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6 Regional Employment Disparities in Belgium: Some Empirical Results

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6.1 Introduction

Employment and unemployment are unequally distributed over space and Belgium is no exception to the rule, its regions recording strongly contrasting performances. The Flemish region displays high levels of participation rate in the labour market and low rates of unemployment. By contrast, Wallonia and Brussels are characterized by poor results for both employment and unemployment. Moreover, the interregional divergence in the performance of the labour market shows no significant tendency to decrease. See Appendix 1 for a breakdown of Belgian spatial administrative divisions.

Over the period extending from 1973 and 2001, Flanders recorded an increase of 33 percent in the number of employees, while Brussels experienced a decline of 1 percent and Wallonia had a slow increase of 6 percent. This employment pattern feeds the political debate in Belgium, putting a strain on the national consensus between the Flemish-speaking Northern region and the French-speaking Walloon region. Within the regions, a similar performance disparity is observable between districts.¹ For example, Bastogne and Charleroi are districts of the same region, Wallonia. Between 1997 and 2001, the number of jobs in Bastogne increased by 98 percent, while Charleroi lost 19 percent of its labour force. Figure 6.1 illustrates, for the different districts, the regional and inter-regional employment disparities in employment rates in 2001.²

To explain the interregional discrepancy, it has long been argued that poor employment results recorded in Wallonia relative to Flanders are primarily ascribable to an initially adverse industrial mix. However, recent work has questioned this hypothesis, stressing instead the mediocre sectoral growth performance in Wallonia (see Estevão 2003). This chapter sets new light on this issue, notably by using a highly disaggregated employment series. More precisely, we intend to examine regional employment disparities in Belgium and their evolution in the recent past by developing a shift-share analysis and an econometric approach and applying this to employment statistics.

¹ We are referring to the territorial entities between regions and municipalities, which in Belgium are called *arrondissements*. There are 43 Belgian districts (see Appendix 1).

² The employment rate is defined for each district as the ratio of the number of employed and self-employed workers to the total population.

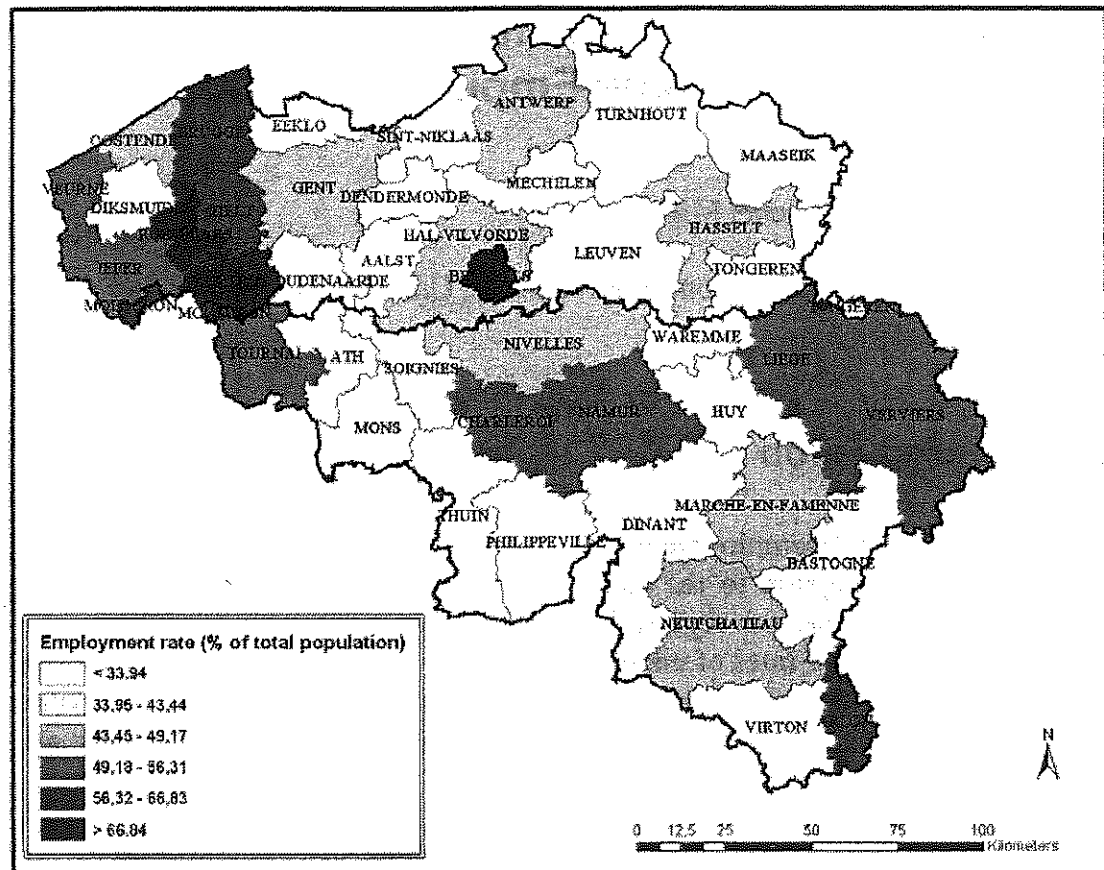


Fig. 6.1. Regional and inter-regional disparities in Belgium: employment rate at the district level in 2001 (employed and self-employed workers as a percent of the total district population)

The layout of the chapter is as follows. The traditional shift-share identity is explained in Section 6.2, while Section 6.3 provides a short overview of the first empirical findings. To overcome some shortcomings of the traditional analysis, Section 6.4 and 6.5 turn to more advanced approaches. They deal respectively with the dynamic shift-share technique and the econometric model developed by Marimon and Zilibotti (1998). In both sections, we briefly outline the method before giving the main results. Section 6.6 briefly concludes.

6.2 The Traditional Shift-Share Method

The shift-share approach sets out to analyse the extent to which the difference in employment growth between each region and the national average is due to the regional industrial structure, or to a residual element that can be interpreted as indicating the locational (dis)advantages of each regional economy.³ First, the

³ The origin of the shift-share technique goes back to the seminal works of Perloff et al. (1960). This method has been extensively used as well as imaginatively applied in the field of regional economics.

growth disparity of regional employment can be attributed to the regional productive structure. The underlying intuition is that regional employment is growing if the region specializes in fast-growing industries and under-specializes in low-growth industries. Conversely, an over-representation of declining industries and an under-representation of high-growth industries in a region explain the relative decay of regional employment. This component is called the structural effect or the industry mix effect.

The second explanation considers all other factors that are not related to the economic structure. Regional employment disparity is then ascribable not to the structure of employment, but rather to an inadequacy of job creation or to an excess of job destruction in some regions. In other words, a high unemployment rate reveals that the performance of the region's industries in generating jobs is weaker than their performance at the national level. This second component is called either the regional share, or the residual or performance effect. The terminology is of little importance if it is understood that the residual component incorporates all factors not related to the activity structure. Some of these are region-specific factors, such as a lack of entrepreneurship on behalf of private agents, the inefficiency of public policies as regards unemployment and mis-allocation of public expenditures. Others are exogenous factors, such as shocks affecting all European economies, or the ability of the region to attract labour-intensive multinational companies.

The traditional shift-share model is defined as follows (see Equation 6.1).⁴ It splits into two component parts the growth rate differential of employment in a particular region and in a benchmark entity, usually the whole country.⁵ Both effects may be observed simultaneously:

$$g_r - g_n = \sum_{i=1}^I w_{in} (g_{ir} - g_{in}) + \sum_{i=1}^I g_{in} (w_{ir} - w_{in}) \quad (6.1)$$

$$i=1, \dots, I$$

where:

- g_{ir} and g_{in} denote the rate of employment change in industry i , at the regional and national level, respectively;

$$g_r = \frac{\sum_i E_{ir}^{t+1} - \sum_i E_{ir}^t}{\sum_i E_{ir}^t} \quad g_n = \frac{\sum_i E_{in}^{t+1} - \sum_i E_{in}^t}{\sum_i E_{in}^t}$$

⁴ This formulation, sometimes called 'two-factor' shift-share analysis, was initially developed by Beaud (1966) and is now commonly adopted in a growing number of applications. See for instance Guesnier (1998), Fernández and Menéndez (2002) or Estevão (2003).

