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A forward-looking tracker of negotiated wages in the euro area

Eurosystem wage tracker experts

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Contents

Abstract

This paper introduces innovative, newly developed forward-looking indicators of negotiated wage growth in the euro area using data on collective bargaining agreements from seven countries: Germany, France, Italy, Spain, the Netherlands, Austria and Greece. The paper demonstrates how agreement-level data can be used to study drivers of aggregate negotiated wage growth, as well as monitor the breadth of wage increases and account for time-varying factors such as one-off payments, when assessing wage pressures. Lastly, the paper shows that the new indicators can provide reliable signals about current and future developments of wage pressures in the euro area while also serving as important cross-checking tools for negotiated wage growth forecasts.

Executive summary

This report presents innovative forward-looking wage trackers for the euro area that are based on a newly compiled database of wage agreements. Forward-looking indicators are constructed for the euro area based on seven countries for which wage agreement data are available: the five largest euro area countries (Germany, France, Italy, Spain and the Netherlands) in addition to Austria and Greece. The new indicators closely track the official time series of past realised negotiated wage growth while also providing important and reliable signals of current and near-term developments with respect to wage pressures in the euro area.

The new wage trackers can enhance the analysis of wage developments across multiple dimensions. The database of individual agreements in seven euro area countries sheds light on the extent to which new agreements affect economy-wide wage developments and on how broad-based the pressures are. The data enable the tracking of developments in the latest collective agreements. The relevance of signals from the latest contracts is assessed by combining the data with information on the share of employees covered by agreements that have been renewed within a given period.

Wage trackers focusing on recently concluded agreements have leading properties in signalling turning points of wage growth. Average wage growth in recently signed agreements (to the extent that they cover a substantial share of employees) can provide more timely information on wage pressures than is the case with wage growth that is based on total agreements. This is especially true for collective agreements that are signed for longer than one year, as in many euro area countries. Wage rises agreed in recent negotiation rounds are also a signal of negotiation sentiment and of the direction in which aggregate negotiated wage growth could develop.

A forecast performance assessment demonstrates that forward-looking wage trackers can serve as reliable cross-checking tools for wage-forecasting purposes. This is particularly the case for augmented wage trackers, which are based on country-specific estimations of the role of key macroeconomic variables in predicting the outcomes of wage agreements that are due to expire over the forecast horizon.

Looking ahead, the ECB and National Central Banks (NCBs) plan to further enhance the forward-looking wage trackers and their implementation for assessment and forecasting purposes in the Eurosystem. Planned improvements include extending the database coverage (the number of countries and contracts covered, time span, information on one-off payments and indexation clauses, among other things), establishing representative sectoral wage trackers and using forward-looking wage trackers as input and cross-checking tools for regular wage forecasts in the Eurosystem.

1   Introduction

The importance of labour costs in total costs across many sectors (especially in services) means that wage inflation and price inflation are closely interconnected.[1] Given the role of wages as a fundamental determinant of inflation, one of the key elements in the pursuit of the ultimate monetary policy goal of price stability is a sound and comprehensive analysis of wage pressures.[2]

Collective wage agreements not only provide reliable, timely and forward-looking information about wage pressures but also are useful for assessing and forecasting wage and price pressures, especially in times of high uncertainty. Based on the staggered, infrequent and decentralised nature of wage-setting in euro area countries, monitoring wage agreements[3] can help to assess and forecast wage and price developments. This is even more the case when high inflation – as observed in recent years – raises concerns over the possible emergence of a wage-price spiral.

As wage negotiations are intrinsically forward-looking, ongoing negotiations and newly concluded agreements are informative when it comes to studying the emergence of wage pressures in real time. In this report we show that the information available on individual collective bargaining agreements provides timely signals of wage pressures. First, agreement-level data are used to compute a "forward-looking" wage tracker, i.e. average year-on-year negotiated wage increases going forward as envisaged in collective bargaining agreements currently in effect. Using information on the number of workers covered by individual agreements along with their end dates, the wage tracker also helps to assess the extent to which upcoming wage negotiations that have not yet been concluded can substantially change the wage growth outlook. With this respect, the forward-looking wage tracker can be used to assess the implications of forthcoming wage increases in future negotiations for average negotiated wage growth under alternative assumptions about the negotiation outcomes.

This report presents novel forward-looking wage trackers for the euro area that are based on a newly compiled database of wage agreements. The wage trackers have been constructed for seven euro area countries for which wage agreement data are available: the five largest euro area countries (France, Germany, Italy, Spain and the Netherlands) in addition to Austria and Greece. Taken together, the seven countries covered by the wage tracker account for nearly 90% of total compensation of employees in the euro area. The country wage trackers are aggregated into a forward-looking tracker of negotiated wage growth in the euro area. The report also highlights that these innovative indicators closely track available time series of negotiated wage growth realised in the past while also providing reliable signals of current and near-term developments relating to wage

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[1] See e.g. Lane, P. R. (2023, 6 March), Underlying inflation, Lecture at Trinity College Dublin.

[2] See e.g. Nickel et al. (2019).

[3] Throughout the report, the terms "agreement" and "contract" are used interchangeably.

pressures in the euro area. The new wage trackers also enable the tracking of wage pressures emerging from recently concluded agreements, allow to assess the breadth of wage increases across agreements, and can serve as a tool to analyse the impact of alternative inflation paths on negotiated wage growth going forward. Finally, they help to cross-check projections of negotiated wage growth in the euro area.

This report presents a detailed description of the methodology used to construct the new wage trackers, along with the underlying database. Section 2 reviews the institutional framework for collective bargaining in euro area countries and discusses alternative indicators that are commonly used to assess wage pressures. Section 3 describes the agreement-level database and the methodology developed for constructing wage trackers. Section 4 illustrates how the newly constructed indicators can help to assess current wage pressures emerging from collective bargaining agreements in the euro area. Section 5 demonstrates how the forward-looking wage trackers can help to cross-check wage forecasts. Finally, Section 6 summarises the key findings and presents key conclusions.

2 Wage-setting in euro area countries and the role of negotiated wage growth

2.1 Collective bargaining design and the availability of micro data on wage agreements in euro area countries

Wages in the euro area are predominantly set via collective bargaining.
Collective agreements in the euro area as a whole as well as on average in the five largest economies, cover more than 75% of total employees (Table 1).[4] In three euro area countries (France, Italy and Belgium – Table 1) collective bargaining effectively covers all employees.[5] The automatic or quasi-automatic administrative extension of sectoral wage agreements explains this very large coverage of sectoral wage bargaining. The vast majority of employees are covered in most other countries (Germany, Spain, the Netherlands, Austria, Portugal, Finland, Slovenia and Luxembourg). In countries such as Greece, Slovakia and Lithuania, where only 50% or less of total employees are covered by collective bargaining, firm-level bargaining tends to play a more prominent role than sector-level bargaining.

Collective wage-setting in the euro area is typically staggered, with agreements having an average duration of around two years, albeit characterised by substantial heterogeneity across countries. Wage contracts are usually agreed for a term of one to four years. In Austria the contract duration is typically only one year, while contracts in Germany and the Netherlands tend to run on average for two years. Longer contract durations of three to four years are common in Italy and Spain. In France there is no explicit contract duration. In practice the period between two agreements is generally one year but may vary over time. The one-year average duration is mainly driven by the legal obligation to negotiate wages at least once a year across all sectors, but there is no obligation to reach an agreement (see Fougère et al. 2018 for additional details).

Most countries do not have a wage negotiations calendar. Although, from a statistical point of view, collective wage negotiations for the euro area as a whole tend to be concluded mainly in the first quarter of each year,[6] this strongly reflects developments in France and Spain and Austria.[7] However, in other large countries (e.g. Germany, Italy and the Netherlands) there is no clearly defined calendar for wage negotiations.

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[4] The numbers on coverage also include the public sector for those countries in which wages in this sector are also determined by collective bargaining (see Table 3 for further details).

[5] In France this refers to all employees in the private sector. Wages for public sector employees are negotiated in a separate framework.

[6] See Koester et al. (2020).

[7] See Avouyi-Dovi et al. (2013) for a detailed analysis of wage agreement seasonality and Gautier et al. (2022) for an analysis on how negotiated wage increases are transmitted to actual wages in France. In Spain a portion of the statistically significant increase in registered agreements in the first quarter of the year is attributable to the inclusion of agreements signed in past years and not to the actual timing of negotiations.

Table 1

Overview of wage bargaining systems in selected euro area countries[8]

	Germany	France	Italy	Spain	The Netherlands	Austria	Greece	Portugal	Finland	Belgium	Slovenia	Slovakia	Lithuania	Luxembourg
Collective agreement coverage (of total employees)	51% formal; 73% effective	100%	100%	80%	80-85%	94%	15-20%	85%	90%	100%	68%	50%	15-20%	59%
Average length	Differs by sector (avg: 25 months in 2019, 19 months in 2020 and 24 months in 2021)	No fixed length but usually one year (obligation to negotiate at least once a year)	3 years	Usually 2-3 years (but some agreements 3-4 years)	1-2 years (average 19 months)	12 months (but can also be 24 months)	min 1 year and max 3 years	2/3 of contracts 1 year; 15% 2 years	1-2 years	2 years (starting in odd year)		Usually 1 year but can also be 3-4 years	4 years (in 2021)	2-3 years (3 years is max)
Calendar	No pattern	Most agreements signed in first quarter of the year	No pattern	Usually agreements start on 1 Jan and end on 31 Dec – but often substantial renegotiation lags	Throughout the year - but each kick off in autumn (with wage demand of largest union)	Whole year (metal sector as wage leader usually in November); most agreements start in Jan or May	No pattern	No pattern		Beginning of the odd year (sector level over the course of the first year)	Most agreements start in January		No pattern	Most agreements start in January
Level	Sector-level	Firm- and sector-level	Sector-level	Sector/region (usually sector-province combination)	Sector- and firm level	Sector-level, region-sector-level	Firm-, sector-, national-level	Sector-level	Sector-level	Firm-, sector- and national level	Firm- and sector-level	Firm- and sector-level	Flexible; working time: different levels	Firm- and sector-level
One-offs	Recently very common; often used in times of high uncertainty	Few sectoral agreements include one-offs	One-offs exist but are usually limited	Delays in negotiations can lead to revisions to previous year figures	One-offs are becoming more important	Usually rare but recently more frequent	Limited role			Limited role			Irregular payments account for around 7% of gross earnings	
Use in wage forecasting	Yes	Partially - mainly as cross check	Yes	Yes – key ingredient to wage forecasts	Yes - forward looking indicator/ scenario analyses	Yes	Partially - as cross check	Some	No	Partially as cross check and add. Information	No	No	No	Yes

Source: National Central Banks and ECB - survey questionnaire July 2022 – updated September 2023.
Notes: Data available for 14 countries. Note that the average agreement duration and frequency of one-off payments may vary over the years. The coverage rate of 94% for Austria is based on an analysis conducted by Statistics Austria and is somewhat lower than the OECD's estimate of 98% cited in Table 3. Green is for countries for which the wage tracker is available, yellow for countries for which the wage tracker is being developed and red for countries for which micro data on wage agreements is not available.

The sectoral level is most important for wage bargaining in euro area countries. Sectoral bargaining is important in all euro area countries although here as well there are important differences in the average size of agreements. In Germany, for example, wage bargaining usually focuses on a relatively limited number of large and important sectors, while wage bargaining takes place on a more granular level both in France (where also firm-level bargaining plays an important role and covers about 15% of all employees, mainly in large firms) and in Spain (where sectoral agreements are additionally negotiated at a provincial level).[9] In Italy, despite a large number of agreements (often covering a small number of employees), a large share of workers are covered by sector-specific agreements

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[8] For wage-setting purposes in euro area countries, wage indexation mechanisms and minimum wages also play an important role. For details see the discussion in Koester and Wittekopf (2022) and in Koester and Grapow (2021).

[9] In France there used to be more than 700 different bargaining sectors, some of which covered a very small number of employees; however, many small bargaining sectors have been merged with larger ones since 2014. The total number of bargaining sectors looks set to gradually converge to 100-150 over the next few years.

signed at the national level by the three main labour unions. Another important difference is the scope of sectoral wage agreements. For example, in France sectoral agreements define job-specific wage floors, below which workers are not allowed to be paid, while in Germany the agreements define general wage increases for all workers.

One-off payments usually play only a limited role in wage agreements but recently have become more prominent in some countries. One-off payments have been most common in Germany, particularly in times of high uncertainty around the economic outlook. In Italy one-off payments have been used also to compensate workers for delays in collective bargaining negotiations. With the recent surge of inflation in the euro area, one-off payments have become more frequently used, both in Germany and Italy but also the Netherlands and France.[10]

Detailed data on individual collective bargaining agreements signed at the sectoral level are currently available in seven euro area countries, representing around 90% of euro area compensation of employees, and are being developed in three more countries. The collective bargaining agreement database currently includes data from Germany, France, Italy, Spain, the Netherlands, Austria and Greece. National Central Banks in Belgium, Finland and Portugal are working on gaining access to micro data on wage agreements. Data availability tends to be correlated with collective wage bargaining coverage in an economy (see Chart 1).

Chart 1
Importance of collective bargaining and the wage tracker
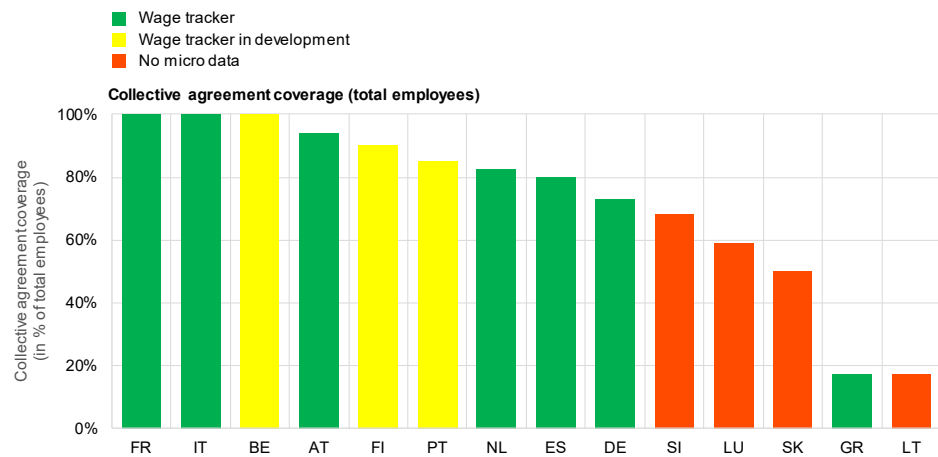
Source: National Central Banks and ECB questionnaire
Notes: Data available only for the 14 countries shown are based on an assessment of Eurosystem NCBs.

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[10] In France one-off payments are not included in sectoral wage agreements but feature much more frequently in firm-level wage agreements (see Baudry et al. 2023 for a recent analysis).

2.2   The ECB's indicator of negotiated wage growth

The outcome of collective bargaining agreements has so far been captured mainly by the ECB's indicator of negotiated wage growth. The indicator of negotiated wage growth has been compiled by the ECB since 2001 and is based on non-harmonised country data.[11] It is designed to capture the outcome of collective bargaining processes in the form of increase in basic pay of an average employee, as agreed between employers and employees (excluding social security contributions and the effect of wage drift, i.e. the difference between negotiated and actual wages and salaries). It is published on a quarterly basis and is available around 40-45 days following the end of each quarter.[12]

The ECB indicator of negotiated wage growth is computed for a subset of countries only. The euro area aggregate is based on nine countries: Germany, France, Italy, Spain, the Netherlands, Belgium, Finland, Austria and Portugal (Table 2).[13] The indicator relies on data for negotiated monthly earnings. The data are provided by the National Central Banks and cover the whole economy (a limited number of sectoral breakdowns are also available for Germany, Spain, Italy, the Netherlands, Austria and Portugal).[14] The data are not seasonally adjusted and are usually only shown as year-on-year growth rates (which reduces the impact of seasonal factors). The frequency of data also varies across countries: Monthly data are available for six countries (Germany, Spain, Italy, the Netherlands, Austria and Portugal, accounting for around 67% of the compensation of employees in the euro area) whereas only quarterly data are available for three countries (Belgium, France and Finland, accounting jointly for 27% of the compensation of employees in the euro area). To derive the euro area indicator, the annual percentage changes to negotiated wages in available countries are aggregated using the national accounts weights which make them more consistent with the compensation of employees data from the national accounts. The euro area indicator is based on a mixture of monthly and quarterly time series. In terms of compensation of employees, overall around 94% of the euro area is covered by countries included in the index.

