

# Technical Paper

HICP and national CPI in Germany:  
as similar as possible, as different as needed

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Thomas A. Knetsch

Dilyana Popova

Patrick Schwind

**Editorial Board:**

Falko Fecht  
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Deutsche Bundesbank, Wilhelm-Epstein-Straße 14, 60431 Frankfurt am Main,  
Postfach 10 06 02, 60006 Frankfurt am Main

Tel +49 69 9566-0

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## **Non-technical summary**

### **Research Question**

Inflation in Germany is primarily measured using the national Consumer Price Index (CPI) and the Harmonised Index of Consumer Prices (HICP). This paper highlights the similarities and differences between the two from a statistical-methodological standpoint and with respect to the main analytical purposes.

### **Contribution**

The differences between the inflation rates measured with the CPI and HICP have become quite large over the past three and a half years, but particularly so in 2022. Differences in weighting have had the most significant contribution, followed by deviations in the coverage, as well as differing revision practices and other methodological differences.

### **Results**

The CPI is a Laspeyres index, the weighting scheme of which is regularly adjusted to a new base year every five years with a three-year delay. By contrast, the weighting of the HICP is adjusted annually based on the structure of consumption expenditure in the previous year. The different index-theoretical foundation results in different weighting schemes. Furthermore, it can be shown that the HICP weights shift significantly in the years in which a new CPI base year is included in their derivation for the first time. This is due to the fact that CPI weights were based substantially on the household budget survey (HBS) up until the penultimate base year changeover, while the annual update of the HICP weights with data from the national accounts (NA) uses a different data source. Since the last base year changeover CPI weighting is also primarily based on the NA consumption expenditure. The HICP weights will likely be less influenced by CPI base year changes in the future.

In the CPI the costs of owner-occupied housing (OOH) are incorporated via the rental equivalence approach. In the HICP they are currently not accounted for. In the 2020/2021 Monetary Policy Strategy Review, the ECB Governing Council recommended to incorporate OOH into the HICP and expressed preference for the net acquisitions approach as the measurement method. This paper argues that the different main analytical purposes of the CPI and HICP can justify the use of a different methodology. Experimental calculations suggest that an OOH-augmented HICP can deviate substantially from the CPI. When communicating the two inflation measures emphasis should thus also be placed on their main use and the resulting methodological differences.

# Nichttechnische Zusammenfassung

## Fragestellung

Inflation wird in Deutschland hauptsächlich anhand des nationalen Verbraucherpreisindex (VPI) und des Harmonisierten Verbraucherpreisindex (HVPI) gemessen. In diesem Papier werden Gemeinsamkeiten und Unterschiede aus statistisch-methodischer Perspektive und in Bezug auf die analytischen Hauptnutzungszwecke beleuchtet.

## Beitrag

Die Unterschiede zwischen den anhand des VPI und des HVPI gemessenen Inflationsraten sind in den vergangenen dreieinhalb Jahren, besonders aber im Jahr 2022 recht groß ausgefallen. Gewichtungsunterschiede haben dabei den bedeutendsten Beitrag geleistet, gefolgt von Abweichungen im Erfassungsbereich sowie unterschiedlichen Revisionspraktiken und sonstigen methodischen Unterschieden.

## Ergebnisse

Der VPI ist ein Laspeyres-Index, dessen Gewichtung regelmäßig alle fünf Jahre mit dreijähriger Verzögerung auf ein neues Basisjahr umgestellt wird. Beim HVPI wird indessen die Gewichtung jährlich an die Ausgabenstruktur des jeweiligen Vorjahrs angepasst. Aus dieser nicht deckungsgleichen indextheoretischen Fundierung ergeben sich abweichende Gewichte. Außerdem lässt sich zeigen, dass sich die HVPI-Gewichte in den Jahren, in welchen ein neues VPI-Basisjahr erstmals Eingang in deren Ableitung findet, kräftig verschieben. Dies ist darin begründet, dass die VPI-Gewichte bis zur vorletzten Basisumstellung wesentlich auf der Einkommens- und Verbrauchsstichprobe (EVS) beruhen, während für die jährliche Fortschreibung der HVPI-Gewichte mit Angaben der Volkswirtschaftlichen Gesamtrechnungen (VGR) eine andere Datenquelle herangezogen wird. Seit der letzten Basisumstellung fußt auch die VPI-Gewichtung maßgeblich auf den VGR-Konsumausgaben. Die HVPI-Gewichte dürften künftig weniger stark von VPI-Basisumstellungen beeinflusst werden.

Im VPI werden die Kosten für selbstgenutztes Wohneigentum (owner-occupied housing, OOH) nach dem Mietäquivalenzansatz erfasst. Im HVPI werden sie derzeit nicht berücksichtigt. In der Geldpolitischen Strategieüberprüfung 2020/21 empfahl der EZB-Rat, OOH in den HVPI einzubeziehen und präferierte den Nettoerwerbsansatz als Messmethode. Im Papier wird argumentiert, dass sich eine unterschiedliche Methodik mit den voneinander abweichenden Hauptverwendungszwecken von VPI und HVPI begründen lässt. Experimentelle Rechnungen legen nahe, dass ein um OOH erweiterter HVPI deutlich vom VPI abweichen kann. In der Kommunikation der beiden Inflationsmaße sollte daher auch Wert auf deren Hauptnutzung und sich daraus ergebende Methodenunterschiede gelegt werden.

# HICP and national CPI in Germany: as similar as possible, as different as needed<sup>†</sup>

Thomas A. Knetsch<sup>‡</sup>

Dilyana Popova

Patrick Schwind

*Deutsche Bundesbank, Directorate General Data and Statistics*

## Abstract

The Harmonised Index of Consumer Prices (HICP) co-exists with the national Consumer Price Index (CPI) as a key measure of inflation in Germany. Both indices are based on the same granular price data and uniform compilation methods at the lower levels of aggregation. However, differences arise at the upper level, concerning e.g. coverage, index formula, weighting schemes and revision practices. Weighting is a major source of differences but its impact is expected to diminish because, in the last base year changeover, national accounts replaced household budget surveys as the dominant source for deriving five-year fixed CPI weights. This change increases conformity with the annual updating procedure for HICP weights. By contrast, the integration of the cost of owner-occupied housing (OOH) into the HICP might increase the differences between these key measures if, following the ECB's request in its 2020/2021 Monetary Policy Strategy Review, the acquisition approach were implemented. Choosing different options can be rationalized with a number of criteria (e.g. alignment with user interest, main purposes, public acceptance, practicality). As differences matter empirically, communication is important.

**JEL classification:** E 31, C 43

**Keywords:** Inflation measurement, weighting, owner-occupied housing

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<sup>‡</sup> Corresponding author; phone: +49 69 9566 33417; email: thomas.knetsch@bundesbank.de

## I. Introduction

Consumer price inflation in Germany is measured with two key indicators – the national Consumer Price Index (CPI) and the Harmonised Index of Consumer Prices (HICP). The two indices give, to a large extent, rather similar signals regarding price developments. In quantitative terms, however, CPI and HICP inflation rates often deviate somewhat from each other; in most cases, the deviations are marginal, though they sometimes amount to a considerable size. This indicates that, despite many similarities in measurement concepts and practices, CPI and HICP are still characterized by notable differences. At first glance, these differences may come as a surprise because the sustained efforts towards European harmonization in price statistics have led to a convergence of national concepts to the European standard. However, country-specific peculiarities persist and this is for good reasons. In general, they may reflect varying measurement targets, but also specific traditions in index concepts and compilation techniques.

In this paper, we examine the differences between CPI and HICP inflation in Germany. We identify the various driving factors and assess their relative importance. Using two examples, we illustrate that current challenges in inflation measurement can make the case for either increasing or decreasing the degree of conformity between CPI and HICP. On the one hand, weighting has so far been a major source of deviations but its impact is expected to diminish because, in the last base year changeover, the national accounts replaced household budget surveys as the dominant source for deriving five-year fixed CPI weights. This change increases conformity with the annual updating procedure for HICP weights and thus has the potential to reduce the impact of changing weights on HICP inflation in years of CPI base year changeovers.

On the other hand, the integration of owner-occupied housing (OOH) into the HICP would increase the differences between the two concepts if the net acquisitions (NA) approach were adopted because, in the CPI, OOH is measured by the rental equivalence (RE) approach. Even with the non-integration in the HICP so far, a substantive difference in coverage exists, frequently leading to marked contributions to the CPI-HICP inflation differences. We compile an OOH-augmented HICP and compare it with the CPI. We show that differences matter empirically, with deviations between OOH prices and imputed rents being much more important than differing OOH weights. Differences rose to a considerable size in 2021/2022 when house prices were on a steep upward trend and construction prices accelerated strongly. The revived discussion about integrating OOH into the HICP (ECB, 2021a,b; Eurostat, 2023) demonstrates how important it is to derive methodological choices from measurement targets.