⁵ The conventional shift-share expression commonly distinguishes between three components: the national share, the industrial mix (or proportional shift), and the regional share (or differential mix). Its formulation is appropriate for examining employment change in a particular region but the two-factor shift-share approach seems more suitable when one region is compared to another (see Dormard 1999).

- E_{ir}^t and E_{in}^t stand for sector i 's employment at the beginning of a time interval extending from t to $(t+1)$, in the region and at national level, respectively;⁶
- i represents the industry; and
- w_{ir} and w_{in} denote industry i 's employment share in the region and the nation, respectively.

$$w_{ir} = E_{ir}^t / \sum_i E_{ir}^t$$

$$w_{in} = E_{in}^t / \sum_i E_{in}^t$$

The second term on the right-hand side of Equation 6.1 measures the structural effect. It expresses the difference of regional employment growth that would have been observed if each regional industry had recorded its respective national employment growth rate. Regional disparities are thus only ascribable to the initial regional specialization in growing or declining industries. Accordingly, a positive (negative) result is indicative of a favourable (unfavourable) regional industry mix. The origin of a positive structural effect is twofold: either the region benefits initially from an activity portfolio consisting mostly of activities that have recorded a positive national employment growth or the opposite occurs and the region is characterized by a portfolio including the relatively few industries that have suffered from severe jobs losses at the national level.

The first term on the right hand-side of the equation (Equation 6.1) is the residual or regional effect. It compares the regional employment growth rate in each industry with its respective growth rate at the national level. A negative residual effect is therefore indicative of a region-specific lack of growth performance.

Shift-share analysis provides an identity that attributes the difference between aggregate regional and national employment growth rates to an industrial structure effect and a residual effect. The model does not allow for isolating the determinants of the residual effect. It does not explain why an industry performed better in a region or why, on the contrary, it was more affected by exogenous shocks.

Shift-share analysis is just a descriptive tool whose main purpose is to explain past regional growth in terms of structural shift. Consequently, as Stilwell (1970) underlines, it is risky to implement economic policies exclusively grounded on shift-share results - that is, on a description of the past growth of employment.⁷

Most of the criticisms directed towards shift-share analysis seem to have arisen from an inadequate utilization of the model. However, even the simple use of the technique as a descriptive tool must be discussed.

First, the quality of shift-share results depends greatly on the activities' homogeneity in the sectoral breakdown. If an industry includes a fast-growing sector and a sector recording a zero growth, the aggregation of the two branches will give moderate sectoral growth. Now, if one region is specialized in the first sector and another in the second, the regional shift will capture some structural

⁶ Alternatively n stands, in a more general way, for any other reference region.

⁷ See also Stevens and Moore (1980).

effects. Accordingly, the more thorough the sectoral decomposition, the more significant are the chances of correctly identifying the structural effects.⁸

However, a detailed sectoral and geographical breakdown, if it is desirable, leads to a computational difficulty related to infinite growth rates. This situation arises when a company locates in a region where its industrial sector was absent at the beginning of the period. Economic literature proposes several methods to meet this issue. These include the aggregation of sectors (so that the industry's initial employment is no longer equal to zero), the replacement of every zero by one, or the replacement of all infinite growth rates by zero (De Brabander 1975).

6.3 Regional Employment Disparities in Belgium: Initial Results

We used employment data published by the National Social Security Organization (ONSS) between 1995 and 2001.⁹ Sectoral data for regional employment are provided for a highly detailed breakdown based on the general classification of economic activities, NACE-BEL, to five digits. As mentioned above, the use of very disaggregated sectoral statistics increases the accuracy of the shift-share analysis. The choice of the correct regional breakdown is equally significant. In particular, if geographic areas are too narrow, takeovers of companies and industrial mergers, as well as any corrections made to the industry classification, are likely to confuse the interpretation of our results. Accordingly, we have decided to use data published at the regional NUTS 3 level, which in Belgium correspond to the district level.¹⁰

However, the major difficulty in studying large series of data is to interpret the results. The shift and share effects that are observed stem from the different performances of employment in a great number of activities, each of them hardly affecting the final results. In addition, the role of shift-share analysis is precisely to provide the keys for the interpretation of aggregate statistics reflecting the evolution of employment. It is not relevant to undertake a shift-share study for observing, for example, the peculiar employment evolution at the industry level.¹¹

The introduction of the new nomenclature of economic activities, NACE-BEL, in 1993, prevents us from comparing the employment statistics for a detailed sectoral breakdown before and after the classification change. Moreover, the ONSS made many corrections to its industry classifications during 1993 and 1994.

⁸ The issue of interaction between industries is linked to this first limitation. For example, a firm producing windscreens may have been classified into the glass industry, although it is probably highly dependent on the growth of the car industry (see Buck 1970).

⁹ We consider data on employees for both the private and public sectors. We do not use data on civil servants within Public Administration (NACE 75 code) and Education (NACE 80 code), nor on self-employed workers. The reader may find results concerning self-employed workers in Meunier and Mignolet (2003).

¹⁰ NUTS stands for Nomenclature of Territorial Units for Statistics.

¹¹ We have replaced all infinite employment growth rates by zero. See Section 6.1.

These corrections are likely to introduce a bias into the results of the shift-share analyses. Therefore, we have decided to restrict the investigation to the period extending from 1995 to 2001, which offers the most homogeneous series of data.

Table 6.1 shows the results of the traditional shift-share analysis undertaken on employment in the Belgian regions between 1995 and 2001. The benchmark entity is the country as a whole.

Table 6.1. Shift-share components, Belgian regions employment, 1995-2001 (national benchmark) percent

Regions	Residual share	Industry mix	Total shift
Flemish region	2.019	-0.401	1.618
Walloon region	0.424	-1.044	-0.620
Brussels	-8.220	2.921	-5.299

Over the period 1995-2001, employment in Flanders recorded a stronger progression than in the whole country. The positive growth difference between Flanders and the Kingdom amounts to 1.6 percent. This deviation is explained by a strong regional shift (2 percent) that outdoes the unfavourable effects of the productive structure in the north of the country (-0.4 percent).

By contrast, the Walloon region displays a weaker growth rate of employment than the national average. The total growth difference over the period is -0.6 percent. This result is explained by an unfavourable structural effect (-1 percent) that dominates a positive residual effect (0.4 percent). Finally, if Brussels benefits from the favourable composition of its activity portfolio (2.9 percent), it experiences a very significant deficit of performance (-8.2 percent). This lack of "regional dynamism", i.e. the residual effect of the firms located in Brussels, explains the negative growth differential of employment (-5.3 percent) in the capital as compared with the Kingdom.

The observations on a regional scale are the result of the employment performances recorded by the districts that make up the regions. Table 6.2 provides the results of the shift-share analysis on the Belgian districts between 1995 and 2001.

The Flemish region recorded faster employment growth than the country as a whole. This difference is not explained by a favourable activities portfolio, but rather by a strong positive regional effect. However, at the district level, one observes that the growth differentials of employment between Flanders and the country are negative in 17 districts out of 22. For these districts, the structural effect dominates even the residual effect in nine cases out of 17. Thus, the strong performance of Flanders as a whole is due to five districts out of 22 - in particular, to Hal-Vilvoorde, which is located close to Brussels. For these districts, both structural and residual effects are positive, except for Maaseik that records an unfavourable industry mix.

