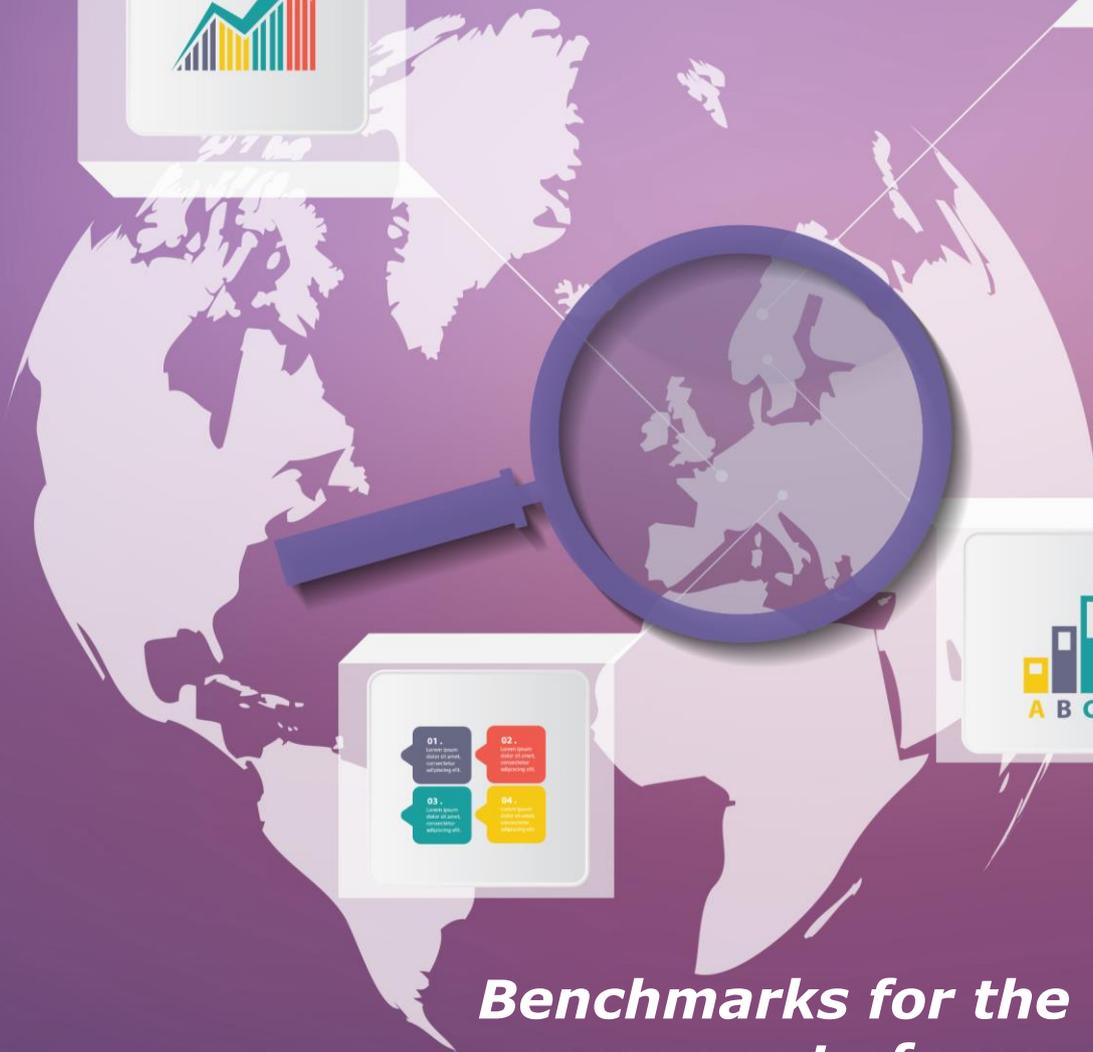
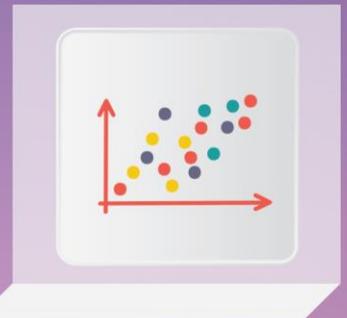


# Analytical Web Note 2/2015



## ***Benchmarks for the assessment of wage developments: Spring 2015***

*By Alfonso Arpaia and Aron Kiss*

Authors: Alfonso Arpaia and Aron Kiss  
Labour Market Reforms Unit, DG Employment and Social Affairs

