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Quarterly Report on the Euro Area

Volume 22, No 1 (2023)

- **Inflation and its heterogeneous social consequences across the euro area** by Balint Menyhert
- **Short- and long-run determinants of labour shortages** by Alfonso Arpaia and Anita Halasz
- **Prospects for long-term productivity growth** by Ben Deboeck
- **The direct effects of the COVID-19 pandemic on exports across the euro area** by Eric Meyermans
- **Annex: The euro area chronicle** by Jakub Wtorek

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Economic and Financial Affairs

The **Quarterly Report on the Euro Area** is written by staff of the Directorate-General for Economic and Financial Affairs. It is intended to contribute to a better understanding of economic developments in the euro area and to improve the quality of the public debate surrounding the area's economic policy.

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The views expressed are the author's alone and do not necessarily correspond to those of the European Commission.

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Despite exceptionally adverse shocks, the euro area has avoided a winter recession: it stagnated in the last quarter of last year and registered marginally positive growth in the first quarter of this year. According to our Spring Forecast growth in the euro area is projected to be 1.1% this year and 1.6% in 2024. The economy will be supported by the ongoing partial reversal of the terms-of-trade shock due to falling energy prices, progressively to the benefit of all domestic sectors of the economy. However, consumer spending will remain subdued until 2024, as the gains in purchasing power will only materialise gradually.

Headline inflation in the euro area is also projected to decelerate from 8.4% in 2022 to 5.8% in 2023 and to 2.8% in 2024. The persistence of inflation well above 2% in 2023, despite sharply abating energy inflation, is mostly due to a delayed pass-through of the past surge in energy prices – especially gas and electricity - to core inflation combined with remaining pandemic-related price pressures, but also to the record strong labour markets and the resilience of firms' unit margins.

Given the important fall in household purchasing power, it is important to analyse the impact of high inflation on the social fabric. Since inflation in the last year has been driven mainly by soaring energy and food prices, the structure of consumption expenditures remains crucial in determining households' vulnerability to ongoing price developments, in particular as the share of those basic goods is larger in the basket consumed by lower-income households.

In this regard, Section I of this issue of the Quarterly Report on the Euro Area (QREA) shows that the impact of inflation is particularly unequal across income quintiles in some Member States. Household income and other individual factors are all important determinants of the changes in living costs faced by households across the euro area. The expenditure structure reveals substantial differences also between Member States. Moreover, innovative statistical methods and data allow us to show that, in the absence of offsetting policy measures and had wages remined constant, material and social deprivation and absolute monetary poverty may have increased substantially in 2022.

At the same time, the euro area labour market has continued to perform strongly, with the unemployment rate remaining at an all-time low of 6.1% until the end of 2022.

With the swift economic recovery in 2021 and strong economic performance in 2022, the labour shortages reported back in 2019, re-emerged quickly in the euro area, especially in services. This indicates that the economic cycle plays a strong role in driving up labour shortages.

Against this background, Section II of this report shows that on top of cyclical factors, labour shortages are also driven by ageing, skills shortages, changes to the patterns of labour mobility, migration as well as poor working conditions in some sectors and occupations. Among skills shortages, the availability of digital skills is of relevance. The pandemic accelerated digitalisation, triggering reallocation pressures. EU instruments such as the Recovery and Resilience Facility, the European Social Fund Plus and Invest EU support a broad range of policies that can be used to reduce labour shortages.

In the long term, demographic ageing will be a permanent drag on economic growth in the euro area, so that growth will depend crucially on productivity. Section III of this issue therefore discusses the trend decline in total factor productivity in the euro area. Such a decline is also seen in other developed economies. The latest figures point to a sluggish medium-term outlook. Prevailing views in the literature on the long-term outlook for productivity growth differ. A downbeat view suggests that innovation has become simply less transformative. As a result, we should not expect a permanent return to a higher growth path. A more optimistic view considers that total factor productivity growth will inevitably rebound once new ground-breaking technologies mature, complementary investments and organisational changes are made, and the necessary new skills acquired. EU programmes like NextGenerationEU and Horizon Europe will not only facilitate the diffusion of existing innovation, but also the creation of new transformative innovation to support the twin green and digital transition.

The final section examines the direct impact of the pandemic on the exports of goods and services by the euro area Member States. The initial drop in aggregate exports from the euro area to the rest of the world was sharper during the pandemic than during the global

financial crisis but the ensuing rebound was also faster. Our analysis shows that the negative impact of lockdown measures weakened over time, suggesting that economic agents learned with each new wave of infections. The section also suggests that vaccination had a significant positive impact on the recovery of exports of services.

I. Inflation and its diverse social consequences across the euro area

By Balint Menyhert

Abstract: *By the end of 2022, the Harmonised Index of Consumer Prices (HICP) had reached double digits in the euro area. Since inflation has been driven mainly by soaring energy and food prices, the structure of consumption expenditure plays a crucial role in determining households' vulnerability to ongoing price developments. Micro-level analysis of European households' expenditure reveals substantial differences both within and between Member States. This translates into uneven increases in living costs across the euro area. Inflation inequality is particularly high in some Member States, but differences in consumption structure also explain a large part of the cross-country variability in current price trends. Household income, social and demographic characteristics and individual factors are all important determinants of the changes in living costs faced by households across the euro area. Moreover, innovative statistical methods and data allow us to quantify the potential social costs of inflation: in the absence of offsetting policy measures, wage developments and behavioural adjustments, material and social deprivation and absolute monetary poverty would have increased by up to 3 and 6 percentage points respectively in 2022. The social effects of inflation can be substantial and largely uneven. Without an effective policy response, they could widen existing inequalities within countries and across the euro area ([1]).*

I.1. Introduction

After decades of low inflation, rising consumer prices present new economic, political and social challenges. According to recent Eurostat figures, the annual inflation in December 2022 was 9.2% in the euro area, with consumer prices increasing by double-digits in half of the Member States. Inflation has been fuelled mainly by surging energy prices that are 25.2% higher on average than a year ago and 57.6% higher than in early 2021. Rising food prices further aggravate the situation, with only the cost of non-energy industrial goods and services remaining largely stable for the time being.

The extent and persistence of ongoing price developments and uncertainty about them raise the question of how these affect European households' finances, purchasing power and social background. This chapter examines some of the most important related aspects and offers some insights into the likely impact of rising prices on poverty and households' living conditions in the euro area. Its main conclusion is that the negative welfare effects and possible social consequences of inflation are substantial among vulnerable groups and particularly worrying in low-income Member States. Unless offset by targeted and effective support measures, high inflation could increase economic inequalities across and within euro area countries, eroding social cohesion and macroeconomic convergence.

The socio-economic findings in this section are preliminary and subject to various limiting assumptions. First, they rely on a snapshot of observed price developments as of December 2022 and are liable to changes as inflation trends and profiles keep evolving over time. Second, they are subject to various limiting assumptions where (1) official HICP data adequately represent price trends faced by different household types at national level; (2) the observed structure of household expenditure remains constant over time; and (3) recent income support measures and ongoing adjustments to households' available financial resources are not considered ([2]). Taking these features into account, this analysis does not

([1]) The author works in the 'Economic and Financial Resilience' Unit of the 'Fair and Sustainable Economy' Directorate within the Joint Research Centre (JRC), the Commission's science and knowledge hub. He wishes to thank Luisa Boa, Puck Boom, Karolina Gralek, Eric Ruscher and Matteo Salto for useful help, comments and suggestions. This section represents the author's views and not necessarily those of the European Commission. A more detailed and comprehensive version of this work is Menyhért, B. (2022). The effect of rising energy and consumer prices on household finances, poverty and social exclusion in the EU, *JRC Science for Policy Report*, JRC130650, and available for download here.

([2]) For a discussion on the recent and ongoing policy response by national governments to the energy and living cost crisis, as well as their potential social effects, see OECD (2022). Income support for working-age individuals and their families; OECD (2022). Minimum wages in times of rising inflation; Bethuyne, G., A. Cima, B. Döhring, A. J. Lindén, R. Kasdorp, and J. Varga (2022). Targeted income support is the most social and climate-friendly measure for mitigating the impact of high energy prices, VoxEU; Sgaravatti, G., S. Tagliapietra and G. Zachmann. (2021). National policies to shield consumers from rising energy prices, Bruegel Datasets; as well as the EU PolicyWatch dataset by Eurofound.

aim to accurately describe actual ongoing social developments, but rather to provide a flexible analytical framework for predictive analysis under various real and hypothetical scenarios.

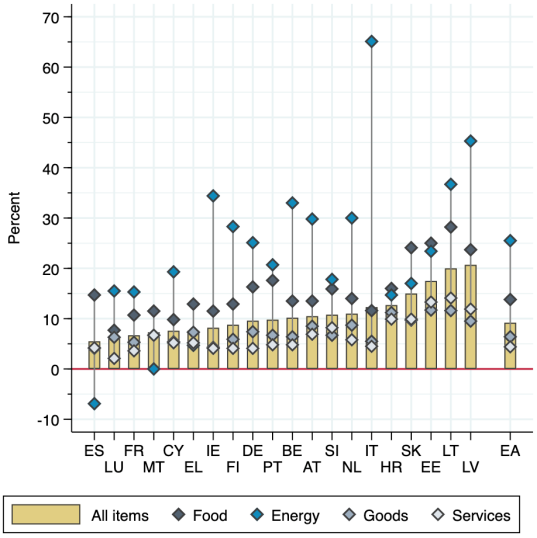
I.2. Patterns of inflation across countries and product categories

After decades of price stability, the euro area has been experiencing soaring consumer prices from early 2021 onwards. Recent Eurostat figures indicate that, following a peak of 10.6% in October, headline annual HICP inflation in the euro area remained above 8% in the first quarter of 2023. This level is much higher than what European policy makers and households were accustomed to. It recalls the inflationary episodes of the 1970s and 1990s that produced a widespread social, economic and political distress. It is well documented that current inflation is driven mainly by soaring energy prices and is fuelled in no small part by the war in Ukraine and its collateral effects. Food is another product category with above-average inflation (13.8% in 2022), while increases in the price levels of non-energy industrial goods and services have remained relatively contained so far (6.4% and 4.4%, respectively). Despite inflation falling since October 2022, the Commission's 2023 Winter Economic Forecast still projects average inflation to remain 5.6% in the euro area and 6.4% across the EU in 2023 ([3]).

From a social perspective, the structure and heterogeneity of inflation profiles are just as relevant as the inflation rate itself. While the broad inflationary pressures are similar throughout the euro area, cross-country differences in market conditions, resource utilisation, fiscal policy, consumption patterns and regulatory environment imply that the trajectory and composition of consumer price trends have been rather uneven across Member States. Graph I.1 shows the main HICP indicator for annual inflation as of December 2022 and reveals that national figures vary between 5.5% (in Spain) and 20.7% (in Latvia). Breaking down the year-on-year price increases by main product category, the figure also reveals that energy price inflation varies greatly across countries (ranging from -6.9% in Spain to 65.1% in Italy) and food price inflation is highly volatile (ranging from 7.7% in Luxembourg to 28.2% in Lithuania). In 2022, inflation for non-energy industrial goods and services remained more contained and below the headline HICP figure in all euro area Member States.

Somewhat surprisingly, cross-country variation in these price components is statistically strongly related to food price inflation, but uncorrelated with energy price inflation ([4]). This suggests that the pass-through of the energy price hikes to other product categories and core inflation has remained rather muted so far ([5]).

Graph I.1: **HICP inflation as of December 2022 by country**



(1) Data (as of December 2022) on annual HICP inflation by country and main consumption by purpose (COICOP) category.
Source: Eurostat (series pcr_hicp_manr)

An in-depth understanding of the causes of cross-country volatility in food and energy price trends will require considerable research and analysis. While the contribution of national and institutional factors is clearly important, it is worth highlighting that a lot (56%) of the cross-country variation in headline HICP rates across the euro area is

([3]) This is in line with the ECB's recent inflation outlook. For details, see the Eurosystem staff macroeconomic projections for the euro area as of December 2022, or the dedicated ECB website.

([4]) The cross-country correlations of non-energy industrial goods and services inflation with respect to food price inflation are 79% and 89%, respectively. The corresponding correlation coefficients with respect to energy price inflation are 13% and 16%, respectively.

([5]) For historical pass-through estimates in the context of the euro area, see Conflitti C. and M. Luciani (2017). Oil price pass-through into core inflation. *Banca d'Italia Occasional Papers*, Nr. 405. Note that other factors could explain the low correlation with energy. For instance, consumer energy prices have been heavily distorted by government measures.

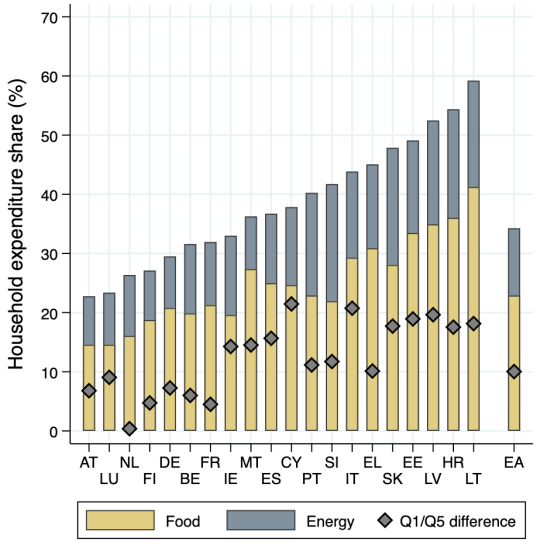
explained by differences in households' expenditure structure. As of December 2022, each percentage point increase in the combined food and energy expenditure share in a country was associated, on average, with the headline inflation rate 0.33 percentage points (pps) higher. This suggests that low-income Member States were likely to experience higher overall inflation even with uniform price trends, and face bigger socio-economic challenges compared to high-income countries that spend relatively more on goods and services.

I.3. Large cross-sectional variations in households' consumption patterns

To analyse the diverse impact of inflation, it is important to study households' consumption patterns and expenditure structure. Since current price trends are driven mainly by soaring food and energy prices, low-income households that tend to spend a relatively high share of their income on essential items and have less elastic consumer demand are at a disadvantage ([6]). This inequality aspect of inflation has traditionally received little scholarly or policy attention, but efforts to measure the gap between the perceived inflation rates experienced by low-income and high-income households have multiplied recently ([7]). Despite differences in scope, data and methodology, these studies confirm the existence of growing income-based inflation gaps that amount to multiple percentage points ([8]).

The detailed analysis of European households' expenditure patterns helps us better understand the main reasons for this phenomenon. Using microdata from the latest available wave of the EU Household Budget Survey (EU-HBS) from 2015, consumer spending can be differentiated between the main product categories of food, energy, (non-energy) industrial goods and services in line with the official COICOP classification by Eurostat ([9]). Empirical evidence shows that households in low-income Member States or with below-median income devote a much higher share of their total budget spending to food and energy than higher-income segments of the euro area population.

Graph I.2: **Structure of household expenditures in euro area countries**



(1) The bars represent the average share of food and energy expenditures in households' total consumption by country. The markers denote the difference in the combined food and energy expenditure share across households of the first (Q1) and fifth (Q5) income quintiles in each country.
Source: Own analysis of microdata from the 2015 wave of the EU-Household Budget Survey (see Menyhért, 2022). Data for Austria are based on aggregate figures by Eurostat [series HBS_STR_T211 and HBS_STR_T223].

Graph I.2 reveals the extent of these gaps. It shows that the combined expenditure share of food and energy ranges from 23% (in Austria) to 60% (in Lithuania) between euro area Member States. The degree of cross-country variability is similar across the food and energy components (i.e. the coefficient of variation is 28% in both cases), but –

([6]) Essential items are hard to define and may vary across individuals and populations. Pillar 20 of the European Pillar of Social Rights provides a non-exhaustive list of such items that include water, sanitation, energy, transport, digital and financial services. In the context of the current analysis, the product categories of food and energy will be considered as essential.

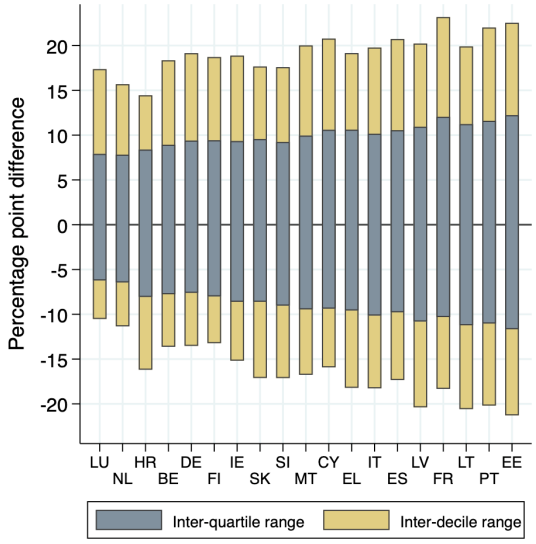
([7]) See Kaplan, G. and S. Schulhofer-Wohl (2017). Inflation at the household level, *Journal of Monetary Economics*, Vol. 91; Gürer, E. and A. Weichenrieder (2020). Pro-rich inflation in Europe: Implications for the measurement of inequality, *German Economic Review*, Vol. 21; Villani, D. and G. Vidal Lorda (2022). Whom does inflation hurt most?, *JRC Science for Policy Brief*, JRC129558; and Menyhért, B. (2022). The effect of rising energy and consumer prices on household finances, poverty and social exclusion in the EU, *JRC Science for Policy Report*, JRC130650.

([8]) See Charalampakis, E., Fagandini, B., Henkel, L. and C. Osbat (2022). The impact of the recent rise in inflation on low-income households, *ECB Economic Bulletin*, 7/2022 for further details. For detailed statistics on inflation inequality and its drivers in the EU, see the Briegel dataset by Claeys, G. and L. Guetta-Jeanrenaud, C. McCaffrey and L. Welslau (2022). In a small number of cases and reference periods, inflation inequality can also benefit low-income households – see Möhrle, S. and T. Wollmershäuser (2021). Zu den Verteilungseffekten der derzeit hohen Inflationsraten, *Ifo Schnelldienst*, 16/2021.

([9]) See Menyhért, B. (2022). The effect of rising energy and consumer prices on household finances, poverty and social exclusion in the EU, *JRC Science for Policy Report*, JRC130650, and Eurostat (2018). Harmonised Index of Consumer Prices (HICP).

given its higher expenditure share in most countries – the food component is the main driver of cross-country differences in household spending on essential items. Graph I.2 also reveals that household spending on food and energy also varies considerably within countries. The gap between the lowest (Q1) and highest (Q5) quintiles amounts to 9.9 pps at the euro area level and ranges between 0.3 pps (in the Netherlands) and 21.4 pps (in Cyprus). This suggests that low-income households are in a rather precarious position in most Member States, and at a double disadvantage in many Central and Eastern European countries.

Graph I.3: **Mean dispersion of household expenditures on food and energy within income quintiles**



(1) The figures represent the mean within-quintile dispersion of households' combined food and energy expenditure share around the respective quintile-specific median by country. Figures for Austria are missing due to data unavailability.
Source: Own analysis of EU-HBS microdata from 2015.

Another noteworthy aspect of households' consumption structure is the large variability within national populations. Even after controlling for income and socio-economic characteristics of households, available budget survey microdata reveals considerable heterogeneity and suggests that similar household types may spend vastly different amounts on essential goods and services. Graph I.3 shows the typical dispersion of households' joint food and energy expenditure share around the income quintile-specific median by country ([10]). The graph suggests that many households spend considerably more (or less) on food and energy than what is typical in their respective income bracket. Indeed, the inter-quartile range (25-75%) of food and energy spending varies between 14.1 pps (in Luxembourg) and 23.9 pps (in Estonia), while the inter-decile range (10-90%) varies much more, namely between 27.0 p.p. (in the Netherlands) and 43.8 pps (in Estonia) ([11]). This also highlights how summary statistics (such as average expenditure shares) can obscure important additional sources of variation across households and may understate the true financial risks and social implications associated with inflation or economic distress.

Moreover, the social and demographic characteristics of households play a rather limited role in explaining the cross-sectional variation in observed expenditure shares within countries ([12]). Regression analysis of national data not reported here shows that, on average, observable characteristics like disposable income, settlement type of residence, household size and composition explain only 18.3% of all variation in households' expenditure shares within countries in the euro area. The share of explained variation is around 30% in countries where income or urban-rural gaps are substantial (such as Cyprus or Slovakia). However, it is less than 10% in Member States with no major socio-demographic differences across population groups (such as Belgium or the Netherlands). This suggests that, to better understand household consumption patterns and their drivers, statistical data collection and analysis need to incorporate new, previously unexplored domains and dimensions (such as living conditions, purchasing habits, access to essential services etc.).

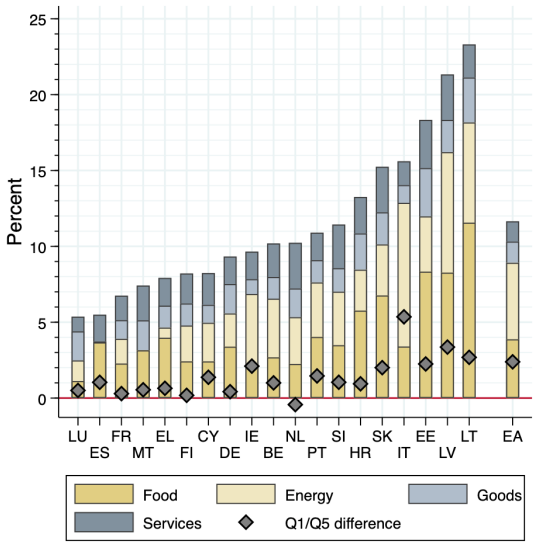
I.4. Uneven effects of inflation on households' cost of living

By combining the inflation profiles and the structure of household expenditures discussed in the previous sections, it becomes possible to

([10]) In other words, it presents the arithmetic average of the five quintile-specific inter-quartile ranges and inter-decile ranges, respectively, in each country.
([11]) The inter-quartile range (IQR) is a measure of statistical dispersion, and in particular the spread, of a particular variable. It is defined as the difference between the 75th and 25th percentiles of the data. The inter-decile range (IDR) corresponds to the difference between the 90th and 10th percentiles of the data and is characterised by similar statistical properties.
([12]) See Menyhert (2022) quoted.

calculate the change in households' living costs and purchasing power in a customised manner. In practice, this means taking the weighted-average of each main inflation component by product category, whereby the relevant expenditure shares of target households are used as weights. Households that spend a higher proportion of their budget on product categories with relatively high inflation will see a higher increase in their cost of living and bigger losses in purchasing power and real income.

Graph I.4: **The size and structure of households' living cost adjustments due to inflation by country (2022)**



(1) The bars represent the implied overall change in living costs of European households with average expenditure shares in each product category by country in 2022. The markers represent the percentage point difference in total living cost adjustments between the 1st and 5th income quintiles by country. The relevant figures for Austria are missing due to data limitations.
Source: Own calculations based on annual HICP inflation data from Eurostat and microdata from the 2015 wave of the EU-HBS.

