



CROATIAN NATIONAL BANK

EUROSYSTEM

The Future of Inflation

Boris Vujčić, Governor

Geneva, October 3rd, 2024



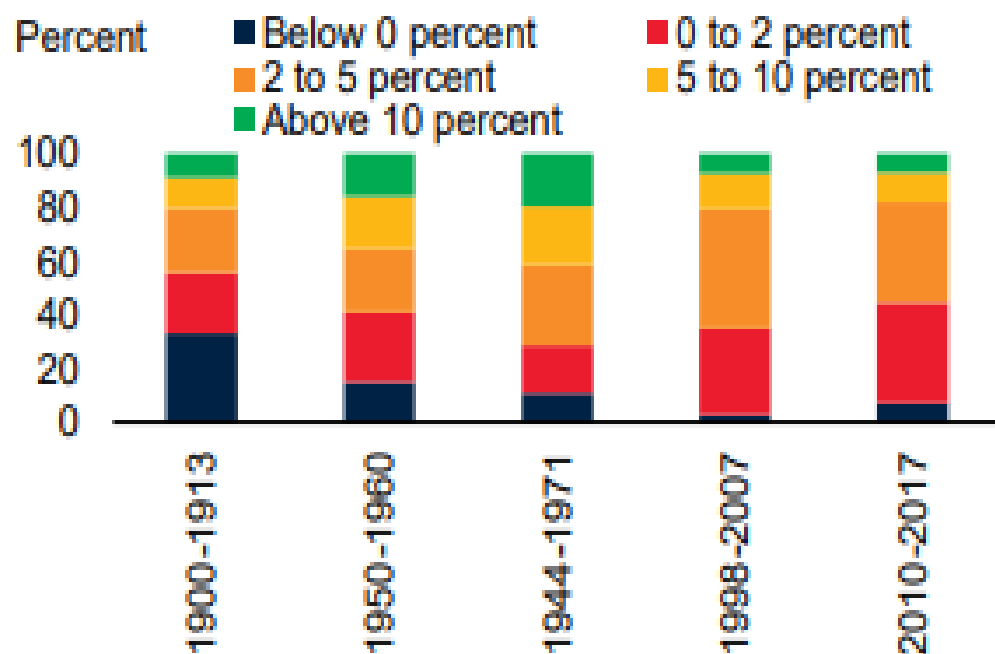
Outline

- Long-term trends in inflation and interest rates
- Impact of structural factors on inflation trends
 - (De)globalization
 - Demographics
 - Digitalisation
 - Climate change

Long-term trends in inflation and interest rates

Pre-pandemic inflation has been lowest and least volatile in over 50 years

Inflation distribution



Source: World Bank

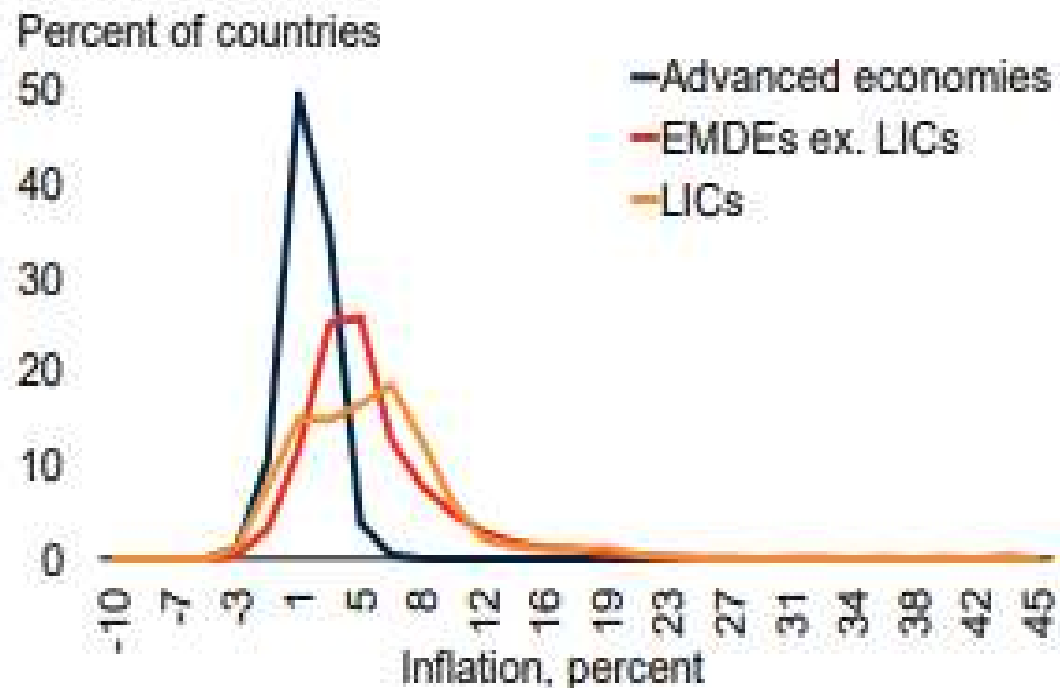
Inflation and inflation volatility



Source: World Bank

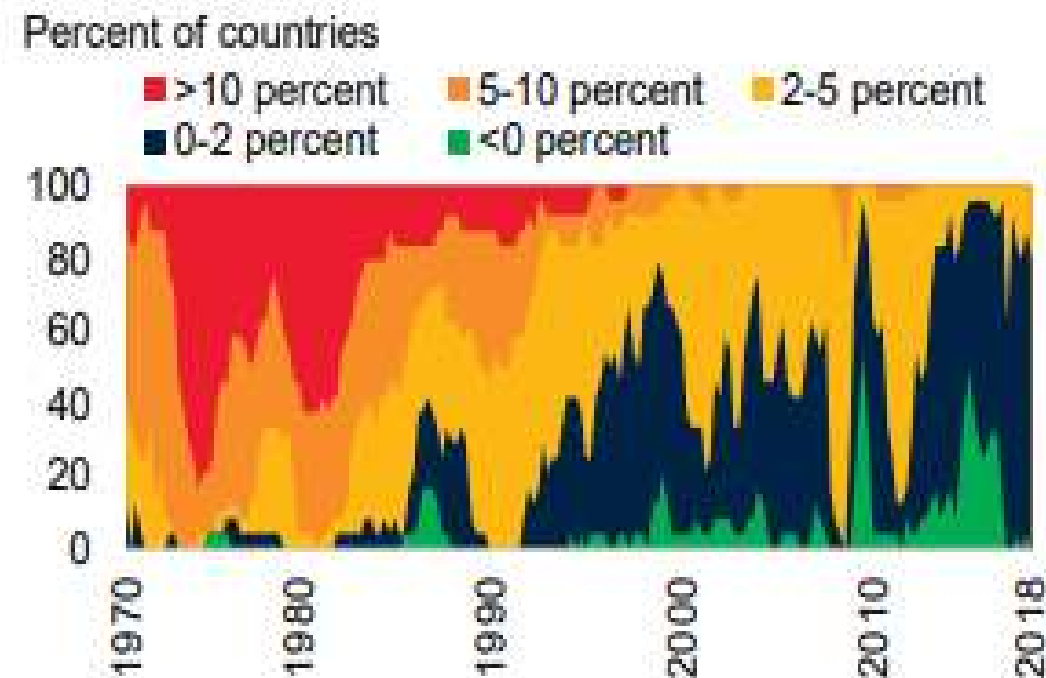
In the decade before the pandemic, more than half of advanced Economies have experienced average inflation below 2%

CPI Inflation distribution: 2010-17



Source: World Bank

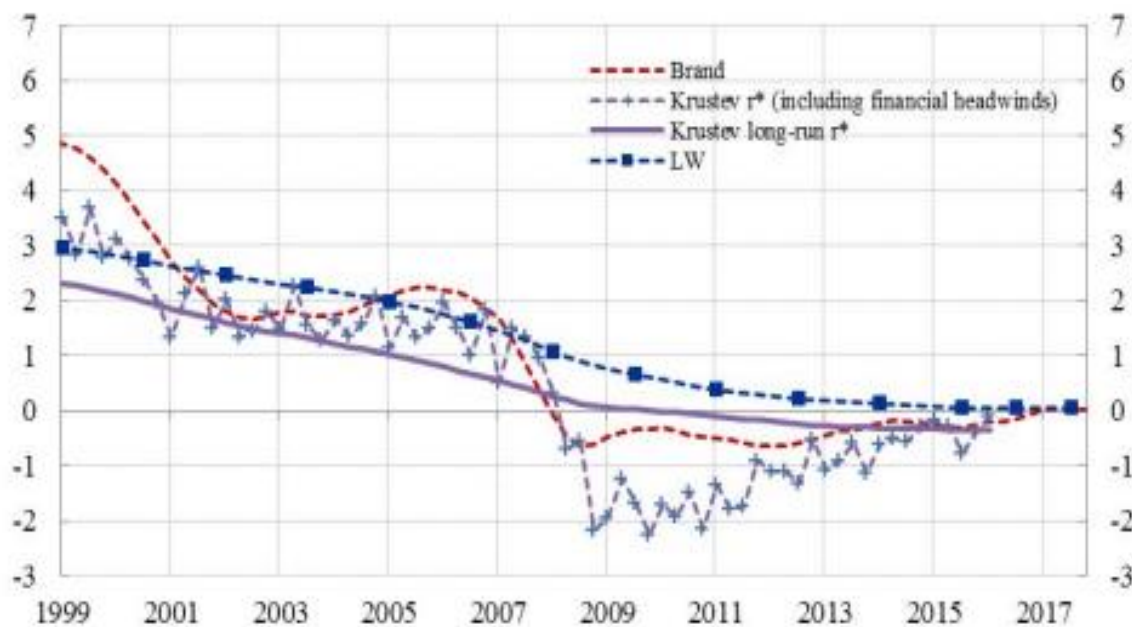
Inflation distribution: Advanced economies



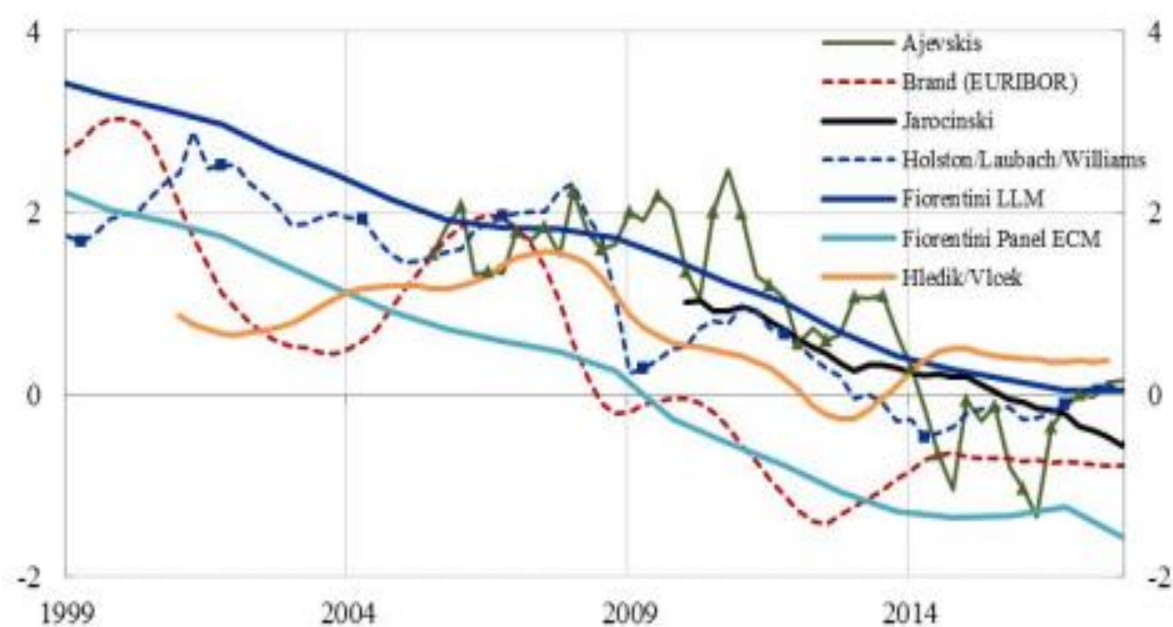
Source: World Bank

Along with the decrease in inflation, structural factors affected the r^* as well, with various estimates pointing to decreasing trend of its value