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# Benchmarks for the assessment of wage developments: Spring 2015

*The analysis of wage benchmarks serves as an input for the assessment of wage developments from a cost competitiveness perspective. The analysis shows a significant wage restraint after the crisis, in particular in countries where unemployment is high. These developments have been supportive of both internal and external adjustment needs, in particular over the period 2012-2014.*

## 1. Introduction

Assessing whether wage and labour cost developments support macroeconomic rebalancing in the EU is an important task for country surveillance in the framework of the European Semester. To this end it is necessary to identify whether wage and labour cost developments reflect changes in underlying variables, contribute to the macroeconomic adjustment or are a source of potential macroeconomic imbalances. The assessment relies on a comparison of actual wage developments with hypothetical benchmarks consistent with Member States' internal or external economic equilibrium. This comparison should be seen as only one element of the complex assessment of economic imbalances and competitiveness. It also needs to be kept in mind that all benchmarks are based on simplifying assumptions and leave out factors that may be relevant for some countries. Finally, benchmarks look only at one aspect of wage developments and do not explore their impact on the demand factors of consumption or investment. The interplay of wages with these macroeconomic aggregates is an important topic that lies outside the scope of the present note. It is ideally treated in general-equilibrium modelling frameworks or empirically with multiple time-series methods which are able to capture complex dynamic relationships.

Three benchmarks for wage developments, based on a standard framework, are considered.<sup>1</sup> The first one is a benchmark for wage growth consistent with internal labour market conditions. It is calculated as the wage growth predicted on the basis of changes in labour productivity, prices and the unemployment rate. The second benchmark is closely related to the first one but it relates to the level of wages. It is calculated as the wage level predicted on the basis of the level of productivity, prices and the unemployment rate. The third benchmark is relevant for external equilibrium. It is computed as the wage growth consistent with a stable evolution of cost competitiveness (real effective exchange rate based on unit labour costs).

The note presents results obtained based on annual macroeconomic data from Eurostat and the European Commission's AMECO database for the period of 1995-2014. It is a contribution to the assessment of macro-economic imbalances, updated annually.

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<sup>1</sup> The analysis is based on the methodology laid out by Koltay (2013).

## 2. Assessing wage developments against fundamentals

Nominal wage growth is first compared to a benchmark reflecting internal labour market equilibrium. A dynamic wage equation is estimated based on the notion that there is an equilibrium relationship between the level of nominal wages, the price level, labour productivity, and the unemployment rate to which nominal wages tend to converge even if there are transitory shocks that divert wages from their equilibrium. This relationship implies that when the labour market is in equilibrium, and the unemployment rate is unchanged, the wage share remains constant, too.

The estimation is done in two steps. In the first step, a reduced-form wage equation is estimated in levels. Country fixed effects are included in the regressions to capture time-invariant country specific features. This allows for the possibility that the equilibrium rate of unemployment or the wage share differs across countries, perhaps because of specialisation, technology or institutions. Country fixed effects also control for potential statistical differences between countries. The first step equation is used to compute the predicted wage level of countries based on their economic fundamentals: the price level, productivity and the unemployment rate. This first step equation is sometimes called the 'co-integrating relationship' (*à la* Engle and Granger) and is interpreted as the long-term equilibrium relationship.

Results of the first-step estimation for three country samples (OECD, the EU 28, and the euro area [EA] 18) are presented in Table 1. Wage levels are very closely associated with prices and labour productivity in the long run (see Table 1). The estimated coefficient of the price level is about 0.9 for the OECD sample and about 1.1 for the EU and EA samples. While the difference from 1 is relatively small, it is statistically significant at the 5% level in all three cases. The point estimates of the coefficient of productivity are between 0.8 and 0.9, not statistically significantly different from 1. The unemployment rate has a negative effect on the long-term level of wages. The estimated coefficient suggests that a one percentage point increase in the unemployment rate is associated with a 0.5% lower wage level. This elasticity is comparable but slightly lower than that found in the previous literature.<sup>2</sup>

In the second step, it is estimated how wage growth depends on the *change* of underlying economic determinants, including the deviation of the wage level from its estimated equilibrium level. Several theories of wage determination (e.g., Blanchard, 2006) predict that wage growth depends positively on price and productivity growth and negatively from the increase in unemployment. Also, it is expected that the wage level shows convergence to its equilibrium level, so that a deviation of the wage level from its long-term equilibrium triggers a dynamics toward that level. It is for this feature that the second-step equation is called '*error-correction model*'.