This procedure is the standard approach to analysing the distributional aspects of inflation. The two underlying assumptions are that headline HICP inflation adequately captures the change in consumer prices for all population segments, and that substitution effects are negligible, and households retain their consumption structure even in the face of changing relative prices ([13]). The figures in Graph I.4 show that living costs increased by 12.4% on average across the euro area in 2022, ranging from 6.1% (in Luxembourg) to 25.4% (in Lithuania) at Member State level ([14]). The figures also reveal that food and energy expenditures are the main drivers of the rise in living costs (33.3% and 32.3% on average, respectively), whereas the cost impact of non-energy industrial goods and services remains limited in most countries (except for Luxembourg and Malta).

Graph I.4 also shows the difference in the cost-of-living adjustments between low-income and high-income households as a result of their different consumption structure. Due to typically higher food and energy expenditure shares among low-income households, the gaps in living cost adjustments between the lowest and highest income quintiles is positive and amounts to 1.6 pps on average across the euro area. National figures range from -0.4 pps in the Netherlands to 5.7 pps in Italy and reflect the extent of within-country divergence in consumption structure. In countries where the household consumption structure is rather similar, with food and energy expenditure increasing elastically with income (as in Germany, the Netherlands or Sweden), inflation inequality remains very low. On the other hand, in countries where low-income households spend a visibly higher proportion of their budget on essential items, inflation inequality is very high and exposes low-income households to much higher losses in purchasing power. Graph I.4 also indicates a strong correlation between the average level of living cost adjustment and Q1/Q5 gap across countries. This suggests that low-income population segments of the euro area tend to be at a double disadvantage.

([13]) Neither of these assumptions are likely to hold true in reality. First, a sizeable empirical literature documents cross-sectional variations in consumer prices within countries, and the analysis of household scanner data also reveals considerable inflation differences between low-income and high-income population segments. With respect to substitution effects, available empirical evidence is rather limited and circumstantial. (For more details and references, see Kaplan, G. and S. Schulhofer-Wohl (2017). Inflation at the household level, *Journal of Monetary Economics*, Vol. 91, and Menyhért, B. (2022). The effect of rising energy and consumer prices on household finances, poverty and social exclusion in the EU, *JRC Science for Policy Report*, JRC130650.) Despite these shortcomings and given the amount of systemic information currently available to European policy makers, the figures represent the best estimates for the change in households' living costs at the proposed level of consumption granularity.

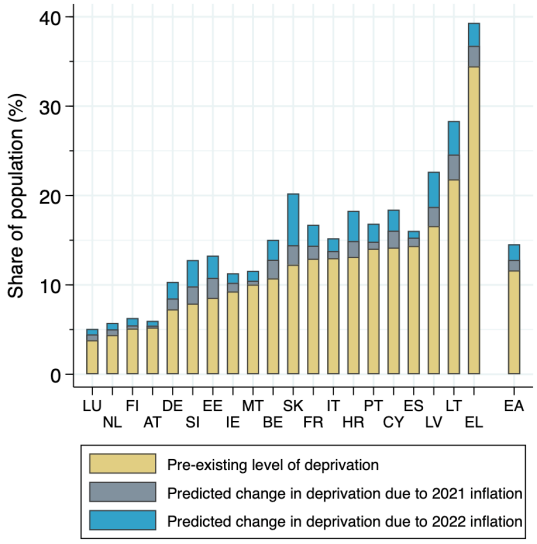
([14]) Given the use of different consumption weights and less granular product categorisation, the living cost adjustments in Graph I.4 are not exactly the same as the HICP inflation data produced by Eurostat.

I.5. Assessing the social consequences of inflation

In the absence of wage developments and government support measures, increases in households' living costs translate directly into commensurate losses in purchasing power and real disposable income ([15]). Quantifying the effects of inflation on key indicators of poverty and social exclusion is nevertheless far from straightforward. Part of the reason lies with data lags and limitations to European household surveys on income and consumption. However, equally important is the fact that many leading EU social policy indicators (such as the AROPE rate for the share of the population 'at risk of poverty and social exclusion') are either non-monetary or only indirectly affected by changes in households' cost of living. Box I.1 gives a brief overview of the different approaches to poverty measurement and social monitoring in the EU.

This section discusses the potential effects of inflation on poverty and social exclusion indicators that are responsive to changes in households' purchasing power. The analysis is based on relatively simple comparative statics and focuses on the partial effect of inflation, while disregarding the potential impact of income growth, government support, demand substitution or other behavioural changes and interventions. As a result, the inflation effects outlined should not be taken as a literal description of current social reality, but rather as potential mechanistic consequences in a hypothetical and unmediated socio-economic system ([16]).

Graph I.5: **The potential effect of inflation on material and social deprivation by country**



(1) The bars represent the pre-existing level and predicted change in the MSD rate, as calculated from the change in households' living cost adjustments and estimated real income elasticities.
Source: Own analysis of microdata from the 2019 wave of the EU-SILC based on Menyhért (2022).

The first indicator under consideration is the material and social deprivation (MSD) rate based on EU statistics on income and living conditions (EU-SILC). This MSD rate – along with the severe MSD rate as part of the AROPE framework – indicates households' enforced inability to afford certain necessary or desirable items needed for an adequate standard of living. As a composite non-monetary indicator across 13 sub-categories, it records the share of the population experiencing deprivation in at least five areas. To capture the inflation effects on MSD, we can employ a regression-based model that identifies ongoing (within-household) changes in deprivation over time from historical cross-sectional (between-household) differences (see Box I.2 for details on the methodology.) Scaling up the estimated income elasticities by the appropriate living cost change by country yields the predicted increase in the MSD rate. This amounted to 1.76 pps as a result of 2022 inflation and 2.94 pps in 2021-2022 across the euro area. National figures for 2021-2022 vary between 0.7 pps in Austria and 8 pps in Slovakia, reflecting large cross-country differences in both the income elasticity of deprivation and size of the living cost shock (Graph I.5).

([15]) Real income is calculated by dividing nominal income by the price level and measures the amount of goods and services that can be purchased with a given level of income. Since the change in the cost of living refers to the change in inflation faced by a particular population segment, the change in the relevant households' real income amounts to the cost of living change with an opposite sign by construction. Change in purchasing power and real income are therefore used interchangeably from now on.

([16]) The relationship between the (unobservable) true effects of inflation and the (hypothetical) partial effects presented in this article is not clear or straightforward. Income support measures (especially targeted ones) and demand substitution away from high-inflation food and energy goods are widely expected to mitigate the measurable social consequences of inflation. On the other hand, important factors (e.g. heterogeneity of item-level and local price trends, idiosyncratic cross-sectional dispersion of household expenditures) and potential second-order effects (e.g. relative price-effects, deprivation trade-offs) are not (yet) known. We should therefore not consider the resulting calculations as upper bounds to the true social effects of inflation.

Box I.1: Measuring poverty and social exclusion in the EU

Poverty and social exclusion are complex and multi-dimensional concepts, and are measured in a number of ways ([1]). In the EU, existing national and EU-level indicators used in the context of the Social Protection Performance Monitor, the Joint Assessment Framework or the revised Social Scoreboard provide comprehensive coverage of various aspects of poverty, inequality and social exclusion ([2]). The different targets and indicators vary considerably in terms of measurement scope, operative function and policy relevance ([3]).

Different approaches to conceptualising and measuring poverty tend to focus on different aspects, forms and dimensions of the social situation. As a complex phenomenon, poverty can be measured in a multi-dimensional way covering a wide range of deprivation areas, but also in terms of its most salient aspect – the financial resources of individuals or households. Such a uni-dimensional measurement is often focused on monetary aspects related to households' income or consumption. These are imperfect proxies of individual well-being, but are found to be instrumental for, and a crucial determinant of, the fulfilment of individuals' capabilities and basic needs. It is worth noting that not all uni-dimensional poverty measures are of a monetary character, especially the ones that target deprivation from particular thematic perspectives (such as energy poverty or transport poverty). Among the most widely-used and policy-relevant monetary indicators, a certain duality prevails in terms of whether poverty is (i) primarily an objective social construct or a subjective phenomenon based on individuals' own perception; and (ii) refers to relative inequalities or absolute deprivation. These two perspectives are often closely connected in practice (i.e., inequalities often leave people so far behind that they fail to meet even their most basic needs), but often imply very different standards for measurement. Absolute poverty indicators are based on some concept of basic needs and focus on minimum acceptable standards of living at the level of individuals and households. The more recent concept of relative poverty, on the other hand, emphasises the importance of prevailing (context-specific) standards of material and social development, and focuses mainly on inequalities, deprivations and the social exclusion process. While there has recently been a convergence and growing compatibility between absolute and relative indicators, considerable conceptual differences and practical challenges remain – especially when it comes to international measurement. Table A provides a summary of the various measurement approaches ([4]).

Table A: Schematic overview of the main approaches to poverty measurement

POSSIBLE DIMENSIONS				EXAMPLES
Uni-dimensional	Monetary	Absolute	National	ISTAT poverty thresholds in Italy
			International	International Poverty Line (IPL) Absolute poverty thresholds for the EU (ABSPO)
		Relative	National	At-risk-of-poverty (AROP) indicator
			International	EU-wide AROP measures
		Subjective		Subjective poverty lines (SPL)
	Non-monetary			Poverty lines based on food energy intake (FEI) Thematic poverty concepts (e.g. energy poverty)
Multi-dimensional				Material and social deprivation (MSD) Global Multidimensional Poverty Index (MPI)

Notes: Own illustration based on United Nations (2018) and Menyhért et al. (2021)
Source: European Commission

Despite the multitude of existing social indicators, only a selected few are directly affected by inflation and changing living costs. This also holds for the EU's headline social indicator, the share of the total population at risk of poverty or social exclusion (AROPE) – a composite of both uni-dimensional and multi-dimensional

([1]) For further details, see Atkinson, A. B., A-C. Guio and E. Marlier (eds.) (2017). Monitoring Social Inclusion in Europe
([2]) For further details, see the dedicated Commission and Eurostat websites.
([3]) For further details, see United Nations (2018). Guide on Poverty Measurement and OECD (2019). Society at Glance.
([4]) For further details and discussion, see Ravallion M. (2016). The Economics of Poverty: History, Measurement, and Policy, or see Menyhért, B., Zs. Cseres-Gergely, V. Kvedaras, B. Mina, F. Pericoli and S. Zec (2021.) Measuring and monitoring absolute poverty (ABSPO) – Final Report, JRC127444.

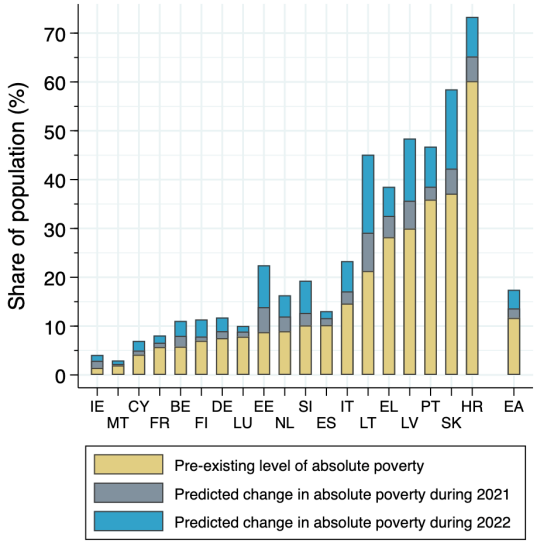
(Continued on the next page)

Box (continued)

elements. Its first component, the at-risk-of-poverty (AROP) rate, is based on a relative threshold (i.e. 60% of the national median equivalised income) and is unaffected by purchasing power considerations. Its second (non-monetary) component of low-work-intensity is driven by changes in individuals' and households' labour force participation. The third AROPE component, the multi-dimensional indicator of (severe) material and social deprivation, refers to an absolute minimum standard and responds (indirectly) to shifts in households' living costs.

The positive correlation between the pre-existing MSD rates and the predicted changes suggests that current inflation is widening existing social inequalities within the euro area.

Graph I.6: **The potential effect of inflation on absolute monetary poverty by country**



(1) The bars represent the pre-existing level and predicted change in the absolute poverty (ABSPO) rate (see Menyhért et al. (2021) for details), as calculated on the basis of households' living cost adjustments.
Source: Analysis of microdata from the 2019 wave of the EU-SILC based on Menyhért (2022).

The second measure is that of absolute monetary poverty. Here we could rely on the set of novel explorative cross-country comparable absolute poverty thresholds that a recent European Commission initiative ('Measuring and monitoring of absolute poverty – ABSPO') produced for EU countries ([17]) at the analytical level. Since the relevant ABSPO poverty lines are explicitly designed and constructed to reflect households' basic needs and minimum living costs, they can be easily adjusted to capture real or hypothetical changes in households' financial position and poverty status due to inflation. Graph I.6 shows the pre-existing level and predicted change due to inflation in absolute poverty across the euro area. Absolute poverty is estimated to have increased by 3.4 pps on average during 2022, and by 5.7 pps during the 2021-2022 period. The relevant national figures for 2021-2022 vary between an increase by 1 p.p. (in Malta) and by 23.8 pps (in Lithuania – light blue bars), reflecting large differences in the size of the population with financial resources only slightly above the pre-existing ABSPO thresholds. The graph also shows that the polarisation between Member States with below-average and above-average poverty rates is considerably larger when compared to material and social deprivation. This implies that more than 11 million more people across the euro area would have been at risk of failing to attain the minimum standards for a decent living in the absence of support measures.

([17]) Menyhért, B., Zs. Cseres-Gergely, V. Kvedaras, B. Mina, F. Pericoli and S. Zec (2021). Measuring and monitoring absolute poverty (ABSPO) – Final Report, JRC127444. The ABSPO poverty lies are derived from the existing deprivation index by assigning a monetary value to each item used to compute deprivation. The (severe) material deprivation rate measures the percentage of the population that cannot afford at least three (four) of the following nine items: (i) to pay their rent, mortgage or utility bills; (ii) to keep their home adequately warm; (iii) to face unexpected expenses; (iv) to eat meat or proteins regularly; (v) to go on holiday; (vi) a television set; (vii) a washing machine; (viii) a car; (ix) a telephone. Note that in the ABSPO families that cannot afford one of those items are below the threshold, which tends to increase the poverty rate.

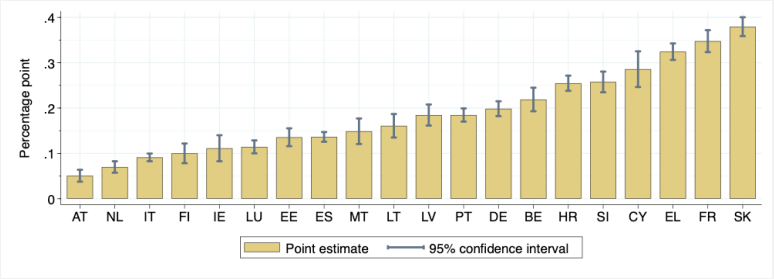
Box I.2: **Modelling the effect of inflation on material and social deprivation**

Empirical evidence from EU-SILC microdata indicates a strong and stable statistical relationship between the level of household income and the incidence of material and social deprivation (MSD) in EU countries ([1]). MSD is highly concentrated among low-income households and decreases exponentially from one income decile to the next, at a constant rate of around one third on average.

Using these insights, we can assess the impact of rising prices on the deprivation rate by focusing on the corresponding change in households' purchasing power and real income. As it is not possible to observe within-household changes in real income over the recent inflationary period due to the lack of available data, using cross-sectional comparisons appears to be the only feasible option. In fact, we could identify the deprivation effects of real income changes from a single EU-SILC wave using cross-sectional elasticities. Instead of observing the same households (or household types) and documenting their MSD status repeatedly during the recent inflationary period, we can focus on the historical difference in deprivation rates across households with different real (and nominal) income positions at a single point in time as a suitable proxy.

For this strategy to work, three conditions need to hold. First, the deprivation probability of a given household type should be determined (primarily) by its level of current income (rather than, e.g., wealth or past savings). Second, conditional on real disposable income, changes in relative prices should not (substantially) affect the deprivation likelihood of a given household. Third, the institutional framework should remain (relatively) stable so that a given level of real income corresponds to similar levels of deprivation incidence over time ([2]).

Figure A: Predicted increase in MSD associated with 1% decrease in real household income.



Notes: Own calculations based on microdata from the 2019 wave of the EU-SILC. The figures present regression-based estimates of income elasticity of MSD on a separate national sub-sample of households with below-median income, and denote the predicted percentage point change in MSD associated with 1% decrease in real household income. The figure also shows the 95% confidence bands around the point estimates.
Source: EU-SILC

Assuming that these conditions hold ([3]), we can estimate the income elasticity of MSD using a simple (sample-weighted) OLS techniques on household-level microdata from the latest pre-COVID and pre-inflation EU-SILC wave (2019). The regression specification features the binary indicator variables of MSD (or severe MSD) as the dependent variable, with household income and socio-demographic controls (on settlement type, household size and composition) on the right-hand side:

$$y_h = \alpha + \beta \log(income_h) + \gamma^T X_h + \varepsilon_h$$

([1]) See Menyhért, B., Zs. Cseres-Gergely, V. Kvedaras, B. Mina, F. Pericoli and S. Zec (2021). Measuring and monitoring absolute poverty (ABSPO) – Final Report, JRC127444.
([2]) These conditions are not specific to the cross-sectional identification proposed above, and would need to hold equally for a longitudinal analysis of dynamic within-household deprivation patterns over time.
([3]) Ascertaining the empirical validity of these conditions goes beyond the scope of this analysis. Based on available empirical evidence, they appear rather realistic: the saving rate among financially-constrained households is very low, and most households with deprivation have limited means to substitute demand in the wake of changes in relative prices.

(Continued on the next page)

Box (continued)

where $y_h \equiv \mathrm{I}(MSD_h)$ is an indicator of the MSD status of household h, income denotes total equivalised disposable household income, and X_h represents the vector of controls. The main elasticities ($\hat{\beta}$) are obtained by estimating this model separately on the sub-sample of households with below-median (equivalised) income in each country.

This setup can therefore be considered as a standard linear probability model that identifies the percentage point change in deprivation associated with a proportionate (1%) increase in household income across different household types. The relevant elasticities are highly robust, statistically significant, and vary considerably between 0.05 (in Austria) and 0.36 (in Slovakia). This demonstrates divergent degrees of deprivation sensitivity to income shocks across the euro area (Figure A) ([4]). Scaling up these elasticities proportionally by the observed change in households' living costs yields the partial effect of inflation on MSD in a country.

([4]) The country-level differences are mostly driven by differences in the overall level and income concentration of material and social deprivation in a country.

I.6. Concluding remarks and policy implications

The main conclusions of this analysis are robust: the negative welfare and social effects of current inflation can be substantial for low-income households in the euro area in the absence of policy measures. Given the large cross-country differences in price developments and household consumption patterns, the social implications are rather different across Member States. Low-income or vulnerable segments of national populations face particularly high risks of financial distress and poverty – especially in Italy, the Baltic states and Central and Eastern Europe. In the euro area, inflation has increased households' cost of living by 9.7% on average in 2022, and by about 16.3% since the beginning of 2021. In the absence of income growth, government support and demand substitution, this would have raised the MSD rate by up to 3 pps and the incidence of absolute poverty by up to 6 pps in the euro area in 2022. The large and uneven social effects of inflation put vulnerable groups in an even more precarious position, risks increasing inequality and eroding social cohesion across the euro area.

This called for a strong and multi-faceted policy response. In response to the spiking energy prices in 2022, Member States have implemented emergency policy measure to support vulnerable households and companies. While incoming empirical evidence suggests that these have been effective at offsetting the immediate negative social consequences of high inflation ([18]). However, the measures adopted have been poorly targeted and have proven costly. In addition, about two-third of the amounts consist in price measures which distort the price signal and reduce incentives for energy savings ([19]).

Over the medium term, a key social policy challenge lies in ensuring that social protection systems effectively address the high inflation. Absent renewed energy price shocks, emergency support measures should be gradually phased out and, in any case, their design, shoud be improved to ensure that they are targeted to the most vulnerable ([20]). The broader and long-term policy objective is to align protective measures with the strategic EU priorities of the twin transitions, the climate objectives of the European Green Deal, and the social fairness agenda of the European Pillar of Social Rights – which requires large social investments, structural reforms and coordinated policy initiatives across a wide range of policy areas.

([18]) See, among many, Amores A., S. Barrios, R. Speitmann and D. Stoehlker (2023). Price Effects of Temporary VAT Rate Cuts: Evidence from Spanish Supermarkets, JRC Science for Policy Brief, JRC132542, or OECD (2022). Minimum wages in times of rising inflation.

([19]) See Bethuyne, G., Cima, A., Döhring, B., Johannesson Lindén, A. Kasdorp, R. and J. Varga, "Targeted income support is the most social and climate-friendly measure for mitigating the impact of high energy prices", VoxEU.org, 6 June 2022.

([20]) For a discussion on income support measures taken recently by national governments to the energy and living cost crisis, as well as their potential social effects, see OECD (2022). Income support for working-age individuals and their families; OECD (2022). Minimum wages in times of rising inflation; ; Sgaravatti, G., S. Tagliapietra and G. Zachmann. (2021). National policies to shield consumers from rising energy prices, Bruegel Datasets; as well as the EU PolicyWatch dataset by Eurofound.

II. Short- and long-run determinants of labour shortages

By Alfonso Arpaia and Anita Halasz

Abstract: *With the swift economic recovery in 2021, labour shortages re-emerged quickly. The lack of labour was reported in several industries, especially the labour-intensive ones. This is not a new phenomenon, as high shortages were reported already in 2019, and their decline during the pandemic was only temporary. After the start of Russia's invasion of Ukraine, labour shortages in the EU kept rising, especially in services, with some signs of lessening towards the end of 2022 as the economy slowed. This suggests that the economic cycle plays a strong role in driving up labour shortages. The cross-country and cross-sectoral patterns of labour shortages during the recovery have followed pre-pandemic patterns, suggesting that besides cyclical drivers, long-term factors constraining the supply of labour, such as the ageing of the population, are also influence labour shortages. In addition to demographic changes, other drivers include skills shortages driven by the digital and green transitions and other ongoing structural changes, changes to the patterns of labour mobility, migration and poor working conditions in some sectors and occupations. Regarding skills shortages, the availability of digital skills is of particular relevance for labour shortages. Policies tackling the structural causes of labour shortages are necessary to ensure that growth prospects are not hampered in the medium and long term. In particular, these policies should support labour market transitions to improve the efficiency of job matching and anticipate potential skills imbalances stemming from the two transitions. Policies that support labour market participation and reallocation can help reduce shortages. In addition, labour mobility and migration policies can also help reduce skill shortages. Yet movement of labour around the EU may just redistribute shortages among Member States, as scarcity in certain occupations is widespread. EU policies support a broad range of policies that can be used to reduce labour shortages, in particular under the European Pillar of Social Rights Action Plan and the European Semester and EU instruments such as the Recovery and Resilience Facility, the European Social Fund Plus and Invest EU.*

II.1. Introduction ([21])

Labour shortages exist when employers cannot find the workers needed to fill vacancies. This occurs when the demand for labour exceeds the available supply for a given skill set, at the particular level of wages and working conditions, at a specific location, and point in time ([22]). It is useful to distinguish quantitative from qualitative shortages ([23]). In quantitative shortages, the total supply of labour (i.e., for all sectors and occupations) is below the total demand for labour. Qualitative shortages occur if labour demand exceeds labour supply in a specific sector, occupation, or at a specific skill level. Skill shortages are a major driver of qualitative labour shortages. Seasonal patterns (e.g., in services or agriculture) or geographical imbalances between labour demand and supply can also drive labour shortages.