One disadvantage of the ECB indicator of negotiated wage growth is that underlying data are not harmonised across countries.[15] In particular, the treatment of bonuses, overtime payments and other components of compensation varies across countries. In some countries these payments are included in the negotiated wage growth calculations. To address this issue, some countries (Germany, the Netherlands and Finland) publish, in addition to the baseline series, an indicator of negotiated wages excluding one-off payments (which is closer to the concept of basic pay). How the underlying data are compiled also differs

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[11] See also "Monitoring wage developments: an indicator of negotiated wages", ECB Monthly Bulletin, September 2002.

[12] For details, see Kanutin (2015).

[13] For example, Maltese data are only available annually, and in the case of the private sector, where collective bargaining is limited, the data cover a very small share of employment.

[14] In the case of France, Spain and Portugal, data underlying the ECB indicator of negotiated wage growth include only private sector negotiations.

[15] For example, in Portugal the time series may have gaps, as monthly figures of negotiated wages reflect wage growth of contracts re-negotiated in that particular month, weighted by the number of employees covered.

substantially from country to country. In Germany, for example, data on current and past negotiation outcomes are publicly available, with wage agreements able to be relatively easily aggregated for the purpose of deriving a reliable indicator of negotiated wages with broad coverage of the economy. In other countries the construction of an aggregate negotiated wage series is more challenging. Looking ahead, work on forward-looking wage trackers for euro area countries can help to further improve and harmonise the ECB's indicator of negotiated wage growth.[16]

Table 2

Country coverage in the ECB's indicator of negotiated wage growth and forward-looking wage trackers

	Weight in compensation of employees in the EA (%)	Included in ECB indicator of negotiated wage growth	Included in forward looking ECB Wage tracker
Austria	3.4	Yes	Yes
Belgium	4.1	Yes	Not yet
Finland	1.9	Yes	Not yet
France	21.1	Yes	Yes
Germany	32.6	Yes	Yes
Greece	1.1	No	Yes
Italy	12.0	Yes	Yes
Portugal	1.7	Yes	Not yet
Spain	9.9	Yes	Yes
The Netherlands	7.1	Yes	Yes
	Total share in EA COE (%):	93.8	87.2

Source: ECB staff calculations. EA COE stands for compensation of employees in the euro area – weights are for 2022. There is no official series for negotiated wage growth available for Greece. For further details on the ECB indicator of negotiated wage growth see Kanutin (2015).

2.3 Role of negotiated wage growth in assessing wage developments in the euro area

Established indicators of wage developments based on national accounts data are available only with a substantial time lag and are heavily distorted by the COVID-19 shock (Chart 2).[17] Standard compensation measures – compensation per employee (CPE), compensation per hour (CPH) and unit labour costs (ULC) – are available only on a quarterly basis and no earlier than 65 days following the end of the quarter. In addition, those measures were heavily distorted by the COVID-19

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[16] For France Banque de France introduced a new indicator of negotiated wages in 2023 (see here for details), which replaced the "index of basic monthly salary rates" based on a survey conducted by the Ministry of Labour in the ECB's indicator of negotiated wage growth (see Gautier (2023)).

[17] The measures are also more strongly affected by changes in the composition of employment compared to, e.g. negotiated wages. See Kouvavas et al. (2019) for an assessment of these compositional effects in the euro area during the pre-pandemic period.

shock, and policy interventions that followed, including temporary job retention schemes (JRS), pushed up CPH and dragged down CPE, particularly in 2020.[18]

Data on negotiated wage growth have been less severely impacted by government support measures, as they reflect the results of bargaining processes between workers and employees, whereas changes in hours worked do not affect the bargaining outcomes in any mechanical way. As a result, negotiated wages have become a key indicator for assessing wage pressures in the euro area in the aftermath of the COVID-19 shock. At the same time, the ECB indicator of negotiated wage growth is still a backward-looking indicator; accordingly, if most collective wage agreements are set for multi-year periods, then the indicator will have a delay in signalling emerging wage pressures.

Chart 2

Measures of wage growth in the euro area

(annual percentage changes)
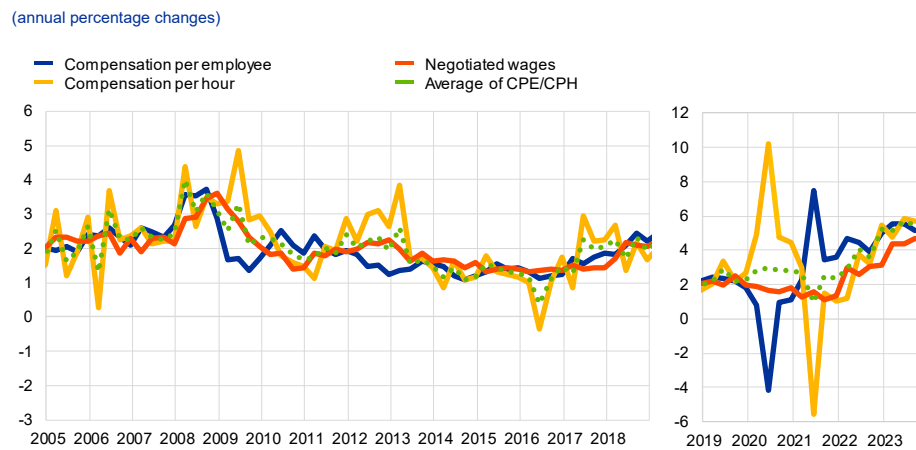
Sources: Eurostat and ECB.
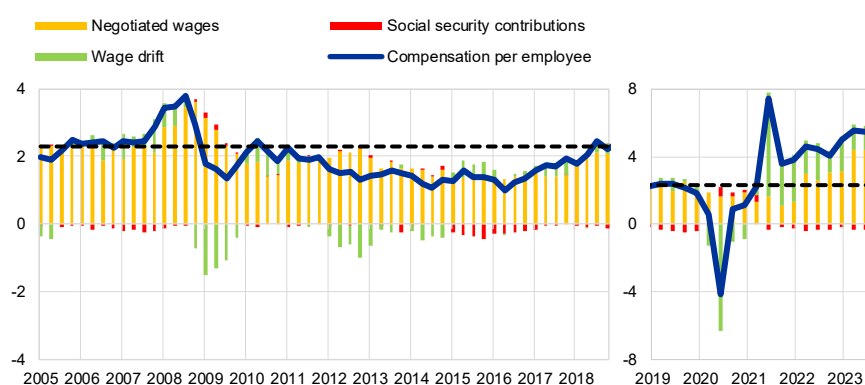Latest observation: 2023Q3.

Negotiated wage growth is the most important driver of compensation per employee growth in the euro area, so it is a vital ingredient in forecasting developments in wage pressures. Compensation per employee growth is the ECB's main wage indicator and is mostly driven by developments in negotiated wages and wage drift. Aggregate wage drift is not directly observable and is usually proxied by the difference between the growth rate of gross wages and salaries per employee and the growth rate of negotiated wages (Chart 3). As it usually takes time for changes in inflation or in labour market tightness to be reflected in wage negotiations, the indicator of negotiated wages tends to respond to cyclical labour market developments with a time lag of several quarters. Wage drift, on the other

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[18] During the COVID-19 pandemic, an important aspect involved the substantial changes in hours worked per person employed (partly linked to JRS), which affected wage indicators such as CPE and CPH, complicating their interpretation as a result. Divergent designs of JRS across countries have also resulted in different statistical treatment of JRS programmes for calculating CPE or CPH. For example, if benefits were paid directly to employees but recorded as social transfers, then compensation relative to the number of hours worked decreased and support schemes had a significant downward effect on CPE whereas CPH was much less severely impacted. In contrast, in countries where a support scheme was based on a subsidy paid to employers, who in turn paid salaries for hours not worked, the scheme was less likely to reduce CPE considerably but was reflected in a higher CPH instead.

hand, reacts more quickly (for details see Koester and Guillochon 2018).[19] Assuming that growth in negotiated wages, for the most part, implicitly relates to the agreed remuneration per hour, wage drift can be affected by changes in average hours worked per employee – such as those resulting from overtime or transitioning between full and part-time employment. Wage drift is therefore a more cyclical variable.

Chart 3

Decomposition of compensation per employee growth

(annual percentage changes; percentage point contributions)

Source: Eurostat and ECB staff calculations
Latest observation: 2023Q3.

The indicator of negotiated wages tends to move in tandem with compensation per employee, but their dynamics may diverge, especially in times of economic crisis. For example, the two data series diverged during the global financial crisis (in 2008/2009), as well as at the height of the sovereign debt crisis in a few euro area countries (in 2012/2013) and very recently during the COVID-19 pandemic (2020/2021) (Chart 3). Moreover, changes in social security contributions, which sometimes occur during crises, may also play a role. A comparison of changes in the contribution of hours worked per employee to growth in compensation per employee with wage drift shows that the substantial reductions in hours worked per employee in 2008-2009 and 2012-2013, as well as at the beginning of the pandemic in 2020, were, unsurprisingly, reflected in the strongly negative contributions of wage drift to overall wage growth (Chart 4).

Indicators of negotiated wage growth can be especially helpful for measuring wage pressures in times of crisis. This is due to the fact that other measures such as compensation per hour and compensation per employee can be easily distorted by policy interventions – e.g. job retention schemes introduced in some euro area countries during both the pandemic and the financial crisis – which, however, do not

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[19] Wage drift may also be influenced by compositional effects (changes in employment structure). In some countries compositional effects played an important role pre-COVID, resulting in a negative contribution of wage drift, even during an economic upturn. See, e.g. Volkerink (2020), as well as Puente and Galán (2014) and Carrasco et al. (2022). See Adamopoulou and Villanueva (2022), as well as Card and Cardoso (2022), for empirical evidence on an only partial pass-through from negotiated wages to compensation per employee.

affect the indicator of negotiated wages (Koester et al. 2020).[20] Signals from wage trackers proposed in this paper may be even more valuable for the purpose of analysing wage pressures in times of crisis and at turning points, as they capture the actual outcomes of wage negotiations in real time.

Chart 4

Link between wage drift and changes in hours worked in the euro area

(percentage point contributions)
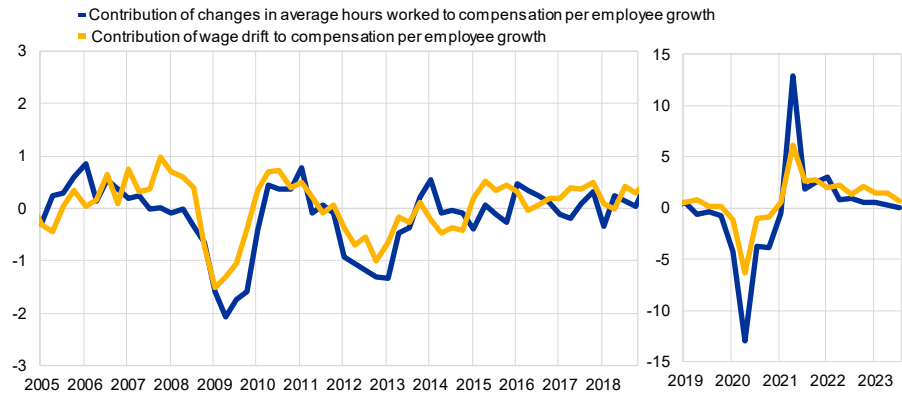
Source: Eurostat and ECB staff calculations.
Latest observation: 2023Q3.

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[20] See also Dias da Silva et al. (2020) and Hahn and Koester (2020) for details on the effects of job retention schemes on compensation per hour and compensation per employee growth.

3 Tracker of negotiated wages: methodology

Tracking developments in collective agreements can be very useful for assessing wage pressures and forecasting wage growth. In this section we discuss the methodology applied to develop wage tracker indicators using information available from the individual collective bargaining agreements in seven euro area countries. We not only track contemporaneous developments in wage growth but also exploit the agreement-level data to compute a "forward-looking" wage tracker, i.e. the average future year-on-year negotiated wage increases as envisaged in the collective bargaining agreements currently in force. Next, we develop a tracker of wage growth agreed in the most recent wage negotiations, which can be used to gauge changes in the outlook on wage dynamics based on agreements reached in a given month or quarter.

3.1 Data

We use data on collective bargaining agreements from seven countries: Austria, France, Germany, Greece, Italy, Spain and the Netherlands. In the case of the Netherlands the data come from the employers' association AWVN. In other countries national central banks compile data either directly (as in the case of Germany and France) or based on information collected by ministries or other national institutions on collective bargaining agreements.

The granularity of the data varies among countries, due also to differences in the collective bargaining process. For example, in Germany and Italy collective bargaining takes place mostly at the main economic sector level. As a result, monitoring a relatively small number of agreements is sufficient for the purpose of tracking developments in aggregate negotiated wages. In the Netherlands and Austria wage bargaining occurs at a more granular sectoral level, so a larger number of agreements need to be monitored. In France bargaining is performed at both sectoral and firm levels. Our data for France cover only sectoral agreements, which are the main wage setting reference for smaller firms (where firm-level agreements are rare) and could also serve as the floor for negotiations at larger firms. In Greece wage bargaining is carried out at sectoral, occupation and firm levels, whereas our focus is on collating information from the sectoral and occupation-based agreements. Finally, for Spain our data span thousands of agreements per year, reflecting a very decentralised collective bargaining process. In many euro area countries collective bargaining also covers the public sector. However, the coverage of the public sector in the agreement-level databases that we rely on varies by country. While the public sector is included for Austria, Germany and the Netherlands, it is not covered in Greece, and is only partially covered both in Italy (covering employees in two large public sectors: the health sector and schools) and in Spain (covering employees in public sector firms that have collective agreements).

In France wages in the public sector are decided in a separate negotiation process linked to the government budget planning and are likewise not covered in our database.

The agreement-level data contain detailed information on the schedule and magnitude of wage increases. For each country, the data contain an identifier of the company (or sector), the start and end dates of an agreement, the signing date, the negotiated wage growth rates for a worker earning an average (or representative) salary and the effective dates of wage increases. If an agreement has been reached at the firm level, information on the corresponding economic sector or industry is also included. Wage increases are sometimes recorded as year-on-year growth rates, while in other cases we have information on wage increases measured in euro together with information on the average (or representative) salary. In the latter case we compute year-on-year wage growth rates according to the information provided. Finally, the database tracks the number of workers covered by each agreement and – in the case of Germany, Italy and the Netherlands – also includes information on additional one-off payments (i.e. non-structural wage increases).

While the agreement-level database is very comprehensive, it is necessary in some cases to implement assumptions in the calculation of wage trackers. Before proceeding with the analysis, we remove all agreements with missing information on negotiated wage increases, the number of workers or the start and end dates. Missing start dates are replaced by the signing date, if available. If information on the date of a wage increase is missing, we assume that the increase takes place on the agreement start date. In the case of Spain, we receive information on wage increases negotiated for the current year of an agreement, but information on the wage increases for the subsequent consecutive years (in the case of multi-year agreements) is available only when the respective year starts and once the wage increase is included in the database maintained by the Ministerio de Trabajo y Economía Social. Consequently, to construct the forward-looking wage tracker, we assume that wage increases in each of the remaining years of an agreement are equal to the wage increase agreed in the first year of the agreement. We also assume that the subsequent consecutive wage increases occur at successive intervals of 12 months.

Data for the five largest countries are available from 2013 onwards, but in some countries the data series start much earlier. Table 3 provides details on the number of workers, average agreement duration and time span covered by the data. Our database includes agreements negotiated since 2020 for Austria, 2006 for France, 2010 for Germany, 2016 for Greece, 2011 for Italy and 2013 for Spain and the Netherlands. The data are updated frequently (as often as every few weeks) with information on new agreements that have been signed very recently. The average duration of the agreements in the sample varies between around 12 months in Austria and France (where there is a legal obligation for every sector to negotiate wages at least once a year, albeit no obligation to reach an agreement) and 40 months in Spain.

The database underlying the wage tracker currently covers more than 55 million employees in the euro area. The number of workers covered by collective

agreements changes from period to period, depending on how quickly the expiring agreements are renegotiated.[21] In the 2018-2022 period our data covered on average 17.6 million employees in Germany, 12.8 million in France, 9.7 million in Spain, 9.3 million in Italy, 5.3 million in the Netherlands, over 3 million in Austria and almost 250 thousand in Greece. The low number of workers in Greece reflects the relatively small role that collective bargaining plays in this country (covering only 14% of total number of employees with the right to bargain). Comparing our data with information from the OECD reveals that we capture a large share of employees covered by those agreements.