Contrary to the first-step regression, the second-step regression (i.e. explaining short-term dynamics of wages) does not include country fixed effects. It can be reasonably expected that price and productivity developments, together with the deviation from the country-specific equilibrium wage level, are sufficient determinants of wage developments. This means that, while the level of the wage share may be different across countries, changes in the wage share are on average similar across countries,

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<sup>2</sup> Compared to other studies, the specification used in this note is in a semi-logarithmic, rather than log-log, form. Thus, the elasticity of wages to unemployment needs to be transformed to be comparable. According to the survey of Blanchflower and Oswald (1995) and Blanchflower (2001), a 1% (not percentage point!) increase in unemployment is associated, in many countries, with a 0.1% fall in wages. This note estimates that a 1% increase in unemployment is associated with a 0.05% fall in wages if the initial unemployment rate is 10%.

as expected in case of an integrated economic area. Thus, unexplained country-specific components in wage growth are interpreted as deviations from the benchmark, rather than be explained by country effects.<sup>3</sup>

Results of the second-step estimation of the determinants of short-run wage dynamics are presented in Table 2. Wages and prices move very closely together, also in the short run. The estimated coefficient of inflation on wage growth is about 1 for the OECD, 1.1 for the EU and 1.2 for the euro area sample, but it is statistically significantly different from 1 only in the case of the EU sample. The relationship between wages and productivity is somewhat weaker than in the long-run: only about one half of short-term changes in productivity translate into wages. Wage developments are negatively affected by the unemployment rate also in the short run. The estimated effect is close to the long-run estimate: a one percentage point increase in the unemployment rate is associated with slower wage growth of about 0.3-0.5%. Finally, the error correction term is estimated to be near -0.2 for the EU28 and euro area samples, which indicates that wages tend to move towards their long-term equilibrium level (as estimated in the first step). It is estimated that about one-fifth of the gap between the actual and equilibrium wage levels is closed in one year (i.e. the gap is closed in 5 years). A somewhat slower convergence is estimated for the OECD sample.

Graphs 1 and 2 compare actual nominal wage growth in Member States to the estimated benchmarks. Up to the financial crisis, wage growth in most countries did not diverge substantially from the prediction based on fundamentals. Wage growth was often lower than predicted in Austria, Bulgaria, Finland, Italy, Spain, and, from 2003, in Germany and Poland; in contrast wage growth was consistently higher than the benchmark in Greece, Hungary, Lithuania, the UK, and for some years in the Czech Republic, Estonia, and Latvia.

With the crisis, predicted wage growth fell considerably in 2009 in light of the sudden drop in productivity and the increase in unemployment. As productivity rebounded in 2010, benchmark wage growth recovered, outpacing actual wage growth in most countries. Graph 1 and 2 also indicate a marked adjustment in wages post-2008 in a number of countries, including Greece, Ireland, Portugal, Spain and the UK, but also the Czech Republic, Hungary, Lithuania, Poland and Slovakia among the New Member States. Table 4 presents the gap between the actual wage growth and the internal benchmark for all EU Member States for the years 2012-2014.

### 3. Assessing wage levels across countries

Important complementary information is provided by benchmarking wage levels. The wage level benchmark is based on the first-step wage regressions described in the previous section. This means that it is based on the assumption that wages in each country varied around their equilibrium level over the course of the sample period (1995-2014).<sup>4</sup> Misalignments that may have persisted over 20 years are filtered out. This is likely not an overly strong assumption, given that this period covers about two full business cycles.

Graph 3 shows the gap between the actual wage level and the level benchmark for the period of 1995 to 2014. A number of observations can be made. The largest volatility

<sup>3</sup> Empirically, country fixed effects are not jointly statistically significant in the second stage regression. The corresponding F-test has a p-value of 0.23 in the regression shown in column (2) of Table 2.

<sup>4</sup> In technical terms, this means that, because of the inclusion of country fixed effects, the average gap between actual wages and the benchmark equals zero over the sample period for each country.

of wage levels relative to the benchmark can be observed in the Baltic countries, where a large gap built up before the crisis, while a significant adjustment took place after 2009. In these countries and Bulgaria, an increasing trend of wages relative to benchmark can be observed, while the opposite trend of prolonged wage moderation can be seen overall in the case of Austria, Germany, Hungary, Poland and Slovakia.

