} \sigma_{U_j}^2 & 0 & \cdots & 0 \\ 0 & \sigma_{H_j}^2 & \cdots & 0 \\ \vdots & \vdots & \ddots & \vdots \\ 0 & 0 & \cdots & \sigma_{P_j}^2 \end{pmatrix} \cdot (X_j' X_j)^{-1}$$

In the case of inaccurate parameter estimations for specific educational types and a small dispersion between types of education, $\hat{\beta}_j$ will be similar to the mean for all educational types $\overline{\beta}$. If on the other hand, the parameter estimations are fairly

accurate and the dispersion between the educational types is large, $\hat{\beta}_j$ will tend to be equal to the parameter estimates of the OLS estimates *bj*.

The introduction of a random element in the parameter for each type of education causes heteroscedasticity in the relationship if the data is being pooled. It is therefore efficient to use generalised least squares (GLS) to determine $\overline{\beta}$.

The GLS estimator for $\overline{\beta}$ is given by (see Judge *et al.*, 1980):

$$\hat{\overline{\beta}} = \sum_{j=1}^{N} W_j b_j \qquad [10]$$

where:

$$W_j = \left\{ \sum_{k=1}^{N} [\Delta + \Sigma_k]^{-1} \right\}^{-1} [\Delta + \Sigma_j]^{-1}$$

and

$$b_{aj} = (X_j' X_j)^{-1} x_j y_{aj}$$

It has to be remarked that in determining the estimations of $\overline{\beta}$ in the first iteration of the model, the mean parameter for all educational types is determined on the basis of:

$$\overline{\beta} = \frac{1}{N} \sum_{j=1}^{N} b_j \qquad [11]$$

The unknown variances σ_j^2 and Δ could be simply estimated by the following two formulas:

$$\hat{\sigma}_{jj} = \frac{\tilde{e}_j' \tilde{e}_j}{T - K} \qquad [12]$$

in which $\tilde{e}_j$ are the residuals of $\tilde{e}_j = y_j - X_j b_j$, T represents the total periods of time in the analyses, K is the number of explanatory variables that are included, and, according to Swamy (1970),

$$\hat{\Delta} = S_b - \frac{1}{N} \sum_{j=1}^{N} \Sigma_j \qquad [13]$$

where:

$$S_b = \frac{1}{N-1}\left(\sum_{j=1}^{N} b_j b_j' - \frac{1}{N}\sum_{j=1}^{N} b_j \sum_{j=1}^{N} b_j'\right)$$

However, since the estimation of Δ may not result in positive semidefinite matrices, De Crombrugghe and Dhaene (1991) introduce an alternative estimator for Δ which is always positive and semidefinite. This estimator is obtained by the following iterative process:

$$F^{(1)} = S_b$$

$$F^{(n)} = F^{(n-1)}\left(F^{(n-1)} + \frac{1}{N}\sum_{j=1}^{N}\Sigma_j\right)^{-1} S_b \qquad [14]$$

Convergence then gives an estimator for Δ which is always positive semidefinite:

$$F = \lim_{n\to\infty} F^{(n)} \qquad [15]$$

In first instance it is assumed in the random coefficient model used that β_j^U, β_j^H, β_j^M, β_j^L, β_j^B, β_j^T and β_j^P are correlated:

$$\begin{pmatrix} \beta_j^U \\ \vdots \\ \beta_j^P \end{pmatrix} \sim N\left(\begin{pmatrix} \overline{\beta}^U \\ \vdots \\ \overline{\beta}^P \end{pmatrix}, \begin{pmatrix} \sigma^2_{\beta_U} & \cdots & \rho\sigma_{\beta_U}\sigma_{\beta_P} \\ \vdots & \ddots & \vdots \\ \rho\sigma_{\beta_U}\sigma_{\beta_P} & \cdots & \sigma^2_{\beta_P} \end{pmatrix}\right) \qquad [16]$$

Whereas ε_{jt}^U, ε_{jt}^H, ε_{jt}^M, ε_{jt}^L, ε_{jt}^B, ε_{jt}^T and ε_{jt}^P are assumed not to be correlated:

$$\begin{pmatrix} \varepsilon_j^U \\ \vdots \\ \varepsilon_j^P \end{pmatrix} \sim N\left(\begin{pmatrix} 0 \\ \vdots \\ 0 \end{pmatrix}, \begin{pmatrix} \sigma^2_{\varepsilon_U} & \cdots & 0 \\ \vdots & \ddots & \vdots \\ 0 & \cdots & \sigma^2_{\varepsilon_P} \end{pmatrix}\right) \qquad [17]$$