Table 3
Wage tracker database on collective negotiations by country

	Austria	**France**	**Germany**	**Greece**	**Italy**	**Spain**	**The Netherlands**
Wage bargaining level	Sector	Sector and firm	Sector	National, sector and firm	Sector	Sector and firm	Sector and firm
Collective bargaining coverage (OECD, % of employment)	98%	98%	54%	14%	100%	80%	76%
Workers covered in wage tracker database (% of employment)	3.0 million (75%)	12.8 million (50%)	17.6 million (43%)	0.24 million (9%)	9.3 million (48%)	9.7 million (56%)	5.3 million (89%)
Average agreement duration in wage tracker database	12 months	12 months	24 months	13 months	32 months	40 months	19 months
Wage tracker database includes public sector	Yes	No	Yes	No	Partially	Partially	Yes
Information on one-off payments in wage tracker database	No	No	Yes	No	Yes	No	Yes
Information on indexation clauses in wage tracker database	No	No	Yes	No	Yes	No	Yes
Sample start	2020	2006	2010	2016	2011	2013	2013

Sources: Oesterreichische Nationalbank (for Austria), Banque de France (for France), Deutsche Bundesbank (for Germany), Bank of Greece (for Greece) Banca d'Italia enhancements of Istat data (for Italy), Employers Association AWVN (for the Netherlands), Ministerio de Trabajo y Economía Social (for Spain), ECB staff calculations.
Notes: Data on collective bargaining coverage originate from the OECD, refer to the latest available year (2017 for Greece and 2018 or 2019 for the remaining countries) and show the percentage of employees with the right to bargain that are covered by collective bargaining agreements. The number of workers covered and average duration of an agreement in the database correspond to the average values between 2018 and 2022 (the coverage for Austria refers to the average for 2022 due to the shorter time span and expanding coverage over time). In France there are no one-off payments granted as part of the sectoral agreements, while indexation clauses in firm-level agreements are forbidden.

Information on additional one-off payments and indexation clauses at the agreement level is available only in some countries of our sample. Historically, one-off payments have been an important part of wage negotiations, especially in

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[21] In Italy, expired agreements are generally still valid – with de facto zero wage growth – until a new agreement is reached.

Germany, but more recently they have also become prominent in other countries—such as in the public sector in Italy—and their role has been increasing following the surge in inflation in 2021-2022. Table 4 shows some summary statistics on the frequency and size of these payments in Germany, Italy and the Netherlands. Indexation clauses have been rather infrequent across the countries in our sample, but in Spain the share of agreements with indexation clauses has increased considerably since 2021. Unfortunately, we do not yet have sufficiently detailed information on wage indexation clauses to take them into account when computing wage growth for newly signed agreements. So far indexation clauses impact the wage trackers ex-post only, i.e., after the introduction of retroactive wage increases, which in turn depend on inflation outcomes.

Table 4

One-off payments in selected countries

	Share of agreements with one-off payments		Average size of one-off payments in % of average monthly salary	
	Before 2021	Since 2021	Before 2021	Since 2021
Germany	24%	65%	14%	64%
Italy	42%	63%	23%	38%
The Netherlands	25%	32%	7%	11%

Sources: Deutsche Bundesbank (for Germany), Banca d'Italia and Istat (for Italy), Employers Association AWVN (for the Netherlands) and ECB staff calculations.
Notes: The pre-2021 average has been computed since 2010 for Germany, 2011 for Italy and 2018 for the Netherlands. For Italy, we include one-off arrears payments.

To summarise, we exploit all of the key elements of collective bargaining agreements. For the purposes of our analysis, we use the information on i) agreement start and end dates, ii) number and size of wage increases for workers earning an average wage in the firm or sector, iii) dates of agreed wage increases, iv) number of workers covered by an agreement and v) one-off payments.

3.2 Tracker of negotiated wages

We compute trackers of negotiated wages for the seven countries in our sample and then aggregate them into a euro area indicator. In this section we first describe how we compute trackers of negotiated wages for the seven countries in our sample, both excluding and including one-off payments, and how we then aggregate country-level tracker data into a euro area indicator (Section 3.2.2). Next, we construct a complementary indicator of negotiated wage growth: one that tracks aggregate wage growth across agreements signed in each quarter (Section 3.3).

3.2.1 Country-level trackers

The main wage tracker indicates aggregate year-on-year wage growth across all collective bargaining agreements that have not yet expired. To calculate the agreed wage growth, we first compute the year-on-year structural wage increase for each month of a given wage agreement. To that end, we consider the impact of base effects within the agreement, albeit not across agreements (for the same company or sector) over time. In other words, we assume that no wage increase took place in the 12 months prior to the first wage rise foreseen by the given agreement. Although following this approach simplifies the computations considerably, it could lead to some bias in the estimate of aggregate wage growth. In quantitative terms, however, these effects are very small because, as our database shows, increases typically occur early within multi-year agreements or immediately in one-year agreements.[22] Finally, in the case of Italy – where agreement re-negotiations are frequently delayed – we treat gaps between the end of one agreement and the official start of a new one as periods when the old agreements are still valid, albeit with zero wage growth.

Table 5

Calculating year-on-year wage growth in a collective bargaining agreement: a numerical example

Month	Event	Year-on-year wage growth	Comments
January 2020	Agreement signed; no wage increase at the start of the agreement	0%	Assuming no wage increase between January and December 2019
February to April 2020		0%	
May 2020	Structural wage increase of 2%	2%	First wage increase under the agreement
June to November 2020		2%	Year-on-year wage growth between the first and second wage increase
December 2020	Structural wage increase of 1.5%	3.5%	Second wage increase under the agreement; year-on-year wage growth increases to 3.5%
January to April 2021		3.5%	
May to November 2021		1.5%	Year-on-year wage growth falls to 1.5% due to base effects from the wage increase in May 2020
December 2021	Agreement ends	0%	Year-on-year wage growth falls to 0% due to base effects from the wage increase in December 2020

Notes: Authors' calculations.

Table 5 explains the computation of year-on-year wage growth for a hypothetical collective bargaining agreement. The agreement is signed in January 2020 for a term of two years and providing two structural wage increases –

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[22] . On-going work aims to also take wage increases in the twelve months before an agreement into account.

in May and December 2020. Next, for each month in the sample, we aggregate wage growth rates from all ongoing individual agreements using as weights the corresponding number of workers covered.

Collective bargaining agreements set wage growth going forward, which enables the development of a forward-looking indicator of wage growth. Since collective bargaining agreements specify wage increases over a given period, we can compute increases in negotiated wages – *both* backward-looking and forward-looking (in the near future). We refer to the resulting weighted average year-on-year wage increase for the months ahead as the "*forward-looking wage tracker*".

The new wage tracker can be computed both including and excluding the effects of one-off payments. Integrating the effects of one-off payments is possible for the three countries where information on these payments is available in our database: Germany, Italy and the Netherlands. If one-off payments have been awarded as part of a collective agreement, the agreement typically specifies the dates on which they are to be disbursed. When incorporating one-offs into the wage tracker, we spread the payments over 12 months from the agreed disbursement date and express the resulting wage increases as a percentage of the prevailing base wage.[23] This approach smooths the impact over time of one-off payments on wage growth while rendering the trackers easier to interpret and likely also helping to detect turning points in wage growth. The underlying rationale is that, while one-off payments are typically disbursed as a lump sum, they constitute a method of compensating employees for costs incurred over a longer period (e.g. in the case of the recent "tax free inflation compensation bonus" in Germany or "arrears" one-offs in Italy paid as compensation for delays in agreement renegotiations) and of facilitating lower *structural* wage growth settlements over the term of a collective bargaining agreement. The country-level aggregate wage growth including one-offs is then calculated by adding to the aggregate structural wage growth the aggregate one-off wage growth, with the latter weighted by the total number of employees[24] benefiting from these payments relative to the total number of employees covered by active agreements.

Smoothing of one-off payments affects the time profile of wage developments. Without any smoothing, for example, a one-off payment in September 2022 will push up wage growth in that month and lead to a downward base effect in September 2023. Smoothing the one-off payment will increase wage growth more moderately in September 2022 but also push it up somewhat in the subsequent 11 months. This will give rise to a more moderate downward base effect in September 2023 but also to downward base effects in the following months. In general, smoothing one-off payments leads not only to lower annual wage growth rates in the year during which

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[23] When computing year-on-year wage growth reflecting one-off payments, we do incorporate base effects from expiring one-off payments. Overall our approach is similar to the approach adopted by Statistics Netherlands when computing realised negotiated wage growth series including one-off payments. For Germany, the Deutsche Bundesbank computes the same series but with one-offs recorded only in the months when they are disbursed (consistent with the statistical rules for wages and salaries in the national accounts).

[24] An alternative weight that could be used, while also taking differences in wage levels into account, would be the share of wages covered in agreements that include one-offs in the total wages of employees covered by active agreements.

the one-off payment occurs (compared to when no smoothing is applied) but also to higher rates in the subsequent year. These effects are more pronounced the later the one-off payment occurs in a given year.

One-off payments have different purposes, and their implementation might not necessarily signal a change in wage pressures. While one-offs have recently been used more frequently to compensate workers for higher costs of living, they also have other purposes. For example, in Italy the so-called "arrears" one-off payments are implemented in the public sector to compensate workers for frequent delays in agreement renegotiations, i.e., periods between the end date of one agreement and the start date of the new one. Similarly, so-called "advance" one-off payments are paid in anticipation of the future renegotiation of an expired agreement. Thus, when interpreting signals derived from one-off payments, the intended use of the payments should also be considered.

Chart 5

Wage trackers by country

(Annual percentage changes and percentage points)
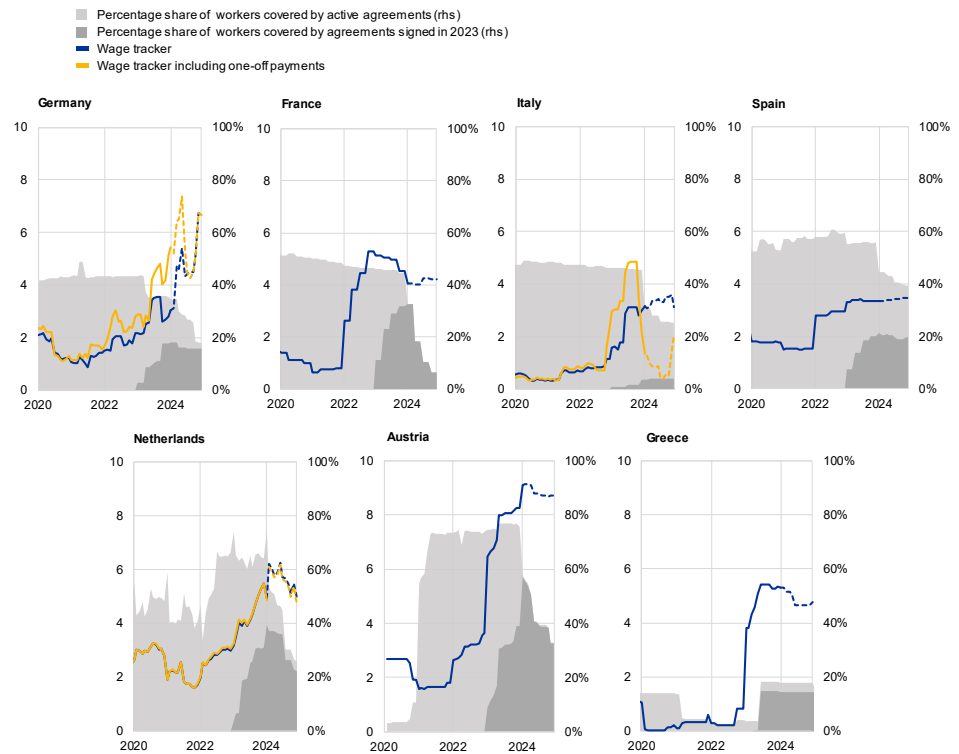
Source: Deutsche Bundesbank, Banco de España, the Dutch employer association (AWVN), Oesterreichische Nationalbank, Bank of Greece, Banca d'Italia and Banque de France.
Notes: Blue and yellow solid lines show the average realised year-on-year wage growth in agreements active at each point in time. Agreements are weighted by the number of workers covered. The dashed blue and yellow lines show the year-on-year wage growth in the future, based on active agreements (i.e. agreements that have not yet expired). Coverage reflects the share of employees in the euro area or a euro area country (in %) who are fall under an active collective agreement.
Latest observation: December 2023 (for wage tracker); December 2024 for forward looking wage tracker.

Wage trackers for the seven countries in our sample show considerable country-level variation in negotiated wage growth over time, as well as in overall coverage and in the role of one-off payments (Chart 5). For Germany,

Italy and the Netherlands, we display two versions of the tracker in Chart 5 – one version excluding (blue lines) and one including (yellow lines) one-off payments. In principle, there is plenty of merit in focusing exclusively on structural wage growth. For one thing, this approach ensures cross-country comparability (given that we do not have information on one-off payments for the remaining four countries and that the role of one-off payments is likely to be much smaller in these countries). For another, one-off payments have only a temporary effect on wage growth and can lead to volatile aggregate wage growth data series, thereby potentially distorting the assessment of medium-term wage pressures. Nevertheless, the significant role of one-off payments in collective bargaining agreements in recent years (Table 4) makes it relevant to consider these payments when assessing current wage pressures. Finally, the blue and yellow dashed lines in Chart 5 illustrate the forward-looking wage trackers (both excluding and including one-offs, respectively), i.e., already agreed year-on-year wage growth rates going forward.

Changes in the number of workers covered by the wage trackers depend on the average contract duration. Grey areas in Chart 5 represent the "coverage", i.e., the share of workers covered by active collective wage agreements in our sample relative to all employees in the economy. The coverage begins to decrease more and more rapidly in the months going forward as an increasing number of agreements expire. Thus, the informational value of the forward-looking trackers is greatest over the next few quarters.[25] At the same time, the speed at which coverage declines over time depends on the average duration of the collective bargaining agreements. For example, in France and Austria – where the vast majority of agreements are re-negotiated each year (mostly during the autumn and winter months) – the coverage of the wage tracker drops rapidly to zero as a given year draws to a close. Accordingly, the dark grey areas in Chart 5, which capture the share of workers covered by agreements that were re-negotiated in 2023, increase quickly after the start of 2023. In comparison, the coverage changes much more gradually in countries such as Spain and Italy, where contracts run over much longer periods on average and only a smaller fraction of agreements are re-negotiated each year.

How quickly negotiated wage growth reacts to changes in macroeconomic conditions will depend on the average duration of collective bargaining agreements. As Chart 5 shows, all countries have witnessed an increase in wage growth since the start of 2022 on account of tight labour markets and unions' demands for compensation associated with high inflation. The jump in negotiated wage growth – as measured by the wage tracker – has been quite abrupt in Austria, France or, more recently, in Greece, while wage pressures seem to have been building up steadily, albeit much more slowly in Italy or Spain. To some extent, this reflects the divergent wage bargaining frameworks across these countries.[26] The

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[25] In Section 5 we construct an "augmented" wage tracker, where we make assumptions regarding the wage growth at which agreements expiring in the future will be re-negotiated. As a result, for the augmented wage tracker coverage remains constant over the forecast horizon.

[26] See Baudry et al. (2023) and Gautier (2022, 2023) for detailed analyses of wage negotiations over the recent period in France. The interaction between the national minimum wage (which is indexed to past inflation and revised more frequently when inflation is high) and sectoral wage agreements is a further driver behind the quick reaction of negotiated wages to higher inflation. Between 2022 and 2023 negotiated wages were revised more than once a year in several industries in France.

shorter average duration of agreements in Austria, France and Greece (Table 3) implies that aggregate negotiated wage growth is more responsive to changes in the macroeconomic environment, including most recently higher inflation, than is the case in Italy or Spain, where most agreements are settled for multi-year periods and only a fraction are re-negotiated each month or quarter. Accordingly, the pass-through of macroeconomic shocks to negotiated wage growth takes a longer time to complete in Italy or Spain. Finally, as evidenced by the chart, the inclusion of one-off payments leads to currently much higher wage pressures in Germany and Italy compared to that indicated by structural wage growth, while in the Netherlands the one-offs affect aggregate wage developments only slightly. In Italy the strong increase signalled by the wage tracker including one-offs in 2022 and 2023 and the rapid fall afterwards are due to very large one-off payments in the education and health sectors in late 2022 and early 2023 in the form of arrears payments.

Forward-looking wage trackers signal continued strong wage pressures in the near term based on data available in December 2023. Especially in Germany the forward-looking wage trackers based on all agreements in force suggest some further continuation of the upward trend in negotiated wage growth extending beyond 2023 into 2024. In the other countries covered, wage trackers foresee wage growth plateauing or moderating over the coming months, albeit remaining at high levels compared to historical averages. We discuss current signals derived from the wage trackers in greater detail in Section 4.

