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Regional labour market dynamics in the Netherlands*

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Abstract. This article analyzes the response of regional labor markets in the Netherlands to region-specific labor demand shocks. Previous studies show remarkable differences in response between regions in European countries and regions in the United States. The analysis shows that, in Dutch regions, the speed of adjustment is similar to that of the US, but the primary adjustment mechanism is the same as in Europe. Whereas previous studies analyze only average patterns of all regions in a country, we also provide a more in-depth analysis of within country differences in labor market adjustment processes, thus showing remarkable differences between regions within the Netherlands.

JEL classification: R23, J21, J60

Key words: Regional labor markets, demand shocks, adjustment mechanisms

1 Introduction

This article analyzes the extent to which regional labor markets in the Netherlands share similar labor market shocks and to what extent regions differ with regard to the adjustment to those shocks. In essence, adjustment to a shock in regional labor demand can occur via changes in regional unemployment, changes in labor participation rates, and through spatial mobility in the form of migration and commuting. One reason to investigate regional rather than national labor markets is the fact that region-specific shocks may trigger adjustment mechanisms different than

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nation-wide shocks. Migration from one region to another within a country is one such response that can be analyzed using regional data rather than national data, since migration between countries is far less important as an adjustment mechanism. This is especially true for Europe, with its cultural differences and language barriers between countries.

This article is in the tradition of the seminal paper of Blanchard and Katz (1992) on labor demand shocks to regional labor markets in the United States, and of Decressin and Fatás (1995), who analyze regional labor markets in European countries. These works show marked differences between Europe and the United States. A labor demand shock in the US is much more likely to lead to worker migration as an adjustment mechanism than a similar shock within Europe would do. In Europe such a shock is mainly the result of changes in participation rates. Furthermore, the speed of adjustment in the US is much higher than in Europe. Researchers frequently argue that the flexibility of the US labor market – or the inflexibility of European labor markets – lies at the heart of these differences. Because of the favorable social security arrangements in Europe, a worker who becomes redundant is less inclined to migrate to other regions to seek work than in the US. In the US the social security payments are less abundant and so triggers a much higher level of (spatial) mobility of workers when they lose their jobs. Van Dijk et al. (1988) show, however, that the extent to which migration really increases the re-entry probability into employment by unemployed is higher in the Netherlands than in the US. Hence the higher spatial mobility in the US does not necessarily imply that the labor market functions more efficiently with higher levels of spatial mobility.

The economic upsurge of the second half of the 1990s sparked a major increase in employment in the US, while Europe was lagging behind. One notable exception in Europe has been the Netherlands, which witnessed 'American' employment growth figures during that period. One explanation for this 'Dutch Miracle' is the policy of wage moderation that could be sustained due to major revisions in the Dutch social security system; see also Broersma et al. (2000). Another question addressed here is to what extent the similarity in employment growth between the US and the Netherlands is also reflected in similarities in the adjustment processes and in the speed of adjustment.

We also aim to study to what extent adjustment processes vary within a country. Whereas previous studies analyze only average patterns of all regions in a country, this article provides a spatially disaggregated analysis of within country differences in labor market adjustment processes. As will be discussed in Sect. 5, even within a small country as the Netherlands, labor market characteristics between regions vary considerably. The unemployment rate in the northern province of Groningen is known to be consistently higher than the national average, while the central province of Utrecht lies consistently below this level. We analyze the effects on regional labor markets taken from data for a regional subdivision of the Netherlands in 18 so-called RBA-areas. This is the regional subdivision used by the Public Employment Service (Arbeidsvoorziening) in the Netherlands. More information about this regional subdivision can be found in Sect. 5.

We find that the mechanism of adjustment of the Dutch regional labor markets, based on these 18 RBA-areas, to a one-period labor demand shock is similar to what Decressin and Fatás (1995) find for European regions. A labor demand shock in a Dutch regional labor market model leads to substantial changes in participation as a way to absorb that shock. The effects of the shock on unemployment and migration/commuting are limited. Conversely, the speed of adjustment to a labor demand shock in the Netherlands is at a similar level to the US, and amounts to at most five years. For Europe, Decressin and Fatás (1995) show that almost ten years is required to completely absorb such a shock. The Dutch labor market may indeed be more flexible than one might usually consider; this notion is more in line with the US than with other European countries.

When a further subdivision of the national labor market is made into the four composite regions North, East, West and South, based on aggregating the 18 RBA-areas, we find substantial differences between these regions in terms of adjustment patterns to a labor demand shock. In the East, West and South, the participation rate is still the major absorption channel of the shock, while in the North, it is mainly the unemployment rate that handles the absorption of the shock. In the periods after the shock we find in the three aforementioned regions that, in the longer run, the share of spatial mobility as an absorptive mechanism becomes more important; meanwhile, the importance of unemployment falls. In the North, on the other hand, we find that in the longer run participation, rather than migration/commuting and unemployment, will absorb a larger share of the remaining shock.

An obvious explanation for this phenomenon is that, the North has long been a high unemployment region, so there is a large reservoir of unemployed from which workers can be found to fill the new jobs that come with the shock. In the other regions unemployed workers are less abundant and mostly newcomers on the labor market, such as (re-)entering women or school leavers fill the new jobs. This work potential will be opened up in the North at a later stage. Initially, migration is also a relatively important absorption mechanism in the North. Hence, in the event of a positive shock, workers are recruited from other regions and in the case of a negative shock, workers move to other regions – at a higher rate than for the other regions.

Another difference between the North and the other three regions is the speed of adjustment in response to the shock. In the North we find the shock is absorbed after about four years. In the other three regions it seems to take longer, between five and seven years. A higher speed of adjustment points towards a more flexible labor market. In other words, there is indeed evidence to support the view that the reallocation rate of unemployed workers and of migration flows in the northern labor market is much higher than in other parts of the Netherlands.

We have organized the analysis as follows. In Sect. 2 we present our data. Section 3 studies whether labor market shocks are common to all Dutch regions, or whether there are also region-specific shocks. Section 4 examines the adjustment to a labor demand shock of the Dutch labor market. Section 5 expands the analysis to account for the difference in adjustment in four regional labor markets. Section 6 scrutinizes evidence that may explicate our empirical findings, and Sect. 7 concludes.