Table 6.2. Shift-share components, Belgian districts employment, 1995-2001 (national benchmark) percent

Districts	Residual share	Industry mix	Total shift
<i>Flanders</i>			
Eeklo	-13.450	-1.999	-15.449
Aalst	-3.001	-6.705	-9.706
Oostende	-5.685	-2.917	-8.602
Oudenaarde	-2.638	-5.531	-8.169
Diksmuide	-4.304	-2.909	-7.213
Kortrijk	-5.929	-0.946	-6.875
Dendermonde	0.395	-6.139	-5.745
Roeselars	-1.800	-3.543	-5.343
Veurne	-6.951	2.785	-4.166
Brugge	2.115	-5.806	-3.691
Antwerpen	-0.352	-3.289	-3.641
Ieper	-2.433	0.102	-2.330
Mechelen	-2.349	0.282	-2.066
Hasselt	0.695	-1.723	-1.028
Tielt	0.922	-1.678	-0.756
Gent	-1.744	1.322	-0.422
Tongeren	2.388	-2.727	-0.339
Leuven	0.990	2.379	3.370
Sint-niklaas	3.006	0.717	3.723
Maaseik	5.760	-1.062	4.698
Turnhout	4.923	1.030	5.952
Hal-Vilvoorde	3.124	11.012	14.137
<i>Wallonia</i>			
Virton	-18.726	-10.044	-28.769
Mons	-9.141	-2.645	-11.786
Ath	-7.255	-1.564	-8.818
Arlon	-1.766	-6.794	-8.560
Bastogne	-2.158	-5.627	-7.784
Soignies	-7.713	0.029	-7.684
Charleroi	-5.047	-1.047	-6.094
Thuin	0.023	-5.111	-5.087
Dinant	-6.317	1.576	-4.741
Huy	-5.270	0.723	-4.547
Marche-en-Famenne	-0.369	-3.135	-3.505
Tournai	-1.436	-1.931	-3.367
Waremme	-5.688	2.566	-3.122
Verviers	-0.126	-2.861	-2.987
Liege	-2.765	-0.124	-2.890
Philippeville	-2.684	1.439	-1.246
Neufchateau	2.814	-2.120	0.694
Namur	2.236	-0.859	1.377
Nivelles	0.231	3.235	3.466
Mouscron	13.118	-7.067	6.051

The results are ranked in ascending order.

Within Wallonia, the only district recording positive results for both shift and share effects is Nivelles, located close to Brussels. Namur, Neufchâteau and Mouscron are also characterized by higher growth rates of employment than the national average. For these districts, the growth differential is explained by a positive residual effect (2.2 percent for Namur, 2.8 percent for Neufchâteau and 13.1 percent for Mouscron) associated with a negative structural effect (-0.8 percent for Namur, -2.1 percent for Neufchâteau and -7 percent for Mouscron).

Employment in the other Walloon districts experiences a lower growth rate than that of the Kingdom. This differential seems primarily ascribable to a lack of performance. In ten out of the remaining sixteen districts, the regional effect (when compared with the structural effect) appears to exert a dominant influence in terms of explaining the growth differentials. For Soignies, Dinant, Huy, Waremme and Philippeville, the lack of performance cancels out even the benefit of a relatively favourable activity structure. The effect of the productive structure dominates the districts of Arlon, Bastogne, Thuin, Verviers, Tournai and Marche-en-Famenne. For the district of Thuin, the residual effect is positive.

These results illustrate for the first time the disparate district performances in terms of employment, and the dispersed contributions of the industry mix and the residual effects. Are these results due to the method and its simplicity? The economic literature stresses that traditional shift-share analysis has indeed an obvious shortcoming. It allows only a study of a time interval between two dates. It is well known that the composition of economic activity may be modified over time. Accordingly, Barff and Knight (1988) developed a dynamic shift-share analysis, which re-actualises the structure of activity at each period. The dynamic shift-share approach then amounts to adding up the results obtained by applying the traditional expression to annual data.

6.4 The Dynamic Shift-Share Model

Dynamic shift-share analysis has three major advantages: first, it is independent of the reference period (often the initial period, or, as proposed by Stilwell (1970), the last year). Second, it takes into account the compound effects, i.e. the automatic change of regional disparities at each period when the structure is not actualised. Finally, the dynamic shift-share model makes it possible to visualize easily, with a simple graph, the evolution of both components over time. The dynamic shift-share analysis that is defined as the yearly computation of both structural and regional effects, can accordingly be formulated as follows (see Equation 6.2):

$$\sum_{t=1}^{T-1} \sum_{i=1}^I \left(\frac{E_{ir}^{t+1}}{E_{ir}^t} - \frac{E_{in}^{t+1}}{E_{in}^t} \right) \frac{E_{ir}^t}{\sum_i E_{ir}^t} + \sum_{t=1}^{T-1} \sum_{i=1}^I \left(\frac{E_{ir}^t}{\sum_i E_r^t} - \frac{E_{in}^t}{\sum_i E_{in}^t} \right) \frac{E_{in}^{t+1}}{E_{in}^t} \quad (6.2)$$

$$t = 1, \dots, T$$

Table 6.3 reports the results of the dynamic shift-share analysis on employment by districts compared with the Kingdom between 1995 and 2001.

The results of the dynamic shift-share analysis broadly confirm the conclusions of the traditional analysis. The ranking of the districts remains basically unchanged. The residual effect of the Walloon districts is still a dominant cause of the growth differentials (in 14 districts out of 20), whereas in the Flemish region, the structural effect is dominant in ten districts out of 22. Table 6.3 shows that employment increases more in Flanders and less in the Walloon region and in Brussels compared with the whole country. The growth rates of employment attributable to the districts and regions are somewhat different from those shown in Tables 6.1 and 6.2. This is due to the dynamic process implemented by Barff and Knight. The sum of yearly components no longer equals the total employment growth differential. Accordingly, the dynamic approach breaks slightly with the traditional shift-share identity.

A remarkable difference in comparison with the results of the traditional shift-share approach should be highlighted. The residual effect appears to be negative for the Walloon region. The differential of growth rates between Wallonia and Belgium results from two negative effects: industry mix and regional shift.

Figures 6.2 to 6.4 display the annual evolution of shift and share effects from 1995 to 2001 for Flanders, Wallonia and Brussels, respectively.

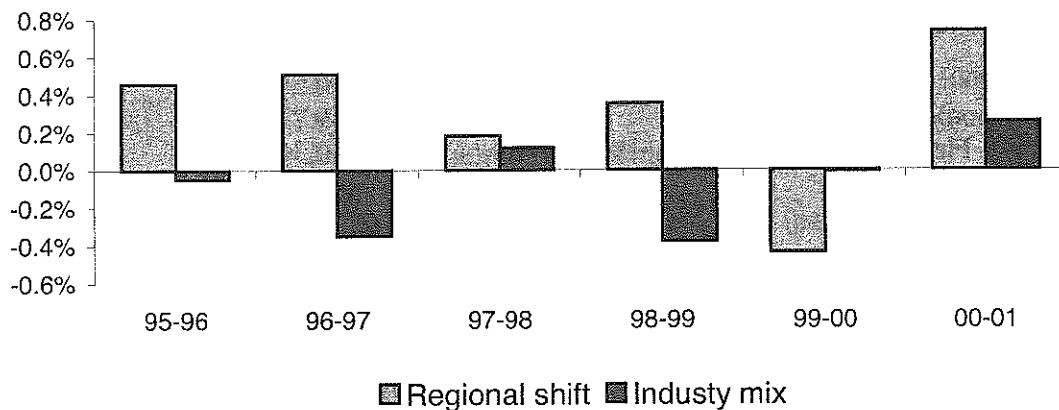


Fig. 6.2. Dynamic shift-share components, Flemish region, 1995-2001 (national benchmark)

In Flanders (Figure 6.2), the effect of performance remains positive over the whole period, except in 1999. The structural effect is sometimes positive, but more frequently negative. Figure 6.3 shows that the growth differential of employment between the Walloon region and the country results not only from an unfavourable structure of economic activity, but also from a relative lack of performance between 1995 and 1998 and after 2000. Regional shift becomes positive in 1999 and 2000.