The new wage trackers are closely aligned with available indicators of negotiated wage growth for individual countries, as well as for the euro area as a whole. One way to assess the quality of the wage trackers is to compare them with the realised negotiated wage growth time series, which are publicly available from national sources. Chart 6 plots the wage trackers against realised negotiated wage growth for each country in our database – with the exception of Greece, for which realized negotiated wage growth data are not available. The backward-looking component of the wage trackers (blue lines for structural wage growth, and yellow lines for wage growth including one-off payments) is very closely aligned with realised negotiated wage growth (red lines excluding one-offs), indicating that the current coverage of agreements included in the wage tracker is sufficiently large to successfully capture the dynamics of negotiated wage growth.
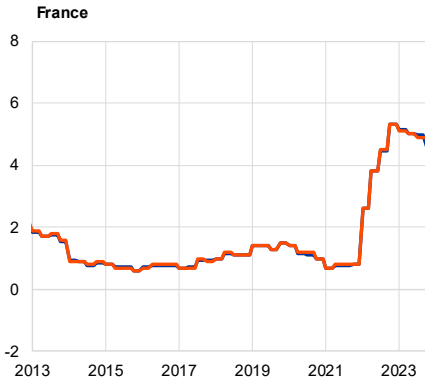
Chart 6

Trackers of negotiated wage growth in euro area countries

(Annual percentage changes)
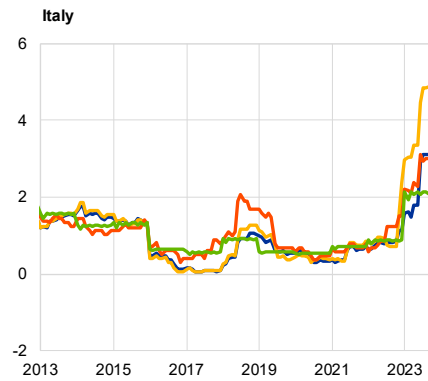
Wage tracker
Wage tracker incl. one-offs
Bundesbank negotiated wages excl. one-offs
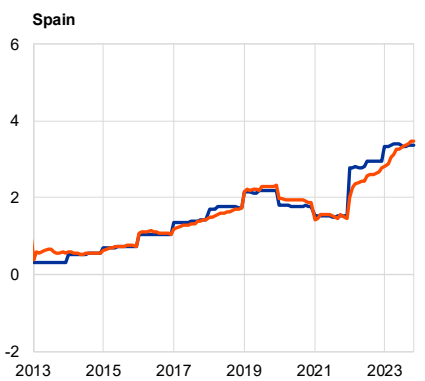Bundesbank negotiated wages incl. one-offs
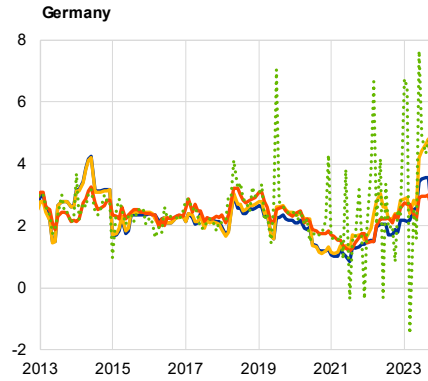
Wage tracker
Banque de France negotiated wages

Germany
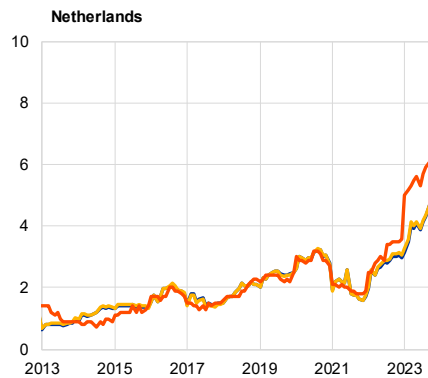
France

Wage tracker
Wage tracker incl. one-offs
Istat negotiated wages: total economy
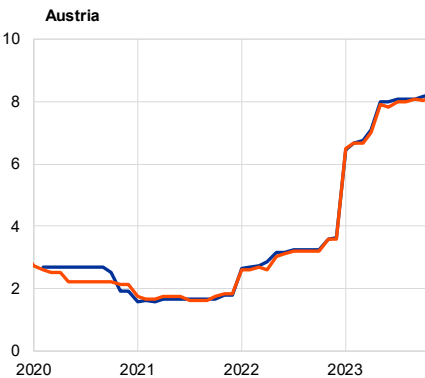Istat negotiated wages: private sector

Wage tracker
Ministry of Labour negotiated wages

Italy

Spain

Wage tracker
Wage tracker incl. one-offs
Statistics Netherlands negotiated wages

Wage tracker
Statistik Austria negotiated wages

Netherlands

Austria

Source: Deutsche Bundesbank, Banco de España, the Dutch employer association (AWVN), Statistics Netherlands, Oesterreichische Nationalbank, Banca d'Italia, Istat and Banque de France. For Germany then two data series "Collective wages, overall economy, including all ancillary agreements monthly basis Germany" and "Collective wages, overall economy, including side agreements without one-off payments, monthly basis Germany" are shown and published here; for France the quarterly series on negotiated wage growth can be found here; for Italy the reference series (wages according to collective labour agreements per employee) is published by Istat here; for Spain data on collective wage agreements are provided by the Spanish Ministry of Labour. The series for the Netherlands (Cao wages including and excluding special payments) is published by CBS here. For Austria the Tariflohnindex can be found here.

The alignment is not perfect, however: In Italy, for example, in the first half of 2023 the wage tracker including one-off payments suggests much higher wage growth in comparison to the official negotiated wage growth series published by Istat. In the Netherlands the situation is the opposite, with the official negotiated wage growth series edging substantially above the wage trackers in 2023.[27] These differences reflect incomplete coverage of collective bargaining agreements in our database, as well as some methodological differences compared to the national data series on negotiated wage growth. For example, in the Netherlands the discrepancy may be a result of differences in the treatment of wage growth for temporary agency employees (which is not detailed in the collective bargaining agreements). In Italy it likely also reflects differences in the treatment of one-off payments. The ongoing expansion of the agreement-level database being rolled forward by the ECB in collaboration with the NCBs should help reduce these differences in the future.[28] Overall, despite temporary deviations, wage trackers quite successfully capture changes in the realised wage growth dynamics. While Chart 6 provides an initial validation of the quality of the wage tracker, a more rigorous out-of-sample analysis to assess the performance of the forward-looking wage trackers is presented in Section 5.

A comparison of the wage trackers with the official series of negotiated wage growth highlights difficulties that arise when including one-off payments in wage growth indicators. While for most countries the official series usually include one-off and other special payments, the Bundesbank computes two versions of the negotiated wage growth indicator, one including and one excluding one-off payments. For Germany, therefore, Chart 6 plots both official series: one data series that excludes one-off payments (solid red line) and one that includes one-off payments (dotted green line).[29] The series including one-off payments is very volatile, reflecting the approach of the Bundesbank in terms of recording one-off payments in full within the month of disbursement (which is also in line with Eurostat's approach towards calculating compensation per employee). In contrast, the ECB wage tracker including one-offs is computed by smoothing one-off payments over a 12-month period. These methodological differences make it hard to compare the wage tracker with the official time series of negotiated wage growth including one-offs.[30]

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[27] For a euro area aggregate, a large proportion of the national differences cancel each other out (see section 3.2.2).

[28] For France, the negotiated wage series and the wage tracker are already fully aligned relative to the past.

[29] Germany aside, the official series for negotiated wages both including and excluding one-off payments are available for the Netherlands only. In the case of the Netherlands, since the differences between the two series are minimal (since the official series similarly smooths the impact of one-off payments), we do not show the negotiated wages excluding one-off payments separately.

[30] At the same time, the German wage tracker of structural wage increases follows the official negotiated wage growth series excluding one-off payments very closely.

Which is the preferable approach to use for including one-off payments in wage growth indicators will ultimately depend on the objective of the analysis. If, for example, the focus is on nowcasting growth in compensation per employee, then including one-off payments in the negotiated wage component at the time of disbursement will lead to better and more consistent results (at least at the national level). If, on the other hand, the aim is to assess turning points in wage growth as implied by collective agreements (which is one of the aims of the wage trackers), then smoothing one-off payments might give a more informative signal.

3.2.2   Euro area wage tracker

Table 6
Weights to aggregate euro area indicators based on wage trackers for countries
(percentages)

Country	Share of total number of workers covered by the wage tracker database	Country weight in the euro area wage tracker
Germany	30.6%	37.4%
France	23.8%	24.2%
Italy	14.2%	13.8%
Spain	17.4%	11.4%
The Netherlands	7.9%	8.1%
Austria	5.7%	3.9%
Greece	0.3%	1.3%

Source: Deutsche Bundesbank, Banco de España, the Dutch employer association (AWVN), Oesterreichische Nationalbank, Bank of Greece, Banca d'Italia and Banque de France.
Notes: The share of total workers covered by the wage tracker database corresponds to the average share in 2022 after removing contracts with missing information on wage increases.

To compute the euro area wage tracker, individual country-level contributions are weighted using the most recent data on country contributions to compensation of employees in the euro area (here for 2022). Taken together, the seven countries covered by the wage tracker account for nearly 90% of compensation of employees in the euro area. Thus, signals from the wage trackers are apt to be informative about negotiated wage growth in the euro area. We use the country trackers in Chart 5 to construct an aggregate euro area tracker of negotiated wage growth. Contributions of individual countries to the aggregate are combined using the fixed country weights applied to the ECB indicator of negotiated wage growth instead of the number of workers covered by active agreements. The weights (shown in Table 6) are based on the country shares in compensation of employees in the euro area. Their application enables the wage tracker methodology to be consistent with the indicator of realised negotiated wage growth. Additionally, the use of *country-specific* weights (instead of the number of employees covered by agreements) results in the euro area wage tracker being less sensitive to fluctuations in the number of workers covered by active collective bargaining agreements in the various countries over time. On average (as Table 6 illustrates), country shares in the total number of workers covered by the wage tracker database tend to be relatively closely aligned with the fixed weights that are used to compute the euro area tracker. Looking at the coverage of agreements active in 2022 in our database,

the largest differences are observed for Germany (where coverage of the database available for the wage tracker is currently still lower than average across the seven countries for which we have wage trackers) and for Spain (where the database coverage is substantially higher than average).

Chart 7

Tracker of negotiated wage growth in the euro area

(Annual percentage changes and percentage shares)
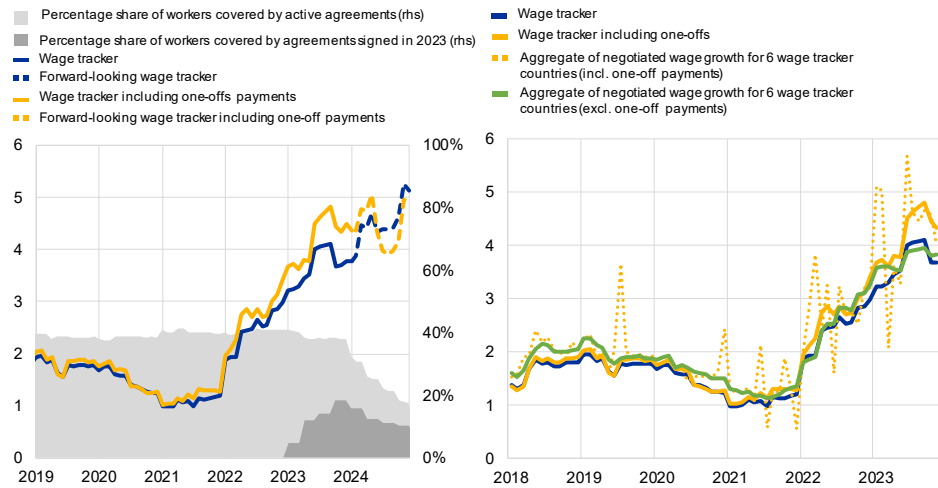
Source: Deutsche Bundesbank, Banco de España, the Dutch employer association (AWVN), Oesterreichische Nationalbank, Bank of Greece, Banca d'Italia and Banque de France.
Notes: Left-hand panel: solid and dashed blue lines show the average year-on-year negotiated wage growth signalled by the wage trackers excluding one-off payments, while solid and dashed yellow lines depict the same for wage growth including one-off payments. The euro area aggregate is an average of country-specific growth rates, weighted using country weights listed in Table 6. Right-hand panel: The green line (yellow dotted line) corresponds to the weighted average of the official time series of negotiated wage growth both excluding and including one-offs, respectively, in countries covered by the wage tracker (with the exception of Greece) - weighted by compensation of employees in each of the six countries. Prior to 2020, the euro area wage trackers were based on six countries (i.e. excluding Austria, for which the wage tracker dataset starts in 2020). Percentage shares in terms of total euro area employment. Latest observation: December 2023 for data; December 2024 for forward-looking indicators.

The euro area wage tracker has been very closely aligned with an indicator of negotiated wage growth based on official series for the countries covered (Chart 7). The left-hand panel of Chart 7 plots the aggregate euro area tracker from 2020 until September 2024. Consistent with country-level developments, the tracker shows a gradual increase in negotiated wage growth in the euro area as of 2022 (even more so when one-off payments are included). A comparison of the two versions of the euro area wage tracker (i.e. including and excluding one-offs) shows that the two were quite closely aligned until the beginning of 2022, when a positive gap started to widen between the two indicators, highlighting a significant increase in the importance of one-off payments for wage growth in the euro area. The forward-looking trackers suggest that – based on contracts in force - negotiated wage growth is set to remain at historically high levels and to fluctuate at levels of around 4.5% over the coming quarters. The wage tracker including one-offs is expected to start declining in the first half of 2024 due to negative base effects from large one-off payments relating to the past. As the right-hand panel of Chart 7 illustrates, the wage tracker follows an aggregate of official indicators for negotiated wage growth for the countries covered very closely – indicating that the coverage of the wage tracker is large enough to give a reliable signal on the development of negotiated wage growth.

3.3 Wage tracker of latest agreements

The wage trackers can also be used to assess wage pressures with a focus on recently concluded agreements. In principle, average wage growth can be computed for any subset of active collective bargaining agreements, depending on the signing date, for example. Average wage growth in recently signed agreements can provide more timely information on wage pressures than wage growth based on all agreements, especially when collective agreements are signed for more than one year, as is the case in many euro area countries. This is because any change in agreed wage growth feeds through only gradually to aggregate negotiated wage growth as old agreements expire and new agreements are concluded. Wage rises agreed in recent negotiation rounds are also a signal of current negotiation sentiment, as well as the direction in which aggregate negotiated wage growth could develop if, for example, high wage increases were to become more broad-based and persistent. At the same time, the number of workers covered in recent agreements should always be considered when interpreting signals from these indicators: Signals from few (small) agreements may not be fully representative of broader wage pressure patterns.[31]

The differences in coverage across countries may be substantial when tracking developments in latest agreements, a factor that needs to be considered in the aggregate measure for the euro area. Chart 8 shows wage trackers of agreements by signing quarter for all countries except Greece (due to the low frequency of new agreements there), with Chart 9 depicting the same for the euro area. We refer to the indicator as the "*wage tracker of latest agreements*". The indicator of latest agreements reflects wage growth in the agreements reached in a certain quarter for the 12 months after an agreement. One-off payments are spread over 12 months from the agreed disbursement date - smoothing the impact of one-off payments on wage growth. Since there are months in which no agreements are signed, this indicator is computed on a quarterly basis. In contrast with the baseline wage tracker, the euro area aggregate that we construct for this additional indicator uses the number of workers covered by latest agreements as country weights. This is done to prevent a situation in which a few (small) agreements signed in countries with high fixed weights have a disproportionately large impact on the euro area average, making the latter less representative of broader wage dynamics in latest bargaining rounds in the euro area.

In most countries, the wage tracker of latest agreements in the sample covered tends to lead the baseline wage tracker. Comparing the dynamics of the wage tracker of latest agreements excluding one-offs (green lines) to the baseline wage tracker likewise excluding one-offs (dark blue lines), wage trackers of latest agreements started rising already in 2021, i.e. substantially earlier than the baseline wage trackers, reflecting the multi-quarter duration of collective bargaining agreements leading to a larger persistence of the wage trackers. More generally, greater sensitivity to cyclical conditions has resulted in more pronounced oscillations

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[31] An additional caveat is that signals from the latest agreements may be prone to a selection bias if, for example, negotiations tend to be delayed in some sectors more frequently than in others.

of the trackers of latest agreements over the years than is the case for the baseline wage trackers.