2 Data description

2.1 Employment

Employment is measured as the number of jobs (excluding the self-employed and agricultural jobs) in each of the 18 RBA-areas. The data come from a large survey among 67,000 Dutch firms and organizations, and covers 82% of all jobs. This so-called survey of Employment and Wages (Enquête Werkgelegenheid en Lonen, abbreviated to EWL) is held by Statistics Netherlands.[1] Regional employment data for this study have been drawn from the above mentioned survey for a number of reasons. First, the survey is large enough for the provision of reliable data for sparsely populated regions that is required for a spatial disaggregated analysis. An alternative source for employment data often used for analysis on the national level is the Labour Force Survey (Enquête Beroepsbevolking, or EBB) of Statistics Netherlands. This is a monthly survey, which includes approximately 10,000 people. In annual terms this is about 1% of employment and is thus a much smaller survey than the EWL. The implication here is that the EBB has a fairly high uncertainty threshold of 5,000 persons, below which results are not reported. Changes in (un)employment in sparsely populated regions may easily remain below this threshold. Another reason for not using the EBB is that it is a survey of persons not of firms and, therefore registers the residence of workers rather than their workplace. This implies that, according to the EBB, it is possible that a change in employment in region i (that is, working persons *living* in region i) is caused by an increase in the number of jobs in region j. Hence, regional employment growth according to the EBB includes commuting to other regions. However, we are interested in employment – in terms of jobs – within a particular region. The EWL employment data allow for this focus. Where the persons who fill these jobs originate from is of secondary interest. For the moment we simply assume that these workers come from the same region. In fact, when we speak of spatial adjustment in this study we mean migration *plus* commuting.

The employment data from the EWL also have some drawbacks, but these are of minor importance for the present analysis. First, the EWL employment consists only of jobs of employees, and hence, the self-employed are not taken into account. The number of self-employed differs between regions. Agricultural regions in particular, such as Fryslân (RBA 2), have a relatively high share of self-employed (farmers). Urban areas, including Rijnmond (RBA 13) have a lower share. Overall, roughly 12% of the employed labor force is self-employed; in Fryslân self-employment is almost 15% and in Rijnmond it is about 9%. Hence, disturbing effects induced by excluding this group are not overly serious. Moreover, the *differences* in regional employment are a central issue to us here, and changes in employment will not be affected much when the self-employed are exempted. A second drawback concerns the frequency of the data. Quarterly data are available only on an aggregate level. Regional data are only available with an annual frequency. In order to arrive at regional quarterly data, we have interpolated the regional data to make it compatible

[1] The data we use are of the same type as used by Blanchard and Katz (1992), who also used establishment-based (non-agricultural) employment.

with the available quarterly unemployment data. When these interpolated data are compared with the de-seasonalized national quarterly data, both series are very similar. We end up with employment data from 1993.2–1999.3 (26 quarters) for each of the 18 RBA-areas.

2.2 Unemployment

Unemployment data are available according to different definitions. Most frequently used in studies at the national level are the registered unemployment and the unemployed labor force. Both are drawn from a survey. The unemployed labor force stems from the Labour Force Survey (EBB), which has already been discussed above. The registered unemployment stems from a separate survey called the Registered Unemployment Survey (Statistiek Geregistereerde Werkloosheid). Both are hampered by the fact that changes in unemployment in sparsely populated regions may fall below the uncertainty threshold of these surveys when these two measures are used. Because the number of unemployed is substantially smaller than the number of employed, for regional unemployment data these surveys are not particularly useful. To avoid these sample issues, we use an alternative unemployment measure not based on a survey, but on an actual count of non-working job searchers registered at the employment offices of the Public Employment Service. The unemployment definition they use is more detailed than both the registered unemployed and the unemployed labor force definitions. The only criterion here is that the unemployed, between 15–64 years of age, be listed at an employment office as job searcher, and that they do not already have a job for more than 12 hours per week.[2] This unemployment definition includes, for example, persons following courses to enhance their employment chances or persons with small part-time jobs. The main difference with registered unemployed is that immediate availability for a job is not necessary here. The main difference with the unemployed labor force is that the 'active search' criterion is not required to count as unemployed. The level of unemployment, according to not-working job searchers of the Public Employment Service is therefore higher, but the pattern and trend are in fact very similar to the other two regular definitions.[3] The monthly series for 18 RBA-areas, covering 1993.03–1999.10, are adjusted to yield quarterly data for 1993.2–1999.3 and seasonally adjusted for an adequate comparison with the employment data.

[2] Registered unemployed are also listed at the employment agencies, but should be able to start a job at a minimum of 12 hours a week within two weeks after a job offer. The unemployed labor force consists of persons between 15–6 4 who are willing, available and motivated to work at least 12 hours a week.

[3] This is clearly shown by Atzema and Van Dijk (2000a, p. 44, Fig. 4). An additional drawback of the unemployment data of the Public Employment Service is that the files are somewhat contaminated in the sense that persons may not be removed when they have found jobs, because they do not report the job finding.

2.3 Participation

Like Blanchard and Katz (1992), we define the regional labor force as the sum of regional employment from the establishment survey and unemployment from the employment offices. Decressin and Fatás (1995) conduct a similar exercise to obtain labor force data for Germany and the UK. In fact, the labor force data constructed in this way do not differ much from the official labor force data of Statistics Netherlands. These official data are not used here for the same reason as before, viz., the small sample properties of the Labour Force Survey (EBB), which are likely problematic for less densely populated RBA-areas. Our labor force definition is consistent with our employment and unemployment measures, and since both measures refer to the regions in which the jobs and unemployed are registered, there is no disturbing effect of commuting. All three measures concern one and the same region. To obtain participation rates we take the ratio of the labor force and the population of working age, i.e., everyone between 15 and 64 years old. Data on the population between 15–64 by region are available from Statistics Netherlands. Since these data are available only annually, they are interpolated (without imposing a seasonal pattern) to a quarterly frequency. Because the size of the population changes very gradually over time, interpolation will not cause any major disturbance.

3 Common labor market disturbances

Our purpose in this section is to determine whether labor market disturbances in the Netherlands are distributed symmetrically across regions and then to compare those results with the US and other European countries. In other words, how much of a typical movement in regional employment is common to all regions, and how much is region-specific? In addition we also specify region-specific variables used later for evaluating regional adjustments to a labor market shock. To determine the extent to which changes in employment are common to all regions, we estimate the following equation for each RBA-area i:

$$\Delta \log(N_{i,t}) = \alpha_i + \beta_i \Delta \log(N_t) + \eta_{1,i,t}, \tag{1}$$

where Δ is the difference operator, $\Delta x_t = x_t - x_{t-1}$, N_i is the employment in region i, N is the nation-wide employment and η is a disturbance term. This equation is estimated using quarterly data from 1993.2 to 1999.3. When β_i differs significantly from unity this means that a nation-wide labor demand shock will not make itself felt in region i to the same extent. Put another way, regions may respond differently to common nation-wide shocks. The estimation results for β for each region are presented in Table 1. Similar specifications can be formulated to check whether shocks in the unemployment rates and the participation rates are common to all regions:

$$\left(\frac{U}{LF}\right)_{i,t} = \mu_i + \gamma_i \left(\frac{U}{LF}\right)_t + \eta_{2,i,t} \tag{2}$$

and

$$\log\left(\frac{LF}{B}\right)_{i,t} = \lambda_i + \delta_i \log\left(\frac{LF}{B}\right)_t + \eta_{3,i,t} \tag{3}$$

where LF is the labor force, $LF = U + N$, and U is the number of unemployed, index i refers to the region, and B is the population between 15 and 64 years of age. Parameter values of γ_i and δ_i that differ from unity again imply the existence of region-specific responses to nation-wide shocks.[4] The estimated values for β, γ and δ for each region are in Table 1. These estimation results in fact refer to elasticities. Thus, in terms of Equation 1 it shows that when national employment changes by 1%, that in reaction regional employment changes by $\beta\%$. When $\beta = 1$, national changes and regional changes are identical in magnitude. The adjusted R^2s in Table 1 indicate the extent to which the pattern of regional labor market indicators (employment growth and unemployment and participation rates) fit the pattern of the corresponding national indicator over the whole sample. The β s give the 'average value' over the sample with which regional indicators follow the national ones. Therefore, a value of β close to unity can easily go together with a low R^2.