Evidence demonstrates that the level of labour shortages in the EU has been rising over the last decade. The European Business and Consumer Surveys (EU-BCS) collect quarterly data from employers in manufacturing, services, and construction, asking whether labour shortages are a major factor limiting their production ([24]). According to the EU-BCS, shortages reached a peak at the end of the past decade. The increasing trend was interrupted by the pandemic, but it has reappeared forcefully since. Labour shortages have appeared increasingly on the policy agenda, amid concerns by policy makers and employers/trade unions about their effects on employment and economic growth ([25]).

This section focuses on the determinants of labour shortages and discusses the implications for policies. It is structured as follows. First, it provides an overview of ongoing trends and developments

([21]) An extended version of this paper has been published the 2022 Labour Market and Wage Developments in Europe report published by DG Employment, Social Affairs and Inclusion. The report contains further analysis on the impact of labour shortages on wages and on the links between the inflow of displaced persons from Ukraine and labour shortages.

([22]) Barnow, Trutko and Piatak, 2013.

([23]) Dafne Reymen & Maarten Gerard & Paul de Beer & Anja Meierkord & Marii Paskov & Valentina di Stasio & Vicki Donlevy & Ian Atkinson & Agnieszka Makulec & Ulrike Famira-Mühlberger & Hedwig Lutz, 2015. "Labour Market Shortages in the European Union," WIFO Studies, WIFO, number 58151.

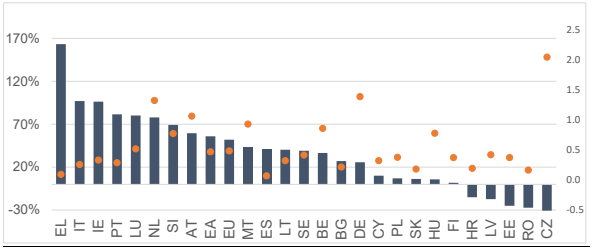
([24]) Services exclude wholesale and retail trade.

([25]) Persistent qualitative labour shortages delay the adoption of new technologies and the opportunities provided by the green and digital transitions. Quantitative labour shortages, especially if combined with supply chain issues, can temper economic activity.

in labour shortages across the EU Member States. Second, it analyses the influence of the short- and long-term determinants of labour shortages, also based on findings from regression analysis.

II.2. Trends and developments in labour shortages and mismatches

Graph II.1: **Change in the vacancy-unemployment ratio from 2019 Q3 to 2022 Q3 (%)**



The blue bars represent the percentage change in the vacancy-unemployment ratio between 2019 Q3 ans 2022 Q3 (lhs). The red dots (rhs) represent the value in 2022 Q3.

Source: Own calculations, Eurostat. Job vacancy data are not available for DK and FR.

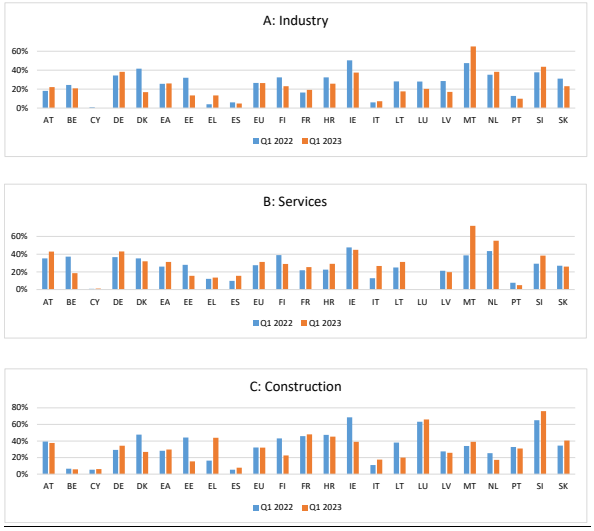
Before the pandemic, labour shortages had been increasing and reached a historical peak in the euro area ([26]). Between 2013 to 2019, when the euro area employment rate was rising from 67.6% to 72.5%, there was in parallel an increase in labour shortages according to several indicators. The proportion of businesses indicating that labour was a factor limiting production increased fivefold in construction, quadrupled in manufacturing and more than doubled in the service sector. Similarly, the job vacancy rate in the euro area, a measure of the unmet demand for labour rose over the same period to 2.2%, its highest value since 2006 ([27]). In 2020, containment measures linked to the pandemic and the resulting economic disruptions led to a decline in labour shortages in almost all Member States as many firms withdrew their job openings.

([26]) The rise in labour shortages in manufacturing and construction was larger for the median euro-area country than for the median non euro-area country; for services there is no difference.

([27]) A *job vacancy* is defined as a paid post that is newly created, unoccupied, or about to become vacant: for which the employer is taking active steps and is prepared to take further steps to find a suitable candidate from outside the company concerned and which the employer intends to fill either immediately or within a specific period of time. The job vacancy rate is defined as the number of job vacancies as a percentage of the total number of occupied posts and the total number of vacancies.

The economic recovery from the Covid-19 pandemic has been characterised by a steep rise in labour shortages. Data from the EU-BCS show that labour shortages in the euro area rose faster in industry and construction, while in services, which were more severely hit by the lockdowns, they increased more slowly (Graph II.2). However, by the end of 2021, shortages exceeded their pre-pandemic levels on average in all three macro-sectors and remained very high thereafter. Evidence of widespread shortages across the EU is also suggested by the vacancy-to-unemployment-ratio, a standard indicator of labour market tightness. The number of vacancies per unemployed person increased from the first quarter of 2020 to the first of 2022 in most euro area countries (Graph II.1). In 2022, the job vacancy rate in the euro area hovered around 3%; this is about 1.7 pps above the average of the 2006-16 period. At the end of 2022, there were two job openings for every unemployed person in the EU; this is the highest rate since 2005.

Graph II.2: **Labour shortages in the EU by sector and country**

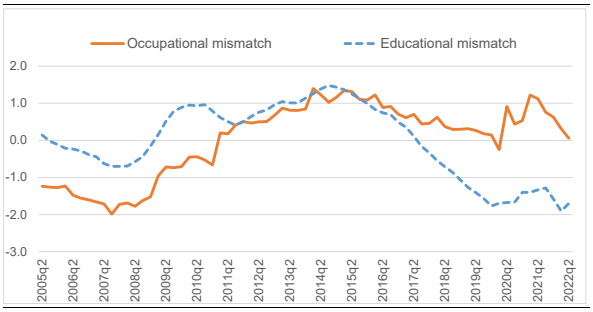


(1) Y axis: the % of employers who report that the availability of labour is a factor limiting production. (2) In the EU-BCS the 'services' category excludes wholesale and retail trade and public services.
Source: European Commission, EU-BCS

During the recovery, labour shortages continued to increase, in parallel with significant decreases in unemployment. The decline in unemployment followed the rise in shortages with a slight lag, as is usual during recoveries. This suggests that the process linking unemployed people with vacant posts (i.e. the efficiency of labour market matching)

did not deteriorate during the pandemic ([28]). Both the macroeconomic skills mismatch ([29]) and the occupational mismatch indicator show that the increase in the imbalance between demand and supply of labour during the pandemic was only temporary (Graph II.3) ([30]).

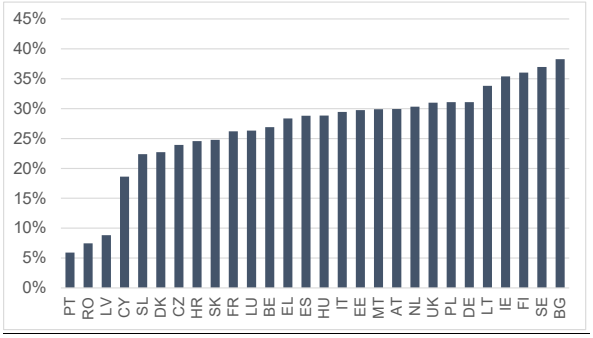
Graph II.3: **The evolution of macroeconomic skills and occupational mismatch in the EU (2005Q1 – 2022Q2)**



(1) Data are standardised by their mean and standard deviation over the period.
Source: Own calculations based on Eurostat, LFS.

In parallel with rising labour shortages before the pandemic ([31]), firms have also reported skills shortages. According to the Eurofound European Company Survey, in 2019 there were 24 Member States that had more than 20% of companies indicating that over 60% of their newly recruited employees did not have the required skills for their jobs (Graph II.4).

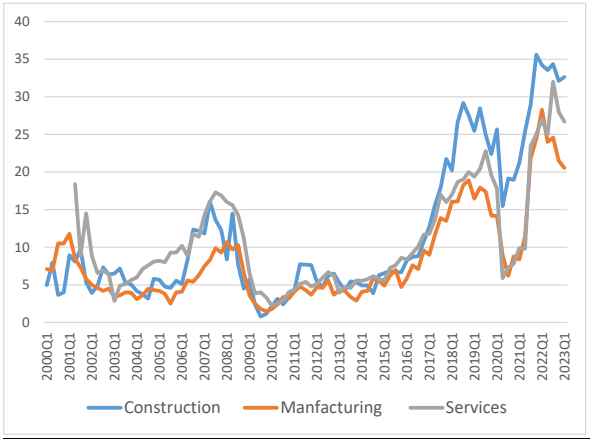
Graph II.4: **Share of managers indicating that 60% or more of their newly recruited employees did not have the required skills (2019)**



Source: Own calculations, based on the European Company Survey, Eurofound.

Skills shortages measured this way were higher in construction (39%) and smaller in manufacturing (28%) and services (22%). Across the EU the share of employers who reported in 2019 to have difficulties finding workers with the required skills ranged from about 10% in Denmark to 46% in Romania. Furthermore, smaller companies appeared to have more difficulties to find workers with the right skills as compared to larger establishments.

Graph II.5: **Labour shortages by sector (median across euro area countries)**



Source: EU-BCS

Preliminary evidence suggests that next to the business cycle, structural factors may have been driving labour shortages. Between 2013 and 2019, their rise was particularly steep, and the pandemic has only temporarily interrupted this trend (Graph

([28]) Kiss A., et al, (2022) reaches the same conclusion. Kiss, A. A. Turrini and A. Vandeplas "Slack and Tightness: Making Sense of Post COVID-19 Labour Market Developments in the EU", DG ECFIN Discussion Paper 178.

([29]) Kiss, A., and A. Vandeplas, (2015) "Measuring skills mismatch. DG EMPL Analytical webnote, 7, 2015"

([30]) Mismatch indicators measure the discrepancy between the skills of the population and the skills required by the labour market. The occupational mismatch measures the dispersion across nine occupational groups of the employment share relative to the population share. Since the population by occupation is not available, it is assumed that the population with skill level i is distributed proportionally to the share of employment in each occupation with a specific skill level i on total employment with skill level i. With this assumption, the occupational mismatch is equivalent to a measure of dispersion of the employment rates by skills relative to total employment rate with double weights. These weights represent the population share of the skill groups and the employment share of the occupational groups with that specific skill level. In symbols

$$\sum_{j=1}^{9}\left|\sum_i\left(\frac{O_i}{O_T}-\frac{P_i}{P_T}\right)\frac{O_{ji}}{O_i}\right|=\sum_{j=1}^{9}\left|\sum_i\frac{e_i-e_T}{e_T}\frac{P_i}{P_T}\frac{O_{ji}}{O_i}\right|$$

Where O_{ji} is the employment in occupation j for skill group i. P_i is the population with skill i; and e_i is the employment rate of skill group i. and

$$\sum_{j=1}^{9}\sum_i\frac{P_i}{P_T}\frac{O_{ji}}{O_i}=1$$

Thus, the mismatch reflects not only the weight of specific skills, but the distribution of occupation conditional on a specific skill. See Box 3.1 in Chapter 3 of the Labour Market and Wage Developments in Europe: Annual Review 2022.

([31]) Similar evidence is not available for the recovery after the pandemic.

II.5). Moreover, across countries and sectors, the levels of shortages in the recovery shows a strong positive correlation with their pre-pandemic levels, suggesting that the processes which had been shaping shortages before the pandemic were continuing to drive them. The similar occupational shortages across the EU, and the evidence of widespread skills shortages also point to the presence of potential common underlying structural factors. All this justifies a closer look at the respective roles of cyclical and structural factors in driving labour shortages

II.3. Short- and long-term determinants of labour shortages

The unmet demand for labour can reflect both cyclical developments and long-term (structural) factors. In the short-term, fluctuations in labour shortages may derive from shifts in the demand for labour over the business cycle. These shifts depend on how firms' hiring policies are influenced by developments in the expected economic outlook. For instance, in the early stages of a recovery, vacancies tend to increase as firms open positions to expand production as the recovery consolidates. Frictions in the process of matching vacant jobs with jobseekers then lead to a temporary increase in the unmet demand for labour.

Long-term trends may also create persistent imbalances between demand for and supply of labour, increasing the level of unfilled vacancies. Long-term drivers of labour shortages may derive from (i) a decline in the labour force related to ageing, (ii) skill-biased technological progress, iii) skill shortages linked to the structural and organisational changes, such as those triggered by the digital and green transitions and the impact of the pandemic, (iv) the influence of labour mobility and migration, and (v) poor working conditions, which make people refrain from accepting some jobs ([32]).

Ageing can influence labour shortage through its impact on the size and composition of the labour force. The combination of demographic change and rapid technological change can generate labour shortages as older workers tend to have skills that do not match those required by technologies, such as those required by the two transitions. On the demand side, ageing increases the demand for specific goods and services requested by older workers (e.g. health and leisure).

The effect of technological progress is a priori ambiguous. Labour-saving technologies tend to reduce the labour per unit of capital, lowering the unmet demand for labour at a given wage. However, new technologies may also complement some specific skills, which can generate skill-biased demand shifts ([33]). Some technologies substitute certain tasks, making obsolete many routine task-intensive (not necessarily manual) occupations. As discussed later, the effect of these contributing factors can differ across sectors, owing to the different skill and age structure of the working age population and the prominence of routine-based occupations.

The cyclical and the structural determinants of labour shortages interact with each other**.** The economic business cycle, through its influence on labour market flows, affects matching and productivity. The employment of low-qualified workers tends to be more sensitive to the economic business cycle than the employment of the high-qualified. Recessions reduce the unfilled demand for labour and have a *cleansing* effect by removing lower-quality matches. During downturns, labour shortages may drop by less when the average level of education of the workforce is high. On the other hand, mismatches, increase during a recession because firms post fewer vacancies and jobseekers reallocate toward more productive jobs more slowly. If low-quality jobs are created during a recession (*sullying effect)* the gap between over- and under-education increases, exacerbating mismatches ([34]).

Employers typically encounter more challenges in recruiting the "right" workers at times of strong economic growth. In upturns, if high productivity firms expand more, and hire workers away from firms with lower productivity, productivity may rise ([35]). At the same time, amid labour shortages,

([32]) While working conditions are likely to have an influence on labour and skills shortages, data that would allow to quantify their influence are lacking.

([33]) Acemoglu, D., and D.H. Autor, (2011) "Skills, Tasks and Technologies: Implications for Employment and Earnings". In Handbook of Labor Economics, ed. D. Card and O. Ashenfelter, Vol. 4, Part B, 1043–1171. Amsterdam: Elsevier

([34]) Baley, Figueredo and Ulbright, (2022) "Mismatch Cycles" Journal of Political Economy, November, Vol 130, No111.

([35]) Haltiwanger, J.C. – Hyatt, H.R. – Mcentarfer, E. – Staiger, M. (2021): Cyclical worker flows: cleansing versus sullying. National Bureau of Economic Research Working Paper 28802.

this process may be disrupted, and the quality of matches may be worse than in a situation without shortages. Empirical evidence supports the view that employers adjust wages upwards and/or recruitment standards (such as minimum qualification levels for hiring) downwards during economic upturns when job applicants become scarcer ([36]).

The effect of short- and long-term determinants on labour shortages is estimated using a panel regression over the period 2000Q1-2022Q2. The dependent variable is the share of firms in manufacturing, construction and services indicating that labour is a factor limiting production – from the EU Business and Consumer Survey. The explanatory variables are the deviation of sectoral value added from trend, the trend in sectoral labour productivity, the share of the low skilled in employment, the age dependency ratio and employment in low routine intensive occupations relative to high routine intensive occupations ([37]). To allow for robust inference with sufficient degrees of freedom, estimation is performed on a panel of EU countries. Since labour shortages across EU countries exhibit persistent differences possibly attributable to country-specific factors which may not be captured by available statistics, country fixed effects are included ([38]). In a macro panel, time period effects are introduced to account for the common evolution of the dependent variable ([39]). To capture the synchronisation of the EU cycle, we introduce dummies in the regression period ([40]). Thus, the response of labour shortages to a change in the dependent variables has to be interpreted as the average effect across countries, controlling for individual and time heterogeneity ([41]).

II.3.1. Role of the business cycle in driving shortages

Tables II.1-II.2 show the results of the estimation of the determinants of labour shortages. Across all specifications, i.e. including also for the long-term drivers of labour shortages (columns (1) to (7) of Tables II.1 and II.2), cyclical shifts are accompanied by a change in the number of employers that consider labour a factor limiting production. This suggests that, during recoveries, firms are not able to expand their activities as they wish because they lack key labour resources. A complementary explanation is that when the economy expands, employers look for additional labour resources in anticipation of further increases in demand. This implies that the number of firms that perceive labour as a factor limiting production rises before job openings are effectively published.

The available data do not allow us to verify this second explanation. Yet, the fact that the volatility of the *factors limiting production* is almost twice that of the *job vacancy rate* hints at the possible relevance of this explanation. Moreover, across all specifications labour shortages are more responsive to the cyclical component of value added in services than in manufacturing or construction (Graph II.6). This may reflect not only the cyclicality of demand in services, but also the relatively higher share of non-permanent contracts in services.

Other short-term pandemic-related factors (not captured in the regression) might have shaped labour shortages in the recovery besides the

([36]) Devereux, P. J. (2002), "Occupational upgrading and the business cycle", Labour, Issue 16, No. 3, pp. 423-452; ; Büttner, T., P. Jacobebbinghaus, and J. Ludsteck (2010), "Occupational Upgrading and the Business Cycle in West Germany", *Economics*, Vol. 4, No.1.

([37]) The BCS does not cover wholesale and retail trade. The sectoral value added is obtained by aggregating the National Account data by A*10 industry. Trends are obtained by applying the Hodrick-Prescott filter with smoothing parameter equal to 1600. For an explanation of the occupational mismatch and of the index of routine task intensity see Chapter 3 of the DG Employment and Social Affairs publication 'Labour Market and Wage Developments in Europe 2022".

([38]) This means that the country specific mean over time is subtracted from both the dependent and the explanatory variables. The fixed effect estimation does not explain the variability between countries because the country specific means are subtracted. The explanatory value of the within estimator is derived from the co-movements of the dependent variable around its country specific mean with the independent variables around their country-specific means.

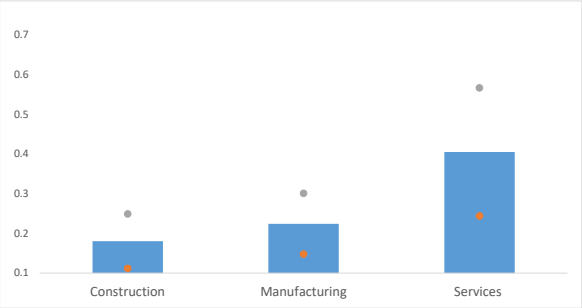
([39]) For example, Islam (1995) uses dummies to capture common trends in TFP. Islam, N. (1995) Growth empirics: a panel data approach. Quarterly Journal of Economics 110(4): 1127–1170.

([40]) Just as fixed effects models require regressors' variation over time within each country, a time fixed effect requires regressors' variation over units within each time period. (Wooldridge 2012, "Introductory econometrics" Chapter 14 "Advanced panel data methods" 5th Edition, South Western Cengage Learning Ed. This has implications for our preferred specification when we introduce variables such as the age dependency ratio that change slowly over time and share a common trend.

([41]) The model allows us to eliminate biases from unobservables that change over time but are constant over countries and it controls for factors that differ across countries but are constant over time. The model with country and time fixed effects (the 'two-way fixed effect estimator') identifies the parameters only through the gap between (i) labour shortages demeaned by the country specific average and (ii) the common time specific component and the explanatory variables expressed as well as deviation from their country-specific average and their time-specific components. This means that it wipes out the effect of any individual or time-invariant variables

increase in demand. In 2021, due to remaining border restrictions and selective lockdown, intra-EU mobility remained low, causing vacancies in certain sectors to remain unfilled. For instance, in Member States such as Greece, the harvesting and planting season was disrupted in 2020, as seasonal workers could not reach their destinations due to travel restrictions.

Graph II.6: **The response of labour shortages to the cyclical component of value added**



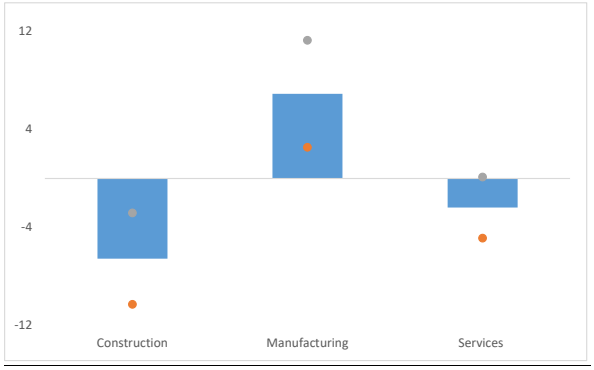
(1) The chart shows the average of the significant coefficients of specifications 1-4 in Tables II.1-II.2. The estimates of column (7) are not included as they refer to a shorter sample period. The dots indicate the 95% interval confidence.
Source: Own calculations

Moreover, the gradual phasing-out of some containment measures and policy support might also have temporarily reduced job-to-job transitions. Finally, health concerns kept people from returning to work; this concerned mostly the high-contact sectors and occupations for which telework is not possible (such as for example hospitality and retail).

