INTERNATIONAL MONETARY FUND

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Dutch Inflation: Developments, Drivers, and the Risk of Wage-Price Spiral

NETHERLANDS

Saioa Armendariz and Alla Myrvoda

SIP/2023/021

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Dutch Inflation: Developments, Drivers, and the Risk of Wage-Price Spiral

Prepared by Saioa Armendariz and Alla Myrvoda

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February 2023

ABSTRACT: Global inflation surged in 2022, driven by high gas price growth. With Russia being a key supplier of energy products, the start of the war in Ukraine has led to strong inflationary pressures in the euro area (EA), given the region's significant exposure to the Russian gas. The price shock has been particularly strong in the Netherlands, largely due to the larger share of gas on the energy mix compared to other peers, making the country vulnerable to changing market conditions.

Against this background, this paper explores the nature of the recent acceleration of inflation in the Netherlands, taking into consideration different perspectives. The first section presents different measures of inflation and the methodological discrepancies among the indicators considered. Secondly, the paper presents an empirical assessment on the main drivers of inflation through a Phillips Curve estimation. The third section analyses the particularities of the Dutch energy mix compared to other EA peers, and the pass-through from wholesale to retail gas and electricity prices. In addition, as increasing inflation has raised concerns for a potential wage-price spiral, the fourth section presents empirical evidence on how the distribution of the total remuneration of productive factors -capital (profits) and labor (wages)- worked in the past. Finally, the paper summarizes the main findings of the study and further potential areas for research.

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Dutch Inflation: Developments, Drivers, and The Risk of Wage-Price Spiral

NETHERLANDS

INTERNATIONAL MONETARY FUND

KINGDOM OF THE NETHERLANDS-THE NETHERLANDS

SELECTED ISSUES

February 8, 2023

Approved By
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Prepared By Saioa Armendariz and Alla Myrvoda

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DUTCH INFLATION: DEVELOPMENTS, DRIVERS, AND THE RISK OF WAGE-PRICE SPIRAL

Global inflation surged in 2022, driven by high gas price growth. With Russia being a key supplier of energy products, the start of the war in Ukraine has led to strong inflationary pressures in the euro area (EA), given the region's significant exposure to the Russian gas. The price shock has been particularly strong in the Netherlands, largely due to the larger share of gas on the energy mix compared to other peers, making the country vulnerable to changing market conditions.

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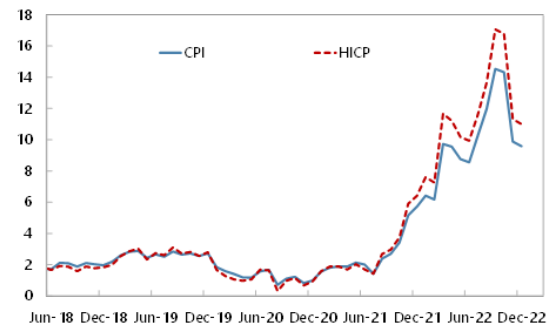
A. Different Measures of Inflation: A Methodological Review

1. In 2022, the Dutch headline inflation reached unprecedented levels since the 70's, largely driven by high energy price growth, with price pressures becoming increasingly more broad-based. After peaking at 17.1 percent year-on-year in September 2022—an all-time high, the HICP headline inflation slowed to 11.0 percent year-on-year in December 2022 driven by the easing of energy prices (Figure 1). Price pressures, however, have become more broad-based, with core inflation continuing to pick up to historical highs by end-2022, as higher energy prices are feeding though into core items.

2. In addition to the Harmonized Index of Consumer Prices (HICP), the Dutch Statistics Office (*Centraal Bureau voor de Statistiek*, CBS) also calculate consumer price index (CPI), with both indicators suggesting high inflation. As of December 2022, the HICP increased by 11.0 percent year-on-year, while the CPI grew by 9.6 percent, with the difference between the two measures increasing over time (text chart). There are two notable fundamental differences between these measures that drive the gap. First, the CPI includes imputed rents for

Inflation
(In percent, year-on-year)



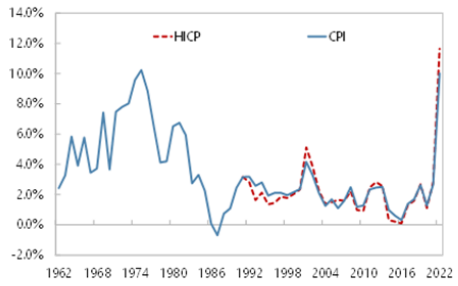
Sources: Haver Analytics, CBS, and IMF Staff

owner-occupied housing. Since rents are regulated, their growth in recent months has been less than that observed for other goods and services, thus, resulting in lower CPI inflation. Second, the energy weight in the HICP is higher than the one used in CPI calculation, making the HICP more sensitive to changes in energy prices. Higher energy weight, combined with large energy price increases in 2022, mainly drove the difference between the HICP and the CPI measures.

Figure 1. Dutch Inflation Developments

After peaking in September 2022 at an all-time high, the Dutch HICP headline inflation slowed to 11.0 percent in December 2022.

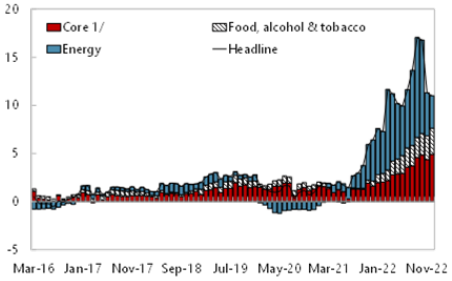
Historical Inflation
(Percent, year-on-year)



Sources: Haver Analytics, CBS and IMF staff

While surging energy prices have constituted the main driver in recent months, price pressures have become more broad-based.

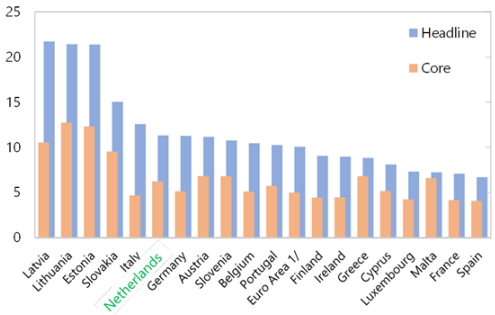
Headline Inflation
(Percent, year-on-year, contributions in percentage points)



Sources: Haver analytics and IMF staff calculations

Despite some decline in prior months, the Dutch headline and core inflation remained high in December 2022 relative to other European peers.

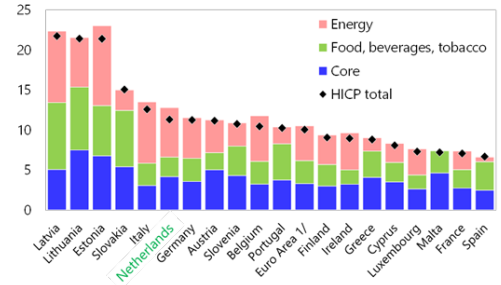
Euro Area HICP Headline and Core Inflation
(In percent, year-on-year, November 2022 1/)



Sources: Haver Analytics; and IMF staff estimates and calculations.
1/ Core inflation defined as headline inflation excluding energy, food, alcohol, and tobacco.

With energy prices as a key driver of inflation growth, while the contribution of food remains is rising but still below some European peers.

Euro Area Core HICP Inflation
(In percent, year-on-year, November 2022 1/)

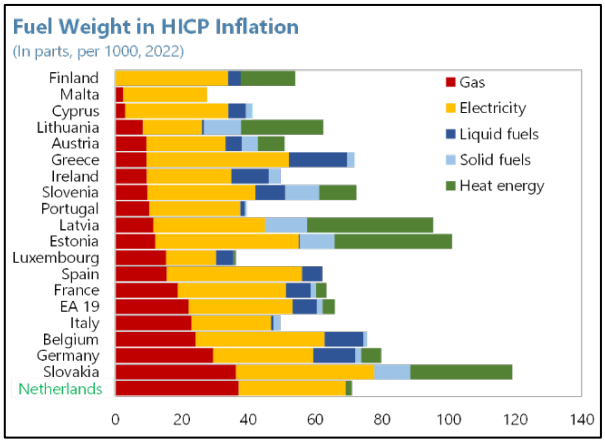


Source: Haver Analytics, and IMF staff estimates and calculations.
1/ Core inflation defined as HCPI inflation excluding energy goods, food, alcohol, tobacco. Euro Area MUICP, which is the Monetary Union Index of Consumer Prices of 19 countries. Core infaltion defined as total excluding energy, food, alcohol, and tobacco.

Source: IMF staff estimates and calculations.
1/ Core inflation excludes energy, food, alcohol, and tobacco.

3. In broad terms, several factors help explain the high energy price growth in the Dutch statistics. Specifically:

- **A greater share of gas in the Dutch consumer price basket than in other EA countries**. Gas prices have experienced greater growth in recent months than other fuels. In the Netherlands, gas constitutes a larger portion of the consumer price basket than in other countries. Most of the electricity in the Netherlands is also produced by fossil fuel-fired powerplants, mainly natural gas. Thus, with gas price growth outpacing other fuels, a greater reliance on gas of the Dutch households has contributed to faster energy price growth in the Netherlands relative to other European countries.[1]



- **Liberalized energy markets increase price volatility and sensitivity to shocks in turbulent times.** The electricity sector in the Netherlands has been liberalized and open to competition since 2004 with about 53 suppliers active in the market.[2] This competition motivates wholesale market participants to adapt different business strategies, as setting prices in advance or to settle procurement of several months with commodity suppliers. As a competitive market, final energy suppliers adjust their final pricing strategy to the costs they face, including risks. Unlike in some other EA countries, there are no social tariffs in the Netherlands. This results in a stronger transmission of wholesale into retail energy prices, introducing more volatility particularly in the time of energy market stress.

- **Dutch TTF gas prices were somewhat higher than in other markets.** During the period of energy market turbulence in 2022, Dutch TTF spot gas prices—the European benchmark and the most liquid market, were somewhat higher than in some other markets, due to the large exposure of European countries to Russia's supplies.

