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# Climate change and inflation in the euro area<sup>1</sup>

*The European Central Bank (ECB) has committed to taking the impact of climate change into consideration in its monetary policy framework. Both climate change and its mitigation can impact relative prices and inflation. Headline inflation increased considerably in recent months, mainly reflecting the surge in energy prices. To date, climate policies have played only a limited role for inflation dynamics. Looking ahead, the energy transition may add inflationary pressures, but there is uncertainty about the magnitude and timing. In the longer run, these pressures could potentially ease or even reverse. To live up to its commitments, the ECB has been working on capturing the impact of climate change policies in the Eurosystem/ECB macroeconomic projections and, accordingly, in the medium-term inflation outlook.*

JEL codes: E31, Q4, Q54

Keywords: climate change, climate change policies, energy transition, energy prices, inflation

## 1 Introduction

*Addressing climate change is a global challenge and a policy priority for the European Union.* While governments and parliaments have the primary responsibility to act on climate change, the Governing Council of the European Central Bank (ECB) has committed, in its strategy review concluded last year, “to further incorporating climate considerations into its monetary policy framework” (ECB, 2021a). This is particularly important, as climate change and climate policies affect the outlook for price stability through their impact on macroeconomic indicators, financial stability, and the transmission of monetary policy (ECB, 2021b).

*Both climate change and its mitigation can impact relative prices and inflation (ECB, 2021c).* On the one hand, climate change shocks – especially if materializing in the form of simultaneous extreme events and compound risks – may prove increasingly challenging to respond to. On the other hand, the transition may add pressure on prices,

but there is uncertainty about the magnitude and the timing. In addition, these pressures could potentially ease or even reverse in the longer run, as the economy is expected to develop in line with the green transition.

## 2 Energy markets are already under pressure

*Pressures on energy commodity prices resulted from a rebound in demand after the pandemic, coupled with supply constraints and the impact of the Russian invasion in Ukraine.* Energy commodity prices have increased to levels far beyond their long-term averages and are expected to stay at elevated levels in the foreseeable future (chart 1, left-hand panel). In particular, European natural gas prices reached an all-time high, contributing in turn to record-high wholesale electricity prices (ECB, 2022a,b).

*Rising energy commodity prices had a large impact on consumer prices in the euro area, with strong contributions of energy inflation to headline inflation (chart 1,*

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The views expressed in this article do not necessarily reflect those of the ECB.

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right-hand panel). The current energy price shock is unprecedented in terms of magnitude and breadth in the euro area: While increases in crude oil prices had reached similar magnitudes in the past, consumers today face not only an oil price shock but also a considerable rise in gas and electricity prices, which has not been observed before in this dimension. Government compensatory measures eased some of the upward pressure on consumer prices, yet price levels continue to be elevated.

### 3 The role of climate change mitigation policies for inflation

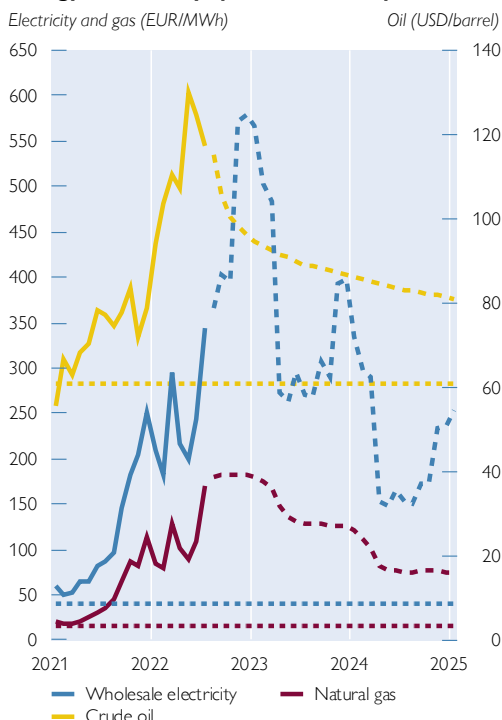
*The role of the energy transition and climate change mitigation policies, including car-*

*bon taxes, for inflation is subject to large uncertainties in terms of sign, size and timing. To consider potential effects and impact channels of the green transition on inflation, it is useful to distinguish between different periods. The recent past and near-term future are characterized by large global shocks including the pandemic recovery and impacts of the Russian invasion of Ukraine, which largely overshadow any potential impacts of climate policies. In the medium-term, price pressures might become largest as the transition picks up in speed, but with decreasing costs of sustainable alternatives it is possible that price pressures ease or even reverse in the medium to long run.*