Table 1. Common shocks in regional employment, unemployment and participation

	Employment		*Unemployment*		*Participation*	
RBA-area	β	adj. R^2	γ	adj. R^2	δ	adj. R^2
1. Groningen	0.52*	0.34	0.84*	0.93	0.63*	0.91
2. Fryslân	0.86	0.62	1.26*	0.99	0.58*	0.90
3. Drenthe	0.68	0.16	0.76*	0.96	1.24*	0.96
4. IJssel-Vecht/Twenthe	0.61	0.11	1.04	0.98	1.80*	0.97
5. IJssel/Veluwe	1.57	0.24	0.99	0.95	0.75	0.47
6. Arnhem-O-Gld/Nijm-Riv.land	0.97	0.79	1.11*	0.98	0.87*	0.98
7. Flevoland	0.39*	0.09	1.18*	0.89	1.56*	0.74
8. Midden-Nederland	1.04	0.86	0.90*	0.98	1.65*	0.98
9. Noord-Holland Noord	1.46	0.39	1.26*	0.98	1.29*	0.90
10. Zuidelijk Noord-Holland	1.46*	0.95	0.99	0.98	1.34*	0.99
11. Rijnstreek	0.88	0.80	1.02	0.99	0.68*	0.97
12. Haaglanden	1.47	0.52	0.71*	0.89	0.53 *	0.66
13. Rijnmond	1.19	0.76	1.04	0.93	0.62*	0.88
14. Zeeland	0.68	0.11	0.51*	0.90	1.43*	0.96
15. Midden- en West-Brabant	1.50*	0.62	1.15*	0.97	0.75*	0.82
16. Noordoost-Brabant	0.99	0.10	1.12*	0.99	1.30*	0.91
17. Zuidoost-Brabant	1.24*	0.84	1.23*	0.88	1.29*	0.91
18. Limburg	0.97	0.46	0.88	0.97	0.66*	0.83

* Significantly different from 1 at 5%

[4] For more on data analysis and application of unit root tests, we refer to the Appendix.

The average adjusted R^2 for the employment equations equals 0.49. So only a limited part of the movement in national employment is reflected in regional employment. Indeed, our result is close to the value of 0.6 which Decressin and Fatás (1995) report for the US. Their value for Europe is a much smaller with only 0.2. Blanchard and Katz (1992) found an adjusted R^2 of 0.66 for the US. So the changes in regional employment shared by all regions is much higher in the US and the Netherlands than in Europe.

The null hypothesis of a unit elasticity of regional employment changes with respect to nation-wide employment changes is rejected for five of the 18 RBA-areas. Hence, a small number of regions do not follow the national employment growth path on a one-to-one basis. The values of β indicate that the variation in regional employment is largely region-specific. This is in striking contrast to the other two equations for unemployment and participation rates.[5] A vast majority of regions is indeed ruled only in part by national shocks. However, the high frequency of the data causes a high fit and elasticities close to unity but statistically different.

These results imply that there are arguments for constructing region-specific variables in our subsequent analysis. These region-specific variables are constructed as the residuals from Eqs. (1)–(3) using the estimated coefficient values of β, γ and δ in the following way:

$$n_{i,t} = \log(N_{i,t}) - \hat{\beta}_i \log(N_t) \tag{4}$$

$$e_{i,t} = \log\left(\frac{N_{i,t}}{LF_{i,t}}\right) - \hat{\gamma}_i \log\left(\frac{N_t}{LF_t}\right) \tag{5}$$

$$p_{i,t} = \log\left(\frac{LF_{i,t}}{B_{i,t}}\right) - \hat{\delta}_i \log\left(\frac{LF_t}{B_t}\right) \tag{6}$$

where n_i is the so-called β-difference and the series e_i and p_i are named accordingly.[6] Further, $LF_{(i)}$ is the labor force and $B_{(i)}$ is the population of working age in region i or nation-wide, respectively. Note that these transformations suggest that we allow different regions to respond differently to common shocks as in Decressin and Fatás (1995), and in contrast to Blanchard and Katz (1992), who assume that all regions respond equally, implying that $\beta = \gamma = \delta = 1$. However, because in our analysis (see Table 1) for many regions these parameter values differ from unity, we proceed with the β, γ and δ-differences.

4 National adjustment to regional demand shocks

This section concerns the mutual relationship of employment growth and relative unemployment and participation rates in reaction to a labor market shock. There are a number of adjustment mechanisms that come into play in the case of a (positive) regional employment shock. First, such a shock may result in a fall in regional

[5] Decressin and Fatás (1995) use the employment rate, which is in fact the mirror image of the unemployment rate, since $\log(N/LF) \approx -(U/LF)$.

[6] Since $\log(N/LF) \approx -(U/LF)$, Equation (5) is equivalent to $u_i = (U_i/LF_i) - \gamma(U/LF)$, where U is unemployment.

unemployment, i.e., an increase in the employment rate. In this case unemployed job searchers fill the newly created jobs as a result of the shock. Second, it may result in a rise in the participation rate, i.e., the newly created jobs are filled by persons previously not in the labor force. Third, such a shock may induce spatial redistribution of labor by means of migration or commuting.

In this section the adjustment mechanisms to an employment shock in the Netherlands are at stake. In many ways the growth rates of employment in the Netherlands of the past years have been more at an 'American' level rather than on par with the rest of Europe. Average annual employment growth in the US was approximately 1.3% over the period 1990–1999. For the Netherlands this was about 1.6%, while the average employment growth in the 15 countries of the European Union was zero during that same period. The similarity between the US and the Netherlands is clearly shown in Fig. 1.

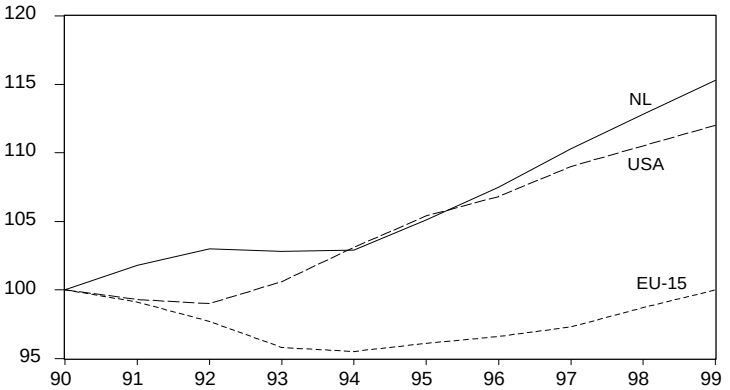

Fig. 1. Employment growth in The Netherlands, US and the EU-15 (1990 = 100). *Source:* CPB (2000, pp. 218–219)

One explanation for these exceptionally high growth rates, in relation to the European Union average, is the policy of sustained wage moderation, which is upheld in the Netherlands over the past 20 years. One possible reason why such a policy could be upheld for so long refers to the restructuring of social security provision beginning at the second half of the 1980s; see Broersma et al. (2000). Is this phenomenon also present when models of regional labor markets are at stake? In other words, do regional labor market models reflect this asserted flexibility of the Dutch labor market in terms of speed and mechanism of adjustment?