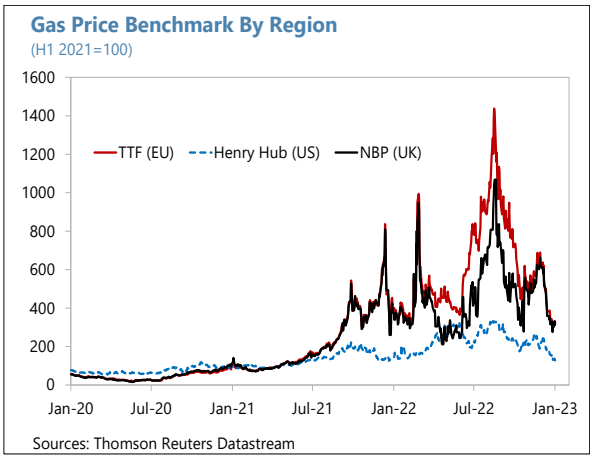
- **The current method of calculating consumer energy prices relies on variable rate contract pricing, resulting in an overestimated energy bill when energy prices increase sharply.** With the current method of estimation, consumer energy prices, which feed into the calculation of the HICP and the CPI indices, are overestimated when energy prices rise sharply and are underestimated when energy prices fall abruptly. This is because in the absence of readily available information on energy contract types and pricing, the current calculation method relies on the prices underlying variable rate contracts, thereby excluding nearly half of households,

[1] Source: https://www.eia.gov/international/analysis/country/NLD

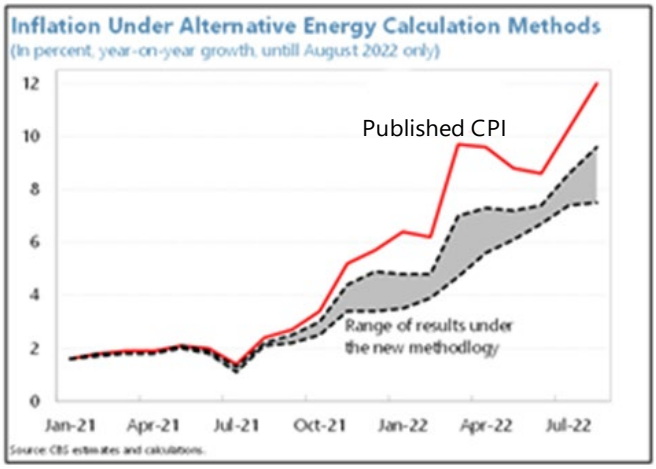
[2] Source: Eurostat's energy market indicators.

since about 44 percent of households remained on fixed energy contracts as of end-August 2022.[3] The share of fixed contracts, however, is quickly declining, since energy suppliers increasingly offer only energy contracts with a variable rate due to strong fluctuations in the energy markets, as fixing prices for a prolonged period exposes energy suppliers to more risk. While the current method of estimating consumer energy prices does not introduce any bias on the aggregate outcome with stable markets, the methodology falls short in volatile episodes, signaling some room for improvements in the future.

4. To better capture the average consumer energy prices, the CBS has been exploring alternative calculation methods since early 2022. To better understand the structure of household energy contracts and pricing mechanisms, the CBS launched a study in early 2022 to explore options for a more precise calculation of electricity and gas prices faced by an average consumer using information from utility companies, which currently covers about ¾ of all households with energy supply in the Netherlands.[4] The study investigates existing longer-term energy contracts to better reflect price discrepancies between fixed- and variable-rate, and new and existing contracts.



5. Preliminary analysis of alternative calculation methods suggests significantly lower CPI inflation than the official statistics report. Preliminary results based on the newly obtained prices of gas and electricity suggest that much lower electricity and gas prices experienced by an average consumer than the official statistics indicate. Specifically, as of August 2022, the latest data point released of alternative calculations, electricity price growth was in the range of 24–93 percent year-on-year instead of the reported 150 percent, and gas



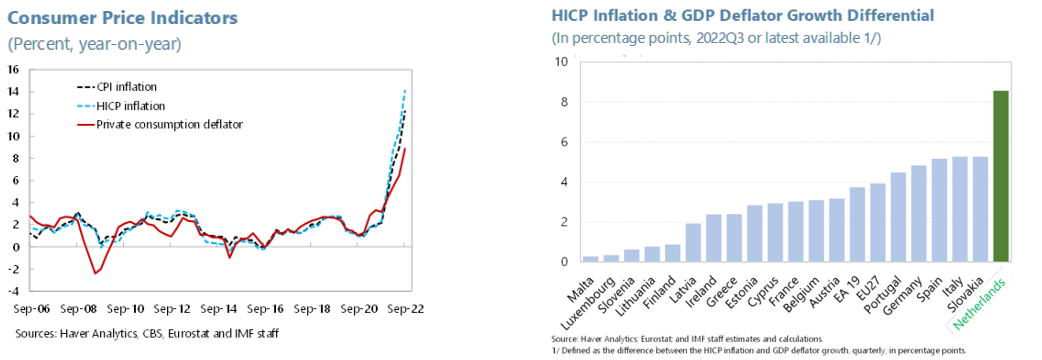
[3] As of end-August 2022, 56 percent of Dutch households had variable rate energy contracts. Among the remaining 44 percent of households with fixed variable contracts, 11 percent of households had contracts fixed for 1 year, 1 percent for 2 years, 25 percent for 3 years, and 8 percent for 5 years. Source: the Dutch Authority for Consumers and Markets (ACM). For details, see ACM: Number of households with a variable energy contract continues to rise.

[4] The CBS reportedly is still in discussion with the remaining energy companies to increase the coverage. The data are not yet sufficiently suitable for the use in the calculation of CPI inflation. Several calculation methodologies have been applied and compared. For details, see Towards a new method of calculating energy prices.

price growth in the range of 34–97 percent year-on-year instead of the published 170 percent. This would imply that the CPI inflation was about 2.4 to 4.5 percentage points lower than published (7.5–9.6 percent instead of the published 12 percent, text chart). The wide margins of the new estimated inflation reflect data imperfections. The introduction of a new methodology will likely take effect in mid-2023 for both CPI and HICP.

6. The private consumption deflator from National Accounts, an alternative method of measuring consumer prices, suggests more modest growth than the HICP inflation in the Netherlands. As CPI/HICP inflation began to rise in late 2021, the implied private consumption deflator increased less robustly, widening the gap between the two measures of price growth (Figure 2). This different performance is partially explained by discrepancies on the technical definition between the indicators. The CPI/HICP measures the level of retail prices at a particular point in time for a fixed basket of goods and services, whereas the private consumption GDP deflator measures inflation also accounting for changes in households' consumption and other goods and services not considered in the CPI/HICP. This methodological differences partially explain that, as of 2022Q3, the HICP inflation stood at 14.1 percent year-on-year, the average CPI at 12.3 percent, and the private consumption deflator at 8.9 percent.

Figure 2. Measures of Inflation

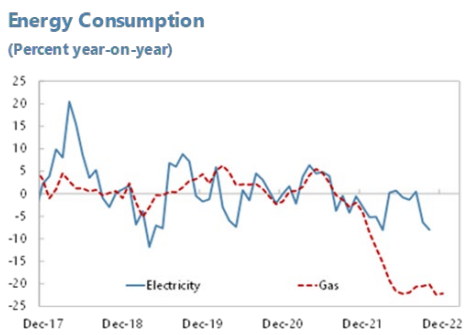


Source: IMF staff estimates and calculations.

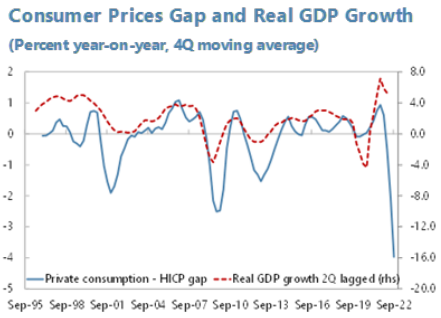
7. Consumer inflation, measured by the HICP and the CPI, may be also overestimated given that the consumer basket weights are updated with a delay at annual frequency. Both the HICP and the domestic CPI measures rely on weights of various items which are updated annually, based on households' budgetary survey. This implies that the HICP and the CPI do not account for changes in private consumption patterns observed within the year, failing to capture price elasticity effects on households' demand, and its effects on aggregated consumer prices calculations. In part, this explains the widening gap between HICP/CPI and the private consumption deflator from the National Accounts, which rely on updated weights at quarterly frequency. This methodological difference plays an important role, given that energy consumption in the Netherlands adjusted by more than 20 percent in 2022 (Figure 3).

8. The widening gap between the HICP and the private consumption GDP deflator may be indicative of an economic slowdown. With consumer price growth at historically highs, the difference between the HICP and the private consumption deflator has also increased significantly. Abrupt demand changes usually take place when an economy faces a shock with immediate or second-round effects on demand. Historically, widening gaps between the HICP and the private consumption deflator overlapped with economic slowdowns in the early 2000's, the global financial crisis and the European sovereign debt crisis, as consumer prices, measured by the private consumption deflator, quickly adjusted to a falling demand (Figure 3).

Figure 3. Energy Consumption, Inflation Differential and Growth



Sources: Thomson Reuters Eikon and IMF Staff calculations



Sources: CBS, Haver Analytics and IMF Staff calculations

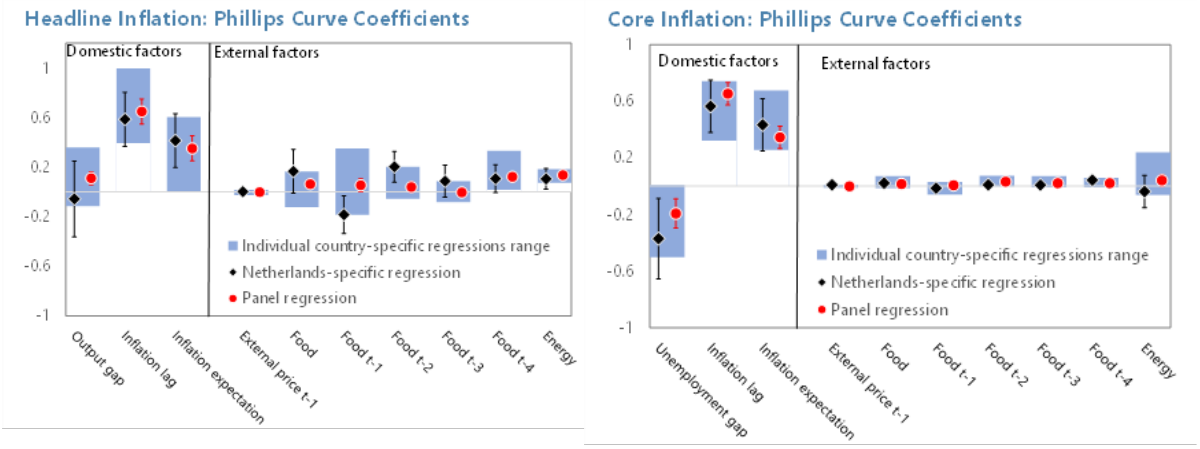
B. The Role of Domestic and Global Factors: An Empirical Assessment

9. The assessment of the role of domestic and foreign factors in determining inflation is based on empirical analysis. To understand the drivers of inflation, this section focuses on the Phillips curve, which relates inflation to its past and expected future values, and domestic economic slack. The Phillips curve analysis is also augmented with foreign price developments to assess the importance of foreign factors in determining inflation. A Phillips curve is estimated for a panel of 17 EA economies and separately for each country with sufficient comprehensive data over 2000Q1–2022Q2. Rolling window panel are also estimated to assess changes over time. The estimated coefficients for the Netherlands are compared to other countries and to the panel estimation results and are used to calculate implied contributions to inflation dynamics. Data sources, country coverage, and the methodology used in the Phillips curve estimation as well as the main results are detailed in the Appendix I.