For a number of countries, the gap between actual wages and the benchmark exhibits a sudden increase in 2009, at the onset of the crisis. This is the artefact of labour hoarding: production fell more abruptly than employment, reducing productivity and thus predicted wages. In some countries this effect dissipates quickly either due to rebounding employment or wage moderation (e.g., Austria, Denmark, Germany, Greece, Ireland, the Netherlands, Portugal, Slovakia, Slovenia, Spain), while in other countries part of the increase in the gap remained in the medium term (e.g. in Finland, France, Italy, Luxembourg, Sweden).

## **4. Assessing wage developments against external cost competitiveness**

The second wage benchmark is informative of the pressures that stem from current account adjustment. The real effective exchange rate (REER) based on unit labour cost (ULC) is a weighted average of one country's currency relative to a basket of its main competitors adjusted for the effects of differential inflation of unit labour costs. It is a key component of external performance. The benchmark is the wage growth consistent with unchanged REER. It permits to assess whether, keeping labour productivity and unit labour cost developments in partner countries unchanged, developments in nominal labour cost (both its wage and non-wage component) are consistent with unchanged costs competitiveness. When actual nominal wage growth is below the benchmark, cost competitiveness improves; the opposite occurs when it is above benchmark.

This is only one of possible benchmarks against which one can assess cost competitiveness adjustment needs. In some cases desirable developments in price competitiveness need not imply constancy of the REER. For example, countries that need to correct current account imbalances and improve their net foreign assets position will have to deviate from a constant REER, keeping ULC growth below the constant REER benchmark (e.g., Giavazzi and Spaventa 2010). Similarly, if a country has stronger productivity growth in the tradable sector than partner countries, the REER would appreciate due to rising wages throughout the economy (this is the so-called Balassa-Samuelson effect), but without significant implications for the export performance. For these reasons, this benchmark should be read together with a broader set of indicators that are informative of the overall external competitiveness.

Graphs 4 and 5 compare the actual growth of nominal compensation per employee and the constant-REER wage benchmark. At first sight, it is clear that this benchmark can yield different results from the one relevant for the internal equilibrium presented above. It is also apparent that the benchmark based on a constant REER is more volatile than the internal-equilibrium benchmark, as the external benchmark needs to reflect not only changes in relative price and productivity, but also of the nominal exchange rate.

Regarding country-specific developments, the chart shows sizeable wage adjustment occurring since 2010 in several vulnerable countries, including the Baltics, Greece, Cyprus, Spain, Ireland, and to a lesser extent Portugal. On the other hand, over the

2012-2014 period, a positive gap between the actual wage growth and the external benchmark is observable for a number of countries, including those with a current account surplus. Table 4 presents the gap between the actual wage growth and the external benchmark for all EU Member States for the year 2012-2014.

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## Annex A: Tables

**Table 1: Long-run wage equations, 1995-2014**

	(1)	(2)	(3)
Dependent variable: Log nominal compensation per employee	OECD countries	EU-28	EA-18
Log CPI	0.914*** (0.031)	1.098*** (0.039)	1.113*** (0.053)
Unemployment rate	-0.005*** (0.001)	-0.005*** (0.002)	-0.006*** (0.002)
Log labour productivity	0.877*** (0.129)	0.828*** (0.103)	0.835*** (0.155)
Constant	-4.456*** (0.592)	-5.241*** (0.354)	-5.353*** (0.542)
Observations	564	520	342
R-squared	0.971	0.974	0.961
Number of countries	31	28	18

**Notes:** Estimation method: Fixed effects. Standard errors clustered by country in parentheses. Asterisks mark estimated parameters that are significantly different from zero at the 1% (\*\*\*), 5% (\*\*), or 10% (\*) level. Chile, Israel and Mexico were excluded from the OECD sample for missing data.

**Data sources:** Nominal compensation per employee, total economy: European Commission DG ECFIN AMECO database. CPI, 2000=100, source: AMECO. Unemployment rate, source: Eurostat. Productivity: GDP / total employment. GDP source is AMECO; total employment source is Eurostat for EU-28 countries and OECD for non-EU members.

