The relationship between economic growth and employment

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Introduction

The question of the relationship between economic growth and employment is highly relevant in the recent economic context dominated by the great recession, in which Belgium stood out from some of its partners thanks to a certain degree of labour market resilience. This article takes stock of how that relationship has changed over time, through various recession episodes, and of the underlying trends in gross domestic product (GDP), the volume of labour, and productivity.

The article begins by describing the respective movements, in Belgium, in the variables that explain the pattern of GDP, both through the various economic cycles and in a long-term perspective. The first section sets out the accounting relationships between activity and employment, while the second section analyses the detailed breakdown of GDP. Next, the third section explains the long-term trends in each element of that breakdown, making it possible to address issues such as the job intensity of growth. The fourth section examines the development of the various branches of activity and their contribution to the changes mentioned above.

After that, the fifth section of the article examines more particularly the quantification of the relationship between growth and employment throughout the business cycle and during various successive cycles. Here, the analysis only considers the cyclical components of the variables concerned. At that level, it endeavours to measure the sensitivity of the cyclical component of employment to the output gap in Belgium, to compare it with the sensitivity observed in other developed economies, and to verify whether it is stable over time or whether there is any asymmetry between expansion and recession episodes. Finally, in the sixth section, this empirical study along the business cycle is extended to a sectoral breakdown and the total volume of labour rather than employment in terms of persons. The conclusion attempts to place the salient findings of the study in perspective while identifying a number of ideas worth exploring.

1. Relationship between activity and employment

1.1 Accounting relationships

GDP represents all goods and services produced and supplied in the economy during a given period. Among other things, that output (Y) has to meet the needs of the total population (P), only some of whom, namely the labour force (A), take part in the production process. In an economy with under-employment, that labour supply is larger than the needs of the production system so that the labour force is sub-divided into workers (E) and unemployed persons (U).

In accounting terms, GDP is broken down as follows:

$$Y = \frac{Y}{TH} \cdot \frac{TH}{E} \cdot E \qquad (1)$$

of which $TH = E \cdot H$ = total hours worked in the economy

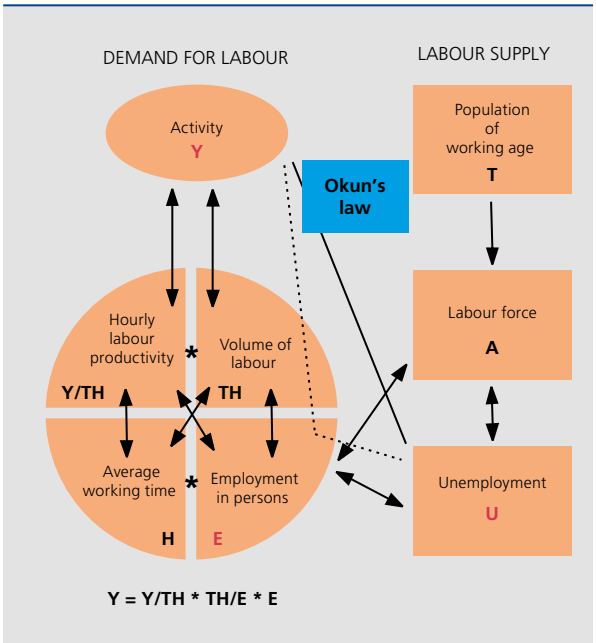
H = average hours worked per worker

Y/TH = hourly labour productivity

Simplifying by employment E, it emerges that GDP (Y) depends on two factors: the volume of labour used (TH), which is equal to employment in persons (E) times the average hours worked (H), i.e. a quantitative aspect, on the one hand, and apparent hourly labour productivity (Y/TH), or a qualitative aspect, on the other. All other things being equal, and leaving aside capital and technical progress, if productivity outpaces economic growth, the volume of labour diminishes.

The relationship between employment and activity is central to "Okun's law". In principle, these two variables have to move in the same direction. In periods of expansion, the production system needs more workers to satisfy demand, so that employment rises and unemployment falls. But although one additional worker potentially reduces the numbers unemployed by one, the unemployment rate (U/A) will not show a decline proportionate to the growth in employment, the main reason being the specific dynamics of the labour force. Those dynamics are determined by the demography of the total population and by the labour market participation rate, which is itself influenced in particular by the prevalence of working women, institutional factors such as compulsory education, retirement age and rules regarding unemployment exclusion, and by the business cycle specific to the labour force. Chart 1 offers a general view of the relationships outlined here.

CHART 1 DIAGRAM OF THE ACCOUNTING RELATIONSHIPS BETWEEN ACTIVITY AND EMPLOYMENT



1.2 Historical pattern of activity and employment

Chart 2 compares economic growth with employment growth over a long period. It clearly reveals a positive correlation between them. However, the peaks and troughs in the economic cycle do not coincide with those corresponding to the growth of employment. In general, it takes some time before fluctuations in demand affect the growth of employment. This response time has not been stable over the past fifty years and depends on such factors as the depth of the recession, its origin, its expected duration, and recourse to flexibility instruments on the part of employers.

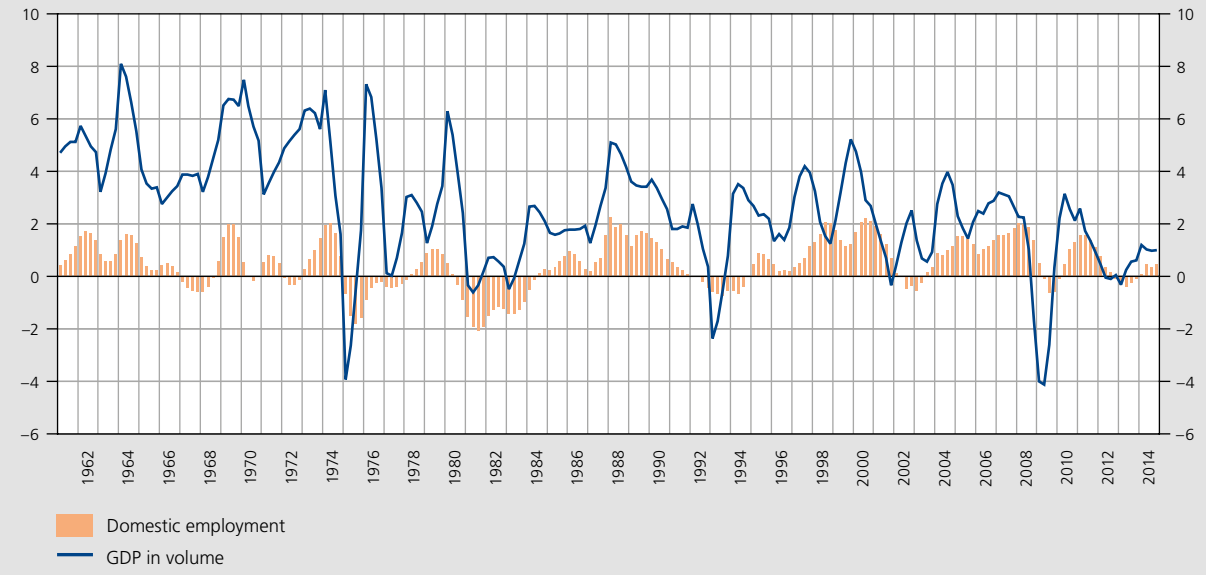
The adjustment of production capacity in line with the changing outlook for activity is an expensive process and one that takes time. Before dismissing workers (or recruiting additional staff), firms respond first to a decline (or increase) in activity by exploiting their intensive production margin (average working time and/or hourly productivity).

By using various organisational methods such as adjusting overtime, switching to part-time working, or temporary lay-offs, firms can align their use of labour more closely with the needs of production (internal quantitative adjustment). In a scenario in which adverse economic conditions persist, if these margins have been used up and the financial resilience of firms is no longer assured, redundancies are unavoidable (external quantitative adjustment). In addition, in view of the procedures to be respected, job losses under collective redundancy programmes take some time to have an effect; in practice, several months may elapse between the announcement of collective redundancies and the actual job losses; that contributes to the time lag.

In the opposite scenario of an economic upturn, it is only once the flexibility levers available to firms have been used and the growth of demand is confirmed that firms take on additional labour; that recruitment procedure also takes some time.

CHART 2 HISTORICAL PATTERN OF EMPLOYMENT AND ECONOMIC GROWTH

(data adjusted for seasonal and calendar effects, percentage changes compared to the corresponding quarter of the previous year)



Sources: NAI, OECD.

2. Breakdown of GDP growth

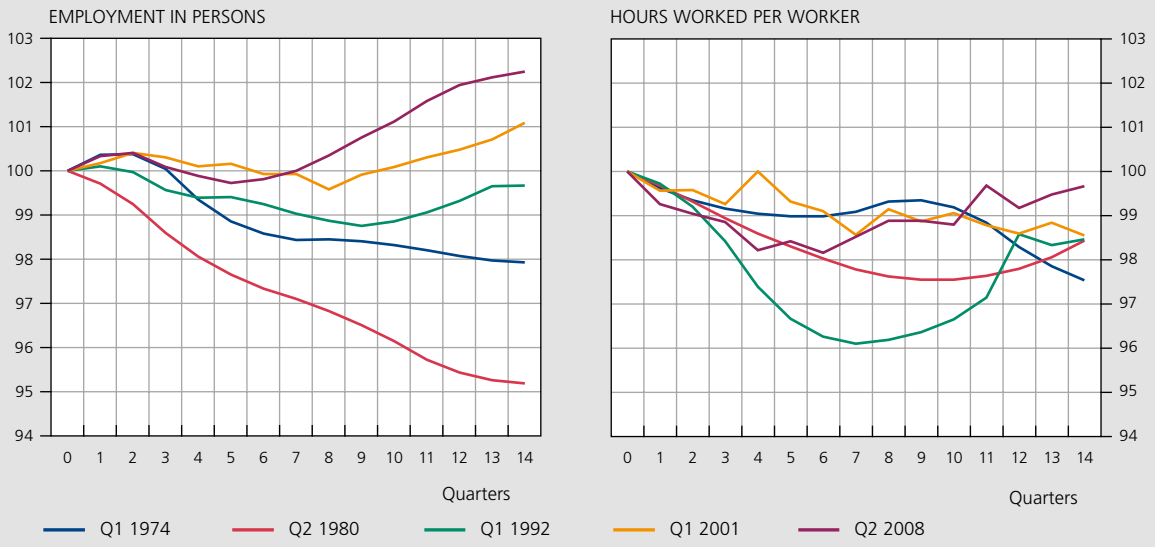
The change in GDP can be attributed to three factors, namely changes in employment, average working time (hours worked per worker) and hourly productivity (GDP per hour worked, or apparent productivity). The relative contribution of each of these factors is not stable over time. The delayed response by employment and the duration of that response can be illustrated by fixing the level of the workforce at the time of the pre-recession GDP peak and observing the moment when employment starts to fall and the duration of that fall. Chart 3 demonstrates this for the five recession episodes in Belgium between 1970 and 2014:

- at the time of the first oil shock in the 1970s, three quarters elapsed before employment responded to the decline in activity. Once the net job losses set in, they were significant for a year and persisted at a slower rate for some time;
- during the 1980-1981 episode which followed the second oil shock, employment responded immediately and strongly. Job losses persisted over a period of more than three years;
- the next recession which began in 1992 generated much more modest job losses, with an almost immediate but fairly slow contraction and a recovery in the tenth quarter (i.e. after two years);
- at the time of the 2001 episode, the decline in real activity was relatively small. It took three quarters for net job losses to appear, and the losses were modest in comparison with other economic crises;
- finally, in the great recession, employment followed the downward trend in activity after a lag of three quarters. Quarter-on-quarter employment growth therefore became negative at the beginning of 2009. Compared to the pre-recession peak in activity, net job losses were on a much smaller scale than in previous episodes, particularly in regard to the decline in real activity. Owing to the sovereign debt crisis in the euro area, employment began falling again in Belgium between 2012 and 2013 (beyond the 14-quarter horizon covered by chart 3).

The flexibility available to firms explains why the time taken for employment to respond to changes in GDP may be shorter in terms of hours worked than in the number of persons employed. At the time of the first oil shock, the decline in hours worked perpetuated a fall that had begun long before 1974, and reflected a downward trend in average working time. During the second oil shock, average hours thus declined in parallel with employment. However, they picked up slightly sooner than employment. In the early 1990s, the hours worked fell more steeply than employment but the situation recovered

CHART 3 RESPONSE BY DOMESTIC EMPLOYMENT IN PERSONS AND AVERAGE HOURS PER WORKER DURING ECONOMIC RECESSION EPISODES

(data adjusted for seasonal and calendar effects; indices, respectively levels of employment and hours corresponding to the pre-recession peak in GDP in volume, = 100)



Sources: NAI, OECD, NBB.

after seven quarters. The priority use of the intensive margin (average working time) was particularly evident at the time of the recession in the early 2000s and in 2008-2009. However, the average hours declined relatively slowly in the early 2000s, while the hours worked per worker were adjusted more rapidly at the start of the great recession. At that time, the decline in the pace of work was spread over four quarters.

The use of temporary lay-offs and the crisis measures adopted in 2009 are regularly cited to explain the relative stability of employment in Belgium despite the seriousness of the 2008-2009 crisis. People laid off temporarily remain on the firm's staff register even if they do not work on the days in question. While the level of temporary lay-offs was historically high and, starting from a low base, their number increased dramatically in 2009, the additional measures taken at the time (referred to as "crisis" measures) had only rather limited success. At the height of the recession, more than 200 000 manual workers were recorded as temporarily laid off, whereas the similar system developed for clerical workers (known as "staff suspension owing to lack of work for firms in difficulty", a system which has since been retained) affected no more than 8 000 people in 2010. Moreover, the crisis time-credit scheme whereby an employer recognised as in difficulty could offer individual full-time workers a time-credit in the form of a 50 % or 20 % reduction in their work, concerned fewer than 3 000 people.

In fact, recourse by Belgian firms to temporary lay-offs for manual workers is largely structural; between 1992 [1] and 2014, there was only one quarter in which the numbers concerned came to less than 100 000 (on average), namely the third quarter of 2000. This is a long-standing instrument in Belgium. Right from the start, the National Placement and Unemployment Office established in 1935 (as the forerunner to the National Employment Office) made provision for a form of temporary lay-offs for manual workers, although there was no legal framework at that stage [2].

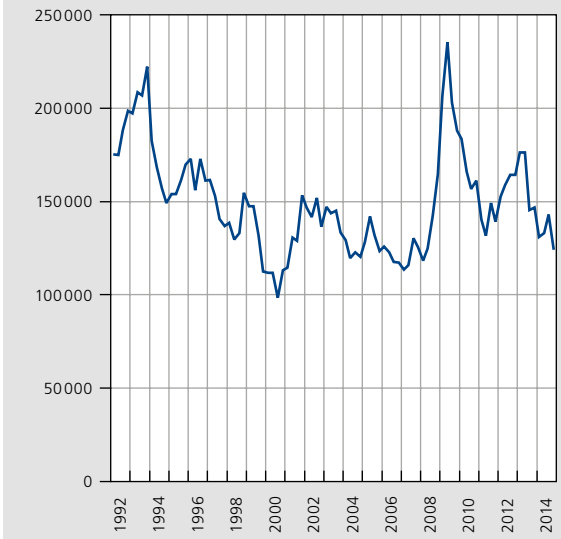
The gap between the change in the total volume of labour and the change in real activity corresponds to the mechanical adjustment of apparent hourly productivity. Chart 5 below presents the growth rates of the intensive and extensive margins over the period 1980-2014, in

(1) Start of the series expressed in number of payment recipients (physical units).

(2) In 1954, the various options for suspension of an employment contract (such as the lack of work owing to economic reasons, bad weather or force majeure) were put on a legal basis without any restrictions on access per sector of activity. However, there is a special scheme for the construction sector. As time went by, new rules on temporary lay-offs came into force (compulsory notification to the NEO, monitoring procedures, level of replacement benefits, etc.), some being applicable to all sectors while others applied only to the construction sector.

CHART 4 TEMPORARY LAY-OFFS

(manual workers, physical units, taking all reasons together[1], seasonally adjusted quarterly averages)



Sources: NEO, NBB.

(1) Economic reasons represent around 70 % of all reasons (on average over the period 1999-2014).

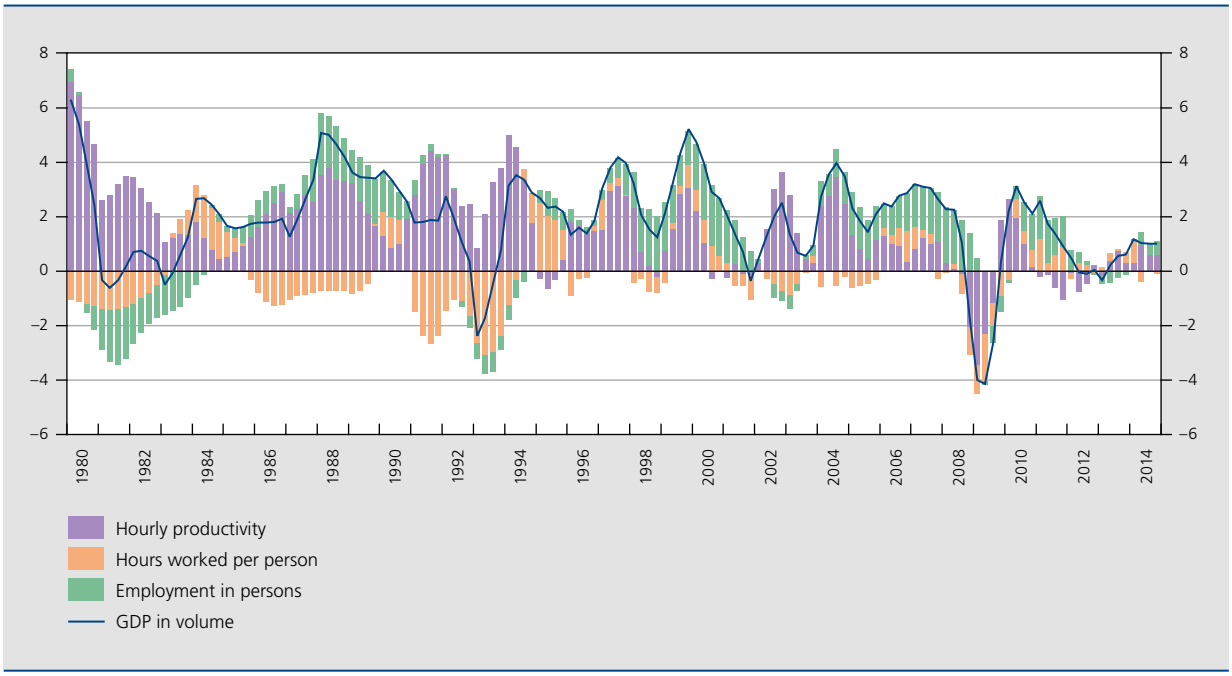
order to study their behaviour throughout the economic cycle. Historically, hourly productivity has acted as a shock absorber, both during cyclical downturn phases when productivity growth has weakened, and during recovery phases when growth is stronger, and firms give priority to restoring their margins. However, although the growth of hourly productivity is pro-cyclical, it has almost always remained positive until the outbreak of the great recession. Conversely, as expected in view of the subsequent relatively limited fall in individual hours, it is thus hourly productivity that has been hardest hit by the decline in activity.

To protect jobs, firms may accept a decline in hourly productivity, while employees may agree to a cut in the hours worked, and hence in their income. For employers, the fear that – in a situation of mismatches on the labour market and population ageing – they might be short of skilled staff once the economy picks up has therefore outweighed the fear of a temporary loss of profitability due to a reduction in hourly labour productivity.