The paper kicks off with a focus on the measurement targets, concepts and methods characterizing the CPI and the HICP. In Section III, we analyze the differences between CPI and

HICP inflation and their driving factors. In Section IV, we elaborate on the compilation procedures for CPI and HICP weights. Section V is devoted to a discussion on how OOH should be dealt with in consumer price indices according to relevant criteria, what the practice in the CPI is and what the ECB Governing Council requests for the HICP. Empirical evidence on the impact of OOH on CPI and HICP inflation is also provided. In Section VI, we draw conclusions.

**II. A brief comparison of CPI and HICP**

Consumer price indices are multi-purpose indicators. An overview of the multitude of uses is given by ILO et al. (2020), for instance. From index number theory and practical experience, we know that, on the one hand, there are construction principles and properties which each and every consumer price index should share but, on the other hand, conflicting measurement targets may justify alternative methodological choices. In this section, we briefly compare the CPI and the HICP according to selected criteria. They are summarized in Table 1.

**Table 1**

Comparing CPI and HICP according to selected criteria			
Criterion	CPI	HICP	
Objectives	Measure of consumer price inflation in Germany as a key macroeconomic indicator  Compensation scale  Deflating nominal values	Measure of price stability in ECB's monetary policy  Indicator for assessing price convergence regarding a possible accession of a country to the monetary union  Indexation of financial instruments	
Scope	Prices of all goods and services that are purchased by households in Germany	Prices of all purchased goods and services which are part of household final monetary consumption expenditure	
Revision	At every base year changeover, recalculation applying the new weighting scheme as well as newly introduced methods and data back to the beginning of the new base year	Only in narrowly defined exceptional cases (e.g. errors, improved data sources and methods)	
Index formula <sup>*)</sup>	Laspeyres index with five-year base year changeover	Chain-linked Laspeyres-type index with annual adjustment of weights	
Index concept <sup>*)</sup>	Cost-of-Goods Index (COGI)		
Elementary level	Data sources and methods		

<sup>\*</sup> Upper aggregation level

The measurement objectives of the CPI and HICP are different. The three main purposes of the CPI are listed in its quality report (Destatis, 2023b, Section 2.2). First, it is a measure of consumer price inflation in the country. Second, it also plays a key role in indexation, informing decisions on the adjustment of wages, pensions, social security benefits and rents. Third, it is used for the deflation of macroeconomic statistics (e.g. national accounts). The HICP is designed to measure consumer price inflation in Europe according to harmonized principles. In particular, it informs monetary policy decisions in the euro area and allows the assessment of price convergence, which is one of the main criteria for adoption of the euro. According to Destatis (2023a, Section 2.1), it is applied to design inflation-linked bonds while it is generally not recommended to be used as a compensation scale.

CPI and HICP are built on the same granular data, and uniform concepts, methods and compilation techniques are applied up to the elementary level (Destatis, 2023a,b, Section 7.1). At the upper level of aggregation, however, differences become noticeable. While CPI and HICP are both cost-of-goods indices (COGI), meaning that the indices measure the total cost of a fixed basket of goods over time, they differ in terms of index concept, including weighting as well as coverage and revision practices.

The CPI is a Laspeyres index where the underlying basket is usually adjusted only once every five years.<sup>1</sup> Hence, it reflects pure price changes in the sense that the basket of goods is fixed from one base year to another. With a base year changeover, the weighting scheme is adjusted using rather detailed and reliable data on the consumption expenditure of households (Mai and Egner, 2023, p. 19). When introduced, however, the new weights lag behind at least three years. On the contrary, the HICP is designed as a chain-linked Laspeyres-type index with an annual adjustment of weights (Eurostat, 2024, Chapter 8). The adjustments are made to reflect households' consumption structures in the previous year. While the consumption pattern underlying the CPI relies on a more reliable database,<sup>2</sup> the HICP reflects the aggregate price development using more up-to-date consumption structures.

As regards coverage, the CPI is based on the prices of all goods and services that are purchased by private households in Germany (Destatis, 2023b, Section 2.1.3). Imputed prices are not excluded, making it possible to measure owner-occupied housing by means of the rental equivalence approach. The scope of the HICP, however, is defined by the final monetary consumption expenditure of households (Eurostat, 2024, Section 2.3). This concept generally excludes non-monetary and imputed transactions. The coverage is even smaller because some

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<sup>1</sup> The changeover to the base year 2015 was postponed by one year to the beginning of 2019, implying that the 2010 consumption structure remained valid for six years while the 2015 consumption kept constant for four years.

<sup>2</sup> According to Destatis (2023b, Section 2.1.3), a Laspeyres index with the basket of goods being fixed for at least three years, is advantageous for the use as a compensation scale.



categories are not covered as a principle (e.g. narcotics, prostitution) or on practical grounds (e.g. games of chance). In the CPI, games of chance and broadcasting licence fees<sup>3</sup> are covered while narcotics and prostitution are excluded, too.

The CPI is revised on a regular basis. With the introduction of a new base year, the CPI is updated back to January of this base year through re-calculation using the new weighting scheme.<sup>4</sup> By contrast, the HICP is rarely revised. Apart from the fact that provisional figures are finalized, revisions may appear if an error is corrected, new or improved basic information is included or national methods are changed (Eurostat, 2024, Section 10.4).

The differences in coverage and weighting are directly quantifiable, whereas deviations between the CPI and HICP due to revisions cannot be easily separated from other factors such as methodological issues. We carry out a decomposition analysis in the next section. We refer to the differing measurement objectives in the discussion about the treatment of the OOH cost in CPI and HICP (Section V).

### III. Decomposition of differences in CPI and HICP inflation

In this section, we decompose the differences between CPI and HICP inflation into the contributions from coverage and weighting, as well as a third component comprising the remaining differences. These refer to methodological issues and revision policy, among other aspects. We consider the monthly observations of the last three years and a half. Owing to the back revision in the last base year changeover, the CPI inflation rate and its breakdown are homogeneous during this period in methodological terms.

We first formally outline the decomposition of the difference between CPI and HICP inflation. Let us write the formulae of the HICP and the CPI as follows:

$$HICP_{t,m} = HICP_{t-1,12} \times \sum_h \frac{p_{t,m}^h}{p_{t-1,12}^h} \times w_{HICP,t-1,12}^h$$

$$CPI_{t,m} = 100 \times \sum_c \frac{p_{t,m}^c}{p_b^c} \times w_{CPI,b}^c$$

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<sup>3</sup> Broadcasting licence fees were removed from the HICP coverage in 2020.

<sup>4</sup> The weighting scheme generally reflects the consumption expenditures of households in the base year. An exception is the current base year 2020. As consumption patterns were strongly affected by the Covid-19 pandemic in 2020 and are thus not regarded as being representative of a "normal" year, the weighting scheme is based on the average over the 2019-2021 period; see Mai and Egner (2023, p. 18).

where  $p_{t,m}^h$  is the price of the HICP item  $h$ ,  $h = 1, \dots, H$ , and  $p_{t,m}^c$  is the price of the CPI item  $c$ ,  $c = 1, \dots, C$ , both in year  $t = 1, \dots, T$  and month  $m = 1, \dots, 12$ . The number of HICP items is denoted by  $H$  and the number of CPI items by  $C$ .  $w_{HICP,t-1}^h$  denotes the weight of the HICP component  $h$  based on the price-updated share in consumer spending in the previous year  $t - 1$  and  $w_{CPI,b}^c$  denotes the weight of the CPI component  $c$  based on the share of consumer spending in the base year  $b$ .

