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Security through stability.

Recent inflation developments in Austria – an analysis based on different decomposition frameworks

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In this paper we show that decomposing national accounts deflators such as the GDP deflator as a proxy for consumer price inflation can lead to misleading results. We compare the decomposition of the value-added deflator, the GDP deflator and the total supply deflator with a HICP decomposition proposed by Schneider (2024). We discuss the differences between these concepts in detail. We find that imports and wages account for the bulk of the differences. Most importantly, the surge in import prices in late 2021 pushed up HICP inflation but had no direct impact on the GDP deflator. Furthermore, we find that wage developments have a much higher impact on the GDP deflator than the HICP. In both 2023 and 2024, the contribution of wages to the GDP deflator was higher than for the HICP even though the latter index increased stronger in both years. We also look at the role of profits. While they were soaring in 2022 and contributed somewhat to inflation, they cratered in 2023 and particularly in 2024.

JEL classification: E31, D33
Keywords: inflation, profit share

Since mid-2021, consumer prices have increased substantially in the euro area, and even more so in Austria. Numerous studies have decomposed inflation to investigate potential sources and/or beneficiaries of high inflation. Most commonly, such papers look at the increase of the GDP deflator or the value-added deflator as a proxy for domestic price pressures (e.g. Arce et al., 2023, Fritzer et al., 2023, or Hahn, 2023) and decompose them into cost-side contributions of national accounts aggregates such as wages, net indirect taxes and depreciation and wages.

These decompositions are very simple and easy to calculate. However, the GDP deflator differs substantially from consumer prices. Particularly in the beginning of the high-inflation period, the GDP deflator increased much less than consumer prices. The main reason for this is that GDP only covers domestic production. Therefore, a decomposition of the GDP deflator cannot cover the effects of the strong increases in import prices that led to a substantial worsening of the terms of trade for the euro area member states. Overall, consumer prices are ultimately relevant for cost of living, and they are more important for both monetary and fiscal policy. The Harmonised Index of Consumer Prices (HICP) is used by the Eurosystem in its definition of price stability. The conceptually very similar national consumer price index is used in Austria as a reference point for agreements on the increase of private and public wages as well as for the indexation of social benefits (particularly pensions) and income tax brackets.

The importance of import prices has been accounted for in the works Diev et al. (2019) and Hansen et al. (2023), but we will show further significant differences between the GDP deflator and the HICP. We do so by linking information on cost structures from input-output tables with data from the quarterly national accounts. We investigate which cost components benefit from price increases, i.e. whether higher prices go into imports, wages, profits or taxes. For example, we can see to which extent the increase in energy inflation was accompanied by higher expenditure on energy imports and by higher profits of domestic energy producers.

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The paper is structured as follows: Section 1 gives an overview of the decomposition frameworks used in this analysis. Section 2 explains the differences between the HICP and the national accounts deflators in detail. Section 3 provides results concerning the decomposition of HICP inflation, including the role of profits. Section 4 concludes.

1 An overview of the decomposition frameworks

This section gives a brief overview of the different decomposition frameworks that we use in our analysis. We decompose the value-added deflator, the GDP deflator, the total supply deflator and the Harmonised Index of Consumer Prices (HICP) into cost components using national accounts data. We first outline the basic decomposition framework and then discuss the differences between the different price indices.

The decomposition is based on a simple accounting identity using quarterly national accounts data. We illustrate it using the value-added deflator ($p_{j,t}$) (see ECB, 2006, and Jaumotte and Morsy, 2012, for early applications). Nominal value added ($y_t^r p_t$) is defined as the sum of k nominal cost (income) components $cc_{k,t}$ (compensation of employees, taxes less subsidies on production, consumption of fixed capital and net operating surplus[2] (including mixed income)).

$$y_t^r p_t = \sum_{k=1}^{K} cc_{k,t} \tag{1}$$

Dividing this equation by real value added y_t^r, we obtain an equation which defines the value-added deflator as the sum of its per unit cost components ($ucc_{k,t}$).

$$p_t = \sum_{k=1}^{K} \frac{cc_{k,t}}{y_t^r} = \sum_{k=1}^{K} ucc_{k,t} \tag{2}$$

We now take the first difference and divide both sides of the equation by the previous period's value-added deflator. In addition, we expand each term of the right-hand side by unit costs observed in the previous period. The percentage change of the price of value added is hence defined as the sum of the percentage changes of its unit cost components weighted with the previous period's real unit cost component.

$$\frac{dp_t}{p_{t-1}} = \sum_{k=1}^{K} \frac{ducc_{k,t}}{ucc_{k,t-1}} \frac{ucc_{k,t-1}}{p_{t-1}} \tag{3}$$

It is straightforward to apply this decomposition to the other two deflators. For the GDP deflator, the list of cost components is augmented by taxes less subsidies on products (value-added tax, mineral oil tax, tobacco tax etc.). The concept of the total supply deflator was proposed by Hahn and Renault (2024). This approach tries to overcome the weakness of the first two approaches that use domestic value added or GDP instead of output. The reason is that quarterly national accounts do not include data on output. Instead, Hahn and Renault (2024) define the concept of "total supply" as the sum of GDP and imports as a proxy for output.