At the time of the great recession, labour hoarding initially limited the job losses in a context of sound corporate fundamentals, but the further decline in GDP in 2012 caused

CHART 5 BREAKDOWN OF GDP GROWTH

(data adjusted for seasonal and calendar effects, percentage changes compared to the corresponding quarter of the previous year)



Sources: NAI, OECD, NBB.

the number of workers to fall more steeply in 2013 than in 2009. The main reason was that the labour retention systems did not act as a buffer to the same extent as in 2008 and 2009. The length of the crisis and the hesitant exit from it eroded the financial capacity of some firms, so that workforce adjustments were inevitable. In addition, the conditions governing recourse to temporary lay-offs for economic reasons were tightened as an accountability contribution was introduced. Thus, the number of people temporarily laid off declined in 2013 to approach its long-term average.

3. Productivity and job intensity of growth : long-term analysis

Productivity fluctuates in line with the business cycle around a medium- to long-term trend. It is essential to distinguish between trend gains in productivity and their cyclical variations. By taking average growth rates per decade, table 1 endeavours to capture the change in the trend component.

Expressed as average annual growth rates, hourly productivity gains dropped from 4.2 % in the 1970s to 0.9 % in the 2000s, before collapsing to 0.1 % over the period 2010-2014. This trend in productivity gains mirrors that in GDP. In the 1970s, the annual growth of GDP averaged 3.4 %, then dropped to around 2 % in the 1980s and 1990s. This growth rate then slowed in the 2000s and 2010s, averaging no more than 1 % in recent years. The other component of GDP, namely the volume of labour, recorded negative growth in the 1970s and 1980s, then edged upwards to 1 % in the recent period.

The difference between the average annual growth rates for hourly productivity and productivity per worker reflects the change in the average working time. That has diminished over the years owing to various factors, such as a decline in the number of contract hours, the increase in the rate of part-time working, development of the use of time-credit, but also the change in the structure of employment within the economy (see below).

If the job intensity of growth is defined as the ratio between the expansion of employment and the change in activity, that indicates the reciprocal of the growth of productivity per worker. In fact, the job intensity of growth is clearly pursuing an upward trend. In parallel with the movement in annual GDP growth, between the 1970s and the 2000s, the average annual growth of employment increased from 0.2 to 0.9 % (0.6 % in 2010-2014). Thus, without any breakdown between the trend and the cycle at this stage, activity growth of 1 % in the 1970s did not create any jobs in the economy, whereas it created 0.3 % extra jobs in the 1990s and 0.6 % in the most recent period. However, in order to study the sensitivity of employment to growth (elasticity), it is necessary to focus solely on the cyclical component of the series, an exercise that will be conducted in section 5.

The job intensity of growth also varies according to the nature of the activity. It is relatively high in the service branches whereas it is lower, or even negative, in industry, given the steady rise in productivity in that branch (see below). At the level of the economy as a whole, job intensity depends on the structure of the activity, and its pattern may be influenced by the gradual shift towards a service economy.

In a context of continuing computerisation of occupations, this rise in job intensity may appear contrary to some predictions concerning the possibility of many "human" jobs being taken over by robots. In the economic debate

TABLE 1 AVERAGE ANNUAL GROWTH RATES OF THE COMPONENTS OF ACTIVITY
(annual averages, in %)

	1970-1980	1980-1990	1990-2000	2000-2010	2010-2014 (1)
GDP	3.4	2.0	2.2	1.5	1.0
Employment	0.2	0.2	0.6	0.9	0.6
Volume of labour	–0.8	–0.1	0.2	0.6	1.0
Productivity per person	3.2	1.8	1.7	0.6	0.4
Hourly productivity	4.2	2.1	2.0	0.9	0.1

Sources : NAI, OECD.
(1) The results for this shorter period are influenced by the effects of the great recession and the sovereign debt crisis.

on the subject, supporters of the "maximalist" approach go quite far, since they consider that the automation of jobs will no longer apply only to routine tasks but will also increasingly affect occupations involving cognitive and non-routine tasks. The study by Frey and Osborne (2013) applies a probability of automation to hundreds of jobs in the United States. Occupations featuring a high degree of creativity, social skills, perceptive qualities and manipulation are less at risk. The same exercise was conducted by the Bruegel Institute (Bowles, 2014) for European countries. It shows that, for Belgium, 50 % of occupations are at risk. However, the findings of this type of research need to be viewed with caution since they are surrounded by an obvious degree of uncertainty and the analysis does not specify the time scale of the potential changes: the definition of current occupations could change in the meantime. Indeed, the disappearance of some occupations and the emergence of new ones (which could actually result from these technological changes) is nothing new and is central to Schumpeter's ideas.

4. Influence of the changes in structure of activity

4.1 Trend in employment in the branches of activity[1]

Employment does not react to cyclical fluctuations in the same way in all branches of activity. The market branches, or those sensitive to the business cycle, comprise agriculture, construction, industry and market services[2]. Non-market services include general government and education, health, social work and other non-market service activities.

Non-market services recorded steady growth of employment up to the end of 2011, i.e. including at the height of the great recession. Since 2012 the growth rate has slowed in a context of fiscal consolidation. In contrast, changes in employment in market services closely reflect the changes in activity, and the number of persons in work there declined in 2009. Finally, job losses have persisted in industry since 2002, and that trend was accentuated during the great recession. This "structural" decline partly reflects the reorganisation of the production process in industry: functions previously performed in-house by firms in the branch have been relocated or outsourced to service companies in order to secure greater flexibility and better cost control.

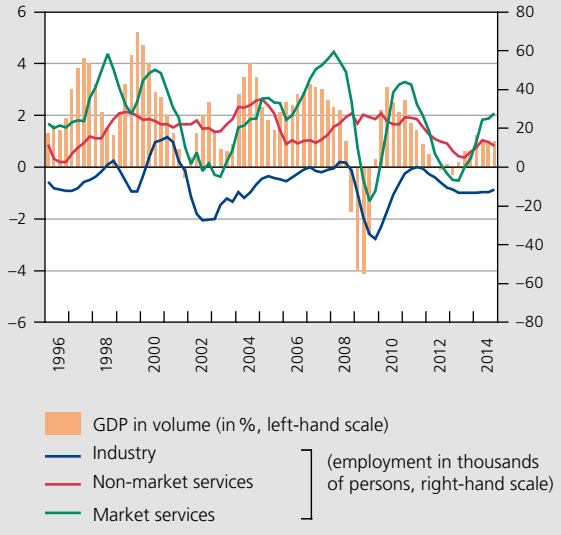
In 2014, industrial jobs averaged 12 % of total employment, as against 19 % in 1995, while market services accounted for the largest share with 46 % (compared to 41 % almost 20 years earlier) and non-market services 35 %, or more than a third[3].

Job losses during the great recession were therefore limited not only by the use of traditional flexibility instruments but also by the resilience of some branches to fluctuations in activity, particularly non-market services, which are generally largely subsidised by the government.

The proportion of non-market sector jobs is relatively high in Belgium. Since 1995, the expansion of employment in Belgium has come mainly from net creation of jobs financed entirely or largely by the government. This concerns extra staff in public authorities and education, but also and primarily workers employed in "human health and social work" and in the service voucher system among private employers. Altogether, it is estimated that seven out of ten jobs created between 1995 and 2014 are largely financed by the government.

CHART 6 GROWTH OF ACTIVITY AND EMPLOYMENT BY BRANCH OF ACTIVITY

(data adjusted for seasonal and calendar effects, change compared to the corresponding quarter of the previous year)



Source: NAI.

(1) In the current NAI series (ESA 2010), the breakdown of employment by branch of activity begins in 1995.

(2) Trade; repair of motor vehicles and motor cycles; transport and storage; hotels and restaurants; information and communication; financial and insurance activities; real estate activities; specialist, scientific and technical activities, and administrative and support service activities.

(3) Agriculture and construction were not included.

The shift to the service economy is one of the factors behind the fundamental trend in total productivity and average working time.

4.2 Working time in the branches of activity

The average working time is generally lower in services than in industry. At the end of 2014, employees worked an average of 388 hours per quarter in industry, compared to 361 in market services and barely 341 in non-market services. In addition, the non-market sector – like industry – is seeing a downward trend in average hours per person. The low point in industry in 2009 was due to the strong adjustment of employees' working hours in response to the crisis. The number of hours worked has still not returned to its previous level.

These marked differences in level are due to the larger proportion of part-time workers in services, especially in the non-market sector. In 2013, according to the results of the labour force survey (LFS), over a third of workers in non-market services worked part time. In market services, around a quarter of employees work reduced hours, whereas in industry only one in ten workers is not employed full-time. The change in the structure of employment, with an increased share of branches with a high rate of part-time work, has therefore depressed the total average working time in the economy.

The over-representation of women in certain branches of activity is a factor here, as two-thirds of jobs in non-market services are filled by women; more than 40 % of women in the workforce work part time. That ratio has doubled since the early 1980s. In the case of male workers, only around one in ten works reduced hours, but that figure has increased five-fold since the early 1980s. In all, the rate of part-time working has risen from 8 % to almost 25 % over the same period. Factors behind this trend are the rise in the labour market participation rate of women, the extension of working life among older workers, and the greater involvement of men in family responsibilities.