For the decomposition, we consider two auxiliary indices. They are CPIs by their very nature but meet some of the characteristics of the HICP. For instance, the first auxiliary index mimics the coverage of the HICP:

$$CPI_{t,m}^* = 100 \times \sum_h \frac{p_{t,m}^h}{p_b^h} \times w_{CPI,b}^h$$

Apart from the coverage, the second auxiliary index additionally shares the (annually changing) weights with the HICP:

$$CPI_{t,m}^{**} = 100 \times \sum_h \frac{p_{t,m}^h}{p_b^h} \times w_{HICP,t-1,12}^h$$

Inflation is defined by the annual percentage rate of the price index, denoted by  $\pi_{t,m}^X$  with  $X = HICP, CPI, CPI^*, CPI^{**}$ . The CPI-HICP inflation difference can be decomposed as follows:

$$\pi_{t,m}^{CPI} - \pi_{t,m}^{HICP} = \underbrace{\pi_{t,m}^{CPI} - \pi_{t,m}^{CPI^*}}_{co_{t,m}} + \underbrace{\pi_{t,m}^{CPI^*} - \pi_{t,m}^{CPI^{**}}}_{we_{t,m}} + \underbrace{\pi_{t,m}^{CPI^{**}} - \pi_{t,m}^{HICP}}_{mr_{t,m}}$$

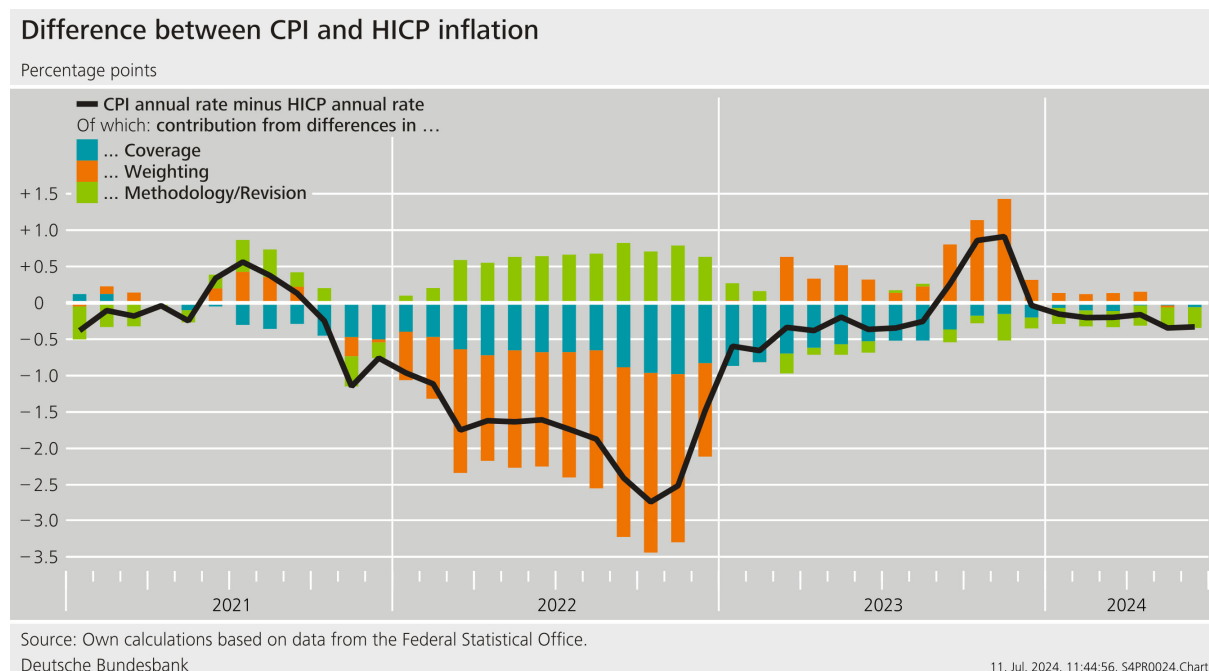
where  $co_{t,m}$  is the effect from differences in coverage,  $we_{t,m}$  from differences in weighting and  $mr_{t,m}$  from differences in methodology/revision.

As shown in Figure 1, the deviations between CPI and HICP inflation have been noticeable since 2021. They range between +0.9 percentage points (pp) and -2.7 pp in the period under review. The largest differences are observed throughout the year 2022, when HICP inflation surpasses CPI inflation by 1.0 pp at the minimum.

The 2022 deviations are largely driven by considerable contributions from differences in weighting. The differences in coverage make a noticeable contribution in this year too, while there is a mitigating impact from the remaining factors. In 2023, the impact from weighting differences turns from negative to positive. With differences in coverage still contributing negatively but at a diminishing scale, the overall effect turns positive towards the end of the year,

implying that CPI inflation exceeds its HICP counterpart.<sup>5</sup> In contrast, during the first half of 2024 HICP and CPI are very similar.

**Figure 1**



In addition to the monthly observations of CPI-HICP inflation differences, we analyze summary metrics such as the mean deviation ( $MD$ ) and the mean squared deviation ( $MSD$ ), where we average over all observations  $t, m$  in the sample under consideration, denoted by subscript  $i = 1, \dots, I$  and  $I = 12 T$ .

$$MD = \frac{1}{I} \sum_{i=1}^I (co_i) + \frac{1}{I} \sum_{i=1}^I (we_i) + \frac{1}{I} \sum_{i=1}^I (mr_i)$$

$$MSD = \frac{1}{I} \sum_{i=1}^I (co_i)^2 + \frac{1}{I} \sum_{i=1}^I (we_i)^2 + \frac{1}{I} \sum_{i=1}^I (mr_i)^2 + COV$$

where  $COV = 2(COV_{co,we} + COV_{co,mr} + COV_{we,mr})$  is the sum of the covariance terms.

The results are summarized in Table 2. On average over the years from 2021 to mid-2024, HICP inflation exceeds CPI inflation by 0.6 pp. The effect from differences in coverage is, in absolute terms, slightly larger than the effect from deviating weighting schemes. This is due to the fact that contributions from differences in coverage are negative almost throughout, whereas the more significant contributions from weighting differences oscillate around the zero

<sup>5</sup> The negative impact from differences in coverage is due mainly to the omission of OOH in the HICP. Imputed rentals for housing expand much more moderately than the aggregate of the remaining CPI items in this period, inducing a dampening influence on CPI inflation. A comparable effect is missing in HICP inflation.

line. By eliminating the sign impact, we prove the dominance of weighting differences for the explanation of the CPI-HICP inflation differential in the period under review. The root mean squared deviation of the weighting component is double the size of the coverage component, for instance.

**Table 2**

<b>Decomposition of the differences between CPI and HICP inflation</b>				
January 2021 – June 2024				
	Position	Mean deviation (in pp)	Root mean squared deviation (in pp)	Share of mean squared deviation (in %)
	Coverage	−0.4	0.5	23
	Weighting	−0.3	1.0	88
	Methodology/revision	0.1	0.4	14
	Covariance			−26
	<b>Total</b>	<b>−0.6</b>	<b>1.1</b>	<b>100</b>

From the decomposition analysis, we draw the conclusion that differences in coverage and weighting schemes are major sources of deviations between HICP and CPI inflation. In the next section, we focus on how the weighting schemes of the two indices are derived, what their common features are and in what respects they differ from each other. In Section V, we address the topic of OOH (non-)treatment in the two indices, as this has been the crucial factor explaining the differences in coverage.

#### **IV. CPI and HICP weighting schemes**

Both CPI and HICP weights are based on the fundamental claim that they reflect consumption patterns in a representative manner. Differences appear because the years to which the weighting schemes refer do not match. Recall from Section II that CPI weights reflect consumption structures in the base year, which usually change every five years, while HICP weights are adjusted annually to make them representative of the previous year. We henceforth call this year the weight reference period.<sup>6</sup>

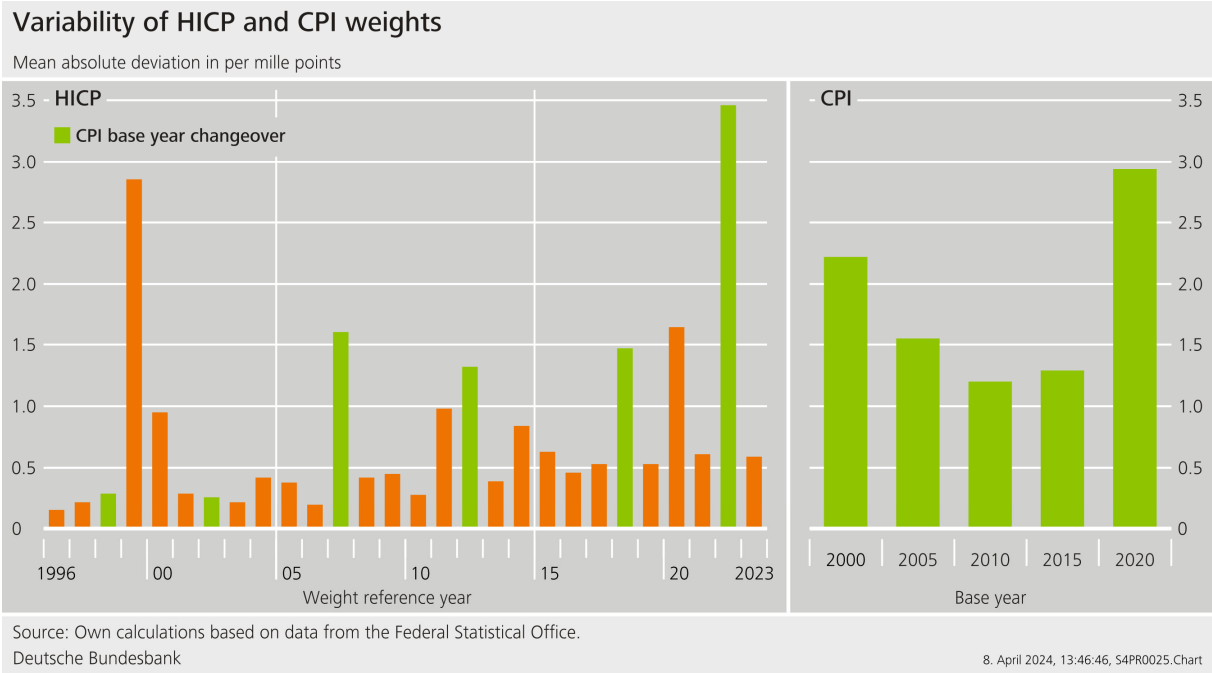
Figure 2 gives an indication of the variability of weighting schemes. We calculate the mean absolute deviation (*MAD*) of item weights using data at the 4-digit level (i.e. 76 or 77 price