Table 6.3. Dynamic shift-share components, Belgian districts employment, 1995-2001 (national benchmark) percent

Districts	Regional share	Industry mix	Total shift
Brussels	-6.753	1.791	-4.963
Eeklo	-12.768	-1.454	-12.548
Aalst	-4.370	-4.655	-8.116
Oostende	-7.289	-1.184	-7.744
Kortrijk	-5.698	-0.805	-6.393
Oudenaarde	-2.326	-5.338	-5.789
Dendermonde	1.501	-6.368	-4.075
Antwerpen	0.379	-4.083	-3.858
Diksmuide	-2.869	-3.959	-3.847
Roeselars	-2.143	-2.799	-3.807
Brugge	0.983	-4.182	-3.041
Veurne	-5.744	2.142	-2.004
Mechelen	-2.014	-0.437	-1.891
Hasselt	0.297	-1.132	-0.510
Gent	-1.908	1.543	-0.395
Ieper	-3.003	0.491	-0.196
Tongeren	1.461	-1.649	0.599
Tielt	1.759	-2.184	1.648
Sint-niklaas	2.245	0.652	2.783
Leuven	0.526	2.455	2.871
Maaseik	4.711	-0.318	5.035
Turnhout	4.878	0.588	5.075
Hal-Vilvoorde	2.705	9.777	12.405
Flemish region	1.816	-0.367	1.448
Virton	-22.291	-9.949	-29.918
Mons	-9.797	-2.358	-10.923
Soignies	-6.874	-0.648	-6.989
Ath	-6.673	-1.598	-6.038
Bastogne	-3.770	-3.988	-5.756
Charleroi	-5.421	-0.171	-5.594
Arlon	-1.188	-5.883	-5.232
Liege	-4.231	0.619	-3.820
Marche-en-Famenne	-0.432	-3.041	-2.908
Huy	-3.400	-1.020	-2.873
Tournai	-3.734	0.301	-2.601
Verviers	-0.413	-2.256	-2.159
Dinant	-8.331	4.153	-1.690
Thuin	0.066	-4.119	-1.658
Waremmes	-4.977	2.098	-0.720
Philippeville	-3.527	0.500	0.559
Namur	3.212	-1.893	1.805
Neufchateau	4.397	-3.863	2.513
Nivelles	-2.500	6.557	3.682
Mouscron	13.067	-6.369	7.807
Walloon region	-0.259	-0.322	-0.581

The results are ranked in ascending order.

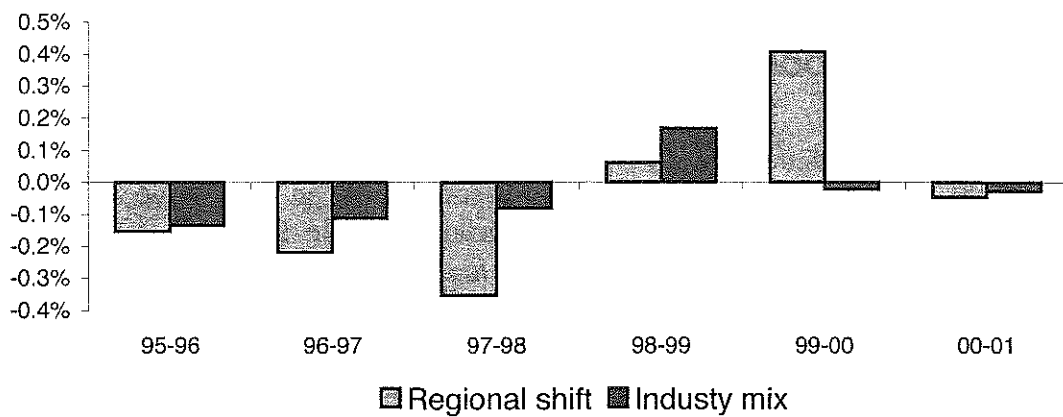


Fig. 6.3. Dynamic shift-share components, Walloon region, 1995-2001 (national benchmark)

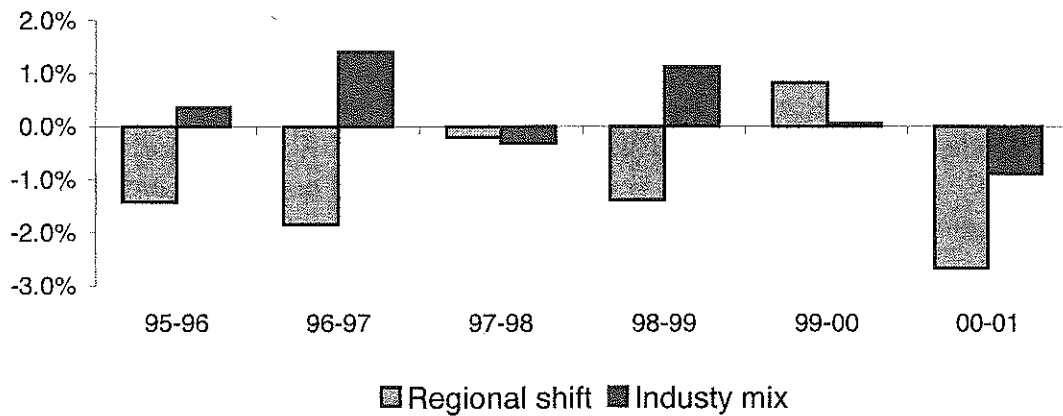


Fig. 6.4. Dynamic shift-share components, Brussels, 1995-2001 (national benchmark)

Brussels (Figure 6.4) displays a negative regional effect each year except 1999. This lack of performance, which is at the origin of the differentiated growth of employment in Brussels and in the Kingdom, is the most significant effect, although the activity structure of Brussels generally shows a favourable sectoral composition.

The dynamic shift-share approach reveals that the contributions of the residual shift and of the industry mix effect are variable in time in order to explain the disparities in regional employment performances.

An important deficiency of shift-share methods is that the effects cannot be statistically tested. As Jayet (1993) emphasizes, without statistical validation, the interpretation of the results is likely to be founded on disparities without significance. Accordingly, numerous extensions have been developed in the economic literature aiming at integrating the shift-share technique into a statistical framework.

6.5 An Econometric Approach: Marimon and Zilibotti's (1998) Model

Berzeg (1978, 1984), Jayet (1981), and, more recently, Patterson (1991) have contributed to converting the shift-share identity into an assessable stochastic formulation. Berzeg used an analysis of variance, while Patterson proposed to substitute the shift-share identity with an analogue regression model.¹² More recent approaches in the economic literature tend to lay emphasis on the processing of the time dimension. Amongst these contributions, the statistical model proposed by Marimon and Zilibotti (1998) seems to offer an elegant new way of disentangling region-specific effects from other effects (sectoral and temporal) in the evolution of regional employment. In this way, their model is useful for assessing the broad performance of each region over time, with performance defined here, as before, as the ability of the region to retain a positive (net) employment growth rate.

The model is specified as follows (see Equation 6.3):

$$e(i, n, t) = h(i) + m(i, n) + b(t) + f(i, t) + g(n, t) + u(i, n, t) \quad (6.3)$$

$$i = 1, \dots, I; n = 1, \dots, N; t = 1, \dots, T$$

where

- $e(i, n, t)$ represents the growth rate of total employment in industry i in region n at time t ;
- $h(i)$ is a time invariant sectoral trend component that is common to all regions;
- $m(i, n)$ is a time invariant effect that is specific to industry i and region n ;
- $b(t)$ is a pure time effect;
- $f(i, t)$ is the interaction between a fixed industry and a time effect;
- $g(n, t)$ captures the interaction effect between a fixed region and a time effect; and
- $u(i, n, t)$ is the idiosyncratic disturbance that is orthogonal to all other effects.

To identify the model, Marimon and Zilibotti (1998) impose restrictions on the coefficients' values. These restrictions take the sample average as reference points:

$$\sum_{n=1}^N m(i, n) = 0, i = 1, \dots, I \quad (R1)$$

$$\sum_{i=1}^I f(i, t) = 0, t = 1, \dots, T \quad (R2)$$

$$\sum_{t=1}^T f(i, t) = 0, i = 1, \dots, I \quad (R3)$$

$$\sum_{t=1}^T g(n, t) = 0, n = 1, \dots, N \quad (R4)$$

¹² See Blien and Wolf (2002).

$$\sum_{n=1}^N g(n, t) = 0, t = 1, \dots, T \quad (R5)$$

$$\sum_{t=1}^T b(t) = 0 \quad (R6)$$

There are $2T + 2I + N + 1$ restrictions, of which all but two are independent. Marimon and Zilibotti (2001) give the following interpretation of coefficients and constraints¹³:

- The summing over regions of the specific effect of industry i and region n gives zero (restriction R1). Thus, the coefficients $m(i, n)$ measure the difference between region-specific employment trends in industry i and the national average rate for the same industry.
- The coefficients $b(t)$ provide national business cycle effects, which homogeneously affect employment growth rates across both industries and countries. It is assumed that the business cycle effects average zero over time.
- The coefficients $f(i, t)$ represent industry-specific effects which cause a temporary deviation from the employment trend in industry i during t . Industry-specific effects at time t are assumed to average zero over industries (restriction R2). For industry i , these effects are also assumed to average zero over time (restriction R3).
- The coefficients $g(n, t)$ express regional transitory deviations of employment growth with respect to the business cycle.