II.3.2. Role of long-term trends in driving shortages

Turning to the role of structural variables, labour productivity has a differentiated effect across sectors. As a sector becomes more efficient, in principle one would expect that the number of workers needed for a given level of demand decreases. However, with skill-biased technological change, the increase in productivity can be accompanied by a shift in employment towards high-skilled workers and, with wage rigidity, this can in turn raise labour shortages and skills mismatches. The regression analysis finds a positive effect of trend sectoral productivity on labour shortages in manufacturing, but not in construction or services (Graph II.7 and columns 2 to 6 of Tables II.1 and II.2). This is consistent with the literature suggesting that skill-biased technical progress plays a role in skill-intensive sectors. On the other hand, the increase in labour productivity in construction, most likely as a consequence of labour-saving technologies, reduces, *holding the other variables constant*, the unmet demand for labour in these sectors ([42]).

Graph II.7: **Response of labour shortages to labour productivity**



(1) The chart shows the average of the significant coefficients of specifications 1-4 in Tables II.1-II.2. The estimates in column 7 are not included as they refer to a shorter sample period. The dots indicate the 95% interval confidence.
Source: Own calculations

The availability of a skilled workforce can reduce the extent of labour shortages in all sectors. At the macroeconomic level, the decline in the share of the low-skilled improves the average skill level of the workforce. Our estimates (columns 1 to 5 of Tables II.1 and II.2) suggest that the improvement in the workforce's level of education reduces labour shortages, more in construction and services than in manufacturing (Graph II.8) ([43]).

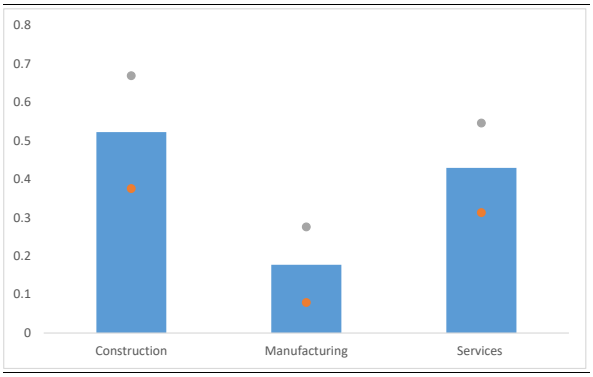
There can be different explanations for this finding. Construction is a sector with a large share

([42]) In the long-term, changes in the structure of specialisation within the EU may modify inter- and intra- industry trade flows, thereby varying the skill structure of labour demand. Labour shortages are likely to emerge if labour supply adjusts slowly to these changes. This, possibility is left for further analysis.

([43]) The decision to hire people with a certain level of education in response to labour shortages might make the employment share of low skilled endogenous. For this reason, the share of low skilled in the working population is used as alternative indicator of skilled workforce. This does not change substantially the results. The hump shaped effect of labour productivity on labour shortages by sector remains valid; yet the effect on labour shortages in manufacturing is not statistically significant. A drop in low skilled employment reduced labour shortages more in construction than in manufacturing or services. The Wooldridge test of strict exogeneity (Wooldridge 2002 pp 298) shows that in all specifications the share of low skilled in total employment is strictly exogenous. Wooldridge, J. M. (2002), "Econometric Analysis of Cross Section and Panel Data" MIT Press.

of low-skilled workers ([44]); yet, it requires some of the most highly skilled workers because projects within the industry are diverse and range from less complex to the most complex ones such as nuclear power plants or oil refineries and large utilities ([45]).

Graph II.8: **The response of labour shortages to the share of low skilled**

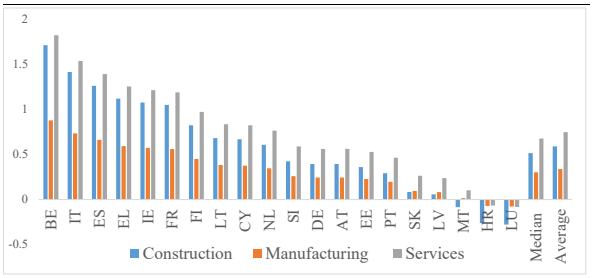


(1) The chart shows the average of the significant coefficients representing the response of labour shortages to the cyclical component of value added. The estimates in column 7 are not included in the average as they refer to a shorter sample period.
Source: Own calculations based on Table II.1

Furthermore, construction is at the forefront of the green transition, which creates additional training needs for workers in this sector across all skill levels, and additional labour demand for higher skills in relation to improvements in energy efficiency and the use of renewable energy. The green transition is also creating additional indirect labour demand in the service sector, for professional services, which require a higher level of skills ([46]). In addition, digitalisation is likely to boost demand for skilled labour in both construction and services and a reduction in the share of the low-educated might reduce the number of unfilled vacancies. Second, the reduction in the share of low-skilled workers has occurred in parallel with an increase in labour market concentration. The prevalence of low wages may induce relatively more skilled workers to no longer accept low-paying jobs ([47]).

Assuming that the effect of the share of the low skilled on labour shortages is the same across countries imposes a homogeneity restriction on countries that in reality have labour market institutions and policies with different capacities to deal with occupational mismatches. Consequently, a change in the share of low-skilled employment might lead to different responses in terms of labour shortage according to the predominant level of occupational mismatch. This effect can be particularly relevant in the short run as institutional constraints make it more difficult to adapt policies. This suggests that we should stop considering the interaction between the occupational mismatch and the share of low skilled as an additional explanatory variable ([48]).

Graph II.9: **Country-specific estimates of the response in terms of labour shortage to the share of the low skilled**



(1) The country-specific estimates are based on specification 5 in Tables II.1-II.2 and are computed as in footnote (28).
Source: Own calculations

Following, Haque et al., the effect of the share of the low skilled is assumed fixed over time but it is allowed to vary across countries with the average occupational mismatch ([49]). Results (column (5) of

([44]) In construction, industry and services (excluding wholesale and retail trade), the share of low-skilled in sectoral employment was in 2020 respectively 30%, 22% and 14%. Over the last ten years this share dropped more in construction (by7 pps) than in industry (6 pps) or services (5pps).

([45]) B. Brucker Juricic, M. Galic, S. Marenjak (2021) "Review of the Construction Labour Demand and Shortages in the EU".

([46]) CEDEFOP (2021): The green employment and skills transformation. Insights from a European Green Deal skills forecast scenario.

([47]) OECD (2022) finds that labour market concentration, one of the key determinants of monopsony power, is pervasive in a wide range of OECD countries; that more concentrated markets result in lower wages and that after one year into the COVID-19 pandemic, concentration was 10% higher. OECD (2022) "Monopsony and concentration in the labour market" Chapter 3 of Employment Outlook.

([48]) Neglecting the slope heterogeneity leads to inconsistent estimates when the response to a dependent variable varies across countries (Pesaran, 2015 "Time Series and Panel Data Econometrics" OUP).

([49]) In symbols, in the regression $y_{it} = \alpha_i + \mu_t + \beta_i x_{it} + u_{it}$ the slope β_i varies with the average mismatch $\beta_i = \gamma_0 + \gamma_1 * \overline{mism_i}$ This implies that in addition to the share of low skilled there is the interaction with the average mismatch. Haque N.U., M.H. Pesaran, and S. Sharma (2000)" Neglected heterogeneity and dynamics in cross-country savings regressions" IMF WP/1999/128.

Table II.1: **Long- and short-term determinants of labour shortages**

	Construction								Manufacturing							
	1	2	3	4	5	5a	6	7	1	2	3	4	5	5a	6	7
Value added cyclical component	0.18***	0.18***	0.18***	0.18***	0.20***	0.20***	0.17***	0.44***	0.24***	0.22***	0.21***	0.22***	0.25***	0.24***	0.23***	0.60***
	(5.1)	(5.0)	(5.2)	(5.3)	(5.7)	(5.7)	(2.96)	(8.2)	(6.3)	(6.5)	(5.4)	(5.6)	(6.1)	(6.1)	(3.5)	(7.8)
Labour productivity trend		-1.8	-5.3***	-7.8***	-6.6***	-8.9***	-16.1***			9.7***	7.5***	6.4***	7.0**	1.8	43.0***	
		(-1.1)	(-3.0)	(-3.8)	(-2.6)	(-3.9)	(-2.3)			(5.7)	(3.4)	(2.8)	(2.1)	(0.7)	(2.6)	
Share of low skilled			0.5***	0.5***	0.4***	-0.05	0.7***				0.2***	0.2***	0.1***	-0.02	0.03	
			(6.8)	(7.1)	(6.6)	(-0.7)	(4.8)				(3.4)	(3.6)	(2.8)	(-0.3)	(0.11)	
Occupational Mismatch						-2.0***								-1.3***		
						(-10.7)								(-9.3)		
Share of low skilled*occupational mismatch					0.03***	0.08***							0.01***	0.05***		
					(4.8)	(11.2)							(3.6)	(9.7)		
Age dependency ratio				-0.5***	-0.4***		0.4	1.1***				-0.09	0.09		1.00	0.9***
				(-6.64)	(-3.76)		(1.4)	(6.2)				(-1.25)	(1.1)		(3.3)	(6.9)
Probability of employment in low RTI occupations relative to high RTI occupations (lagged)							0.02								0.043	
							(0.6)								(1.60)	
Country fixed effect	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Period effects	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	N	N
Observations	2172	2166	2123	2123	1847	1847	693	2172	2247	2241	2196	2196	1881	1881	691	2247
R-squared- adjusted	0.7	0.7	0.71	0.71	0.73	0.74	0.83	0.53	0.69	0.69	0.7	0.7	0.73	0.74	0.85	0.54

(1) Estimation: fixed-effects OLS with robust t-statistics in parentheses. Sample period: 2000q1-2022q2. *,**,*** stand for statistical significance at the 10%, 5% and 1% level. Age dependency ratio: population 0 to 19 years and 60 years or over, to population 20 to 59 years. RTI stands for routine task intensity.
Source: Own calculations

Tables II.1 and II.2) suggest that for all sectors the response to a change in the share of the low skilled differs significantly across countries, depending on their *average degree of mismatch*. The country-specific estimates reported in Graph II.9 suggest that a decline in the share of low skilled has a larger effect on labour shortages in countries where the mismatch is high. In addition, they confirm the hump shape response of labour shortages obtained with specifications 1 to 4, which assume a homogenous response across countries.

When the occupational mismatch is introduced as a standalone variable (equation 5), in addition to the share of the low skilled and the interaction term between the two, it turns out that its coefficient is negative while the share of the low skilled is statistically significant only in services. This suggests that a reduction in the occupational mismatch in one country (relative to its common EU-wide component) rises labour shortages in the same country (always relative to the EU-wide common component). This effect is to some extent offset by a reduction in the share of the low skilled, as hinted at by the positive coefficient of the interaction between the two variables.

As digitalisation becomes pervasive, the lack of digital skills may also cause labour shortages ([50]). While the lack of digital skills might lead to labour shortages in expanding non-routine task occupations, it may be irrelevant for routine-task occupations that are predicted to decline. The available data are too short for robust inference of the impact of digital literacy on labour shortages ([51]). Cross-section regressions suggest that there is a significant negative correlation across countries between the share of individuals with at least basic digital skills and the labour shortages in manufacturing and construction (for the latter only

Table II.2: **Long- and short-term determinants of labour shortages**

	Services							
	1	2	3	4	5	5a	6	7
Value added cyclical component	0.40***	0.40***	0.40***	0.41***	0.42***	0.42***	0.98***	1.1***
	(5.8)	(5.8)	(5.8)	(4.6)	(4.6)	(4.8)	(3.6)	(10.4)
Labour productivity trend		1.5	-4.1***	-4.4***	-6.2***	-10.8***	-19.1	
		(0.9)	(-2.7)	(-2.6)	(-3.6)	(-5.3)	(-1.3)	
Share of low skilled			0.4***	0.4***	0.5***	0.29***	-0.3	
			(9.4)	(9.6)	(8.9)	(4.4)	(-1.2)	
Occupational Mismatch						-1.1***		
						(-8.5)		
Share of low skilled*occupational mismatch					0.02***	0.04***		
					(4.07)	(8.6)		
Age dependency ratio				-0.07	-0.07		1.3***	1.2***
				(-0.7)	(-0.72)		(6.1)	(11.5)
Probability of employment in low RTI occupations relative to high RTI occupations (lagged)							0.02	
							(0.67)	
Country fixed effect	Y	Y	Y	Y	Y	Y	Y	Y
Period effects	Y	Y	Y	Y	Y	Y	N	N
Observations	1814	1809	1800	1800	1754	1681	691	1814
R-squared- adjusted	0.72	0.73	0.74	0.74	0.74	0.75	0.75	0.61

(1) Estimation: fixed-effects OLS with robust t-statistics in parentheses. Sample period: 2000q1-2022q2. *,**,*** stand for statistical significance at the 10%, 5% and 1% level. Age dependency ratio: population 0 to 19 years and 60 years or over, to population 20 to 59 years. RTI stands for routine task intensity.
Source: Own calculations

([50]) Information on online job postings, available since 2018, show a strong increase for a wide range of digital occupations. OECD (2022) "Skills for the Digital Transition. Assessing recent trends using big data".

([51]) Eurostat data on digital skills is available from 2015 to 2021 (but no data for 2018 and 2020).

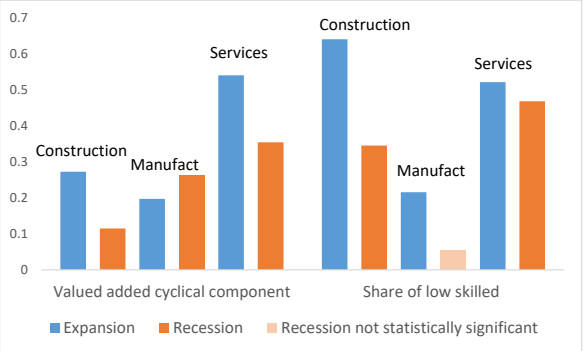
if the sample excludes the pandemic recession and subsequent recovery) ([52]).

For services, there is a positive correlation between digital literacy and labour shortages, which might reflect the rising labour demand in services as a consequence of the increase in the digital capabilities of the population.

The old-age dependency ratio (the ratio between the number of persons aged 65 and over and the number of persons aged between 15 and 64) increased in the EU from 26.3% in 2010 to 32.5% in 2021. ([53]) When the estimate is made with both period and country fixed effects, an increase in the old-age dependency rate reduces labour shortages only in construction, while its effect is not statistically significant in manufacturing and services. However, the results are strongly influenced by the presence of the time fixed effects, which capture unobservable components common across countries but that change over time. Indeed, with period fixed effects, we cannot include any explanatory variables that have a constant difference over time for each country; the period fixed-effects absorb all time-constant effects ([54]). This is the case with the age dependency ratio, which is available only on an annual basis and we assume it remains constant within each year ([55]). For this reason, when we include the age dependency ratio, our preferred specification is without fixed effect. The sign of the coefficient of the dependency ratio turns positive and significant in panel estimate only with country fixed effects. This provides indirect evidence that ageing is a common component that drives labour shortages. ([56]) Ageing implies an increase in the inactivity rate and a decline in the working age population, which reduces the size of labour supply ([57]). In parallel, it increases consumption and changes it towards specific goods and services such as housing and health care ([58]).

The estimates have been conducted splitting the sample in periods where the change in the cyclically adjusted value added is either positive or negative (Graph II.10). The results confirm the sign of estimates for the full sample. Yet, labour shortages in construction and services are more responsive to the cycle when the economy expands. Only for labour shortages in construction and manufacturing the share of low skilled has a stronger effect during recoveries than during recessions. In construction and services, the effect of trend productivity is statistically significant only during recoveries, while rising productivity trend soften the drop of labour shortages in manufacturing during recessions.

Graph II.10: **Response of labour shortages to selected variables during expansions and recessions**



Source: Own calculations

Graph II.11, based on specification (6) of the regression analysis, tries to identify the cyclical and structural determinants of labour shortages. It shows that swings in the business cycle accounted for a large share of the fluctuations in labour shortages during the pandemic recession and the subsequent recovery. The contribution of the cycle is particularly significant in the case of construction and services. In manufacturing, the widespread use

([52]) For manufacturing, the relationship is still significant and negative for the pre-pandemic period.

([53]) When the dependency ratio increases the size of the workforce declines

([54]) The same would be true if a linear time trend is introduced in place of the period dummies.

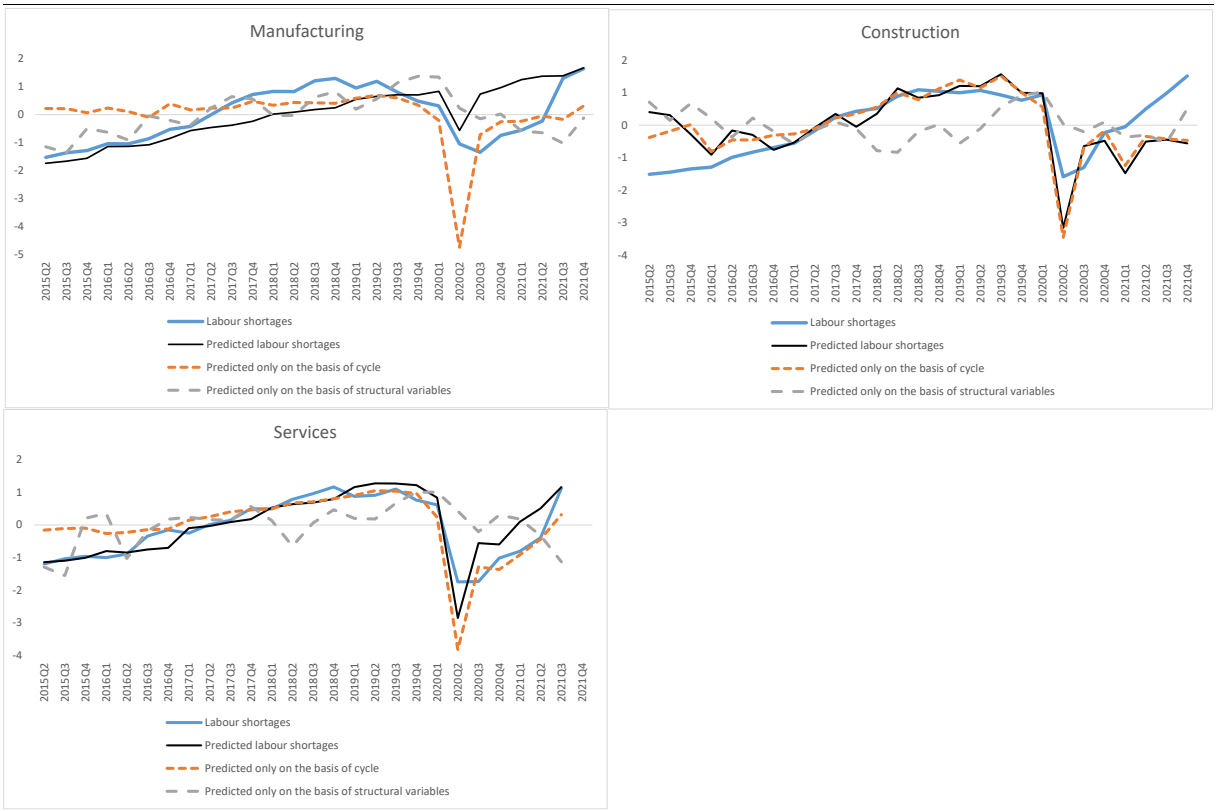
([55]) A pooled regression of the dependency ratio on period dummies gives an R2 of 15% while for labour productivity this is less than 2%. Graph II.12 in the Annex shows that the age dependency ratio is high correlated with the period effects in the equation without a dependency ratio (Equation 3 of Tables II.1-II.2)

([56]) In a cross-section estimate, about 10% of the differences across countries in the dependency ratio are explained by time-fixed effects; for labour productivity, the time-fixed effect does not explain differences across countries; for the share of the low-skilled, less than 6% of the differences by country are due to common factors.

([57]) According to the life-cycle model, aggregate consumption rises when the share of elderly people in the population increases. Moreover, older workers enjoy a more stable employment relationship which reduces uncertainty about their incomes which in turn keeps up consumption and labour demand.

([58]) Ageing-related changes in the population structure also affect the labour component of potential output via differences in age-specific participation rates. Nerlich, C. and Schroth, J.(2018), "The economic impact of population ageing and pension reforms", Economic Bulletin, Issue 1, ECB

Graph II.11: **Contribution of short- and long-term drivers to labour shortages by sector**



(1) The chart shows the mean contribution of different factors estimated from column 6. Estimates are based on a panel of EU countries. The cycle does not include the time fixed effects. The predicted data are is based on the estimated coefficients, excluding fixed effects. Standardised data.
Source: Own calculations

of short-time work schemes during the pandemic recession preserved employment relationships, making employers' hiring plan relatively more shielded from the business cycle ([59]). The rise of labour shortages in the recovery was partly due to the strong increase in demand after the end of the Covid-19 related lockdown. This expansion arrived after a downturn in which short-time work schemes allowed firms to maintain their firm-specific human capital, which was clearly in their interest after a period of intense labour shortages leading up to the pandemic. The post-pandemic surge in labour demand was fast, and the rise in vacancies preceded a drop in unemployment and labour market slack. Compared to industry, the contraction of value added in services and construction was more prolonged, which contributed to moderate labour shortages throughout the early stages of the recovery.

The labour shortages predicted on the basis of structural variables is a gauge of the unmet demand for labour that would prevail over the longer-term assuming that temporary demand shocks fade away. Before the pandemic, most of the increase in labour shortages was related to structural factors, in particular ageing and the decline in the share of the low skilled in employment. Long-term productivity developments also contributed to the increase in labour shortages, notably in manufacturing ([60]).

In the long-term, labour mobility can reduce the amount of labour shortages. However, as many of the most widespread and most severe occupational shortages are common across Member States, ([61])

([59]) Drahokoupil, J. and T. Müller (2021) "Job retention schemes in Europe" ETUI, Working Paper 7. For Germany, the share of employees benefiting from short-time work schemes was the highest in manufacturing. In wholesale and retail trade, the share of workers in short-time work schemes was the second highest; however, the wholesale and retail trade sub-sector is excluded from the definition of services in the Business and Consumer Survey data used to measure the labour shortages.

([60]) The EU old-age dependency ratio (population 0 to 19 years and 60 years or over to population 20 to 59 years) was below 80 until 2010; in 2021 it was around 91% and is expected to increase according to the population projection. Similarly, the share of the low skilled in the EU dropped from 26% of 2005 to 16% of 2021.

([61]) McGrath (2021)

panel estimates with country-fixed effects would not identify the relationship between labour shortages and labour mobility. A cross-section regression looks at this relationship across countries. The results in Table II.3 suggest that countries with respectively high intra-EU mobility and migration have low labour shortages in construction and manufacturing.

In services, only a high share of the non-EU population is associated with low labour shortages. The lack of correlation between labour shortages and mobility in cross-section regression is suggestive of the linguistic barriers and difficulty of getting qualifications recognised being more constraining in services than in construction and manufacturing ([62]). Conversely, migrant population is more likely employed in low-skilled jobs with few barriers of entry because these requirements are less constraining ([63]).