The decomposition of the HICP utilizes the decomposition framework developed by Schneider (2024). It is based on the same basic account identity but takes into account the differences in the structure between simple national accounts deflators and the HICP. It consists of two main parts. First, it uses input-output tables to derive the detailed cost structure of the HICP subindices at the

[2] Profits (net operating surplus) are not a cost component in a literal sense from a firm's perspective. For the sake of simplicity, however, we refer to them as a cost component.

COICOP-45 level. In the second main part, quarterly national accounts data and trade data are combined with the cost structure of the input-output tables. This is done in five steps: the first step is to estimate the cost components that are missing in quarterly national accounts.[3] In the second step, we adjust compensation of employees, profits and net other taxes on production for crisis-related subsidies.[4] In the third step, the share of the cost components implied by private consumption is isolated from other final uses and referred to as "consumption-implied cost components." The fourth step is to combine the cost components derived from the input-output table with growth rates of the consumption-implied cost components at the quarterly level. Finally, the last step is to decompose HICP inflation. This approach makes it possible to decompose HICP inflation into contributions stemming from value-added components per industry, taxes less subsidies on products, and imports. The annex provides more details on this approach.
Table 1 gives an overview of the cost components included in the different decomposition approaches.

Table 1

Overview of the cost components of different price indices

	Scope	Costs components					
		Compensation of employees	Taxes less subsidies		Consumption of fixed capital	Net operating surplus	Imports
			On production (other than on products)	On products			
Value-added deflator	Price index of domestic value added	X[1]	X[1]	-	X[1]	X[1]	-
GDP deflator	Price index of GDP	X[1]	X[1]	X[1]	X[1]	X[1]	-
Total supply deflator	Price index of total supply (= GDP + imports)	X[1]	X[1]	X[1]	X[1]	X[1]	X[1]
HICP	Harmonized Index of Consumer Prices	X[2]	X[2]	X[2]	X[2]	X[2]	X[2]

Source: Authors' compilation.

[1] *Total economy.*

[2] *Weighted sum of cost components based on weights from input-output tables and HICP weights.*

When interpreting results based on such decompositions, one has to keep in mind that one cannot infer causal relationships from identities. For example, high wage increases can, in different cases, be both the cause of high inflation (via pushing up costs) and the consequence of high inflation (via wage agreements based on inflation). Further caveats regarding our approach are discussed in chapter 7 of Schneider (2024).

[3] The published QNA data only contain value added and compensation of employees per industry. Therefore, we must estimate the three missing components (net taxes on production, consumption of fixed capital and net operating surplus), which are all published only at the total economy level. Details of the procedure can be found in Fritzer et al. (2023).

[4] From 2020 to 2022, the Austrian federal government paid out substantial subsidies to firms for short-time work, foregone revenue and increases in energy costs. These transfers led to a strong drop in net indirect taxes and have pushed up compensation of employees (short-time work subsidies) and net operating surplus (other subsidies). We have adjusted these three time series for these artificial breaks by subtracting these crisis subsidies from compensation of employees and net operating surplus. For a detailed description of these calculations see Fritzer et al. (2023).

2 A comparison of the decomposition of the HICP with different deflator decompositions

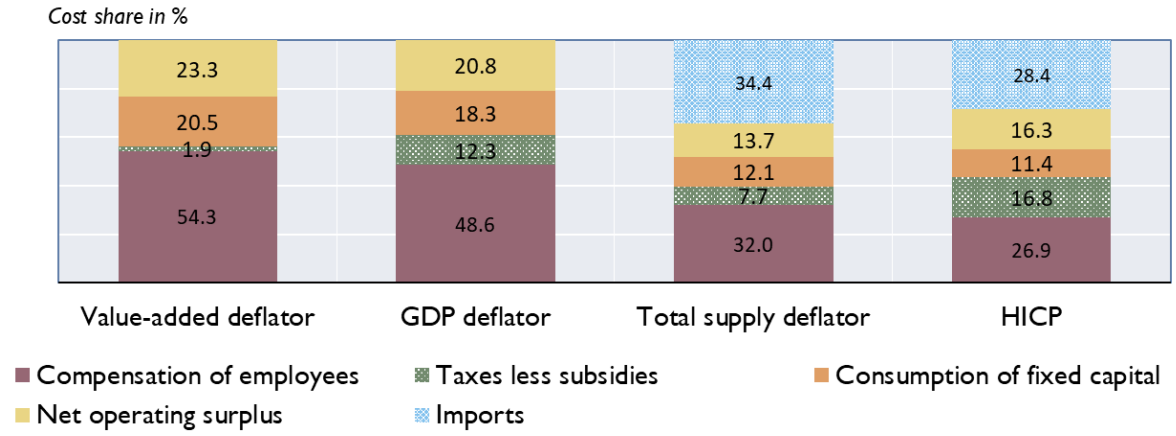
In this section we compare our four decomposition frameworks along two dimensions. First, we compare the cost structure (cost shares) for the year 2019.[5] Second, we compare the results of the decomposition for the period from 2019 until the third quarter of 2024.