Country wage trackers of latest agreements (by signing quarter)

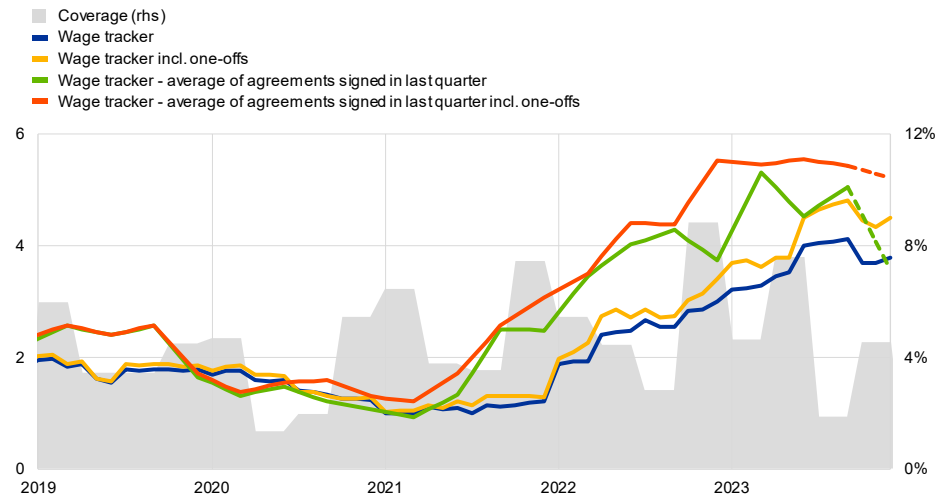(Annual percentage changes; percentages)
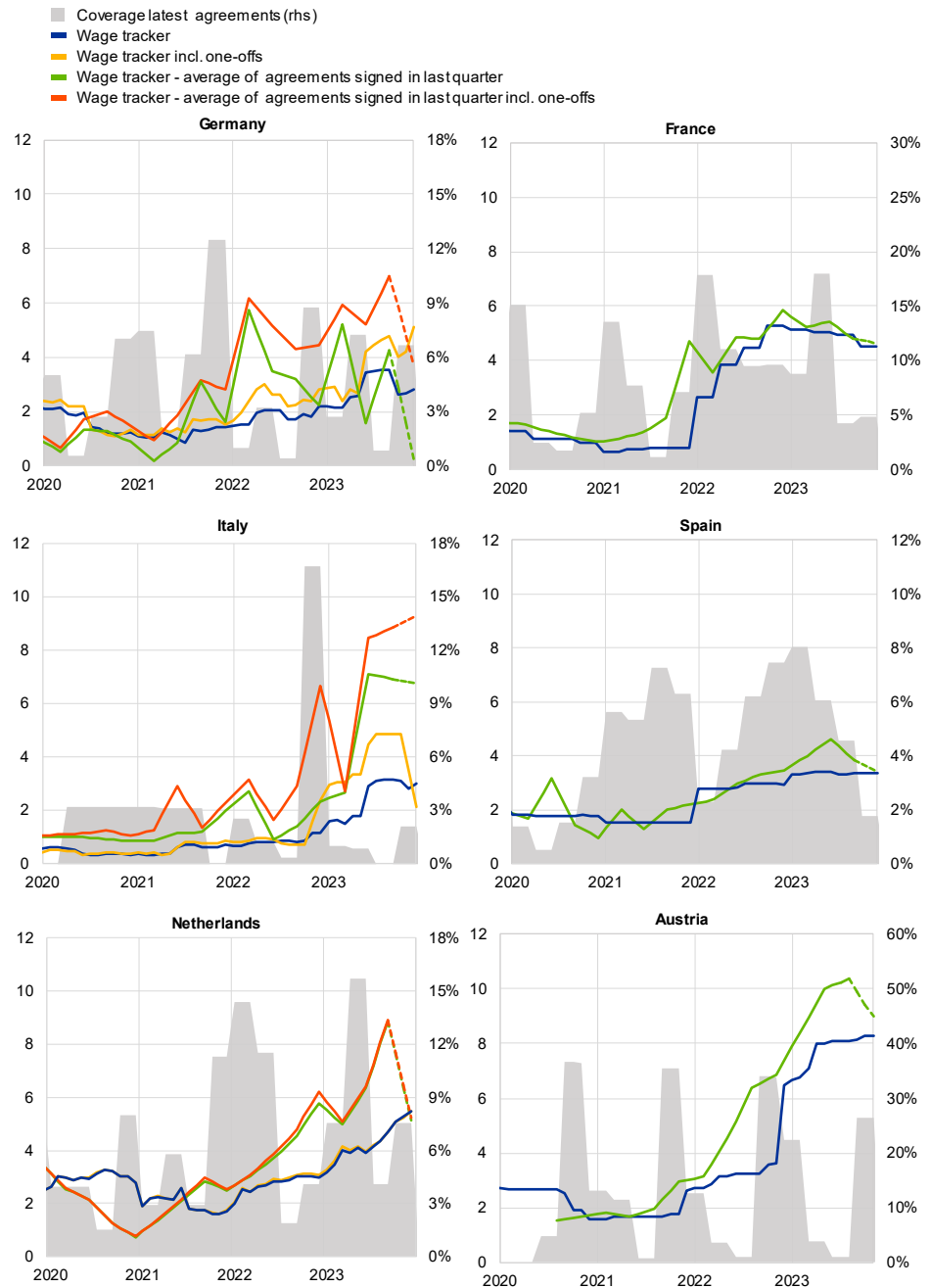
Source: Based on data from Deutsche Bundesbank, Banco de España, the Dutch employer association (AWVN), Oesterreichische Nationalbank, Banca d'Italia and Banque de France. Notes: Coverage of latest agreements corresponds to the share of employees in a country (in %) that had their agreements signed in a given quarter.
Latest observation: Q4 2023 for wage growth in latest agreements preliminary as not all collective agreements reached in Q4 2023 are available yet; December 2023 for the baseline wage trackers.

The trackers of latest agreements also tend to vary more over consecutive quarters than is the case with baseline trackers. The reason is that the number of agreements used to compute the wage growth is much lower compared to the baseline tracker and varies depending on the timing of new agreements. Against that background the number of workers covered in recent agreements should always be considered when interpreting signals from the indicator in order to avoid weighting developments in few (small) agreements too heavily (see grey shaded areas in Chart 8 and 9). Finally, a comparison, where possible, of the wage trackers of latest agreements both excluding (green lines) and including one-off payments (red lines) confirms that one-off payments have been playing an important role in recent collective bargaining rounds, resulting in higher overall wage growth.

Chart 9

Euro area wage tracker of latest agreements

(Annual percentage changes; percentages)

Source: Based on data from Deutsche Bundesbank, Banco de España, the Dutch employer association (AWVN), Oesterreichische Nationalbank, Bank of Greece, Banca d'Italia and Banque de France.
Notes: Coverage of latest agreements corresponds to the share of the euro area employees (in %) that had their agreements signed in a given quarter. Data of latest agreements for Q4 2023 preliminary as not all collective agreements reached in Q4 2023 are available yet.
Latest observation: Q4 2023 for wage growth in latest agreements; December 2023 for the baseline wage trackers.

4 Assessing wage pressures in the euro area using wage trackers

We now illustrate how the wage trackers introduced in Section 3 can be used to assess current and near-term wage pressures in the euro area and its member countries. We start with a brief overview of negotiated wage developments before and during the recent inflationary episode and then go on to discuss signals about the near-term outlook for negotiated wages using wage trackers. The section concludes with an illustration of how our agreement-level database can be used to analyse the structure of negotiated wage growth in the euro area.

4.1 Recent developments in negotiated wage growth

Prior to the coronavirus (COVID-19) pandemic, negotiated wage growth was relatively moderate across euro area countries (Charts 6 and 7). In most countries wage growth began to increase gradually around 2018-2019, reflecting stronger economic growth and an improving situation in the labour markets.[32] Despite the pick-up, average negotiated wage growth in the euro area (excluding Greece) remained at around 2% between 2018 and early 2020. Negotiated wage growth slowed somewhat in 2020 and 2021 amid worsening economic conditions, low inflation, and heightened uncertainty caused by the COVID-19 pandemic. In addition, the large number of people working remotely and the alternative mechanisms for rewarding employees during the pandemic (which included one-off support for teleworking or pandemic-related payments) may have kept wage demands low.[33]

Negotiated wage growth started to pick up in 2022, with compensation for higher inflation and labour shortages in some sectors being important drivers. Across all countries in our sample, agreements signed in 2022 and 2023 were characterised by higher negotiated wage increases compared with previous years (Chart 8). At the same time, there was considerable heterogeneity both in negotiated wage growth rates across countries and in terms of wage growth acceleration. In some countries, such as Germany, wage increases were mainly passed on to workers in the form of larger-than-usual one-off payments rather than permanent increases in base wage rates.[34] In France, negotiated wages responded rather

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[32] In Spain negotiated wage growth has been on a very slow upward trend since 2013.

[33] See also Koester et al. (2020).

[34] In the case of Germany these one-off payments are also tax-free, increasing net wages very strongly as a result. See also Bodnár et al. (2022).

quickly to the surge in inflation at the end of 2021, fuelled by the more frequent-than-usual revisions of the national minimum wage.[35]

There is considerable uncertainty regarding the persistence of the current high negotiated wage growth rates. In the third quarter of 2023, the ECB's indicator of year-on-year negotiated wage growth in the euro area reached 4.7% (4.1% excluding one-off payments), well above its long-term average of 1.8% since 2010. While the pick-up in negotiated wage growth is not surprising given high inflation rates and strong labour markets, the question that is frequently asked is whether this elevated growth is set to persist. On the one hand, weaker economic activity and moderation in inflationary pressures should put downward pressure on wage growth. Higher recent use of one-off payments as opposed to structural wage increases similarly suggest that the current pick-up in negotiated wage growth might be of a temporary nature. At the same time, the staggered wage-setting mechanism across many countries could lead to a delayed and more long-lasting response of negotiated wages to past inflation.

4.2   Identifying wage growth turning points using wage trackers

Wage trackers can provide useful signals about the likely direction of negotiated wage growth in the near term. As the negotiated wage growth time series are backward-looking, the indicator will imply a delay in signalling any emerging wage pressures – even more so in countries where collective wage agreement durations are long. In this section we show how the wage trackers described in Section 3 can be used to assess wage pressures and the outlook in real time.

Forward-looking wage trackers albeit based on limited data, so far show no clear signs of a broad-based slowdown in negotiated wage growth in the near term (Charts 5 and 7). Given their leading character and assuming they cover sufficiently many workers, both the forward-looking wage trackers and the trackers of latest agreements can be helpful in identifying turning points of negotiated wage growth. As of December 2023, the forward-looking wage trackers suggest some further increases of negotiated wage growth in Germany and in the Netherlands based on the agreements already in force.[36] In the other countries, wage trackers indicate negotiated wage growth over the coming months either plateauing or moderating, albeit remaining at high levels. One-off payments matter when

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[35] In particular, sectoral wage floors in the pay scale negotiated in many French sectors started to lag behind the inflation-linked national minimum wage (NMW). As a consequence, social partners had to catch up with the revised value of the NMW, with the result that the wage agreements passed through the NMW increase to implement the new pay scale directly (partially or fully). See Baudry et al. (2023) and Gautier (2022, 2023) for details.

[36] The abrupt increase in structural wage growth in Germany expected in Q1 2024 is largely attributable to a foreseeably large structural wage increase in the public sector (at federal and municipal levels). The substantial volatility in the German wage tracker including one-offs signalled for mid-2024 is attributable to negative base effects from past one-off payments. In Italy, the strong increase of the wage tracker including one-offs in 2022 and 2023 and the rapid fall afterwards are due to very large one-off payments in the education and health sectors in late 2022 and early 2023 in the form of arrears payments.

assessing the outlook for negotiated wages. Looking at the euro area, the wage trackers signal aggregate negotiated wage growth of 3.7% in 2023 on average excluding one-offs, compared to 4.2% including one-offs. Based on the contracts already in force, wage growth (both excluding and including one-offs) is expected to move broadly sideways at levels around 4.5% in 2024.

The wage trackers of latest agreements indicate some cooling of wage pressures in recent months (Charts 8 and 9). For the euro area, average structural wage growth for the next 12 months in agreements signed in Q2 2023 (covering 7.5% of employees in the euro area) was 4.5%, while for agreements signed in Q3 2023 (covering relatively few workers, namely 1.4% of employees in the euro area) growth was 5%. Preliminary data for contracts signed in Q4 2023 covering 4.5% of employees in the euro area indicates an average growth rate of 3.6% in the next 12 months. However, the weakening of wage growth in latest agreements in 2023Q4 is driven to a large extent by the wage agreement of the public sector of the German states reached in December 2023, which is very backloaded in the sense that it foresees a structural wage increase only towards the end of 2024. The strength of wage growth in the latest agreements is greater when taking one-off payments into account: 5.5% in Q2 2023, 5.4% in Q3 2023 and 5.2% in Q4 2023 (the latter based on preliminary data). Looking at developments over time, wage growth in the latest agreements has in all countries covered plateaued and even slightly cooled down in recent quarters up to Q4 2023 (except for the indicator of latest agreements including one-offs in Italy, which however has only a very small coverage).

Chart 10

Wage growth in agreements signed in 2023 and share of agreements renewed

(Annual percentage changes and percent)
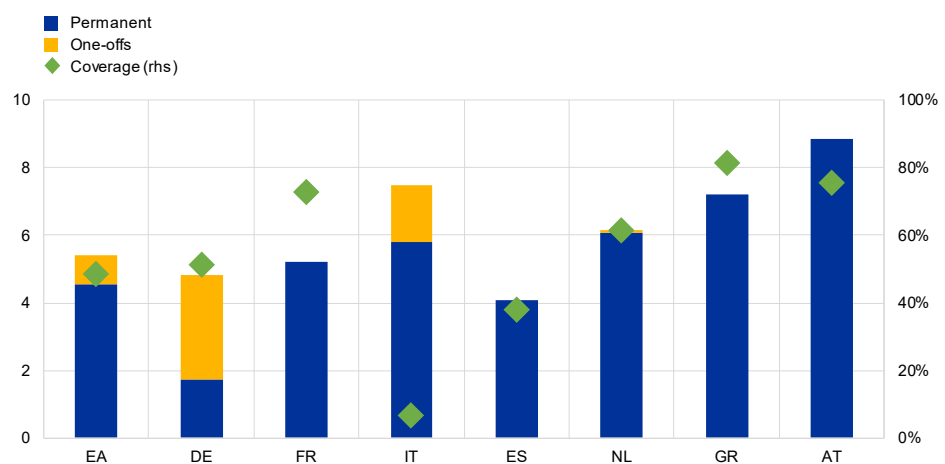
Source: Deutsche Bundesbank, Banco de España, the Dutch employer association (AWVN), Oesterreichische Nationalbank, Bank of Greece, Banca d'Italia and Banque de France.
Notes: The blue columns show the average wage growth over next 12 months negotiated in wage agreements signed in Q1 2023 to Q4 2023 (Q4 2023 data are preliminary as not all agreements concluded are available yet), by country and for the euro area. The diamonds reflect the share of agreements renewed and denote the number of employees who have had their collective agreements re-negotiated in 2023 as a percentage of total number of employees covered by the wage tracker database for the respective countries. Data included up to December 2023.

To properly interpret the relevance of latest agreements for wage growth, their coverage needs to be taken into account. Overall, average wage growth in

agreements signed in the euro area in 2023 has been 4.5% when excluding one-off payments and 5.4% when including one-off payments (Chart 10). Looking at country developments, wage growth in latest agreements has been highest in Austria and lowest in Spain. Germany, France and Spain recorded wage growth in latest agreements below the euro area average, while in the Netherlands, Greece, Italy and Austria it was above the euro area average. In total, roughly 49% of all workers covered by the wage tracker database have had their collective bargaining agreements renewed in 2023. In countries with usually short contract durations – like France, Austria and Greece – the share of employees for whom collective agreements were renewed was very high (around 75% or more). For Italy, where the contract duration is relatively long (usually 3 years) and where a large share of agreements that had expired in previous years has not been renegotiated, this share has been very low, at around 8%. The case of Italy highlights the importance of looking at the coverage of workers affected by recent agreements when interpreting signals from the wage trackers.

Box 1
The Indeed tracker of posted wages[37]

A new monthly wage growth tracker, developed by the Central Bank of Ireland (CBI) in collaboration with the Indeed online platform, examines trends in wages posted in online job ads. The Indeed tracker is based on data from millions of online job postings on the Indeed platform across France, Germany, Ireland, Italy, the Netherlands, Spain and the UK.[38] Chart A shows the Indeed trackers covering euro area countries for which we have also computed the wage trackers of negotiated wages.[39]

Similarly to developments in the wage trackers of negotiated wages, the Indeed tracker shows a considerable pick-up in wage growth as of 2021. Just like the tracker of latest agreements, the Indeed tracker started rising already around mid-2021. In principle, as new job offers can be adjusted instantaneously, the Indeed indicator is more closely correlated with the wage tracker of latest agreements than with the baseline tracker of negotiated wages. Both trackers show that wage growth in the five largest euro area economies increased further over 2022. Looking at countries, compared to autumn 2022 when the Indeed tracker for the euro area had reached its peak, the Indeed tracker has since declined in Germany, France and especially in Italy, but is now at higher levels in Spain and the Netherlands. Especially for Italy, the two trackers show quite different developments in terms of wage growth. This could also be the result of differences in coverage: In Italy (as well as in Spain) the number of job ads tracked by Indeed and the share of job ads that include the wage being offered are relatively low, so the signals from the Indeed tracker might be less reliable than they are for other countries. For the euro area, the Indeed tracker has decreased substantially since its peak in autumn 2022 and currently oscillates in the vicinity of 4%, while the wage tracker of latest agreements (including one-offs) reached 5.5% in Q2 2023 and decreased since then only slightly to 5.4% in Q3 2023 and – based on preliminary data – to 5.2% in Q4 2023.