10. Overall, the analysis reflects the key role of past and future inflation expectations in determining consumer price growth (Figure 4). The first takeaway from the proposed Phillips curve is consistent with the economic theory and most recent estimations (ECB, IMF's 2022 October Regional Economic Outlook), with lagged inflation and the 3-year-ahead inflation expectations statistically significant and showing the largest estimated coefficients. This is the case in both panel data results for the euro area and the Netherlands-specific regression estimates, and for both headline and core inflation rates. The latter results confirms that inflation is backward- and forward-looking even accounting for volatile components such as energy prices.

11. Dutch domestic cyclical conditions, as proxied by the unemployment gap, are statistically significant in determining Dutch core inflation. Three different variables are used to proxy and quantify domestic cyclical conditions in separate regressions: unemployment gap, output gap, and a combined measure of slack.[5] At the euro area level, the coefficients obtained on the different regressions confirm that all three measures are statistically significant and positively correlated with both headline and core inflation, suggesting the positive relation between inflation and the position in the economic cycle (Annex 1 Table 1). In the Netherlands-specific regressions, however, the results suggest that other factors different than the economic cycle contribute to consumer's price growth, resulting from the no significance of the coefficients estimated in the different specifications with only one exception. The Dutch unemployment gap is statistically significant in determining core inflation rate -but neither the output gap nor the principal components measure-, highlighting the relevance of the Dutch labor market in non-volatile domestic prices performance. Similarly to the panel data setting at the euro area level, the size of the impact is relatively small: a one percentage point increase in the unemployment gap is associated with 0.35 percentage point decline in core inflation under the Netherlands-specific baseline specification regression; and about 0.2 in the panel data setting.

Figure 4. Phillips Curve Coefficients for Headline and Core Inflation
(Range of coefficients obtained in different specifications)

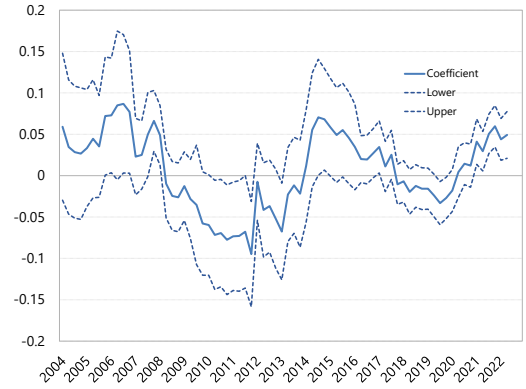


Sources: IMF staff estimates and calculations.
Note: Error bars correspond to 90th – 10th percentile confidence intervals. All estimates shown correspond to the baseline regression specification with imposed restriction of sum of expected inflation and the lag of inflation to equal one. Estimates with robust standard errors, and country fixed effects for the panel regression.

[5] The domestic slack variable is measured as the first principal component of seven variables: output gap, participation rate, unemployment gap, hours worked gap, self-employment gap, and the deviation of the share of part-time employment and temporary employment from their corresponding long-run averages.

12. External factors also constitute important determinants of the EA headline inflation dynamics. The measure of external price pressures is not statistically significant in most regression specifications neither in the panel setting, nor in the country-specific regressions. Commodity prices, however, are an important determinant of inflation, given the positive and statistically significant signs on the energy and food price coefficients both for the EA and for the Netherlands. Rolling window analysis undertaken using panel data suggests that the pass-through from energy to core inflation has increased substantially in the EA. with a higher coefficient on lagged inflation. The latter suggests that EA inflation has become more backward-looking and persistent.

Core Inflation Rolling Window Regression Coefficient on Energy in the Euro Area 1/

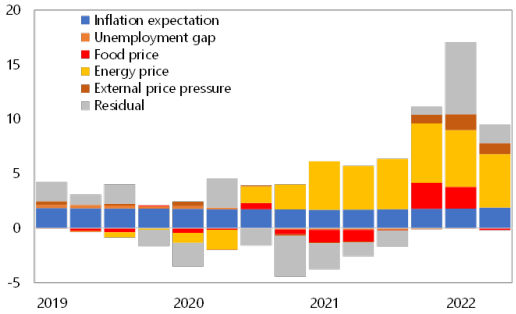


Sources: IMF staff estimates and calculations.
1/ Results based on panel-data setting. Solid lines indicate rolling regression coefficients of the headline (left) or core (right) regressions. Dashed lines show their 10th –90th percentile confidence intervals. Estimates are based on the baseline constrained regressions with country fixed effects and cover a rolling window of 16 quarters ending in the quarter indicated on the x-axis.

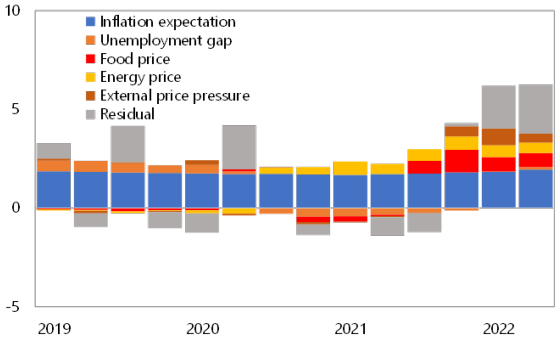
13. Global commodity prices have also played a key role in determining headline and core inflation in the Netherlands. Contributions of each driver are computed using dynamic simulations of the estimated Netherlands-specific Phillips curve. The results confirm that global commodity prices, specifically food and energy, have played a key role in inflation developments in the Netherlands. Energy prices, and to a lesser extend food prices, have been a major driver of the Dutch headline inflation since 2021. Meanwhile, food and energy price growth has also been key to core inflation acceleration since mid-2021.

Figure 5. Implied Contribution to Headline and Core Inflation

Implied Contributions to Headline Inflation Dynamics
(In percentage points, quarter-over-quarter seasonally adjusted annualized)



Implied Contributions to Core Inflation Dynamics
(In percentage points, quarter-over-quarter seasonally adjusted annualized)



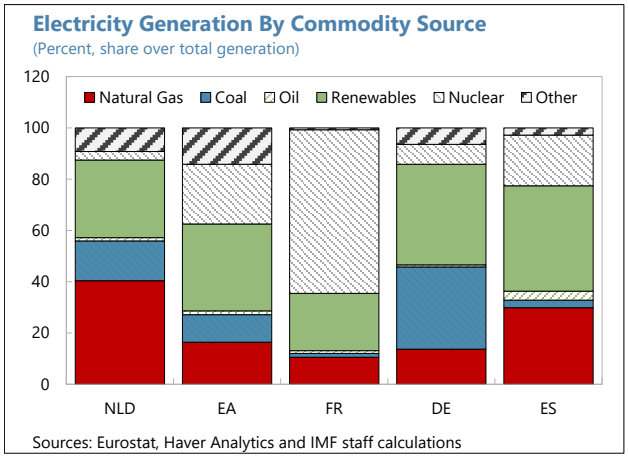
Sources: IMF staff estimates and calculations.
Note: Contributions are calculated based on the dynamic simulations of the Netherlands-specific Phillips curve regression.

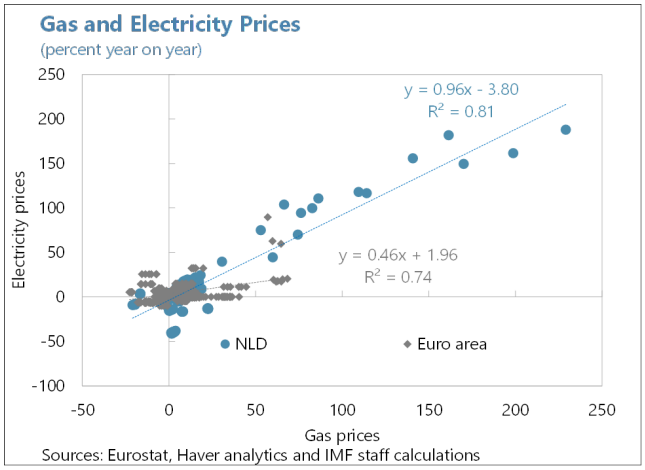
C. Wholesale Energy Price Pass-Through

14. The increasing role of gas and electricity price contribution to consumer's inflation has led to a greater cross-country heterogeneity in the euro area. This is linked to differences in the

pass-through from wholesale to consumers prices, depending on different factors such as the energy mix in electricity generation, the price-setting mechanism, and the price composition. Moreover, the impact of wholesale price changes depends on whether tariffs are set at a variable price, implying a fast adjustment of consumer prices, or are set at a pre-fixed level (ECB, 2022).

15. The large share of gas in the Dutch energy mix largely explains higher inflation in the Netherlands than in other EA peers. We find three factors that largely explain higher inflation in the Netherlands. First, as previously discussed, the consideration of variable-rate contracts on CPI/HICP methodology introduces some bias on inflation estimations.[6] Second, on the demand side, the share of gas and electricity items in the final consumer basket is one of the highest in EA, only surpassed by Slovakia. Third, on the supply side, the use of gas in electricity generation in the Netherlands is comparatively high, making electricity prices more sensitive to changes in gas prices (text chart). The EU's wholesale market relies on the system of marginal pricing, where all electricity generators get the same price for the power they are selling at any given moment, with independence on the commodity used on the process. However, electricity price depends on the source of energy for its generation, with fossil fuel typically more expensive than renewable energy. When national electricity producers bid into the market, the cheapest electricity is purchased first until the demand is met, but the last producer's price becomes the prevailing final price that all producers receive. Member states typically try to cover as much demand as possible with the less costly commodity source. Given that gas has been the most expensive commodity-source for electricity, the threshold for gas prices to determine electricity prices is lower in the Netherlands than in other EA countries, which contributes to the larger elasticity of Dutch electricity prices to gas markets (text chart).