Table II.3: **Effects of mobility and migration on labour shortages in a cross-section**

	Construction	Manufacturing	Services
Value added cyclical component	0.14*	0.17*	0.04
	(1.62)	(1.69)	(0.17)
Share of EU population except reporting country on total poulation of reporting country	-0.14***	-0.18***	0.08
	(-2.7)	(-4.7)	(0.6)
Share of non EU population on total population of reporting country	-1.44***	-1.30***	-0.66***
	(-10.3)	(-12.7)	(-5.9)
Country fixed effect	N	N	N
Period effects	Y	Y	Y
Observations	1301	1307	1209
R-squared- adjusted	0.30	0.31	0.25

Source: Own calculations based on Business and Consumer Survey and Eurostat Labour Force Survey.

II.3.3. Influence of the pandemic on the long-term drivers of shortages

The pandemic has accelerated some pre-existing trends, potentially contributing to a rise in labour shortages. First, it increased the demand for information and communication technologies. Second, its effects on consumers' preferences and labour supply have proven persistent in some sectors. In services, notably high-contact occupations, part of the workforce may have reconsidered returning to their previous jobs, due to concerns of contracting the virus and uncertainties of business continuity where there were recurrent lockdowns. These new developments added to the problem of low wages in some service sub-sectors, further reducing their attractiveness ([64]). Activity in manufacturing has also been less resilient in some Member States (including Germany), reducing the related labour demand and contributing to labour reallocation to other activities. Once employed in a new activity, employees are less likely to return to their previous occupations ([65]).

The pandemic is likely to have exacerbated poor working conditions in some occupations and created new demands for job quality in others. Worsening working conditions in health care reduced the supply of labour that was already previously insufficient ([66]). They drove health care workers out of their profession for example in Denmark and Croatia. During lockdowns, when activities in the hospitality sector (hotels, restaurants and catering) were interrupted, some of the employees in the sector switched jobs, and in the recovery, they were not attracted to return, also due to poor working conditions, as well as the available opportunities elsewhere in Europe's tight labour markets. Poor working conditions have also been reported in the IT sector in Spain, where ICT specialists often lack upskilling or reskilling opportunities, and in Germany, where IT specialists reported challenges in terms of work intensity ([67]).

Yet the *Great resignation*, in which employees quit their jobs in search of job quality and flexibility and better work-life balance, has received significant attention in the US but has not so far affected a sizeable part of the workforce in the EU. This

([62]) In the EU Business and Consumer Survey, the service sector excludes wholesale and retail trade.

([63]) This is consistent with the evidence provided by the European Labour Authority on the share of workers with a migrant background.

([64]) Due to travel restriction and closures of restaurants and bars, parts of the labour force have been driven out of the hospitality sector in Belgium, Denmark, Italy, Sweden or the Netherlands.

([65]) In the Italian hospitality sector (hotel, restaurants), the increased uncertainty about the possibility of work during the pandemic has incentivised workers to search for occupations in other sectors. This caused a shortage of staff after the restriction were lifted. Source: Country reports in the 2022 thematic review by the European Centre of Expertise (ECE) in the field of labour law, employment and labour market policies, entitled 'Skills shortages and structural changes in the labour market during the Covid-19 pandemic and in the context of the digital and green transition'.

([66]) Eurofound (July 2021), Tackling labour shortages in EU Member States | Eurofound (europa.eu)

([67]) E.g., in IT, a larger share of employees than in other types of services perceive that the tasks they were given were often or very often not doable within the given time frame. Source: ECE Thematic Review 2022, op. cit.

trend has been reported only in some sectors and Member States, for example in the construction sector in Italy ([68]). Altogether, the movement of workers out of occupations and sectors with poor working conditions may contribute to increasing skills imbalances, although to a limited degree ([69]).

II.4. Conclusions

To a large extent, the current labour shortages are not new. Their patterns closely follow those of the pre-pandemic period and have significant structural drivers. These include ageing, the influence of skills shortages and mismatches, the ongoing digital and green transitions, migration and poor working conditions in some sectors and occupations.

While the pandemic reduced labour shortages due to its negative cyclical economic impact, it accelerated digitalisation and, created new pressures for reallocation by influencing consumers' and employees' preferences; thereby, it increased the likelihood for skills mismatches triggered by transitions between sectors. By reducing labour mobility and migration, the pandemic also caused a decline in the labour supply. Furthermore, it worsened working conditions in some sectors.

Persistent labour shortages may have several negative economic consequences. They can lead to employers being required to hire workers with significant skills gaps, or leave vacancies unfilled for protracted periods, which can in turn negatively affect labour productivity, hamper innovation capacity and adaptation to technological developments ([70]). Countries with labour and skills shortages may become less attractive for innovation and investment in R&D, which may negatively affect productivity and their competitiveness. Skill shortages can contribute to skills mismatch if employers are unable to find the skills they need and end up recruiting workers who are under-skilled for a specific job ([71]). Lack of workers in specific occupations could worsen the quality of the services provided, most prominently in health care. At the individual level, labour shortages can represent an opportunity for improvements in wages and working conditions. At the same time, employees may also face higher work intensity and work-life balance conflicts.

Currently, the ongoing green transition can also trigger a pressure towards reallocation in the labour market. The speed and effectiveness of this depends on the adaptability of the skills of workers. The green transition increases demand for digital, technical and transferrable skills ([72]). Structural weaknesses in the adult learning systems in most Member States risk slowing down this adaptation. Skills mismatches triggered by the twin green and digital transition can lead to longer unemployment spells and eventually higher structural unemployment, slowing down the transition itself. These factors might increase labour shortages and these risks should be anticipated and addressed by policies. The implementation of the Recovery and Resilience Plans and of the cohesion policy funds, including the European Social Fund Plus and the Just Transition Fund, will boost labour demand in some sectors including the green and digital ones; it will also provide support for up- and re-skilling and for increasing the labour supply via active labour market policies. On the other hand, robotisation and AI are likely to reduce labour demand for different occupations, and the current high level of labour shortages may accelerate this process.

At the current juncture, the European economy is affected by high food and energy prices and inflation. The current economic downturn, although milder than previously expected, may dampen labour shortages in some sectors and countries, especially in industry. The inflow of displaced people from Ukraine has the potential to increase the labour supply and help somewhat ease shortages in sectors with the lowest barriers to skills transferability, such as services if these persons are integrated in the labour market. In line with the activation of the Temporary Protection Directive by the Council on 4 March, a broad

([68]) Yet many of the people voluntarily quitting their job in 2021 are postponed resignations, due to the freezing of the labour market during the pandemic. See Banca d'Italia (2021) "Il mercato del lavoro dati e analisi" N6.

([69]) The great resignation may also contribute to the desirable increase in job quality. Employers will need to offer better working conditions and possibly benefits, beyond wages, to attract and keep their workers.

([70]) Brunello, G. – Wruuck, P. (2019): Skill Shortages and Skill Mismatch in Europe: A Review of the Literature. Journal of Economic Surveys, 2021, 35 (4), 1145-1167.

([71]) Desjardins, R. and Rubenson, K. (2011): An Analysis of Skill Mismatch using Direct Measures of Skills, OECD Education Working Papers n.63, Paris.

([72]) CEDEFOP (2021), "The green employment and skills transformation. Insights from a European Green Deal skills forecast scenario."

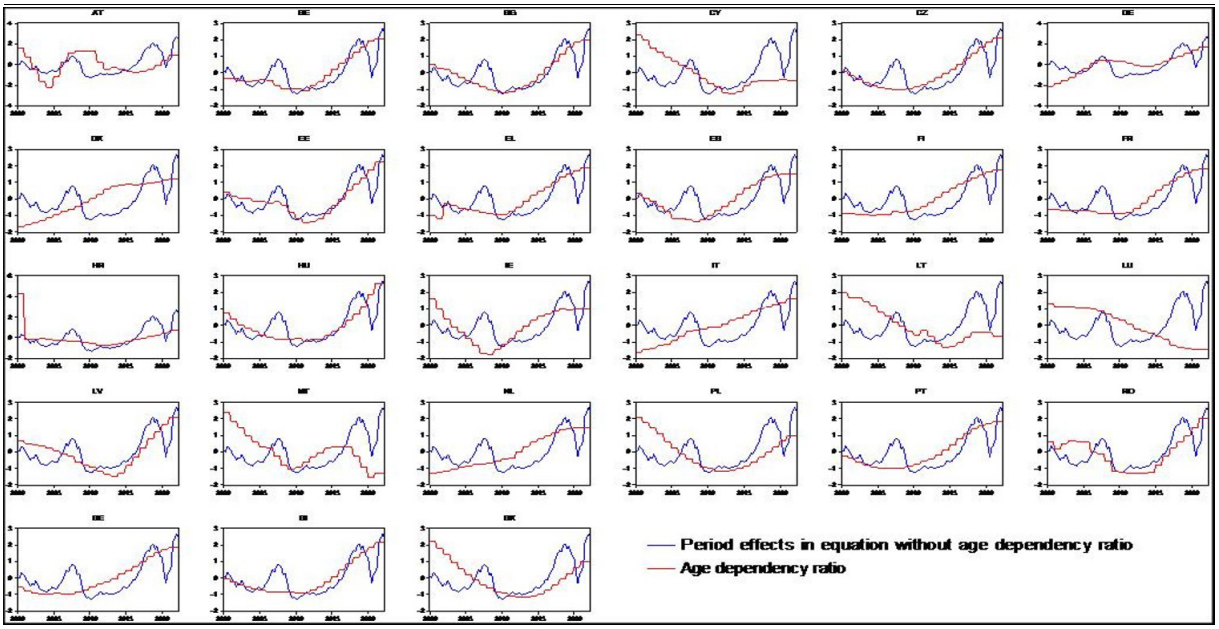
range of measures (language and training policies, access to education, care and healthcare services, targeted labour market measures such as profiling, counselling, and employment subsidies and measures to prevent undeclared work) could support the integration of displaced persons from Ukraine into the labour market of their host societies. Improved policy coordination between the different policy domains affecting labour shortages (activation policies, education and training, mobility and migration policies) could contribute to better addressing this macroeconomic challenge. Policies should continue to address the underlying drivers of labour shortages, regardless of whether an economic downturn temporarily alleviates them. This can ensure that in the short run, the positive impact of shortages on wages and working conditions prevails and that in the medium to long run, shortages do not constrain innovation and growth prospects.

Policies at the national level can effectively address the main causes of labour shortages. Activation policies could reduce both shortages and potential wage pressures, thereby contributing to price stability. Skills policies could address the main root causes of labour shortages, with the contribution of migration policies. There is scope to step up policies supporting transitions in the labour market and promoting quality of work. Labour mobility can help address labour shortages to some extent, including to cope with the consequences of an ageing workforce and in combination with measures that keep older people in the labour force. As regards migration, the Commission's recently proposed Skills and Talent package provides the framework for supportive national policies to attract talent, which can ensure an effective right to mobility for non-EU nationals and simplify admission procedures for all workers from non-EU countries. Improvements in the recognition of professional qualifications could support labour mobility filling labour shortages across the EU.

Most national actions to address the structural causes of labour shortages will have a delayed impact. This is the case especially for policies that target the labour market relevance of initial education and training. Yet it is important to implement both policies with a short-term impact (such as PES actions to improve matching, migration policies or short training courses) along with structural policies with a long-term impact on labour shortages, including structural policies affecting the provision of adult learning.

Annex 1

Graph II.12: **Period effects in equation without age dependency ratio, and age dependency ratio (data standardised by detracting means and dividing by the standard error)**



(1) The chart shows the period effects for equation 3 for manufacturing in Table II.1 and the age dependency ratio. For the equation of labour shortages for construction and services a similar relation is observed.
Source: Source: Own calculations based on period effects of regression 3 in Table II.1

III. Prospects for long-term productivity growth

By Ben Deboeck

Since the number of people at working age will begin shrinking in the coming years, demographic ageing will impose a permanent drag on economic growth in the euro area. As a result, growth will critically depend on labour productivity. Developments in total factor productivity (TFP) particularly matter, since they reflecthow technological progress allows for a more efficient use of labour and capital. However, TFP growth in the euro area has fallen back to the lowest levels in a very long period. The latest figures point to a sluggish medium-term outlook. Views on the long-term outlook for productivity growth differ. A more optimistic view considers that TFP growth will unavoidably rebound once new ground-breaking technologies mature, complementary investment and organisational changes are made and the necessary new skills acquired. However, technology diffusion has fallen because of the rising importance of intangible capital and higher market concentration, all of which deter innovation. Therefore, a return to historical TFP growth rates seems a tall order under current policies. A more downbeat view concludes that, aside from a transmission problem, innovation has become simply less transformative. As a result, productivity growth has reversed to its long-run trend and we should not expect a permanent return to a higher growth path. In addition, the cautious view points to rising structural headwinds, such as global fragmentation, climate change, demographic ageing and rising government debt, all of which might add to the downward trend in productivity growth.

Based on the standard neoclassical Cobb-Douglas production function, economic growth g_{GDP} can be expressed as a function of five parameters:

$$g_{GDP} = g_{TFP} + \alpha \times g_{K/L} + g_{WAP} + g_{ER} + g_{hours} \quad (1)$$

With capital inputs K (e.g. infrastructure, machinery, equipment or software); labour inputs L (the number of hours worked); α the income share of capital; K/L capital deepening or capital intensity, measuring the amount of capital per worker; WAP the size of the working-age population; ER their employment rate; and $hours$ the average number of hours they work. TFP stand for total factor productivity, a non-observable variable that measures how efficient labour and capital inputs are used ([73]).

The last three terms in equation 1 determine the change in the total number of hours worked and the first two terms constitute hourly labour productivity growth ([74]). Graph III.1 provides the breakdown of economic growth in the euro area since the mid-1960s, on the basis of the above expression ([75]). It shows how economic growth in past decades has been mainly driven by labour productivity (capital intensity and TFP), with a much smaller effect from the labour supply.

- The size of the ***working-age population*** has expanded steadily, though at a slowing pace. It still rose slightly over the past decade but is about to enter a downward trajectory, reducing future economic growth. In most of the newer euro area countries, this is already the case.

  Rising ***employment rates*** have been contributing to growth. However, employment rates are already high in many countries, while for others lifting them would require a tightening in retirement conditions and reforms to labour markets.

- The average number of ***hours worked*** has been declining for many decades. This reflects shorter working weeks, a higher prevalence of part-time employment and a reduction of working time leading up to retirement.

  Since the mid-1990s, ***capital intensity*** contributed 0.4 pps to average annual growth, and more for newer euro area countries. The falling contribution over time highlights limits to the extent to which capital accumulation can produce growth, considering diminishing returns and a constant depreciation of the existing capital stock.

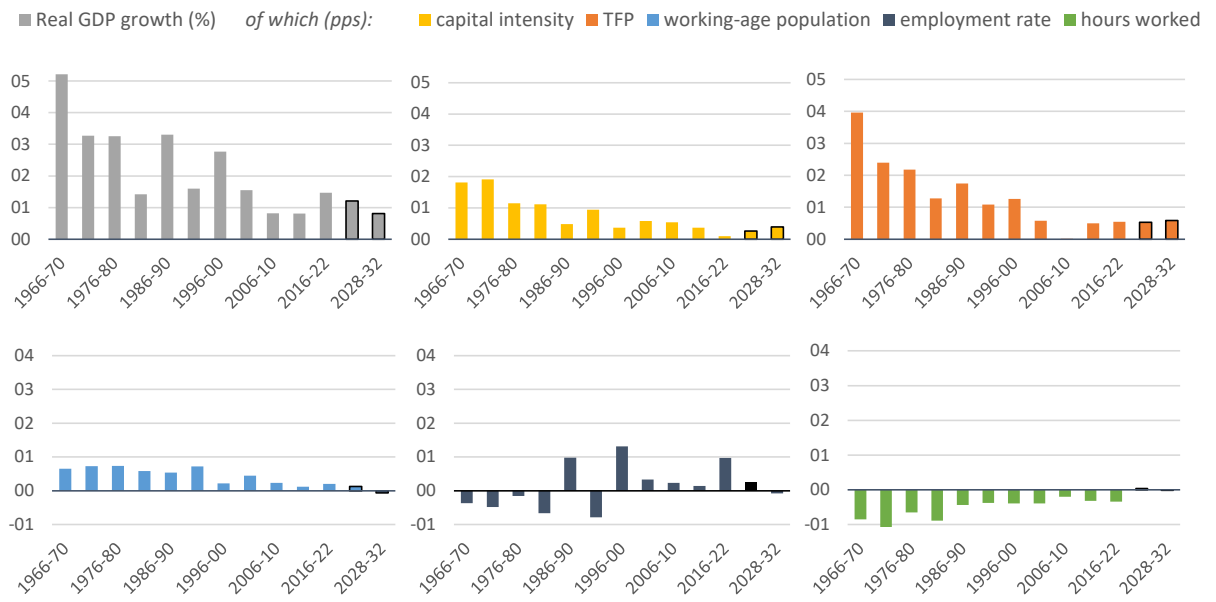
- ***TFP*** has been on a declining trend since the 1970s, a period when it was still growing by more than 2% annually. It has contributed just 0.4 pps to GDP growth since 2000 and even fell to zero in 2006-10. Recent TFP growth figures are more robust for newer euro area

([73]) In growth accounting terms, TFP is measured as the 'Solow residual': the variation in growth that cannot be explained by capital and labour inputs.

([74]) Since total output is the product of the total number of hours worked in the economy (i.e. the last three terms in equation (1)) and the output per hour worked (hourly labour productivity).

([75]) Summary country tables can be found in Annex 1.

Graph III.1: **Breakdown of economic growth in the euro area (1966-2032)**



EU20 as of 1995; EA14 (the 14 euro area countries) before (excluding EE, HR, LV, LT, SI & SK). Projections for 2022-32.
Source: AMECO; 2022 European Commission autumn forecast.

countries, which have nevertheless seen a slowdown compared to 1996-2005.

These trends show how labour productivity has been the main growth driver. Given population ageing, it will become even more key to future growth, in particular TFP growth. While capital deepening contributes to GDP growth when an economy is catching up with its peers, once nearing the technology frontier, TFP should become the predominant productivity driver ([76]). Yet TFP growth also slowed considerably, especially in the original euro area countries.

The ultimate drivers of TFP are manifold and often interrelated. While a detailed discussion of these determinants goes beyond the scope of this article, they can be summarised as:

innovation (the adoption of new technologies and ideas in production and organisation);

human capital (higher educational attainment and better health raise the potential for innovation and facilitates technology diffusion);

investment in tangible capital (e.g. plants, research facilities, machinery, equipment, hardware)

investment in intangible capital (e.g. R&D, design, advanced software, databases, business processes);

physical infrastructure (e.g. transport, energy and telecommunication networks);

market efficiency (achieving an optimal sectorial allocation of available resources, e.g. through competition policy and labour mobility);

financial development (access to finance);

trade openness (access to foreign capital and intermediary goods);

prices and availability of *commodities* needed for certain production technologies;

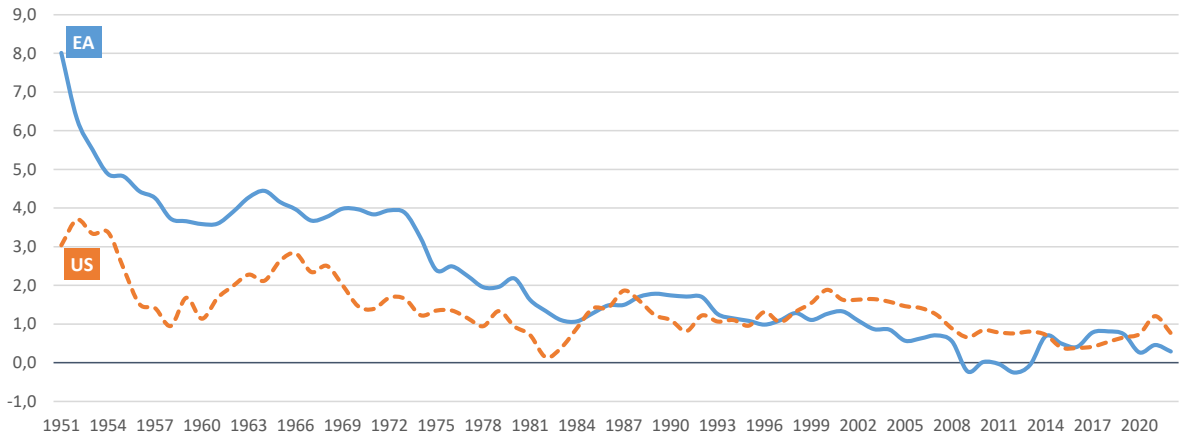
the socially embedded system of *formal rules*, e.g. (intellectual) property rights, tax system, rule of law, labour and product market regulations

informal constraints, e.g. political stability, bureaucratic efficiency, norms and conventions, culture.

The next sections discuss past developments in TFP, and the medium- and long-term outlook for TFP growth, based on a literature review.

([76]) Over 80% of the income differences between rich and poor countries can be explained by different rates of technology adoption, according to Comin D. & M. Mestieri (2018), *If Technology Has Arrived Everywhere, Why Has Income Diverged?*, American Economic Journal: Macroeconomics, Vol. 10 No. 3, pp 137-178.

Graph III.2: **TFP growth (%, 5y moving average)**



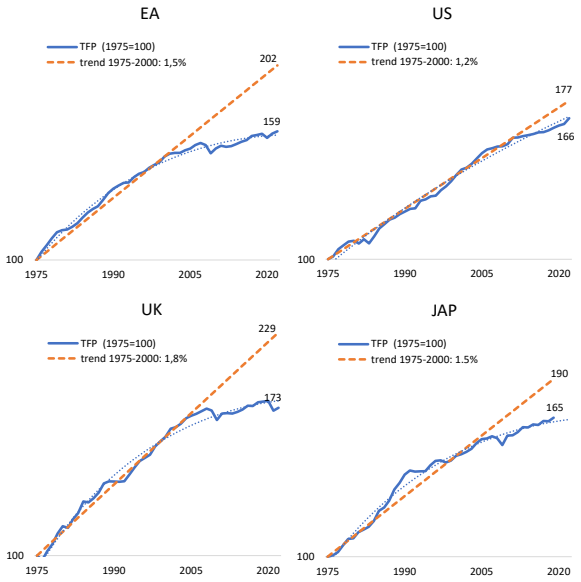
EA based on DE, FR, IT, ES, NL, BE, PT & FI for 1950-1965.
Source: European Commission; 1950-1965 based on www.longtermproductivity.com.