<sup>6</sup> This labelling is consistent with Eurostat (2024, p. 37), which states “weights to be updated to  $t - 1$  (which is the weight reference period in a Laspeyres type index)”. It is worth mentioning that, in ILO et al. (2024, p. 191), the weight reference period is defined as the “period covered by the expenditure data used to calculate the weights”. The two definitions are not coincident if the underlying expenditure data, be it price-updated or not, reflects a reporting period prior to the previous year.

items). In the five CPI base year changeovers under consideration, item weights change by 1.8 per mille points, on average. This exceeds the *MAD* of HICP weight changes (0.8 per mille points). This comes as no surprise considering the fact that consumption habits tend to change more markedly over a period of five years than from one year to another.

While CPI base years refer to the years ending with a 0 or 5, they are introduced only at the beginning of the (subsequent) years ending with a 3 or 8.<sup>7</sup> In the years of introduction, HICP weights are affected by the CPI base year changeover. This causes more pronounced weight shifts. With 1.4 per mille points, the *MAD* of the annual HICP weight adjustments is lower in these years than the *MAD* of CPI weight shifts. This is in stark contrast to the variability of HICP weight shifts in the remaining years. On average, the *MAD* is 0.6 per mille points. Only the weight reference years 1999 and 2020 stand out. With the significant adjustment of HICP coverage (ECB, 2000, Box 3; Destatis, 2000, p. 148), a statistical reason is crucial for the former case, while the latter is explainable by the considerable changes in consumption patterns caused by the outbreak of the Covid-19 pandemic.

**Figure 2**



In order to better understand why CPI weights are decisive for HICP weights, we elaborate on the compilation practice in the next part of this section. We follow up with an illustration of the effect of the CPI base year changeover on HICP weights for two selected items, namely package holidays and gas. In the final part of this section, we focus on the derivation of CPI weights.

<sup>7</sup> The changeover to the base year 2015 is an exception, as new CPI weights were introduced at the beginning of 2019 instead of 2018.

## Derivation of HICP weights

According to the HICP regulation (EU, 2020 Art. 3, 1), the expenditure shares of the penultimate year, for which national accounts data are usually available when the weights are updated, should be made representative for the weight reference year and then price-updated to December of the previous year. The Federal Statistical Office (Destatis) has implemented these legal requirements with a compilation procedure which can be described by the following formula (Elbel and Preißmann, 2012):

$$w_{HICP,t-1,12}^h = \gamma_{t-1,12}^{-1} \times w_{CPI,b}^h \times \frac{c_{t-\rho}^h}{c_b^h} \times \frac{p_{t-1,12}^h}{p_{t-\rho}^h} \quad \text{with} \quad \begin{cases} \rho = 2 & \text{for } 2012 \leq t < 2021 \\ \rho = 1 & \text{for } t \geq 2021 \end{cases}$$

where  $\gamma_{t-1,12} = \sum_{h=1}^H w_{HICP,t-1,12}^h$  is the factor which normalizes the updated HICP weights such that they sum to unity.

The starting point for the derivation of the HICP weight of item  $h$  in year  $t$  is the respective CPI weight of the current base year  $b$ . Between 2012 and 2021, this weight had been updated from the base year to  $t - 2$  using private household consumption expenditure data from the national accounts. Since 2021, early and still unpublished national accounts data for  $t - 1$  have been taken instead in order to ensure representativeness during the Covid-19 pandemic.<sup>8</sup> On top of the updating with the private consumption ratio, there is a price update until December of the previous year, which is the price reference period of the HICP.

With the weight updating formula, it is possible to separate out the effect of the CPI base year changeover on HICP weights. In particular, we calculate hypothetical HICP weights using this formula for the years of, and prior to, the year of the CPI base year changeover. The differences between the actual and hypothetical weights are directly attributable to the base year changeover.

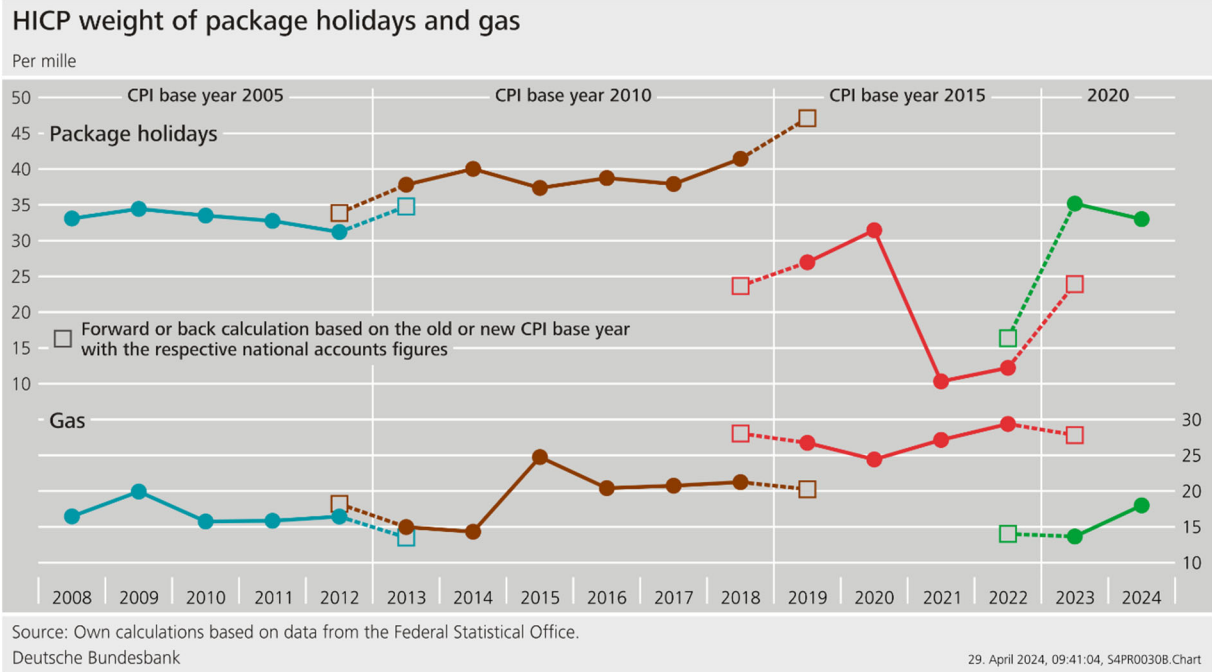
Figure 3 displays these changeover effects for package holidays and gas. From 2018 to 2019, the HICP weight of package holidays is reduced by 1.5 pp. This is solely caused by the changeover from base year 2010 to 2015, as both forward and back calculations based on the old and the new CPI base year, respectively, using national accounts would imply a small weight increase. From 2022 to 2023, the HICP weight of package holidays jumps by 2.3 pp. This is larger than the decline observed in 2021 due to the Covid-19 pandemic. The normalization of the travel market explains a large part of this increase. However, the 2020 CPI base year

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<sup>8</sup> This procedure was introduced for the derivation of 2021 HICP weights (Eurostat, 2020) as an exceptional measure for dealing with the large changes in consumer expenditure induced by the Covid-19 pandemic. It has since been applied for weight compilation in the following years.

changeover also plays a significant role. Concerning the HICP weight of gas, this changeover makes up the overwhelming part of the drop from 2.9 % in 2022 to 1.4 % in 2023. National accounts data would imply only a moderate decrease.