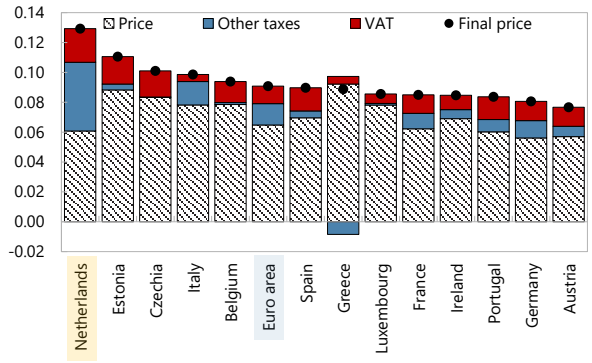


16. Item composition of consumer gas and electricity bills, also a key driver for final consumer's cost. The average household bill in Europe can be broken down into three basic components: the price of the commodity (including transportation and distribution costs to final users), value added tax (VAT), and other taxes (Figure 3). In the Netherlands, the latter component

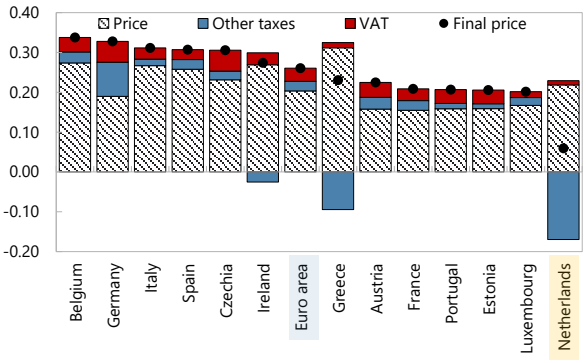
[6] As discussed in section A, gas and electricity prices in the Netherlands HICP refers to variable-price contracts which are closely determined by wholesale prices.

includes the ODE tax[7], meant to stimulate financing of the production of sustainable energy and the energy tax. In addition, electricity bills also include the energy tax refund or energy tax credit, which is a deduction on the taxes on the use of electricity awarded per electricity connection.

Figure 6. Gas and Electricity Prices for Households



Sources: CBS, Eurostat and IMF staff



Sources: CBS, Eurostat and IMF staff

17. Taxes play a key role in promoting a consumption shift. Gas and electricity are taxed in the Netherlands through the ODE and the energy tax as set in the Environmental Taxes Act. With the decline in the domestic gas production over the last decade, the strategy towards a more efficient and less gas-dependent economy has gained relevance, shifting taxation towards gas usage while promoting efficiency in electricity use. In the first half of 2022, the energy tax on gas usage was at 0.26 EUR/m3, up from 0.16 EUR/m3 in 2018; while the energy tax on electricity has been reduced to 0.037 EUR/kWh[8] from 0.10 EUR/kWh in 2018. In addition, an energy tax credit is applied per electricity connection, as a way to protect a basic amount of consumption of electricity by eliminating the energy tax up to a basic amount. The government sets the amount of the tax credit each year. In 2022, the tax credit was 681.6 EUR from 308 EUR in 2018.

18. The relevance of natural gas sector in the Netherlands has contributed to a stronger pass-through from wholesale prices into the wider economy. Despite the shift from a net gas exporter to a net importer, the Netherlands has faced a relatively mild terms-of-trade shock. However, the large share of gas in the Dutch energy mix, including electricity generation, has exposed the country to more intense domestic inflationary pressures, now also passing-through to core items.

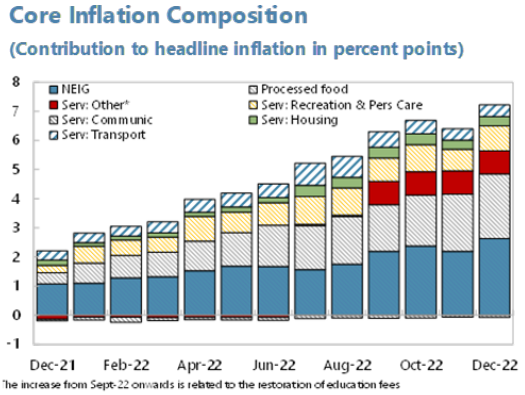
19. By end-2022, the Dutch core inflation accelerated faster than the EA average. Core inflation in the Netherlands has gained traction in 2022 to reach 8.4 percent in December

[7] Sustainable Energy Surcharge (*Opslag Duurzame Energie,* ODE)

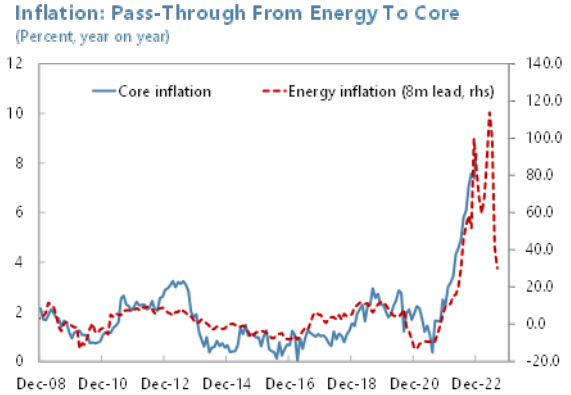
[8] The energy tax on electricity was markedly lowered to 0.037 EUR/kWh in January 2022 from previous 0.094 EUR/kWh, as a measure to help to offset the increase in gas and electricity prices recorded in 2021H2.

(6.6 percent in EA) from 2.3 percent in December 2021 (2.7 percent in EA), with the positive contribution of its three aggregates: processed food (14.1 percent in December from 2.4 percent in December 2021), non-energy industrial goods (NEIG) (8.8 percent in December from 3.4 percent in December 2021), and services (5.8 percent in December from 1.3 percent in December 2021). This outcome is partially related to supply chain disruptions (mostly on NEIG) and post-pandemic effects (services), but the role of both energy and non-energy commodity prices in the increase of input costs cannot be ignored (Figure 4).

Figure 7. Core Inflation Composition and Energy Pass-Through



Sources: Thomson Reuters Eikon and IMF Staff calculations



Sources: CBS, Haver Analytics and IMF staff calculations

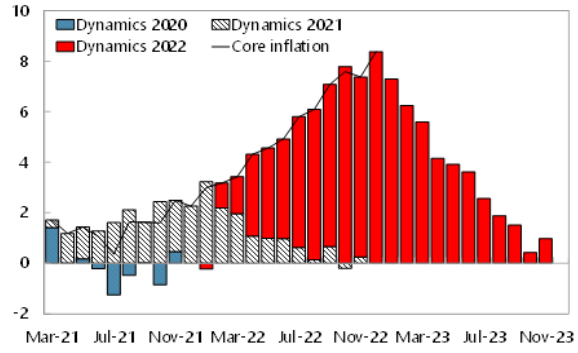
20. Empirical evidence suggests it takes about 6–8 months for energy prices to pass-through to core items, increasing the likelihood of inflation persistence and adding downside risks for domestic demand (Figure 4). With volatile components excluded, such as energy and unprocessed food, core inflation typically displays a more stable pattern. As a result, core inflation becomes more persistent after a shock. The lead-lag structure of the pass-through from energy to core inflation and different estimations on its persistence suggest that the effects of high energy prices could last up to 18 months.

21. Food price growth acceleration and persistently high energy prices could result in further deterioration of the cost-of-living, with particular impact on low-income households. High inflation disproportionately affects lower-income households due to the lack of substitution capacity towards cheaper items, given that they tend to consume cheaper white-label products, while richer households usually consume more-expensive/branded products. In addition, low-income households also show a higher marginal propensity to consume and have less room to preserve their consumption through savings, with a lower value of liquid assets (ECB, 2022).

22. The key role of monetary policy with increasing risks of persistence. From a purely quantitative approach, i.e., without considering the economic relationships, core inflation acceleration during 2022 automatically translates into strong base effects for 2023, indicating that elevated core inflation rates will remain in place in the coming months. The 2022 carry-over effect will account for 3.7 percentage points in the average core inflation rate in 2023. On a monthly basis, this effect will maintain the year-on-year core inflation reference above 2 percent until August 2023 (text chart). This means that, in the absence of a strong adjustment of core prices throughout the year, non-volatile inflation will remain above its historical average. With both domestic and external drivers of inflation still adding upward risks, monetary policy tightening should diminish inflationary pressures on core at some point, reducing its persistence and pass-through effects in the economy.

Core Inflation

(Percent year-on-year and contributions in pp)



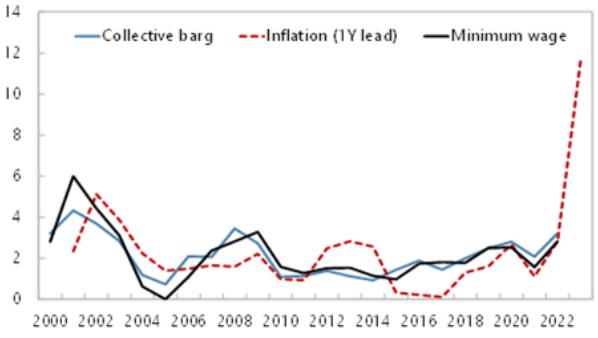
Sources: Haver analytics and IMF Calculations

23. The dynamic interaction between prices and wages is time-varying and depends on the stage of the economy. Increasing core inflationary pressures may call for result in wage increases, protecting households' purchasing power while stimulating demand and fulfilling a wage price spiral. ECB research finds that the pass-through of wages into prices is systematically lower in periods of low inflation as compared to periods of high inflation. This theoretical finding raises concerns about potential risks of strong wage growth, potentially leading to negative effects on the domestic economy. On the one hand, corporate profits may face liquidity and solvency problems due to the strong increase of input costs, particularly in a context of deteriorating economic conditions. On the other hand, strong wage increases could preserve purchasing power of employees, reinforcing demand and adding inflationary pressures into the economy (a wage-price spiral process).