2.1 Deflator concepts differ concerning the role of import prices

Chart 1 shows the cost structure of the three deflators and the HICP for the year 2019. For the *value-added deflator*, wages are the most important cost component with a share of 54.3%. The total cost share of firms (43.8%) equals the sum of consumption of fixed capital (20.5%) and net operating surplus (23.3%). The cost share of other taxes less subsidies on production (1.9%) is negligible. The *GDP deflator* has a very similar cost structure. The only difference is that the GDP deflator also includes taxes less subsidies on products, which have a cost share of 12.3%. Consequently, the cost shares of the other components fall, but their relative magnitude remains unchanged. The *total supply deflator* also includes imports, which are the most important cost component (34.4%). Once again, the role of the other cost components falls, but their relative magnitude remains constant.

Chart 1

Cost shares for three deflators and for headline HICP for Austria (2019)



Source: Statistics Austria, authors' calculations.

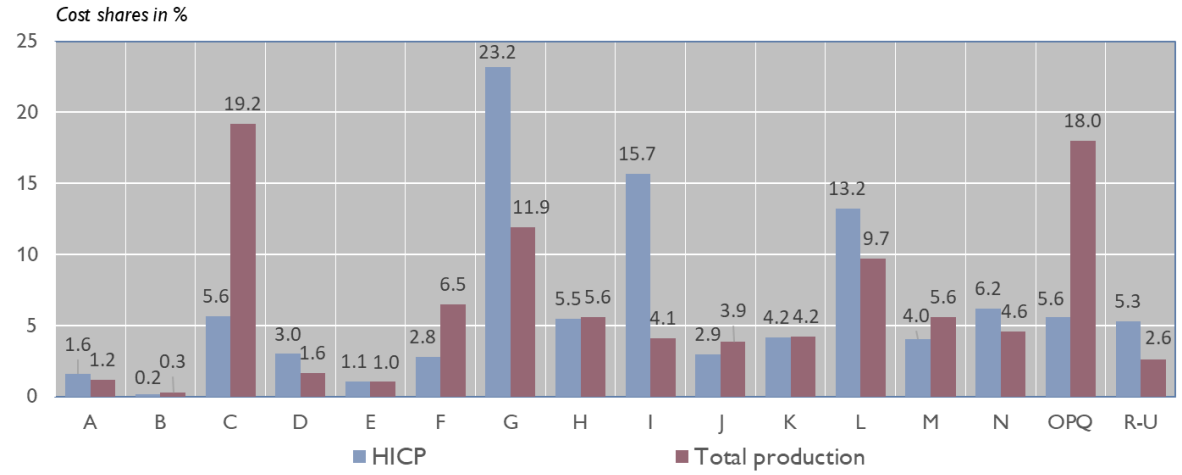
This picture changes when we look at the cost structure of the consumption bundle underlying the *HICP*. We can obtain the following differences: First, the cost share of wages (26.9%) is slightly lower than the share of gross operating surplus (= sum of net operating surplus and consumption of fixed capital) of 27.7%. This is a huge difference compared to the three other deflators, where the cost share of wages is considerably higher than that of gross operating surplus. This is due to the different roles of industries in the production of goods and services. For the three other deflators, total domestic production is considered, which serves all final demand

[5] We use the input-output table for the year 2019 for our analysis. Obviously, the cost structures have changed since then; first, due to the COVID-19 pandemic and, second, due to the massive increases of energy prices that followed. Our approach at least partly accounts for these structural changes since we use the cost structures from 2019 only as a starting point and update them with nominal national accounts data.

components. For the HICP, only the production of goods and services for private consumption is considered. Hence, the consumption bundle underlying the HICP has a different sectoral structure than total production (chart 2). The three industries that are much more important for private consumption than for total production are trade and repair of motor vehicles (G), accommodation and food services (I) and arts, entertainment, recreation and other private services (R-U). On the other hand, manufacturing (C), construction (F) and the public sector (OPQ) play a less important role for private consumption. Since the wage share of the public sector (75%) is much higher than the economy-wide wage share of 54%, wages are far less important for private consumption than for total production. This is also a very important factor when thinking about price-wage spirals: Wage agreements in Austria typically take past increases in the consumer price index (which has weights similar to the HICP) as a reference point. Ceteris paribus, a 1% increase in all wages raises the value-added deflator by 0.54 percentage points, the GDP deflator by 0.49 percentage points, but the HICP (similar to the CPI) only by 0.27 percentage points. This means that potential second-round effects of wage increases are much smaller than one would think based on the share of wages in GDP.

Chart 2

Cost shares of industries in domestic value added for total production and for the production of the consumption bundle underlying the HICP



Source: Statistics Austria, authors' calculcations.

Note: A: agriculture, forestry and fishing; B: mining and quarrying; C: manufacturing; D: energy; E: water and sewerage; F: construction; G: trade and repair of motor vehicles; H: transportation and storage; I: accommodation and food services; J: information and communication; K: finance and insurance activities; L: real estate activities; M: professional, scientific and technical activities; N: administrative and business support activities; OPQ: public sector activities; RTU: arts, entertainment, recreation and other private services.

Furthermore, the share of (net) indirect taxes is higher for the HICP. The value-added deflator does not include taxes and subsidies on products (e.g. VAT and energy taxes), and while GDP and total supply include them, their weight is still much lower than for consumption. The main reason is that a large share of the other final demand categories is exempted from VAT. Therefore, policies regarding indirect taxes and subsidies tend to have a larger effect on the HICP than on the GDP deflator.