**Figure 3**



**Derivation of CPI weights**

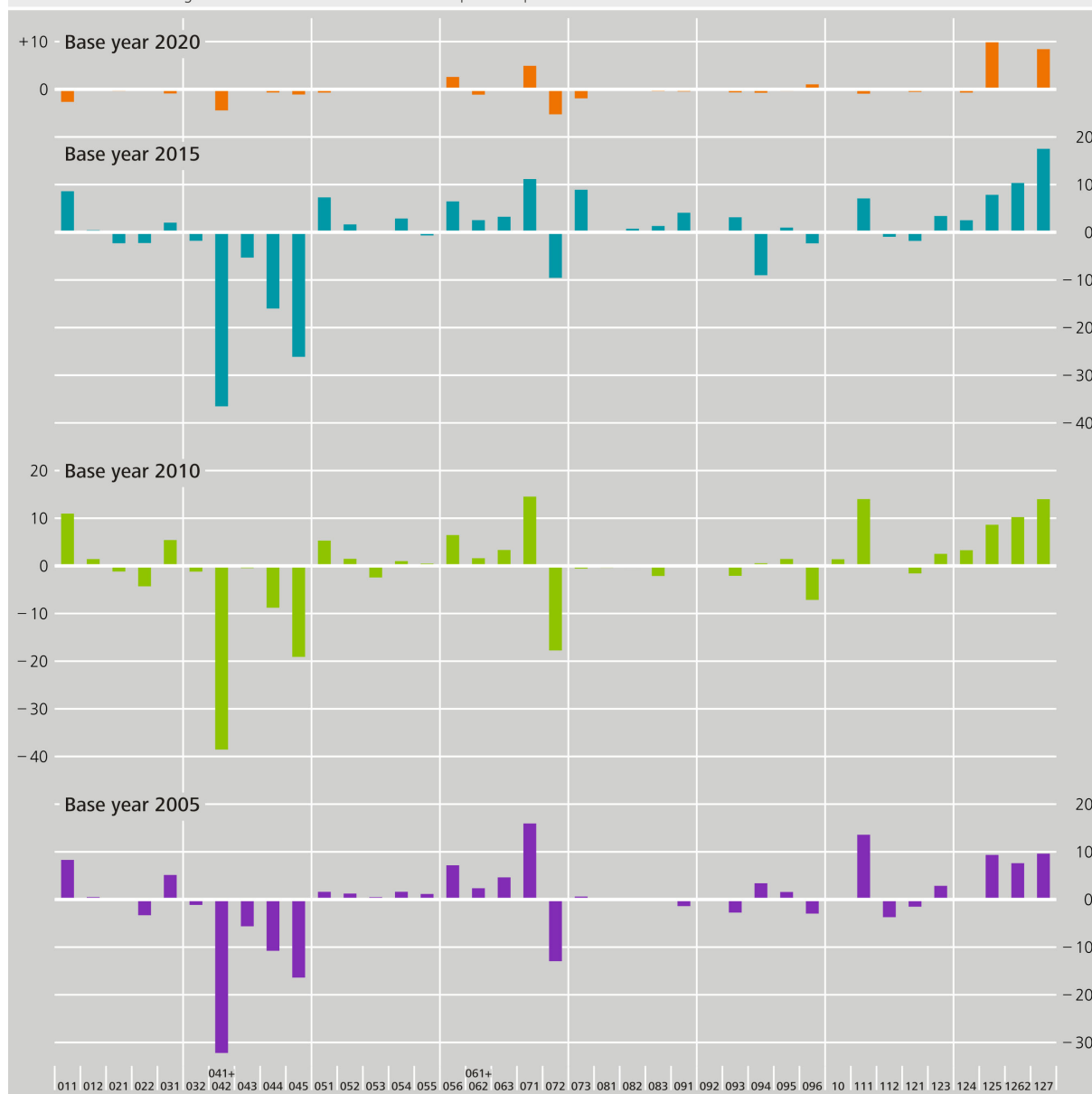
Against the backdrop that CPI base year changeovers may significantly affect HICP weights, it is worth studying the derivation of CPI weights in more detail. This is particularly important because, with the last base year changeover, the relative importance of the underlying data sources is altered. Following the requirement that national accounts data be the primary source of HICP weights as of 1 January 2023, while data from the most recent household budget survey (HBS) and other sources are only complementary (EU, 2020, Art. 3, 1a), national accounts are given priority over HBS data in the derivation of CPI weights, too (Mai and Egner, 2023, p. 23).<sup>9</sup>

<sup>9</sup> National accounts data are usable for the derivation of CPI weights down to the 4-digit level at maximum. The weighting schemes for the CPI breakdown beyond this level are still compiled using HBS information.

**Figure 4**

**CPI weight and national accounts share\* of consumption expenditure items in comparison**

Deviation of the CPI weight from the national accounts share in per mille points



\* Share of expenditure item according to the COICOP breakdown in total consumption expenditure as defined in CPI; data as per national accounts at the time of the respective base year changeover.

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Owing to this rule, it comes as no surprise that the CPI weighting scheme referring to the base year 2020, implemented in January 2023, is rather similar to the structure of private consumption expenditure in the national accounts. As shown at the top of Figure 4, the differences between the CPI weight and the respective national accounts share are marginal for most of



the 39 product items considered for the comparative analysis.<sup>10</sup> The largest deviations, which are found for purchases of vehicles (07.1) and goods and services for vehicles (07.2), as well as insurance services (12.5) and the residual category of other services (12.7), are in the range between 5 and 10 per mille points. On average over all product items under consideration, the absolute deviation is about 1.4 per mille points.

By contrast, the *MAD* is considerably larger in the three preceding CPI base year changeovers, with 5.9 per mille points for 2015=100, 5.5 for 2010=100 and 5.3 for 2015=100. In Figure 4, we observe the differences not only in the above-mentioned categories but also in a couple of other categories. They belong to the COICOP position 04 (housing, water, electricity, gas and other fuels) and some services such as restaurants, recreation and culture, as well as package holidays.<sup>11</sup> In these cases, the differences between the CPI weight and the national accounts share are rather striking, exceeding 10 per mille points without exception and even partly reaching the interval between 20 and 40 per mille points.

With the replacement of the old practice of a HBS-led weight compilation, well-known shortcomings such as outdated survey information and underreporting in specific categories (e.g. alcohol, tobacco) are overcome. In addition, the compilation of CPI weights and the updating procedure for HICP weights is now coherent in terms of the underlying primary data source. This leads us to expect HICP weight adjustments to be much less affected by future CPI base year changeovers than by past ones.

## **V. Accounting for OOH costs in consumer price indices**

Weighting is a measurement issue for which a higher degree of coherency between CPI and HICP has been achieved. A similar development in the case of OOH is unlikely. In the next

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<sup>10</sup> To improve the comparability between CPI weights and national accounts, some adjustments are made. Actual and imputed rentals for housing (04.1 and 04.2) are aggregated. The same applies to medical products, appliances and equipment (06.1) and out-patient services (06.2). Furthermore, the estimated expenditures for cruises are deducted from the CPI weight for package holidays (09.6) and added to transport services (07.3), the category to which cruises are assigned in the national accounts.

<sup>11</sup> Since the national accounts benchmark revision 2015=100 implemented in 2019, package holidays have been treated similarly to the compilation of CPI weights (Hauf and Schäfer, 2019, p. 67). While the expenditures for package holidays had consisted of the service fees of travel agencies before the benchmark revision, they have additionally included the expenses for travel services since then. In our calculations, we therefore account for travel expenses in the national accounts figures prior to the 2015 benchmark revision.

part of this section, we discuss the conceptual and practical factors hampering harmonization.<sup>12</sup> We take a look at the German CPI and the HICP in its development perspective proposed by the ECB Governing Council in the 2020/2021 Monetary Policy Strategy Review.<sup>13</sup> In the second part, we complement the empirical picture by presenting OOH-augmented inflation figures for Germany.

### **Criteria for selecting the approach to OOH measurement**

There are a number of approaches to OOH measurement in consumer price indices; see Diewert and Shimizu (2021) for an overview. The NA approach measures the expenses for owner-occupied dwellings at the point in time when they become the property of the household sector by purchase or construction. The RE approach and the user cost approach are methods that measure the services flow generated by dwellings during their useful life. The payments approach takes a cash flow view capturing the households' actual expenses for their dwellings. In measurement practice, we observe simplified forms of these approaches or hybrid versions, too. For a discussion of Germany's situation, it is sufficient to focus on the RE approach and the NA approach, as the former is implemented in the national CPI while the ECB Governing Council regards the latter as the preferred method for the integration of OOH into the HICP (ECB, 2021a,b).

A central message of the vast scientific literature on the treatment of OOH in consumer price indices is that no approach dominates all the others in every respect. Comparative advantages and disadvantages are attributable to each approach. In other words, selecting the appropriate approach essentially means making an overall assessment according to various criteria. ILO et al. (2020, pp. 245-246) list the following: alignment with user needs and the main purpose, conceptual consistency, public acceptance, and practicality of implementation.<sup>14</sup>

We continue with some deliberations about these criteria with regard to the CPI and the HICP. Table 3 gives a summary of the main arguments.

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<sup>12</sup> We abstain from explaining the various approaches in detail and assessing their pros and cons. This is explored comprehensively in the literature; see ECB (2021b) and Eurostat (2023) for recent examples.