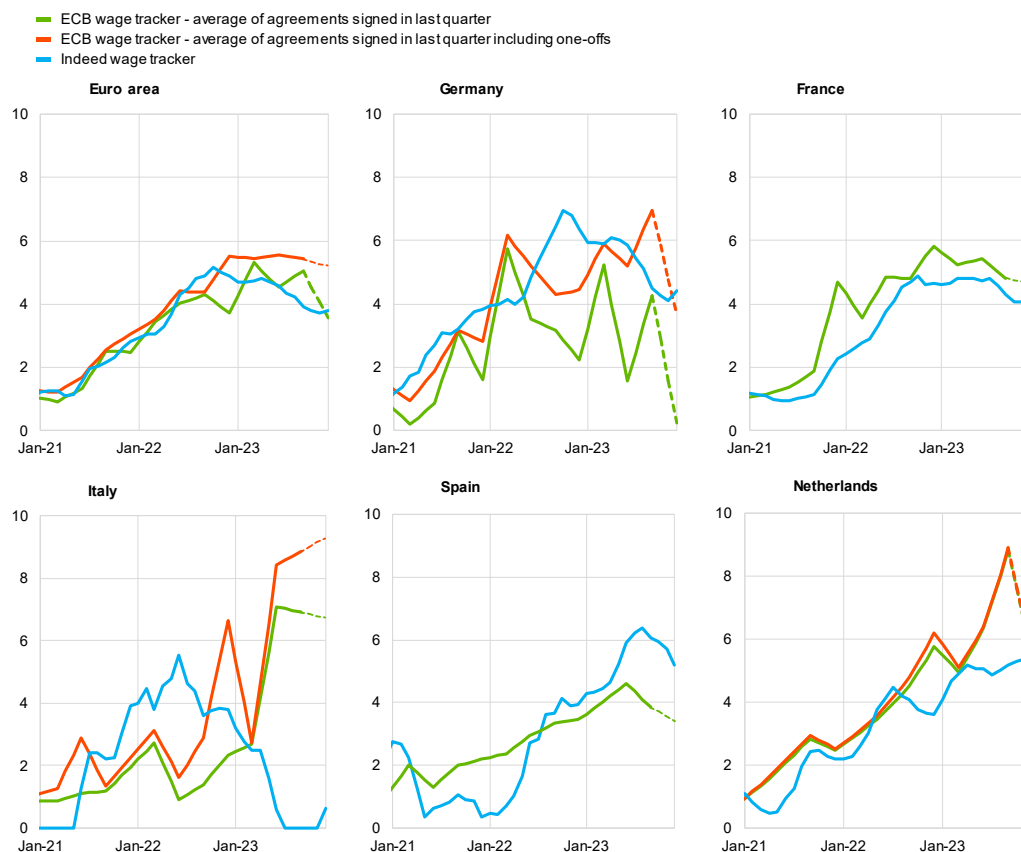[37] Prepared by Bruno Fagandini, Lucyna Górnicka, Peter Healy and Gerrit Koester.

[38] See Adrjan and Lydon (2022).

[39] More details including on coverage of the indeed tracker can be found in Adrjan, P. and R. Lydon (2023).

Indeed tracker of posted wages and the wage tracker of latest agreements

(Annual percentage changes)

- ECB wage tracker - average of agreements signed in last quarter
- ECB wage tracker - average of agreements signed in last quarter including one-offs
- Indeed wage tracker

Sources: Central Bank of Ireland and Indeed.
Note: EA aggregate based on DE, FR, IT, ES, NL, AT and GR. Indicator of latest wage agreements shows the wage growth implied by agreements reached in a quarter for 12 months ahead. The Indeed tracker (developed in cooperation with the Central Bank of Ireland) measures wage growth in online job ads.
Latest data point: December 2023 for the Indeed wage tracker, Q4 2023 for the rest.

When comparing signals from the Indeed tracker and the trackers of negotiated wages, it is important to consider methodological differences between the two. The ECB wage tracker captures the agreed wage growth for employees covered by collective bargaining agreements, while the Indeed indicator reflects only changes in wages offered to new hires.[40] As the two indicators capture wage dynamics in different parts of the labour market, they likely reflect disparate sources of wage pressures. For example, given its focus on the "marginal" worker, the Indeed indicator is apt to be more sensitive to labour market tightness (while showing only potential wage increases). By contrast, the ECB wage tracker of negotiated wages captures wage growth of "insiders" (who are sure to be paid) while providing much broader coverage. Overall, given their differences in terms of scope, the two indicators should be seen as complements rather than substitutes, even though they are in practice often highly correlated.

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[40] Additionally, coverage of different sectors in the Indeed database varies substantially across countries and should be taken into account when making cross-country comparisons.

4.3 Analysing drivers of wage pressures using agreement-level data

Data on individual collective bargaining agreements are useful for analysing the drivers of aggregate negotiated wage growth captured by the wage trackers. In the next step, we take advantage of our agreement-level database to look both at the contributions of individual countries to negotiated wage growth in the euro area and at the breadth of wage increases in individual countries.

Germany is expected to be the main contributor to negotiated wage growth in the euro area over the coming quarters (Chart 11). The country's contributions reflect both the weight attributed to the country (based on its contribution to the compensation of employees in the euro area – see Table 6) and the average negotiated wage growth. Given their substantial weights, developments in Germany and France are the most important for the euro area wage tracker. The contribution of France gained importance in 2022, reflecting the relatively quick response of negotiated wages to the surge in inflation. This is due to the explicit role of inflation in the legal rule of the national minimum wage adjustments, as well as the frequent re-negotiation of sectoral wage agreements whenever the latter are adjusted (Gautier 2022, 2023). The contribution of France to euro area negotiated wage growth is expected to decline in 2024, as disinflation will put downward pressure on wage growth. Developments in Germany are likely to continue contributing substantially to euro area aggregates well into 2024. To some extent, this rotation from France to Germany as the main contributor to euro area negotiated wage growth reflects the difference in durations of collective agreements and thus the different speeds of pass-through of recent inflationary shocks to negotiated wages.

Chart 11

Country contributions to the tracker of negotiated wage growth in the euro area

(Annual percentage changes and percentage point contributions)
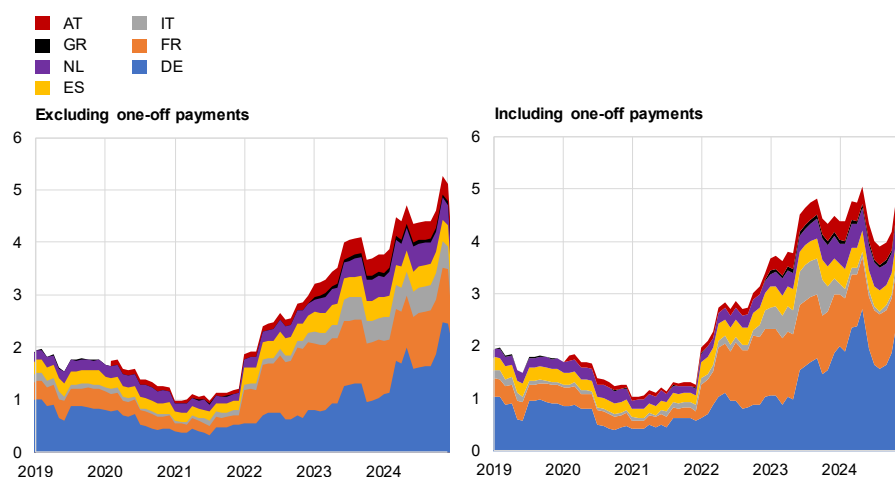
Chart 12

Contributions of wage agreements to the ECB wage tracker (excl. one-offs) by magnitude of wage increase

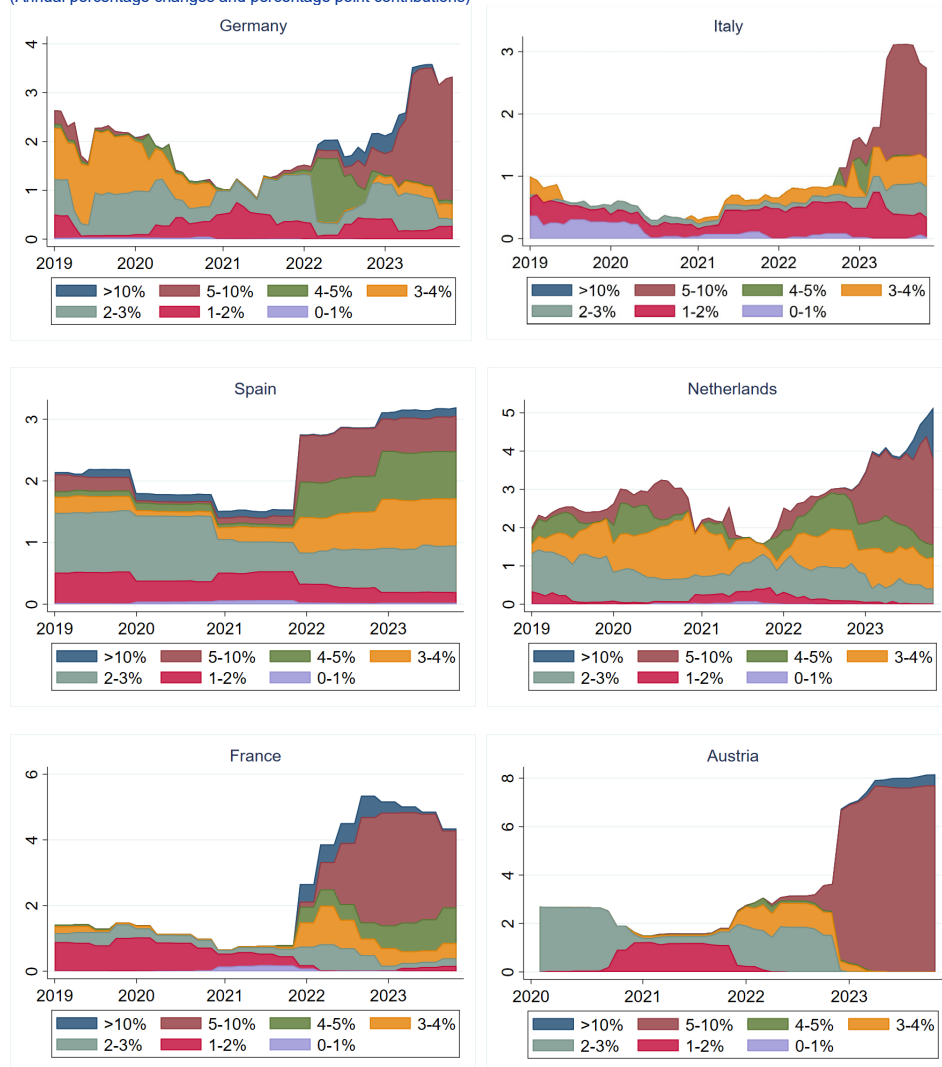(Annual percentage changes and percentage point contributions)

Source: Deutsche Bundesbank, Banco de España, the Dutch employer association (AWVN), Oesterreichische Nationalbank, Bank of Greece, Banca d'Italia and Banque de France.
Notes: Each chart shows contributions of agreements signed at a given wage growth rate to the aggregate negotiated wage growth at a given moment in time, based on all agreements valid at that time, independently of their signing date.
Latest observation: December 2023.

In some countries average negotiated wage growth masks considerable dispersion in wage rates across individual agreements. Our agreement-level database enables us to also investigate whether the recent pick-up in negotiated wage growth has been broad-based or driven by a few agreements with very high wage increases. Chart 12 shows contributions of wage agreements to country-level negotiated wage growth by year-on-year wage growth rate (we do not show the contributions for Greece due to the relatively low number of agreements). Considerable cross-country differences are noticeable here as well. First, it is not surprising that acceleration in negotiated wage growth has been broad-based in Austria and France, where inflation has an automatic (or implicitly automatic) impact

on collective bargaining outcomes. In these two countries, as well as in Germany, most agreements signed in 2023 were agreed at rates of between 5% and 10%. In comparison, the distribution of wage increases in collective agreements was much wider in countries such as Italy, the Netherlands and Spain. Notably in Spain, the range of wage increases seems particularly broad, which could potentially reflect the very decentralised nature of the collective bargaining process and, thus, the weaker position of the workers' unions, as well as the larger role played by firm-specific factors in the negotiations.

Chart 13

Contributions of wage agreements to ECB baseline wage tracker (excl. one-offs) by signing year

(Annual percentage changes and percentage point contributions)
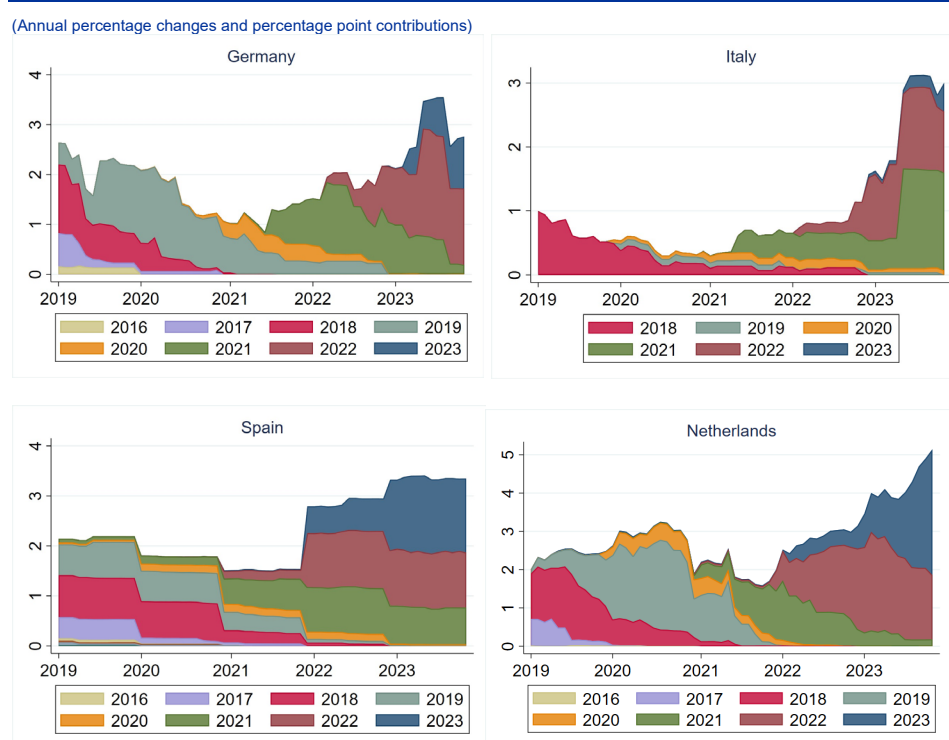
Source: Deutsche Bundesbank, Banque de France, Banco de España, the Dutch employer association (AWVN), Banca d'Italia.
Notes: Each chart shows contributions of agreements signed in different years to the aggregate negotiated wage growth at a given point in time.
Latest observation: December 2023.

Data on individual agreements also illustrate how quickly – **and for how long** – **changes in collective agreements affect aggregate negotiated wage growth in a given country.** Chart 13 shows – for the four countries with the longest average duration of collective agreements – the contribution of agreements signed in different years to the baseline country wage trackers over time. The contribution of agreements signed before inflation began to surge in autumn 2021 (these agreements tended to include much lower wage growth than agreements reached after the start of 2022) to structural wage growth in 2023 has declined considerably in the Netherlands, but they still play a large role in other countries such as Italy and Spain. This is because the relatively longer average duration of collective agreements in the latter countries compared to the Netherlands leads to an increase

in the inertia of negotiated wage growth. In Germany, agreements signed in 2021 were an important contributor to aggregated wage growth until mid-2023. There, large sectors such as wholesale and retail, as well as the public sector, had agreed on relatively long agreements in 2021, dragging down aggregate wage growth in Germany until very recently (when these two agreements were re-negotiated). Since a long average agreement duration reduces the pass-through speed of shocks to negotiated wages, it could potentially lead to a longer persistence of the current high wage growth in the future. Therefore, changes in average length of wage contracts and the agreed profile of wage increases are also important to monitor.

In summary, wage trackers show some plateauing of wage growth at high levels and highlight the role of country-specific characteristics when it comes to assessing the outlook. Divergent developments in negotiated wage growth across countries partly reflect differences both in terms of collective bargaining agreement duration and consequently in terms of how quickly new agreements replace the ones signed before the recent surge in inflation. Looking at recent developments there is evidence for some cooling of wage pressures in the euro area. However, the latest collective agreements up to Q4 2023, do not show a clear indication of a turning point for negotiated wage growth yet and the long average contract duration in some countries could potentially lead to quite some persistence of the current high wage growth rates in the future.