Moreover, compared to exports and gross fixed capital formation, private consumption comprises a much higher share of services. The services sectors have a higher share of self-employed persons

(e.g. of profit earners) in employment than construction and manufacturing,[6] pushing up the share of net operating surplus.

2.2 The inflation shock affected the HICP sooner than the GDP deflator

Next, we look at the decomposition results for the different price concepts (chart 3). The decomposition of the HICP draws the picture of an initial import price shock, followed by substantial domestic price pressures. Imports were the main determinant of inflation in the years 2021 and 2022. In 2021, nonenergy imports were the strongest explanatory factor for inflation due to supply chain problems. In 2022, the largest contribution to inflation came from energy imports. The contribution of profits to inflation amounted to 27% in 2022, with the energy sector as the most important contributor[7]. Due to the lagged inflation adjustment of wages, their role as a cost factor for inflation (12%) was considerably below their cost share in the HICP (27%).
In 2023, the picture changed completely. Due the fall of energy and food prices, the contribution of imports vanished almost completely. Two domestic factors were the most important contributors: Driven by past inflation, the contribution of unit labor costs amounted to 60% of inflation. In addition, the replacement costs for the capital stock of firms (consumption of fixed capital) increased strongly in 2023 as a consequence of strong increases in the price of investment goods. The contribution of firms' profits fell to almost zero. In the first three quarters of 2024[8], inflation halved compared to 2023. As wage increases were strong and the contribution of consumption of fixed capital was still high, too, firms' unit profits fell sharply.

Chart 3.1

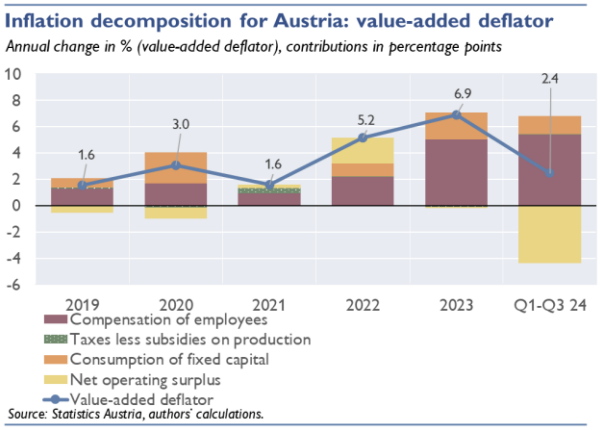
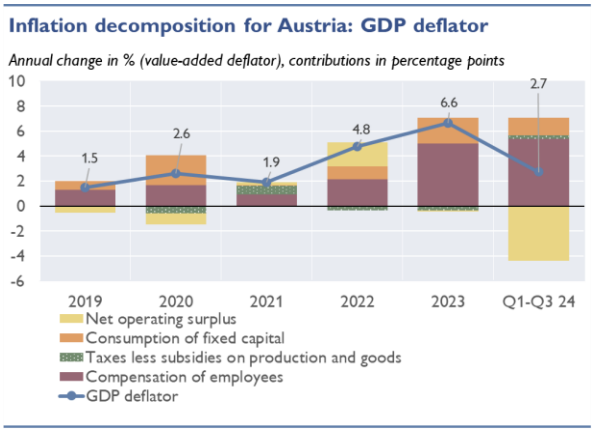


Chart 3.2



[6] There are two important differences between the HICP consumption basket and private consumption expenditure: The former follows the domestic concept, while the latter looks at the resident population only. Therefore, the weight of restaurant and hotel services is much higher in the HICP. More importantly, private consumption is defined more broadly in terms of which services can be consumed. It also includes consumption of financial intermediation and particularly of imputed rents from living in owner-occupied housing, which raises the shares of net operating surplus and consumption of fixed capital.

[7] Note that we rely on a definition of "profits" based on national accounts data. First, this implies that we value consumption of fixed capital (or depreciation) at contemporary market prices. Second, net interest payments do not affect our definition of profits (unless they are part of FISIM). Valuing depreciation at the original purchase price of capital goods (as Weber and Wasner, 2023, have argued for) would have led to larger profit contributions in 2022 and 2023, when prices of investment goods rose substantially. At the same time, deducting net interest payments from profits would have led to lower profits (or even stronger negative contributions) from 2022 to 2024, particularly in 2023.

[8] Our results for 2019 to 2023 are based on very detailed data from the annual accounts. However, the numbers for 2024 have been computed using preliminary data from the quarterly accounts, which may change substantially until the release of the annual accounts for 2024 in autumn 2025. This uncertainty particularly concerns the level and composition of profit growth.