However, in testing this specification, the assumption of uncorrelated error terms had to be rejected, implying that the

following specification is included in the model:

$$\begin{pmatrix} \varepsilon_j^U \\ \vdots \\ \varepsilon_j^P \end{pmatrix} \sim N\left(\begin{pmatrix} 0 \\ \vdots \\ 0 \end{pmatrix}, \begin{pmatrix} \sigma^2_{\varepsilon_U} & \cdots & \rho\sigma_{\varepsilon_U}\sigma_{\varepsilon_P} \\ \vdots & \ddots & \vdots \\ \rho\sigma_{\varepsilon_U}\sigma_{\varepsilon_P} & \cdots & \sigma^2_{\varepsilon_P} \end{pmatrix} \right) \quad [18]$$

3. Data

Two sources of data have been used. First, the Dutch Labour Force Survey (LFS) is used to calculate the discrepancy between labour demand and supply. The LFS is a continuous monthly survey that has been carried out since 1987 by Statistics Netherlands. The yearly sample of the LFS includes about 120,000–130,000 addresses, with about 100,000–110,000 individuals between the ages of 15–64 years old being interviewed, a sample fraction of 1 percent. Eventually, the results of the sample are scaled up to the size of the Dutch population. This scaling up involves a stratification by sex, age, marital status, nationality and region (Statistics Netherlands, 1993). The LFS provides information on the type of education an individual has completed and the occupation he works in. Furthermore the LFS is the source for information about unemployment rates, needed to calculate the supply of labour.

In order to examine the effect of demand or supply surpluses on the various aspects of the situation on the labour market, as a second source data has been obtained from two large Dutch school-leaver surveys. These surveys are the *Registration of Outflow and Destination of School-leavers* ('Registratie van Uitstroom en Bestemming van Schoolverlaters' (RUBS)) and the *Higher Vocational Education Monitor* ('HBO-Monitor'). These postal surveys examine the situation of school-leavers approximately one year after leaving school. The RUBS survey is a large-scale survey intended to periodically record the outflow and destination of school-leavers from secondary general and lower and intermediate vocational education. The HBO-Monitor is an instrument for monitoring graduates from higher vocational education.

In the RUBS survey of 1992 in all, 80,000 school-leavers from the 1990/1991 school year were approached. The response was

approximately 55 percent, so information about the destination approximately one year after leaving school was obtained from more than 44,000 school-leavers (see Wieling *et al.*, 1993a, b). In 1993 some 47,000 school-leavers were approached and information on about 28,000 school-leavers was obtained (see Van Smoorenburg *et al.*, 1994). In the HBO-Monitor of 1992 about half of the total outflow from higher vocational education was sent a questionnaire, in total 16,000 graduates. The response rate was 62 percent, so that information was obtained from almost 10,000 school-leavers about their destination (see Van de Loo *et al.*, 1992). In 1993 almost 20,000 graduates from higher vocational education were approached. The response was 56 percent, so information was again obtained for more than 10,000 school-leavers (see Van de Loo *et al.*, 1993). Those who do not successfully complete their courses are not taken into account in the analyses. Furthermore, graduates who received part-time education are not included, since these graduates were probably already active on the labour market during their study, which means that the information they provide does not necessarily refer to their first destination.

As mentioned earlier, for each year and for both surveys, seven dichotomous indicators were selected to give a description of the situation on the labour market. The key indicators are:

1. percentage of school-leavers who are unemployed;
2. percentage of school-leavers who earn a relatively low hourly income;
3. percentage of school-leavers who earn a relatively low monthly income;
4. percentage of school-leavers who work at a level that is lower than their completed education;
5. percentage of school-leavers who work in a job for which another, or no (specific) branch of study, is required;
6. percentage of school-leavers who have a temporary job;
7. percentage of school-leavers who have a part-time job.

The first of the key indicators of the situation on the labour market is the unemployment of school-leavers. The percentage of school-leavers who are unemployed is determined by relating the unemployed school-leavers to the school-leavers who are in the labour force. We followed the definition of unemployment by the Statistics Netherlands (1993) as closely as possible.[4] An exact match was not possible, mainly because the surveys provide no

information on whether an 'unemployed' graduate has already accepted a job and is merely waiting to begin. Furthermore, the phrasing of the questions concerning unemployment differs in the two surveys slightly.