To answer this question, we estimate the joint behavior of relative employment growth, the relative employment rate and the relative participation rate for all 18 RBA areas. To the extent that a regional labor demand shock is not reflected in unemployment or participation rates, it must be absorbed by interregional migration (among these 18 areas), or migration from abroad. The following system is specified:

$$\Delta n_{i,t} = \phi_{i,1,0} + \phi_{k,1,1}(L)\Delta n_{i,t-1} + \phi_{k,1,2}(L)e_{i,t-1} + \phi_{k,1,3}(L)p_{i,t-1} + \varepsilon_{i,\rho,t} \quad (7)$$

$$e_{i,t} = \phi_{i,2,0} + \xi_1 \Delta n_{i,t} + \phi_{k,2,1}(L)\Delta n_{i,t-1} + \phi_{k,2,2}(L)e_{i,t-1} + \phi_{k,2,3}(L)p_{i,t-1} + \varepsilon_{i,\sigma,t} \quad (8)$$

$$p_{i,t} = \phi_{i,3,0} + \xi_2 \Delta n_{i,t} + \phi_{k,3,1}(L)\Delta n_{i,t-1} + \phi_{k,3,2}(L)e_{i,t-1} + \phi_{k,3,3}(L)p_{i,t-1} + \varepsilon_{i,\tau,t} \quad (9)$$

where n, e and p are defined in Equations (4)–(6), the lag polynomial $\phi_{k,i,j} = \sum_{k=0}^{1} \phi_{k,i,j} L^k$, and L is the usual lag operator. Note that Δn in system (7)–(9) has an instantaneous effect on both e and p. Hence, current changes in relative employment are assumed to affect unemployment and participation rates but not *vice versa*. We allow for the region-specific fixed effect, reflected by the ϕs. This system is simultaneously estimated with OLS on pooled data on all 18 RBA-areas over the period 1993.2–1999.3. Next, the resulting model[7] is used to conduct an impulse response analysis.[8] The data analysis, including the application of a unit root test, on which specification of (7)–(9) is based, is presented in the Appendix. We follow Blanchard and Katz (1992) in determining the labor demand shocks from which the adjustment paths are studied. We associate unexpected changes in regional relative employment with changes in labor demand. Therefore, it suffices to determine the effect of a shock in relative employment, i.e., the ε-term of Equation (7), in order to understand the dynamic effects of an innovation in labour demand on relative employment, employment rates and participation rates.[9]

Figure 2 shows the impulse responses of employment, employment rates (the mirror image of the unemployment rate) and labor force participation rates to a 1-percentage-point regional specific shock in relative employment for the Netherlands.[10] This figure shows that the initial shock is almost completely absorbed by an increase in the relative regional participation rate. The effect of the shock on the employment rate is very small. Hence, a positive labor demand shock in the Netherlands in the 1990s leads to an increase in participation rather than a fall in

[7] The detailed estimation results of the model are available from the authors upon request.

[8] Note that OLS yields consistent estimates. The first equation contains lagged variables e and p, so these variables can be labelled weakly exogenous. On the other hand, the latter two equations contain contemporaneous variable Δn, which might lead to biases when applying OLS. Seemingly unrelated regression estimation (SURE) to (7)–(9) accounts for the fact that the error terms of the three equations might be correlated. These correlations could be the result of the presence of such contemporaneous variables. However, application of SURE gives almost similar coefficient values, therefore the responses of (7)–(9). The estimation with OLS indeed suffices. Applications of two (or three) stage least squares (2SLS or 3SLS) to system (7)–(9) are probably the most appropriate methods to account for this simultaneity bias. These estimation methods both require adequate instrumental variables for Δn, e and p, which are, however, currently unavailable.

[9] This means that a 1-percentage-point shock in Equation (7) affects $\Delta n_{i,t}$ of Equation (7), but also Equations (8) and (9) through the inclusion of $\Delta n_{i,t}$.

[10] This means a 1-percentage-point regional shock in the $\Delta n-$equation (7) for 1 period in all regions.

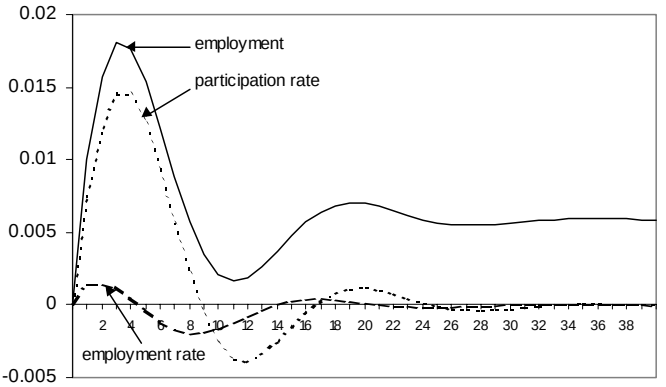

Fig. 2. Impulse responses to a regional labor demand shock in the Netherlands, based on 18 RBA-areas

unemployment. Inter-regional migration becomes an important adjustment channel only after a few years when a large part of the initial shock has already been absorbed.[11] Notice that some 25 periods (quarters), or six years after the shock, the impulse is completely absorbed. The initial shock has invoked a reallocation process, with obsolete jobs being destroyed and new jobs being created, which has eventually resulted in a new relative employment equilibrium lying 0.6%-points above the original level.

The response of the relative participation rate, p_i, closely mimics the pattern of the impulse in n_i for the first eight periods (two years) and diverges afterwards. Hence, participation remains to play a prominent role in the absorption of the shock. In addition, unemployment falls only modestly over the whole period. The difference between the employment response on the one hand, and the participation and unemployment responses on the other, refers to absorption through spatial adjustment, i.e., migration and commuting, and other possible mechanisms. Figure 2 indicates that the role for spatial adjustment as adjustment mechanism is small. Table 2 reviews the responses of an employment shock at the national level. When these results are compared to those of Blanchard and Katz (1992) for the US and Decressin and Fatás (1995) we find that the speed of adjustment of six years is closer to the US figure of six years and shorter than the European figure of about nine years. So in terms of flexibility of the labor market, the Dutch situation more closely resembles the US than Europe.[12] However, as far as the three adjustment channels are concerned, we find that the Netherlands mimics the situation of the European countries, where a labor demand shock is mainly absorbed through adjustments in labor participation.

[11] International labor migration is only a minor adjustment mechanism in the Netherlands, as Sprangers (1995) and Nicolaas and Sprangers (2000) report.