Econometric estimates for US



Econometric estimates for euro area

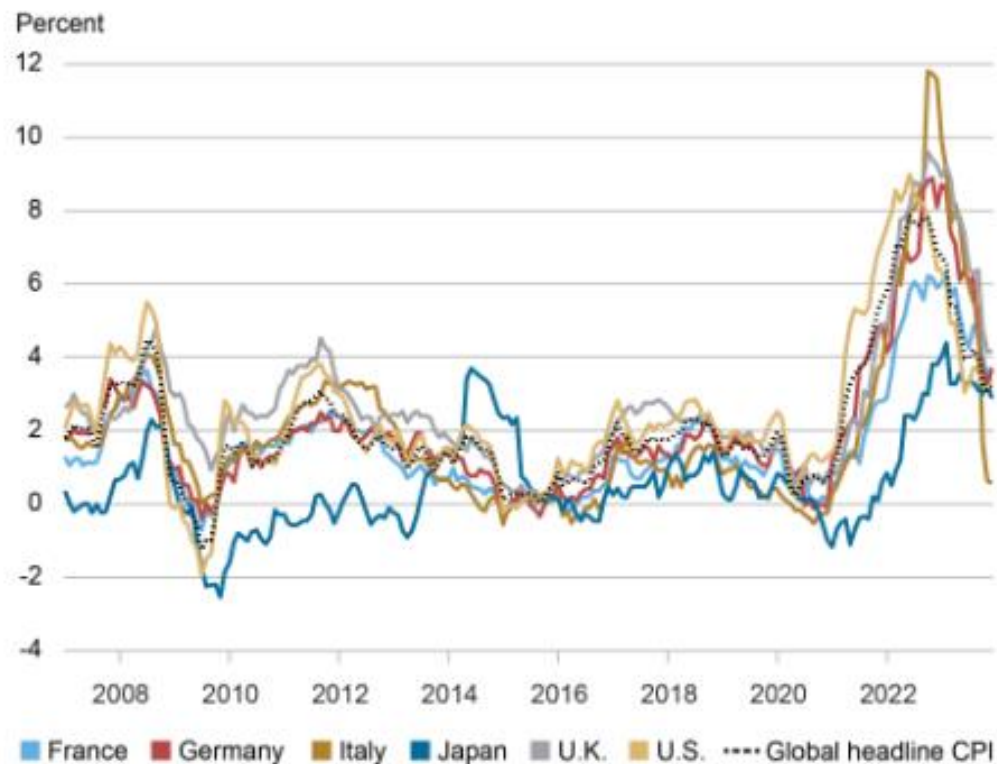


Notes: Both euro area estimates from Holston et al. (2017) and (updated) US estimates from Laubach and Williams (2003) are obtained from the homepage of the Federal Reserve Bank of San Francisco with latest observation being 2017Q4 in both cases. Holston et al. (2017) based on filtered estimates and Brand and Mazelis (2018) based on smoothed estimates of states.

Source: ECB (2018)

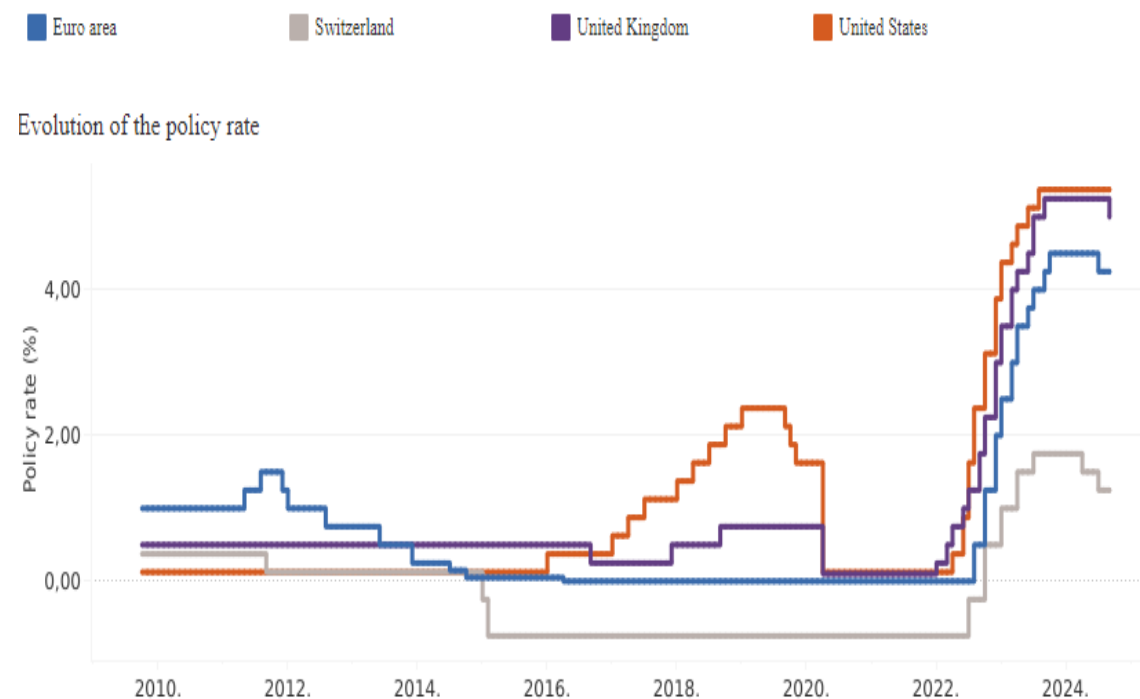
Recent period of strong surge and gradual return of inflation towards the target arose the question of future trends in inflation and interest rates

Headline CPI inflation in selected countries



Source: OECD

Central bank interest rates



Source: BIS

Impact of structural factors on inflation trends

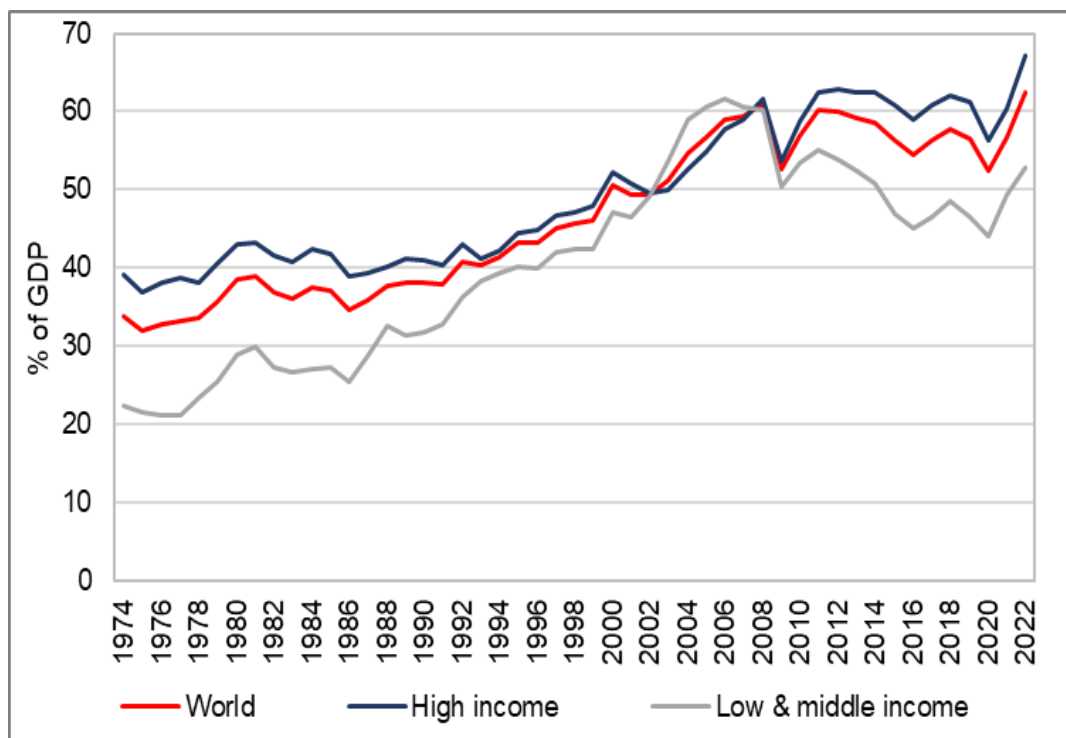
Globalization: influencing economies worldwide for 50 years

Until recently, it had a disinflationary effect through four channels

- Rapid economic integration due to globalization has reduced barriers to the free movement of people, capital, goods, services, information, and knowledge
- Trade liberalization and falling tariff rates, as features of globalization, have led to an increase in the share of global imports and exports in GDP, boosting economic growth worldwide
- Globalization can have a **disinflationary** impact on inflation through four channels:
 1. Increased trade integration - enhances competition that results in lower prices
 2. Greater role of emerging markets – introduces lower-cost goods and services
 3. Expansion of global value chains - increases efficiency and reduces production costs
 4. Reduced bargaining power of workers - Limits wage growth pressures
- The economy of scale, resulting from the increase in global trade, has led to a decrease in transportation costs. This trend has been further fueled by technological improvements, higher competition, and the rapid increase in information availability.

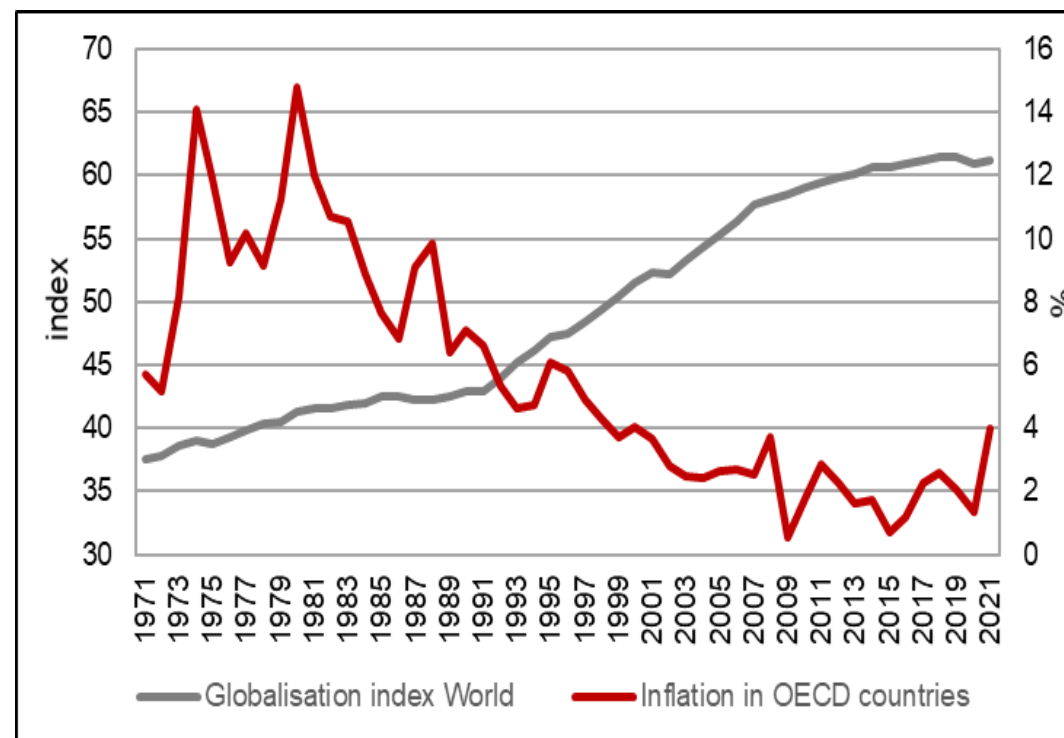
Higher level of openness of countries has contributed to lower inflation globally for a long time...