To determine the hourly wages, the monthly earnings are first related to the number of hours which the graduates work per week. Then, to divide hourly and also monthly income into two categories, *per educational level*, the average income and standard deviation are determined. The incomes of the graduates, in both hourly and monthly terms, are then classified in one group with a relatively low income (below $\mu - 0.524 \times \sigma$) and a second group with an average or relatively high income (above $\mu - 0.524 \times \sigma$), following Wieling *et al.* (1990). The percentages of graduates who earn a relatively low monthly or hourly income is determined for those graduates who have a job for 12 hours or more per week (analogous to the definition of the Statistics Netherlands (1993)). It should be noted that in the RUBS project of 1992 the school-leavers were asked about their net monthly income, whereas in the same project in 1993, and in the HBO Monitors of 1991 and 1992, they were asked about their gross monthly wages. Therefore a dichotomous variable is expected to be the best way to compare the different surveys.

Both surveys included a question about the type of education normally required for the job the graduates were holding at the time of the survey. These educational types are categorised into 6 educational levels.[5] The educational level that was required for the job that the graduate was holding is then compared with their completed educational level. A similar question was included about the branch of study that was required for the job the graduates held at the time of the survey, so that the percentage of school-leavers who held jobs for which no specific education, or education in another field, was required could be calculated. Both indicators, of level and field of study, are determined for the graduates who held a job for 12 hours or more per week.

The last two key indicators refer to how many school-leavers have a temporary job or a part-time appointment approximately one year after completing their initial education. Part-time work is defined as less than 30 hours per week, and this, and the numbers with temporary work, are both related to the total number of employed school-leavers, i.e. those with a job for 12 hours or more.[6]

4. Findings

The main results concerning the estimation of the adjustment model are the weighted average parameters of individual types of education. Table 1 presents the estimated $\overline{\beta}$. In general, one would expect a negative relationship between the discrepancies between supply and demand and the key indicators of the labour market situation. The *t*-values presented in the table are based on an equal weighting of all parameters, while the average parameter is based on the optimal weight, provided in Section 2. Using the optimal weights would lead to a downward bias in the estimated standard errors, so overestimating the *t*-value. The alternative presented in this table is, on the other hand, too pessimistic regarding the standard errors.

The smaller the excess demand in the labour market (or the larger the excess supply), the larger the percentages of school-leavers who are unemployed, earn relatively low wages, work at a level below their completed educational level, work in a job for which no particular qualification, or a qualification in another field of study was required, or have a temporary and/or a part-time job will normally be. As can be seen in Table 1, with the exception of unemployment, the $\overline{\beta}$'s are negative as expected. The $\overline{\beta}$ representing unemployment has a small positive value. It is interesting to note that the parameter value for unemployment is however not significantly different from zero. There are four key indicators which are significantly influenced by the gap between demand and supply. These are monthly wages, hourly wages, job level and part time work. These results imply that, on average, a

Table 1. Estimated mean of the OLS parameters per labour market aspect

Labour market aspects	$\hat{\overline{\beta}}$	***t*-value**
Unemployment	0.05	0.19
Low hourly wages	−0.61*	1.90
Low monthly wages	−0.63*	4.43
Job level below educational level	−0.33*	1.93
Required branch of study other than completed	−0.08	0.39
Temporary work	−0.37	1.41
Part-time work	−0.18*	1.95

* = significantly different from zero at 10% level.

surplus of school-leavers of a certain educational type is absorbed by the labour market by their accepting jobs below their educational level. These jobs, which may be part-time, have a lower hourly payment and therefore the monthly wages, which are influenced by both the hourly wages and the number of working hours, are most strongly affected.

Table 2 presents the estimates of the random coefficient model for each educational type. As for the $\overline{\beta}$, the influence of the discrepancies between labour supply and demand on the percentage of school-leavers who might really be unemployed is positive for several educational types. For every educational type, the gap has a negative effect on the percentage of school-leavers working at a level below their completed educational level and on the percentage of school-leavers having a temporary job.

The largest negative influence with regard to the unemployment of school-leavers can be found for 'Higher general secondary education'. Relative large effects can also be seen for 'Preparatory vocational education, commerce and administration', 'Intermediate vocational education, commerce and administration', 'Higher vocational education, teacher training' and 'Lower general secondary education'. This suggest that for some specific fields of study excess supply does result in unemployment.

Besides estimates for the relationship with regard to the various types of education and the averages of these relationships over all educational types, a random coefficient model also provides the correlation structure between the types of education analysed. This correlation structure can be divided into two aspects: a covariance structure for the error terms in the estimated equations, and, since the parameters are stochastic, a covariance structure for the parameters. The error term structure indicates correlations in unsystematic deviations from the adjustment processes. If a key indicator is larger than might be expected from the gap, the correlation matrix points to other key indicators that are also likely to deviate.

