

## ANALYSIS OF COMPOSITION EFFECTS ON WAGE BEHAVIOUR

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### Introduction

In the Spanish labour market, characterised by high labour market inflows and outflows,<sup>1</sup> aggregate wage behaviour may be significantly affected by changes in the composition of employment. This effect may have been particularly important in the period dating from 2008, in which the marked job destruction has been concentrated in lower skilled and in less experienced workers whose average wage is below the Spanish average. It is therefore important to isolate the mechanical changes which this phenomenon may have caused in wages, in order to determine accurately how wages have responded to economic developments.

Table 1 shows that the changes in the composition of employment since 2008 have been extremely sharp and generally skewed towards a significant loss in the relative weight of lower-paid workers. For example, the share of younger workers in total employment fell by nearly 9 percentage points (pp) between 2008 and 2012, and that of foreign workers dropped by nearly 2 pp in the same period. Similarly, the fall in employment was particularly pronounced in workers with a lower educational level, the proportion of which dropped from 14.8% in 2008 to 10.2% in 2012. Finally, in terms of work experience, the share of workers with fewer years of service in the firm decreased sharply, reflecting the greater impact of the crisis on temporary jobs. Specifically, the share of workers with more than three years experience expressed as a percentage of total employment increased from 61.7% in 2008 to 73% in 2012.

In aggregate wage statistics (those normally used for economic analysis), such large changes in the composition of employment may give rise to relatively significant statistical effects which have to be taken into account when attempting to make a precise diagnosis on the behaviour of labour costs and their relationship with the cyclical situation. However, estimating these effects requires disaggregated information on the wage received by each worker, as well as the characteristics of the incumbent and of the job held. This article estimates these composition effects in the private sector of the economy using data from the social security administrative labour records (*Muestra Continua de Vidas Laborales*, hereafter “MCVL” by its Spanish abbreviation), which provides such information up to 2012 for a representative sample of social security records.<sup>2</sup>

The rest of the article is organised as follows. The second section briefly summarises the methodology used to estimate the aforementioned composition effects. The third section sets out the main results of the exercise and analyses the relative contribution of each of

1 See, for example, ECB (2012) or Fernández and Izquierdo (2013).

2 The MCVL provides individual information for 4% of the individuals having a relationship with the social security system in the relevant year. This information includes the contribution base (a good proxy of wage) and information on gender, age, work experience, nationality, contribution group (which serves as a proxy of occupational skills), contract type and economic sector. It should be taken into account that the data used relate to contribution bases and therefore do not allow wages above the maximum contribution base to be distinguished, so the results should be interpreted with due caution. In any event, this problem does not seem to be quantitatively significant because the aggregate contribution bases evolve similarly to wages in the National Accounts and, moreover, the results do not change if the individuals located at the aforementioned ceiling are excluded from the analysis. For more details on the characteristics of the MCVL, see Argimón and González (2006).

		2006	2008	2010	2012
By gender	Male	59.5	57.9	55.8	54.6
	Female	40.5	42.1	44.2	45.4
By age	Age 16-34	40.1	38.0	33.5	29.3
	Age 35-44	27.9	28.4	29.8	31.0
	Age 45-54	20.8	21.9	24.1	25.6
	Over 55	11.1	11.7	12.7	14.1
By educational level	Low	15.8	14.8	12.8	10.2
	Medium	61.5	61.8	61.1	61.6
	High (university)	22.7	23.5	26.1	28.2
By nationality	Spanish	87.5	85.5	86.2	87.3
	Foreign	12.5	14.5	13.8	12.7
By years of service	Less than 6 months	13.7	11.9	9.9	9.1
	6 months to 2 years	18.5	18.8	13.7	12.3
	2 to 3 years	7.0	7.6	7.6	5.6
	More than 3 years	60.8	61.7	68.9	73.0

SOURCE: INE (EPA).

the employment characteristics considered. Finally, the fourth section sets out some brief conclusions.