[12] We do acknowledge that our study is based on a more recent sample than the other two studies. Blanchard and Katz's study refers to the 1950-1990 era, while Decressin and Fatás' study is roughly based on the 1970s and 1980s. As far as the European situation is concerned, we do not expect any major changes in terms of labor market institutions. The fact that the European employment performance in the 1990s was virtually flat, as shown in Fig. 1, corroborates this premise.

Table 2. Comparison of the main results of a 1-percentage-point shock in relative employment, both for the nation as a whole, and for groups of regions in four parts of the country

	Netherlands	Regions in the :			
		North	East	West	South
Absorption time (quarters)*	26	17	27	35	28
Final employment effect	0.58%	0.63%	0.83%	1.50%	0.64%
Adjustment in 1^{st} quarter by					
– participation	74%	35%	65%	56%	75%
– unemployment	14%	38%	26%	31%	6%
– spatial adjustment	12%	27%	10%	14%	19%
Cumulative adjustment after 30^{th} quarter by					
– participation	72%	49%	59%	58%	77%
– unemployment	14%	33%	15%	13%	7%
– spatial adjustment	14%	18%	26%	29%	16%

* Absorption completed when less than 1% of the initial shock remains

5 Regional adjustment to region specific demand shocks

In this section we attempt to fully exploit the regional character of our data. The central question here is: are similar adjustment patterns, as shown in Fig. 2, observed for labor demand shocks in all regions within the Netherlands? This implies that we next shift our focus from a nation-wide to a regionally based analysis. Unfortunately, the number of observations does not allow for the estimation of system (7)–(9) for each of the 18 RBA-areas. We need at least four RBA-areas in order to yield a stable system. Therefore, we divided the Netherlands into four parts and allocated the 18 RBA-areas in the Netherlands to these parts. Each part consists of 4 or 5 preferably adjacent RBA-areas with more or less similar regional labor market characteristics. Figure 3 shows the regional demarcation as well as the unemployment rate in the third quarter of 1999, the end of our analysis period.[13]

The high unemployment regions are clearly the ones in the North (RBA 1, 2 and 3) and the regions with the important urban centers in the Netherlands (Amsterdam, Rotterdam, The Hague, and Utrecht), where unemployment is also relatively high, i.e., in RBA 8, 10, 12, and 13. In these parts of the country unemployment is the highest, 9.5% in the North and 8.3% in the West. Despite the relatively high unemployment in the West, this is the economic heart of the Netherlands with the highest participation rate of 68.2%, while the lowest participation is found

[13] Notice that the geographical North of the Netherlands usually comprises Groningen (RBA 1), Fryslân (RBA 2) and Drenthe (RBA 3). However, based solely on these areas we could not obtain a stable system (7)–(9). Therefore, we have augmented the North with Noord-Holland Noord (RBA 9), which is not only geographically located in the vicinity of the other three areas, but also has similar characteristics, such as relatively high unemployment, a rural character, and focus on agriculture and manufacturing. In that sense it fits with the other areas. The subsequent analysis was also conducted with RBA-4 (IJssel-Vecht/Twenthe) attached to these three northern areas instead of RBA-9. The resulting impulse responses were rather similar than the results presented in Table 2.

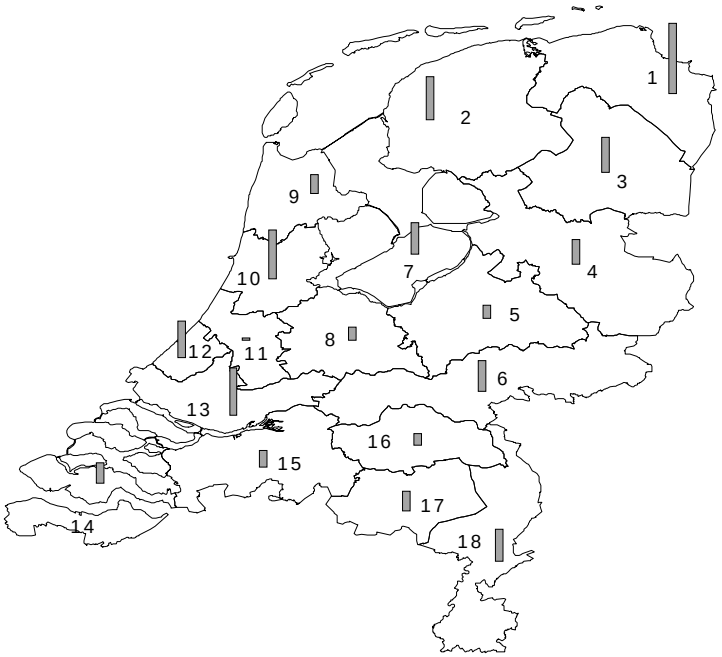

Fig. 3. The 18 RBA-areas in the Netherlands; the bars give the unemployment rate for each region at 1999:3; the national unemployment rate is then equal to 7.9%. *North*: 1. Groningen; 2. Fryslân; 3. Drenthe; 9. Noord-Holland Noord. *East*: 4. Ijssel-Vecht/Twenthe; 5. Ijssel/Veluwe; 6. Arnhem-O.Gld/Nijmegen-Rivierenland; 7. Flevoland. *West*: 8. Midden-Nederland; 10. Zuidelijk Noord-Holland; 11. Rijnstreek; 12. Haaglanden; 13. Rijnmond. *South*: 14. Zeeland; 15. Midden en West-Brabant; 16. Noordoost Brabant; 17. Zuidoost Brabant; 18. Limburg

in the North (64.6%). The other two parts of the country acquire intermediate positions. Unemployment in the East amounts to 7.0%; in the South it is 6.6%, while participation is 66.1% in the East and 65.3% in the South. During the period under study, 1993–1999, the average national unemployment rate decreased from 11.7% to 7.9%, with a peak of 13.5% in 1995. The same pattern occurs more or less in all regions, but especially in the regions with high unemployment, the peak in unemployed occurred somewhat later. During the whole period the highest unemployment rates are found in the regions in the North and in the large cities in the western part of the country. In terms of reduction of unemployment, the RBA-areas 15–17 in the province of Brabant show the largest decrease, followed to a lesser extent by the RBA-regions 4–6 in the middle-eastern part of the country. A detailed overview of the regional differences in labor market performance in the Netherlands during the last decade of the previous century can be found in Atzema and Van Dijk (2000a,b). We may conclude that even in a small country as the Netherlands substantial differences occur between regions, thus justifying a spatially disaggregated analysis.

We run the system (7)–(9) for each of the four parts of the country (North, East, West, and South), where the data for each of the composing RBA-areas are

pooled, thus allowing for fixed region-specific effects. In order to be consistent with the methodology used in the previous section, the variables, n, e and p, have to be computed using β, γ and δ-differences that are now all taken relative to the averages of the specific part of the country in which the RBA-area is located and not relative to the nation-wide situation. Therefore, for each of the four parts of the country we again determine the region-specific variables, constructed as the residuals of Equations (1)–(3) but now relative to the part in which they are located. For convenience sake – and due to the similarity in the procedure with the national analysis in the previous section – we do not report all the elasticity values needed for these β-differences and the estimation results of the system.[14] We proceed with a discussion of the results from the analysis in terms of the speed of adjustment, the final employment effect, and the share of each of the three mechanisms of adjustment to a unit labor demand shock for each of the four parts of the country summarised in Table 2.