Trade openness



Source: World Bank

Globalisation index and inflation in OECD countries

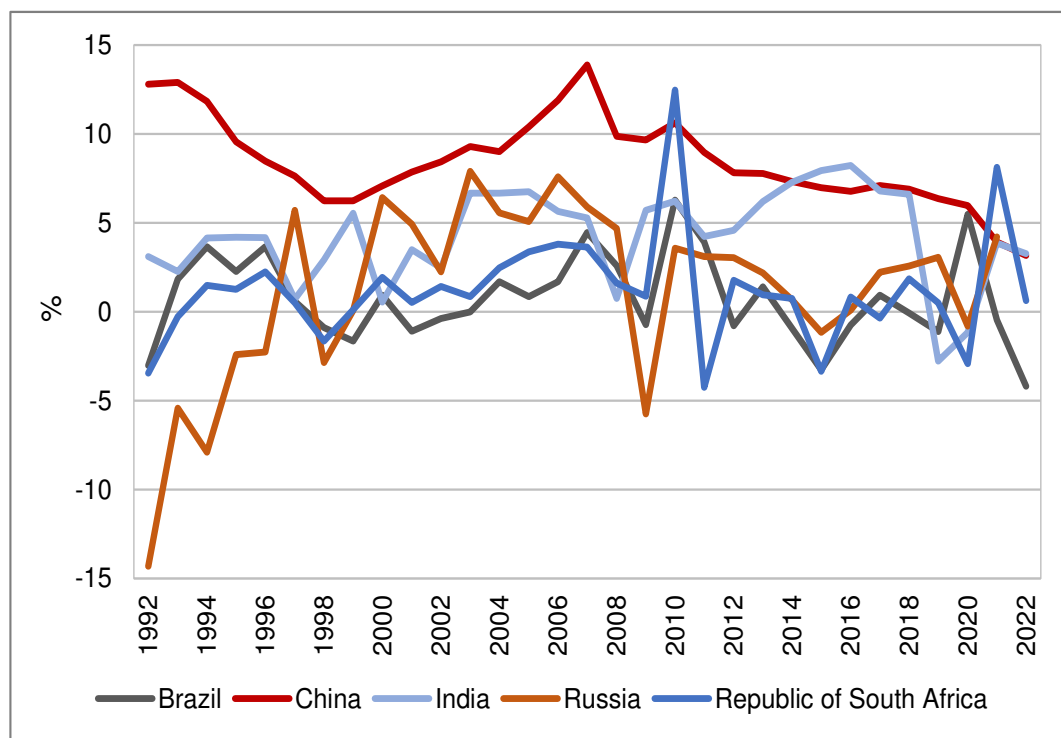


Note: The index measures globalization on a scale from 1 to 100, where higher values indicate a higher degree of globalization.

Sources: KOF Swiss Economic Institute, OECD

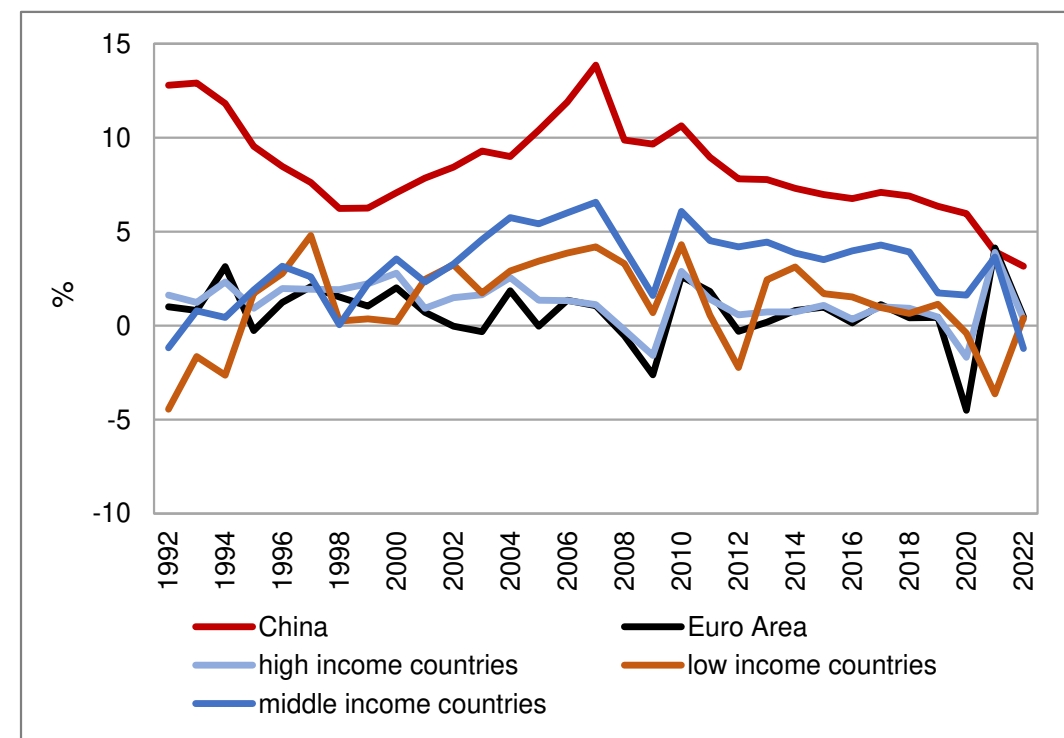
...which, among other things, reflected higher productivity growth in the BRICS countries, especially China, but the trend has recently reversed

Annual growth rate of labour productivity in BRICS countries



Note: Labour productivity is measured by GDP per employed person.
Source: World Bank; author's calculations

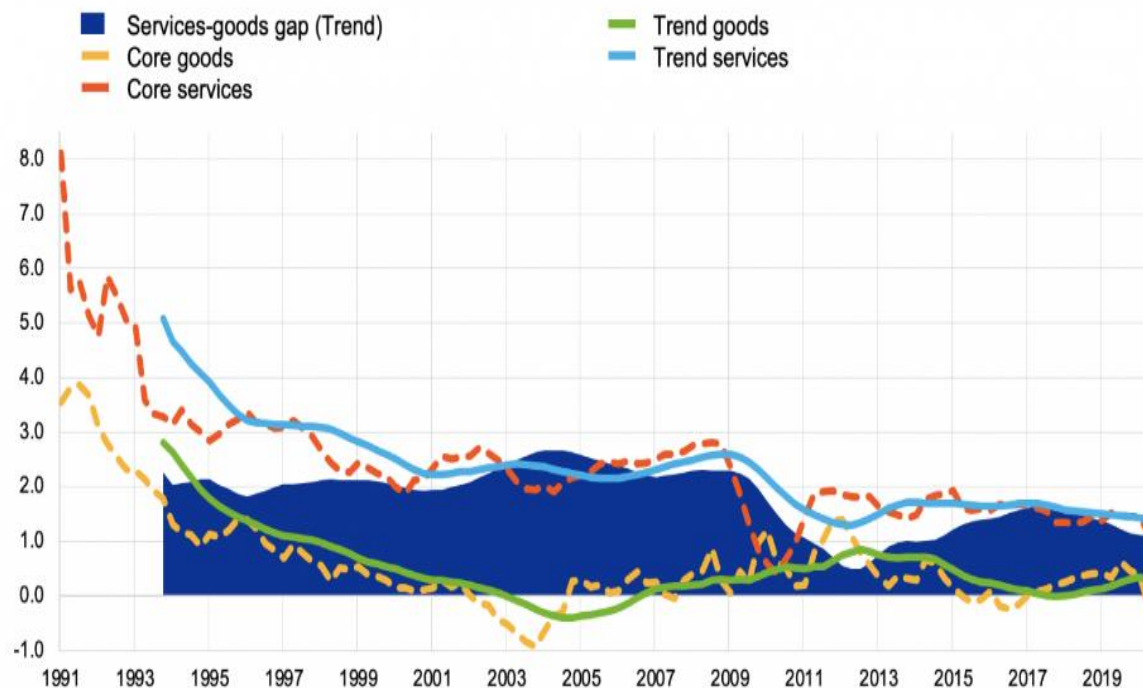
Annual growth rate of labour productivity in China and selected groups of countries



Note: Labour productivity is measured by GDP per employed person.
Source: World Bank; author's calculations

Lower inflation a result of similar underlying developments, although core inflation still under impact of idiosyncratic factors

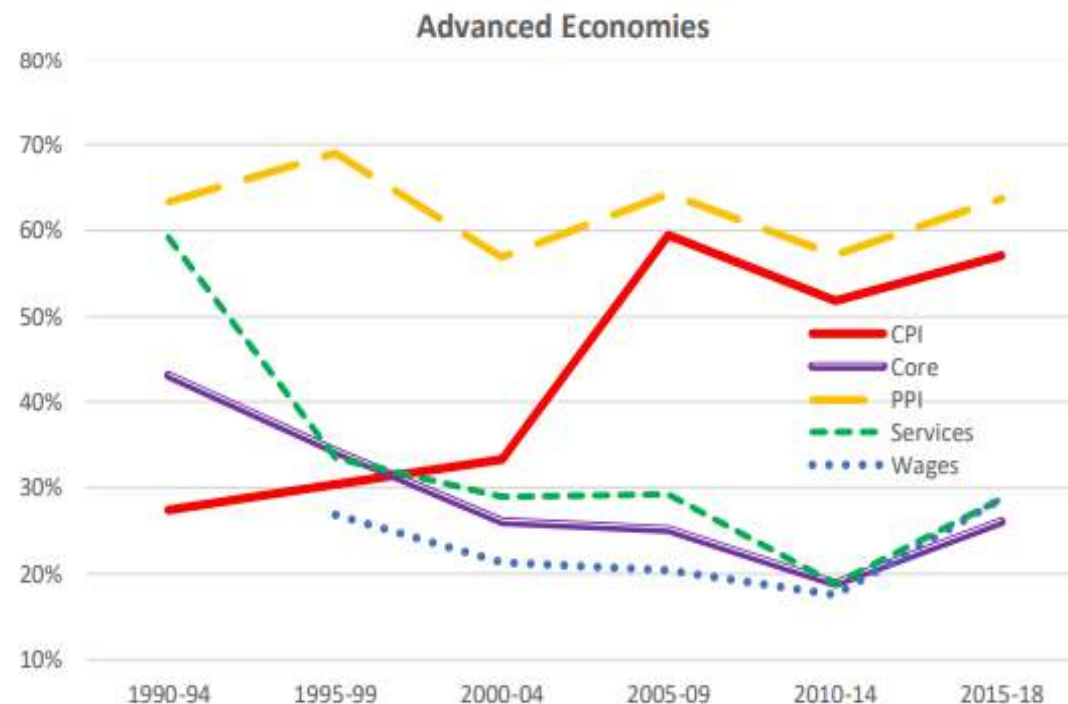
Trend inflation in goods and services in advanced economies



Sources: ECB calculations and national sources.

Notes: Inflation trends are computed based on 12-quarters moving averages of core inflation in advanced economies, computed as weighted average (GDP PPP weights) of six advanced economies (Australia, Canada, euro area, Japan, UK, and US). Latest observation: 2020 Q2.