24. To date, the pass-through from inflation into wages remains moderate. Collective bargaining agreements in Europe is closely linked to inflation performance, with several countries relying on inflation-linked annual indexation of wages, pensions, and other social benefits. However, there are no inflation-linked clauses in the Dutch regulatory framework, increasing the flexibility to the negotiation process among social partners and allowing for a healthy economic interaction between wages and corporate profits. This is also the case for the minimum wage, which

Inflation and Wages

(Percent year-on-year)



Sources: Haver analytics and IMF Calculations

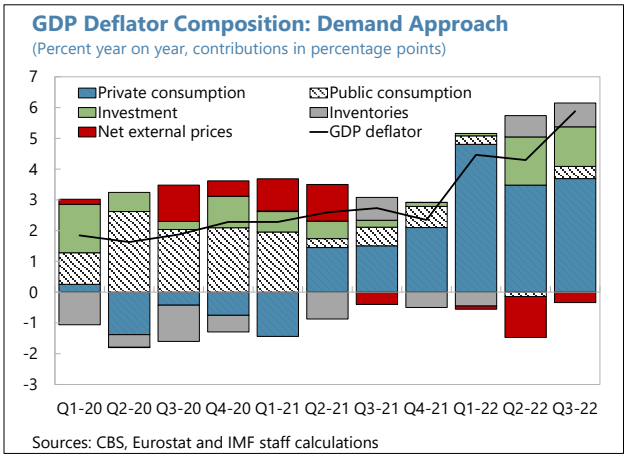
is linked to the evolution of contractual wages through a legal indexation mechanism. The latest available information confirms the recent acceleration of wages, despite remaining well below the inflation rate (text chart). Contractual wage growth, which refers to newly agreed wages, reached 5.0 percent in December 2022, up from 1.0 percent one year earlier. As some collective agreements are signed on a multi-year basis, the average wage remained contained growing by 3.7 percent year-on-year. In the case of the minimum wage, the increase by 10.3 percent in early 2023 will help to support purchasing capacity of low-wage employees and benefit claimants, partially offsetting the effects of high and persistent inflation on the most vulnerable groups, while preserving a basic demand.

25. The extend to which higher wages translate into higher inflation depends on profit margins. In a context of deteriorating macroeconomic outlook and increasing input costs (intermediate consumption and wages), the capacity of producers to absorb the shock will depend on their flexibility to adjust profits, or to pass-through higher costs into final consumer prices. The unprecedented acceleration of energy prices, combined with the post-pandemic shock, has raised concerns over the economy's capacity to increase wages (supporting purchasing capacity) without compromising corporates' profits. In this context, the following section reviews the performance of income distribution between capital (profits) and labor (wages) in past episodes, bringing some empirical evidence on the flexibility (or not) of the Dutch economy.

D. Profits at Risk? Breaking Down the GDP Deflator

26. Together with wages, profits are a key determinant of domestic price pressures. As previously discussed, inflation is driven by both domestic and external factors (see section B). On the domestic front, final consumer prices are to a large extent influenced by producer prices, inflation expectations and the interaction of wages and corporate profits. On a broad basis, domestic prices could be understood as the evolution of profits charged by corporates over the costs they face. From a macroeconomic perspective, the National Accounts framework provides for the decomposition of the GDP deflator into its main components, adding complementary information on the different drivers of final prices.

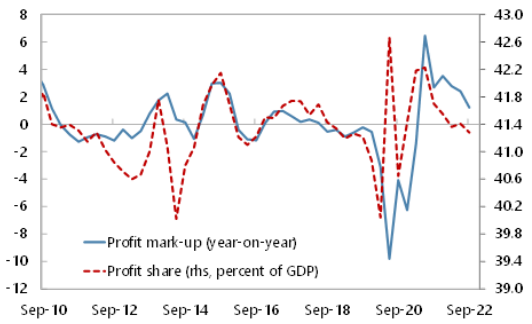
27. From the demand perspective, the GDP deflator growth in 2022 was mostly driven by private consumption prices and moderated by the external sector. Since energy prices started to accelerate in 2021Q2, purchasing prices in the economy accumulated an increase of 6.8 percent until 2022Q3, led by the strong increase in final consumer prices by 9 percent resulting from the pass-through from wholesale to retail energy prices, and the post-pandemic



recovery.[9] The slowdown of private consumption over 2022 helped to moderate the impact of accelerating consumer prices on the GDP deflator, despite remaining historically high. By the same token, moderated investment growth in the second half of 2021 avoided a further contribution of increasing prices to the GDP deflator. However, the recovery of investment growth from 2022Q2 onwards coupled with the acceleration of capital investment prices, translating into an acceleration of the GDP deflator. The intensification of domestic demand was minored by the net impact from the external sector, as the strong performance of exports and the capacity of domestic producers to re-export imported inflation, reduced the impact of imported prices on the domestic economy. Still, as a net energy importer, increasing energy prices induced a deterioration in the terms-of-trade, eroding the income used to remunerate domestic factors of production. The rest of this section will focus on the distribution of domestic income between labor and capital in the Dutch economy.

28. Domestic prices can be also interpreted as the combination of the remuneration of capital (profits) and labor (wages). There are several measures to quantify profits in national accounts terms. One is the *profit share*, which is the ratio of the gross operating surplus (or the gross value added) to GDP. This measure is of interest for macroeconomic analysis since movements in the profit share are primarily determined by the relative dynamics of the gross operating surplus and labor costs. The second measure is the *profit mark-up* which, at a macro level, can be proxied by the difference between gross value added and remuneration of employees. While both measures, the *profit mark-up* and the *profit share*, constitute a good proxy of corporate profits, methodological discrepancies among the two indicators bring relevant analytical information. Unlike the gross operating surplus, the gross value added excludes intermediate consumption (such as energy and other input costs), becoming a key reference in the current episode driven by the hike in energy costs. However, the profit share reflects the interaction of corporate's income with other sectors, a relevant measure when analyzing the interaction between profits and labor costs. The latter helps to explain the different performance of both indicators since the pandemic, with the public sector playing a key role in the profit share performance (to be shown later). However, going forward, as the effect of the pandemic income support is fully phased out, energy prices remain high and the economic slowdown materializes, the profit mark-up may deteriorate further driven by both declining value added, with accelerating input costs and raising wages.

Corporate Profits Indicators
(Percent)



Sources: Haver Analytics, Eurostat, and IMF calculations

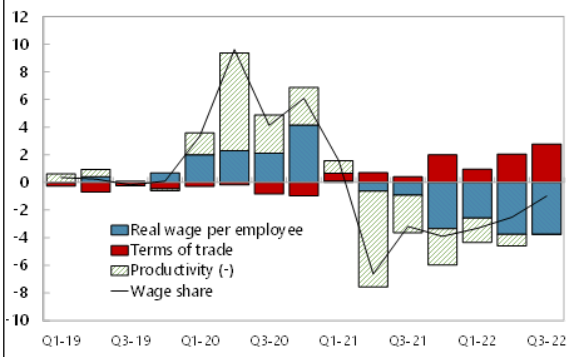
29. Increasing inflation and the strong economic performance have lowered the wage share since early 2021. Complementary to profits performance, a key reference for household's

[9] The final contribution of each component is determined in nominal terms, capturing the performance of prices and quantities purchased in the quarter.

income is the wage share, measured as the representativeness of wages over total income.[10] Based on the National Accounts, the wage share can result from the combination of real consumer wages (measured by nominal wage per employed person divided by the private consumption deflator), labor productivity and terms of trade performance (proxied by the GDP deflator-to-private consumption deflator ratio).[11] Understanding these relationships may help design economic policy when an unprecedented shock takes place, benefiting economic policy outcomes. In the absence of a strong economic shock, the wage share is inversely related to the profit share, meaning that a decreasing wage share takes place on the back of raising profits. According to the proposed decomposition, the wage share can be lower due to decreasing real wages, increasing labor productivity and/or a relevant terms of trade shock. Since consumer prices started to accelerate in mid-2021, the Dutch wage share has maintained a declining path, largely driven by the loss of labor income purchasing capacity (text chart).

Wage Share

(Percent year on year, contributions in pp)



Sources: CBS, Haver Analytics, and IMF calculations

30. The dynamics between profits and wages can be also analyzed from the GDP income approach. The GDP composition from the income perspective includes the gross operating surplus, which is a measure for corporate profits, compensation of employees and the remuneration of the public sector, measured as indirect taxes net of subsidies. This approach allows to understand the price/cost per unit of output as the result of the remuneration to corporates, workers, and the public sector. With taxes and subsidies already set, and wage growth mostly determined in collective bargaining agreements, profits are the most flexible component when a sudden sock takes place. The extent to which corporates pass-through an increase in other costs to domestic prices depend on their willingness -or capacity- to absorb the shock on the back of their own profits.

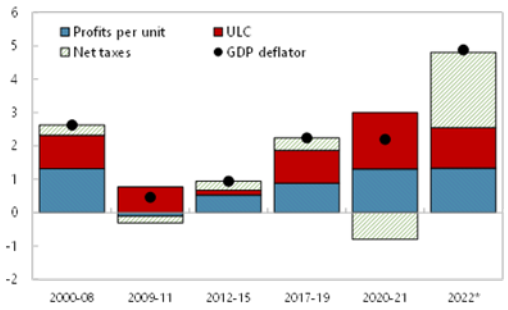
31. Labor productivity is also a key determinant of the impact of increasing wages into labor costs. Intuitively, wages are the key reference to analyze labor costs, and their impact on corporate profits. However, the extent to which wage growth affects labor costs depends also on labor productivity, measured as units produced per worker. Unit labor costs can be then further broken down into wages and labor productivity. While wage performance will positively affect unit labor costs (ULC), labor productivity growth will be inversely related to ULC, helping to offset wage performance on corporates' costs. This means that a relevant pick-up in wages could be offset by a similar increase in productivity, reducing the final impact of ULC on prices.

[10] Calculated as nominal compensation of employees over nominal GDP.