**Table 2: Dynamic wage equations, Error Correction Model, 1995-2014**

	(1)	(2)	(3)
Dependent variable: $\Delta$ log nominal compensation per employee	OECD countries	EU-28	EA-18
$\Delta$ log CPI	0.973*** (0.019)	1.140*** (0.043)	1.180*** (0.155)
$\Delta$ unemployment rate	-0.003* (0.001)	-0.004** (0.002)	-0.005** (0.002)
$\Delta$ log labour productivity	0.363*** (0.071)	0.535*** (0.059)	0.445*** (0.074)
Error correction term	-0.132*** (0.020)	-0.216*** (0.039)	-0.218*** (0.023)
Constant	0.007*** (0.002)	0.002 (0.002)	0.002 (0.003)
Observations	533	492	324
R-squared	0.882	0.775	0.621

**Notes:** Estimation method: Pooled least-squares estimation. Standard errors clustered by country in parentheses. Asterisks mark estimated parameters that are significantly different from zero at the 1% (\*\*\*), 5% (\*\*), or 10% (\*) level. Chile, Israel and Mexico were excluded from the OECD sample for missing data.

**Data sources:** Nominal compensation per employee, total economy: European Commission DG ECFIN AMECO database. CPI, 2000=100, source: AMECO. Unemployment rate, source: Eurostat. Productivity: GDP / total employment. GDP source is AMECO; total employment source is Eurostat for EU-28 countries and OECD for non-EU members.

**Table 3. Gap between actual wage growth and internal wage growth benchmark**

	2012	2013	2014
Austria	-0.9%	-1.1%	-2.0%
Belgium	-0.5%	0.8%	-0.3%
Bulgaria	3.3%	7.4%	4.1%
Croatia	-3.0%	-1.9%	-4.2%
Cyprus	-1.6%	-3.6%	-2.4%
Czech Republic	-2.3%	-2.3%	0.2%
Denmark	-1.4%	0.1%	0.2%
Estonia	0.5%	3.6%	7.6%
Finland	-0.1%	0.4%	0.2%
France	0.3%	1.0%	1.1%
Germany	-1.7%	-1.4%	-0.7%
Greece	-2.3%	-6.2%	-2.5%
Hungary	-4.8%	-3.0%	0.5%
Ireland	-1.9%	1.0%	0.8%
Italy	-1.0%	-0.1%	0.7%
Latvia	0.7%	5.9%	6.2%
Lithuania	-2.8%	0.3%	1.4%
Luxembourg	0.6%	1.3%	1.3%
Malta	1.2%	-1.5%	-0.8%
Netherlands	0.5%	-0.1%	-0.8%
Poland	-3.4%	-1.8%	-1.7%
Portugal	-5.6%	0.9%	-1.8%
Romania	4.9%	-2.9%	-4.0%
Slovakia	-3.6%	-1.9%	0.1%
Slovenia	-3.1%	-0.9%	-2.5%
Spain	-2.7%	-0.5%	-0.9%
Sweden	3.0%	2.7%	3.2%
United Kingdom	-1.3%	-1.9%	-0.4%

**Note:** The internal benchmark is a prediction based on the estimation presented in column (2) of Tables 1 and 2 and depicted in Graphs 1 and 2. Wages is measured as nominal compensation per employee (source: AMECO).