III.1. Past trends in TFP growth

In the decades following World War II, European countries grew at previously unseen rates. Between 1950 and the mid-1970s, annual GDP per capita growth averaged around 5% in the euro area, compared to a little under 3% in the US (77). For Europe, the post-war run of solid, broad-based growth represented a catching-up with the US, which saw the earlier mass adoption of two crucial 'general-purpose technologies': electrification and the internal combustion engine. Other major innovations concerned advances in chemistry and medicines. This led to a fast growth in TFP (see Graph III.2), which in itself put economic growth at about 4%. Worker' productivity was boosted also through a sharp rise in capital intensity because of the post-war reconstruction and the shift to more capital-intensive production, possibly also related to the increased productivity of capital.

The oil shocks of the 1970s ushered in a period of lower growth. The persistent growth slowdown was particularly driven by TFP growth, which fell back to about 1.5% on average in the euro area in 1975-2000. The oil shocks highlighted how western economies had, for more than a century, achieved rapid productivity growth by augmenting labour output with rising amounts of (cheap) energy and other resources (78). Aside from the surge in oil prices, also the nature of technology changed. The key innovations that fuelled the post-war stretch of high growth had been largely exploited.

Graph III.3: **Total factor productivity developments: actual and trend (log scale)**



EA14 before 1995 (excluding EE, HR, LV, LT, SI & SK).
Source: European Commission; Japan from www.longtermproductivity.com.

However, at the same time, the early 1970s heralded the emergence of a new general-purpose technology: microprocessors and, more in general, information technology. Computing power grew exponentially, and computers started to appear everywhere in the 1980s, similar to electricity and the internal combustion engine some decades earlier.

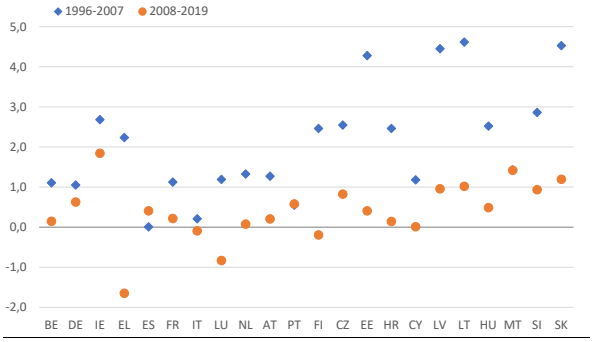
(77) Based on data from www.longtermproductivity.com, euro area figure includes DE, FR, IT, ES, NL, BE, PT & FI.
(78) DeLong B. (2022), *Slouching Towards Utopia*, Basic Books.

In hindsight, IT spread more slowly, affected fewer sectors and in less fundamental ways than electrification had done, so its impact on productivity was weaker and shorter. The temporary uptick in TFP growth for the US in 1995-2005 (see Graph III.2) can be attributed to IT-intensive sectors ([79]). The euro area generally did not experience a comparable acceleration.

Already before the onset of the global financial crisis in 2008, advanced economies had suffered a slowdown in TFP growth. Then, when the financial crisis hit, followed by the euro area debt crisis, productivity dropped further. The prolonged crisis seems to have amplified the already downward trend by the hysteresis it caused through tight credit conditions, a decline in aggregate demand, economic uncertainty, and lower investment. Trend TFP growth in the euro area has been at about 0.3% since 2008. Rather than a bug, weak productivity growth has become a feature of almost all euro area countries (see Graph III.4). However, this is not a uniquely European problem. In nearly all advanced economies, productivity has come down notably from the trend growth of 1975-2000 (see Graph III.3). This occurred despite the computer age being quickly followed by the emergence of internet and mobile technology, cloud computing, robotics, big data, etc. As a result, the view that new innovations fail to produce the tidal waves caused by past technologies has gained in prominence, as will be discussed in Section IV.3.

Productivity dynamics in the euro area were thus already sluggish going into the COVID-19 pandemic. On top of the uncertain outlook for productivity growth from the pandemic comes the energy shock that hit the European economies barely two years after the onset of the pandemic.

Graph III.4: **Average TFP growth since 1996**



Source: European Commission.

Following the oil shocks from the 1970s, oil prices remained elevated until 1985. Azam (2020) found that this prolonged oil shock inflicted sizable damage on potential TFP in France and Germany, who are resource-poor economies like most EU Member States. A similar fall in potential TFP is estimated to have taken place in 2003-15, another extended period of high oil prices ([80]). These findings highlight how the current energy crisis risks hampering further TFP growth.

III.2. Medium-term outlook

Based on its latest forecast, the European Commission prepares medium-term economic projections, including for TFP growth. The TFP figure derived from the forecast, which covers two years ahead, is broken down into a trend component and a cyclical component based on a Kalman filter methodology which exploits the link between the TFP cycle and capacity utilisation. This trend-cycle breakdown is used to project potential TFP growth ten years ahead ([81]).

Graph III.5 shows the medium-term TFP projections based on the Commission forecast from autumn 2019 (so prior to the pandemic and energy crisis) and the projections based on the 2023 Spring Commission forecast. At the end of 2019, TFP growth was expected to average 0.6% in 2016-22 and to rise to about 0.7% over the next decade. This compares to an average growth rate of 0.5% since 2000, so slightly above the recent average.

([79]) Aghion P., A. Bergeaud, T. Boppart, P.J. Klenow & H. Li (2019), *A Theory of Falling Growth and Rising Rents*, Working Paper Series 2019-11, Federal Reserve Bank of San Francisco. Gordon R. & H. Sayed (2020), *Transatlantic Technologies: The Role of ICT in the Evolution of U.S. and European Productivity Growth*, NBER Working Paper No. 27425.

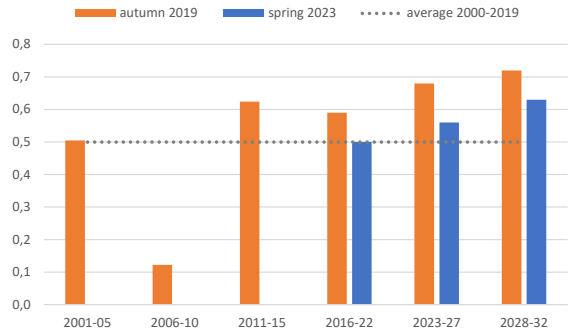
([80]) Azam J-P. (2020), Oil shocks and Total Factor Productivity in resource-poor economies: The cases of France and Germany, TSE Working Paper, n° 20-1126.

([81]) For more details about the methodology, see European Commission (2021), Output Gap Estimation Using the European Union's Commonly Agreed Methodology: Vade Mecum & Manual for the EUCAM Software, European Economy Discussion Paper 148.

Growth figures in the 2023 Spring Commission forecast have been revised downward compared to 2019. TFP growth eventually averaged just 0.5% in 2016-2022 and is projected to remain around these values before slightly increasing to 0.6% in 2028-2032. Lower medium-term estimates of TFP growth relative to Autumn 2019 are explained by the effects of the COVID-19 and energy shocks, which are still surrounded by considerable uncertainty. On the upside, capital accumulation and, subject to large uncertainty, technology fostered by the RRF are expected to give a significant boost to growth in the medium to long run.

TFP growth is, in other words, expected to only slightly improve upon the average of recent decades, which already compared bleakly with the longer-term average growth rate of 1.5% in 1975-2000. The tables in Annex 1 show a high dispersion in TFP growth among euro area countries. Most newer members have been achieving higher growth (see Graph III.4) and, despite downward revisions also for these countries, this difference is expected to persist over the next decade as they continue to catch up. Likewise, sluggish TFP growth would persist among the initial euro area countries.

Graph III.5: **TFP growth – euro area**



Source: European Commission.

III.3. Long-term outlook

Notwithstanding the fast pace of innovation in information technologies, productivity growth has been modest at best in the past two decades. Views on prospects for future productivity growth differ, depending on how this apparent paradox is assessed. Three broad views can be distinguished, which are discussed in this section:

1. According to the **mismeasurement hypothesis**, the observed slowdown in productivity is, at least partially, misleading since this apparent declining trend reflects how statistics do not appropriately account for digital productivity gains.

2. The **optimistic** view argues that time is needed for new technologies to mature and overcome barriers that hamper technology diffusion, stressing the role of structural policies.

3. The **pessimistic** view concludes that the decline in productivity growth is a structural phenomenon. It reflects how past transformative innovations are unlikely to be repeated in the future, with rising structural headwinds adding to the downward trend.

The mismeasurement hypothesis

Some economists point at mismeasurement by official productivity metrics to explain the modern productivity paradox. According to this view, traditional procedures for estimating GDP do not fully account for new and better products ([82]). However, studies that seek to correct for such omissions and biases generally conclude that mismeasurement alone can explain just a fraction of the slowdown. Syverson (2017) argues that the asserted mismeasurement in GDP data is inconsistent with estimations based on alternative sources for the US ([83]). Similarly, Byrne et al. (2016) argue that growth measurement errors for the ICT sector cannot explain the observed slowdown ([84]). They stress that the issue is not whether there is a bias but whether it is larger than it used to be. Aghion et al. (2018) estimate that at most one-sixth of the decline in the productivity growth rate between 1996-2005 and 2005-13 in the US could be attributed to mismeasurement since the rate did not increase much after 2005 ([85]).

([82]) See for example Hatzius J. & K. Dawsey (2015), *Doing the Sums on Productivity Paradox v2.0*, US Economics Analyst 15/30; Feldstein M. (2015), *The U.S. Underestimates Growth*, opinion contribution in the Wall Street Journal.

([83]) Syverson C. (2017), *Challenges to Mismeasurement Explanations for the US Productivity Slowdown*, Journal of Economic Perspectives, Volume 31-2, pp 165-186.

([84]) Byrne D., J. Fernald & M. Reinsdorf (2016), *Does the United States have a Productivity Slowdown or a Measurement Problem?*, Brookings Papers on Economic Activity.

([85]) Aghion P., A. Bergeaud, T. Boppart, P. Klenow & H. Li (2018), *Missing Growth from Creative Destruction*.

The fact that the productivity slowdown is observed across all advanced economies, regardless of their ICT intensity, also suggests that it is driven by underlying macroeconomic factors, considering the varied sources and methods used across national statistical systems. Byrne et al. (2016) discuss how apparent innovations such as smartphones, Google searches, and social networks might create substantial consumer welfare, but this is essentially a non-market effect. Overall, the mismeasurement hypothesis does not satisfactorily explain the TFP growth slowdown. Brynjolfsson et al. (2017) nevertheless highlight how national statistics could fail to measure the full benefits of new technologies such as artificial intelligence (AI) in the future ([86]).

The optimistic view

The prolonged spell of sluggish TFP growth over the two last decades should be seen as a pause before a new acceleration arrives, argues a group of economists who are optimistic about long-term productivity prospects. In their view, a tidal wave of ground-breaking innovation is building, including: quantum computing, AI and machine learning, the Internet of Things, additive manufacturing, advanced robotics, blockchain, augmented reality, biochips, bionics and biological augmentation, human genome research and genetic engineering, synthetic biology, brain-machine interfacing, autonomous vehicles, revolutionary new materials such as graphene or nanotubes, and the innovation needed to meet the net zero carbon emission target by 2050. Spurred by global competition, these technologies should bring transformative change once they spread more widely across industries, accompanied by waves of complementary innovations ([87]).

Proponents of this view argue that many of the benefits of the digital and information revolutions are still to come as the technology needs to mature and spread in the economy and society. As the past showed, there can be a long lag between an innovation and the moment its applications start to have a significant impact. Van Ark (2016) considers that recent technology is often still in its 'installation phase' and productivity effects may occur only once it enters the 'deployment phase'. ([88]) The apparent paradox is, in other words, consistent with an economy in transition that is experiencing growing pains. Complementary investment, new skills and organisational changes are required to realise the benefits of new technologies, with productivity growth assumed to follow a J-curve (Brynjolfsson et al., 2020) ([89]). Frey (2019) reveals strong similarities with historical episodes, underscoring the disruptions and popular resistance that labour-replacing technologies brought about. As automation risks leaving many people worse off in the short term, the resulting social unrest might slow the pace of automation and productivity growth ([90]).

However, many authors believe that, while innovation might continue unabated, diffusion of new technology has become a problem, so the asserted potential might never come to fruition. This underscores the importance of structural policies. OECD firm-level analysis suggests that the aggregate productivity slowdown does not apply to the most productive firms. The overall slowdown then results from a diffusion problem from the best performers (typically larger, more profitable and younger firms, and more likely to be part of a multinational group) to the laggard firms ([91]). The highly uneven technological diffusion seems due to the nature of innovations at the current juncture. Intangible assets (e.g., digital platforms, design, computerised information, and organisational capital ([92])) are characterised by high fixed costs and low marginal costs and are more difficult to replicate than machinery and hardware. As a result, intangible-intensive companies can scale up faster, becoming more productive and widening the gap with lagging companies (de Ridder, 2019) ([93]). Brynjolfsson et al. (2020) find that digital capital has disproportionately accumulated in a small

([86]) Brynjolfsson E., D. Rock & C. Syverson (2017), *Artificial Intelligence and the Modern Productivity Paradox: A Clash of Expectations and Statistics*, NBER Working Paper No. 24001.

([87]) See for example Brynjolfsson E. & A. McAfee (2014), The Second Machine Age - Work, Progress, and Prosperity in a Time of Brilliant Technologies, WW Norton & Co; Mokyr J., C. Vickers & N. L. Ziebarth (2015), The History of Technological Anxiety and the Future of Economic Growth: Is this Time Different?, Journal of Economic Perspective, 29/3, pp 31-50.

([88]) Van Ark (2016), *The Productivity Paradox of the New Digital Economy*, International Productivity Monitor 31, pp 3-18.

([89]) Brynjolfsson E., D. Rock & C. Syverson (2020), *The Productivity J-Curve: How Intangibles Complement General Purpose Technologies*, NBER Working Paper No. 25148.

([90]) Frey C.B. (2019), The technology trap. Capital, labor and power in the age of automation, Princeton University Press

([91]) Andrews D., C. Criscuolo & P. N. Gal (2015), *Frontier Firms, Technology Diffusion and Public Policy: Micro Evidence from OECD Countries*, OECD Productivity Working Papers No. 2.

([92]) Bloom, Sadun & Van Reenen (2017) find that differences in management practices account for about 30% of TFP differences both between countries and within countries across firms.

([93]) De Ridder M. (2019), *Market Power and Innovation in the Intangible Economy*, Cambridge Working Papers in Economics 1931.

subset of 'superstar' firms and its concentration is much greater than that of other assets ([94]).

Aghion et al. (2019) conclude that the expansion of firms achieving high productivity levels leads to higher market concentration, thus deterring innovation by smaller and less productive firms. Notwithstanding an initial burst of growth, TFP would fall and undermine growth in the long term. Autor et al. (2020) see evidence of winner-take-all effects in high-tech sectors ([95]). Suedekum & Woessner (2019) find that industrial robots disproportionally lifted productivity in the European firms that were already the most productive, allowing them to increase markups ([96]). Akcigit and Ates (2019) see a sharp increase in the concentration of the number of patents applied for and bought by the top 1% innovating companies, with killer acquisitions by large companies, who buy patents to put them on the shelf rather than deploy the patented technology ([97]). Given that major leaps in technology tend to come from younger, smaller firms, the increasingly dominant position of such 'superstar' companies bodes ill for innovation.

These findings draw attention to the importance of the institutional environment and public policies such as competition policy, fundamental research, tax policy, network infrastructure, education and training, data proprietary rights and industrial policies. Philippon (2019) documents how 'superstar' firms have been lobbying successfully for anticompetitive regulations, a point stressed also in Aghion et al. (2021) ([98]).

As a result, even the more optimistic voices admit that a positive impact from artificial intelligence might take time to materialise and warn about excessive incentives for automation over labour-augmenting technologies. AI is considered the prime candidate to become the next general-purpose technology. It has the potential to spur a wave of complementary innovations and to automate non-routine cognitive tasks and services once thought out of reach, such as driving or medical evaluations ([99]). However, technology is not skill-neutral, nor is its outcome preordained: there are plenty and highly varying ways in which AI can be developed and applied. According to Acemoglu & Restrepo (2019) recent trends in AI have been biased towards automation of production ('human-replacing innovations'), resulting in 'so-so technologies': advances that disrupt employment and displace workers without generating much of a boost in productivity or quality of service ([100]). They argue that there has been insufficient focus on creating new activities for which labour can be employed more productively ('human-enhancing innovations'). Brynjolfsson (2022) similarly warns about an excessive focus on human-like artificial intelligence, which tries to imitate humans. Such an outcome would negatively affect inequality and welfare, feeding resentment and political instability ([101]). This corroborates with findings and warnings in Frey (2019). Presumable factors tilting the balance against new tasks include tax distortions between capital and labour, excessive enthusiasm about the benefits of fast automation based on not yet very effective frontier technology and skills mismatches. Hoffmann & Nurski (2021) conclude that skills, data and financing put constraints on artificial intelligence advancement in Europe ([102]). The prevailing business model and vision of large tech companies steering AI developments might also play a role, as well as the overall declining government role in innovation, with research paying less attention to future promises than on near-term automation possibilities. According to Acemoglu (2021) government regulation and policies, going beyond promoting competition, are needed to redirect AI research towards the most beneficial outcomes ([103]).

([94]) Brynjolfsson E., L. Hitt, D. Rock & P. Tambe (2020), *Digital Capital and Superstar Firms*, NBER Working Paper 28285.

([95]) Autor D., D. Dorn, L.F. Katz, C. Patterson & J. Van Reenen (2020), *The Fall of the Labor Share and the Rise of Superstar Firms*, NBER Working Paper No. 23396.

([96]) Suedekom J. & N. Woessner (2019), *Robots and the Rise of European Superstar Firms*, European Economy Discussion Paper No. 118.

([97]) Akcigit U. & S.T. Ates (2019), *What Happened to US Business Dynamism?*, BFI Research Brief.

([98]) Philippon T. (2019), *The Great Reversal: How America Gave Up on Free Markets*, Harvard University Press; Aghion P., C. Antonin & S. Bunel (2021), *The Power of Creative Destruction*, Belknap Press.

([99]) See, for instance, Trajtenberg M. (2018), *AI as the next GPT: a Political-Economy Perspective*, NBER Working Paper No. 24245; Agrawal A., J. Gans & A. Goldfarb (2019), *The Economics of Artificial Intelligence: An Agenda*, University of Chicago Press.

([100]) Acemoglu D. & P. Restrepo (2019), *The Wrong Kind of AI? Artificial Intelligence and the Future of Labor Demand*, NBER Working Paper No. 25682. As examples of 'so-so technologies', they point to self-checkout kiosks at grocery stores, self check-in at airports and automated customer service software.

([101]) Brynjolfsson E. (2022), The Turing Trap: The Promise & Peril of Human-Like Artificial Intelligence, Stanford Digital Economy Lab Insights.

([102]) Hoffmann M. & L. Nurski (2021), The triple constraint on artificial-intelligence advancement in Europe, Bruegel blog post 06/12/2021.

([103]) Acemoglu (2021), *Harms of AI*, NBER Working Paper No. 29247.

The pessimistic view

According to other economists, even if barriers to productivity diffusion were to be overcome, future innovation will fail to lift productivity growth permanently above its sluggish trend. Gordon (2014, 2016) is probably the best-known proponent on this side of the debate. He argues that, similar to what has been ongoing for the past 50 years, contemporary breakthroughs in for example AI, robotics or nanotechnology fall short of the progress during 'the long century' of 1870-1970, which was exceptional in the number and scope of life-changing innovations. The 'big wave' of broad-based innovation seen during that exceptional period can simply not be repeated ([104]). The downward trend of past decades then justifies a cautious view about the ability of new technology to significantly lift future productivity growth.

Vollrath (2020) similarly highlights how the 20th century was exceptional. Lower growth is the outcome of a successful process of rising longevity and living standards, which shift demand towards services. Services can less easily achieve productivity gains, though, as they often require interaction and non-standard actions. The sharp price decrease for electronics and computing power might have accelerated the shift to services and ageing might do the same. According to Vollrath, policy makers should focus on issues such as environmental and distributional problems rather than trying to bring growth back to past rates ([105]).

Importantly, Gordon does not claim that technological progress has stopped but rather that it has reversed to its historical trend. The IT-driven acceleration that started in the mid-1990s is considered a temporary deviation from the long-term downward trend in productivity growth. Moreover, it was only a minor wave compared to the 'one big wave'. More such deviations might follow since new technologies could result in positive shocks, though no permanent return to a higher growth rate is to be expected. Gordon notes how progress since the 1970s has been concentrated in a relatively narrow part of the economy: entertainment, communication and information processing.

Claims that technological progress has reached a saturation point are not new. Already in 1988 Olson argued that a slowdown in productivity growth was unavoidable. He observed that within a couple of decades after World War II, the previously neglected innovations had largely been exploited, gains from reallocating resources had largely disappeared, high-tech production had dispersed globally because of technology adoption, and gains from institutional reforms had reached their limits ([106]). Similar observations were made at the end of the 19th century, as the drivers of the first Industrial Revolution had run their course and the benefits of electrification were not yet felt. Towards the end of the Great Depression, Alvin Hansen (1938) saw the emergence of a 'secular stagnation', due to a lack of investment because of faltering innovation and slowing population growth ([107]). Refuted by the post-war economic boom, the secular stagnation thesis was revived in the past decade. It blames weak economic growth on an imbalance between declining investment and higher savings so that negative real interest rates are needed to achieve full employment ([108]). A supply-side approach to the secular stagnation theory boils down to the arguments advanced by Gordon and others.

Bloom et al. (2017) find that ideas are getting ever harder to find: research inputs have been rising substantially but research output is declining sharply across industries. They estimate that just to maintain the same overall rate of economic growth, the US would need to double its research efforts every 13 years. It now takes, for instance, more than 18 times the number of researchers to achieve Moore's law — doubling chip density/power about every two years — than in the early 1970s. So, while the world is not running out of ideas, they are getting more expensive to find, for example because researchers need to master an ever-larger body of knowledge and they increasingly work in

([104]) Gordon R.J. (2014), The Demise of U.S. Economic Growth: Restatement, Rebuttal, and Reflections, NBER Working Paper No. 19895; Gordon R.J. (2016), The Rise and Fall of American Growth: The U.S. Standard of Living since the Civil War, Princeton University Press.

([105]) Vollrath D. (2020), Fully Grown: Why a Stagnant Economy Is a Sign of Success, University of Chicago Press.

([106]) Olson M. (1988), *The Productivity Slowdown, The Oil Shocks, and the Real Cycle*, Journal of Economic Perspectives, Volume 2, No. 4, pp 43-69.

([107]) Hansen A. (1938), *Economic progress and declining population growth*, Presidential address delivered at the 51th Annual Meeting of the American Economic Association.

([108]) Teulings C. & R. Baldwin (ed.) (2014), *Secular stagnation: Facts, causes, and cures*, CEPR Press.

larger teams of specialised members ([109]). In other words, innovation has run into diminishing returns, inexorably slowing TFP growth. Nordhaus (2021) concludes that, Contrary what is suggested by writers such as Brynjolfsson & McAfee (2014) ([110]), a 'growth singularity' is not near.