The model is estimated applying the restricted least squares method. The residuals of the regression are the estimates of $u(i, n, t)$. This allows us to construct a “virtual” employment series, that is, the employment that would have been observed in the absence of any region-specific components. As the difference between actual employment and virtual employment can only originate from regional performance disparities, the comparison of both series offers another measure of the residual effect provided by the shift-share analysis.

Setting $m(i, n) = g(i, t) = u(i, n, t) = 0$ for all i and t in Equation 6.3, gives the virtual employment growth rates (see Equation 6.4):

$$e_{virt} = h(i) + b(t) + f(i, t) \quad (6.4)$$

To find virtual employment in industry i at time t in region n , it is sufficient to apply the virtual employment growth rate of industry i between time $t-1$ and time t to virtual employment in industry i at time $t-1$ in region n . Summing virtual employment of all industries located in region n at time t gives virtual employment in that region at time t .¹⁴

Considering the ratio of actual employment to virtual employment, Toulemonde (2001) defines a performance indicator: if the ratio is larger (less

¹³ See also Toulemonde (2001).

¹⁴ Note that by construction, the virtual employment estimated for the whole country does not equal the level of national employment actually observed.

than) than one, industry i of region n (or region n as a whole) is performing better (worse) than the same industry in the country (or in the country as a whole).¹⁵

The choice of the employment data set, in particular the degree of sectoral and geographical breakdown, is dictated by a double constraint. First, the estimation of Marimon and Zilibotti's (1998) specification inappropriately put up with an excessively thorough sectoral and geographical breakdown.¹⁶ Second, a highly detailed sectoral breakdown leads to the observation of a larger number of infinite rates of employment growth. Including this issue brings only a limited bias to the traditional shift-share analysis. By contrast, Marimon and Zilibotti's specification is founded exclusively on employment growth rates that are not weighted by the level of employment. This leads to a number of questions: how is the "appearance" of one or two workers taken into account correctly?; how should the case of a newly created company that takes on 50 workers in the first year of activity be handled? and is it necessary to treat the recruitment of a worker in an identical way when employment increases from zero to one as when it increases from 100 to 101 units? Whatever method is adopted, the correction of the infinite growth rates ends in the addition of false information, which is certainly advisable to limit. Conversely, reducing the sectoral and geographical breakdown seems to provide a more appropriate way to resolve this infinite growth rate issue. Accordingly, we restricted our sample to the employment of the ten Belgian provinces (of which five are Flemish and five are Walloon) and Brussels, for a breakdown of 42 industries.¹⁷ The period of investigation extends from 1995 to 2001.

The estimate of Marimon and Zilibotti's (1998) specification, applying restricted least squares, gives the formal statistic of the regression $R^2 = 0.427$. In other words, the model seems to explain more than 42 percent of the employment growth rate variance in the ten Belgian provinces and in Brussels during the period 1995-2001. Our R^2 is definitely lower than the result of Marimon and Zilibotti (1998), who obtained an R^2 equal to 0.647 for a panel of 15 sectors observed in ten European countries. As Toulemonde (2001) emphasizes, our result indicates that, "at the local level, many shocks are idiosyncratic", i.e. recorded by the error term $u(i, n, t)$, which tends to reduce the R^2 value.

Marimon and Zilibotti's (1998) approach enables us to construct a virtual employment series by filtering out all the province-specific components from the actual employment series. The ratio of actual employment to virtual employment

¹⁵ A ratio larger than one does not necessarily mean that the employment level of industry i in region n is increasing; it may be decreasing more slowly than in the whole country (Toulemonde 2001).

¹⁶ When the geographical areas are too narrow and/or when the number of sectors is too high, industrial mergers and takeovers or sectoral reclassification are considered exogenous effects, which do not contribute to the 'spontaneous' explanation of the employment evolution as estimated by the specification of Marimon and Zilibotti (1998).

¹⁷ The sectoral breakdown is based on the classification of economic activities NACE-BEL to two digits, published by the ONSS. We have regrouped some closely related activities for computational ease. The listing of sectoral activities is provided in Appendix 2.

provides a performance indicator. A negative (positive) residual regional effect disclosed by shift-share analysis should be measured by a performance indicator lower (larger) than one. Indeed, the deviation between virtual and actual employment can only originate from factors that are not related to the provincial productive structure but are linked instead to some undefined regional impact.

Summing up the virtual employment of all provinces in both regions gives the virtual employment of Flanders and Wallonia. Figures 6.5 to 6.7 show the evolution of actual and virtual employment, as well as the ratio of actual to virtual employment for the Flemish region, the Walloon region and Brussels, respectively, during the period from 1995 to 2001.

Between 1995 and 1999, Flemish actual employment records a higher increase than Flemish virtual employment (see Figure 6.5). This relative growth surplus results from the greater Flemish dynamism during the first two years of the period. Until 1997, the growth rate of Flemish virtual employment is inferior to the growth rate of observed employment. This reveals the competitive advantage of the Flemish region, which is a positive regional effect. In 1997, the performance index is equal to 1.008. In other words, if the Flemish region had recorded employment growth for each industry identical to that observed in the country as a whole, employment in Flanders would have been 0.8 percent lower than the employment rate actually observed in 1997. Between 1998 and 2000, the locational advantage of Flanders fades: the virtual employment growth rate becomes superior to the actual employment growth rate. In 2000, virtual employment slightly exceeds real employment. The end of the period marks the return of a positive performance effect in the Flemish region. In 2001, the observed employment is very close to its virtual level, indicating that the good Flemish performance in 1996-1997 has been offset by the poor results for employment creation recorded at the end of the decade.

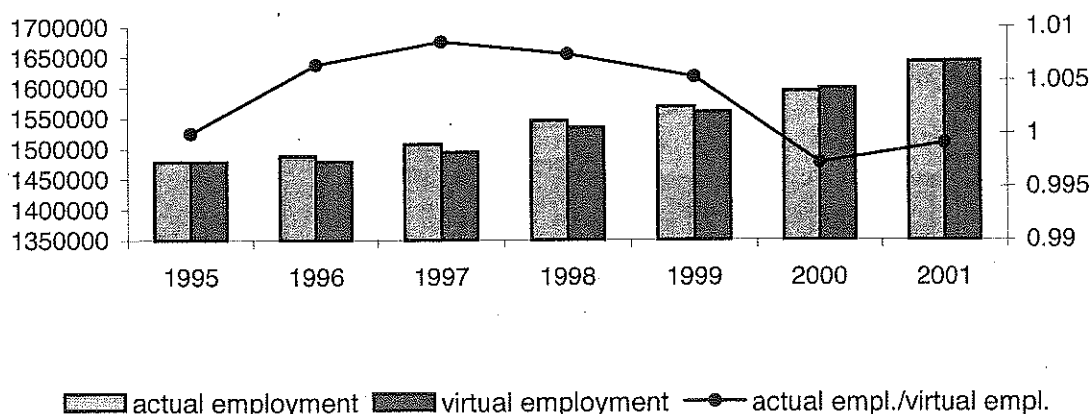


Fig. 6.5. Virtual and actual employment and the ratio of actual to virtual employment, Flemish region, 1995-2001

In the Walloon region, the observed employment remains lower than virtual employment over the whole period (see Figure 6.6). Moreover, the region never benefits from a competitive regional advantage. The real employment growth rate never exceeds the virtual employment growth rate. The years 1998 to 2000 are

characterized by a stabilization of the ratio between actual and virtual employment growth rates, but at the end of the period, the performance effect becomes unfavourable again. In 2001, the performance index is 0.975. Accordingly, the employment in Wallonia in 2001 might have reached a level 2.5 percent higher if employment growth had not been affected by factors related to the location in the South of the country.