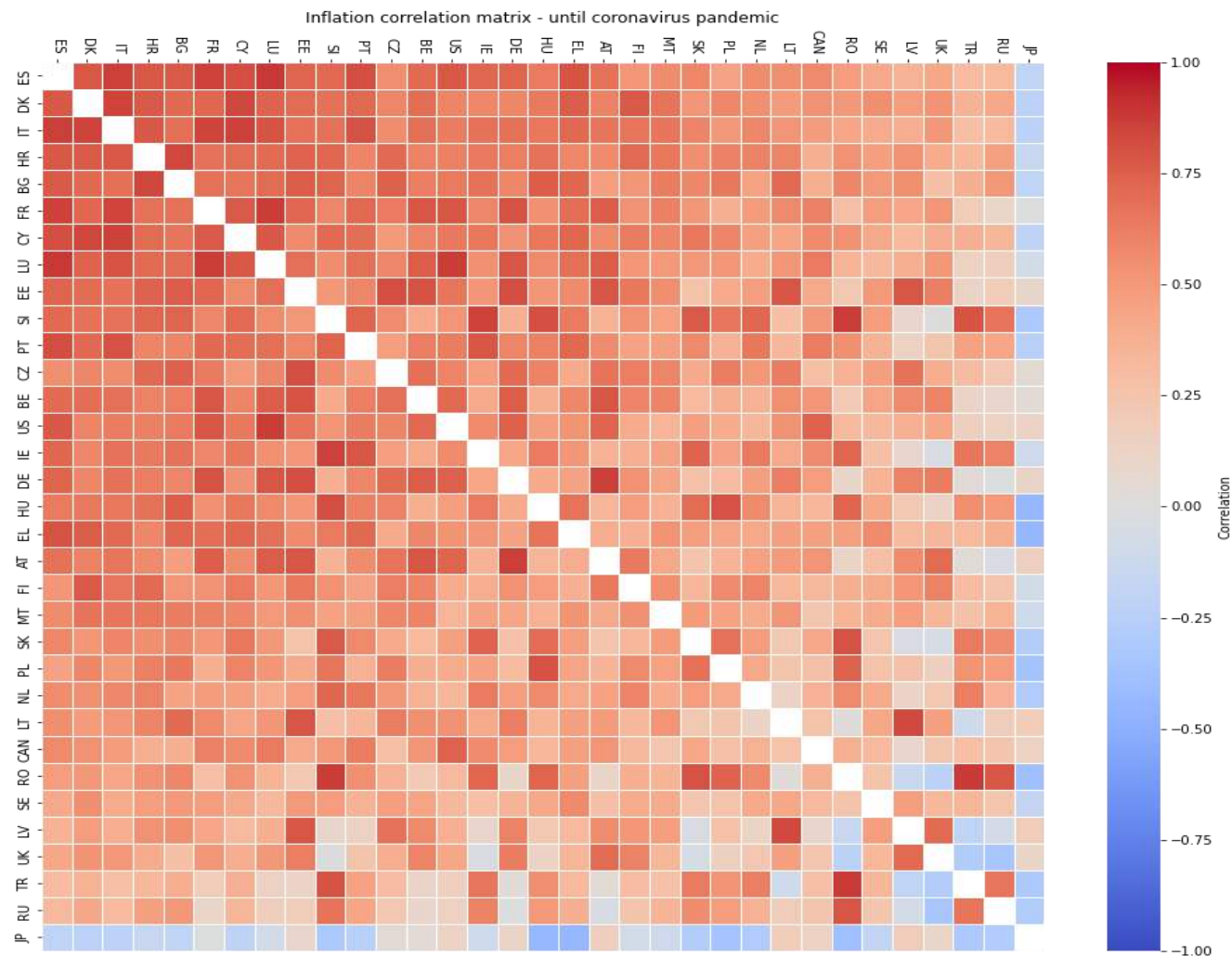
Percent of variance of inflation measures explained by 1st Principal Component



Note: Percent of variance for each measure of inflation explained by first principal component over 5-year windows starting in 1990-94.

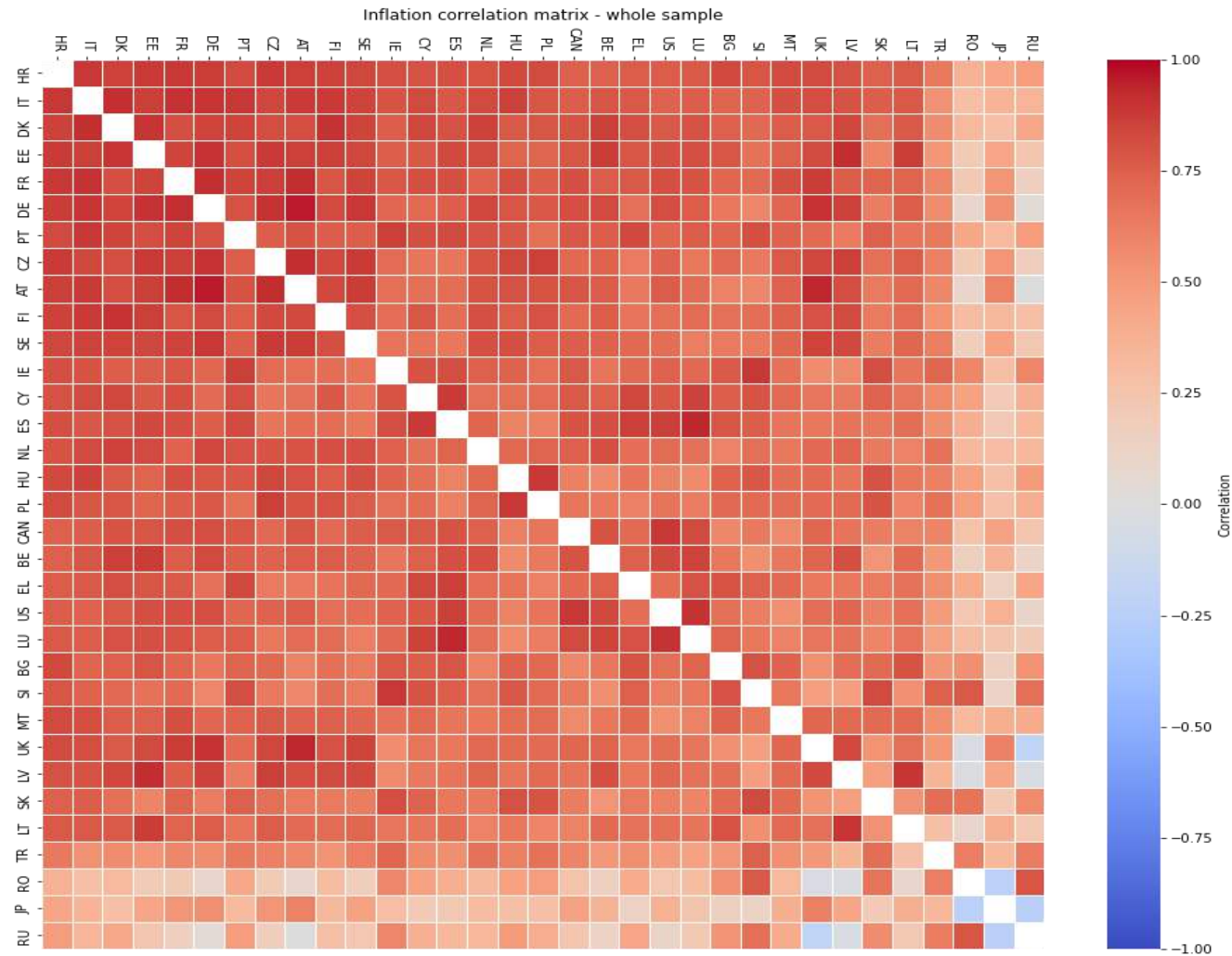
Source: BIS

The correlation of inflation across the world was high before the pandemic...



Note: Correlation matrix. The data covers the period from January 2000 to February 2020.
Source: Eurostat, OECD; HNB calculations

...and in the period following the pandemic, it further increased as a result of joint global shocks

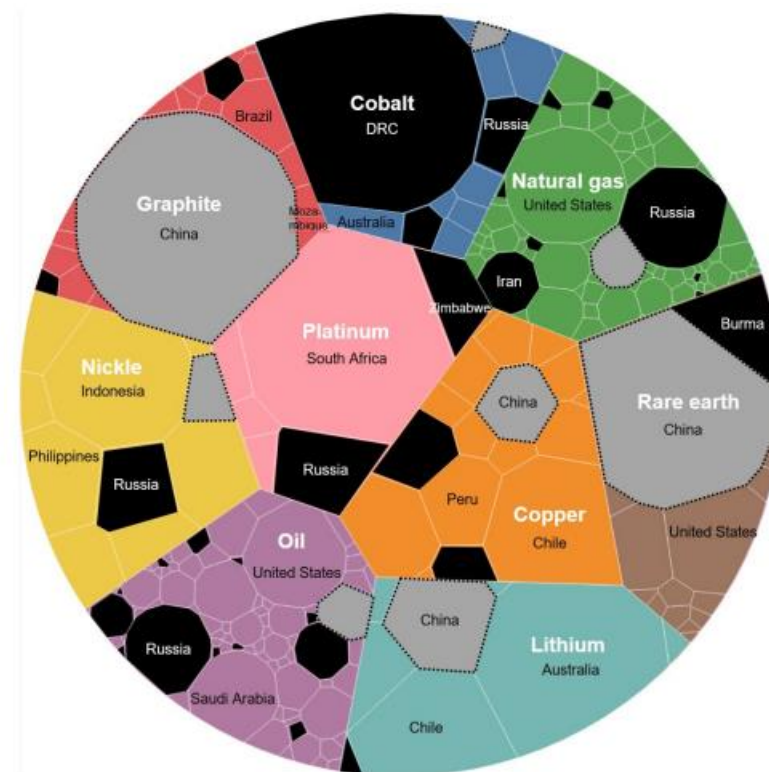


Note: Correlation matrix. The data covers the period from January 2000 to July 2024.
Source: Eurostat, OECD; HNB calculations

The issue of deglobalization and fragmentation is becoming more and more important

- Deglobalization can affect inflation through several channels:
 1. Higher energy prices -> **inflationary effect**
 2. Increased procurement and production costs -> **inflationary effect**
 3. Increased labour costs -> **inflationary effect**
 4. Reduced external demand for domestic products and services -> **disinflationary effect**
- Fragmentation -> **can have both inflationary and disinflationary effects**

World production of selected commodities



Note: Different colors represent different commodities. Countries under sanctions are colored black, and China is colored grey.