#### Brief description of the methodology used

In this study wage behaviour, after controlling for changes in the composition of employment, is estimated using an econometric model which allows us to estimate the relationship between wages, proxied by contribution bases, and a set of worker characteristics. In particular, for each year  $t$ , the following model is used:

$$W_{it} = f_t(X_{it}) + \varepsilon_{it}$$

where  $i$  represents an individual,  $W_{it}$  the logarithm of real wages<sup>3</sup> and  $f_t(X_{it})$  denotes the part of wages that is explained by workers' individual characteristics. In particular, included in  $X_{it}$  are worker gender, age,<sup>4</sup> contribution group<sup>5</sup> and years of service to the firm.<sup>6</sup> In this exercise we opted to estimate the impact of individual characteristics on wages in a flexible manner and thus made use of dummy variables covering all the possible combinations of age group, gender, experience and occupational skills. In this way account is taken not only of the direct effect which, for example, experience has on wages, but also of how that effect may vary depending on, for example, skills.<sup>7</sup> This estimated relationship between wages and worker characteristics is used below to predict the wage which individuals would have in year  $t+1$  if that functional relationship remained unchanged:

$$\hat{W}_{it+1} = f_t(X_{it+1})$$

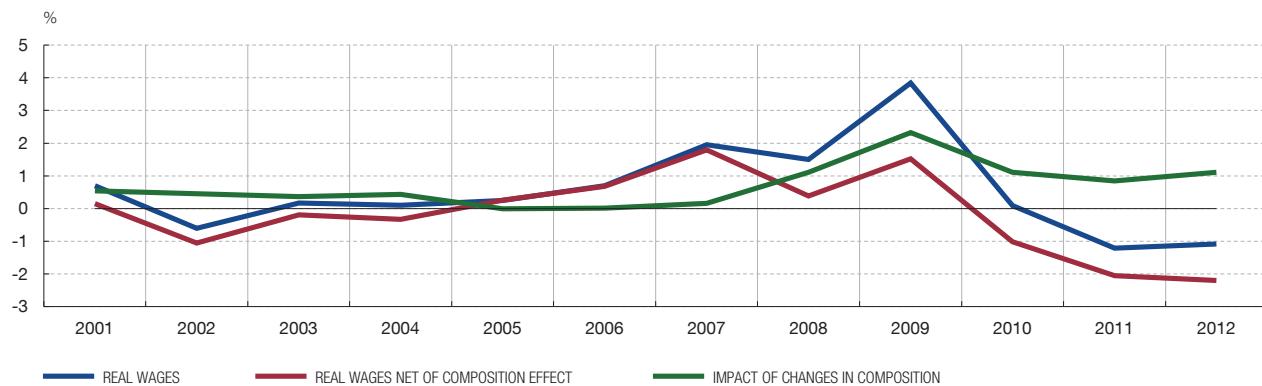
3 Deflated using the overall CPI for each period.

4 Four age groups are distinguished: age 16 to 34, 35 to 44, 45 to 54 and over 55.

5 To proxy occupational skill level, use has been made of the contribution group in which the worker is registered in the social security system, distinguishing four categories: groups 1-2 (highest skills, including university graduates and diploma-holders), 3-4, 5-8 and 9-11 (lowest skilled, including manual workers).

6 In this case four categories are also distinguished: less than half a year in the job position, from 0.5 to 1.5 years, from 1.5 to 3 years, and over 3 years.

7 Also, an additional dummy variable denoting whether the individual is Spanish or not has been introduced. The nationality variable has been included separately in the estimate because for certain combinations of the other variables the number of observations of foreign workers is too low for an accurate estimate.



SOURCE: Ministry of Employment and Social Security.

That is to say,  $\hat{W}_{it+1}$  denotes the wage level which would be observed in year  $t+1$  given the characteristics of the workers employed in that year and provided that the remuneration of those characteristics remains unchanged and equal to that of year  $t$ . The impact of composition effects on aggregate wage behaviour can be estimated through the difference between  $\hat{W}_{it+1}$  and  $W_{it}$ , since in both cases the same functional form is used ( $f_t$ ), but the individual characteristics observed are different. Meanwhile, the difference between the wages observed at  $t+1$  ( $W_{it+1}$ ) and the estimated wage level  $\hat{W}_{it+1}$  may be interpreted as the wage variation after stripping out composition effects, since in both cases workers' individual characteristics are the same, but not so the remuneration associated with each characteristic.