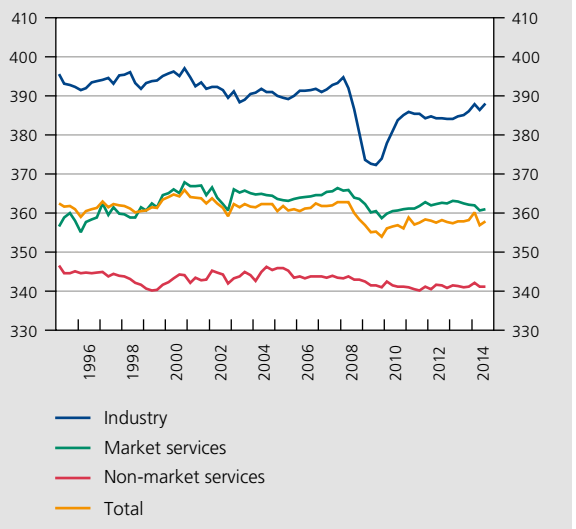
4.3 Productivity in the branches of activity

Changes in the relative weight of the branches of activity in the economy are also part of the reason for the trend in average labour productivity. In practice, it is not feasible to obtain a measure of the output of all economic activities since some are non-market activities[1]. In their case, value added is estimated in the national accounts as the sum of the costs[2]. The measure of productivity is then biased since any change in the wage bill is passed on in full to the change in value added. For that reason, chart 8

(1) The selling price does not cover 50 % of the production costs.
(2) Intermediate consumption, compensation of employees, other taxes on production net of subsidies and fixed capital consumption.

CHART 7 AVERAGE HOURS WORKED PER EMPLOYEE, BY BRANCH OF ACTIVITY

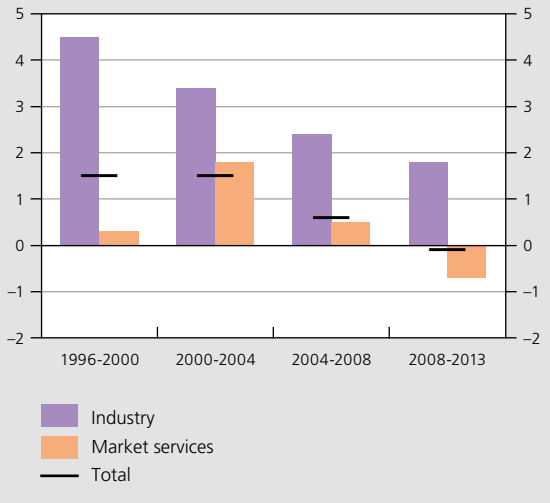
(level per quarter, data adjusted for seasonal and calendar effects)



Source: NAI.

CHART 8 AVERAGE ANNUAL GROWTH OF HOURLY PRODUCTIVITY BY BRANCH OF ACTIVITY[1]

(annual averages, in %)



Sources: NAI, NBB.
(1) Based on detailed annual accounts, for which the most recent year available is 2013. Estimated volume of hours for self-employed workers before 1999.

only compares the trend in productivity for industry and market services.

The level and growth of productivity have always been lower in services than in industry. In industry, the average annual growth of hourly productivity dipped from 4.5 % in 1996-2000 to 1.8 % over the recent period encompassing the great recession. In market services, the average annual growth of productivity surged between 2000 and 2004, notably as a result of increased capital intensity, and particularly that relating to investment in ICT (Federal Planning Bureau, 2007), though without surpassing the growth rate in industry. In telecommunications, the average annual growth rate between 2000 and 2004 exceeded 10 %, while it was above 5 % in trade activities over the same period. In financial and insurance activities, that growth exceeded 5 % in the latter half of the 1990s. After that, the average annual growth rate in market services declined, and even became negative between 2008 and 2013. Thus, the initially promising developments could not prevent the downward trend in the growth of productivity gains for the economy as a whole.

5. Estimate of the relationship between activity and employment

As explained in section 3 above and as illustrated in table 1, the growth rates of GDP, employment, and total hours worked follow non-linear, divergent long-term trends. This implies that, in order to study – and above all, measure – the relationships between these variables throughout the business cycle, it is essential to distinguish between the cycle and the trend. That breakdown may operate, for example, for the variables central to chart 1, constituting Okun's law (1962).Okun's law represents the empirical regularity that Okun observed in the relationship between unemployment and real GDP :

$$U_t - U_t^* = \alpha(Y_t - Y_t^*) + \varepsilon_t^{uy},\ \alpha < 0 \qquad (2)$$

where U_t represents the unemployment rate, Y_t the neperian logarithm of real GDP, and U_t^* and Y_t^* the trend value of those variables. The difference between the observed value of a variable and its trend value is that variable's cyclical component, or the gap relating to that variable. The coefficient α therefore describes the sensitivity of the cyclical component of the unemployment rate to a 1 % change in the cyclical component of GDP. Equation (2) above is commonly used to estimate the percentage increase (namely $-1/\alpha$) in real activity above its long-term trend necessary to generate a 1 percentage point fall in unemployment compared to the long-term equilibrium.

That relationship can be deemed to originate from two other empirical relationships found, namely the positive correlation between the cyclical component of employment and that of GDP, and the negative correlation between the cyclical component of employment and that of the unemployment rate :

$$E_t - E_t^* = \beta(Y_t - Y_t^*) + \varepsilon_t^{ey},\ \beta > 0 \qquad (3)$$

$$U_t - U_t^* = \gamma(E_t - E_t^*) + \varepsilon_t^{ue},\ \gamma < 0 \qquad (4)$$

with [1] : $\gamma = \alpha/\beta$ and $\varepsilon_t^{uy} = \varepsilon_t^{ue} + \gamma\varepsilon_t^{ey}$

where E_t represents the neperian logarithm of employment expressed in persons.

There are various ways of making this distinction between trend and cycle. There is a degree of consensus in favour of the method popularised by Hodrick and Prescott [2]. One advantage of that method is that it can explicitly take account of medium/long-term changes in the trend, unlike a growth rate analysis which implicitly presupposes a constant linear trend. This breakdown is illustrated in chart 9 for GDP and for employment.

The difference between the trend and the gross series gives the cyclical component expressed as a percentage deviation from the trend. By construction, it is stationary, oscillating around 0. The joint observation of the cyclical components of employment and real GDP is highly informative :

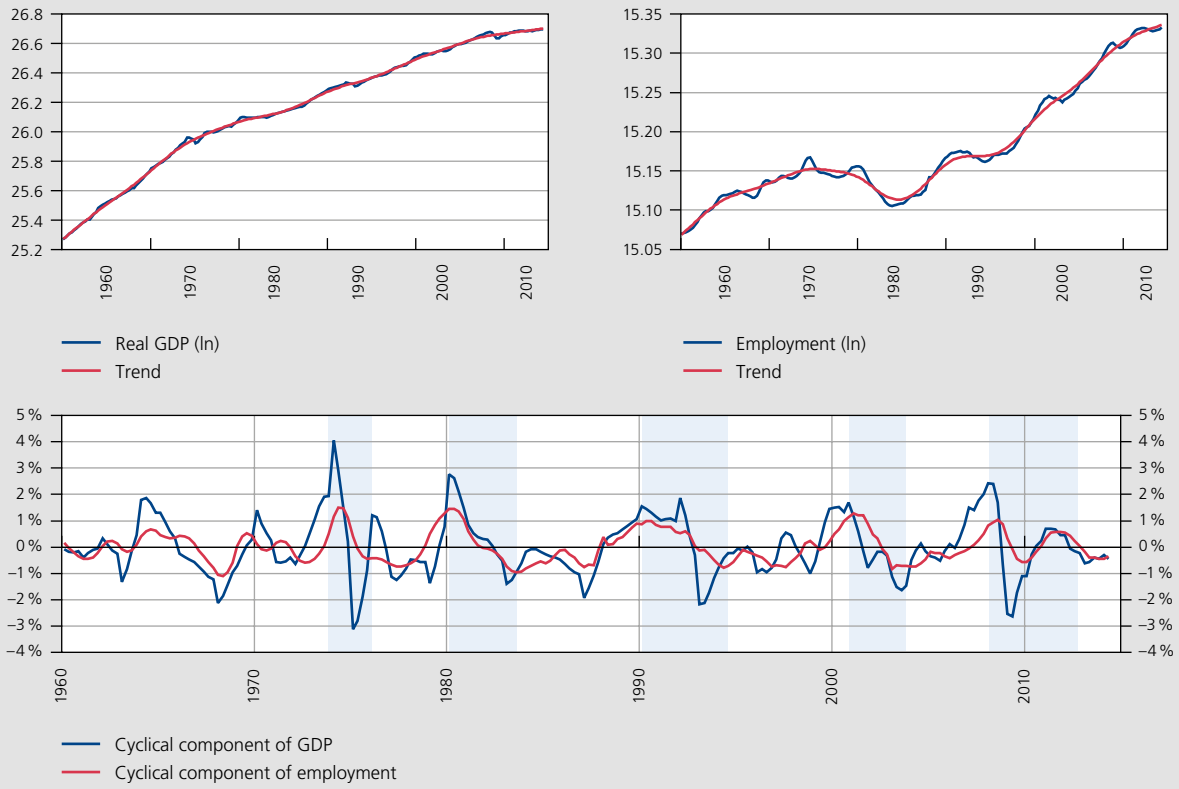
- employment is evidently a delayed pro-cyclical variable, i.e. it lags slightly behind GDP. That characteristic is more obvious than in chart 2, expressed as an annual growth rate. It is also evident that its movements throughout the business cycle are equivalent in amplitude to around two-thirds of the movement in GDP ;
- the closeness of the relationship between employment and GDP may change from one cycle to the next. Let us take the example of the recent double-dip recession in 2008-2010 and 2011-2012. At the time of the financial crisis, the cyclical component of employment produced a delayed and extremely moderate reaction, both in the growth phase and in the contraction phase occurring around 2008. In contrast, at the time of the "aftershock" sovereign debt crisis, employment reacted at the same time as economic activity and in exactly the same proportion.

(1) If the term on the right of equation (4) is replaced by equation (3), that gives an expression equivalent to equation (2). The restrictions mentioned in the text require the estimated system to be consistent with the breakdown envisaged.

(2) The method itself was devised by the mathematician Edmund Whittaker in 1923. It uses a coefficient of penalty λ for the first difference from the trend. That coefficient is usually set at 1600 for quarterly variables, which is what applies here.

CHART 9 TREND AND ECONOMIC CYCLE IN THE CASE OF REAL GDP AND EMPLOYMENT

(neperian logarithm in the upper charts and percentage deviation from the trend in the lower chart. The grey areas correspond to periods of recession)



Sources: OECD, own calculations.