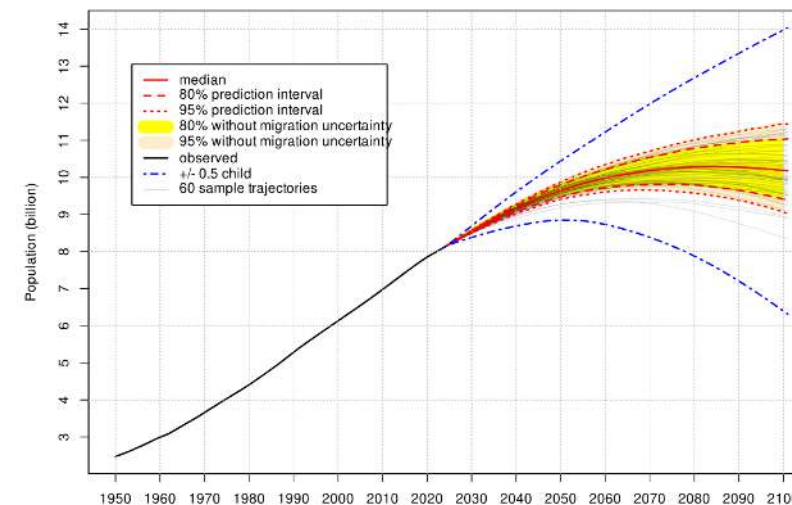
Source: Aiyar, S. et al. (2023), Goeconomic Fragmentation and the Future of Multilateralism, IMF Staff Discussion Notes No. 2023/001

Demographic trends

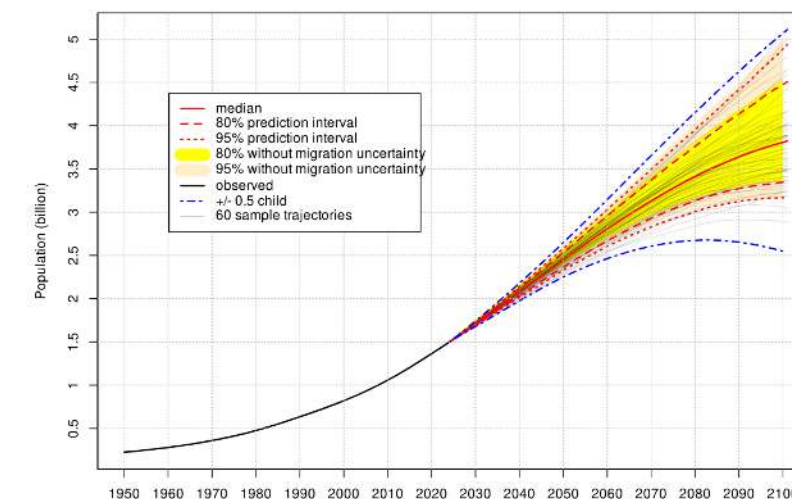
Population growth is slowing or declining on all continents, except Africa

- By 2100 the world's population could increase by about 2 billion people (from 8 to 10 billion)
- In the same period, the population of Africa is expected to grow by about 2.5 billion (from 1.5 to 4 billion)
- Africa is much less integrated into global economic flows
- The global impact of African demographic trends will depend heavily on the degree and form of future integration
 - repeating the story with China from previous few decades
 - or these young people will migrate in large numbers to other countries

World: Total Population



Africa: Total Population

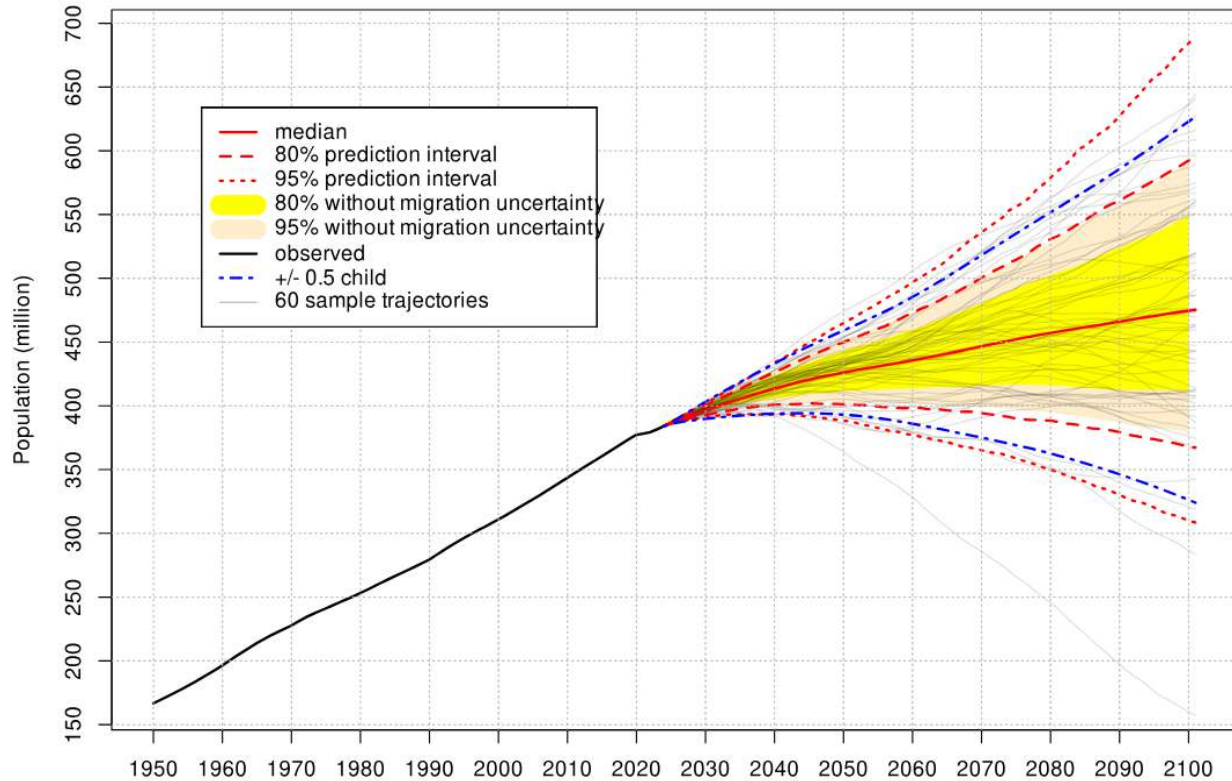


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United Nations, DESA, Population Division. *World Population Prospects 2024*. <http://population.un.org/wpp/>

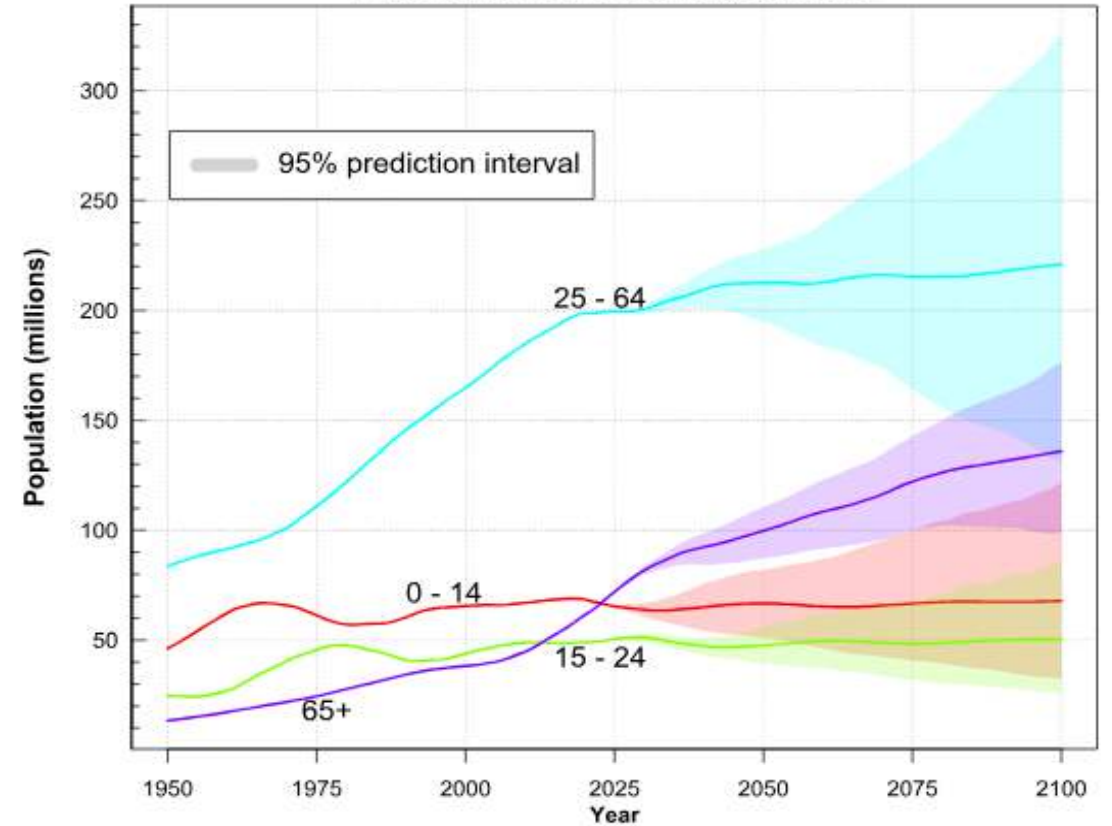
Demographic trends

In North America, population growth is expected to slow down

Northern America: Total Population



Population by broad age groups

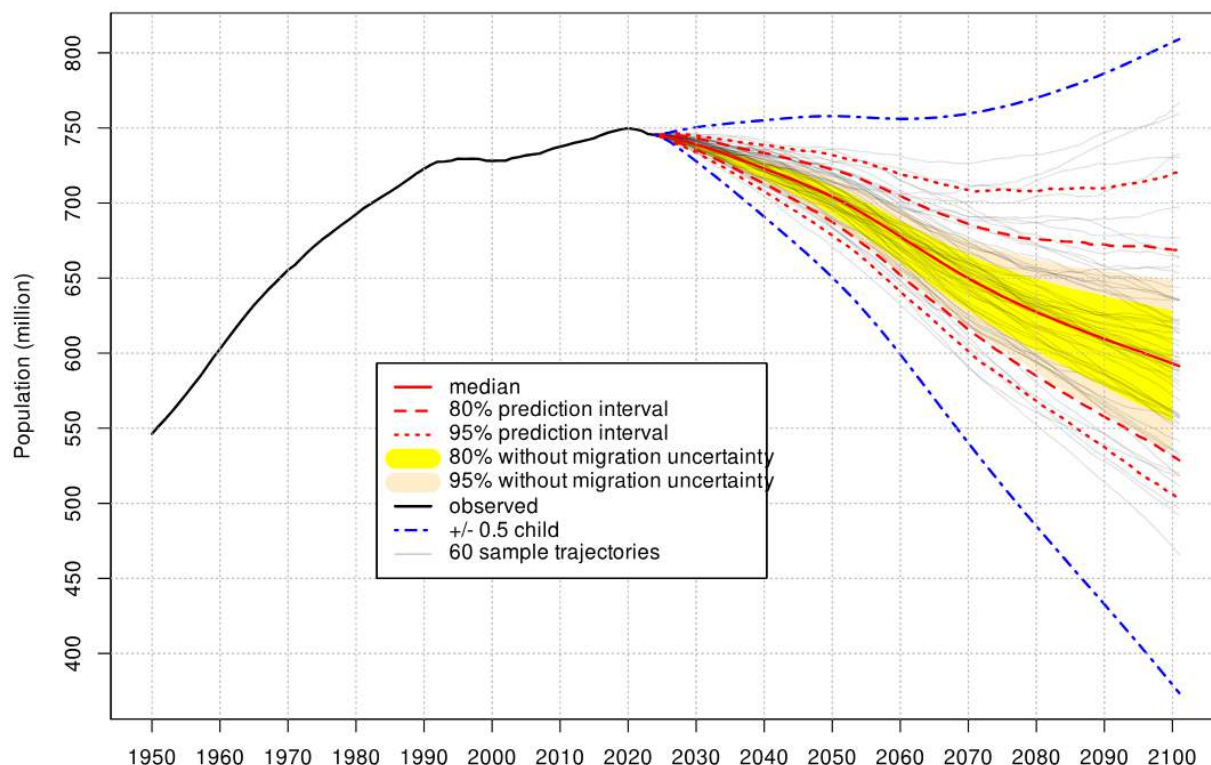


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United Nations, DESA, Population Division. *World Population Prospects 2022*. <http://population.un.org/wpp/>