From Table 3 it can be seen that the error term in the unemployment equation does not significantly correlate with any of the other key indicators which describe the labour market position of school-leavers. All other key indicators do have a positive significant correlation, except that the percentage of school-leavers with a temporary job does not significantly correlate with the percentage who have a part-time job or the percentage who are working in another branch. The lack of any

Table 2. Estimated random coefficients

Type of education	Unemployment	Low hourly wages	Low monthly wages	Low job level	Outside own branch	Temporary work	Part-time work
Lower general secondary	−0.06	−1.19	−1.75	−0.63	−0.40	−0.68	−0.88
Preparatory vocational							
Agricultural	0.11	−0.66	−1.27	−0.97	−0.07	−1.09	−0.77
Technical	0.03	−0.86	−1.57	−0.90	−0.27	−1.04	−0.93
Commerce and administration	−0.10	−0.72	−1.10	−0.06	−0.06	−0.35	−0.57
Community care, hotel and catering	−0.02	−1.07	−0.96	−0.23	−0.29	−0.12	−0.19
Higher general secondary	−0.24	−1.18	−2.83	−0.69	−0.19	−1.31	−1.97
Intermediate vocational							
Agricultural	−0.00	−1.07	−1.13	−0.38	−0.22	−0.30	−0.34
Non-medical laboratory	0.11	0.00	−0.77	−0.68	0.33	−1.18	−0.75
Engineering	0.32	−0.14	0.63	−0.58	−0.09	−0.25	0.75
Medical laboratory	0.07	−0.69	−0.48	−0.34	−0.27	−0.22	0.03
Nursing and paramedical services	−0.03	−0.39	−1.09	−0.32	0.19	−0.79	−0.79
Commerce and administration	−0.08	−1.36	−1.74	−0.52	−0.45	−0.47	−0.75
Social and cultural	0.03	−0.55	−0.65	−0.26	−0.00	−0.39	−0.24
Community care	0.05	−0.92	−0.97	−0.45	−0.12	−0.40	−0.30
Hotel, catering and hairdressers	0.01	−0.16	−0.82	−0.38	0.17	−0.86	−0.69
Higher vocational							
Teacher training	−0.08	−1.41	−2.24	−0.87	−0.50	−0.92	−1.21
Non-medical laboratory	0.13	0.03	−0.18	−0.37	0.24	−0.68	−0.18
Engineering	0.21	0.57	0.24	−0.55	0.33	−0.99	−0.14
Medical laboratory	0.01	−1.22	−1.37	−0.55	−0.25	−0.44	−0.48
Nursing and paramedic	−0.04	−0.90	−1.26	−0.36	−0.09	−0.49	−0.60
Commerce and administration	0.13	−1.01	−0.31	−0.67	−1.08	−0.01	0.43
Business administration technology	0.15	−0.08	0.49	−0.22	−0.34	−0.07	0.56
Administrative, legal and fiscal	0.14	−0.30	−0.51	−0.96	−0.75	−0.88	−0.28
Social and cultural	−0.03	−1.10	−1.60	−0.57	−0.19	−0.66	−0.80
Fine arts	−0.02	−0.95	−1.36	−0.51	−0.20	−0.60	−0.67

Table 3. Correlation matrix of the error terms

Labour market aspects	Unemployment	Low hourly wages	Low monthly wages	Low job level	Outside own branch	Temporary work	Part-time work
Unemployment	1.00						
Low hourly wages	0.06	1.00					
Low monthly wages	0.23	0.75*	1.00				
Low job level	0.16	0.49*	0.76*	1.00			
Outside own branch	0.22	0.38*	0.53*	0.71*	1.00		
Temporary work	0.13	0.57*	0.40*	0.28*	−0.12	1.00	
Part-time work	0.20	0.46*	0.84*	0.71*	0.66*	0.03	1.00

* = significantly correlated at 5% level.

significant negative correlation indicates that there seems to be complementarity rather than substitution between unsystematic adjustments. If, for example, the rise in the number of people getting a job below their educational level is larger than usually, this is not (significantly) compensated by a lower adjustment in other aspects. If one adjustment is larger than might be expected from the measured gap, all other adjustments also tend to be larger.