A growth singularity in this case refers to a rapid growth in computation and artificial intelligence, toa point after which economic growth will accelerate sharply, causing an ever-accelerating pace of improvements to cascade through the economy.

Even leaving aside the dearth of economy-altering innovation, the pessimistic viewpoint considers that the emergence of several structural headwinds raises the likelihood of a growth slowdown. To offset the impact of these structural changes, lots of additional innovation would be needed. There is, for example, a natural limit to the long-run pattern of rising educational attainment, both in duration of schooling and how many people are affected. Bergeaud et al. (2017) conclude that few gains remain to be obtained from this for the euro area, though there are considerable disparities among countries, and Bell et al. (2019) highlight how the 'inventor pool' includes few women, minorities and children from low-income families, resulting in 'lost Einsteins and Marie Curies' ([111]). Other factors that darken the productivity outlook include demographic ageing, deglobalisation, climate change and high public debt (limiting the potential to boost public investment).

Adler et al. (2017) estimate that shifts in the age structure may have played a role in lower TFP growth, reducing it by as much as 0.2-0.5 pps per year on average across advanced economies ([112]). Aiyar et al. (2016) find that an ageing workforce would reduce TFP growth by 0.2 pps per year in the euro area in the period up to 2035. They calculate that around 45% of the EU workforce is concentrated in occupations where productivity decreases with age and only 25% in occupations where productivity increases with age ([113]). However, micro-level studies argue that the link between age structure and firm productivity is more nuanced. Rather than being a function of age, the productivity divide appears to be based on skills levels. Acemoglu & Restrepo (2017) even find a positive relationship between ageing and economic growth and suggest that this might be related to a more rapid adoption of automation technologies such as industrial robots in countries undergoing rapid population ageing ([114]). Basso & Jimeno (2021) add an important qualification in that, because of a trade-off between investment in automation and innovation, population ageing eventually leads to lower growth in GDP per capita. Automation increases productivity by substituting labour in production but cannot sustain growth in the long run because automation is a subsidiary activity of innovation, which yields new products ([115]).

A decades-long drive toward global integration has halted and risks going into reversal. The post-war paradigm (that welfare increases when economies engage in international trade and integrate into global value chains) is challenged by the rising prevalence of protectionist policies and mounting geopolitical tensions. In addition, the COVID-19 pandemic exposed how tightly integrated global production systems are vulnerable to disruptions, which might lead to a retrenchment of global value chains. Together with the rise in trade barriers this might cause a partial reversal of globalisation. Such global fragmentation into trading blocs might negatively impact productivity growth through reduced technology transfers, a deterioration in input access and quality, and fewer possibilities for productive firms to grow internationally.

Climate change might lead to considerable losses in productivity, particularly via lost hours worked, damage to capital stocks, and resource diversion from investment in productive capital and innovation to climate change adaptation and

([109]) Bloom N., C.I. Jones, J. Van Reenen, M. Webb (2017), *Are Ideas Getting Harder to Find?*, NBER Working Paper No. 23782.

([110]) Nordhaus D. (2021), *Are We Approaching an Economic Singularity? Information Technology and the Future of Economic Growth*, American Economic Journal: Macroeconomics, 13(1), pp 299–332.

([111]) Bell A., R. Chetty, X. Jaravel, N. Petkova & J. Van Reenen (2019), *Who Becomes an Inventor in America? The Importance of Exposure to Innovation*, The Quarterly Journal of Economics, Volume 134/2, pp 647-713.

([112]) Adler G., R. Duval, D. Furceri, S. Kiliç Çelik, K. Koloskova & M. Poplawski Ribeiro (2017), *Gone with the Headwinds: Global Productivity*, IMF Staff Discussion Notes No. 2017/004.

([113]) Aiyar S., C. Ebeke & X. Shao (2016), *The impact of workforce ageing on Euro area productivity*, IMF Working Papers 16/238.

([114]) Acemoglu D., Restrepo P. (2017), Secular Stagnation? The Effect of Aging on Economic Growth in the Age of Automation, NBER Working Paper No. 23077.

([115]) Basso H.S. & J.F. Jimeno (2021), From Secular Stagnation to Robocalypse? Implications of Demographic and Technological Changes, Journal of Monetary Economics, Vol. 117, pp 833-847.

reconstruction efforts ([116]). These effects are expected to be further exacerbated by more frequent and intense extreme weather events. Estimates indicate that TFP in advanced economies hit by natural disasters declines by 0.3% in the first year, with climate disasters being particularly detrimental for productivity. Estimates for advanced economies indicate that climate disasters reduce labour productivity by about 0.5% and have persistent effects ([117]). At the same time, mitigating climate change by drastically cutting CO2 emissions and reaching net zero by 2050 is such an all-encompassing challenge that it would require a massive boost in innovation. This could push the technological frontier significantly outwards.

Gordon (2012) considers that efforts to cope with global warming partly represent a payback for past growth ([118]). To a considerable extent, current welfare levels mirror efficiency gains from technologies that rely on hydrocarbon burning, the negative externalities of which were ignored for much of the past century ([119]). The urgent need to decarbonise implies a large supply shock, with an overhaul of the economic fabric, abandoning certain technologies and investing massively in alternatives. The absolute priority of climate mitigation and adaptation measures over other considerations might crowd out more productive investment, thus restraining productivity growth in the medium term ([120]). However, the OECD (2021) finds that in recent decades the negative effect on aggregate productivity growth of (less far-reaching) environmental policies was temporary. At the same time, the productivity gap widened: the most technologically advanced companies and sectors saw a small increase in productivity, possibly as they were in the best position to adapt, while productivity fell further for the least productive firms ([121]).

([116]) Batten S. (2018), *Climate change and the macro-economy: a critical review*, BoE Staff Working Paper No. 76.
([117]) Dieppe A. (ed.) (2021), Global Productivity – Trends, Drivers and Policies, World Bank Group.
([118]) Gordon R.J. (2012), Is US economic growth over? Faltering innovation confronts the six headwinds, NBER Working Paper No. 18315.
([119]) Similarly, productivity growth can be overestimated where economic growth relies on heavily polluting technologies or on natural capital depletion.
([120]) Pisani-Ferry J. (2021), Climate Policy is Macroeconomic Policy, and the Implications Will Be Significant, PIIE Policy Brief 21-20.
([121]) OECD (2021), Assessing the Economic Impacts of Environmental Policies: Evidence from a Decade of OECD Research, OECD Publishing.

III.4. Conclusion

Total factor productivity is the dominant determinant of growth in the long term, since it captures how technological progress allows for a more efficient use of labour and capital inputs. However, a declining trend in TFP growth has been ongoing for many decades.

The oil shocks of the 1970s ended a decades-long period of fast economic growth. The slowdown mainly affected TFP growth, which entered a lower growth trajectory as of the 1970s, despite notable technological progress. Around the turn of the century, TFP growth decelerated further in nearly all initial euro area countries, while newer members in turn caught up. However, when the global financial crisis hit, productivity dropped across the board and came to a standstill. In the 2010s, few countries showed signs of a substantial recovery in TFP growth, with the prolonged financial crisis seemingly having hurt the productivity potential. The succession of frequent supply shocks in recent years, with the COVID-19 pandemic, the war in Ukraine and the energy crisis, might further erode the already weak trend in TFP growth.

The apparent discrepancy between relentless innovation and the productivity slowdown in advanced economies has been attributed to several factors. The more optimistic view considers that TFP growth will unavoidably rebound once (i) new ground-breaking technologies such as artificial intelligence have had more time to mature, (ii) complementary investment and organisational changes are made, and (iii) the necessary new skills have been acquired. Less optimistic studies conclude that technology diffusion has fallen because of the rising importance of intangible capital and higher market concentration, deterring innovation. Or because innovation is simply not as transformative as in the past.

However, the extent to which innovation eventually translates into productivity is not predetermined since certain factors can inhibit the growth potential of new technology, e.g. a shortage of skilled workers, access to financing or competition policies that favour incumbents.

There are also signs that research has an insufficient focus on creating new activities for which labour can be employed more productively. As a result, even the more optimistic voices admit that a positive impact from breakthrough

technologies such as artificial intelligence might take time to materialise.

An even more cautious view has gained in prominence because of the observed developments. It concludes that, aside from a transmission problem, innovation is simply not as transformative as in the past. A dearth of economy-altering innovation has pushed productivity growth back to its long-run historical trend and one should not expect a permanent return to a higher growth rate, even though new technologies might temporarily lift it (as was the case with the IT-driven acceleration at the end of the 20th century).

In addition to a lack of transformative inventions, the cautious view points to rising structural headwinds that might add to the downward trend in productivity growth, such as global fragmentation, climate change, demographic ageing, and rising government debt.

In conclusion, in the medium-term, the outlook for productivity growth is negatively affected by the effects of the COVID-19 pandemic and the energy shocks, which are still surrounded by considerable uncertainty, partly compensated by capital accumulation and technological developments fostered by the RRF. In the longer term, curbing the slowing trend in productivity growth depends on fully exploiting the potential of breakthrough innovation. This underlines the importance of policies that enable innovation to be translated into technology. These policies include fundamental research, taxation, network infrastructure, competition policy, access to finance, education and training, data proprietary rights, and industrial policy.

EU programmes such as NextGenerationEU and Horizon Europe, as well as the effectiveness of national research frameworks, should facilitate the diffusion of existing innovation and the creation of new innovation in the context of the twin green and digital transitions.

Annex 1: Country tables

Table III.1: **Average growth and contributions**

BE	K/L	TFP	WAP	ER	hours	total
1966-70	1,4	3,6	0,4	0,1	-0,8	4,7
1971-75	1,5	2,8	0,6	-0,3	-1,1	3,5
1976-80	1,5	2,5	0,5	-0,5	-0,9	3,1
1981-85	0,7	1,0	0,2	-1,0	0,0	0,9
1986-90	0,6	1,7	0,3	0,9	-0,5	3,0
1991-95	1,2	1,4	0,5	-0,3	-1,2	1,6
1996-00	0,3	1,2	0,0	1,2	0,1	2,8
2001-05	0,3	0,9	0,4	0,4	-0,1	1,9
2006-10	0,2	0,3	0,7	0,3	0,0	1,5
2011-15	0,3	0,5	0,5	0,0	0,0	1,3
2016-22	0,2	0,1	0,5	0,9	-0,2	1,5
2023-27	0,2	0,3	0,4	0,3	0,2	1,4
2028-32	0,3	0,4	0,2	0,0	0,0	0,9

DE	K/L	TFP	WAP	ER	hours	total
1966-70	1,8	3,4	0,4	-0,5	-1,1	4,0
1971-75	1,9	2,4	0,4	-0,7	-1,7	2,4
1976-80	0,8	2,2	0,5	0,4	-0,6	3,3
1981-85	0,9	1,2	0,3	-0,1	-0,9	1,4
1986-90	0,4	2,1	0,3	1,6	-1,1	3,2
1991-95	1,0	1,4	0,7	-0,6	-0,5	2,0
1996-00	0,6	1,1	0,1	0,9	-0,9	1,9
2001-05	0,6	0,7	0,2	-0,5	-0,5	0,5
2006-10	0,0	0,4	-0,4	1,3	-0,1	1,2
2011-15	0,0	1,0	-0,2	1,2	-0,4	1,7
2016-22	0,2	0,7	0,1	0,7	-0,6	1,1
2023-27	0,2	0,6	-0,1	0,3	-0,2	1,0
2028-32	0,5	0,8	-0,2	-0,3	0,0	0,7

EE	K/L	TFP	WAP	ER	hours	total
1966-70	-	-	1,1	-	-	-
1971-75	-	-	1,0	-	-	-
1976-80	-	-	0,6	-	-	-
1981-85	-	-	0,5	-	-	-
1986-90	-	-	0,5	-	-	-
1991-95	-	-	-1,3	-4,2	-0,2	-
1996-00	1,9	4,9	0,1	-1,6	0,8	6,1
2001-05	2,1	3,8	-0,3	1,2	0,3	7,1
2006-10	3,4	-0,2	-0,6	-1,6	-1,4	-0,4
2011-15	0,6	0,4	-0,8	3,4	-0,2	3,3
2016-22	1,1	1,0	0,3	0,7	0,1	3,1
2023-27	0,9	1,0	0,2	-0,2	0,0	1,9
2028-32	0,8	1,0	-0,3	0,0	0,0	1,4

IE	K/L	TFP	WAP	ER	hours	total
1966-70	1,7	3,0	0,6	-0,9	0,1	4,6
1971-75	2,0	3,2	1,7	-1,3	-0,8	4,8
1976-80	1,7	2,3	1,5	0,0	-1,1	4,4
1981-85	1,8	2,0	1,1	-2,6	0,1	2,5
1986-90	0,4	3,0	0,2	0,8	-0,1	4,5
1991-95	0,4	3,3	1,3	0,4	-0,9	4,6
1996-00	-0,2	4,3	1,7	4,1	-0,9	9,0
2001-05	1,3	2,0	2,1	0,7	-0,9	5,2
2006-10	2,3	0,7	1,7	-2,8	-1,5	0,4
2011-15	2,9	2,0	0,4	0,9	0,2	6,4
2016-22	0,1	4,8	1,3	1,7	-0,2	7,7
2023-27	0,2	3,1	1,2	-0,1	0,3	4,6
2028-32	0,8	1,8	0,7	-0,2	0,0	3,1

EL	K/L	TFP	WAP	ER	hours	total
1966-70	3,1	6,0	0,7	-1,4	-0,7	7,7
1971-75	2,3	2,2	0,6	-0,2	0,1	4,9
1976-80	1,3	1,7	1,4	-0,4	0,1	4,1
1981-85	0,6	-1,3	0,9	0,5	-0,5	0,1
1986-90	0,6	0,3	0,9	-0,2	-0,4	1,2
1991-95	0,3	0,0	1,4	-0,8	0,3	1,2
1996-00	0,5	2,4	0,8	-0,1	0,0	3,6
2001-05	0,2	1,8	-0,1	1,6	0,3	3,8
2006-10	0,9	-0,6	0,0	0,3	-1,0	-0,3
2011-15	0,1	-2,5	-0,9	-0,8	0,0	-4,1
2016-22	-0,9	0,4	-0,5	2,5	-0,4	1,2
2023-27	-0,1	0,7	-0,5	1,3	0,0	1,4
2028-32	0,4	0,8	-0,8	0,3	0,0	0,7

ES	K/L	TFP	WAP	ER	hours	total
1966-70	1,4	3,4	0,9	-0,2	0,4	6,1
1971-75	1,8	3,0	1,2	-0,8	0,0	5,2
1976-80	2,2	2,0	1,2	-2,8	-0,8	1,8
1981-85	1,8	2,5	1,0	-2,4	-1,5	1,4
1986-90	0,2	1,0	0,9	2,6	-0,3	4,4
1991-95	1,3	0,6	1,2	-1,5	-0,1	1,5
1996-00	-0,1	0,2	0,7	3,1	0,2	4,0
2001-05	0,5	-0,3	1,3	2,0	-0,3	3,2
2006-10	1,4	0,0	1,0	-1,2	-0,2	1,0
2011-15	0,7	0,5	-0,3	-0,8	-0,1	0,0
2016-22	0,0	0,2	0,4	1,0	-0,4	1,3
2023-27	-0,1	0,2	0,6	0,6	0,3	1,6
2028-32	0,4	0,4	0,1	-0,2	0,0	0,8

FR	K/L	TFP	WAP	ER	hours	total
1966-70	2,1	4,2	1,0	-0,3	-1,6	5,4
1971-75	2,0	2,6	0,9	-0,4	-1,3	3,8
1976-80	1,2	2,1	0,7	0,0	-0,6	3,3
1981-85	1,5	2,0	0,7	-0,8	-1,8	1,6
1986-90	0,6	1,9	0,7	0,3	-0,1	3,3
1991-95	0,9	1,0	0,7	-0,7	-0,5	1,3
1996-00	0,3	1,6	0,3	1,2	-0,5	2,9
2001-05	0,6	0,8	0,6	-0,1	-0,3	1,7
2006-10	0,5	-0,2	0,4	0,0	0,1	0,8
2011-15	0,4	0,5	0,5	0,0	-0,3	1,0
2016-22	0,1	-0,1	0,4	0,8	0,0	1,1
2023-27	0,4	0,2	0,1	0,1	0,0	0,8
2028-32	0,2	0,1	0,0	0,1	0,0	0,4

HR	K/L	TFP	WAP	ER	hours	total
1966-70	-	-	-	-	-	-
1971-75	-	-	-	-	-	-
1976-80	-	-	-	-	-	-
1981-85	-	-	-	-	-	-
1986-90	-	-	-	-	-	-
1991-95	-	-	-	-	-	-
1996-00	0,8	2,6	-	-	0,0	3,2
2001-05	0,8	2,8	-	-	0,0	4,5
2006-10	1,2	-1,4	-0,3	1,0	0,2	0,6
2011-15	1,3	1,1	-0,5	-0,8	-1,2	-0,2
2016-22	0,1	1,6	-1,1	2,6	0,1	3,2
2023-27	0,6	0,7	-0,7	1,1	0,0	1,8
2028-32	1,0	1,1	-1,0	0,2	0,0	1,3

IT	K/L	TFP	WAP	ER	hours	total
1966-70	1,7	4,9	0,5	-0,5	0,0	6,6
1971-75	2,0	1,6	0,6	0,0	-1,4	2,8
1976-80	1,1	2,6	0,8	0,1	-0,6	4,0
1981-85	0,9	0,3	0,6	-0,3	0,0	1,4
1986-90	0,6	1,5	0,5	0,4	0,0	3,0
1991-95	0,9	1,1	0,5	-1,2	-0,1	1,2
1996-00	0,3	0,8	-0,2	1,2	-0,1	2,0
2001-05	0,4	-0,3	0,1	1,1	-0,4	0,9
2006-10	0,5	-0,7	0,2	0,0	-0,4	-0,3
2011-15	0,3	-0,1	0,3	-0,5	-0,7	-0,7
2016-22	-0,1	0,4	-0,4	1,0	-0,2	0,8
2023-27	0,3	0,4	-0,1	0,0	0,1	0,7
2028-32	0,3	0,4	-0,1	0,0	0,0	0,5

CY	K/L	TFP	WAP	ER	hours	total
1966-70	-	-	-	-	-	-
1971-75	-	-	-	-	-	-
1976-80	-	-	-	-	-	-
1981-85	-	-	-	-	-	-
1986-90	-	-	-	-	-	-
1991-95	-	-	-	-	-	5,2
1996-00	0,9	1,6	1,9	-0,7	0,3	4,1
2001-05	0,7	1,0	1,9	1,1	-0,8	4,0
2006-10	1,3	-0,7	2,9	-0,9	0,0	2,7
2011-15	1,0	-0,5	0,4	-2,3	-0,2	-1,7
2016-22	0,0	1,3	1,0	2,1	-0,1	4,3
2023-27	0,8	0,3	0,6	-0,2	0,4	1,9
2028-32	1,0	0,7	0,0	0,0	0,0	1,7

LV	K/L	TFP	WAP	ER	hours	total
1966-70	-	-	-	-	-	-
1971-75	-	-	0,9	-	-	-
1976-80	-	-	0,5	-	-	-
1981-85	-	-	0,3	-	-	-
1986-90	-	-	0,5	-	-	-
1991-95	-	-	-1,0	-6,5	-0,2	-12,6
1996-00	1,3	4,0	-0,3	0,2	0,0	5,1
2001-05	2,3	4,8	-0,7	1,7	-0,2	7,8
2006-10	4,0	0,0	-1,4	-1,3	-1,7	-0,5
2011-15	0,7	2,0	-1,8	2,9	-0,3	3,4
2016-22	1,0	1,9	-1,1	0,9	-0,2	2,4
2023-27	1,0	1,3	-1,0	0,5	0,0	1,9
2028-32	1,3	1,7	-1,1	-0,5	-0,1	1,4

LT	K/L	TFP	WAP	ER	hours	total
1966-70	-	-	-	-	-	-
1971-75	-	-	1,4	-	-	-
1976-80	-	-	1,0	-	-	-
1981-85	-	-	0,8	-	-	-
1986-90	-	-	1,0	-	-	-
1991-95	-	-	0,0	-2,4	-2,2	-10,9
1996-00	0,8	3,5	-0,4	-0,7	1,3	4,5
2001-05	1,4	5,3	-0,6	0,9	0,4	7,3
2006-10	2,8	0,8	-1,3	-1,3	0,1	1,2
2011-15	0,6	2,0	-1,5	3,0	-0,3	3,7
2016-22	1,3	1,2	-0,5	1,7	-0,4	3,3
2023-27	1,4	1,2	-0,4	0,0	0,2	2,5
2028-32	1,4	1,5	-0,9	-0,5	0,0	1,5

LU	K/L	TFP	WAP	ER	hours	total
1966-70	0,5	3,0	0,6	-0,1	-0,6	3,3
1971-75	0,5	1,2	1,5	0,8	-1,2	2,9
1976-80	1,1	1,7	0,4	-0,4	-0,7	2,2
1981-85	0,7	2,1	0,4	-0,1	-0,6	2,5
1986-90	0,1	4,0	0,7	2,4	0,0	7,2
1991-95	0,6	1,1	1,2	1,5	-0,5	3,9
1996-00	0,1	1,7	1,1	2,8	-0,1	5,5
2001-05	0,4	0,1	1,2	1,8	-0,5	3,1
2006-10	0,4	-0,1	1,9	1,2	-0,6	2,7
2011-15	0,3	-0,6	2,6	-0,2	0,0	2,1
2016-22	-0,1	-0,3	2,1	0,9	-0,4	2,2
2023-27	-0,3	-0,1	1,8	0,7	0,4	2,5
2028-32	0,3	0,1	1,2	0,0	0,0	1,7

MT	K/L	TFP	WAP	ER	hours	total
1966-70	-	-	-	-	-	-
1971-75	-	-	-	-	-	-
1976-80	-	-	-	-	-	-
1981-85	-	-	1,0	-	-	-
1986-90	-	-	1,2	-	-	-
1991-95	-	-	1,4	0,2	-1,2	-
1996-00	0,6	2,2	1,0	-0,8	1,4	4,4
2001-05	1,0	0,8	1,5	-0,8	-0,7	1,8
2006-10	0,8	0,9	0,9	0,7	-0,3	3,0
2011-15	0,4	2,9	1,4	2,5	-2,0	5,3
2016-22	0,2	0,2	2,6	2,4	-0,4	5,0
2023-27	0,9	1,2	1,8	0,4	-0,2	4,1
2028-32	0,7	1,2	1,5	0,3	-0,1	3,6