Demographic trends

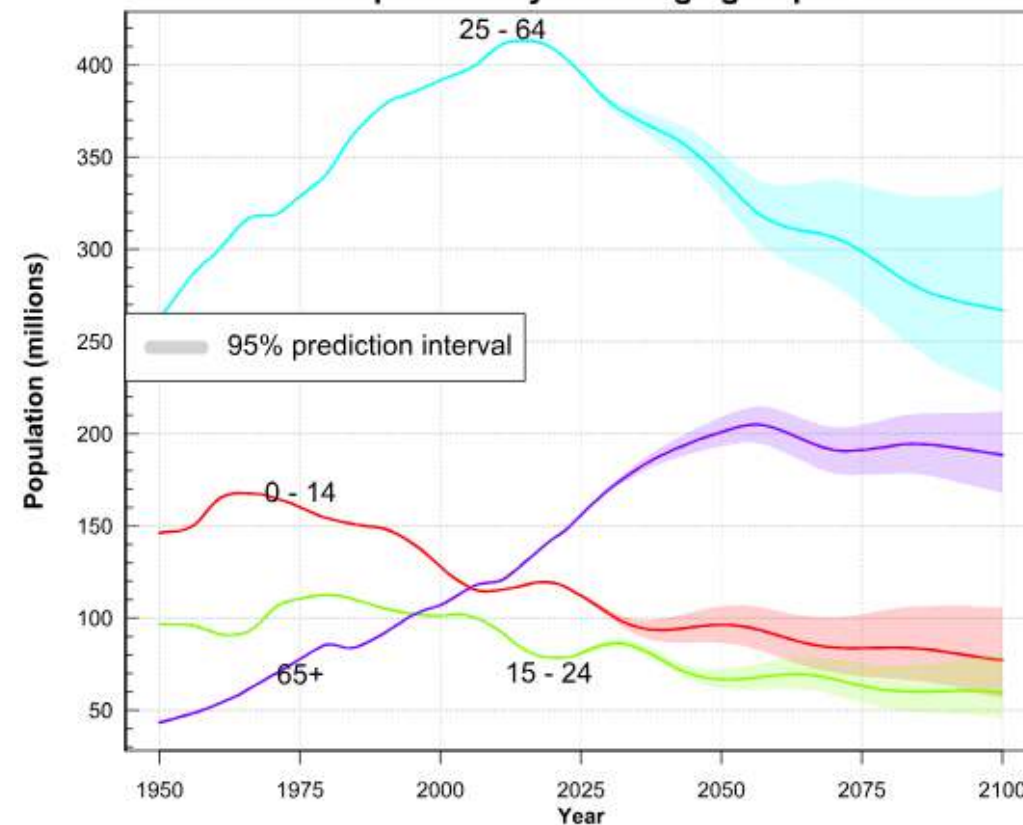
In Europe, the population is expected to decrease with the significant change in age structure

Europe: Total Population



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United Nations, DESA, Population Division. *World Population Prospects 2022*. <http://population.un.org/wpp/>

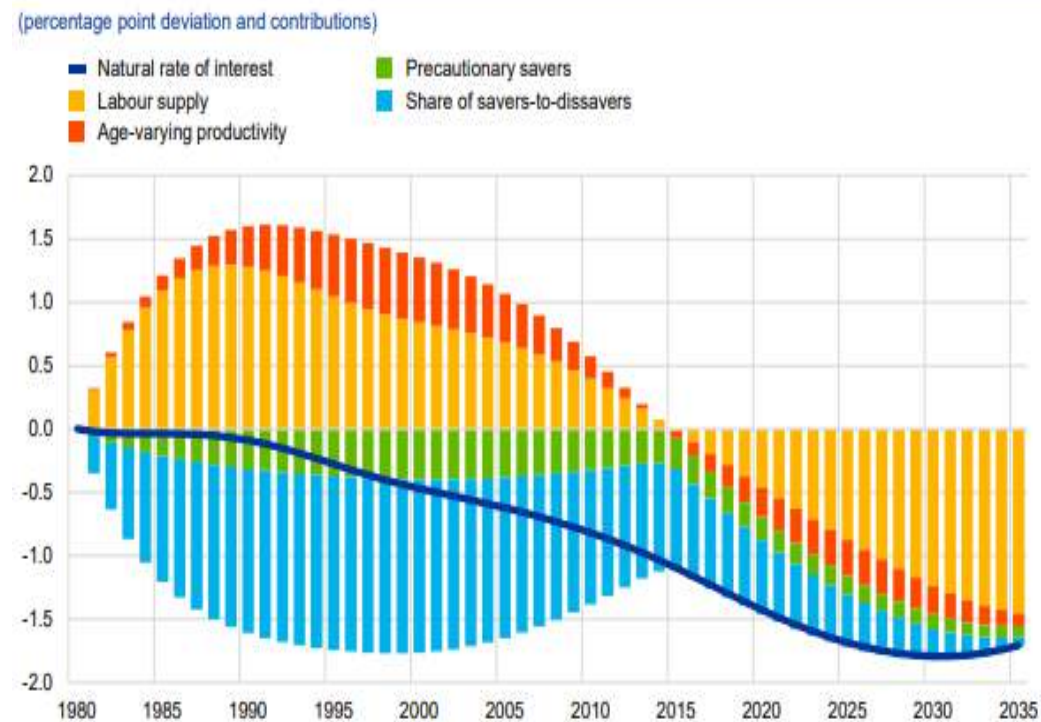
Population by broad age groups



Demographic trends: downward pressure on natural rate related to ratio of savers-to-dissavers and labour supply expected to gradually ease

It could, in the long run, result in increased inflationary pressures

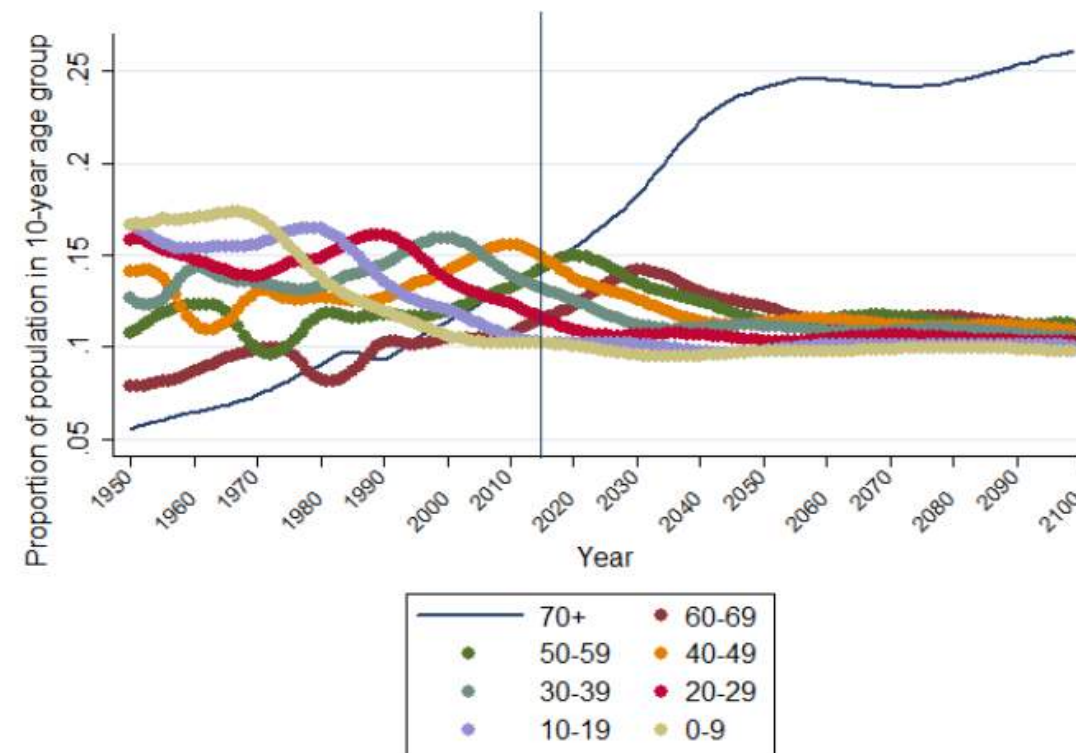
Illustration of demographic drivers of the natural rate of interest



Sources: Brand, Bielecki and Penalver (2018), based on Papetti (2019).

Notes: The natural rate of interest is expressed as percentage point deviation from the initial steady state.

Demographic structure in the euro area



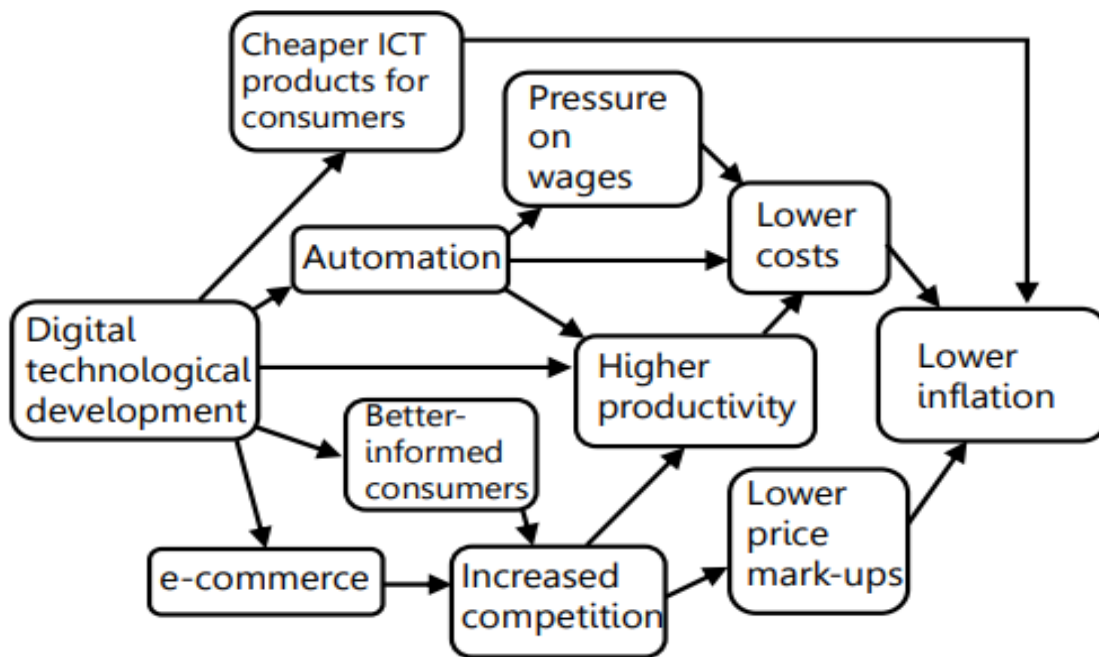
Note: Vertical line denotes the point in time at which share of 70+ year old became highest.

Source: UN Population Statistics

Digitalization

Can impact inflation through three main channels

The effects of digitalisation on inflation



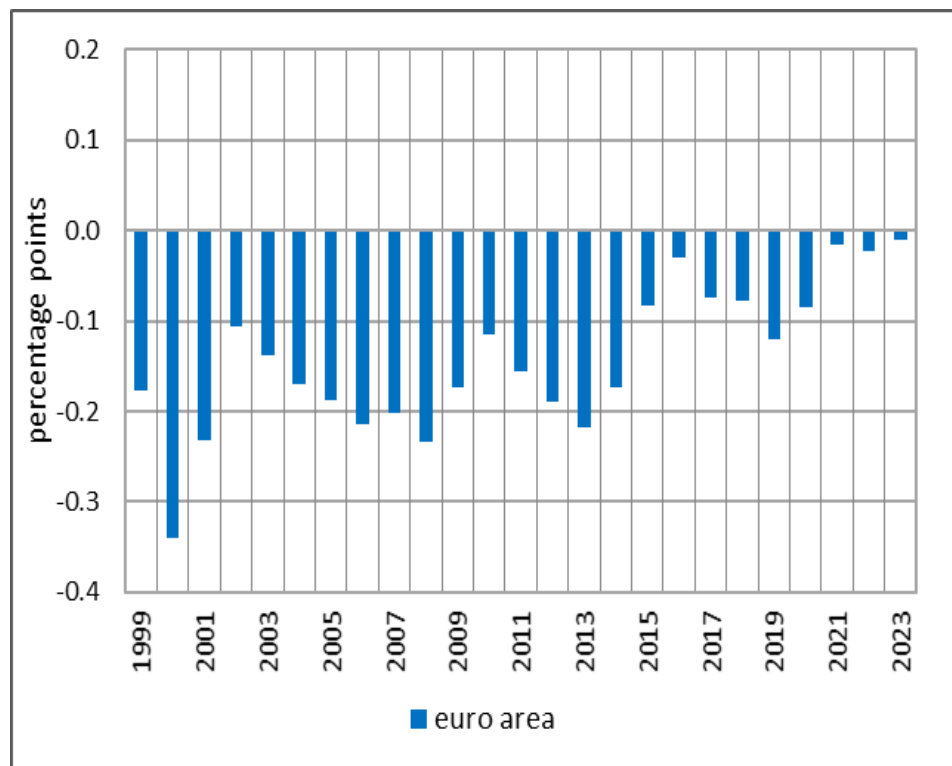
- Digitalization is one of the structural factors influencing inflation over the past 20 years
- It can impact inflation either directly through cheaper ICT products for consumers or indirectly through the use of the internet and automation
- As a result of digitalization, inflation is on average lower than it would be without it

Source: Sveriges Riksbank (2015.), *Digitalisation and inflation*, Monetary Policy Report (February), 55. – 59.