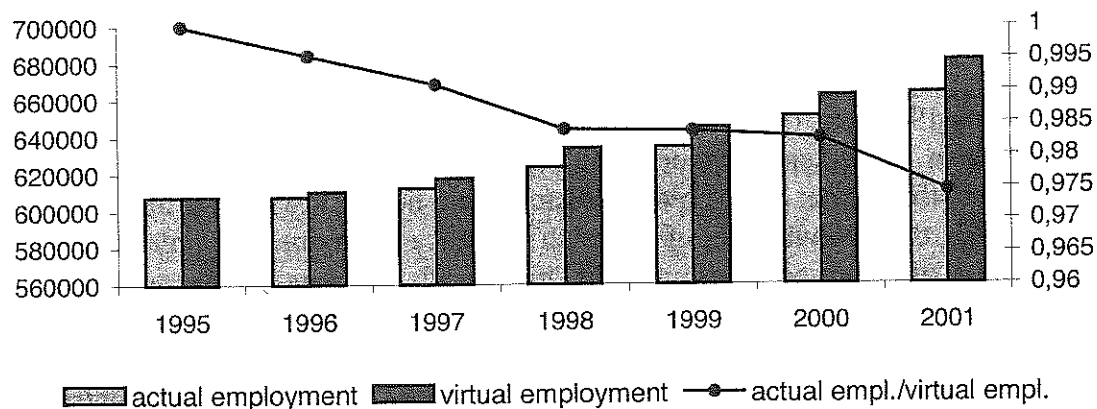


Fig. 6.6. Virtual and actual employment and the ratio of actual to virtual employment, Walloon region, 1995-2001

Brussels records a lack of performance similar to that of the Walloon region (see Figure 6.7). The virtual employment growth rate remains higher than the actual growth rate over the whole period, except for 2000. In 2001, the performance ratio shows a relative growth deficit of employment up to 4.8 percent.

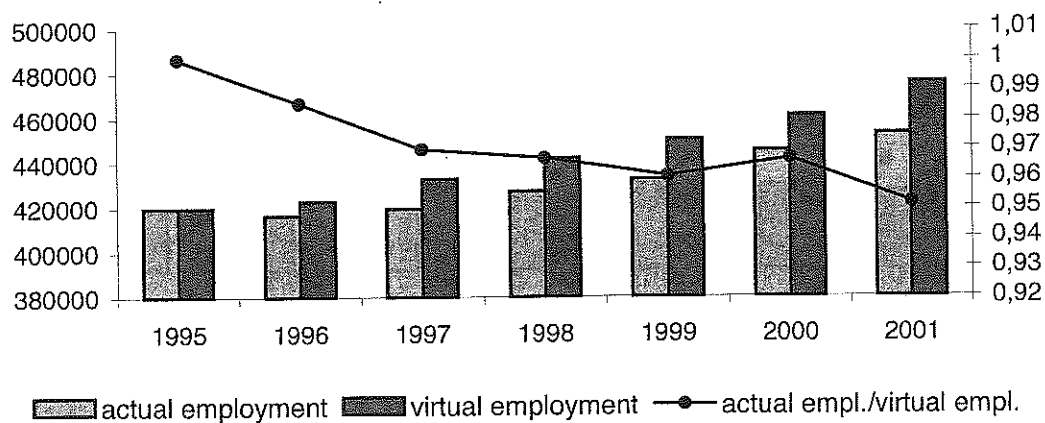


Fig. 6.7. Virtual and actual employment and the ratio of actual to virtual employment, Brussels, 1995-2001

However, the regional results should be qualified, as a consideration of the evolution of virtual employment at a provincial level discloses significant intra-regional disparities. Figures 6.8 and 6.9 show the ratio of actual to virtual employment in the ten Belgian provinces. The Flemish Brabant is the best

performing Flemish province, displaying a ratio higher than one over the whole period. The performance of Antwerp is not very impressive. The Walloon Brabant recorded an actual employment larger than virtual employment from 1999. The provinces of Hainaut as well as of Liège performed quite poorly over the period.

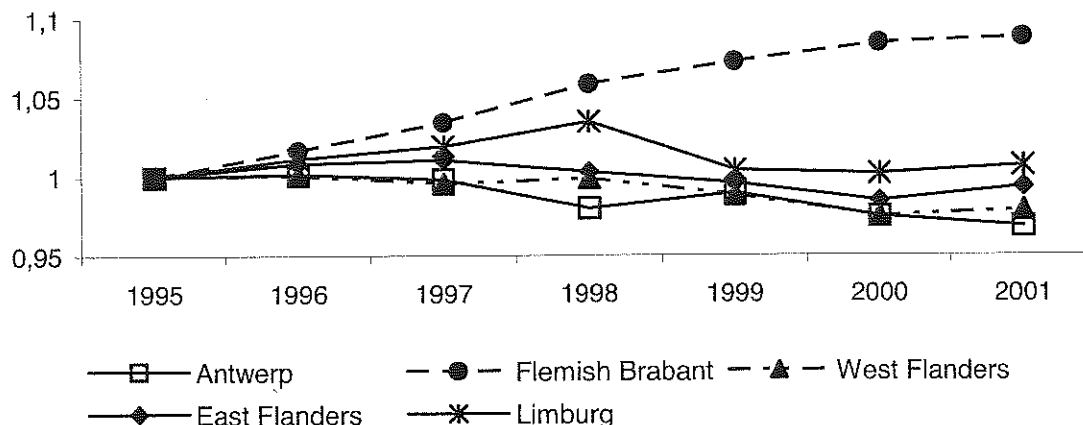


Fig. 6.8. Ratio of actual to virtual employment, Flemish provinces, 1995-2001

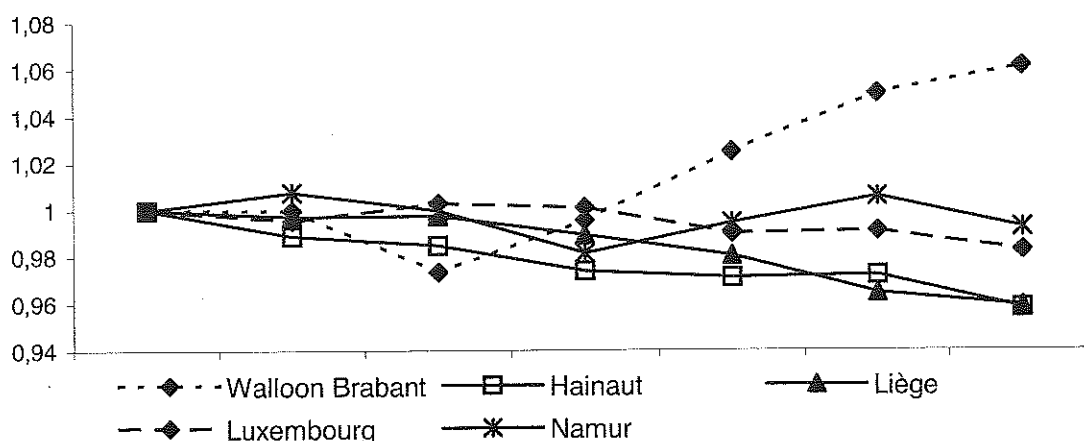


Fig. 6.9. Ratio of actual to virtual employment, Walloon provinces, 1995-2001

A more circumstantial analysis shows that for most industries, regional performance remains close to the national average, i.e. actual employment is close to its virtual level for a majority of sectors. Figures 6.10 to 6.12 display the average of the ratios of actual employment to virtual employment, by industry, for the Flemish region, the Walloon region and Brussels, respectively.¹⁸

The air transport industry (26) performed remarkably in the three regions, but this result actually highlights a limitation of the model. The employment statistics in the air transport industry show a brutal decrease around 1997 in all provinces except Brussels, the Flemish Brabant and Liège (where employment has actually soared). Because of the various constraints imposed by Marimon and Zilibotti's (1998) specification, the residual employment growth rate does not integrate the atypical employment evolution in these three provinces. Accordingly, residual

¹⁸ The industries are listed in Appendix 2.

growth tends to reflect the downward trend of employment recorded by the other provinces.