5.1 Estimates for different economies

It must be clearly understood that there can be no question of verifying expressions (2) to (4) from one quarter to the next. For the purposes of the econometric estimation of the coefficients of these equations, namely α, β and γ, it is therefore preferable to use a dynamic specification. By introducing dynamics, it is possible to take account of the fact that the employment cycle lags slightly behind the cycle of real economic activity, as observed above.

$$U_t - U_t^* = \alpha_0 + \alpha_1(Y_t - Y_t^*) + \alpha_2(Y_{t-1} - Y_{t-1}^*) + \alpha_3(Y_{t-2} - Y_{t-2}^*) + \varepsilon_t^{uy} \; ; \; \alpha = \alpha_1 + \alpha_2 + \alpha_3 \qquad (5a)$$

$$E_t - E_t^* = \beta_0 + \beta_1(Y_t - Y_t^*) + \beta_2(Y_{t-1} - Y_{t-1}^*) + \beta_3(Y_{t-2} - Y_{t-2}^*) + \varepsilon_t^{ey} \; ; \; \beta = \beta_1 + \beta_2 + \beta_3 \qquad (5b)$$

$$U_t - U_t^* = \gamma_0 + \gamma_1(E_t - E_t^*) + \gamma_2(E_{t-1} - E_{t-1}^*) + \gamma_3(E_{t-2} - Y_{t-2}^*) + \varepsilon_t^{ue} \; ; \; \gamma = \gamma_1 + \gamma_2 + \gamma_3 \qquad (5c)$$

with $\gamma_3 = [\frac{\alpha}{\beta} - \gamma_1 - \gamma_2]$

The following tables only present the sum of the coefficients associated with the various lags of the explanatory variable, i.e. only the coefficients α, β and γ[1], for ease of interpretation[2].

In order to place the value of the elasticities α, β and γ obtained for Belgium in relation to those of other developed economies, the system of equations (5) was also estimated for some euro area countries (Germany, Spain, Finland, France, Ireland, Italy and the Netherlands), the euro area as a whole, Denmark and the United Kingdom, and the United States. As far as possible, the estimate was based on long quarterly series from the first quarter of 1960 to the second quarter of 2014. However, for some countries the data are not available for the whole period, so that the estimated coefficients are not always entirely comparable. That is the case, in particular, for Ireland

(1) The statistical significance tests also concern the sum of all the partial slope coefficients for each relationship examined.

(2) By estimating the three equations in a single system simultaneously it is possible to impose the theoretical restriction $\gamma = \alpha/\beta$ on the coefficients, whereas that is not necessarily the case if the equations are estimated independently.

TABLE 2 ESTIMATION OF THE ELASTICITY OF UNEMPLOYMENT TO GDP, EMPLOYMENT TO GDP AND UNEMPLOYMENT TO EMPLOYMENT FOR TWELVE DEVELOPED ECONOMIES

Country	Period	Elasticity of unemployment to GDP		Elasticity of employment to GDP		Elasticity of unemployment to employment	
		α	R^2	β	R^2	γ	R^2
Germany	91Q3-14Q2	–0.273** (0.023)	0.505	0.304** (0.024)	0.427	–0.898** (0.065)	0.785
Belgium	60Q3-14Q2	–0.401** (0.020)	0.559	0.512** (0.023)	0.568	–0.783** (0.037)	0.692
Denmark	66Q3-14Q2	–0.348** (0.019)	0.636	0.567** (0.024)	0.599	–0.614** (0.032)	0.686
Spain	76Q3-14Q2	–0.903** (0.044)	0.754	1.302** (0.052)	0.766	–0.694** (0.033)	0.831
Finland	75Q3-14Q2	–0.418** (0.017)	0.715	0.637** (0.020)	0.771	–0.656** (0.025)	0.884
France	66Q3-14Q2	–0.281** (0.013)	0.560	0.462** (0.016)	0.710	–0.608** (0.028)	0.740
Ireland	90Q3-14Q2	–0.387** (0.031)	0.611	0.872** (0.043)	0.648	–0.444** (0.035)	0.848
Italy	60Q3-14Q2	–0.144** (0.014)	0.273	0.318** (0.021)	0.346	–0.453** (0.040)	0.456
Netherlands	60Q3-14Q2	–0.354** (0.018)	0.505	0.468** (0.022)	0.500	–0.756** (0.035)	0.829
United Kingdom	60Q3-14Q2	–0.302** (0.015)	0.656	0.491** (0.019)	0.547	–0.615** (0.028)	0.830
Euro area	70Q3-14Q2	–0.348** (0.013)	0.804	0.571** (0.016)	0.772	–0.609** (0.021)	0.846
United States	60Q3-14Q2	–0.467** (0.014)	0.849	0.824** (0.017)	0.832	–0.567** (0.019)	0.909

Sources: OECD, own calculations.
** indicates a deviation significantly different from zero at the 5 % threshold, * indicates a deviation significantly different from zero at the 10 % threshold, ( ) standard deviations

and Germany and, to a lesser extent, for Denmark, the euro area, Spain and Finland. The estimation periods are reported systematically in table 2.

As expected, table 2 shows that the strongest relationship is between unemployment and employment, as the former merely mirrors the latter via the distorting filter of the job supply, so that the correlation is not perfect. On this subject, it is interesting that the elasticity γ (unemployment-employment) is particularly high in Belgium [1]. This is probably due to the system of unemployment benefits with no time limit (at least until recently); as a result of that system, within the population of working age, the numbers joining or leaving the labour force are relatively few, which implies a relatively non-cyclical job supply.

The column showing the elasticity of employment to GDP indicates that employment is more sensitive to fluctuations in economic activity in the United States (0.82) than in the euro area (0.57). In the core European countries, namely Belgium, the Netherlands, France and the United Kingdom, that elasticity is very uniform, hovering around 0.5.

In principle, a country with a flexible (rigid) jobs market typically has a high (low) elasticity of employment to GDP. For most countries in the sample, the ranking is not too surprising, with the notable exception of Spain which emerges as the champion in terms of job market flexibility [2], and Germany at the other end of the spectrum. Until the recent reforms, the Spanish employment market

(1) The figure for Belgium is 0.8, only exceeded by Germany at 0.9. However, the figures calculated for Germany are not entirely comparable owing to a much shorter estimation period.
(2) The fact that the estimated elasticity is significantly greater than one for this country is troubling, and indicates that the labour market is to say the least atypical.

exhibited a marked division between highly protected jobs, on the one hand, and fixed-term or agency jobs offering employers massive flexibility. Presumably, the latter cushion shocks in either direction and are responsible for the great sensitivity of employment to the economic cycle. The very low sensitivity of German employment to economic activity may seem surprising, but it is necessary to bear in mind that the sample is much shorter than for the other countries since it begins in 1990, i.e. just as the country embarked on the process of reunification. Apart from Spain, it is the United States and Ireland that clearly have the most dynamic labour market (since the 1990s). They are followed by the Scandinavian countries and, finally, the old European countries, with Italy trailing behind with a job market particularly insensitive to the economic cycle.

5.2 Robustness of the estimate of the relationship between employment and GDP

Before going any farther in this international comparison, it is appropriate to question the robustness of these estimates. The robustness of these estimated elasticities can first be assessed with the aid of a binary variable D_{85}, which takes the value 0 before the first quarter of 1985 and the value 1 from that date onwards. It thus allows the period observed to be divided into two more or less equal halves. That date also corresponds to a spate of labour market liberalisation measures in various economies. The employment-GDP relationship presented in the above system of equations (5b) is re-estimated by allowing the partial slope coefficients to change in the second half of the estimation period:

$$E_t - E_t^* = \beta_0 + \beta_1(Y_t - Y_t^*) + \beta_2(Y_{t-1} - Y_{t-1}^*) + \beta_3(Y_{t-2} - Y_{t-2}^*) + D_{85}\,[\,\beta_4(Y_{t-1} - Y_{t-1}^*) + \beta_5(Y_{t-1} - Y_{t-1}^*)\,\beta_6(Y_{t-2} - Y_{t-2})] + \varepsilon_t^{ey} \quad (6)$$

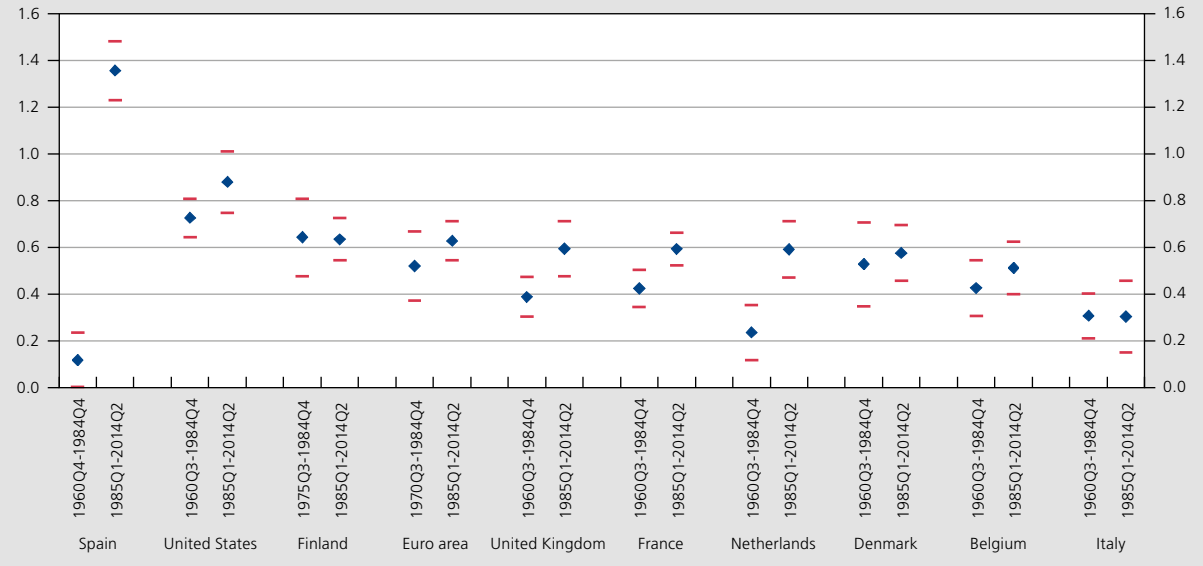
with $\beta = \beta_1 + \beta_2 + \beta_3$ and $\beta_{D85} = \beta_4 + \beta_5 + \beta_6$

The coefficient β indicates the elasticity of employment to GDP during the first half of the period examined, while the sum of $\beta + \beta_{D85}$ gives that same elasticity during the second half of the period (1). The results obtained for the ten economies with a sufficiently large sample are set out in chart 10. There are two lozenges corresponding to each country, representing β and $\beta + \beta_{D85}$ respectively, while the red lines above and below correspond to the confidence interval of 95 % around these estimates. Overlapping confidence intervals should be interpreted as meaning that there is no statistically significant structural change at the 5 % threshold

(1) It could be said that by considering only the sum of the partial slope coefficients, we are only testing an overall structural change, but it is perfectly possible that, although this overall coefficient did not change after 1985Q1, the dynamics were affected, i.e. the relative weight of GDP and GDP after a lag of one or two quarters. This study does not address that type of structural change.