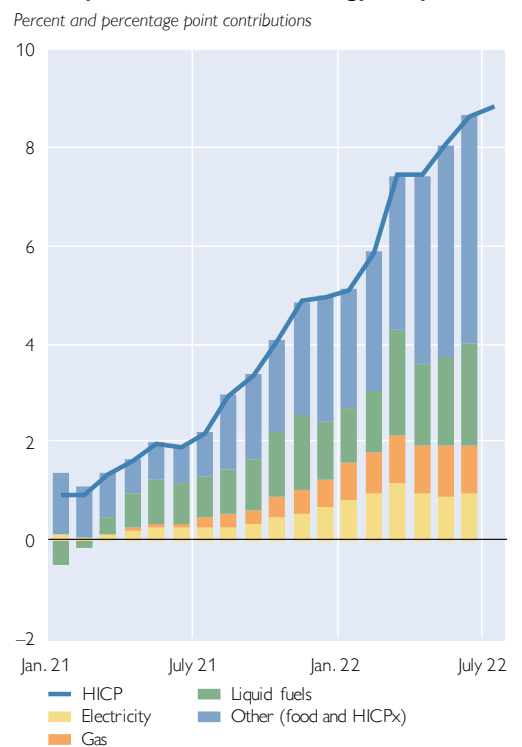
Chart 1

## Energy markets are already under pressure from the pandemic and the war in Ukraine

### Energy commodity spot and futures prices



### Developments in HICP and energy components



Sources: Refinitiv, Eurostat and ECB calculations.

Notes: Left-hand panel – futures price curves as of June 21, 2022. Future prices are dashed. Futures prices include for gas the TTF Dutch Gas Futures and for electricity a weighted average (weighted by net electricity generation) of prices in the five biggest euro area economies. Averages from 2014 to 2020 are added as dotted lines.

Right-hand panel – latest observation from July 2022 (flash).

HICP – harmonized index of consumer prices.

HICPX refers to HICP inflation excluding energy and food.

To date, climate policies have played only a very limited role for inflation. Though carbon prices under the EU emissions trading system (ETS) have increased strongly since the beginning of 2021 (chart 2, left-hand panel), their impact on inflation so far was limited. Overall, around 40% of emissions in the EU are subject to carbon prices under the EU ETS (chart 2, right-hand panel; European Commission, 2022), but more than two-thirds of those emissions are still covered by free allowances (ECB, 2021d). Electricity and heat production have so far been the main activities for which emissions had to be covered by allowances purchased on the market. However, the impact of carbon prices on wholesale electricity prices – and consequently also on consumer prices – has been largely overshadowed by the unprecedented increases in natural gas prices. Natural gas prices have been the main driver of wholesale electricity prices in the last months of 2021 and at the beginning of

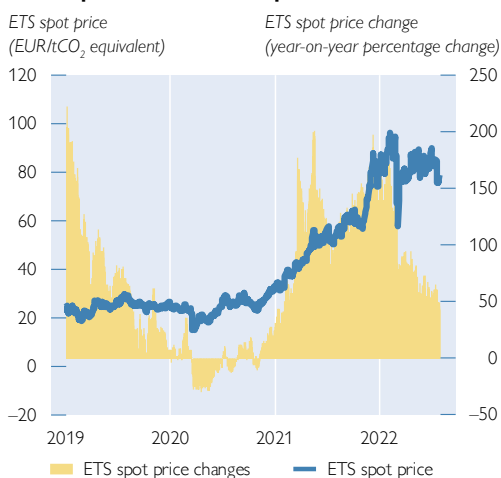
2022 (ECB, 2022a). Similarly, national carbon pricing schemes, covering up to 65% of individual countries' emissions not falling under the EU ETS, have contributed to, or are expected in the near term to contribute to, a limited extent to price developments in euro area countries (World Bank, 2022; Bundesbank, 2021; Oesterreichische Nationalbank, 2022).

Going forward, there is evidence that the transition may add to some upward pressures on inflation and to heightened price volatility. ECB staff performed a sensitivity analysis of euro area inflation to an increase in effective carbon taxes (chart 3, left-hand panel; ECB, 2022c). The results point to limited but non-negligible effects on inflation in the gradual adjustment scenario until 2024. The scenario assumes a gradual and linear increase in carbon taxes until 2030, consistent with a pathway to reach net zero emissions by 2050. The impacts would be amplified in the case of the front-loaded carbon pricing scenario,

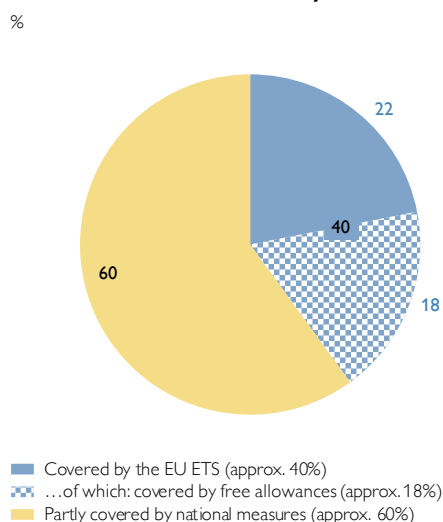
Chart 2

## To date climate policies have played only a very limited role for inflation

### Developments in EU ETS prices



### Total EU emissions covered by the EU ETS



Sources: Refinitiv, European Environment Agency, European Commission, ECB calculations.