<sup>13</sup> The treatment of OOH in national CPIs of European countries is diverse; see Eurostat (2023, Chapter 3) for an overview. Finland is the only euro area country whose national CPI includes OOH on the basis of an NA approach. For this country, the preference of the ECB Governing Council means that CPI and HICP would become more coherent through implementation. For Germany, the Netherlands and Ireland, it would be a step neither towards nor against more coherency. For the remaining euro area countries, the integration of OOH would reduce coherency if national CPIs were not adjusted accordingly.

<sup>14</sup> The list contains alignment with international practices as a further criterion. However, it is conceded that this criterion is not helpful in the case of OOH because there is no single agreed methodology.

**Table 3**

<b>Comparison of the CPI and HICP with regard to the suitability of approaches to measuring OOH</b>			
	Criterion	CPI	HICP
	Alignment with user needs and main purpose	<b>Deflating</b> nominal values is among the main purposes ➔ <b>OOH costs</b> are accounted for in the <b>national accounts</b> via the RE approach	<b>Monetary policy</b> and <b>convergence assessment</b> are the clear main purposes ➔ Reference to monetary consumption expenditure and observed prices speaks in favor of NA approach
	Conceptual consistency	RE approach is <b>not consistent</b> with the treatment of other durables	NA approach is <b>consistent</b> with the treatment of other durables
	Public acceptance	RE approach is considered an <b>established measurement concept</b> in the CPI	In <b>public consultations</b> OOH costs were primarily put into the context of house or construction price developments
	Practicality of implementation	RE approach is well implemented in <b>Germany due to the large rental market and free pricing</b>	<b>Parallel publication in the interim phase</b> (monthly HICP and quarterly OOH-augmented HICP) is desirable for monetary policy

By recalling the main purposes of the CPI and the HICP from Section II, we acknowledge some differences, which play a role in the decision on the treatment of OOH. In particular, the NA approach generally fits the HICP, as its central purpose is to measure inflation for monetary policy and convergence issues in Europe. For central banks, it is relevant to know what happens in monetary transactions entailing signals about prices formed by market activities. Imputed prices as explicitly used in the RE approach are not compatible with that aim. However, they are consistent with an important purpose of the CPI. Deflating nominal values by the CPI ensures consistency because OOH expenses are measured by the RE approach in the national accounts.

As regards consistency with key measurement principles, it is worth stressing that, in both the CPI and the HICP, the price of any durable good is generally recorded at the time of its purchase, ignoring the fact that its useful life exceeds the length of the reporting period. If the NA approach were used in the HICP, the measurement of OOH would be consistent with the treatment of cars, refrigerators and so on. By contrast, measuring OOH by the RE approach is an exceptional case in the CPI. The internal inconsistency, however, makes the CPI coherent with the measurement of durables consumption in the national accounts.

In 2020, the ECB and national central banks carried out listening events in order to take account of public opinion in the Monetary Policy Strategy Review. The ECB's summary of the

key findings regarding OOH is that “the vast majority of respondents considered [housing] costs to be relevant to inflation and many stated that they should be more adequately included in the Harmonised Index of Consumer Prices” (ECB, 2020). This statement confirms the public’s desire to integrate OOH. Taken literally, it provides no information on the approach the public wishes to be adopted. However, when respondents expressed concerns about “the burden of housing costs”, they primarily thought in terms of the high and rising house prices observed during this period. We interpret this as a soft indicator in favor of the NA approach. In the empirical part, we will show that the steep upward trend of the NA-based OOH price index (OOHPI) is able to capture the worrying experiences of the public while, at the same time, actual rentals for housing kept on rising rather moderately.

The long-standing practice in CPI measurement proves that the RE approach is successfully implementable in Germany. Large rental markets and free pricing in most segments enable Destatis to design surveys, which are usable not only for compiling indices of actual rentals but also for imputing the equivalent rents proxying OOH costs. The NA approach is currently not implementable because of unsolved methodological issues and practical impediments. It is not clear how one can deal with the dual character of the purchase of a house the new owner moves into, i.e. being both a consumption and an investment decision at the same time. In Germany, as in most other European countries, house prices are reported only quarterly, with a significant publication delay.

In order to fill the information gap until the methodological challenges are solved and the practical impediments are removed, ECB (2021a,b) suggests that Eurostat regularly publish a quarterly OOH-augmented HICP by combining the HICP with the experimental OOHPIs, which have been developed in all euro area countries except Greece. So far, they have been used as stand-alone indices. If combined with the HICP, they would make the combined index inferior in terms of frequency and timeliness. However, complementing the monthly HICP with a quarterly OOH-augmented HICP is seen as a value added for monetary policy assessments (ECB, 2021a). In contrast, the European Statistical System (ESS) gives more weight to the risk parallel publication may pose to the credibility of the HICP, and does not support Eurostat publishing an experimental OOH-augmented HICP on a regular basis (Eurostat, 2023, p. 9).

To sum up, there are good reasons for both the integration of OOH into the CPI according to the RE approach and the request to include OOH in the HICP according to the NA approach. Using different methodological options is, thus, a deliberate decision against coherency. In the remainder of this section, we show that the incoherency matters empirically.

### **Comparing OOH-augmented consumer price indices**

As part of the work preparing the ESS response to the ECB Governing Council recommendation on OOH, experimental calculations combining the HICP with OOHPIs and approximate

imputed rentals were carried out. These estimates are available from the beginning of 2011 to mid-2022 but are not updated. Following the Monetary Policy Strategy Review, ECB staff set up a compilation method for analytical NA-based and RE-based OOH-augmented HICPs for the euro area and euro area countries on the basis of publicly available data. The results are not published regularly but on specific occasions (e.g. Eiglsperger et al., 2024; Eiglsperger et al., 2022).

The empirical analysis is based on our estimates of NA-based and RE-based OOH-augmented HICPs for Germany. The estimates combining HICP and OOHPI result from applying the common compilation method agreed upon with ECB staff. In order to provide a long time series for the NA-based OOH-augmented HICP, we calculate the OOHPI back to the start of the HICP's history in 1998, following the Destatis approach (Brunßen and Wolf, 2018) as closely as possible using house price and construction price indices. Details are found in the Appendix. We compile an RE-based OOH-augmented HICP by weighting the item "Actual rentals for housing" with the share actual and imputed rentals have in the HICP basket according to the national accounts. As the composition of owner-occupied dwellings differs from the stock rented-out,<sup>15</sup> this is an approximation only. Since the last CPI base year changeover, actual and imputed rentals for housing have been split into separate items (Mai and Egner, 2023, pp. 26-27), enabling us to exactly calculate the CPI with and without OOH from 2020 onward.

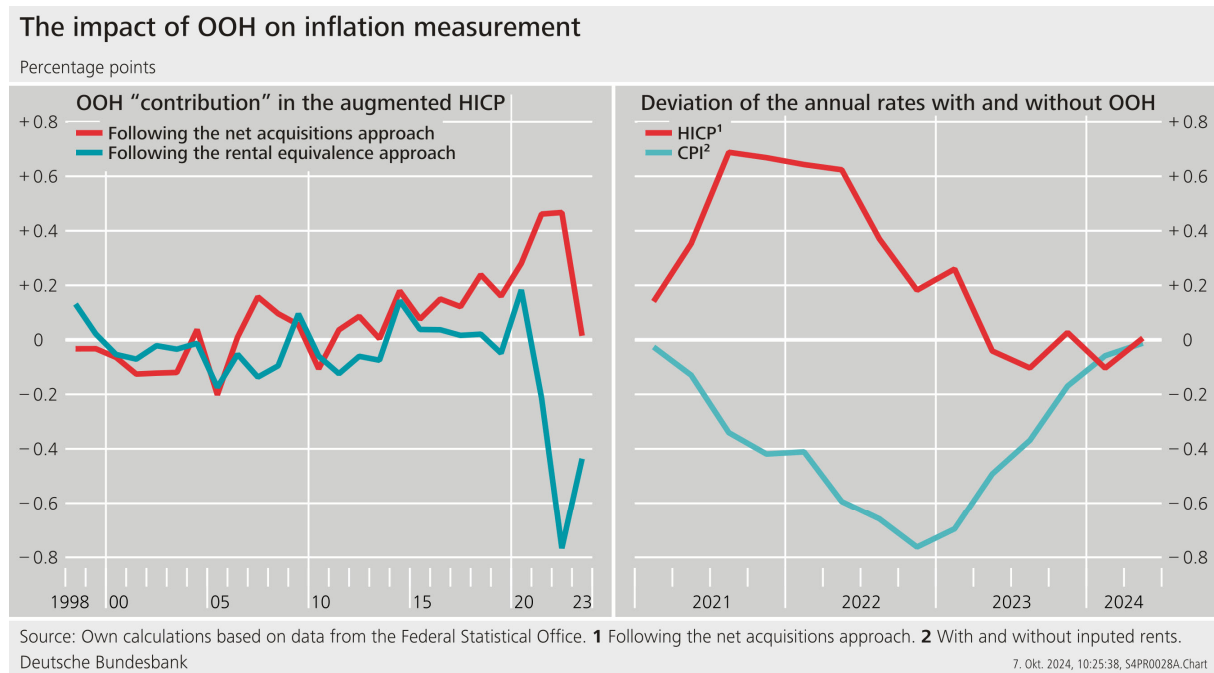
In Figure 5, we display the impact of OOH on the measurement of consumer price inflation according to both approaches, taking a long-run and a short-run view. Considering the long period from 1998 to 2023 enables us to derive rather robust evidence on the systematic OOH impact, given that its contribution is largely driven by developments in housing markets and building construction, the cycles of which are typically more stretched than usual business cycles.<sup>16</sup> In the long run, the impact of OOH on HICP inflation would have tended to be neutral. The OOH-augmented HICP has risen by 2.0 % per year (NA approach) and 1.9 % (RE approach) on average over the last 25 years, while the mean annual HICP rate has been 1.9 %. With the exception of the period from 2020 to 2022, the inclusion of OOH would not have affected HICP inflation by more than 0.2 pp in absolute value. This margin is irrespective of the approach used. In about one-third of the years, however, NA-based and RE-based augmentations do not exhibit an equally signed impact.