[11] $Wage\ share = \left(\frac{Wage\ per\ employee}{Priv.C\ Deflator}\right) * \left(\frac{Employment}{Real\ GDP}\right) * \left(\frac{Priv.C\ Deflator}{GDP\ Deflator}\right) = Real\ wage\ per\ employee * \frac{1}{Productivity} * \frac{1}{ToT}$

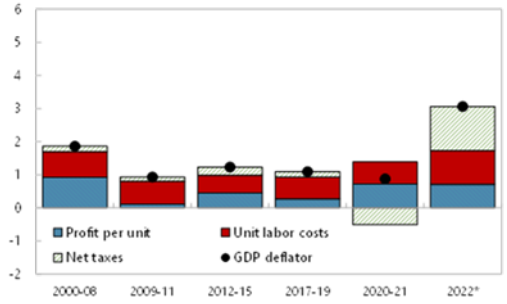
Figure 8. Netherlands vs Euro Area GDP and ULC Composition

GDP Deflator Composition in the Netherlands
(Percent year-on-year and contributions in percentage points)



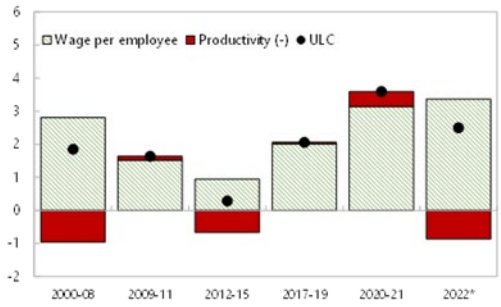
Sources: CBS, Haver Analytics, and IMF calculations

GDP Deflator Composition in the Euro Area
(Percent year-on-year and contributions in percentage points)



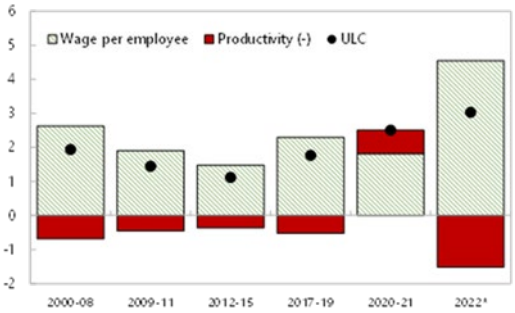
Sources: Haver Analytics, Eurostat, and IMF calculations

ULC Composition in the Netherlands
(Percent year-on-year and contributions in percentage points)



Sources: Haver Analytics, Eurostat, and IMF calculations

ULC Composition in the Euro Area
(Percent year-on-year and contributions in percentage points)



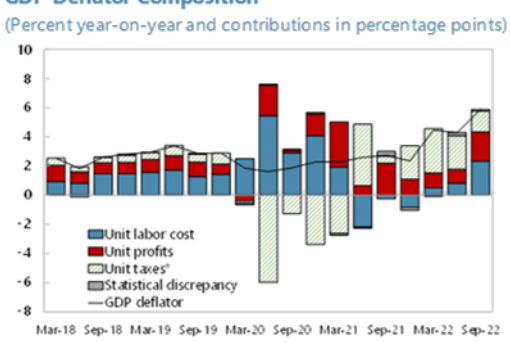
Sources: Haver Analytics, Eurostat, and IMF calculations

Note: Information until 2022Q3

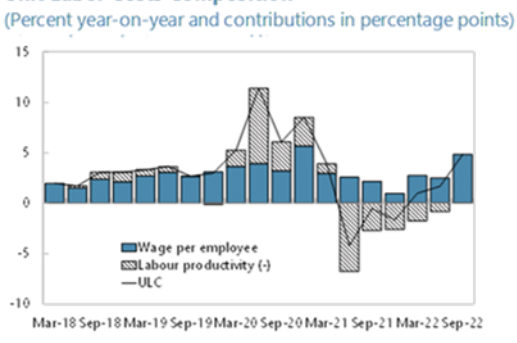
32. From a historical perspective, profits have been more stable in the Netherlands than in the Euro Area, providing some buffer against short-term cyclical fluctuations in ULC (Figure 5). Growth of domestic prices in the Netherlands has been more intense and volatile than in the EA over the last 20 years. From an income perspective, this performance has been driven by the larger flexibility shown by both corporate profits and wages to changes in the economic cycle. Domestic prices in the Netherlands grow stronger than the EA average during the upswings, while moderate faster during the downturns. Moreover, the composition of final prices, measured from the income approach, reveals the key role played by the profit and wage flexibility on the capacity of domestic prices to adapt to changes in economic growth. For example, the sudden impact of 2008 global financial crisis on demand was completely absorbed by corporate profits, avoiding the pass-through of increasing wages and the productivity loss to final prices. However, Dutch corporate profits recovered faster and stronger than in the EA during the years after the sovereign debt crisis in 2011–12, without adding inflationary pressures, supported by more moderate wage growth and stronger productivity gains than the EA. From 2017 until 2020, the strength of the economic performance of the Netherlands translated into a more intense recovery of wages and corporate profits, increasing Dutch domestic prices in times of strong economic growth.

33. The role of government support has markedly shaped domestic prices since 2020 while preserving wage and corporate profits' growth (Figures 5 & 6). The unprecedented support from the public sector during the pandemic in 2020–21 was notably channeled through subsidies to corporates, reflected in the strong negative contribution of public sector income to overall domestic costs.[12] This support allowed corporates to partially pass-through higher ULC to final consumers, while preserving their profits during the pandemic without increasing final prices. This effect was more visible in the Netherlands than in the EA, driven by a larger public support, and due to a stronger wage growth. By the same token, public sector income per unit continued playing a relevant role in domestic inflation. The end of the remaining pandemic-income support has played a key role in 2022, driven by the increase of indirect taxes and the end of the remaining pandemic-income support (that is to say, lower subsidies).

Figure 9. Quarterly GDP Deflator and ULC Composition in the Netherlands



Sources: CBS, Haver Analytics, and IMF calculations



Sources: CBS, Haver Analytics, Eurostat and IMF calculations

34. As the effects from the pandemic vanish, the remuneration of corporates and labor will determine domestic prices. The acceleration of inflation in mid-2021 coincided with the gradual re-opening of European economies, masking the impact of raising prices on economic activity. The unprecedented fiscal support during the pandemic also affected the income distribution between wages and profits, as well as the final impact of wage performance on labor costs. The latest information related to 2022Q3 confirms the increasing weight of wages on labor costs, and the lack of productivity growth in a context of economic slowdown. However, higher labor costs did not impeed corporate profits also to accelerate, translating into a new acceleration of the GDP deflator growth.

35. Based on the healthy interaction between profits and wages in the past, risks for a wage-price spiral appear to be limited at an aggregate level. The Dutch economy faces the energy and cost-of-living crises with a positive output gap and a tight labor market, which could further fuel wage bargaining. However, the latest statistics confirm that wage growth remains well below inflation, despite the tight labor market, and the wage shares accumulates five-quarter in a

[12] Public sector income is defined as indirect taxes net of subsidies.

row on a decreasing trend. This, together with past experiences, reduces the likelihood for wage increases that would compromise corporate profits or result in a price spiral in the economy.

36. With different sectors of economy affected differently by the high energy prices, ability to adapt to the new environment and improve productivity is key. At an aggregate level, the remuneration of capital and labor show a typical interaction when determining final prices. However, energy prices, particularly in post-pandemic, may affect different sectors of the economy differently, compromising the viability of some Dutch firms or sectors. The ability of these vulnerable sectors to adapt to the new energy environment and to improve productivity is key to preserving employment through competitive wages and their own profits.

E. Conclusions

37. A combination of domestic and external factors has led to high inflation, with price pressures becoming broad-based, increasing inflation persistence, and adding risks for domestic demand. In 2022, the Dutch headline inflation reached unprecedented levels since the record began, largely driven by high energy price growth, with price pressures becoming increasingly more broad-based. Despite some decline in the last few months of 2022, inflation remained high by end-2022 compared to the country's historical performance, and also to the growth rates recorded by other EA peers. Several factors help explain the higher energy price growth in the Netherlands. These include: a greater share of gas in the Dutch energy mix, liberalized energy markets, and the current method of energy inflation calculation, among others. Different specifications of the Phillips curve analysis suggests that past and future inflation expectations are the main determinants of consumer prices, while the contribution from domestic and external factors is statistically significant but less dominant in determining inflation dynamics. During 2022, price pressures have become more broad-based, with core inflation continuing to pick up, as higher energy prices are feeding though into core items. Empirical evidence suggests it takes about 6–8 months for energy prices to pass-through to core items, increasing the likelihood of inflation persistence and adding downside risks for domestic demand.

38. Despite the recent acceleration in wages, risks for a wage-price spiral remain low. Contractual wages started to rise in 2022, on the back of a strong post-pandemic recovery and a tight labor market. Still, the pass-through from inflation into wages remained moderate and real wage growth continued falling. With no inflation-linked clauses in the Dutch regulatory framework, the flexibility to negotiate among social partners allows for a healthy economic interaction between wages and corporate profits. While the Dutch economy faces the energy and cost-of-living crises with a positive output gap and a tight labor market, the risks for a wage-price spiral appears to be limited at an aggregate level based on the historical performance and the Dutch regulatory setting. However, there is a large heterogeneity at a micro-level on the capacity of corporates to absorb higher input costs in a context of economic slowdown. In addition, as risks of high inflation persistence increase, the effects of the loss of purchasing power for households will be also heterogeneous among different income quintiles, with unclear effects on demand and economic activity overall. The capacity of the Dutch economy to adapt to the new energy environment and to improve productivity is key to preserving employment, growth, and profits.

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Annex I. Phillips Curve Specification

This annex provides information on data sources, country coverage, and methodology used in the Phillips curve estimation and summarizes main results.

Data Sources and Panel-Data Analysis Country Coverage

1. The Phillips curve analysis is conducted for 17 Europe Area economies, including Austria, Belgium, Cyprus, Estonia, Finland, France, Germany, Greece, Ireland, Italy, Latvia, Lithuania, Netherlands, Portugal, Slovak Republic, Slovenia, and Spain.[1]

2. Annex I Table 1 summarizes the data sources for the key variables. The analysis was conducted in quarterly frequency, covering the period 2000Q1–2022Q2. Data availability varies by year and by country.

Annex I. Table 1. The Netherlands: Data Sources

Variable	Source	Frequency
Core/headline consumer price index	Haver Analytics	Quarterly
Energy and food weights in HICP	Haver Analytics	Quarterly
Three-year-ahead inflation expectations	Consensus Economics	Quarterly
World food price index	IMF, International Finance Statistics	Quarterly
World energy price index	IMF, International Finance Statistics	Quarterly
External price pressure	IMF staff calculations	Quarterly
Producer price index	Haver Analytics	Quarterly
Nominal effective exchange rate	IMF, INS	Quarterly
GDP deflator	Haver Analytics	Quarterly
Bilateral imports	IMF, Direction of Trade Database	Quarterly
Real GDP	Haver Analytics	Quarterly
Nominal GDP	Haver Analytics	Quarterly
Unemployment rate	Haver Analytics	Quarterly
Participation rate	Haver Analytics	Quarterly
Share of part-time employment	Haver Analytics	Quarterly
Share of temporary contracts	Haver Analytics	Quarterly
Share of self-employed	Haver Analytics	Quarterly
Hours worked per employee	European Commission	Annual

Sources: IMF staff compilation.