CHART 10 TEST FOR A STRUCTURAL CHANGE IN THE EMPLOYMENT-GDP RELATIONSHIP AROUND 1985Q1

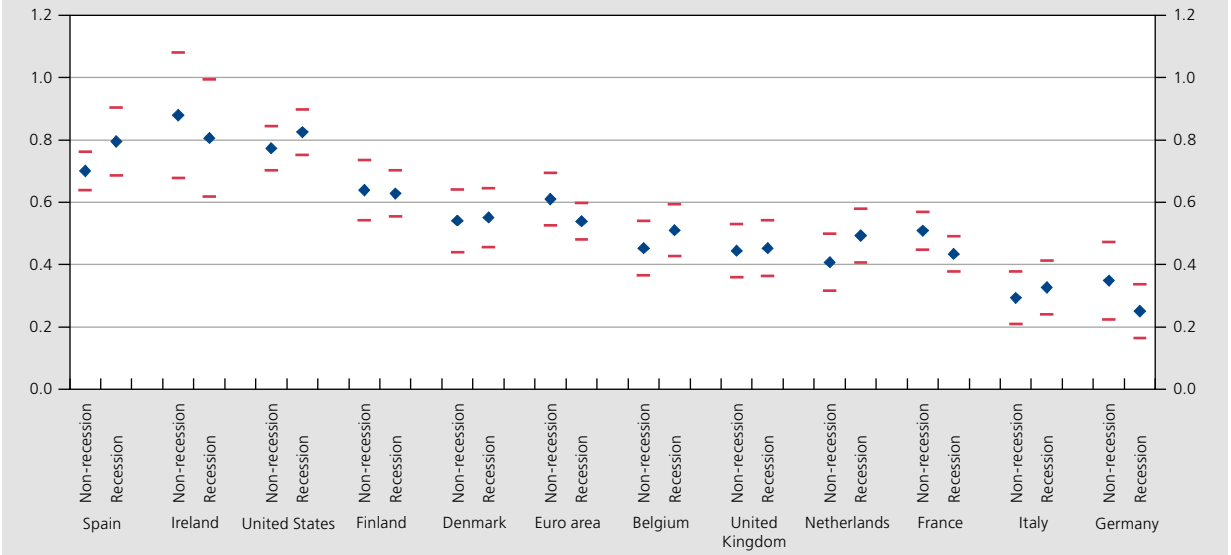
(the red lines correspond to confidence intervals of 95 % on either side of the estimated elasticities, represented by the lozenges)



Sources: OECD, own calculations.

CHART 11 TEST ON THE EFFECT OF RECESSIONS ON THE ELASTICITY OF EMPLOYMENT TO GDP

(the red lines correspond to confidence intervals of 95 % on either side of the estimated elasticities, represented by the lozenges)



Sources: OECD, own calculations.

in the employment-GDP relationship. The countries are ranked in descending order of employment-GDP elasticity estimated for the second half of the period observed.

In general, the estimated elasticity of employment to GDP is slightly greater for the second half of the sample. However, that difference is not significant for six out of ten countries, the exceptions being Spain, the Netherlands, France and the United Kingdom. The specific case of Spain is readily explained by Francoism, a degree of labour market liberalisation and the pursuit of European integration. The case of France has already been highlighted by Blanchard and Cohen (2004); it corresponds to the easing of constraints on the labour market and on job security. The Netherlands also introduced fundamental labour market reforms following the crisis of the 1980s; the reforms were apparently more drastic than those in the United Kingdom during the Thatcher era[(1)].

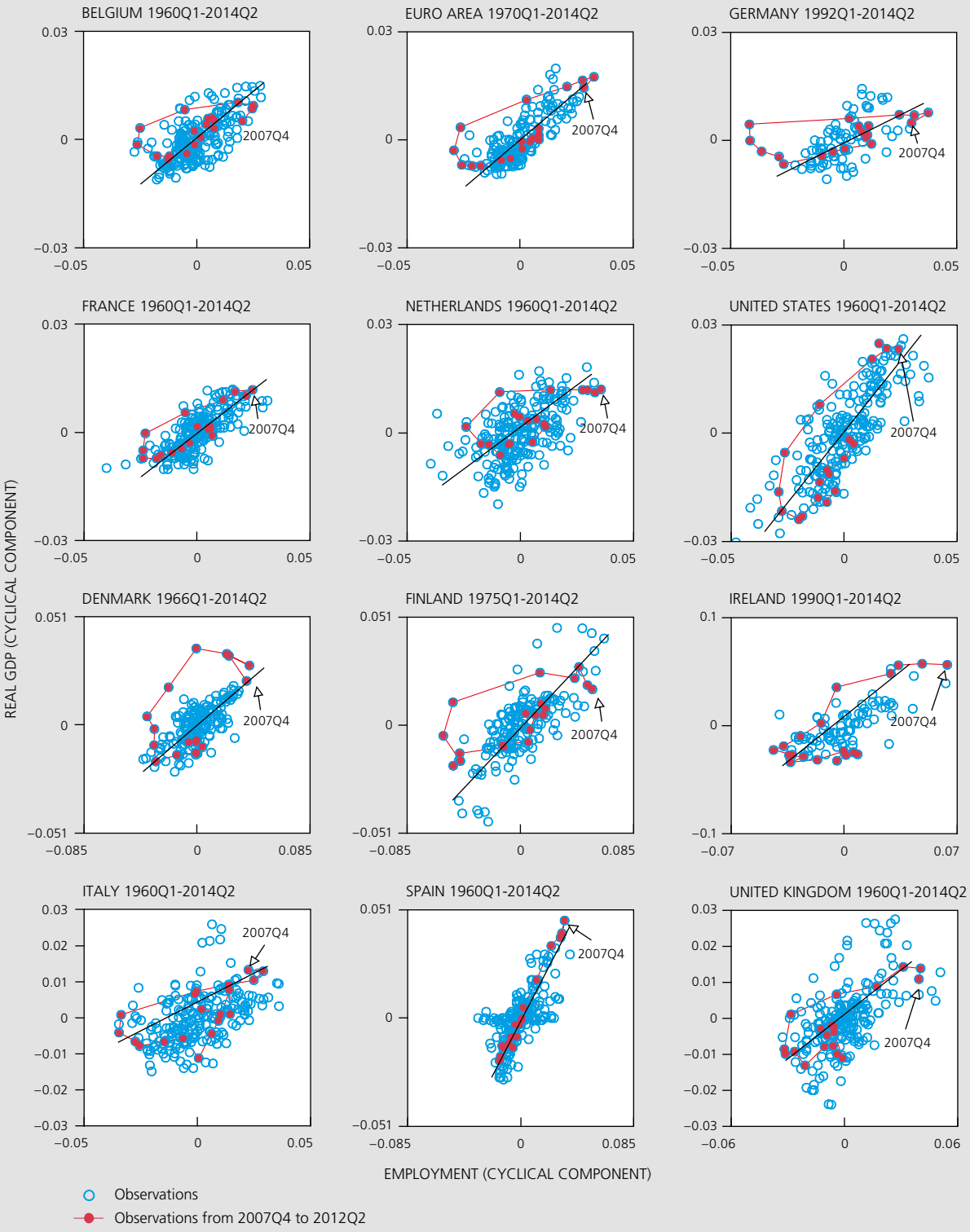
The above observations are unaffected if account is taken of a possible change in the relationship between employment and GDP in the mid-1980s. After 1985, the 95 % confidence intervals show that there is no statistical difference in this elasticity between Belgium, Denmark, France, Finland, the United Kingdom and the euro area as a whole. Finally, as regards the elasticity of employment to GDP, Belgium is particularly similar to Denmark, another small, very open economy which was also hard hit by the second oil shock. That comparison may appear flattering, since Denmark is the country with "flexible security", but it is also fallacious since it is valid only for the relationship between employment and GDP. If the level of the unemployment rate and the average duration of unemployment are considered, those two parameters are much lower in Denmark.

A second robustness test can be conducted at the level of the symmetry of the relationship between employment and growth according to whether or not the economy is in recession. For that purpose, we consider five economic crisis episodes:

- 1973Q3-1976Q1: first oil crisis;
- 1980Q1-1983Q3: second oil crisis;
- 1990Q2-1994Q3: banking crisis in Finland and Sweden (1990-1993) and EMS crisis (1992-1993);
- 2001Q1-2003Q2: technology stocks crisis and repercussions of the New York terrorist attacks on the air transport sector and others;
- 2008Q1-2012Q4: financial crisis and sovereign debt crisis.