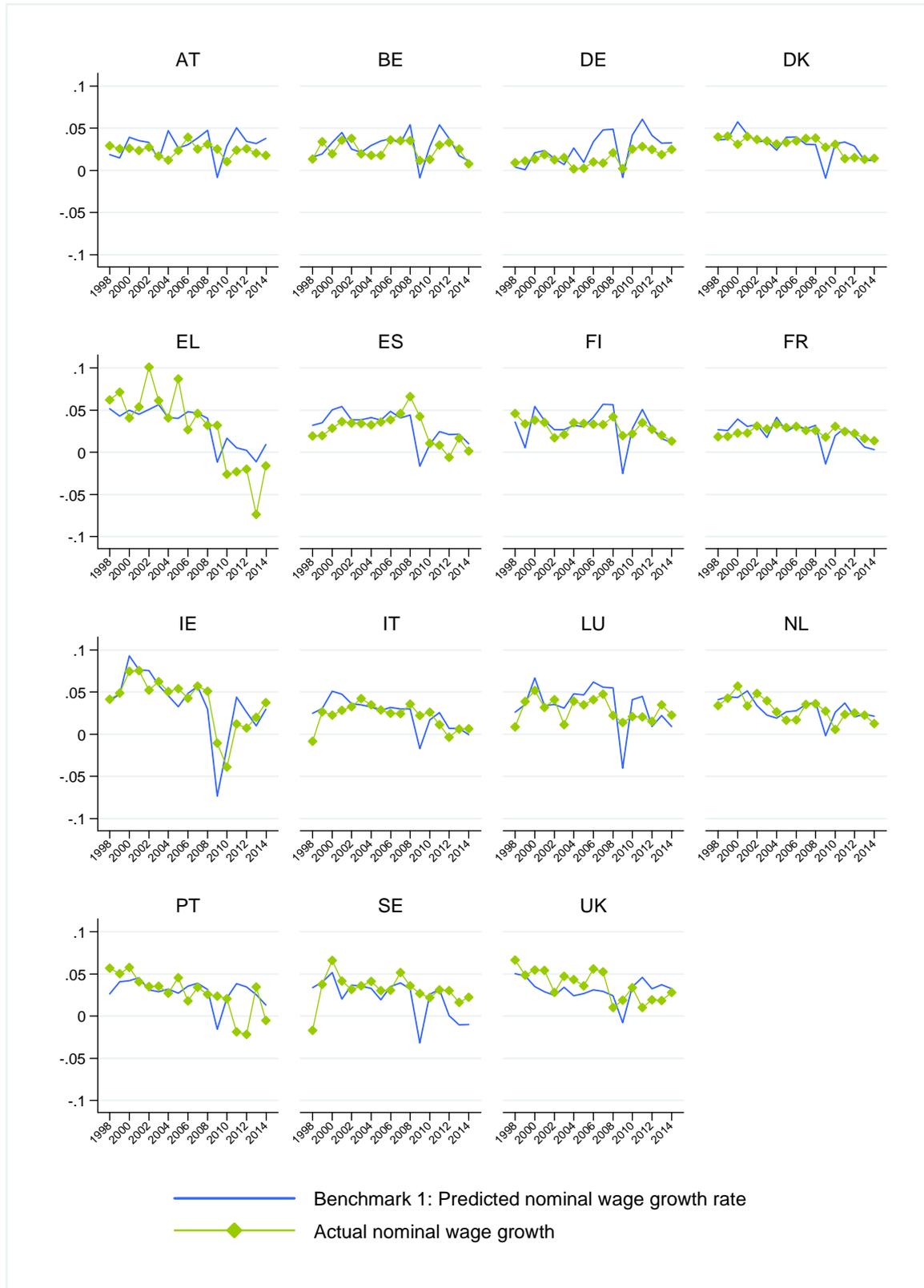
**Table 4. Gap between actual wage growth and external wage growth benchmark**

	2012	2013	2014
Austria	-0.6%	3.2%	1.8%
Belgium	-0.7%	3.0%	-0.6%
Bulgaria	0.9%	7.9%	0.0%
Croatia	-5.8%	-1.1%	-3.8%
Cyprus	-5.5%	-3.1%	-4.6%
Czech Republic	-3.0%	-2.9%	-5.4%
Denmark	-3.1%	3.0%	1.2%
Estonia	-1.5%	6.0%	5.9%
Finland	0.1%	3.4%	1.3%
France	-2.5%	3.0%	0.9%
Germany	-1.1%	4.4%	1.6%
Greece	-7.4%	-6.3%	-1.7%
Hungary	-3.5%	-1.7%	-1.9%
Ireland	-5.0%	6.2%	-0.3%
Italy	-2.6%	2.2%	0.8%
Latvia	-0.1%	6.1%	3.6%
Lithuania	-1.9%	2.6%	2.4%
Luxembourg	0.1%	3.7%	0.7%
Malta	0.3%	2.3%	0.8%
Netherlands	-0.5%	2.1%	-0.9%
Poland	-3.6%	0.5%	0.3%
Portugal	-5.5%	2.6%	-0.6%
Romania	-5.6%	-0.3%	0.1%
Slovakia	-1.9%	0.0%	1.6%
Slovenia	-2.2%	1.3%	-2.7%
Spain	-6.7%	0.4%	-1.1%
Sweden	2.8%	3.2%	-3.7%
United Kingdom	4.8%	-1.7%	6.4%