First channel: Direct impact through lower prices of ICT goods and services

Contribution of ICT products and services to average annual inflation in most countries negative

Contribution of ICT products to average annual inflation
in euro area



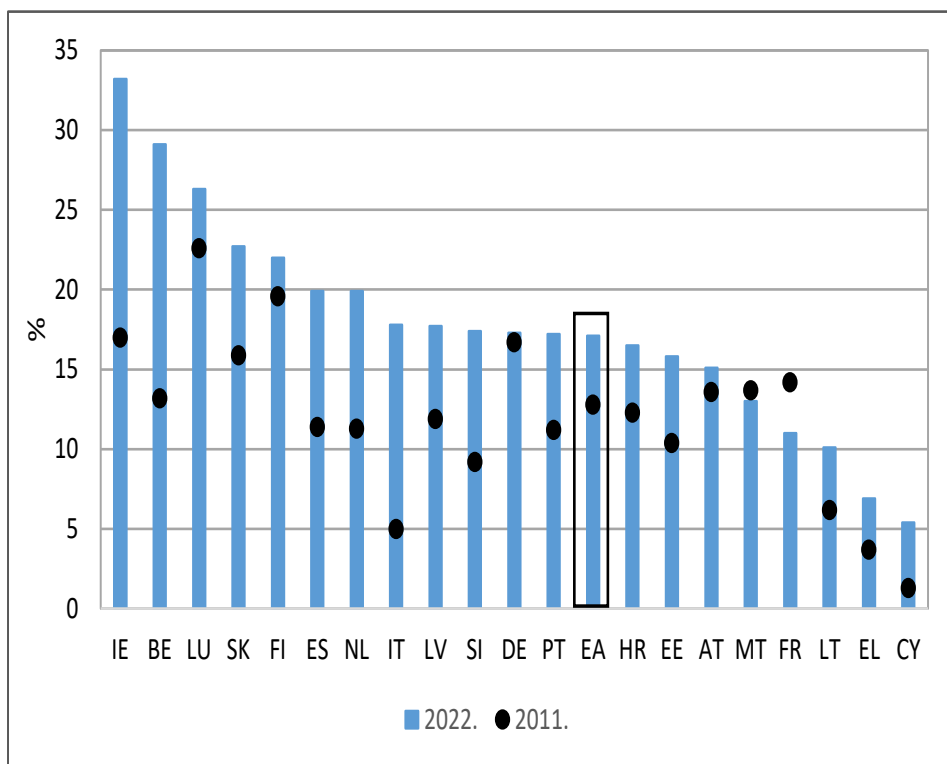
Source: Eurostat; HNB calculations

- Digitalization can directly lead to lower prices of ICT products due to technological advancements and increased production efficiency
- The availability of cheaper digital products enhances consumer access to advanced technology at reduced costs, contributing to lower inflation
- Rapid technological changes in the ICT sector drive continuous price reductions as newer, more efficient products replace older ones

Second channel: Increased use of digital technologies

Easier price comparison and increased competition (price reduction);
the emergence of "superstar" companies that dominate the market (price increase)

Share of e-commerce in total retail

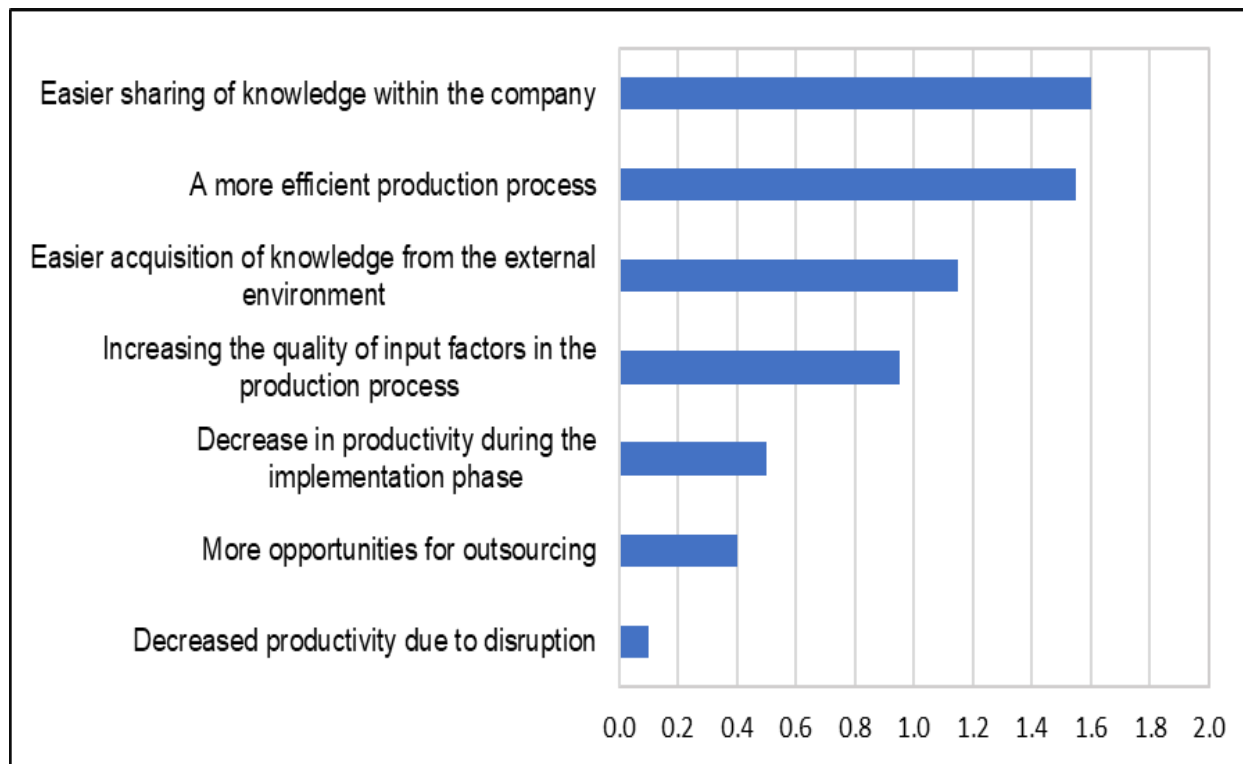


Source: Eurostat

- **Increased Competition:** Digital technologies lower barriers to entry, increasing competition and leading to a potential decrease in prices
- **E-commerce Growth:** The rise of e-commerce enhances price transparency and competition, potentially driving down prices as consumers can compare and switch to cheaper online options
- **Market Concentration:** On the other hand, digital technologies also enable the rise of dominant "superstar" firms with significant market power, which can lead to higher prices due to reduced competition

Third channel: Automation

The impact of digitization on labor productivity

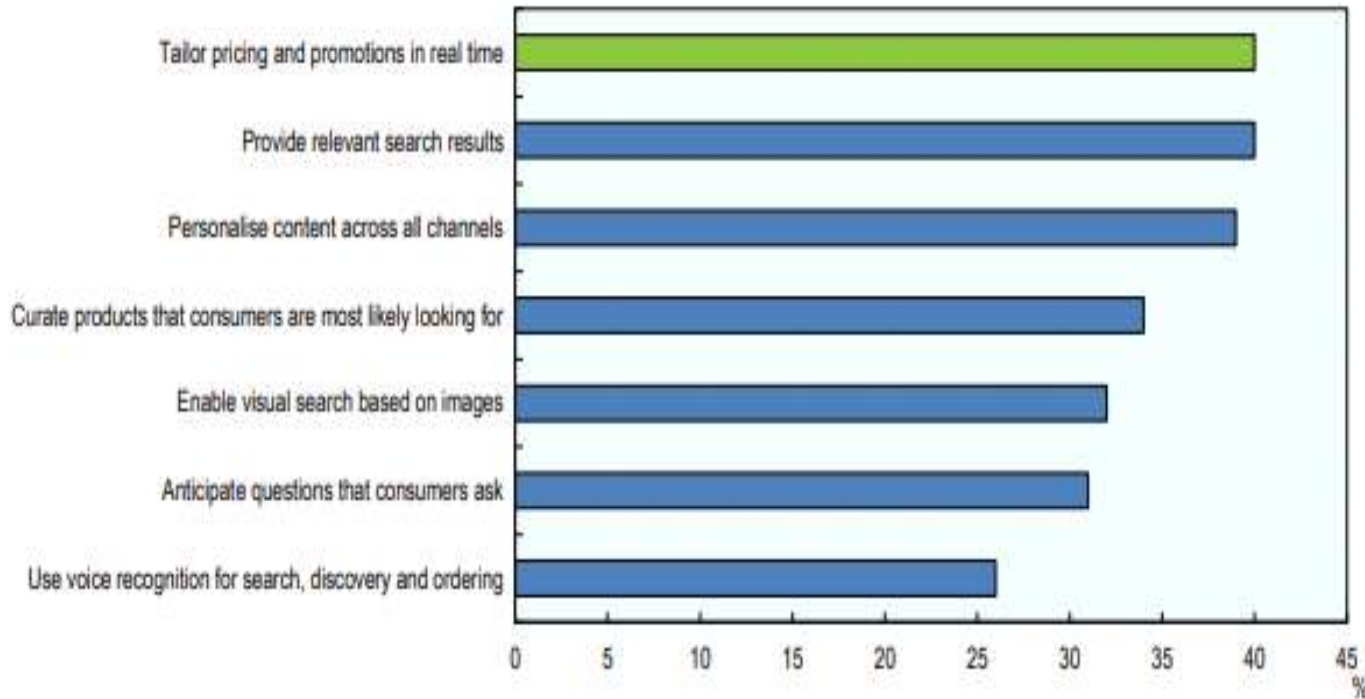


Note: The calculation is based on respondents' answers to the question of how digital technologies affect company productivity. The answer values refer to the average of the answers of all respondents; 0 = unimportant; 1 = important; 2 = very important. Source: Elding, C. i Morris, R. (2018.), *Digitalisation and its impact on the economy: insights from a survey of large companies*, ECB Economic Bulletin, Issue 7/2018, 67. – 69.

- **Operational Efficiency:** Digitalization lowers firms' costs through efficiency gains and automation, reducing production costs and potentially leading to lower prices
- **Labour Impact:** Digital technologies can enhance replacing labour, thus reducing costs for firms and potentially suppressing aggregate demand
- **Investment and Market Structure:** Reduced need for physical investment can suppress demand and neutral interest rates, contributing to long-term disinflationary pressures

On the other hand, digitalisation has enabled the development of personalized pricing models, which has inflationary effects

Usage of AI to personalize the consumer experience



Note: "Based on a survey to more than 500 traditional retail, pure play, consumer goods, and branded manufacturing leaders from around the world."