Notes: Left-hand panel – latest observation on June 21, 2022;

Right-hand panel – the share of free allowances is based on 2021 data, obtained by the ratio of total free allowances and total emissions under the EU ETS. The share of total emissions covered by the EU ETS is taken from European Commission (2022). The illustration does not consider proposed EU policies under the “Fit for 55” package.

where the same increase in carbon prices already takes place by 2024, i.e. in a much shorter time horizon than currently assumed in EU policy proposals. Therefore, these results can be seen as upper bound estimates. Results also suggest that recycling the additional revenues would increase the inflationary impact of increasing effective carbon taxes but could mitigate negative effects on output. The results are subject to a number of important methodological caveats, which illustrates the uncertainty surrounding such estimates currently.

*Increased cost pressures during the green transition are also expected by a recent survey among large nonfinancial corporations* (chart 3, right-hand panel; ECB, 2022d). Among the 90 large nonfinancial companies surveyed, a large majority expects slightly or significantly increasing input costs during the transition and resulting pressures on selling

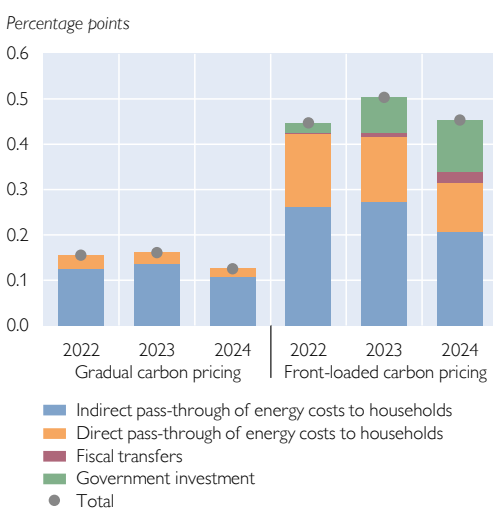
prices. However, after the transition only a small share of respondents expects cost and price pressures to remain significantly higher.

*While these survey results suggest that these pressures on prices are likely to ease in the longer run, it may well be possible that they even reverse as clean technology matures.* One important example are energy prices: Under policy measures proposed by the European Commission – notably the Fit for 55 package, but more recently also the RePowerEU proposal – cheaper renewable sources of energy are expected to increasingly contribute to meeting energy demand (chart 4, upper panel). It is likely that effects will materialize first for electricity prices, which could decline as electricity demand is increasingly met by cheaper renewable electricity toward the end of this decade. Even though costs increased recently, already today

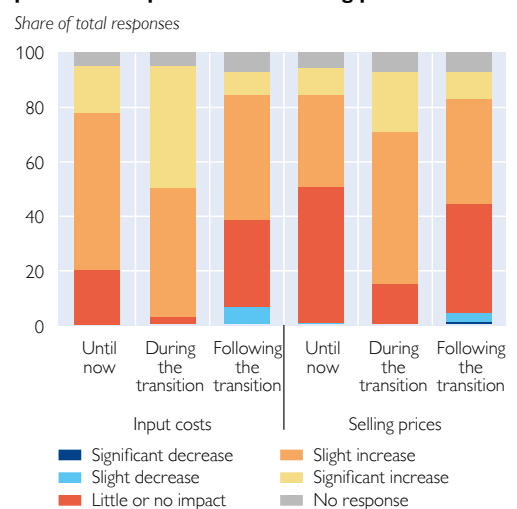
Chart 3

**Going forward, the transition may add to pressures on energy prices and inflation**

**Impact of an increase in effective carbon taxes on euro area inflation**



**Overall impact of climate change and climate policies on input costs and selling prices**



Sources: Left-hand panel – OECD and ECB calculations (ECB 2022c); Right-hand panel – ECB (2022d).

Notes: Left-hand panel – the simulations are based on the ECB’s New Multi-Country Model (NMCM). In the “frontloaded carbon pricing” scenario, the amount of transfers to households equals the revenues collected from taxes paid by consumers. The amount of government investment equals the revenues collected from the carbon taxes paid by companies. The simulations are conducted under exogenous monetary policy, without automatic fiscal stabilizers, and without additional trade spillovers.