[1] Luxembourg and Malta were excluded from the sample of Euro Area countries due to limited consistent data on inflation expectations.

Phillips Curve Specification

3. A Phillips curve was estimated to assess key drivers of inflation, with the baseline specification as the standard New Keynesian Phillips curve augmented with variables that proxy for global price developments.[2]

$\pi_{i,t} = \beta_1\pi_{i,t-1} + \beta_2\pi^e_{i,t} + \beta_3 y_{i,t} + \beta_4 Energy_{i,t} + \sum_{k=0}^{4}\beta^F_k Food_{i,t-j} + \beta_5 extP_{i,t-1} + FE_i + \varepsilon_{i,t}$, where

- $\pi_{i,t}$ is the quarter-over-quarter seasonally adjusted annualized HICP headline/core inflation in country i in quarter t.

- $\pi^e_{i,t}$ represents the three-year-ahead inflation expectations, defined as the three-year-ahead expected inflation, taken from the Consensus Economics, which report the average inflation forecast across professional forecasters.

- $y_{i,t}$ is the measure of domestic economic slack, which is proxied by three variables:

    - unemployment gap, defined as the deviation from the Hodrick-Prescott (HP) filtered unemployment rate;
    - output gap, defined as the deviation from the HP filtered real GDP; and
    - domestic slack variable, measured as a principal component of seven variables: output gap, participation rate, unemployment gap, hours worked gap, self-employment gap, and the deviation of the share of part-time employment and temporary employment from their corresponding long-run averages.[3]

- $Energy_{i,t}$ and $Food_{i,t-j}$ are quarter-over-quarter annualized growth rates of the world food and energy price indices, weighted by the shares of these items in the domestic HICP baskets.

- $\beta_5 extP_{i,t-1}$ denotes the lagged external price pressures, defined as the quarter-on-quarter annualized percent change in the import-weighted producer price index (PPI) of countries j from which country i imports, converted to local currency using the trade-weighted nominal effective exchange rate, and relative to the percent change in the GDP deflator (Bems et al., 2018).

- FE_i are the country fixed effects.

- $\varepsilon_{i,t}$ is the error term.

4. The baseline specification includes contemporaneous energy prices, and contemporaneous food prices with four lags to account for the longer speed of pass-through of food than energy

[2] The model follows the methodology used in Chapter 2 "Inflation in Europe: Assessment, Risks, and Policy Implications" of the IMF's Regional Economic Outlook (October, 2022).

[3] The first principal component explains about 30 percent of the total variance.

prices to domestic inflation. The benchmark specification imposes a constraint on the sum of coefficients on past inflation and inflation expectation to be equal to one. This is done to introduce forward- and backward-looking components of inflation consistent with the assumption of inflation equal to expected inflation over the long run. This assumption is relaxed in alternative specifications (OLS, and median regressions).

Phillips Curve Estimation Results

5. The Phillips curve is first estimated in a panel setting for the 17 euro area economies, with the estimation results reported in Annex I Table 1. Results of the alternative specification with added time fixed effects are reported in Annex I Table 2. The analysis is then repeated with individually for each country with at least 30 quarters of data available. The results are qualitatively comparable to IMF (2022).

6. Overall, explanatory variables account for about 66 (65) percent of the variation of headline (core) OLS regressions with country fixed effects.[4] In median regressions, the estimated pseudo R-squared declines to 0.38 (0.32) for headline (core) regressions.[5]

7. The findings suggest that inflation rates are backward-looking, given the statical significance of the coefficient on the lag of headline/core inflation. The price-setting also appears to be to some extent forward-looking, as the estimated coefficients on the three-year-ahead inflation expectations are statistically significant in most regression specifications and range between 0.4 and 0.6 for headline, and 0.2 and 0.4 for core inflation regressions. Inflation persistence is lower and coefficients on inflation expectations are higher when time fixed effects are included (Annex I Table 2).

8. Domestic cyclical conditions, as proxied by the output gap, unemployment gap, and the measure of economic slack, are all statistically significant in determining headline/core inflation. The size of the impact, however, is relatively small: a one percentage point increase in the output gap is associated with an increase in the headline (core) inflation rate by about 1.1 (0.9) percentage points; one percentage point increase in the unemployment gap is associated with 0.2 percentage point decline in headline/core inflation; and one percentage point increase in the measure of economic slack is associated with about 0.2 percentage point increase in inflation under the baseline specification.

9. With respect to the external variables, the external price pressure measure is not statistically significant in most regression specifications. The variable is only significant in core regressions with country and time fixed effects. Commodity prices, however, are an important determinant of inflation, given the positive and statistically significant sign on the energy price and food price coefficients.

[4] R-squared increases marginally upon inclusion of time fixed effects to 0.73 and 0.71 for headline and core OLS regressions, respectively.

[5] Pseudo R-squared increases marginally to 0.45 and 0.38 for headline and core median regressions when time-fixed effects are included.

Annex I. Table 2. The Netherlands: Phillips Curve Panel Estimation with Country Fixed Effects

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
		Full sample									
		Headline inflation					Core inflation				
	Expected sign	Constrained regressions			OLS	Median regression	Constrained regressions			OLS	Median regression
Lag of inflation	(+)	0.650***	0.649***	0.636***	0.651***	0.553***	0.676***	0.629***	0.575***	0.683***	0.658***
		(0.0456)	(0.0613)	(0.0745)	(0.0271)	(0.0237)	(0.0495)	(0.0534)	(0.0609)	(0.0309)	(0.0346)
Inflation expectations: 3 years ahead	(+)	0.350***	0.351***	0.364***	0.151	0.603***	0.324***	0.371***	0.425***	0.0886	0.183
		(0.0456)	(0.0613)	(0.0745)	(0.186)	(0.120)	(0.0495)	(0.0534)	(0.0609)	(0.170)	(0.123)
Unemployment gap	(–)	-0.163**			-0.176***	-0.152***	-0.166***			-0.179***	-0.154***
		(0.0738)			(0.0560)	(0.0399)	(0.0632)			(0.0530)	(0.0400)
Output gap	(+)		0.111***					0.0879***			
			(0.0319)					(0.0245)			
Measure of economic slack				0.190***					0.183***		
				(0.0665)					(0.0483)		
Food price $_{t}$	(+)	0.0665***	0.0632***	0.0578**	0.0684***	0.0425***	0.0107	0.0244	0.0358**	0.0128	0.0170
		(0.0223)	(0.0221)	(0.0228)	(0.0120)	(0.0133)	(0.0173)	(0.0170)	(0.0174)	(0.0162)	(0.0133)
Food price $_{t-1}$	(+)	0.0580*	0.0538*	0.0535*	0.0586	0.0145	0.0734***	0.0755***	0.0723***	0.0741***	0.0546***
		(0.0338)	(0.0319)	(0.0317)	(0.0397)	(0.0124)	(0.0182)	(0.0182)	(0.0178)	(0.0159)	(0.0125)
Food price $_{t-2}$	(+)	0.0445*	0.0395	0.0335	0.0463*	0.0572***	0.0396**	0.0314*	0.0251	0.0413***	0.0343***
		(0.0257)	(0.0256)	(0.0259)	(0.0245)	(0.0107)	(0.0178)	(0.0177)	(0.0174)	(0.0154)	(0.0117)
Food price $_{t-3}$	(+)	0.00122	-0.00470	-0.000168	0.00219	0.0140	0.0217	0.0262*	0.0341**	0.0228*	0.00985
		(0.0205)	(0.0214)	(0.0227)	(0.0124)	(0.0111)	(0.0142)	(0.0143)	(0.0146)	(0.0125)	(0.0101)
Food price $_{t-4}$	(+)	0.124***	0.122***	0.116***	0.125***	0.0521***	0.0766***	0.0820***	0.0779***	0.0780***	0.0596***
		(0.0251)	(0.0235)	(0.0232)	(0.0210)	(0.0108)	(0.0150)	(0.0150)	(0.0150)	(0.0120)	(0.0110)
Energy price	(+)	0.140***	0.136***	0.148***	0.137***	0.137***	0.0291***	0.0194**	0.0203**	0.0263***	0.0245***
		(0.0134)	(0.0134)	(0.0138)	(0.0102)	(0.00702)	(0.00947)	(0.00952)	(0.00971)	(0.00735)	(0.00788)
External price pressure $_{t-1}$	(+)	-0.000607	-0.00141	-0.000876	-0.000717	-0.00216	0.000513	-0.00160	-0.00191	0.000393	-0.00106
		(0.00314)	(0.00300)	(0.00304)	(0.00358)	(0.00148)	(0.00197)	(0.00189)	(0.00197)	(0.00148)	(0.00150)
Observations		1,218	1,208	1,183	1,218	1,218	1,218	1,208	1,183	1,218	1,218
Number of countries		17	17	17	17	17	17	17	17	17	17

Source: IMF staff estimates and calculations.