**Note:** The external benchmark is depicted in Graphs 3 and 4.

## Annex B: Graphs

**Graph 1: Benchmark for wage growth: prediction from wage equation, EU-15**



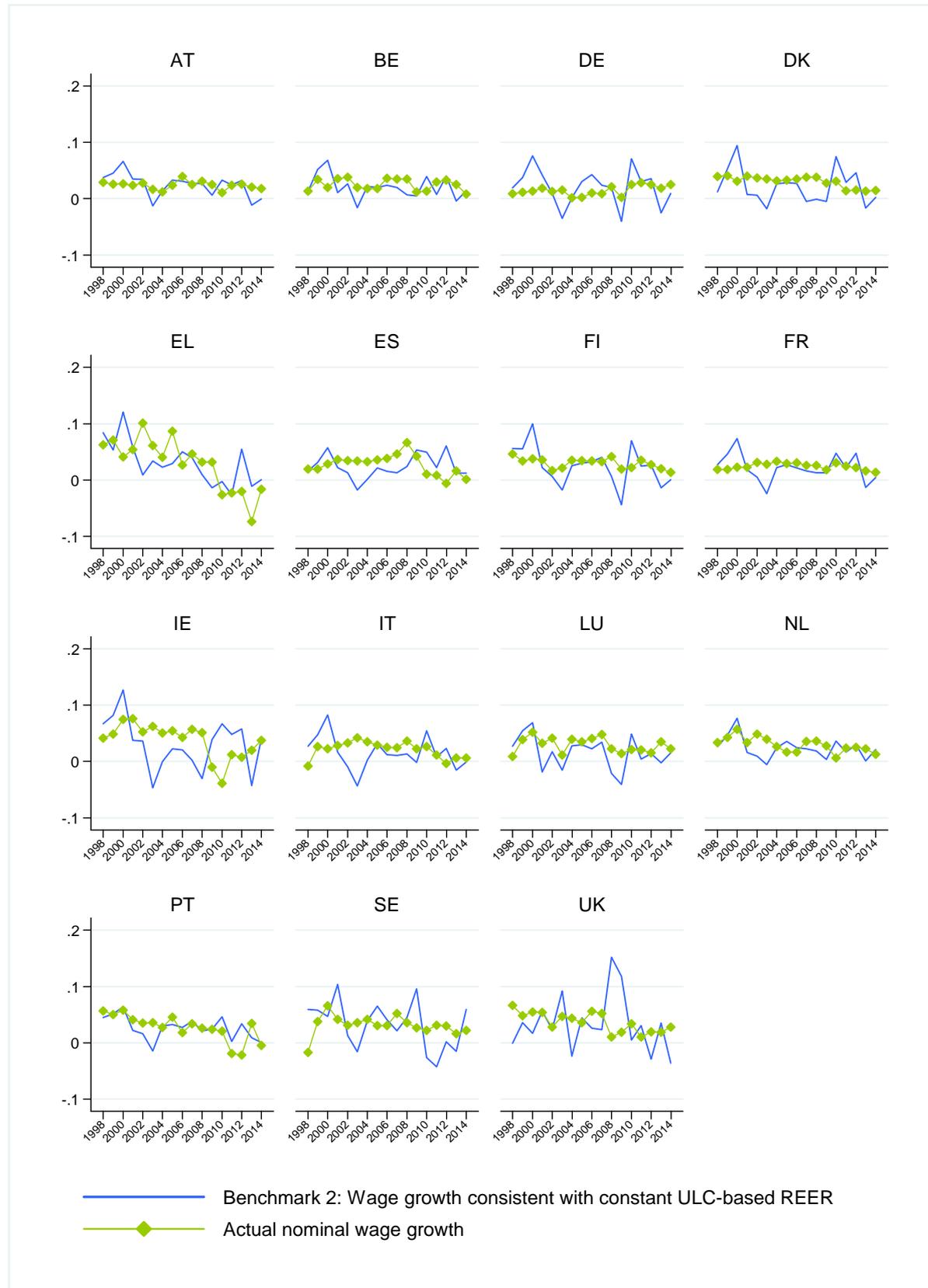
**Graph 2: Benchmark for wage growth: prediction from wage equation, EU-13 (EU member states since 2004 or after)**



**Graph 3: Gap between actual wages and wage level benchmark, 1995-2014**



**Graph 4: Benchmark for wage growth: constant ULC-based REER, EU-15**



**Graph 5: Benchmark for wage growth: constant ULC-based REER, EU-12 (EU member states since 2004 or after)**