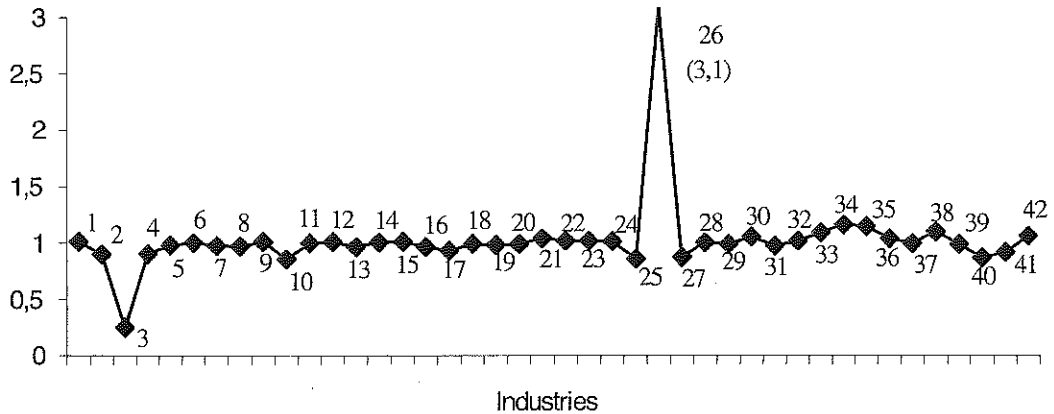


Fig. 6.10. Ratio of actual to virtual employment, by industry, Flemish region, average 1995-2001

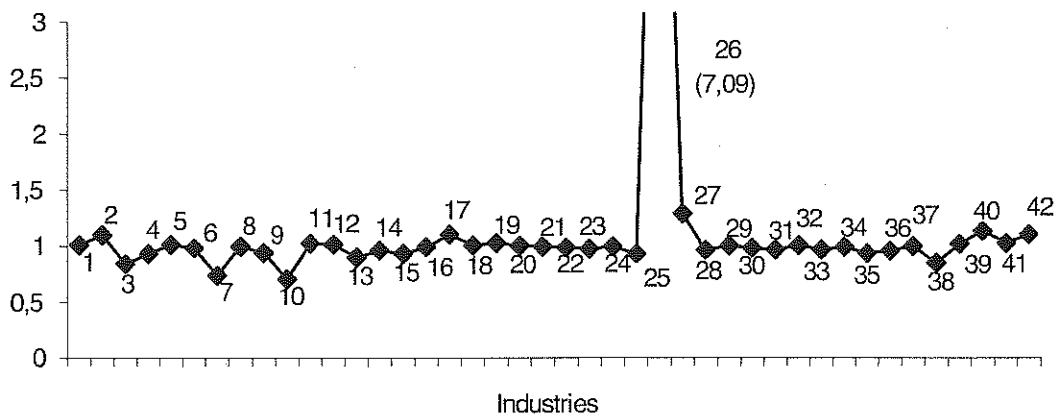


Fig. 6.11. Ratio of actual to virtual employment, by industry, Walloon region, average 1995-2001

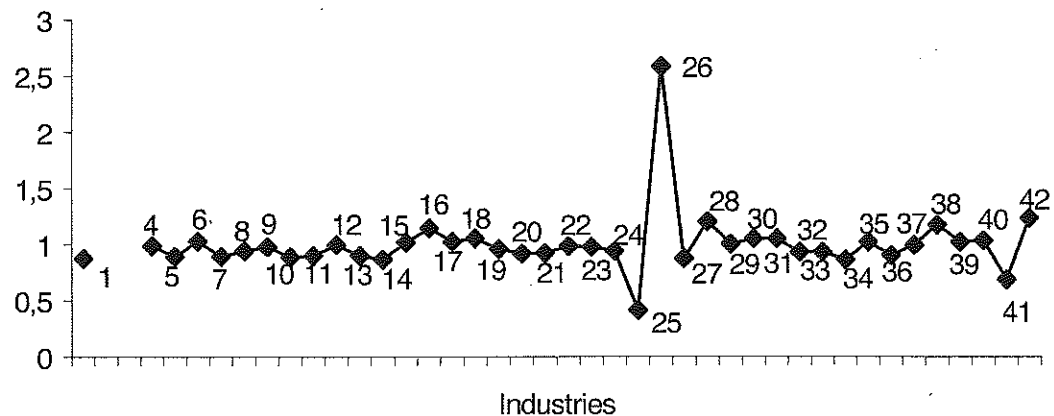


Fig. 6.12. Ratio of actual to virtual employment, by industry, Brussels, average 1995-2001

In the Flemish region, other activities that performed well are the computer industry (34), the renting of machinery and equipment (33) and insurance and pension funding (30). Walloon's dynamic industries are the supporting and auxiliary transport activities (27), the manufacturing of office, shop and other

furniture and the recycling of metal waste (17). In Brussels, the sectors that performed well are post and telecommunications (28), research and development (35), sanitation and similar activities (38) and extra-territorial organizations and bodies (42).

In Flanders, the activities that show a deficit in performance are mainly the extraction of coal, lignite and peat (3), mining of metal ores (10) and water distribution (25). In Wallonia, the industries that employ significantly fewer workers than their corresponding virtual employment levels are, like Flanders, the extraction of coal, lignite and peat and the mining of metal ores as well the production of leather accessories (7). In Brussels, the performance indicator is significantly lower than one for the extraction of coal, lignite and peat, the distribution of water and the supporting and auxiliary transport activities (27).

6.6 Conclusion

This chapter has examined regional and intra-regional performances of employment in Belgium in the recent past. Different methods were implemented to investigate this question: the traditional shift-share approach, the dynamic shift-share version or the econometric model of Marimon and Zilibotti. The results are converging, whether expressed in terms of the industry mix effect and regional shift or in terms of virtual and actual employment. They show that employment dynamics are disparate in the three Belgian regions and are driven by different forces linked to the sectoral specialization (or the lack of specialization) of the regions. Neither Flanders nor the Walloon region has inherited a favourable industrial mix. In the Flemish region, the weight of the unfavourable structure is overcompensated by better dynamic performances. In a way, Flanders holds some winning cards. The region gives firms locational advantages due either to natural endowments (easy access to the sea, for example) or to non-traded infrastructures (a dense highways network, well equipped harbours and airports, etc.). Firms also benefit from the agglomeration economies attributable to pecuniary externalities (the proximities to a large market) and to production externalities (knowledge spillovers, specialized workforce, opportunities for efficient subcontracting resulting from the closeness to firms engaged in similar activities, or cross fertilization, easy access to complementary services and inter-industry information exchanges due to urbanisation economies). These locational advantages stimulate regional economic activity and accordingly employment creation.

On the contrary, the Walloon region's ability to create jobs has remained too weak to overcome its structural handicap. Wallonia, which took the lead of the industrialization process in the 19th century, has remained too involved in declining industries (such as steel) and, with reference to the economic base theory, in non-basic activities (such as social and public services). Conversely, the region suffers from a lack of specialization in the service sector, notably in financial intermediation and business to business activities. In addition, Wallonia is not as well-endowed as Flanders. Accordingly, it faces a slight productivity

handicap that slows down the employment dynamics. This is particularly ascribable to a common labour market that insufficiently differentiates the wage rates between regions. As Estevão (2003) suggests, other likely reasons are “poor job matching” and “low labour mobility”.

Let us observe that performance disparities appear to be even stronger at an intra-regional level, in the provinces and districts. Over the whole period considered, no convergence of employment performances was observed. In particular, Brussels, which is both an administrative region and a district, has benefited from a highly favourable industrial mix but has recorded poor residual employment performances.

Basing public policies exclusively grounded on shift-share results is a risky process. The shift-share technique proves useful however “for providing guidance for industrial targeting” and contributes “to understanding and selection of key leading industries in a region” (Dinc 2002). Broadly speaking, our analysis stresses the need for political measures aimed at increasing the relative share of “basic” sector activities in the Walloon industrial mix and the need for raising productivity levels.