The new wage trackers can enrich the analysis of wage developments across multiple dimensions. The underlying database of individual agreements illustrates not only the importance of individual country contributions but also the extent to which new agreements affect wage developments and how broad-based the pressures are in individual countries, as well as in the euro area. The data enable close tracking of developments in the latest agreements, and the relevance of these latest agreements can be assessed in combination with information on the share of agreements due to expire in a given period or already renewed.

5 Cross-checking wage forecasts based on the forward-looking wage tracker

Inflation, labour market conditions and productivity developments play a prominent role in forecasting wage growth in the euro area. Wage developments can be assessed against empirical regularities by estimating a Phillips curve for wages, which links wage growth to economic or labour market slack, as well as past or expected inflation and productivity. In this context, the ESCB Wage Expert Group (see Nickel et al. 2019) has found that cyclical drivers, as captured by a standard Phillips curve, explain much of the wage growth developments in the euro area during pre-COVID time period and proposes a set of Phillips curve specifications as suitable cross-checking tools for medium-term wage forecasts for the euro area. Most of the consistently well-performing wage Phillips curve specifications rely on the unemployment rate as a measure of slack.

Given their forward-looking dimension, wage trackers could be useful as an additional cross-checking tool for negotiated wage growth forecasts. Box 2 describes how the Bundesbank uses the collective agreement data when forecasting negotiated wage growth. Below, we show how wage trackers introduced in Section 3 can be applied as cross-checking tools for wage forecasts. As already discussed, the forward-looking part of the baseline wage tracker reflects average negotiated wage growth based on all agreements in force at any given moment in the future. While capturing future wage growth as already agreed in collective bargaining contracts should help to forecast wage growth reliably, the number of employees covered by the baseline tracker decreases over time as more and more agreements are due to expire. As a result, the signal from the indicator becomes less relevant as one moves further out into the future. To be able to compare signals about future negotiated wage growth from the forward-looking wage tracker with forecasts for negotiated wage growth, one consequently needs to make assumptions on how to extend agreements that are due to expire over the forecast horizon. In this section, we describe scenarios that are used to extend the baseline wage tracker under various assumptions for productivity and inflation. Additionally, we derive "augmented wage trackers", which are based on country-specific estimations of the role of key macroeconomic variables for future wage agreements. We then compare the forecast performance of the baseline and "augmented" wage trackers for negotiated wage growth against a subset of wage Phillips curves. The analyses presented here should be viewed as mainly illustrative; follow-up work, including among other things an in-sample evaluation of the wage trackers, is planned.

Box 2
Forecasting negotiated wages at the Bundesbank[41]

The Bundesbank's negotiated pay rates statistic is the key database for the German wage projection in the Eurosystem staff projections. This database covers around 21 million employees (around half of the total employees) and includes detailed information on more than 500 collective sectoral wage agreements, as well as civil servants' wage adjustments as of January 1991.[42] For instance, it includes information on the duration of sectoral wage contracts and on future pay hikes. The database thus comprises the time profile of pay hikes according to the collective wage contracts, including also regular annual payments (e.g. vacation payments) or special payments (e.g. one-off inflation compensation premia). It therefore reveals an exact pattern of the future negotiated wage profile. The projection of collective wage increases can then serve as a key input for predicting actual wages and compensation per employee.

Data on industry-specific agreements are regularly fed into the Bundesbank projections. The starting point for the forecasting exercise is industry-specific wage contracts. The projection horizon is divided into two periods. The first period covers the remaining duration of the sectoral contracts, for which information on the wage profiles is set out in the contracts. The second period refers starts after a contract's expiration and before the end of the projection period. Following expiration of the individual wage contract, a new wage contract for the subsequent 12 months is projected by setting a sector-specific pay increase for this period. In a further step a follow-up 12-months-ahead pay increase is added. The assumptions for the projected wage profile are based on historical wage growth, the pass-through from inflation to wages and industry-specific developments.[43] Moreover, the wage forecast is conditional on the overall scenario of the macroeconomic projection exercise. It is important to note that the expected wage increases refer to the total pay volume for the subsequent 12 months, which usually applies to wage components that are regularly lifted by pay rates ("dynamic adjustment"). This means that the wage projection is based only on scheduled payments.[44] The industry-specific wage increases are based on a subset of the total sample of wage contracts, which covers around two-thirds of all employees in the database, spanning all major sectors such as the metal and electrical industry, as well as the public sector. Wages are projected uniformly in the remaining sectors.

During the projection exercise, a range of sensitivity analyses with various assumptions for the wage projection are conducted. Moreover, econometric models serve as additional cross-checks on the wage projections. These models include the Bundesbank's semi-structural macroeconometric model[45] and traditional wage equations based on Phillips curve relationships.

Compared to the ECB wage tracker, the projection of collective wages (after contracts have expired) is based on a broader set of information. This results in more nuanced wage forecasts – for example, with respect to industry-specific pay increases in major sectors. Similarly to the ECB

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[41] Prepared by Daniel Radowski, Deutsche Bundesbank.

[42] For West Germany individual wage contract data date back to January 1984. In addition, there are a few older time series for aggregate data that start in January 1958. Please note that these older time series are calculated using a different methodology and for a much smaller sample.

[43] To this end, the Bundesbank considers, for example, (sector-specific) productivity growth in addition to sentiment indicators. Moreover, we closely monitor press releases and statements issued by social partners.

[44] Note that for the June 2023 Eurosystem staff projections, the Bundesbank incorporated the widespread use of the tax-free inflation compensation premia in its wage projection.

[45] See Haertel et al. (2022)

wage tracker, the Bundesbank database facilitates the calculation of agreed pay rates for a subset of contracts, e.g. those that have only recently been settled. This enables the monitoring of early signs of increasing wage pressures. The highly detailed information on all pay components also makes it possible to decompose negotiated wage growth into, e.g. the contribution of permanent wage increases, usual one-offs and inflation compensation premia. Moreover, the forecast exercise produces time series of projected wage increases for the total economy, the largest sectors and many individual industries for East and West Germany separately.

5.1   Scenario analysis

Forward-looking wage trackers collate information indicative of future wage growth based on already concluded collective bargaining contracts. This information, while relevant for assessing future wage pressures, is only partial, as more and more contracts are due to expire over the forecast horizon, with coverage of the forward-looking wage trackers declining in parallel.

Agreement-level data can be used to project negotiated wage growth under alternative scenarios for contracts that are due to expire over a projection horizon. Using information on the end dates and number of workers covered by individual collective bargaining agreements, it is possible to assess the extent to which upcoming wage negotiations could potentially change the outlook for negotiated wage growth in comparison to the agreements that have not yet expired. For example, a scenario analysis can be performed to assess the impact of wage rises in agreements scheduled for re-negotiation in future quarters on aggregate negotiated wage growth, were they to be re-negotiated at the same wage growth rates as in the latest negotiation rounds.

We consider three main scenarios for the renewal of wage contracts, each differing with respect to the pass-through of inflation to wage growth. The first scenario assumes that wage pressures remain at the same level as in the most recent negotiation rounds, with agreements that are due to expire over the forecast horizon being re-negotiated at the same wage rate. The second and third scenarios exploit the fact that labour productivity and price inflation have historically been the most important drivers of wage growth (see Nickel et al. 2019). As the importance of various inflation measures that serve as the basis for wage negotiations might change over time, the second scenario assumes that contracts that are due to expire are renewed at a rate of labour productivity growth plus HICP excluding food and energy. This contrasts with the third scenario, which assumes that changes in energy and food prices are additionally taken into account in wage negotiations and therefore uses HICP (headline) inflation as the relevant inflation measure.

Scenario analysis is performed at the country level taking the latest forecast data into account. In all scenarios *country-specific* data on wage growth in latest agreements are used, as are the latest *country-specific* ECB or Eurosystem staff projections. Country-level results are then compiled to give a euro area aggregate.

Scenario analysis based on the wage tracker enables the derivation of benchmarks for negotiated wage growth over the subsequent quarters. Chart 14 compares the path of the forward-looking euro area wage tracker (including and excluding one-offs) until end-2024 for the three scenarios. First, the red dashed line shows the average negotiated wage growth if all new agreements to be re-negotiated over 2024 were to settle on a wage increase equal to the rate, as set in the collective agreements concluded in 2023Q3 (the last quarter for which all data is available), which equalled on average 5.4% including one-offs and 5% excluding one-offs in the euro area (Scenario 1). The yellow dashed line shows the second scenario, in which all new agreements settle on a wage increase equal to the latest (December 2023) Eurosystem forecast of HICPX inflation for 2024 plus the projected labour productivity growth. The third scenario (green dashed line) assumes that all agreements expiring over the scenario horizon will be extended at a wage rate equal to the latest Eurosystem staff projections of headline inflation for 2024 plus projected country-specific annual labour productivity growth.[46]

Chart 14

Scenario analysis of negotiated wage growth in the euro area

(Annual percentage changes)
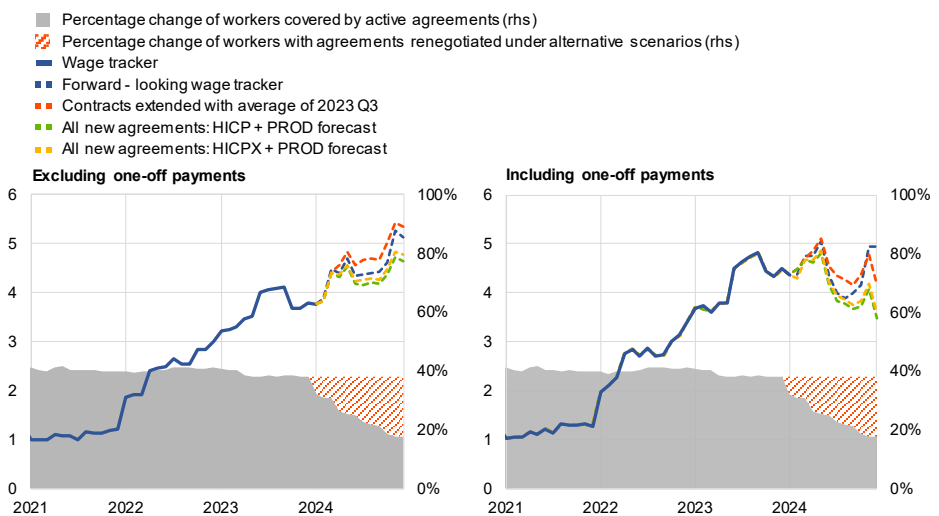
Note: Euro area aggregate based on Germany, France, Italy, Spain, The Netherlands, Austria, Greece .
Latest data point: December 2024 for scenario analyses. Latest historical data point: December 2023.

Forward-looking wage trackers including and excluding one-offs indicate wage growth in 2024 slightly above 2023 levels. For 2023, the forward-looking wage trackers indicate an average year-on-year growth of negotiated wages of 4.2% when including one-offs, substantially higher than an average of 3.7% when excluding one-offs. For 2024, the forward-looking baseline trackers indicate a slight further increase in negotiated wage growth to around 4.5% - both including and excluding one-off payments. That the trackers including and excluding one-offs are so similar indicates

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[46] For reference, the Eurosystem staff projections of December 2023 envisage euro area year-on-year HICP inflation and HICP excluding energy and food inflation both at 2.7% in 2024 on average. Labour productivity in the euro area is foreseen in the December projections to increase by 1.0% in 2024.

that in 2024 the negative base effects of one-offs paid out in 2023 and the upward effects of additional one-off payments broadly cancel out.

If wage agreements that are due for renegotiation from now until end 2024 were concluded at the same rate as in Q3 2023, negotiated wage growth in 2024 would be broadly similar to what the forward-looking wage trackers indicate. In this case negotiated wage growth including one offs would be at the same level as the forward-looking wage tracker (4.5%) and slightly above the level of the forward-looking tracker when one-offs are not accounted for (4.7%).

A full pass-through of the on-going disinflation in 2024 to wage agreements over the next quarters would lead to a lower aggregate negotiated wage growth in 2024. As the December 2023 projections foresee very similar values for HICP and HICPX inflation in 2024, the scenarios in which all agreements are re-negotiated at a rate equal to the projected HICP or HICPX inflation plus productivity growth are very similar. These scenarios would signal negotiated wage growth in 2024 to be at 4.1%-4.3%, which is somewhat lower than suggested by the forward-looking wage trackers or by the scenario based on latest agreements.

Negotiations over the first quarter of 2024 are likely to be decisive for the development of wage pressures over 2024. As a large share of contracts will run out and is due for renegotiation over the first quarter of 2024 (Chart 14), the wage growth agreed in these renegotiations can be expected to have a decisive impact on the development of wage pressures in 2024. This reflects the importance of a detailed monitoring of wage negotiations over the first months of 2024.

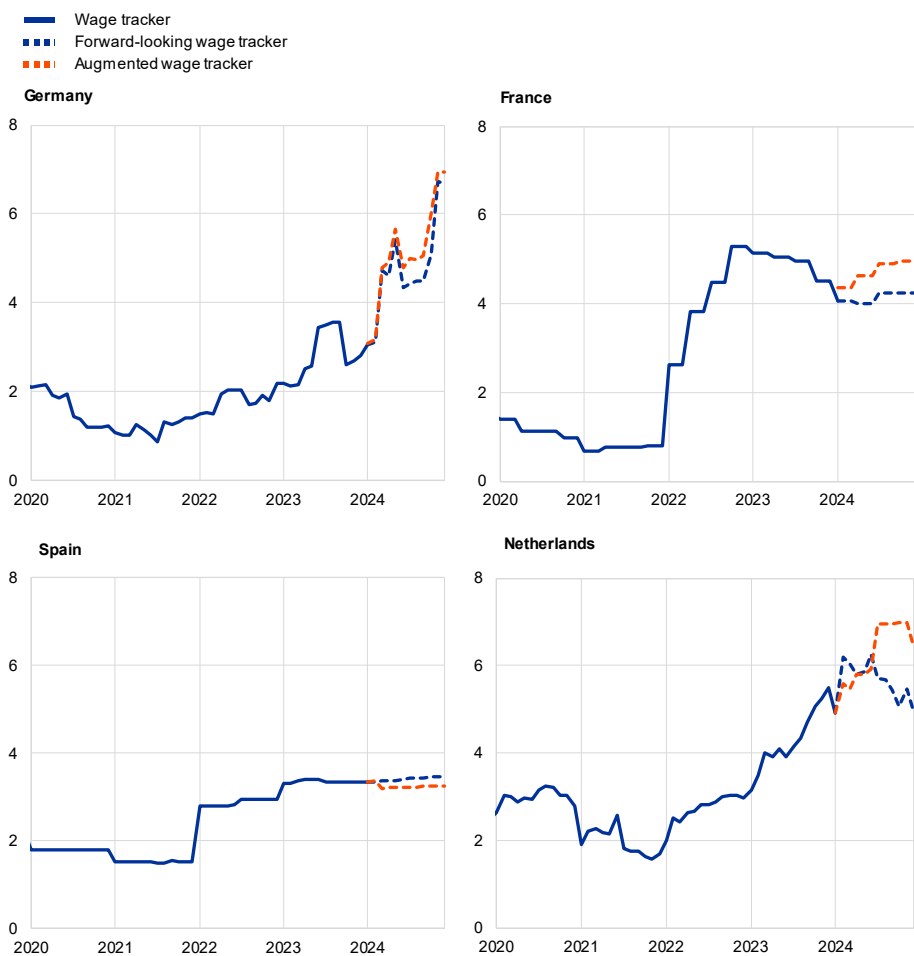## 5.2   Augmented forward-looking wage trackers

The rates at which new agreements going forward will be re-negotiated can also be estimated based on historical relationships between negotiated wage growth and other macroeconomic variables. As we have argued, wage growth in new agreements is more responsive to the current macroeconomic environment (including changes to inflation and unemployment) than is aggregate negotiated wage growth, which adjusts only gradually as old agreements expire and new agreements are concluded. Estimating the role of drivers such as inflation and labour productivity for wage growth in latest agreements can thus help to infer wage growth in agreements that are due to expire over the next few quarters.

Below, we construct an "augmented" forward-looking wage tracker in two steps. First, we regress the time series of structural wage growth (i.e. excluding one-off payments) in the latest agreements on a few key macroeconomic variables that are of key importance in wage negotiations: measures of inflation, labour market slack and productivity. To obtain meaningful estimates, it is necessary to have sufficiently long time series of agreement-level data, with significant variation over time. This excludes Austria and Greece, where the sample is very short, as well as Italy, where there was little variation in wage growth in the latest agreements before 2021. We focus on negotiated wage growth excluding one-offs, as the estimates

from the regressions of structural wage growth on macroeconomic variables are more statistically significant than in the case of wage growth including one-off payments (given the volatile character of the latter). Next, we use coefficient estimates from these regressions and the latest Eurosystem staff projections of the macroeconomic variables to produce forecasts of wage growth in future negotiation rounds. In the second step, we compute the *augmented forward-looking wage tracker* by assuming that the agreements expiring over the next few quarters are extended at the wage growth rates derived in step 1.