(1) If longer series had been available for Ireland, a marked structural change would also have been identified for that country, which undertook fundamental structural reforms from the late 1980s and especially in the early 1990s.

CHART 12 SCATTER DIAGRAMS FOR THE CYCLICAL COMPONENTS OF EMPLOYMENT AND REAL GDP, SHOWING OBSERVATIONS RELATING TO THE LATEST RECESSION



Sources: OECD, own calculations.

These periods are somewhat arbitrary in that the recession episodes may vary from one economy to another. However, they were chosen to be long enough so that each sub-period offered an adequate degree of freedom and so that each one covered the interval between the peak and the trough for every country. The test follows exactly the same procedure as the previous one, The only difference is that, in equation (6), the binary variable D_{85} is replaced by a binary variable $D_{recession}$, which takes the value 1 in the quarters included in the above list of recessions and the value 0 elsewhere. The result is shown in chart 11.

A quick glance is enough to confirm that the relationship between employment and growth is not generally affected by crisis episodes. It is not surprising that the business cycle has no influence here, since Okun's law and its corollaries express a long-term relationship. However, each recession phase is different, being caused by different types of shock, and it is conceivable that the relationship between employment and GDP may be affected temporarily from one crisis or one country to another. In particular, at the time of the recent "great recession" various countries, including Belgium, made much of their policies aimed at preserving jobs. Did they actually work? Chart 3 above has already given an illustration for Belgium, while chart 12 tries to extend the analysis to all twelve economies under review.

For each economy considered, the chart presents a scatter diagram illustrating the statistical relationship between the cyclical component of real GDP, on the x axis, and the cyclical component of employment, on the y axis. For each country, a scatter plot emerges with a positive slope, synthesised by the ordinary least squares regression line passing through it, with a slope equal to the elasticity calculated in table 2 above. These blue scatter plots look fairly homogenous, but that impression disappears if the plots corresponding to the last recession are highlighted. For all the countries included here, those observations take the form of a spiral, i.e.:

– at first, the employment-GDP relationship appears to be greatly attenuated, with GDP falling (movement towards the left) and employment not responding (the movement is almost horizontal). That movement towards the left edge of the scatter plot is initiated from an area close to the regression line;
– after several quarters of weak or zero reaction, employment declines, often at a time when the fall in GDP has ceased, triggering a vertical downward movement;
– once it stops falling, employment stabilises while GDP edges very gradually back up towards its central trend, causing a return to the right, towards the centre of the scatter plot;
– this to and fro movement is typical of the first crisis period. The aftershock crisis in the form of the sovereign debt crisis has a very different profile. This time, employment contracts at the same time as GDP, along a slope identical with the slope of the regression line, or even more steeply.

Does this visual observation correspond to a statistically significant change in the slope? Are these phenomena also apparent in other recession episodes? To answer those questions, we need to conduct a new test on structural change, this time, separately for each recession [1]. For the twelve economies considered, the elasticity of employment to GDP is re-estimated with a binary variable for each recession episode described above, namely the variables D_1, D_2, D_3, D_4 and D_5. That gives the following expression [2]:

$$E_t - E_t^* = \beta_0 + \beta_1(Y_t - Y_t^*) + \beta_2(Y_{t-1} - Y_{t-1}^*) + \beta_3(Y_{t-2} - Y_{t-2}^*) + \Sigma_{i=1}^{5} [\beta_{1Di} D_i(Y_t - Y_t^*) + \beta_{2Di} D_i(Y_{t-1} - Y_{t-1}^*) + \beta_{3Di} D_i(Y_{t-2} - Y_{t-2}^*)] + \varepsilon_t^{ey} \quad (7)$$

with: $\beta = \beta_1 + \beta_2 + \beta_3$ and $\beta_{Di} = \beta_{1Di} + \beta_{2Di} + \beta_{3Di}$ (i = 1, 2, 3, 4, 5)

D_i: binary variable taking the value 1 in the quarters corresponding to the recession i (i = 1, 2, 3, 4, 5), and the value 0 elsewhere.

The estimated coefficient β gives the sensitivity of employment to economic activity outside recession periods, while the coefficients β_{Di} estimate the extent to which crisis *i* affects that elasticity. If they deviate significantly from 0, that implies that this recession did actually change the relationship between employment and GDP. Table 3 offers more information concerning chart 11. For the twelve economies considered, it contains the results of the estimated deviations of the employment-GDP elasticity compared to non-recession periods. The figures marked with one asterisk correspond to coefficients significantly different from 0 at the 10 % threshold, while those marked with two asterisks are significantly different at the 5 % threshold. The countries were ranked from the one with the smallest number of recession episodes associated with a significant change in elasticity to the one with the largest number. The following points emerge from observation of this table:

(1) Not forgetting the structural change identified in 1985 for the four countries concerned.
(2) For completeness, it must also be pointed out that, for the economies which saw a significant structural change in the relationship between employment and GDP in the mid-1980s (see chart 10), an additional binary variable is included in the regression to take account of that factor.

– chart 11 shows that, taking all crisis episodes together, there is no statistically significant impact on the elasticity of employment to GDP in any country. Conversely, a horizontal reading of table 3 indicates that if the recessions are considered individually, some of them seem to be associated with an employment-GDP elasticity significantly different from the figure estimated for non-crisis periods as a whole. Depending on the recession and the country, the elasticity is sometimes increased and sometimes reduced;
– Belgium and Germany both recorded a considerable increase in the elasticity of employment to GDP at the time of the 2001 recession and a (smaller) reduction in that elasticity during the last recession;
– France seems to be the country with the least constant relationship between employment and GDP;
– a vertical reading of the table reveals that, for any given recession episode, economies may see a considerable change in the elasticity of employment to GDP, but the sign is never the same for all countries, except in the most recent crisis. In fact, there is apparently a consensus concerning the "great recession" in that the elasticity declines significantly (at the 10 % threshold) for seven out of twelve economies, the other five producing no significant change. That confirms the visual impression left by the "spirals" in chart 12;
– the economies in which there was no significant reduction in the relationship between employment and GDP during the last crisis are either the ones where that relationship is extremely robust, such as the United States and Denmark, or the peripheral euro area countries which were more seriously affected by the financial crisis and the sovereign debt crisis.

As already stated, this decline in the elasticity of employment to GDP during the last recession must certainly not be interpreted as a permanent structural change since, during the period from the first quarter of 2008 to the last quarter of 2012, the employment-GDP relationship becomes very flat at first, reverting to its original form or

TABLE 3 DEVIATIONS IN THE ELASTICITY OF EMPLOYMENT TO GDP FOR EACH RECESSION EPISODE COMPARED TO NON-RECESSION PERIODS

Country	Period	Recession episodes					
		73Q3-76Q1	80Q1-83Q3	90Q2-94Q3	01Q1-03Q3	08Q1-12Q4	R^2
United States	60Q3-14Q2	0.012 (0.080)	0.000 (0.070)	0.155 (0.160)	–0.008 (0.154)	0.153 (0.108)	0.855
Denmark	66Q3-14Q2	–0.056 (0.199)	0.052 (0.153)	0.102 (0.153)	–0.014 (0.247)	0.023 (0.096)	0.675
Italy	60Q3-14Q2	–0.148 (0.103	–0.074 (0.107)	0.526** (0.138)	–0.102 (0.222)	0.019 (0.110)	0.450
Spain	76Q3-14Q2	0.284** (0.134)	–0.118 (0.364)	0.006 (0.102)	–0.0036 (0.277)	0.067 (0.120)	0.858
Ireland	90Q3-14Q2	n.	n.	0.440** (0.225)	–0.174 (0.327)	0.083 (0.154)	0.705
Germany	91Q3-14Q2	n.	n.	0.117 (0.155)	0.405** (0.145)	–0.173** (0.073)	0.573
Euro area	70Q3-14Q2	–0.125 (0.092)	–0.057 (0.110)	0.271** (0.071)	0.043 (0.119)	–0.198** (0.061)	0.847
Belgium	60Q3-14Q2	0.091 (0.110)	0.192* (0.116)	0.071 (0.101)	0.423** (0.177)	–0.153* (0.092)	0.660
Netherlands	60Q3-14Q2	0.039 (0.123)	0.359** (0.095)	0.163 (0.124)	–0.030 (0.146)	–0.245** (0.067)	0.624
Finland	75Q3-14Q2	–0.248 (0.197)	–0.212 (0.169)	0.232** (0.066)	–0.398** (0.191)	–0.240** (0.061)	0.867
United Kingdom	6073-14Q2	–0.188* (0.112)	0.135 (0.100)	0.170 (0.104)	–0.394* (0.207)	–0.249** (0.090)	0.703
France	6073-14Q2	–0.123** (0.057)	–0.218** (0.121)	0.151* (0.069)	0.047 (0.102)	–0.204** (0.058)	0.810

Sources: OECD, own calculations.
** indicates a deviation significantly different from zero at the 5 % threshold, * indicates a deviation significantly different from zero at the 10 % threshold, ( ) standard deviations

even becoming more marked when the second recession follows the first. It is as if, during the initial crisis, firms had withstood the blow fairly well and protected jobs by drastically reducing the hours worked and productivity. That was possible so long as the firms' financial health was sufficiently good. Conversely, when the recession returned in 2011, bankruptcies were more numerous[1] and firms responded immediately, not just by ending recruitment but also by making workers redundant. This bears out the observations made earlier.

6. Some sectoral estimates for Belgium

Following the international comparison exercise which enabled us to place Belgium in relation to other developed economies, it is interesting to go back to a sectoral analysis like the one in section 4 above. The data series available for the main economic sectors (value added and employment) are considerably shorter, not starting until the first quarter of 1995. The economic sectors considered are agriculture, construction, manufacturing, market services and non-market services. In addition, agriculture, construction, manufacturing and market services are aggregated in a "sector sensitive to the business cycle" or a "market sector", as opposed to non-market services.

(1) In Belgium, bankruptcies were around 25 % higher in the period 2011-2012 than in 2008-2009.