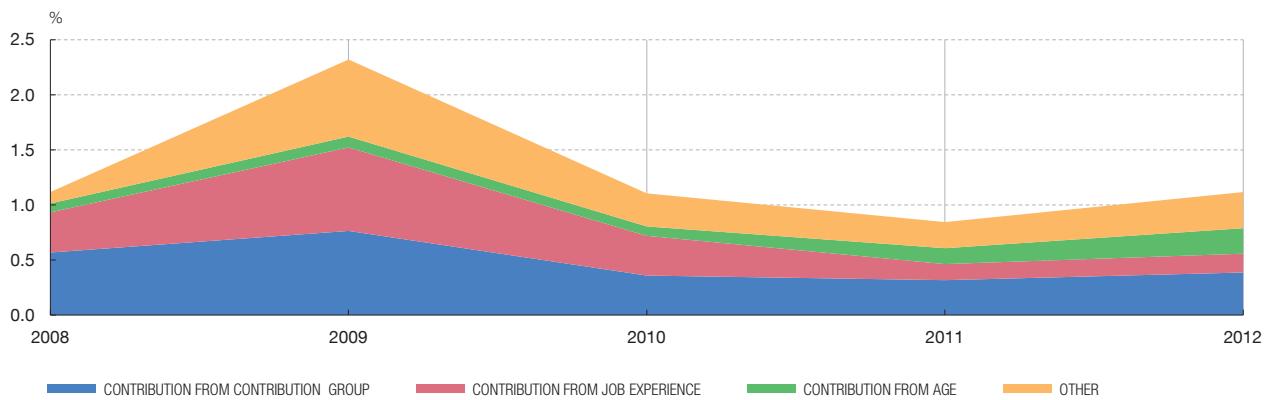
#### Impact of changes in the composition of employment on wages

Chart 1 shows the results of the exercise for the period 2001-2012. Three variables are plotted for each of these years. First, wages in real terms estimated using the average contribution bases taken from the MCVL; second, the estimated impact of changes in the composition of employment on wages; and, finally, the change in real wages net of these composition effects.

The average contribution bases in real terms rose from 2006 in the private sector of the economy, after having remained steady in the preceding years. Subsequently they embarked on a progressive moderation. This behaviour is broadly consistent with that indicated by other information sources, such as the remuneration per employee according to the National Accounts. The results shown in Chart 1 suggest that changes in the composition of employment played a significant role in this wage behaviour. In particular, from 2008 onwards, and coinciding with the process of job destruction, the contribution of the estimated composition effects began to increase significantly. On average in the period 2008-12, composition effects contributed 1.3 pp each year to the observed increase in contribution bases. Overall, this result is consistent with the changes in the characteristics of the employed population due to the economic crisis, i.e. basically a higher relative weight of the groups of workers with higher average remuneration.

Chart 1 also shows that, even when these effects are stripped out, wages rose in real terms in the initial phase of the crisis, and only from 2010 did they begin to behave more in line with the cyclical weakness of the labour market.

Given the importance of the estimated composition effects, it is of interest to analyse the relative contribution of the different characteristics to the behaviour of wages. To do so, we



SOURCE: Muestra Continua de Vidas Laborales (social security administrative labour records).

repeated the exercise, successively excluding each of the characteristics considered. The difference between the results so obtained and the previously estimated total effect is a measure of the relative contribution of each characteristic.

Chart 2 sets out the main results of this exercise for the three most significant variables in the analysis: age, experience and skills.<sup>8</sup> It can be seen that, in the three cases, the impact of the changes in the composition of employment on wages has been clearly positive, as evidenced by the increase in the groups with a higher relative wage. There are, however, some differences in the successive phases of the crisis. Specifically, in the initial years the changes in the average experience of workers had a stronger positive effect, reflecting the high destruction of temporary employment in that period. The changes in average skills followed a more stable course, although they too were particularly significant between 2008 and 2010. Finally, the changes in the composition by age had less impact on aggregate wage behaviour, although their contribution grew throughout the period.

## Conclusions

In the last few years the changes in the composition of employment have been marked and the relative weight of more highly trained and experienced workers who, on average, receive higher wages, has increased. These changes in the composition of employment have played a notable role in aggregate wage behaviour and may, depending on the methodology used, explain a part of the increase in real wages early in the crisis, although the net increase in wages from these effects was still positive, despite the sharp deterioration in employment. The process of wage moderation initiated in 2010 may be somewhat sharper than is indicated by the aggregate statistics on labour costs.

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<sup>8</sup> The contributions of gender and nationality are very small. They are included in the "other" category, as are all interactions between the excluded variable and the others.