Chart 15

Augmented forward-looking wage trackers for selected countries

(Annual percentage changes)

Notes: Augmented forward-looking wage trackers are computed using the two-stage approach described in Box 3. When computing augmented wage trackers, structural negotiated wage growth (excluding one-offs) is shown.
Latest data point: December 2024. Latest historical data point: December 2023.

The augmented forward-looking wage trackers remain relatively close to the baseline wage trackers at the current juncture. Chart 15 shows the results for four countries: Germany, France, Spain, and the Netherlands. The augmented wage tracker indicates higher negotiated wage growth compared to the forward-looking wage tracker in 2024 in Germany, France and the Netherlands, and slightly lower growth in Spain. In France the augmented wage tracker shows future wage growth

stabilising at current growth rates. In Overall, the two versions of the indicator are relatively close to each other in all four countries. The fact that the augmented wage tracker is currently very close to the baseline version of the forward-looking tracker could also indicate that wage growth agreed in recent bargaining rounds is broadly in line with what would be implied by developments in macroeconomic fundamentals: inflation, unemployment and productivity.

A forecast performance assessment shows that the baseline and augmented wage trackers can serve as reliable cross-checking tools for wage-forecasting purposes. To assess the quality of signals for future negotiated wage growth from the baseline forward-looking wage tracker and its augmented version, we compare the root mean squared forecast errors of their out-of-sample forecasts with forecasts based on two well-performing Phillips Curve (PC) specifications for negotiated wage growth (Box 3). The two wage trackers perform closely in line with the two wage PCs at short-term forecast horizons but often outperform them over longer horizons. For Spain and France, the augmented wage trackers seem to outperform the two PCs across horizons. In sum, the results of our simple forecast performance exercise suggest a high potential of the wage tracker as a reliable cross-checking tool for wage-forecasting purposes. In addition to refinements in the modelling of the augmented wage tacker, expanding the coverage of the agreement-level database underlying the wage tracker should help to further improve the usefulness of the augmented forward-looking wage tracker as a cross checking tool for wage forecasts.

Box 3
Forecasting performance of the forward-looking wage trackers[47]

Real-time forecasting performance of the wage trackers is assessed against two versions of the wage Phillips Curve. To assess the real-time forecast performance of the forward-looking wage tracker and its augmented version, we use the Phillips Curve (PC) framework for negotiated wage growth as a benchmark. We compute two alternative wage PC specifications, which include lagged negotiated wage growth (NW) measures of slack, measures of year-on-year inflation (headline, core, excluding energy, depending on the particular country) (π) and productivity per employee growth (prod):

$$NW_q = \alpha + \beta * NW_{q-1} + \gamma * \pi_{q-i} - \delta * slack_{q-j} + \zeta * prod_{q-k} + \varepsilon_q, \qquad (1)$$

where NW_q stands for year-on-year negotiated wage growth in quarter q. For each country, we consider two PC specifications: one using the unemployment rate and one using the unemployment gap as a measure of slack. We then compute forecasts of negotiated wage growth up to six quarters ahead using the vintage of ECB forecasts of the three explanatory variables available in a given quarter.

We also compute real-time forecasts using the baseline and augmented forward-looking wage trackers. For the augmented version of the tracker, we first estimate the following regression of wage growth in latest agreements:

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[47] Prepared by Giulia Gardin and Lucyna Górnicka

$$\widetilde{NW}_q = \alpha + \beta * \pi_{q-i} - \gamma * slack_{q-j} + \delta * prod_{q-k} + \varepsilon_q, \tag{2}$$

where $\widetilde{NW}_q$ stands for wage growth over next 12 months, as agreed in collective agreements signed in quarter q. We experiment with measures of slack, inflation and productivity and then choose specifications that maximise the goodness of fit. Table 7 shows the explanatory variables selected for each country. We then use coefficients from regression (2) and the vintages of (B)MPE forecasts of the explanatory variables to project $\widetilde{NW}_q$ up to six quarters ahead.

Table 7: Country-level regressions of wage growth in latest agreements: selected explanatory variables

Country	Explanatory variables in equation (2)
France	headline inflation (r), unemployment gap (r), lagged dependent variable
Germany	headline inflation (r), GDP growth (r)
Spain	core inflation (f), unemployment rate (r), productivity per worker (r)
The Netherlands	core inflation (f), productivity per worker (r), lagged dependent variable

Notes: (r): realized value, (f): forecasted value.

We use the projected $\widetilde{NW}_q$ to extend collective bargaining agreements expiring over the next six quarters. Finally, we compute the aggregate negotiated wage growth forecast by combining the forecasted wage growth in new agreements with wage growth in the baseline forward-looking wage tracker, which shows wage growth in agreements that will not have expired over a given projection horizon.

The forecast performance comparison demonstrates the high potential of the wage tracker to serve as a reliable cross-checking tool for wage-forecasting purposes. Table 8 shows the results of the real-time forecast exercise, comparing the performance of the two PCs and the two versions of the wage tracker in terms of the root mean squared forecast error for three horizons: namely, two, four and six quarters ahead. For Spain, both versions of the wage tracker exhibit forecast errors that outperform one or both of the wage PCs, while for France it is the augmented version that has smaller forecast errors across horizons compared to the two wage PCs. In Germany and in the Netherlands the two wage PCs are outperformed by the augmented forward-looking tracker at the six-quarters-ahead horizon only. The results for Germany and the Netherlands clearly show that more work needs to be done in terms of identifying best performing specifications of the regression of wage growth in latest agreements for the wage tracker to compete with the wage PCs. Nevertheless, our straightforward exercise highlights the wage tracker's clear potential to be used as a cross-checking tool for forecasting purposes.

Table 8: Real-time forecasting of negotiated wage growth: root mean squared forecast error comparison

Country	Model	2 quarters ahead	4 quarters ahead	6 quarters ahead
Germany	Wage PC (1)	0.36	0.49	0.59
	Wage PC (2)	0.33	0.43	0.56
	Baseline WT	0.51	0.53	0.81
	Augmented WT	0.44	0.51	**0.50**
The Netherlands	Wage PC (1)	0.31	0.49	0.74
	Wage PC (2)	0.31	0.49	0.71
	Baseline WT	0.55	0.74	0.82
	Augmented WT	0.36	0.58	**0.68**
Spain	Wage PC (1)	0.29	0.28	0.42
	Wage PC (2)	0.28	0.28	0.46
	Baseline WT	**0.12**	**0.23**	**0.30**
	Augmented WT	**0.18**	**0.27**	**0.39**
France	Wage PC (1)	0.49	0.81	1.06
	Wage PC (2)	0.49	0.82	1.07
	Baseline WT	**0.14**	0.83	1.83
	Augmented WT	**0.17**	**0.51**	**0.92**

Notes: Wage PC (1) stands for the wage Phillip's curve specification with unemployment rate as a measure of slack, while Wage PC (2) denotes the wage Phillip's curve specification using the unemployment gap as a measure of slack instead. Baseline WT stands for the baseline wage tracker, augmented WT for the augmented version of the wage tracker. Evaluation sample: 2013-2022 for the baseline WT for the Netherlands and Germany, augmented WT for Germany; 2014-2022 for the augmented WT for the Netherlands, for the baseline and augmented WT for Spain; 2010-2022 for the baseline and augmented WT for France.

6   Summary and conclusions

Tracking developments in collective wage agreements can be very useful in assessing wage pressures and forecasting wage growth in the euro area. Given the importance of collective bargaining in many euro area countries, negotiated wage indicators enable wage growth to be tracked for a vast majority of employees and. In the medium term, negotiated wages are the main driver of total growth in compensation per employee in the euro area.

Contrary to existing indicators of negotiated wages, we not only track contemporaneous developments in wage growth but also exploit the agreement-level data to compute a "forward-looking" wage tracker. The baseline forward-looking wage tracker covers the average future year-on-year negotiated wage increases as envisaged in the collective bargaining agreements currently in force. Additionally, we develop trackers of wage growth agreed in the most recent wage negotiations, which can be used to gauge the changes in the outlook for wage dynamics based on agreements reached in the most recent period under study. To calculate these wage trackers, we deploy a detailed database on individual collective bargaining agreements. The database covers more than 55 million employees in the euro area. Data for all five largest euro area countries are available from 2013 onwards, but in some countries the data series start much earlier.

The euro area wage trackers have been very closely aligned with indicators of negotiated wage growth. This implies that coverage of the forward-looking wage tracker is large enough to give important and reliable signals about current and future wage developments in the euro area. At the same time, the two indicators are not perfectly aligned, which can also partly result from the fact that indicators of negotiated wage growth are not harmonised across countries (for details see Koester et al. 2020). The link between the series of negotiated wages and the wage tracker is somewhat less closely aligned when including one-off payments, reflecting differences in national approaches on how to integrate one-off payments.

The new wage trackers can enhance the analysis of wage developments along multiple dimensions. The newly established database of individual agreements in seven euro area countries serves not only to illustrate the importance of individual country contributions to negotiated wage growth in the euro area but also to see the extent to which new agreements affect wage developments and how broad-based the pressures are. The data makes it possible to closely track developments in the latest agreements, and the relevance of signals from the latest agreements can be assessed in combination with information on the share of agreements that have been renewed or are due to expire in a given period.

Wage trackers focusing on recently concluded agreements have leading properties in signalling turning points of wage growth. As long as recently signed agreements cover sufficiently many workers, wage growth in those agreements can provide more timely information on wage pressures than wage

growth based on all agreements, especially when collective agreements are signed for more than one year, as is the case in many euro area countries. This is because any changes in the agreed wage growth in individual agreements feed through only gradually to aggregate negotiated wage growth as old agreements expire and new agreements are concluded. Wage rises agreed in recent negotiation rounds are also a signal not only of current negotiation sentiment but also of the direction in which aggregate negotiated wage growth could develop if, for example, high wage increases were to become more broad-based. Hence, the wage trackers of latest agreements tend to lead the baseline wage trackers and can help to signal turning points in wage growth early on.

A forecast performance assessment shows that the baseline and augmented wage trackers can serve as reliable cross-checking tools for wage forecasting purposes. An analysis of root mean squared forecast errors of the out-of-sample forecasts shows that the wage trackers can beat well-performing Phillips Curve (PC) specifications for negotiated wage growth, especially at a horizon extending beyond two quarters ahead. This is the case for augmented wage trackers in particular, which are based on country-specific estimations of the role of key macroeconomic variables for wage agreements that are due to expire over the forecast horizon. Looking ahead, further refinements in the modelling of augmented forward-looking wage trackers and expansion of the agreement-level database coverage should help to further improve the usefulness of the forward-looking wage tracker as a cross-checking tool for wage forecasts.

Wage trackers are an example of very successful cooperation in the Eurosystem, and there are plans for further enhancements, including for their use in assessment and forecasting. ECB and NCBs have jointly developed the new forward-looking wage trackers to enhance the assessment of wage pressures in individual countries and the euro area – combining the expertise of the ECB on the euro area and of the NCBs on national wage-setting and data. The forward-looking wage trackers are a major innovation in the Eurosystem toolbox for assessing negotiated wage developments and are unmatched also outside of the Eurosystem. Planned improvements include extending the coverage of the database (including in terms of the number of countries and contracts covered, time span, information on one-off payments and indexation clauses), establishing representative sectoral wage trackers and applying forward-looking wage trackers as an input and a regular cross-checking tool for wage forecasts in the Eurosystem.

7 References

Adamopoulou, E. and Villanueva, E. (2022), "Wage determination and the bite of collective contracts in Italy and Spain", Labour Economics, Vol. 76, pp. 102-147.

Adrjan, P. and Lydon, R. (2022): "Wage growth in Europe: evidence from job ads", Economics Letter – Central Bank of Ireland, Vol 2022, No. 7.

Adrjan, P. and Lydon, R. (2023): What Do Wages in Online Job Postings Tell Us About Wage Growth? (May 16, 2023 – SSRN).

Avouyi-Dovi, S., Fougère, D. and Gautier E. (2013), "Wage rigidity, collective bargaining and the minimum wage: evidence from French agreement data", The Review of Economics and Statistics, Vol. 95, No 4, pp. 1337-1351.

Baudry, L. , Gautier E. and Tarrieu S. (2023), "Wage negotiations in a context of rising inflation", Bulletin de la Banque de France, No°245, Article 6.

Bodnar, K. and Le Roux, J. (2022), "Wage dynamics across euro area countries since the start of the pandemic", ECB Economic Bulletin Issue 8/2022.

Bodnár, K., Gonçalves E., Górnicka, L. and Koester, G. (2022), "Wage developments and their determinants since the start of the pandemic", ECB Economic Bulletin, Issue 8/2022.

Card, D., and Cardoso, A. (2022): "Wage flexibility under sectoral bargaining", Journal of European Economic Association, Vol. 20, pp. 2013-2061.

Carrasco, R., García-Pérez, J. I. and Jimeno, J. F. (2022), "Worker flows and wage dynamics: estimating wage growth without composition effects", Oxford Economic Papers 2022.

Dias da Silva, A., Dossche, M., Dreher, F., Foroni, C. and Koester, G. (2020), "Short-time work schemes and their effects on wages and disposable income", Economic Bulletin, Issue 4, ECB, 2020.

European Central Bank (2002), "Monitoring wage developments: an indicator of negotiated wages", ECB Monthly Bulletin, September 2002.

Fougère, D., Gautier, E. and Roux, S. (2018), "Wage floor rigidity in industry-level agreements: evidence from France", Labour Economics, Vol. 55, pp. 72-97.

Gautier, E. (2022), "Negotiated wage rises for 2022: the results so far", BdF blog post published on 05/13/2022.

Gautier, E. (2023), "Negotiated wage increases: what is the picture for 2022?", BdF blog post n°301 published on 01/20/2023.

Gautier, E., Roux, S. and Suarez Castillo, M. (2022), "How do wage setting institutions affect wage rigidity? evidence from French micro data", Labour Economics, Vol. 78, October 2022.

Hahn, E. and Koester, G. (2020), "Developments in compensation per hour and per employee since the start of the COVID-19 pandemic", Economic Bulletin, Issue 8, ECB, 2020.

Haertel, T., Hamburg, B. and Kusin ,V. (2022), "The macroeconometric model of the Bundesbank revisited", Deutsche Bundesbank. Technical Paper 01/2022.

Hahn, E. and Koester, G. (2020), "Developments in compensation per hour and per employee since the start of the COVID-19 pandemic" in the article entitled "The impact of the COVID-19 pandemic on the euro area labour market", Economic Bulletin, Issue 8, ECB.

Kanutin A. (2015), "The ECB's experimental indicator of negotiated wages", manuscript available here.

Koester, G. and Grapow, H. (2021), "The prevalence of private sector wage indexation in the euro area and its potential role for the impact of inflation on wages." ECB Economic Bulletin, Issue 7/2021.

Koester, G. and Wittekopf, D. (2022), "Minimum wages and their role for euro area wage growth", ECB Economic Bulletin, Issue 3/2022.

Koester, G., and Guillochon, J. (2018), "Recent developments in the wage drift in the euro area", Economic Bulletin, Issue 8, ECB.

Koester, G., Benatti, N. and Vlad, A. (2020), "Assessing wage dynamics during the COVID-19 pandemic: can data on negotiated wages help?", ECB Economic Bulletin, Issue 8/2020.

Kouvavas, O., Kuik, F., Koester, G. and Nickel, C. (2019), "The effects of changes in the composition of employment on euro area wage growth", Economic Bulletin, Issue 8, ECB, 2019.

Lane, P. R. (2022, 25 November), Inflation diagnostics, The ECB Blog. Lane, P. R. (2022b, 11 October).

Lane, P. R. (2023, 6 March), Underlying Inflation, Lecture at Trinity College Dublin.

Nickel, C., Bobeica, E., Koester, G., Lis, E. and Porqueddu, M. (eds.) (2019), "Understanding low wage growth in the euro area", Occasional Paper Series, ECB, No 232, September 2019.

Puente, S., Galán, S. (2014), "Analysis of composition effects on wage behaviour," Economic Bulletin, Banco de España, February issue.

Volkerink, M. (2020), "Influx of young employees and flex workers slowed down wage growth", DNB Bulletin published on 2 July 2020.

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BOXES

Box 1: The Indeed tracker of posted wages
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Box 2: Forecasting negotiated wages at the Bundesbank
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Box 3: Forecasting performance of the forward-looking wage trackers
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