The second aspect concerning the correlation structure of the model concerns the correlation between the stochastic parameters. Since the adjustment parameters may vary between the types of education, it is possible that certain types of adjustment are more likely to be found in one group of educational types, while others are more dominant in the other group. Table 4 presents the correlation between the estimated β's. From the table it can be seen that the estimated parameter in the unemployment equation correlates with the estimated parameters in the other equations, with the exception of the relation between the gap and the percentage of school-leavers working in temporary jobs. Such a correlation indicates that types of education in which adjustment take place to a relatively large extent via unemployment, also have much adjustment in the (positive) correlating indicator. So types of education with relatively high amounts of adjustment via unemployment also have sharp adjustments via wages, having relatively many people working outside the branch, and relatively many part-time jobs. Relatively few adjustments are made in that case in the form of people getting jobs at lower levels. This latter finding can easily be explained by the process of downward displacement. For many types of education, low demand can be compensated for by accepting jobs below the usual level. Where downward displacement is not possible, for example at the lower educational levels or within certain very specific occupations, unemployment will increase instead.

The two other correlations which are significantly negative are those between the temporary work parameter and the parameters concerning hourly wages and the field of study. Apparently there are certain types of education whose school-leavers keep on getting jobs within their own occupational domain when the market has a surplus, without a reduction in the wages. However, these jobs are on a temporary basis instead of a regular contract. Significantly positive correlations can be found between the temporary work parameter and the parameters that refer to the monthly wages,

Table 4. Correlation matrix of the estimated parameters

Labour market aspects	Unemployment	Low hourly wages	Low monthly wages	Low job level	Outside own branch	Temporary work	Part-time work
Unemployment	1.00						
Low hourly wages	0.40*	1.00					
Low monthly wages	0.66*	0.67*	1.00				
Low job level	−0.53*	0.08	0.22	1.00			
Outside own branch	0.29*	0.51*	0.20	0.06	1.00		
Temporary work	−0.13	−0.30*	0.37*	0.67*	−0.35*	1.00	
Part-time work	0.61*	0.21	0.87*	0.22	−0.07	0.68*	1.00

* = significantly correlated at 5% level.

the job level, and part-time jobs. Furthermore, there is a positive correlation between the parameters for hourly and monthly wages, and also between the parameters of hourly wages and outside the own branch. Finally, Table 4 shows a significant positive correlation between the parameters for part-time work and monthly wages.

10. Conclusions

This article has investigated the relationship between discrepancies between demand and supply for certain types of education on the one hand and manifestations of adjustment processes as observed in the school-leaver surveys on the other hand. The starting-point in this analysis is that the gap between demand and supply should be interpreted as an indicator of the labour market tension. This tension will lead to adjustment processes, which will improve the labour market situation of those who are in a shortage situation and worsen the perspectives of those who are in a surplus supply situation. The question of this paper is in which way this tension is revealed.

A random coefficient model has been used to investigate this relationship. This model has the advantage that it recognises the fact that adjustment processes might differ between types of education, but still makes full use of all information available in the data. The model provides estimates of average levels and separate estimates for each type of education.

On average, discrepancies between demand and supply seem not to lead directly to unemployment. Except for some specific types of education, discrepancies seem to have more impact on wages, the number of people working below their educational level and the number of part-time jobs. From this it can be concluded that surpluses for a type of education lead to pressure on school-leavers to accept a job below their educational level. These jobs may have lower wages. Also, school-leavers may get jobs with part-time contracts instead of the full-time contracts.

It can be concluded from this study that the labour market does indeed show a rather high degree of flexibility in adjusting to discrepancies in the demand and supply of labour of a certain educational type, although this does not necessarily refer to wage adjustments. These labour market adjustments circumvent unemployment to a large extent.

Notes

[1] Of course, Figure 1 is only based on a partial market model. In a general equilibrium framework discrepancies between supply and demand might lead to spill-over effects on other market segments. Borghans and Heijke (1995) provide a method to take into account these interaction effects, but facing all the assumptions needed to make such calculations, we prefer in this paper to neglect these effects and treat them as noise in our analyses.

[2] Borghans and Heijke (1995) provide alternatives for this fixed coefficient model, which make allowance for some autonomous changes in the demand for types of education, in addition to the occupational effect.

[3] Although longer time-series could be useful, their useful length is also restricted, since it has to be assumed that types of education react to gaps in the same way over time. This might obscure structural changes, which are likely to occur over longer periods of time due to institutional changes.

[4] This is based on the definition of the registered unemployed, the individuals between the ages of 15 and 64 who are not employed for 12 hours or more per week and who are available for a job of 12 hours or more per week, or who have accepted a job which will provide work for at least 12 hours per week.

[5] The required educational type are classified as follows:

1 = no education or primary education
2 = preparatory vocational education or lower general secondary education
3 = apprenticeship system
4 = intermediate vocational education, higher general secondary education
5 = higher vocational education
6 = university.

[6] Wieling and Borghans (1995) provide all the data.

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