5.1 North

Table 2 reveals two eye-catching differences when comparing the adjustment paths, that is, the impact and shares of the absorption channels for the northern part of the Netherlands with the nation-wide situation of column 1 of Table 2. First the speed of adjustment in the North is higher than the national rate. In the North, a regional labor demand shock is completely absorbed after just over four years, when a new employment equilibrium level of a 0.6 %-point above the initial level is reached. This mirrors the result seen in the nation-wide model. The adjustment speed nation-wide was six-and-a-half years. This suggests that the northern labor market is better suited to adjust to shocks and in that sense may be more flexible than the national labor market. Second, the impact of the absorption channels differs with the national picture. Table 2 shows that the initial impact of the shock in terms of adjustment channel is almost evenly spread among participation, unemployment and spatial adjustment. Indeed, the main adjustment is through changing unemployment rates. Initially some 38% of the shock is absorbed by a fall in unemployment, 35% is absorbed by increasing participation, and 27% is absorbed through spatial adjustment. In due course the share of participation increases to almost 50% where the unemployment share is reduced slightly until exactly one third, and the importance of spatial adjustment lowers to slightly below 20%. An obvious explanation for the higher speed of adjustment and the large share of unemployed that accepts a job, is the relatively high quality of the unemployed in the North. Due to the historically high unemployment in the North, there is a large reservoir of unemployed immediately suitable for a job. In other regions the pool of unemployed consists of a much larger part of unemployed who are not immediately suitable for a job, but first need additional occupational or social training.

[14] The detailed estimation results of the model are available from the authors upon request.

5.2 East

The impulse responses of the eastern regions in Table 2 show longer adjustment paths than those of the North. The shock has died out completely after about 27 periods, or seven years. The new equilibrium level is fairly high with some 0.8 %-point above the original level. We see from Table 2 that participation is the major adjustment channel to the shock in the East, both immediately after the shock, as well as during the rest of the time. In addition, we can also see that, in due course, the role of spatial adjustment as a means to absorb the remnants of the shock becomes increasingly important. Four years after the shock the spatial adjustment is practically twice as important as unemployment as an absorptive channel. Hence the impact of spatial adjustment grows as time passes. In the first period, about 10% of the adjustment process occurs through spatial adjustment. The cumulative effect of commuting and migration after 30 periods is 26%. The role of unemployed in the absorption process goes down over time. Nevertheless, changing participation rates are still the primary way in which the labor demand shock is absorbed.

5.3 West

This part of the Netherlands can be characterized as the economic heart of the Netherlands where about 40% of total Dutch employment is located. Furthermore, most headquarters and the offices of the central government are located here. The adjustment speed of the western part of the country to a labor demand shock, which can be obtained from Table 2, is relatively slow compared to the North and East. Here it takes some 35 periods (almost nine years) before the effects of the shock have completely disappeared. Another striking outcome of the impulse responses for the West is the relatively high new employment equilibrium level of 1.5 %-point above the original level. Notice that a labor demand shock will always lead to some level of reallocation of jobs: new jobs are being created, (some) obsolete jobs are destroyed. This reallocation process has for the other parts of the country resulted in a new equilibrium employment level below the initial value of the shock of a 1% change in employment. In the West, this reallocation process initiated by the labor demand shock there, has generated an even larger amount of additional jobs (1.5%) than implied by the initial shock of 1%. This means that jobs created in the West generate additional jobs as well, rather than only destroying obsolete jobs as part of this reallocation process. It becomes clear that also in the West a change in participation is the main adjustment channel through which the shock is absorbed. Initially, there is also a substantial share of unemployment as means of adjustment, but in due course we find that the share of spatial adjustment becomes more and more important, at the expense of unemployment. The share of participation remains almost constant at roughly 55%.

5.4 South

Finally, Table 2 reports the adjustment paths and patterns for the southern RBA-areas. The effects of the shock have died out after about seven years (28 periods).

After that time a new employment equilibrium is reached, which lies some 0.6 %-point above the original level. This outcome is in line with the nation-wide analysis and the results for the North. Also for the South the main adjustment channel to a labor demand shock is through changing participation rates. Table 2 shows virtually no change in the absorption channel as time passes. In the South spatial adjustment acts from the beginning as the second important adjustment mechanism, both immediately after the shock and in the longer run. Most striking is the very low share of unemployment as an adjustment mechanism in the South. A possible explanation is that all the unemployed with relatively favorable labor market characteristics have found jobs, and that the remaining unemployed have a rather large distance to the labor market. They need substantial occupational and/or social training before they are qualified to accept a job, if it is available.

In summary, this impulse response analysis shows:

1. Adjustment of the Dutch labor market to employment shocks is quicker than the European average and more in line with the speed of adjustment in the US. Within the Netherlands we find the northern labor market adjusts more rapidly than other parts of the country. Perhaps a more flexible labor market exists in the North than elsewhere in the Netherlands.
2. A labor demand shock yields a new positive equilibrium value for the relative employment, i.e., this shock has a permanent (positive) effect on the regional employment level. This new equilibrium is by far the highest in the West and lowest in the North and South.
3. In the East, West and South, a positive labor demand shock is about two-thirds absorbed through a rise in participation rates. Unemployment and spatial adjustment are of secondary interest. Of these secondary effects, in the East and West unemployment stands out, while in the South this is spatial adjustment. Over time the share of unemployment decreases considerably in the East and West, and this is taken over by a higher share of spatial adjustment. In the South there are hardly any changes over time.
4. Besides the high speed of adjustment, the North also reveals another scenario with regard to the shares of the various mechanisms in the adjustment process. In the North absorption runs initially through all three channels in an almost equal share. In due course the impact of spatial adjustment and unemployment slightly diminishes, thus favoring the role of participation. An obvious explanation for the higher speed of adjustment and the large share of unemployed that take jobs is the relatively high quality of the unemployed in the North. In other regions unemployment is relatively low and, hence, the pool of unemployed consists largely of unemployed who are not immediately job qualified, but who first require additional occupational or social training.