Chart 3.3

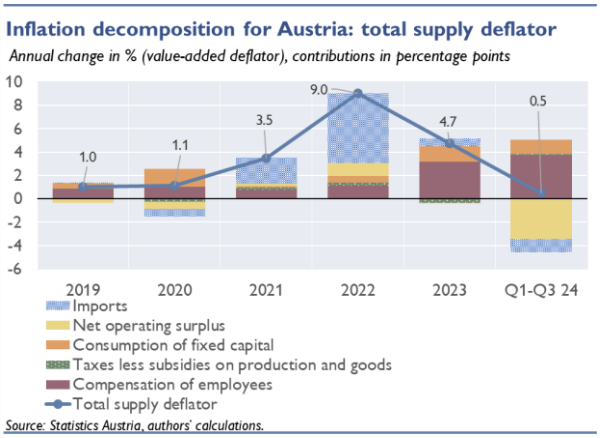
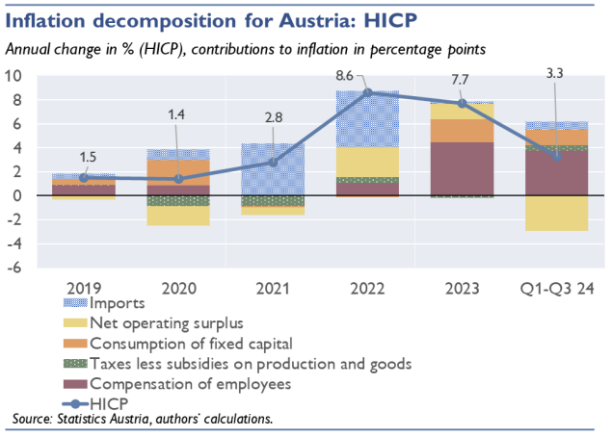


Chart 3.4



The difference between the GDP and value-added deflator versus the HICP has been striking over the last years. In 2021 and particularly in 2022, the HICP increased much more strongly than the GDP deflator (chart 3). The main reason is the large increase in import prices, which had no direct effect on the GDP deflator, but a very large one on HICP (as well as on the total supply deflator). If we look at the period from 2020 to 2022, the total supply deflator behaves relatively similar to the HICP, but in 2023 and 2024 it is far below it. In those years, both the investment and the export deflator (not shown in charts 3.1 to 3.4) increased much less than the HICP as unit cost increases were particularly strong in consumption-intensive services industries (restaurants and hotels, real estate etc.). The latter effect also impacts the differential between the HICP and the GDP deflator in 2023/24, but this is broadly compensated by the HICP-dampening effect of weak or even negative growth in import prices in those years.

These developments also contribute to the remarkable results concerning the relative role of profits and wages for the HICP and the GDP deflator. In the two years with the highest inflation rates, namely 2022 and 2023, the contribution of wages to the HICP was lower than that to the GDP deflator, while the opposite was the case for profits. The strong recovery of the aforementioned consumer services industries led to a pickup in profits that had a much higher impact on the HICP than on the GDP deflator. At the same time, the drop in profits in manufacturing affected the GDP deflator more strongly than the HICP. This trend also continued in the first three quarters of 2024, when HICP inflation was comparatively lower.

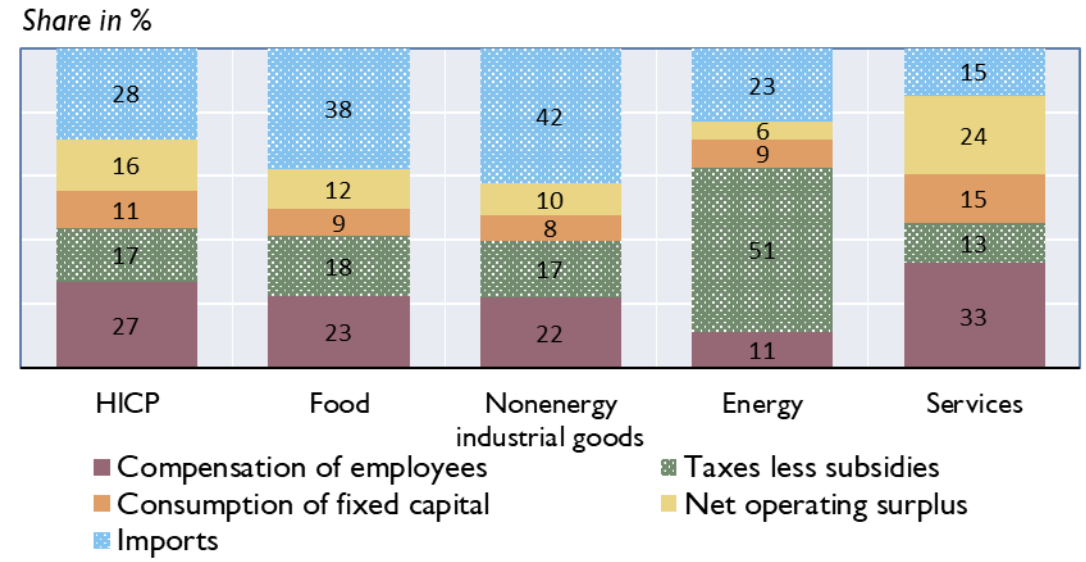
3 Detailed results for HICP special aggregates and the role of profits

To get a better understanding of the differences of HICP inflation versus other price variables, it is also helpful to look at the four main special aggregates of the HICP, namely food, energy, nonenergy industrial goods, and services. These categories differ substantially in their cost structure (chart 4). In 2019, about half of spending on energy was on taxes (mostly mineral oil tax, energy taxes and VAT), while for the other categories it was below one-fifth. The share of imports is highest for nonenergy industrial goods and food. Accordingly, the combined share of wages and profits is highest for services and lowest for energy. In 2019, the ratio of wages to profits was around 2:1 for energy, nonenergy industrial goods and food, while it was only around 4:3 for services.[9] For overall GDP it was around 5:2.

[9] Note that our method takes into account subsequent changes in the share of profits. This is particularly relevant for energy as profits of energy producers were particularly volatile.