Note: Robust standard errors reported in parentheses. All regressions include country fixed effects. *** p<0.01, ** p<0.05, * p<0.1

Annex I Table 3. The Netherlands: Phillips Curve Panel Estimation with Country and Time Fixed Effects

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
		Full sample									
		Headline inflation					Core inflation				
	Expected sign	Constrained regressions			OLS	Median regression	Constrained regressions			OLS	Median regression
Lag of inflation	(+)	0.373***	0.398***	0.409***	0.371***	0.349***	0.474***	0.486***	0.463***	0.474***	0.447***
		(0.0444)	(0.0519)	(0.0584)	(0.0478)	(0.0326)	(0.0509)	(0.0519)	(0.0561)	(0.0497)	(0.0252)
Inflation expectations: 3 years ahead	(+)	0.627***	0.602***	0.591***	0.800***	0.832***	0.526***	0.514***	0.537***	0.550***	0.507***
		(0.0444)	(0.0519)	(0.0584)	(0.167)	(0.141)	(0.0509)	(0.0519)	(0.0561)	(0.185)	(0.108)
Unemployment gap	(–)	-0.360***			-0.349***	-0.294***	-0.289***			-0.288***	-0.196***
		(0.0733)			(0.0733)	(0.0454)	(0.0634)			(0.0669)	(0.0357)
Output gap	(+)		0.121***					0.0896***			
			(0.0358)					(0.0307)			
Measure of economic slack				0.278***					0.231***		
				(0.0765)					(0.0641)		
Food price $_{t}$	(+)	0.0739***	0.0542**	0.0194	0.0739***	0.0785***	0.00873	0.0104	0.00935	0.00874	0.00899
		(0.0234)	(0.0234)	(0.0262)	(0.0138)	(0.0170)	(0.0176)	(0.0172)	(0.0187)	(0.0187)	(0.0118)
Food price $_{t-1}$	(+)	0.101**	0.0904**	0.0701**	0.101**	0.0469***	0.0692***	0.0708***	0.0641***	0.0690***	0.0512***
		(0.0403)	(0.0372)	(0.0341)	(0.0409)	(0.0163)	(0.0200)	(0.0196)	(0.0194)	(0.0180)	(0.0120)
Food price $_{t-2}$	(+)	0.128***	0.125***	0.122***	0.128***	0.0998***	0.0606***	0.0568**	0.0555**	0.0606**	0.0294**
		(0.0276)	(0.0283)	(0.0279)	(0.0325)	(0.0173)	(0.0218)	(0.0224)	(0.0220)	(0.0259)	(0.0131)
Food price $_{t-3}$	(+)	0.0790***	0.0632**	0.0433*	0.0779***	0.0537***	0.0498***	0.0488***	0.0474**	0.0496***	0.0429***
		(0.0253)	(0.0251)	(0.0252)	(0.0173)	(0.0163)	(0.0184)	(0.0185)	(0.0189)	(0.0172)	(0.0125)
Food price $_{t-4}$	(+)	0.124***	0.118***	0.0953***	0.123***	0.0541***	0.0631***	0.0681***	0.0604***	0.0630***	0.0323***
		(0.0277)	(0.0255)	(0.0232)	(0.0275)	(0.0147)	(0.0172)	(0.0171)	(0.0173)	(0.0175)	(0.0107)
Energy price	(+)	0.140***	0.132***	0.153***	0.141***	0.136***	0.0300***	0.0195*	0.0247**	0.0301***	0.0206***
		(0.0144)	(0.0146)	(0.0148)	(0.0109)	(0.00985)	(0.0104)	(0.0108)	(0.0108)	(0.00821)	(0.00596)
External price pressure $_{t-1}$	(+)	-0.00519	-0.00585*	-0.00422	-0.00522	-0.00192	-0.00408**	-0.00513***	-0.00439**	-0.00409***	-0.00277**
		(0.00318)	(0.00311)	(0.00305)	(0.00365)	(0.00159)	(0.00182)	(0.00187)	(0.00193)	(0.00146)	(0.00120)
Observations		1,218	1,208	1,183	1,218	1,218	1,218	1,208	1,183	1,218	1,218
Number of countries		17	17	17	17	17	17	17	17	17	17

Source: IMF staff estimates and calculations.

Note: Robust standard errors reported in parentheses. All regressions include country and time fixed effects. *** p<0.01, ** p<0.05, * p<0.1

Contribution to Inflation Dynamics

10. Country-specific coefficients are used to calculate contributions to inflation dynamics from each regression in every quarter using dynamic simulations to account for the persistence of inflation. Specifically, $C_{i,t}^{x}$, which is the contribution of each explanatory variable x to inflation dynamics in country i at time t is calculated using the following formula:

$$C_{i,t}^{x} = \widehat{\beta_t^x} x_{i,t} + \widehat{\beta_1} C_{i,t-1}^{x},$$

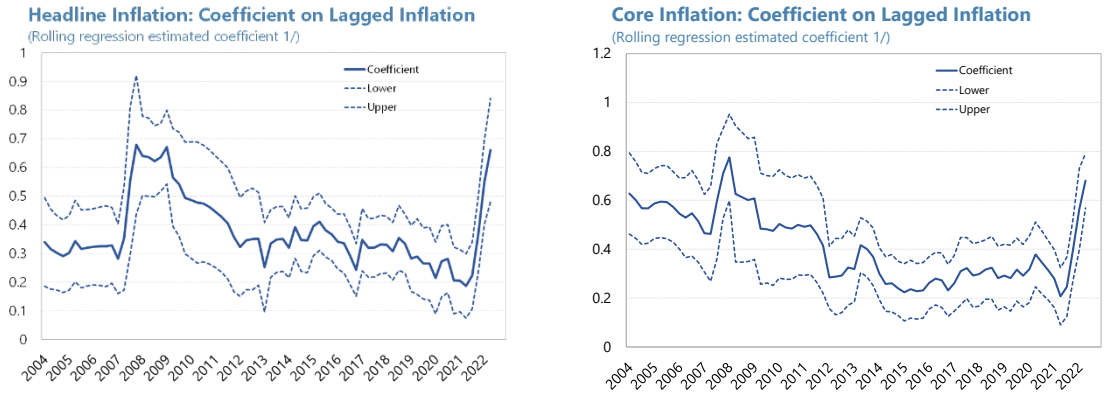
Where $\widehat{\beta_t^x}$ is the corresponding coefficient on variable x obtained from country-specific Phillips curve regressions; $\widehat{\beta_1}$ is the coefficient on lagged inflation.

Stability of the Phillips Curve Estimates

11. To examine possible structural shifts and change in estimated coefficients over time, the panel-data Phillips curve is estimated on a rolling basis, using the panel data for 17 economies over 16 quarters. Estimated coefficients with their corresponding 90th percentile confidence intervals are included in Annex Figure 1.

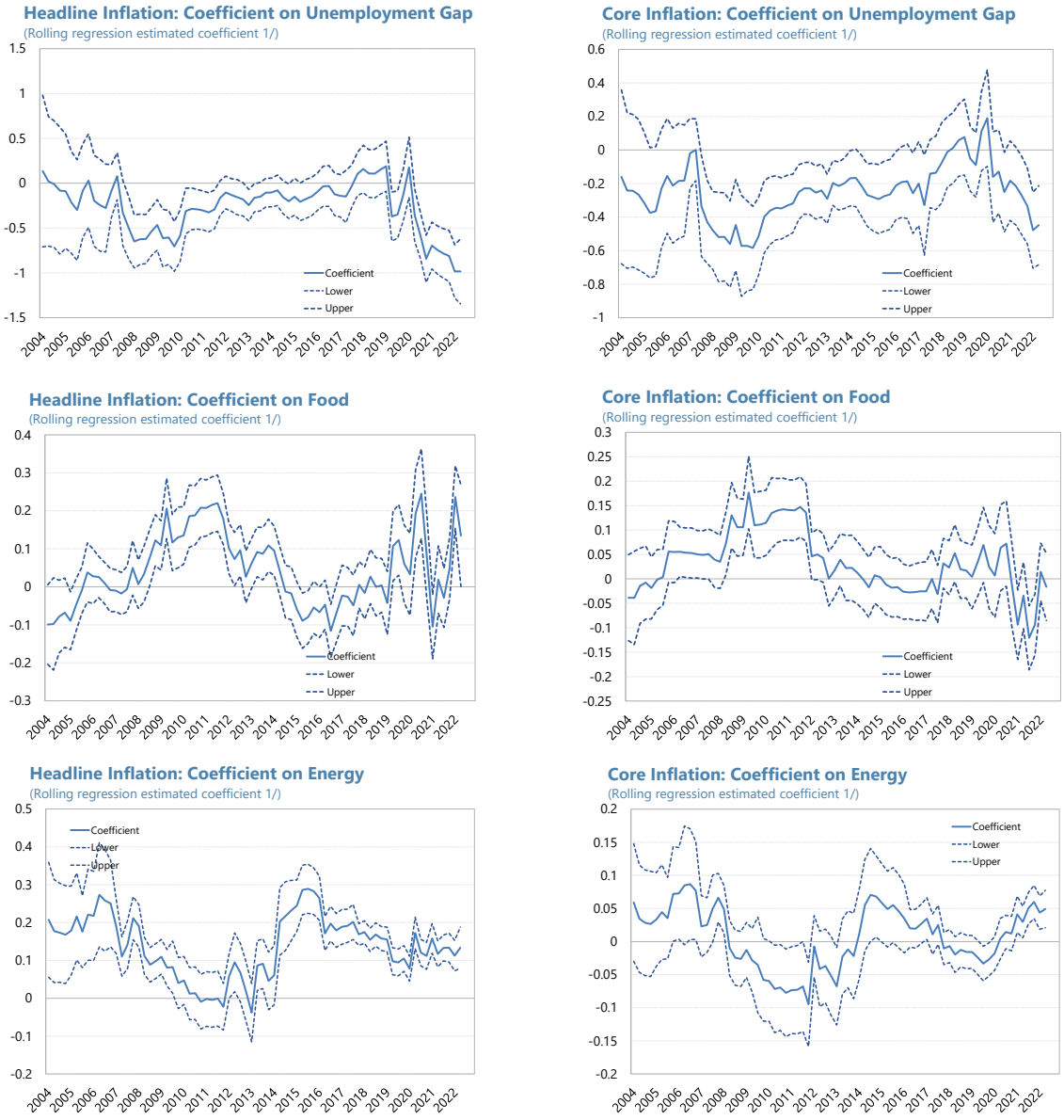
12. Estimates of the rolling regressions indicate changes in the Phillips curve coefficients in recent periods. First, the estimated coefficient on the lagged headline (core) inflation has significantly increased in the last 3 rolling window periods, suggesting that inflation has become more backward-looking. The pass-through of the energy prices has increased substantially to core inflation. The coefficient on the unemployment gap suggests that the Phillips curve has become steeper over the last few years. Given few data points that underlie the change in estimated coefficients, it is premature to suggest any long-lasting changes in the structural relationships. However, greater pass-through of commodity prices into core inflation increases susceptibility to negative supply shocks, while the larger effect of the past inflation on the current inflation suggests potential difficulties in reducing inflation going forward.

Annex I. Figure 1. Phillips Curve Rolling Regression Results



1/ Solid lines indicate rolling regression coefficients of the headline (left) or core (right) regressions. Dashed lines show their 10th –90th percentile confidence intervals. Estimates are based on the baseline constrained regressions with country fixed effects and cover a rolling window of 16 quarters ending in the quarter indicated on the x axis

Annex I. Figure 1. Phillips Curve Rolling Regression Results (Concluded)



Sources: IMF staff estimates and calculations.

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1/ Solid lines indicate rolling regression coefficients of the headline (left) or core (right) regressions. Dashed lines show their 10th –90th percentile confidence intervals. Estimates are based on the baseline constrained regressions with country fixed effects and cover a rolling window of 16 quarters ending in the quarter indicated on the x axis.