6 Corroboration of the results

Using a relatively simple labor market model to study the effects of regional labor demand shocks for the Netherlands, we have found a relatively high speed of adjustment to these shocks. In fact, this adjustment speed is more aligned with

'American' levels than with 'European'. This implies that the Dutch labor market operates in a more flexible way than the European average. Until about a decade ago, the Netherlands was still characterized by its slow adjustment and inflexibility ('the Dutch Disease'). One explanation for this increase in flexibility compared to the European perspective stresses the importance of structural reforms in welfare state provisions within the Netherlands since the latter part of the 1980s. See for more information Broersma et al. (2000). Furthermore, impulses in labor demand are largely met by workers moving in and out of the labor force as a reaction to that shock. It is a well-known phenomenon that, in the 1980s and early 1990s, redundant workers moved out of the labor force rather than become unemployed. In addition, the recent increase in Dutch employment was not accompanied by an equal fall in unemployment, thus implying that a substantial part of the new jobs are filled by former non-participants entering the labor force.[15]

There are a number of reasons for these phenomena. First, the early retirement and disability schemes enabled employers to get rid of redundant personnel. These people were willing to enter into these arrangements, because the benefits were higher and longer lasting than unemployment benefits (Hassink et al. 1997). Second, a large part of these non-participants moving into employment consist of school-leavers who are more interesting to employers than are the unemployed, because they are (assumed to be) more motivated, more productive and cheaper. The same can be said for another group of non-participants that has become more important to employment growth in the Netherlands: women who participate for the first time, or who enter the job market after a period of interruption to care for their children.

When we consider the results of the four geographical parts in which we subdivided the Netherlands based on the 18 RBA-areas, the adjustment paths of the North stand out. Therefore, we will now focus on the plausibility of the results for the North in greater detail. Labor market adjustment to a region specific labor demand shock runs in the North initially through unemployment, participation and spatial adjustment in an almost equal way. In due course, the role of participation becomes more important. In the other three parts of the country, adjustment runs mainly through changes in participation, both initially and in the longer run. For these three parts of the country the role of spatial adjustment as absorptive channel to the shock becomes more important as time passes. In a flexible labor market, persons lose their jobs earlier than in the case of inflexible labor markets, but they also find a new job sooner. We found that persons losing their jobs in the North become unemployed more frequently than elsewhere, or move more often to other regions to obtain work. Following the same reasoning, once jobs are created in the North, there is substantial inflow of unemployed workers to those jobs, but also an inflow of workers from other regions. We will therefore consider in this section the flows of persons moving into and out of unemployment, and the flows of persons moving into and out of the northern district (as migrants). We do so in order to answer the question: is the reallocation rate of these groups relatively high in the North compared to the rest of the country?

[15] Only the employment increase of the last couple of years corresponds with a dramatic fall in unemployment figures. Unfortunately, our data do not allow for a similar analysis on a shorter sample period than the one in this analysis.

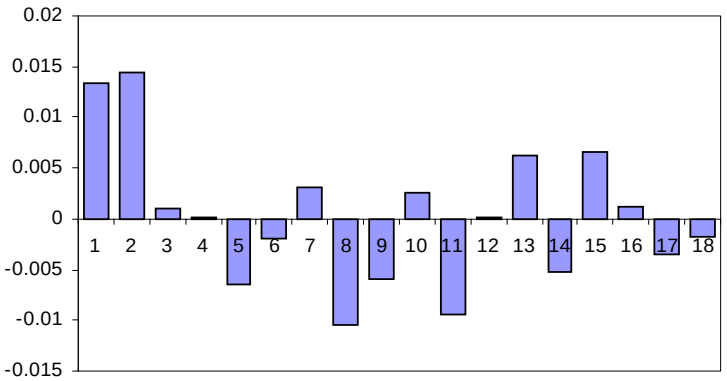

Fig. 4. Regional unemployment turbulence (sum of unemployment inflow plus outflow as % of labor force) in 18 Dutch RBA-areas minus the national reallocation rate, averages 1993–1999

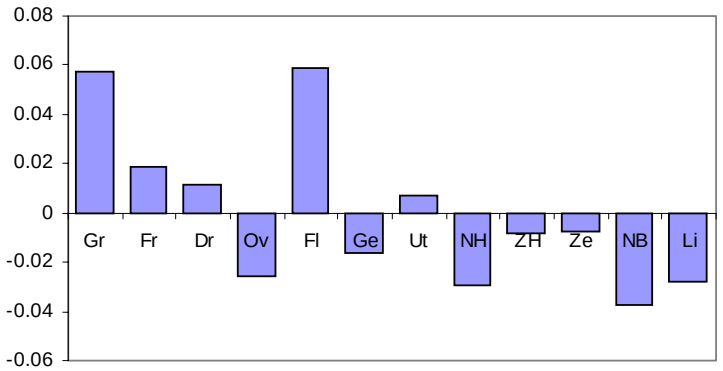

Fig. 5. Regional migration reallocation rate (sum of migration inflow and outflow as % of labor force) in 12 Dutch provinces minus the national reallocation rate, 1993–1999

Figure 4 shows the average reallocation of persons moving into and out of unemployment as a percentage of the labor force for each of the 18 RBA-areas, relative to the nation-wide reallocation rate between 1993 and 1999. Indeed, two of the northern RBA-areas, Groningen and Fryslân, have by far the highest reallocation rate of 1.5 percentage points above the national level. Figure 5 shows the reallocation of persons moving into and out of each of the 12 Dutch provinces as a percentage of the labor force, relative to the nation-wide percentage between 1993–1998.[16] Apart from the province of Flevoland, which is known for its high in-migration rates because it consists of newly reclaimed land from the sea, the reallocation rate of migration flows in the three northern provinces is clearly above the nation-wide average.[17] These two figures corroborate the fact that both unemployment and

[16] Unfortunately, we have no migration figures for the 18 RBA-areas, but provinces do give a rough indication of the size of migration reallocation in the four parts of the country we distinguish. The three northern provinces Fryslân, Groningen and Drenthe are identical to the three RBA-areas in the North.

[17] Obviously not all migration is linked to job opportunities, but this is true for all provinces, so the rank order of the size of the migrant reallocation will remain the same. The very high rate for the

migration are important as a means of adjusting to shocks in the North. There is substantially more unemployment reallocation and migration in- and outflow in at least two of the four RBA areas in the northern part of the country than anywhere else.

7 Conclusion

This article has analyzed regional labor market dynamics in the Netherlands over the past 10 years. We find that the speed of adjustment to a labor demand shock in the Netherlands is high compared to other European countries and more in line with the US labor market. On the other hand, a shock in regional labor demand in the Netherlands is primarily absorbed by changing participation rates as in most other European countries; whereas in the US, migration is the most important adjustment mechanism. The effect on unemployment or spatial adjustment as ways to absorb a shock is only of minor importance. This corroborates the general European labor market situation. In other words, the Dutch labor market shows 'American' levels of flexibility, but 'European' ways of adjustment. This flexibility may explain the employment upsurge in the Netherlands, which reached 'American' employment growth rates in the 1990s.

A spatial disaggregated analysis shows remarkable differences between regions within the Netherlands. In particular, the response of the regions in the northern part of the country stands out. First, adjustment to a shock is absorbed much faster than in other Dutch regions. Second, the shock is absorbed more through changes in unemployment than through changes in participation. Spatial mobility plays in the North an especially prominent role during the initial phase of the adjustment process compared to other parts of the country. Whereas in the latter, the importance of spatial adjustment increases over time, but it decreases for the North. The different effects in the North can be explained by the characteristics of the labor market and the unemployed in this part of the country. The North is known for its adverse labor market performance in terms of high unemployment and low participation rates. Obviously, the availability of these relatively large reservoirs of (potential) job searchers means that, in the North, a labor demand shock is absorbed relatively easily through unemployment. The fact that spatial adjustment also plays a relatively large role means that workers are not unwilling to move to the North to fill a job, or move from the North to other regions when opportunities are better, or that commuting flows are important here as well.