Chart 4

Cost shares of headline HICP and special aggregates for Austria (2019)



Source: Statistics Austria, authors' calculations.

3.1 Consumption components with higher import weights showed faster increases in inflation

The initial increase in inflation in the second half of 2021 could be primarily attributed to imports (section 2). Initially, this primarily affected nonenergy industrial goods and energy, amid the partial recovery of from the COVID-19 crisis and worldwide shortages in the production of durable goods (e.g. cars). In early 2022, prices for food imports also picked up amid the Russian attack on Ukraine. Services were only marginally impacted by increases in import prices.

Profits of domestic energy producers increased substantially in 2022 and 2023, while at the same time various fiscal measures (energy tax cuts, subsidy on electricity consumption) dampened energy inflation. Interestingly, a large share of households' contracts for heating energy and electricity involves price fixing, leading to a lagged pass-through of wholesale prices to consumer prices in Austria. Therefore, profits of energy producers continued to rise significantly in 2023 when prices of energy imports dropped, and energy inflation went down substantially. Only in the first three quarters of 2024, these profits started to decline.

Chart 5.1

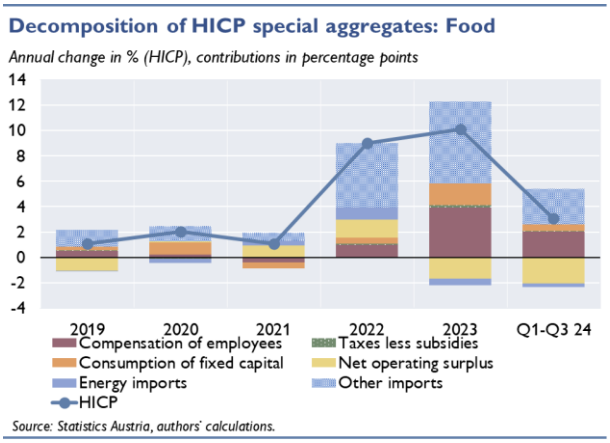


Chart 5.2

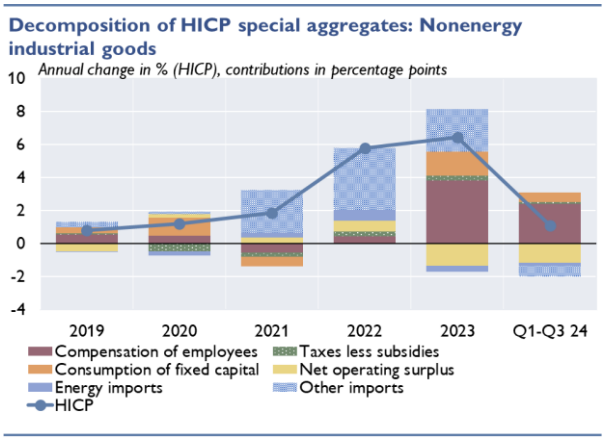


Chart 5.3

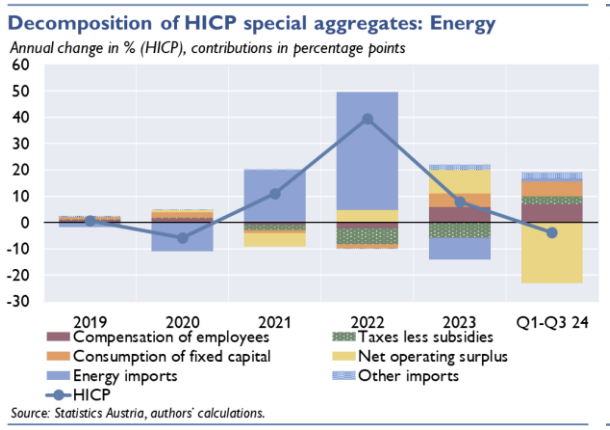
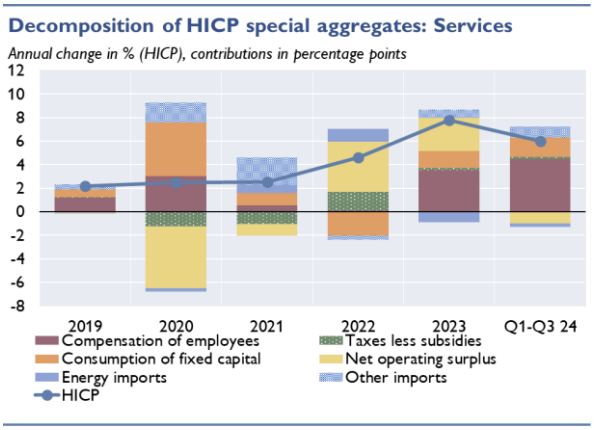


Chart 5.4



The increase in both food and nonenergy industrial goods inflation in 2022 was also accompanied by increases in domestic profits. These additional profits were primarily observed in the trade sector. In 2023, wages increased substantially and inflation declined somewhat in these categories, leading to a reversal of profits. Services inflation increased later than the other three main special aggregates. At the same time, its growth rate was above average in 2023, and in the first three quarters of 2024, services were the item with the by far highest inflation rate. As services are more important for the HICP than for other demand aggregates (chart 2), they contribute substantially to the differential of HICP inflation versus the growth in the total supply deflator (chart 3). There are two main reasons why services inflation has been so high compared to the other special aggregates recently: Services have a relatively high wage intensity by comparison, and nominal wage growth was very high in 2023/24. Furthermore, while overall profits have developed very poorly since 2023, the profits of some specific services sectors have jumped, for example for restaurants and hotels, as well as real estate and financial services.