Right-hand panel – 90 respondents in total. The respondents consist of large and mostly multinational companies engaged in a wide range of nonfinancial business activities. Firms were asked to compare to a hypothetical baseline without climate change.

onshore wind and solar photovoltaic ventures are offering long-term contracts that are below the wholesale price averages over the last few months (IEA, 2022; chart 4, right-hand panel). In addition to decreasing costs of solar and wind energy, the unit costs of batteries used in passenger electric vehicles have fallen, notably by around 85% between 2010 and 2019 (chart 4, lower panel; IPCC, 2022). Furthermore, it is likely that increased energy efficiency may dampen pressures on energy prices. However, fossil fuels are expected to play a role in the energy mix for some decades to come (chart 4, upper panel), as will consequently crude oil and natural gas prices for total energy prices.

#### 4 Conclusion

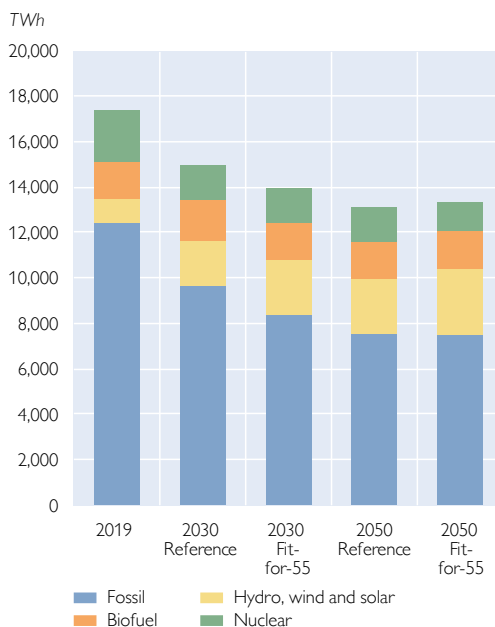
*There is a lot of uncertainty around the magnitude and timing of the impact of climate change and climate change mitigation on inflation.* Nevertheless, it is possible to lay out the possible channels through which the energy transition and carbon taxes could have an effect. Impacts depend on the way the transition progresses, i.e. on whether policy stringency and carbon prices are increased gradually and in a coordinated manner

(“orderly transition”; NGFS, 2021), or the transition is further delayed and then implemented in an abrupt and uncoordinated fashion (“disorderly transition”). It also depends on the pace of technological

Chart 4

### A successful transition could lead to downward pressures on prices in the long run

#### Energy consumption and mix in the EU – scenarios



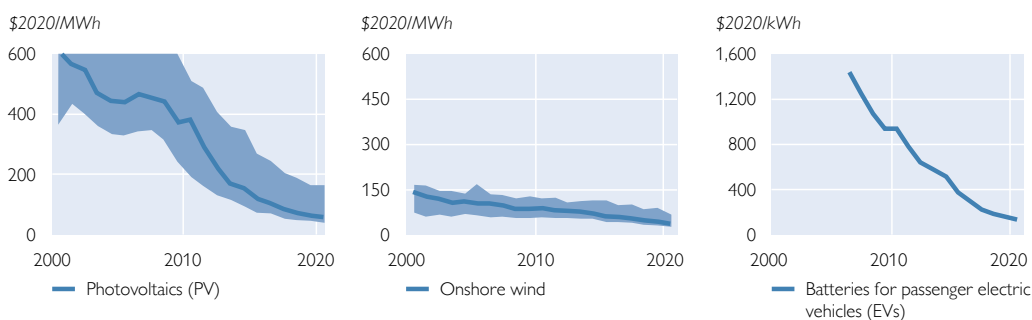
Sources: ECB staff calculations based on European Commission.

Notes: Scenarios include a reference with current policies, and the “Fit for 55 MIX” scenario. “Fossil” includes gas, oil, coal and waste.

Chart 4 continued

### A successful transition could lead to downward pressures on prices in the long run

#### Costs for renewables



Sources: IPCC, 2022a.

Notes: Photovoltaics and onshore wind are costs and batteries for passenger electric vehicles is Li-Ion battery packs.



progress and the availability of key technologies to decarbonize the emission-intensive sectors, such as carbon capture and storage technologies (IEA, 2021). Impacts on the macroeconomy and inflation more specifically will depend on the way governments support more vulnerable households or sectors to weather the transition (ECB, 2022c). Overall, however, there is clear evidence

of the catastrophic impacts of unmitigated climate change (IPCC, 2021; IPCC, 2022b), underlining the urgency of forceful action to transition to carbon-neutral economies.

*In its 2021 strategy review, the ECB Governing Council agreed on a roadmap on climate change, which also proposes further work on the above-mentioned questions. In particular, the ECB Governing Council has committed to expanding its analytical capacity in macroeconomic modeling with regard to climate change, including conducting scenario analyses regarding transition policies (ECB, 2021a). The ECB is also working on capturing the impact of climate change policies in the Eurosystem/ECB macroeconomic projections and, accordingly, in the medium-term inflation outlook, which is particularly relevant for monetary policy considerations.*

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