8 Appendix data characteristics

The suitability of the data used in this article for our particular type of analysis of regional labor market dynamics is discussed below. The data are seasonally

province of Groningen is partly caused by the in- and outflow of students to the university located near to the border of this small province.

adjusted quarterly time series from 1993.2 through 1999.3 on employment, unemployment and population of 15 and 64 years of age for 18 so-called RBA-areas in the Netherlands.

First, the time span is relatively short, in essence the second part of the 1990s, compared to similar studies of Blanchard and Katz (1992) and Decressin and Fatás (1995). These studies are based on annual data sets covering a period of 12 years (1978–1990 and 1975–1987, respectively) on some 50 different regions. Our analysis is based on 29 observations over time for 18 different regions. The data of Blanchard and Katz and of Decressin and Fatás includes an economic upswing following the 1975 recession (1977–1979), a period of deep recession (1981–1982), and the subsequent "mild" boom (1984–1986). There is a full cycle. Our data set essentially covers only half a cycle from the recession of 1993–1994, to the strong boom of 1997–1999. In other words, it covers only an economic upswing period. Our analysis therefore shows the effects of an employment shock in a booming period. The studies of Blanchard and Katz and Decressin and Fatás basically average the possible different responses in recession and boom. This may hide some of the effects that occur because Pekkala and Kangasharu (2000) show that the response of the labor market may be quite different in a period of economic growth compared to a recession period. The fact that our analysis therefore only refers to an upswing period is an advantage, because our results will also uncover effects that are opposite in booming and recession periods, and will be faded out when data of booming and recession periods are combined. Of course, it would be interesting to compare our results with results for a recession period, but this data are currently not available for the Netherlands.

Second, we de-seasonalized our quarterly data with a simple multiplicative moving average adjustment method. We are well aware that this may lead to spurious results, since elimination of the seasonal pattern may induce the emergence of new spurious patterns (Ghysels 1994; Franses and Vogelsang 1998). There are a number of reasons for using seasonally adjusted data. First, since we have no reason to assume some seasonal model specification, we would assume a deterministic seasonal pattern resulting in the inclusion of a series of seasonal dummies. This would expand the number of model variables and reduce the degrees of freedom and does not necessarily result in a better model and/or other results. Second, some variables are interpolated annual data, and the imposition of a seasonal pattern in the time series is not a good idea since this indeed means incorporating spurious patterns. Hence application of de-seasonalized data is the best option.

Finally, a simple unit root test is conducted in order to assess whether or not the variables in our system of Equations (7)-(9) are indeed stationary. The results of the unit root test of Dickey and Fuller (1979), using 4 lagged dependent variables to eliminate possible residual auto-correlation, are presented in Table A. This test boils down to estimating:

$$\Delta y_t = \theta_0 + \theta_1 y_{t-1} + \sum_{j=1}^{4} \Delta y_{t-j} \tag{A.1}$$

Table A1. Augmented Dickey-Fuller (ADF) unit root test, including coefficient values, for variables of system (7)–(9)

	$n_i = \Delta\log N_i - \beta_i \Delta\log N$		$e_i = (U_i/LF_i) - \gamma(U/LF)$		$p_i = (LF_i/B_i) - \delta(LF/B)$	
RBA-area	Coefficient	t-value (DF)	Coefficient	t-value (DF)	Coefficient	t-value (DF)
1	−0.12	−1.98	−0.22	−1.34	−0.07	−0.41
2	−0.03	−0.33	−1.19	−3.91**	−0.65	−2.97*
3	−0.07	−2.06	−1.39	−4.51**	−0.38	−2.62*
4	−0.02	−1.19	−0.34	−2.12	−0.17	−2.60
5	−0.04	−1.76	−0.19	−2.20	−0.13	−2.51
6	−0.23	−3.02**	−0.20	−1.70	−0.30	−1.84
7	−0.00	−0.21	−0.09	−1.39	−0.12	−1.52
8	−0.01	−0.69	−0.19	−1.41	−0.26	−1.68
9	−0.16	−2.77*	−0.42	−2.62*	−0.17	−2.03
10	0.01	0.72	−0.35	−3.01**	−0.46	−2.54
11	−0.10	−2.25	−0.45	−2.27	−0.27	−1.54
12	−0.02	−1.20	−0.51	−2.91*	−0.10	−1.17
13	−0.02	−1.54	−0.11	−1.28	−0.20	−1.31
14	−0.05	−1.72	−0.40	−2.23	−0.21	−2.92*
15	−0.02	−1.13	−0.11	−1.56	−0.13	−1.99
16	−0.12	−1.99	−0.41	−2.07	−0.30	−3.07**
17	−0.10	−2.46	−0.11	−2.00	−0.09	−1.85
18	−0.06	−2.36	−0.36	−2.11	−0.17	−1.35

*** Unit root rejected at 1% significance
** Unit root rejected at 5% significance
* Unit root rejected at 10% significance

These results include both the coefficient θ_1 and its t-value. In fact this t-value is the augmented Dickey-Fuller (ADF) unit root test, which follows a non-standard distribution in case of a unit root for which critical values are available from Monte Carlo simulations. The coefficient value is presented because its size provides additional information on the deviation from unity of the series y_t. This can easily be seen when (A.1) is rewritten as:

$$y_t - (1 + \theta_1) y_{t-1} = \theta_0 + \sum_{j=1}^{4} \Delta y_{t-j} \tag{A.2}$$

The more negative θ_1 is, the more likely that y_t does not contain a unit root. Notice that this information is not based on the significance of the associated t-value of θ_1 (i.e., on the ADF-test), but merely on the size of the coefficient, and on the fact that unit roots are known to have low size ands power properties in case of near-unit roots and small samples (see, e.g., Schwert 1989 and Cochrane 1991). Hence this value of coefficient merely provides additional information on the stationarity of the time series. See also Blanchard and Katz and Decressin and Fatás, who (without explanation) do the same thing.

When a significance level of 10% is considered, we find for the regional (β)-difference of employment growth that a unit root is rejected only twice. For the regional (γ- and δ-)differences of the (un-)employment rate and the participation rate equations, a unit root is rejected in five and four regions, respectively. However, note that the coefficient values of the latter two equations are much larger in absolute value than the coefficient values of the regional employment growth equation. The average coefficient value for this equation is some –0.06, against –0.4 and –0.2 for the regional (un-)employment rate and participation rate equations. The coefficient values for the latter two series thus imply that the presence of a unit root is rejected and so these series are considered to be stationary, while the coefficient values for the regional employment growth equation indicate that the presence of a unit root is not rejected. On the basis of the foregoing we may conclude that the characteristics of our data allow for our type of analysis.

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