3.2 Profits increased strongly in 2022, but cratered afterward

When inflation rates peaked in 2022, excessive profit growth was deemed one partial cause (Fritzer et al., 2023, Weber and Wasner, 2023). Indeed, profits increased substantially more than other cost components in 2022. This is illustrated in chart 6.1, which compares the actual development of the profit contribution (red line) to a fictional scenario where the share of all cost components remained constant over time (green bars). In such a scenario, the share of profits in

all cost components would remain at its 2019 level of about 16% (yellow bar in chart 1), meaning that the profit contribution would always amount to 16% of HICP growth. In such a case, industry markups would also remain constant. The difference to this hypothetical scenario can be interpreted as excess profits (yellow bars in chart 6). While these excess profits were indeed large and positive in 2022, they were substantially negative in 2020 and the first three quarters of 2024. Therefore, the cumulative effect since 2020 is clearly negative. This holds for practically all branches of the economy. The trade sector had strong profit developments in 2020/21 which unwound afterward. The development for restaurants and hotels was exactly the opposite as very weak developments in 2020/21 were followed by strong profit growth from 2022 onward. The financial sector recorded enormous increases in profits after 2020, but the weight of financial services in the HICP is very low (also due to the exclusion of FISIM from the consumption basket). Profits in the energy sector increased dramatically in 2022 and 2023 but dropped considerably in the first three quarters of 2024.

Chart 6.1

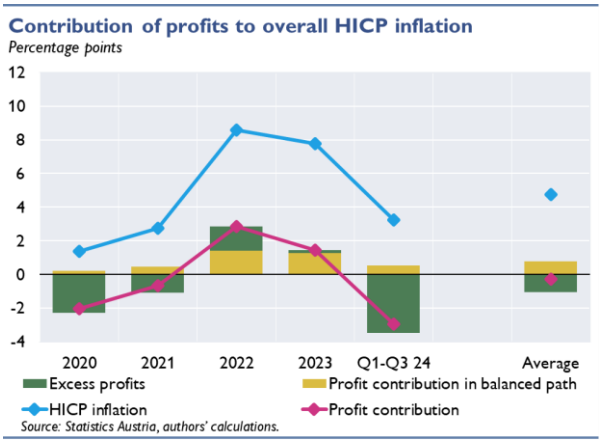
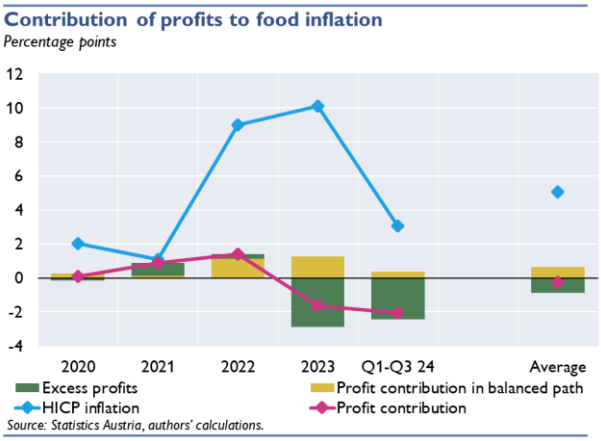


Chart 6.2



One particularly interesting special aggregate in this context is food. Experts at the Austrian Federal Competition Authority (Bundeswettbewerbsbehörde, 2023) were tasked with investigating whether increased profit margins contributed to the high food inflation in Austria. They found no evidence of increases in the profit margins of food producers and retailers in 2022 and the first half of 2023, measuring profit margins as the share of profits in revenue. Our study is consistent with their results. Overall excess profits related to food consumption were rather small in 2022 and substantially negative in 2023 and the first three quarters of 2024 (chart 6.2). The cumulative effect has been clearly negative since 2019. This is also true for the three main branches involved in the supply of food consumption, namely agriculture, manufacturing and trade. Temporary initial gains made by agriculture (2021/22) and trade (2020/21) were more than neutralized by unfavorable developments in 2023/24.

4 Conclusions

In this paper, we compare cost-based decompositions of the value-added deflator, the GDP deflator and the total supply deflator with the HICP decomposition proposed by Schneider (2024). Our main finding is that decomposing national accounts deflators as a proxy for consumer price inflation can lead to misleading results. This is mainly attributable to the different roles of imports and wages. During the last years, rises in import prices were the main contributor to the initial rise in Austrian consumer price inflation. The role of wages was less important for the HICP than

for the GDP deflator. Domestic wages made up only slightly more than a quarter of the costs incurred for the production of domestic consumption goods and services, while they were more important for domestic value added. Domestic profits, on the other hand, had a higher impact on the HICP than on the GDP deflator in the period with the highest inflation rates due to the recovery of the consumer services sectors.