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<sup>15</sup> According to Mai and Egner (2023, p. 27), houses make up one-eighth of the CPI weight for the item "Actual rentals for housing" whereas they account for almost three-quarters in the case of "Imputed rentals for housing".

<sup>16</sup> Eiglsperger et al. (2024, p. 11) argue that OOH-augmented HICPs, which are compiled using official OOHPIs, cover the observation period since 2010 and are thus "too short when dealing with housing market cycles".

**Figure 5**



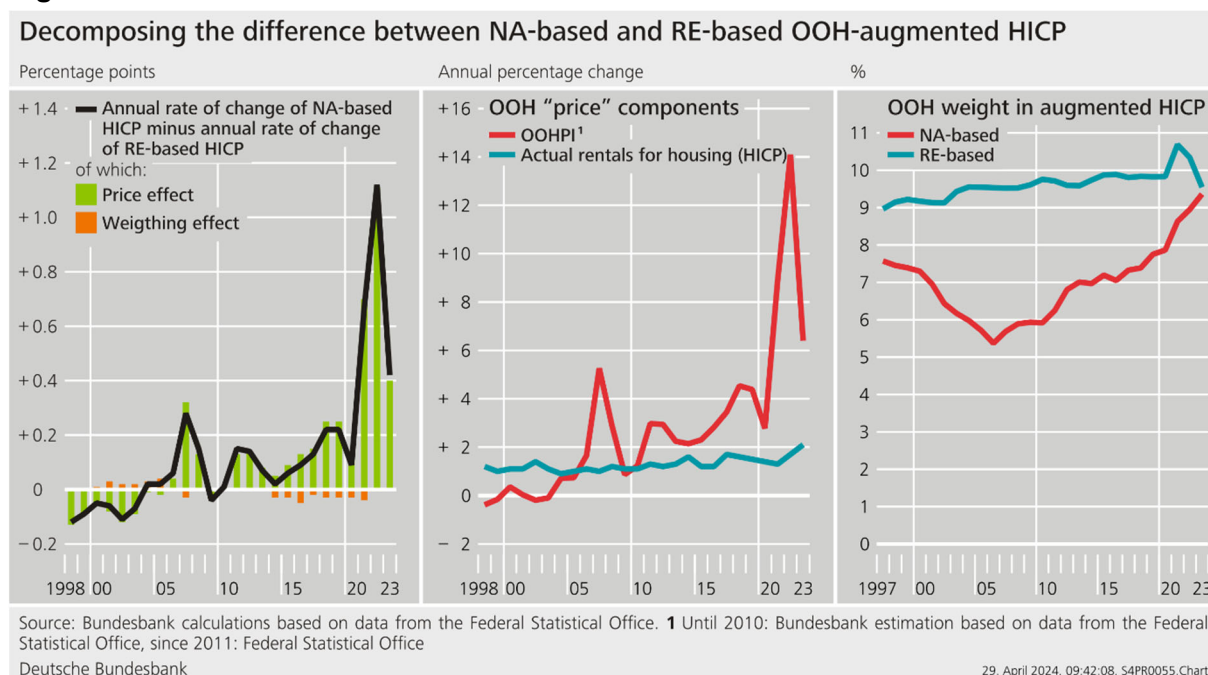
The NA-based OOH contribution clearly reflects the long fluctuations in the housing market and the building construction cycles. From 1998 to 2005, OOH tends to have moderately dampened inflation. Between 2006 and 2012, the inclusion of OOH had, by and large, no significant impact.<sup>17</sup> From 2013 to 2022, the contribution of OOH was steadily positive, tending to increase. The RE-based OOH contribution broadly mirrors the phases of stronger and lower general inflation, as actual rentals increase more smoothly than the prices of the remaining basket of goods on average. The impact was moderately negative in the 2000s and the first half of the 2010s, with the recessionary year 2009 marking an exception. In the low-inflation phase during the second half of the 2010s, rental equivalents made a small positive contribution.

In 2021 and 2022, the deviations between inflation rates with and without OOH have risen to unprecedented levels in absolute value. The NA-based OOH contribution reaches +0.7 pp between mid-2021 and mid-2022 as a result of strongly rising house prices and rapidly accelerating construction prices. The dampening effect of rental equivalents steadily increases until end-2022, standing at -0.8 pp. Despite the impact of the different OOH measures converging in 2023, the evidence since 2021 makes it clear that the conceptual differences between the two approaches have the potential to matter significantly in actual inflation measurement.<sup>18</sup>

<sup>17</sup> The year 2007 is affected by a special factor, as construction prices increased considerably over the course of this year owing to the sharp increase in VAT.

<sup>18</sup> This pattern is observed in other European countries, too, and led Eurostat (2023) to conclude that, “were OOH to be included in the HICP, one method would have to be chosen with little flexibility in the implementation.” The reference is Art. 4 (2) of the HICP Framework Regulation, which defines concepts or methods to be comparable if the systematic difference is not larger than 0.1 pp on average over one year referring to the overall HICP:

**Figure 6**



We disentangle the difference between the NA-based and RE-based OOH-augmented HICP inflation rates into their price and weight components. As displayed in Figure 6, the difference is shaped by the fluctuations in the OOHPI whose variability is much more pronounced than that of actual rentals for housing. In addition, how OOH is weighted in the augmented HICP plays a negligible role in explaining the deviations between the two approaches.<sup>19</sup>

## VI. Conclusions

The co-existence of the national CPI and the HICP as key measures of inflation in Germany can be explained by the different purposes the two indices serve for users. These justify the adoption of various methodologies, implying that results can deviate from each other. Deviations may pose a challenge for communication. Attempting to actively address communication issues with enriched transparency and interpretation seems to be more beneficial for users than enforcing a higher degree of coherency at the cost of restricting the information content of the indices.

In this paper, we have examined weighting and OOH treatment as two statistical-methodological topics which raise the question of more or less conformity between CPI and HICP. By decomposing the differences between CPI and HICP inflation rates into contributions from

<sup>19</sup> The NA weights of OOH are generally based on data on the owner-occupancy rate (the distribution of the population in each country by tenure status is published annually by Eurostat) and data on residential investment (available from the national accounts).

coverage, weighting, methodology and revisions, we have found that coverage and weighting have so far been major sources of deviations. In the last base year changeover, the national accounts were prioritized over the HBS for the derivation of CPI weights, implying data source conformity with the compilation of annual HICP weights. As regards weighting, we expect the conformity between CPI and HICP inflation to increase when a new base year is introduced in the future.

We have emphasized the close connection between the measurement targets of the consumer price index and the methodological choice regarding OOH. Measuring OOH with the NA approach in the HICP and with the RE approach in the CPI is justifiable given that the former is primarily designed for monetary policy and convergence issues in Europe while the latter plays a role in indexation and deflating nominal values. However, differences matter empirically. They were particularly sizeable in 2021 and 2022.

Facing this pattern at the European level too, Eurostat (2023, p. 8) concludes that the selection of a single method is required. A lack of consensus has prevented the ESS from moving forward.<sup>20</sup> The time currently being taken to conduct more research on OOH should be used not only to address the critical implementation issues of either approach but also to sharpen public understanding of inflation measures and their purposes. Measuring OOH using different approaches in CPI and HICP raises the likelihood that more substantive communication around publications of inflation figures will be needed.