This sectoral exercise is also an opportunity to take another look at the relationship between the volume of hours and economic activity. We have already said that the hours worked are used partly as an adjustment variable to remedy the lack of response by employment in terms of persons throughout the economic cycle. What does that mean exactly? Use of the data on total hours worked, available for the main Belgian economic sectors, makes it possible to consider a system of equations very similar to the system (5a)-(5b)-(5c) set out above. This time, it is a system of equations which can be used to estimate the relationships between the cyclical components of real value added (*Y*) and employment in persons (*E*) and in volume of hours worked (*TH*):

$$E_t - E_t^* = \beta_0 + \beta_1(Y_t - Y_t^*) + \beta_2(Y_{t-1} - Y_{t-1}^*) + \beta_3(Y_{t-2} - Y_{t-2}^*) + \varepsilon_t^{ey}; \beta = \beta_1 + \beta_2 + \beta_3 \quad (8a)$$

$$TH_t - TH_t^* = \eta_0 + \eta_1(Y_t - Y_t^*) + \eta_2(Y_{t-1} - Y_{t-1}^*) + \eta_3(Y_{t-2} - Y_{t-2}^*) + \varepsilon_t^{th,y}; \eta = \eta_1 + \eta_2 + \eta_3 \quad (8b)$$

$$E_t - E_t^* = \theta_0 + \theta_1(TH_t - TH_t^*) + \theta_2(TH_{t-1} - TH_{t-1}^*) + \theta_3(TH_{t-2} - TH_{t-2}^*) + \varepsilon_t^{e,th}; \theta = \theta_1 + \theta_2 + \theta_3 \quad (8c)$$

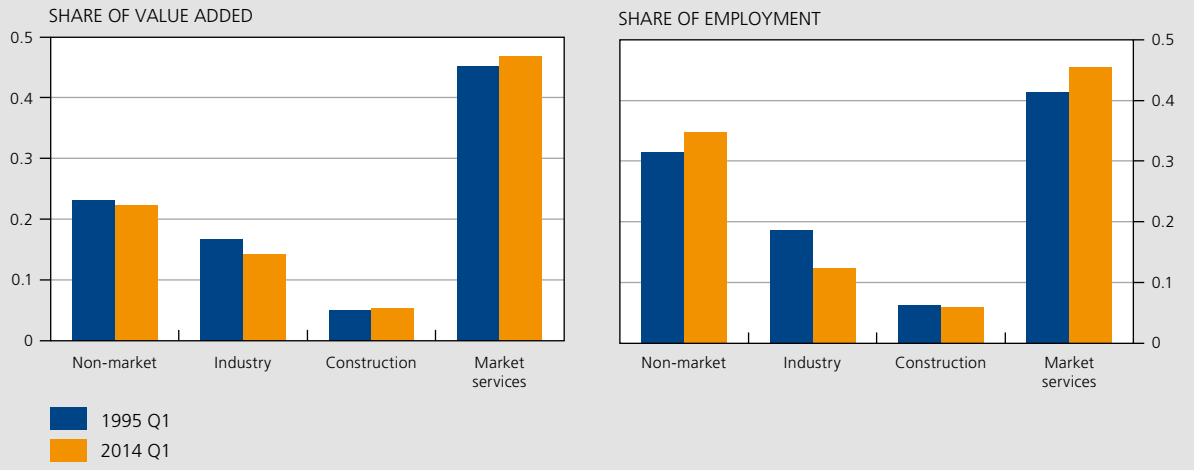
The system of equations is estimated subject to the restriction $\theta_3 = \beta/\eta - \theta_1 - \theta_2$, so that $\theta = \beta/\eta$, which ensures that the system is consistent, when viewed as a breakdown of the relationship between employment and value added into a relationship between the volume of hours to value added and a relationship between employment to the

TABLE 4 ESTIMATED ELASTICITIES OF EMPLOYMENT TO VALUE ADDED, HOURS TO VALUE ADDED, AND EMPLOYMENT TO HOURS IN THE MAIN SECTORS OF ACTIVITY IN BELGIUM

Period 1995Q3-2014Q2	Elasticity of employment to value added		Elasticity of hours to value added		Elasticity of employment to hours	
Sector	β	R^2	η	R^2	θ	R^2
Agriculture	0.000 (0.009)	0.017	0.076 (0.102)	0.147	0.061 (0.079)	0.058
Construction	0.369** (0.040)	0.415	0.523** (0.048)	0.565	0.704** (0.072)	0.530
Industry	0.451** (0.037)	0.521	0.676** (0.045)	0.718	0.670** (0.051)	0.880
Market services	0.617** (0.048)	0.602	0.873** (0.057)	0.630	0.713** (0.052)	0.837
Sector sensitive to the business cycle	0.619** (0.038)	0.676	0.921** (0.046)	0.773	0.668** (0.040)	0.901
Non-market services	0.282** (0.049)	0.178	0.408** (0.063)	0.291	0.687** (0.089)	0.662

Sources: NAI, own calculations.
** indicates a deviation significantly different from zero at the 5 % threshold, * indicates a deviation significantly different from zero at the 10 % threshold, ( ) standard deviations

CHART 13 BREAKDOWN OF VALUE ADDED AND EMPLOYMENT BETWEEN THE MAIN SECTORS OF ACTIVITY IN BELGIUM BETWEEN 1995Q1 AND 2014Q1



Source : NAI.

volume of hours. The estimate results are presented in table 4.

This table shows that the cyclical component of employment is twice as sensitive to the cyclical movement in value added in the market sector compared to the non-market sector, confirming the impression obtained from chart 6 above. A more detailed breakdown within the sector sensitive to the business cycle produces the following findings :

- as expected, agriculture is highly atypical with employment hardly sensitive at all to value added. This confirms that, in this sector, labour is needed to produce the output but the volume of that output will ultimately depend on climatic conditions and global agricultural markets. This sector represents only a very marginal share of the economy, namely 0.6 % of total value added and 1.4 % of employment ;
- otherwise, construction is the sector where employment is least sensitive to value added, just behind industry, whereas employment in market services is the most sensitive to fluctuations in economic activity ;
- it is noticeable that the elasticity of total hours to value added is roughly one and a half times the elasticity of employment to value added ($1/\theta$). That ratio is extremely robust, both in international comparisons (not shown here) and between economic sectors, except for agriculture. The hours per worker are therefore more sensitive to cyclical variations and, as one might expect, do not appear to be a lagged variable, unlike employment ; that confirms the descriptive analysis in chart 5 above.

At this point, it could be interesting to link the cyclical analysis to the longer-term picture. While the contribution to value added by each of the main economic sectors was very stable over the period 1995-2014, the apportionment of jobs between the sectors was much less constant, as mentioned above and illustrated in chart 13 below. Employment is very clearly shifting from the industrial sector to the market and non-market service sectors, in equal shares. If that trend continues, we cannot expect the reallocation of economic activity between the sectors to result in any change, in the medium-long term, in the elasticity of employment to GDP at the level of the Belgian economy as a whole. The elasticity in the industrial sector is in fact the average of the elasticities of the market and non-market service sectors (see table 4). However, that would no longer be true if the deindustrialisation were to take place in favour of one services sector rather than the other.

7. Conclusion

The essential finding of this study is that the growth of productivity has tended to slow down over the past three decades. After allowing for that fundamental tendency, examination of the picture for the whole business cycle shows that the relationship between employment and growth appears broadly stable over time and is generally unaffected by recessions. In Belgium in particular, it is estimated that, in terms of deviation from their respective trends, a 1 % rise in GDP brings a 0.5 % increase in

employment. These figures are in line with the European average. However, it must be pointed out that this stable relationship between employment and growth may conceal a variation in job "quality", as part-time jobs are constantly expanding.

The downward trend in productivity is accompanied by a shift to the tertiary sector of the economy, i.e. workers are switching from the manufacturing sector to the market and non-market services sectors. That shift to the services sector is part of the reason for the decline in productivity and the fall in the average working time. If that trend persists, it should not in principle affect the relationship between employment and economic activity across the business cycle, since the estimated employment-value added elasticity for the manufacturing sector is the average of that same elasticity calculated for market and non-market services.

Although the relationship between employment and GDP is very stable across the business cycle, it is nevertheless noteworthy that, at the time of the recent financial crisis, in the twelve economies studied, there was at first a general tendency to protect jobs. However, that tendency soon ended and normality was restored; if employment is struggling to pick up, that is essentially because of the weakness of the economic recovery.

Finally, focusing on the volume of hours worked rather than the number of persons in work shows very clearly that firms prefer to respond to fluctuations in the economy by adjusting the intensive margin of the production factor labour.

Having established these findings, we must draw the necessary conclusions for economic policy. First, if the problem identified is indeed a downward trend in productivity, the solution lies in effective structural policies on education, innovation and investment in intangible assets and innovative technologies in cutting-edge sectors. Next, what kind of employment market do we want? Although an increase in the reaction of employment to economic growth would mean that workers would enjoy the benefits of an economic upturn sooner, it would mean more job losses in a recession. Is that desirable in view of the cost of unemployment in terms of destruction of human capital and wealth in general? Also, if we limit fluctuations in employment too much by using the margin of working time, is there not a risk of penalising first-time participants[1], by delaying recourse to them in a recovery phase and taking on fewer of them in a recession period[2]? It is likewise important to remember that there is an intrinsic equality problem in the cyclical fluctuation in employment since, all other things being equal, the least-skilled workers will be the first to be affected by the recession, be it in terms of jobs or hours worked. Finally, the study establishes the link between employment and growth across the business cycle, but the question of an efficient labour market also involves structural unemployment and how to absorb it. That complex problem requires the activation of numerous levers at the level of both labour market institutions and the taxation of production factor incomes.

(1) And outsiders in general.

(2) On this subject, it is interesting that, at the time of the last recession when employment was initially protected in all the economies, the outcome was a large rise in unemployment among young people, while those over the age of 50 were significantly less affected.

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