Appendix 1

Table 6.4. Belgian spatial administrative divisions

FLANDERS		WALLONIA	
Provinces (a)	Districts (b)	Provinces	Districts
1. Antwerp	11. Antwerp 12. Mechelen 13. Turnhout	2. Walloon Brabant	25. Nivelles
2. Flemish Brabant	23. Hal-Vilvorde 24. Leuven	5. Hainaut	51. Ath 52. Charleroi 53. Mons 54. Mouscron 55. Soignies 56. Thuin 57. Tournai
3. West Flanders	31. Brugge 32. Diksmuide 33. Ieper 34. Kortrijk 35. Oostende 36. Roeselars 37. Tielt 38. Veurne	6. Liège	61. Huy 62. Liège 63. Verviers 64. Waremme
4. East Flanders	41. Aalst 42. Dendermonde 43. Eeklo 44. Gent 45. Oudenaarde 46. Sint-Niklaas	8. Luxembourg	81. Arlon 82. Bastogne 83. Marche-en-Famenne 84. Neufchateau 85. Virton
7. Limbourg	71. Hasselt 72. Maaseik 73. Tongeren	9. Namur	91. Dinant 92. Namur 93. Philippeville

(a) NUTS 2; and (b) NUTS 3.

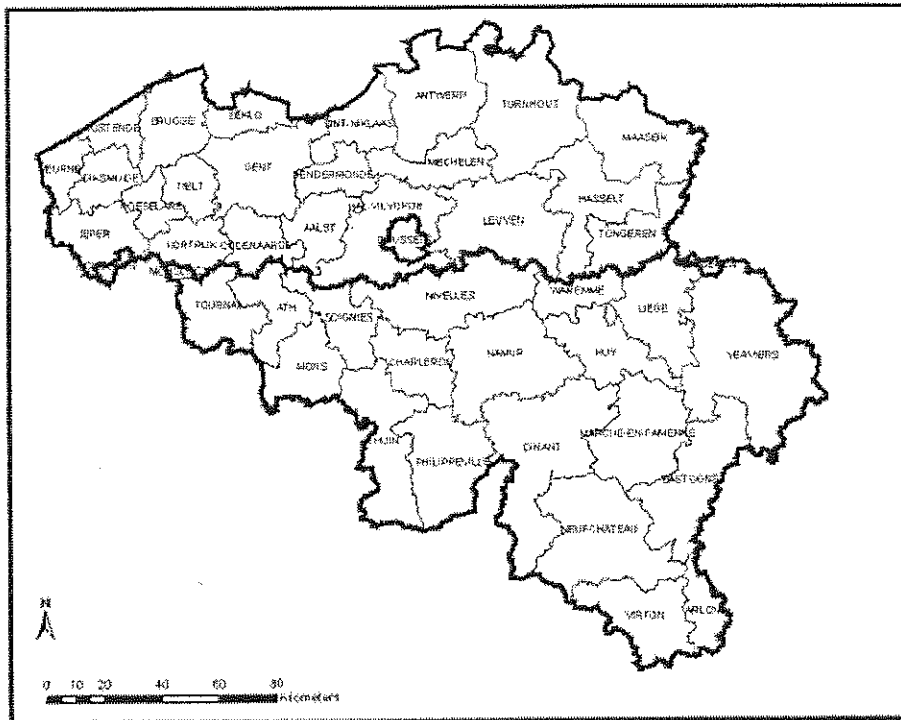


Fig. 6.13. Administrative regions and districts of Belgium

Appendix 2

Table 6.5. Definition of industries

1	Agriculture and Forestry	23	Hotels
2	Fishing	24	Land transport and via pipelines
3	Mining of coal and lignite and extraction of crude petroleum and natural gas	25	Water transport
4	Mining of uranium, of metal ores and other mining	26	Air transport
5	Beverages, food and tobacco products	27	Other transport activities
6	Textiles	28	Post and telecommunications
7	Leather products	29	Financial intermediation
8	Manufacture of wood	30	Insurance and pension funding, except compulsory social security
9	Paper products and publishing, printing, and reproduction of recorded media	31	Activities auxiliary to financial intermediation
10	Coke, refined petroleum products and nuclear fuel	32	Real estate activities
11	Chemical, rubber and plastic products	33	Renting of machinery and equipment
12	Other non-metallic mineral products	34	Computer
13	Basic metals and manufactured of fabricated metal products	35	Research and development
14	Machinery and equipment and office machinery and computers	36	Other business activities
15	Electrical apparatus and radio, television, communication and medical optical instruments, watches, clocks	37	Human health and hospital activities
16	Transport equipment	38	Sanitation and similar activities
17	Office, shop and other furniture	39	Activities of membership organisation and recreational, cultural and sporting and other service activities
18	Electricity, gas and water supply	40	Domestic service
19	Construction	41	Undefined activities
20	Motor and cycle vehicles; retail sale of automotive fuel	42	Diplomatic representation, international organisations and allied forces
21	Wholesale and commission trade		[Administration of the State]
22	Retail trade		[Education]

Regrouping by the authors on the basis of the NACE nomenclature.

Acknowledgements

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References

- Barff R, Knight PL (1988) Dynamic shift-share analysis. *Growth and Change* 19(2):1-10
- Beaud M (1966) Analyse régionale-structurale et planification régionale. *Revue Economique* 1:1-10
- Berzeg K (1978) The empirical content of shift-share analysis. *Journal of Regional Science* 18(3):463-469
- Berzeg K (1984) A note to statistical approaches to shift-share analysis. *Journal of Regional Science* 24(2):277-285
- Blien U, Wolf K (2002) Regional development of employment in Eastern Germany: an analysis with an econometric analogue to shift-share technique. *Papers in Regional Science* 81:391-414
- Buck TW (1970) Shift and share analysis - a guide to regional policy?. *Regional Studies* 23(1):43-48
- De Brabander GL (1975) The traditional and the Esteban-Marquillas shift-share models, a comparison with an application to Belgium (1846-1896). Workshop on Quantitative Economic History Discussion Paper, Katholieke Universiteit Leven
- Dinc M (2002) Regional and local analysis tools. Mimeo, World Bank Institute, Washington
- Dormard S (1999) Evaluation de l'emploi, gain de productivité et spécialisation régionale: développements et application de la méthode structurelle-résiduelle. Paper presented at the 35th ASRDLF Congress, Hyères, September 1st-3rd
- Estevão M (2003) Regional labor market disparities in Belgium. *Reflets et Perspectives* 42(1):95-114
- Fernández MM, Menéndez AJL (2002), The evolution of the employment in the European Union. A stochastic shift and share approach. Paper presented at the European Regional Science Association Congress, Dortmund, August 27th-31st
- Guesnier B (1998) La dynamique spatiale du système productif. In: Louinger G, Némery JC (eds) *Recomposition et développement des territoires*. L'Harmattan, Paris
- Jayet H (1981) L'analyse de variance et l'extension de la méthode shift-share. *Revue d'Economie Régionale et Urbaine* 4:505-515
- Jayet H (1993) Analyse spatiale quantitative. Une introduction. *Economica*, Paris
- Marimon R, Zilibotti F (1998) 'Actual' versus 'virtual' employment in Europe - is Spain different?. *European Economic Review* 42:123-153
- Meunier O, Mignolet M (2003) L'emploi en Belgique et ses disparités régionales. Discussion Paper, Observatoire de l'emploi, to be published

- Patterson MG (1991) A note on the formulation of the full-analogue regression model of the shift-share method. *Journal of Regional Science* 31(2):211-216
- Perloff HS, Dunn ES, Lampard EE, Muth RF (1960) *Regions, resources and economic growth*. John Hopkins Press, Baltimore
- Stevens BH, Moore CL (1980) A critical review on the literature on shift-share as a forecasting technique. *Journal of Regional Science* 20(4):419-437
- Stilwell FJB (1970) Further thoughts on the shift and share approach. *Regional Studies* 4:451-458
- Toulemonde E (2001) 'Actual' versus 'Virtual' employment in Belgium. *Regional Studies* 35(6):513-518