Source: Hogan, K. (2018), Consumer Experience in the Retail Renaissance: How Leading Brands Build a Bedrock with Data

- Personalized pricing can increase firms' market power by allowing them to charge higher prices to consumers with a higher willingness to pay, driving inflation up
- With personalized pricing, firms can effectively engage in price discrimination, often leading to higher average prices, especially from wealthier consumers who can afford more, thus raising the general price level

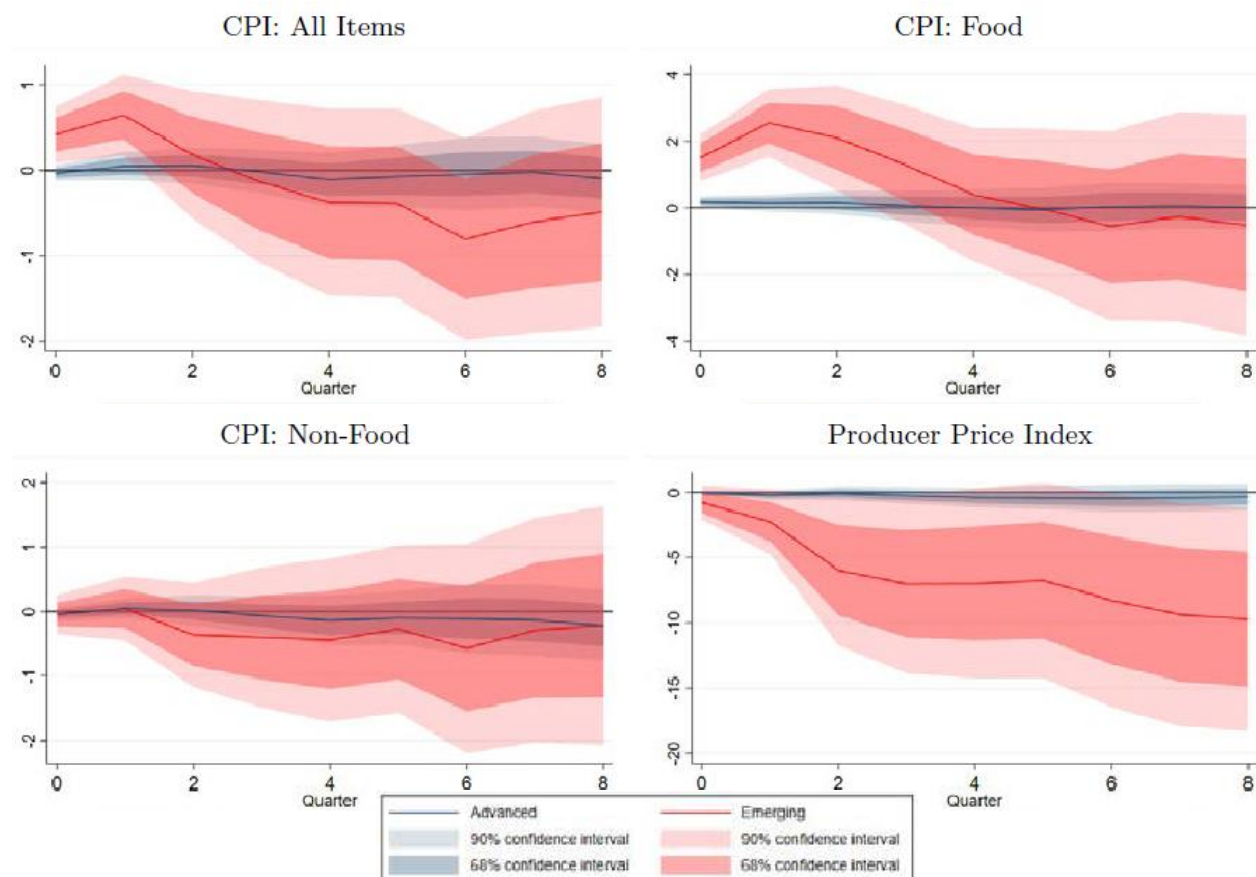
Climate change and the impact on inflation

Physical and transition risks ↔ *climateflation, greenflation, fossilflation*

- Climate change is one of the most significant structural forces shaping the global economy. Its impact will be significant and diverse, and will affect all economic actors and sectors around the world (NGFS, 2020)
- Isabel Schnabel (2022) – lists three different, but interconnected channels/shocks that can be expected to lead to a prolonged period of pressure on inflation in the coming period due to climate disasters (physical risks) and green transition (transition risks):
 - **climateflation** – natural disasters and unfavourable weather conditions can affect economic activity and prices – a consequence of the physical risks of climate change
 - **greenflation** – the transition to green technologies is likely to lead to a significant increase in demand for certain commodities whose supply is limited, which affects prices (e.g. it takes 5 to 10 years to open a mine; demand and supply mismatch) – a consequence of the green transition
 - **fossilflation** – the fight against climate change makes fossil fuels more expensive due to introduction of a carbon tax, through which their harmful impact on the environment is more clear – the consequence of the green transition

Climate change and the impact on inflation

Climateflation – the effect of extreme temperatures on price stability



- Extreme weather conditions, such as high temperatures, often increase food prices in less developed countries, while the impact on developed countries remains limited.
- Nevertheless, climate-induced conditions are becoming more frequent and stronger, which presents a challenge for assessing their future impact on prices, so even central banks of developed economies cannot ignore this issue.

Source: Faccia, D., Parker, M. i Stracca, M. (2021), *Feeling the heat: extreme temperatures and price stability*, ECB Working Paper Series, No. 2626

Climate change and the impact on inflation

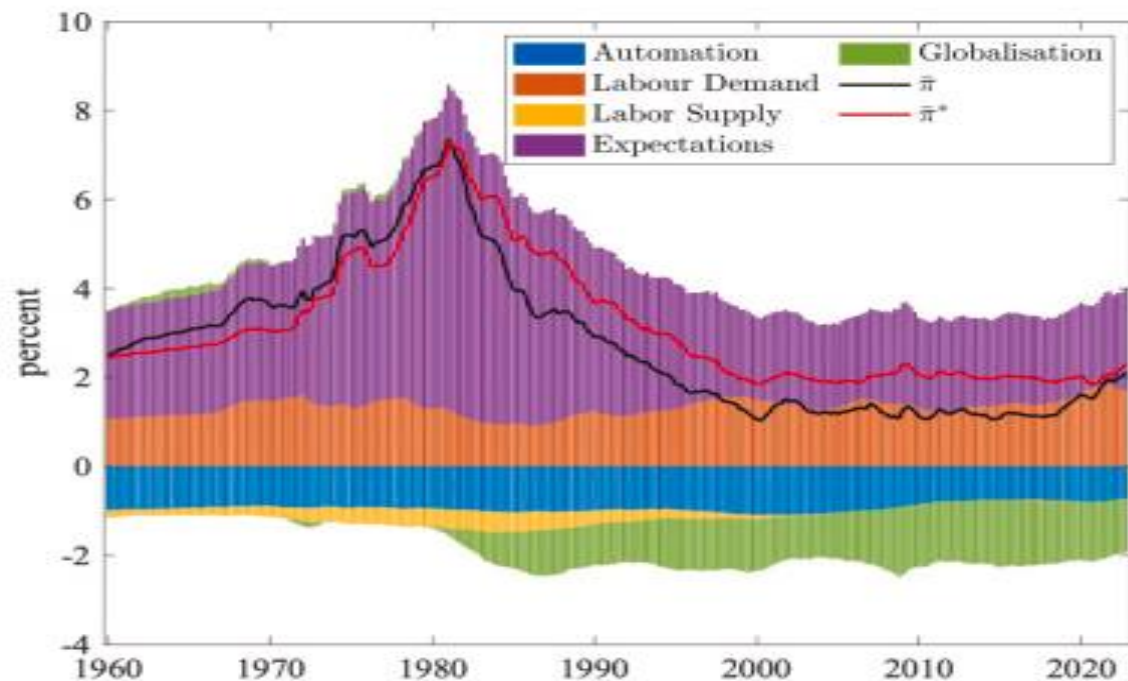
Transition risks → *greenflation, fossilflation*

- Analysing the link between transition climate risks and their impact on prices is challenging, as transition climate risks include many interrelated variables, including but not limited to:
 - Different reactions of economic entities to climate change, depending on the sector and region.
 - Decisions of climate policy makers that include measures to reduce greenhouse gas emissions and promote sustainable business practices.
 - Significant investments in new technologies to reduce greenhouse gases and protect against damage caused by climate change.
 - Changes in consumer preferences towards sustainable products and services, which may affect market demand and prices.

Concluding remarks (1)

- Inflation expectations are the primary driver of long-term inflation persistence, while its anchoring contributed to decrease in inflation
- Alongside expectations, labor demand, automation, demography, and globalization collectively influence trend inflation. While labor demand adds inflationary pressure, automation, demographic changes, and globalization counteract it, keeping inflation below target in recent decades.

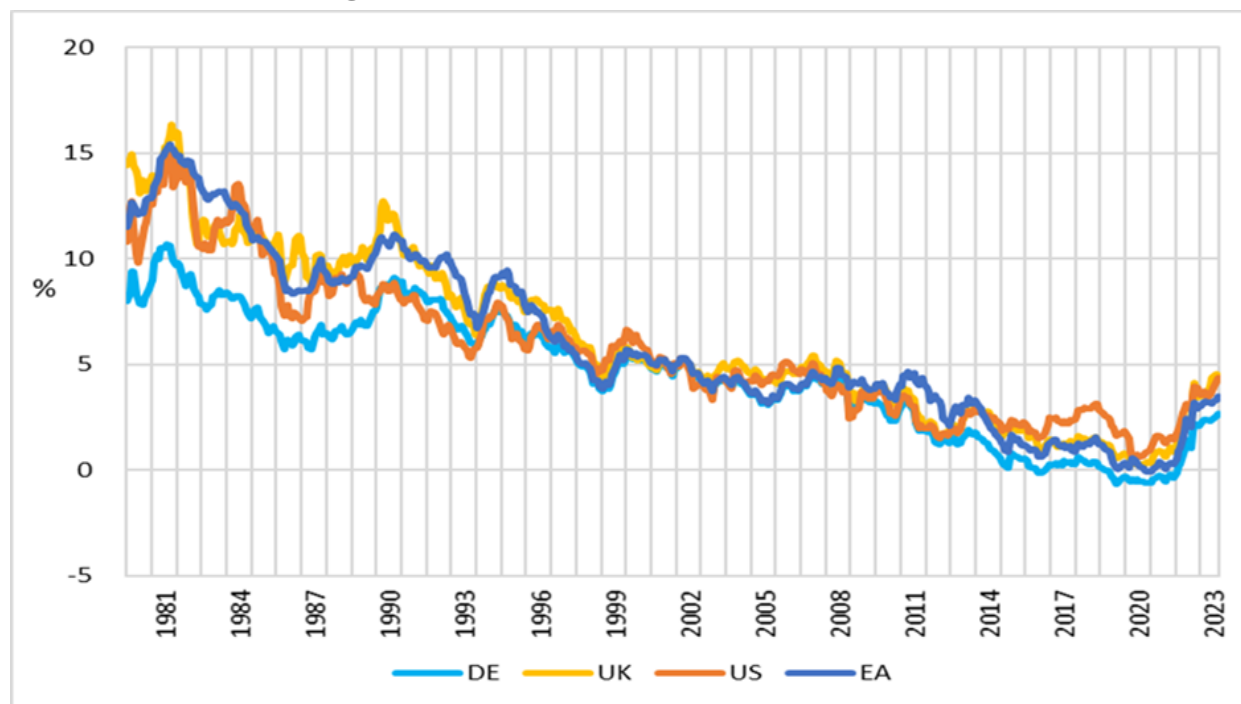
Historical decomposition of trend inflation



Concluding remarks (2)

- Complex changes in the environment with potentially large effects on inflation (upwards and downwards)
- The net effects of structural factors on inflation could likely become positive
- Central banks will not sit and wait: due to potentially stronger and more volatile inflationary pressures, a reversal of the long-term downward trend in the long-term interest rates is possible.

Movement of long-term interest rates



Sources: ECB; OECD



Thank you very much for your attention!