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Annex

This annex details the HICP decomposition based on Schneider (2024). It combines the cost structure of the consumption bundle underlying the HIPC derived from the input-output table with quarterly national accounts and trade data. The method involves calculating cost shares at the CPA-74 level, aggregating them to COICOP-45 level, and updating these cost shares with quarterly national accounts and trade data.

In the first main part, we use the input-output table for Austria (2019) with 74 goods/industries to calculate the cost components of the consumption bundle underlying the HICP. For each good *i*, direct and indirect cost components are distinguished. Direct cost components include direct imports and taxes less subsidies on products. They are obtained directly from the input-output table. Indirect cost components are determined by the domestic production of consumption goods. A multiplier analysis is used to derive the indirect cost component *k* in industry *j* attributable to the production of consumption good *i* at the CPA-74 level. This is done by multiplying a final demand vector D_i[10] with the Leontief inverse $((I-A)^{-1})$[11], which gives the vector of output Q_i generated in all industries by the production of D_i.

$$Q_i = (I-A)^{-1} D_i$$

The cost component *k* of industry *j* necessary to produce consumption good *i* is derived by multiplying output of industry *j* generated by the production of consumer good *i* ($q_{j,i}$) with the share of cost component *k* ($cc^{IO}_{k,j}$) in output of industry *j* ($q_{j,i}$) from the input-output table:

$$cc^{CPA}_{k,j,i} = \frac{cc^{IO}_{k,j}}{q_j} q_{j,i}$$

These cost components must be aggregated from the CPA-74 level to the COICOP-45 level. This is done by utilizing a correspondence table provided by Statistics Austria that maps CPA-74 goods to COICOP-45 categories[12].

In the second main part, the cost shares derived input-output tables are combined with quarterly national accounts data. This is done in five steps. The first step is to estimate the cost components that are missing in quarterly national accounts (QNA). The published QNA data only contain value added and compensation of employees per industry. Therefore, we must estimate the three missing components (net taxes on production, consumption of fixed capital and net operating surplus), which are all published only at the total economy level. Details of this procedure can be found in Fritzer et al. (2023).

In the second step, we adjust compensation of employees, profits and net other taxes on production for crisis-related subsidies. From 2020 to 2022, the Austrian federal government paid out substantial subsidies to firms for short-time work, foregone revenue and increases in energy costs. These transfers led to a strong drop in net indirect taxes and pushed up compensation of employees (short-time work subsidies) and net operating surplus (other subsidies). We have

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[10] For each good *i*, we set the final demand vector D_i to zero except for good *i*, which we set to the value of private consumption at basic prices from the input-output table.

[11] *A* is the matrix of technology coefficients which can be obtained by dividing the matrix of intermediate demand by output by industry.

[12] This table has to be converted from purchasing prices to basic prices to account for trade and transport margins (see Schneider, 2024).

adjusted these time series by subtracting the crisis subsidies from them. For a detailed description of these calculations, see Fritzer et al. (2023).

In the third step, we have to address the problem that industry-specific cost components in quarterly national accounts correspond to the production of all final demand components. Hence, we have to isolate the share of the cost components implied by private consumption from other final uses. We do this by performing a multiplier analysis for all 11 final demand components from QNA to obtain their cost shares. Combining these cost shares with final demand from quarterly national accounts, we obtain *hypothetical cost components* implied by each final demand component. We then calculate the share of private consumption for each cost component and refer to is to as "consumption-implied cost component" ($cc^{QNA}_{k,C,t}$). For further details see Schneider (2024).

The fourth step is to combine the cost components derived from the input-output table with growth rates of the consumption-implied cost components at the quarterly level relative to the corresponding quarter of 2019 (base year of our input-output table). This gives us the cost share $cs_{k,i,t}$ for cost component *k* for consumer good *i* in period *t*.

$$cs_{k,i,t} = cs^{IO45}_{k,i} * \frac{cc^{QNA}_{k,C,t}}{cc^{QNA}_{k,C,2019}}$$

In the final step, we use these cost components to calculate inflation contributions. We first have to calculate nominal private consumption of good *i* (which is not available in quarterly national accounts) as the sum of its cost shares.

$$c_{i,t} = \sum_{k=1}^{K} cs_{k,i,t}$$

Then we divide it by the consumer price index to obtain real consumption of good *i*.

$$c^{r}_{i,t} = \frac{c_{i,t}}{p_{i,t}}$$

After this, we calculate unit cost shares (per real unit of consumption good *i*).

$$ucs_{k,i,t} = cs_{k,i,t} / c^{r}_{i,t}$$

Finally, we obtain contributions to year-on-year inflation using the same decomposition formulas as used for value-added deflator.

$$\frac{dp_{i,t}}{p_{i,t-4}} = \sum_{k=1}^{K} \frac{ducs_{k,i,t}}{ucs_{k,i,t-4}} \frac{ucs_{k,i,t-4}}{p_{i,t-4}}$$

Note that the contribution of taxes on products is not computed via unit cost shares but by comparing the HICP to the HICP at constant tax rates.[13]

[13] Subsidies on products are very small in Austria. For energy crisis-related subsidies on products (particularly for the electricity price cap), we computed the contributions to the HICP ourselves using quarterly data on the payouts of these subsidies. In the decompositions of the GDP deflator and the total supply deflator in section 2, we calculate the contribution of net taxes on products as the difference between the GDP deflator and the value-added deflator.

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ISSN 2960-5415 (online)