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<sup>20</sup> According to Destatis, the „renewed discussion of whether owner-occupied housing should be incorporated into the HICP calculated for European purposes is fully justified, even if uniform methodological implementation on a pan-European scale poses a very considerable challenge“ (Hagenkört-Rieger and Sewald, 2021, p. 6).



## Appendix: Back-calculation of HICP including OOH

Extending the HICP including OOH to the period before 2010 requires a back-calculation of the OOHPI. To achieve this, we use proxies for four subcomponents, which make up the total OOHPI almost completely (see Table A.1).

**Table A.1**

Expenditure categories in the OOHPI 2010 – 2023		
Item		Mean weight in %
0.1	Owner-occupiers' housing expenditure	100.0
0.1.1	Acquisition of dwellings	89.9
0.1.1.1	New dwellings	83.4
0.1.1.1.1	Purchases of new dwellings	9.6
0.1.1.1.2	Self-build dwellings and major renovations	73.8
0.1.1.2	Existing dwellings new to households**	-
0.1.1.3	Other services related to the acquisition of dwellings	6.5
0.1.2	Ownership of dwellings	10.1
0.1.2.1	Major repairs and maintenance	8.4
0.1.2.2	Insurance connected with dwellings	1.4
0.1.2.3	Other services related to ownership of dwellings*	-
* Item 0.1.2.3 is omitted from this calculation, as this was included for the first time in 2017.		
** Not included in the OOHPI for Germany.		
Source: Authors' calculations based on Eurostat data.		

For the subcomponent “Self-build dwellings and major renovation” (0.1.1.1.2), which is by far the most important item in the German OOHPI,<sup>21</sup> we aggregate the construction price index for newly built dwellings and the producer price index for products for prefabricated wood buildings using weights derived from building completion statistics (cost shares). This closely follows official OOHPI compilation (Dechent, 2011).

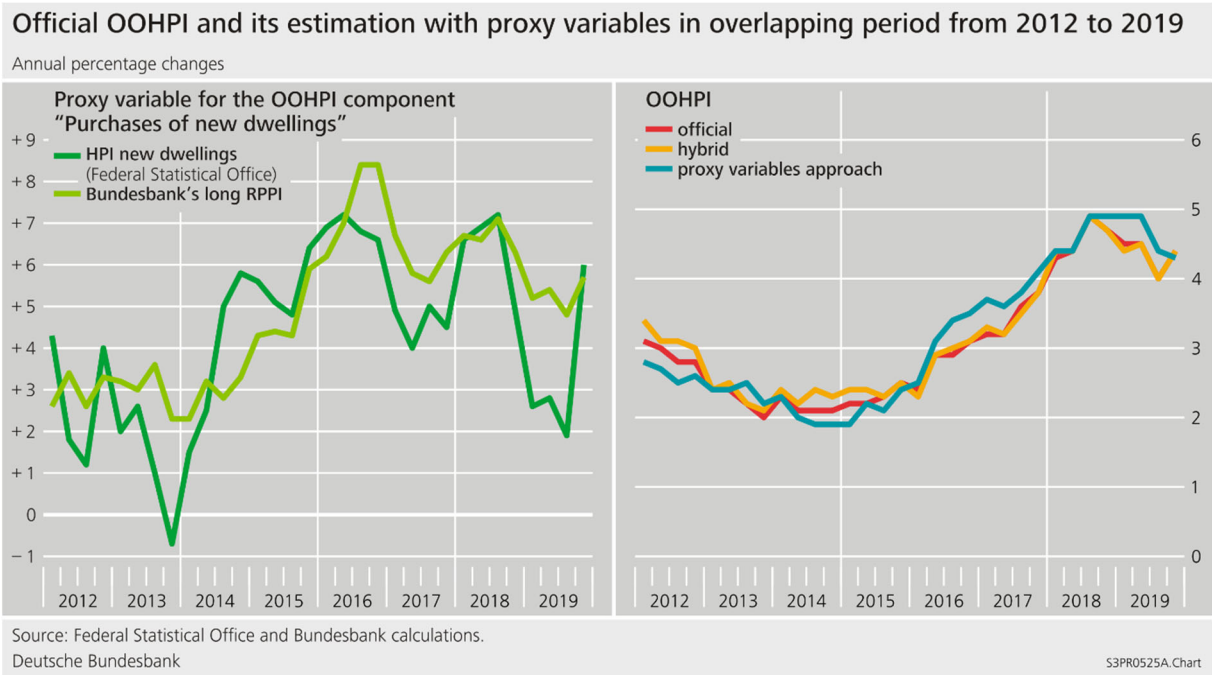
For the subcomponent “Purchases of new dwellings” (0.1.1.1.1), Destatis uses the subindex for newly built housing from the official house price index (HPI), which is not available back to 1996. For the back-calculation, we use the Bundesbank's long residential property price index (RPPI) series.<sup>22</sup> It includes the HPI only since 2014 and captures the price movements of all (not just newly built) housing. As shown in Figure A.1, left panel, the annual percentage

<sup>21</sup> With a share of 75 %, the order of magnitude is rather unusual in the euro area. In most countries, the weight of this component is below 50 %. In Luxembourg and Portugal, for example, it is only 11 %.

<sup>22</sup> The long time series published by the Bank for International Settlements (BIS) is used. From 2006, this is identical to the long time series of the Bundesbank's RPPI on a quarterly basis. Prior to 2006, it is the Bundesbank's long RPPI on an annual basis, which was temporally disaggregated by BIS.

changes of the HPI component used in the official OOHPI are characterized by a larger volatility than those of the Bundesbank’s RPPI. This might be due, first, to the fact that the prices of new housing are generally subject to stronger fluctuations than the prices of housing overall. Second, the fact that, up to 2013, the HPI suffered from losses of quality with small and non-representative samples may play a role. Overall, it therefore appears justified to use the Bundesbank’s RPPI in the overlapping period as well.

**Figure A.1**



In order to measure the subcomponent “Other services related to the acquisition of dwellings” (0.1.1.3), we assume that the rates for agents, solicitors, land register and real estate transfer tax remain constant on average and over time.<sup>23</sup> Hence, this component mimics the price movements of the new dwelling, implying that the Bundesbank’s RPPI is the proxy variable for this item, too.

Adopting the approach used in official OOHPI compilation (Brunßen and Diehl-Wolf, 2018), we capture the price movements for the subcomponent “Major repairs and maintenance” (0.1.2.1) using the construction price index for residential buildings (excluding minor repairs).

The weighting scheme needed to aggregate the four proxy variables is derived using a number of data sources, as the OOH expenditures and its breakdown are not reported in the national accounts. However, the national accounts item “Gross fixed capital formation of dwellings”,

<sup>23</sup> In particular, the rate of real estate transfer tax remained largely constant in the period relevant to the extension.

capturing all sectors, is still the starting point. From this, the share attributed to owner-occupiers is derived by applying the average owner-occupancy ratio for new builds, which is approximated by using the statistics on building completions, as these data enable us to differentiate between residential construction for own use or for renting out. The result is owner-occupiers' construction investment and comprises owner-occupiers' expenditures for the purchases of new dwellings, self-builds and rebuilds. With data from the German Institute for Economic Research (DIW Berlin), we separate out the expenditures for rebuilds and, by applying to the remainder the share of non-household sectors in total construction costs taken from building completion statistics, we yield an estimate for the "Purchases of new dwellings" (0.1.1.1.1). The rest (which is the part pertaining to the household sector) and the rebuilds proxy the expenditures for "Self-build dwellings" (0.1.1.1.2).

To proxy the owner-occupiers' expenditures for "Other services related to the acquisition of dwellings" (0.1.1.3), we start from the national accounts item "Cost of ownership transfer on land". As this item refers to all sectors, we separate out the owner-occupiers' part by applying the owner-occupancy rate. We perform an analogous calculation starting from the expenditures for repairs in the residential buildings stock in order to yield an estimate for the owner-occupiers' expenditures for "Major repairs and maintenance" (0.1.2.1).

The expenditure categories are available annually from 1996 onward. Hence, we compile the OOHPI proxy by applying the same Laspeyres-type index formula, with annually changing weights, as the official OOHPI.

To assess the quality of the back-calculation, we compare our approach with the four proxy variables with the official OOHPI in the overlapping period from 2012 to 2019. Figure A.1, right panel, exhibits that the annual percentage changes of our OOHPI proxy do not differ markedly from those of the official OOHPI. The mean absolute deviation amounts to 0.2 pp. The figure also displays a "hybrid" index in which the official OOHPI subcomponents are aggregated using the proxy weights. This index deviates only marginally from the official index, suggesting that the uncertainties regarding the derivation of weights play a minor role. The good approximation in the overlapping period allows us to conclude that the back-calculation of the OOHPI is unlikely to entail any major statistical breaks that might impair interpretation.

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