NL	K/L	TFP	WAP	ER	hours	total
1966-70	1,4	3,0	1,4	0,2	-0,7	5,3
1971-75	1,9	2,8	1,4	-0,9	-1,9	3,3
1976-80	0,9	1,5	1,4	-0,1	-1,1	2,6
1981-85	0,8	1,0	1,1	-1,1	-0,7	1,1
1986-90	0,1	1,5	0,8	1,5	-0,7	3,3
1991-95	0,1	0,8	0,6	0,7	0,1	2,3
1996-00	0,1	2,0	0,4	2,0	-0,2	4,3
2001-05	0,7	0,7	0,5	-0,1	-0,4	1,3
2006-10	0,4	0,1	0,4	0,6	-0,2	1,4
2011-15	0,3	0,3	0,4	-0,4	0,1	0,7
2016-22	-0,2	0,2	0,6	1,4	0,0	2,1
2023-27	0,3	0,2	0,4	0,3	0,1	1,2
2028-32	0,4	0,4	0,0	0,0	0,0	0,7

AT	K/L	TFP	WAP	ER	hours	total
1966-70	2,0	5,0	0,2	-0,9	-1,1	5,2
1971-75	1,4	1,5	0,5	0,3	0,1	3,9
1976-80	1,3	1,6	0,5	0,2	-0,3	3,2
1981-85	1,3	1,2	0,5	-0,9	-0,6	1,5
1986-90	0,7	1,4	0,4	0,5	0,0	3,0
1991-95	1,2	1,4	0,8	-0,7	-0,6	2,2
1996-00	0,6	1,2	0,1	0,8	0,3	2,9
2001-05	0,7	0,9	0,6	0,0	-0,5	1,8
2006-10	0,6	0,6	0,5	0,6	-1,0	1,3
2011-15	0,4	0,5	0,6	0,3	-0,7	1,1
2016-22	0,3	0,5	0,5	0,8	-0,5	1,5
2023-27	0,3	0,2	0,1	0,5	0,1	1,2
2028-32	0,4	0,6	0,1	0,1	0,0	1,2

PT	K/L	TFP	WAP	ER	hours	total
1966-70	1,1	4,4	-0,7	0,8	-0,8	4,8
1971-75	1,3	1,4	1,2	-1,2	1,7	4,5
1976-80	1,4	3,3	1,7	-1,7	0,4	5,1
1981-85	1,4	-0,5	0,9	-1,7	1,0	1,2
1986-90	0,7	3,2	0,6	0,5	1,0	6,0
1991-95	1,5	0,8	0,6	-1,2	0,1	1,9
1996-00	0,7	1,0	0,7	1,5	0,2	4,0
2001-05	1,2	-0,1	0,3	-0,3	-0,2	0,9
2006-10	0,9	0,4	0,0	-0,7	0,0	0,6
2011-15	0,3	0,3	-0,5	-0,8	-0,2	-0,8
2016-22	-0,3	1,5	-0,1	1,5	-0,6	2,0
2023-27	0,1	0,9	-0,2	0,3	0,4	1,4
2028-32	0,5	0,9	-0,6	-0,2	0,1	0,7

SI	K/L	TFP	WAP	ER	hours	total
1966-70	-	-	1,0	-	-	-
1971-75	-	-	0,8	-	-	-
1976-80	-	-	1,0	-	-	-
1981-85	-	-	0,7	-	-	-
1986-90	-	-	0,9	-	-	-
1991-95	-	-	0,7	-	-	-0,6
1996-00	1,5	3,2	0,4	-0,5	-0,5	4,0
2001-05	1,2	2,1	0,2	0,1	-0,2	3,5
2006-10	1,2	0,2	0,2	0,5	-0,2	1,9
2011-15	-0,1	0,9	-0,3	-0,1	0,1	0,4
2016-22	-0,4	2,5	0,2	1,7	-0,6	3,5
2023-27	0,8	1,2	0,1	-0,2	0,0	1,9
2028-32	0,7	1,6	-0,3	0,1	0,0	2,1

SK	K/L	TFP	WAP	ER	hours	total
1966-70	-	-	1,5	-	-	-
1971-75	-	-	1,1	-	-	-
1976-80	-	-	0,8	-	-	-
1981-85	-	-	0,5	-	-	-
1986-90	-	-	0,8	-	-	-
1991-95	-	-	1,1	-	-	-
1996-00	0,8	3,8	0,7	-1,5	-0,4	3,4
2001-05	0,3	4,4	0,5	0,1	-0,5	4,9
2006-10	0,8	3,0	0,3	0,4	0,4	5,0
2011-15	0,9	1,2	0,1	0,8	-0,6	2,5
2016-22	0,9	1,3	-0,1	1,1	-1,1	2,0
2023-27	1,0	1,2	-0,3	0,0	-0,1	1,8
2028-32	1,0	1,5	-0,6	-0,4	-0,1	1,5

FI	K/L	TFP	WAP	ER	hours	total
1966-70	1,9	3,5	0,8	-0,7	-0,9	4,6
1971-75	2,2	3,5	1,0	-0,6	-1,5	4,6
1976-80	1,5	2,6	0,5	-0,2	-1,2	3,2
1981-85	1,1	1,6	0,5	0,1	-0,4	2,8
1986-90	1,2	2,2	0,2	0,2	-0,3	3,4
1991-95	1,4	1,8	0,5	-4,1	0,1	-0,4
1996-00	-0,1	3,2	0,3	1,9	-0,3	5,0
2001-05	0,4	1,6	0,2	0,8	-0,4	2,6
2006-10	0,5	0,1	0,5	0,1	-0,4	0,9
2011-15	0,4	-0,2	0,3	-0,1	-0,4	0,1
2016-22	0,3	0,5	0,2	1,1	-0,5	1,6
2023-27	0,5	0,5	0,0	0,2	-0,1	1,2
2028-32	0,6	0,7	-0,2	0,1	0,0	1,1

EA	K/L	TFP	WAP	ER	hours	total
1966-70	1,8	4,0	0,7	-0,4	-0,8	5,2
1971-75	1,9	2,4	0,7	-0,5	-1,3	3,3
1976-80	1,1	2,2	0,7	-0,2	-0,6	3,3
1981-85	1,1	1,3	0,6	-0,7	-0,9	1,4
1986-90	0,5	1,7	0,5	1,0	-0,4	3,3
1991-95	0,9	1,1	0,7	-0,8	-0,4	1,6
1996-00	0,3	1,3	0,2	1,3	-0,3	2,8
2001-05	0,5	0,5	0,4	0,3	-0,3	1,6
2006-10	0,6	0,1	0,2	0,2	-0,3	0,8
2011-15	0,4	0,6	0,0	0,1	-0,4	0,8
2016-22	0,1	0,6	0,1	1,0	-0,3	1,5
2023-27	0,2	0,5	0,1	0,3	0,1	1,2
2028-32	0,4	0,6	-0,1	-0,1	0,0	0,8

The columns show the contribution to the total growth of the different factors: K/L: capital intensity; TFP: total factor productivity; WAP: working-age population (people aged 15-74y); ER: employment rate (15-74y); hours: average number of hours worked by workers aged 15-74. Note that growth projections follow the methodology explained in The Production Function Methodology for Calculating Potential Growth Rates & Output Gaps (europa.eu).

Source: European Commission

IV. The direct effects of the COVID-19 pandemic on exports across the euro area

By Eric Meyermans

This section examines the direct impact of the lockdown measures to contain the spread of the COVID-19 virus on the exports of goods and services of the euro area Member States. A first look at the data suggests that the initial drop in aggregate exports from the euro area to the rest of the world was sharper during the pandemic than during the global financial crisis, but that it also showed a faster rebound. Furthermore, the exports of services were harder hit than the exports of goods especially at the onset of the crisis. This is in strong contrast with the global financial crisis, when the share of services in total exports increased strongly on impact. Focusing on the lockdown measures affecting social interactions, business operations, people crossing borders and logistical support infrastructure, the econometric analysis suggests that the lockdown measures had a significant direct negative impact on exports, but with their impact on goods exports on average only about two thirds of the impact on services exports. This analysis also suggests that the impact of the lockdown measures weakened over time suggesting that economic agents learned with each new wave of infections. For the export of services, the strongest negative direct impact of the lockdown measures is recorded for Spain and Portugal, followed by Italy and Greece, which are all Member States with an important tourism sector. For the exports of goods, the strongest negative impact is recorded for Italy, Portugal, France and Spain. The estimates also suggest that vaccination had a significant positive impact on the recovery of the export of services ([122]).

IV.1. Introduction

Following the outbreak of the COVID-19 pandemic ('the pandemic'), total exports declined sharply across the euro area during the first quarter of 2020. For the euro area as a whole, total exports were down by more than 20% in the second quarter (compared with the same quarter in 2019). At the same time, Member States recorded strong differences, with Spain recording the largest decrease at almost 40%, but Ireland recorded a modest rise at almost 4%.

Although the overall economic and health situation remained highly uncertain, by the end of 2020 goods exports started already to show signs of recovery while services exports remained subdued. At the same time, the exports of services experienced a very strong shift in its composition, away from contact-intensive services such as travel. This shift persisted for as long as the roll-out of COVID-19 vaccines had not become effective, allowing for a relaxation of the lockdown measures.

Across the euro area, Member States' exports were also severely affected, with the countries showing a high share of contact-intensive services recording the sharpest decreases. While it is too early to draw conclusions on whether any of these developments will have long-term effects, this section presents a quantitative analysis of developments in exports during the pandemic and their drivers. It is organised as follows.

The second subsection describes developments in exports during the pandemic and compares them with developments during the global financial crisis. While total exports were severely affected during both periods, exports of services were much harder hit than that of goods during the pandemic, while the reverse occurred during the global financial crisis.

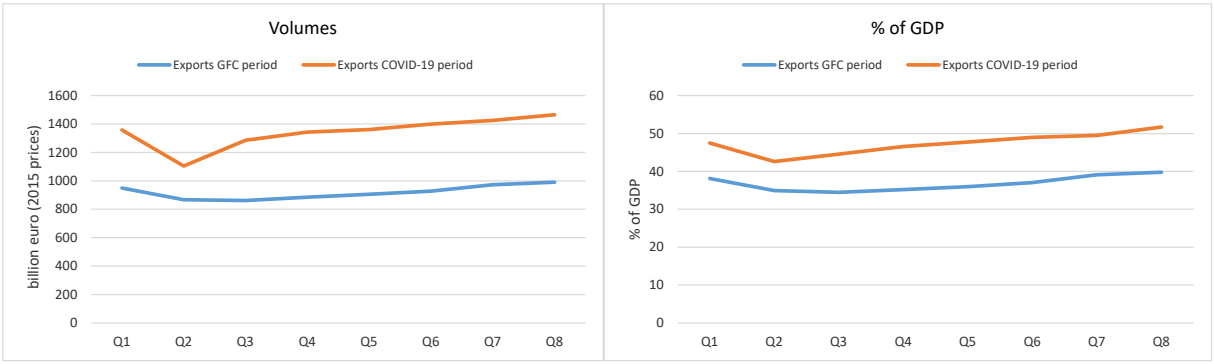
The third subsection briefly reviews some pandemic-specific factors that affected exports such as the measures to confine the spread of the COVID-19 virus and rising freight costs for international shipping ([123]).

The fourth subsection assesses the significance and magnitude of the direct impact of the lockdown measures on Member States' total exports of goods

([122]) The author wishes to thank Goran Vuksic for useful comments. This section represents the author's views and not necessarily those of the European Commission.

([123]) UNCTAD (2021), *High freight rates cast a shadow over economic recovery* argues that during the pandemic these rising freight costs were caused by a surging demand for maritime transport services following strong rises in working from home and online shopping, and on the supply side by container shortages and global port congestion.

Graph IV.1: **Euro area total exports – global financial crisis and COVID-19 pandemic (first eight quarters of each episode)**



(1) Q1 of the global financial crisis (GFC) period refers to the fourth quarter of 2008, Q1 of the COVID-19 period refers to the first quarter of 2020.
Source: Eurostat National Accounts.

and services ([124]). More specifically, the empirical analysis assesses differences in the responsiveness of exports to the lockdown measures across the euro-area Member States, over time and between various types of lockdown measures.

The fifth subsection examines the impact of the lockdown measures on the product composition of exports of goods and services ([125]), which allows us to have a closer look at developments in specific export categories such as tourism and machinery ([126]). The last subsection draws some conclusions.

The analysis examines exports from a macroeconomic perspective that is without investigating specific micro channels that were affected by the pandemic such as container shortages and port shutdowns ([127]) or the severance of exporter-importer relationships. In addition, the empirical analysis adopts a partial macroeconomic approach as it does not analyse the pandemic's impact on text-book macroeconomic factors that affect exports growth such as real GDP growth of the exports destination countries, export prices and exchange rates.

IV.2. A first look at the data

This subsection provides a brief overview of export developments following the outbreak of the pandemic until the start of the war in Ukraine ([128]). First, it focusses on exports of goods and services of the euro area as a whole to the rest of the world. Next it focuses on the exports of the Member States to other countries including the other euro-area Member States.

The overview focusses on changes in aggregate trade volumes. While the study of the severance of firms' trade relationships with foreign importers may also be a useful dimension to assess the pandemics' impact on exports ([129]), harmonised

([124]) It does not try to assess the (indirect) impact of the pandemic on macroeconomic factors that affect exports (in normal times) such as the real effective exchange rate or real GDP of the export destination countries.

([125]) While the analysis in subsection III.3 makes use of quarterly data covering all euro-area Member States over the 2000-2010 period, in subsection III.4 the analysis makes use of annual data for the period from 2003 until 2021 for goods and from 2010 until 2021 for services. Data in current and constant prices are available for the exported goods, but only in current prices for the exports of services and for a selected set of Member States. These data issues have been dealt with as discussed in subsequent subsections and Box IV.1.

([126]) Data limitations hinder a smooth analysis of changes in the geographical distribution of exports

([127]) For a survey of the latter see for instance UNCTAD (2021), *Review of Maritime Transport*. The econometric analysis will include a variable measuring freight costs that increased notably during the pandemic.

([128]) I.e. from the first quarter of 2020 until the fourth quarter of 2021.

([129]) It is easier to recover from decreases in trade volumes and prices (intensive margin) than to recover from broken international trade relations (extensive margin). However, available studies suggest that euro area Member States adjust mainly on the intensive margin in the face of severe shocks. For instance Brussevich, M., C. Papageorgiou and P. Wibaux (2022), 'Trade and the COVID-19 Pandemic: Lessons from French Firms', *IMF Working Paper* WP/22/81 illustrates this for the case of French firms showing that they adjusted mainly along the intensive margin during the pandemic. Minondo, A. (2021), 'Impact of COVID-19 on the trade of goods and services in Spain', *Applied Economic Analysis*, Vol. 29 No. 85,pp. 58-76 reports that the intensive margin explained 95.3% of the decrease in Spanish exports during the COVID-19 pandemic. Similarly, Behrens, K., Coreos, G. and G. Mion (2013), 'Trade crisis? What trade crisis?', *The Review of Economics and Statistics*, Vol. 95, No. 2, pp. 702-709 estimate that about 97% of the export loss of Belgian firms can be ascribed to decreases in volume rather than losses of trade relations during the global financial crisis.

international trade data at firm level are not readily available.

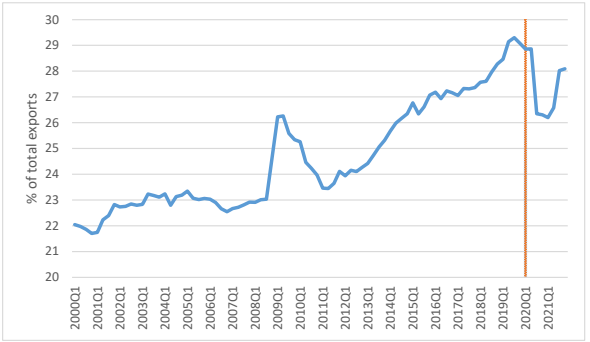
IV.2.1. Euro-area level: strong fluctuations in exports driven by services

Total exports of the euro area as a whole were strongly hit by the outbreak of the pandemic and the measures to contain the spread of the virus. For the euro area as a whole, exports (in constant prices) were down by about 21% in the second quarter of 2020 compared with the same quarter in 2019 (left-hand pane of Graph IV.1), while exports as a percentage of GDP were down by 5.6 pps in the second quarter of 2020 compared with the same quarter the year before.

Comparing total exports of the euro area during the first eight quarters of the pandemic with total exports during the first eight quarters of the global financial crisis suggests that while the initial drop in total exports was sharper during the pandemic, it showed a faster rebound (right-hand pane of Graph IV.1). While during the global financial crisis international trade was primarily affected by strong decreases in aggregate demand, during the pandemic international trade was harshly affected by severe supply-side shocks (such as firm closures and social distancing) giving also rise to large decreases in aggregate demand as the demand effects of the shock got transmitted to less contact-intensive sectors ([130]) and gave rise to unprecedented uncertainty in economic decision-making ([131]).

The exports of goods (-18% quarter-on –quarter) and services (-20%) decreased strongly in the second quarter of 2020. However, in subsequent quarters both showed a different path as illustrated by the developments of the share of services in total exports in the euro area as a whole (Graph IV.2). While exports of goods recovered gradually, exports of services remained weak in the second half of 2020, bottoming out only in the first quarter of 2021. Exports of services increased strongly in the third quarter of 2021 and in the fourth quarter, they settled at about 1pps below the level recorded in the last quarter of 2019.

Graph IV.2: **Share of services in total exports in the euro area**



(1) Share of services exports is equal to services exports divided by total exports.
Source: Eurostat National Accounts.

These developments reflect the fact that during the pandemic the delivery of most services was severely hindered by the need for social distancing and international travel bans ([132]). They also are in strong contrast with the global financial crisis when the share of services in total exports increased strongly initially as the exports of goods (especially durable capital goods) were hindered by growing external financial constraints in the wake of severe financial market disturbances ([133]).

IV.2.2. Member State level: large country differences

The euro-area Member States showed strong differences in terms of export growth during the pandemic. In 2020, Spain and Greece, followed by Portugal and Italy, recoded very sharp drops in the export of services, down by about 50% in Spain and Greece (first pane of Graph IV.3). Given the importance of contact-intensive tourism in these Member States, such outcomes should not be surprising as the lockdown measures limited physical proximity and hindered cross-border travel. This was especially acute in April and May 2020, when hotels were shut down and reopened only gradually as of June 2020.

([130]) Especially those sectors complementary to the contact-intensive sectors. See Werning, I., G. Lorenzoni, L. Straub and V. Guerrieri (2020), 'Viral recessions: Lack of demand during the coronavirus crisis', *VoxEU*. See also Baldwin, R. (2020), 'The Greater Trade Collapse of 2020: Learnings from the 2008-09 Great Trade Collapse', *VoxEU*.

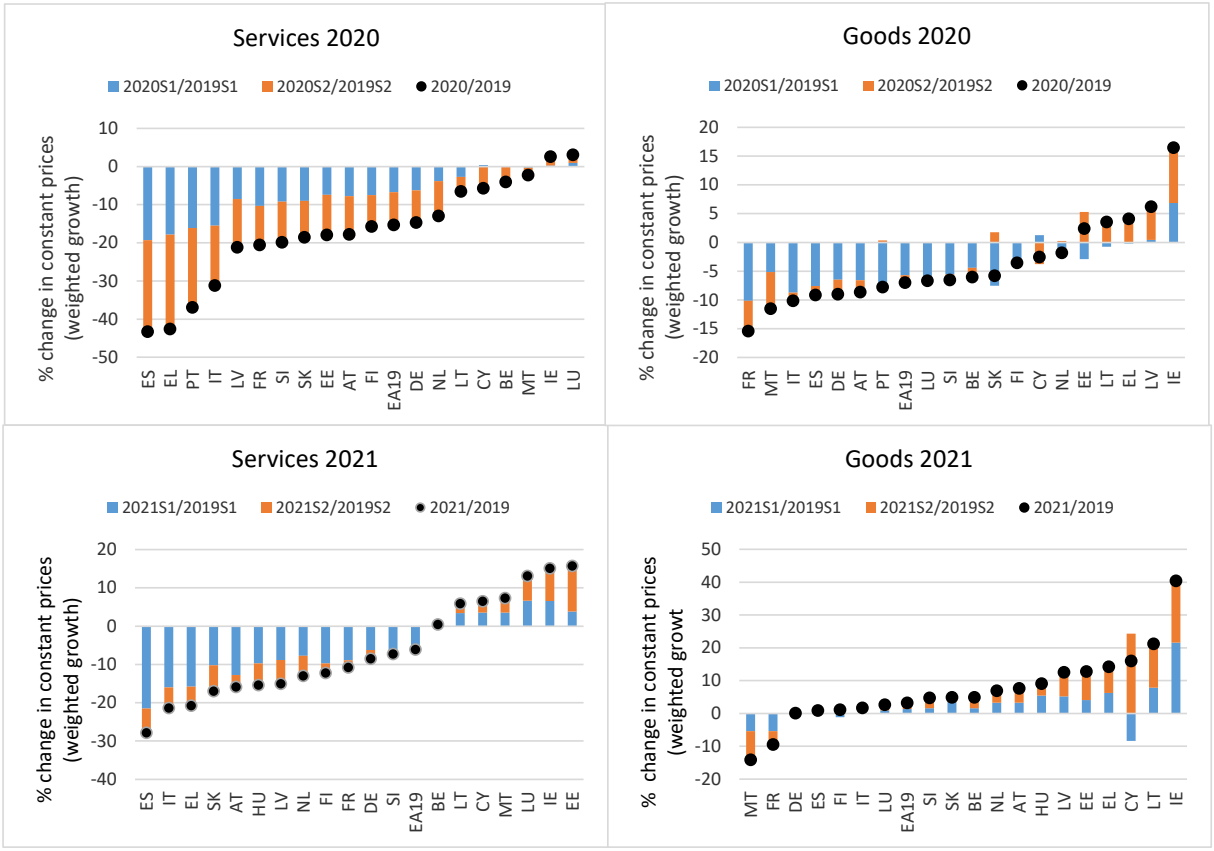
([131]) Kay, J. and M. King (2020), *Radical Uncertainty: Decision-Making Beyond the Numbers*, W. W. Norton & Company. Kay, J and M. King, 'The radical uncertainties of coronavirus', *Prospect*, March 2020.

([132]) As further explored in the following subsections.

([133]) The production and international trade of goods is usually in more need of external financing. Borchert, I. and A. Mattoo (2010), 'The crisis-resilience of services trade', *The Service Industries Journal*, Vol. 30, No. 13.

Graph IV.3: **Exports of goods and services: euro-area Member States between 2020 and 2021**

(weighted % change of 2020 and 2021 semesters compared with same semesters in 2019 – scales vary)



Growth rates weighted with share of respectively 2019S1 and 2019S2 exports in total 2019 exports. As such the blue (S1) and orange bars (S2) add up to the year total change (black dot).

Source: Eurostat National Accounts.

Developments in the exports of goods were less dramatic in 2020. Nevertheless, several Member States recorded decreases of about 10% or more with France showing the strongest decrease (second pane in Graph IV.3). An outlier was the strong export growth in Ireland reflecting its sharp rise in the exports of pharmaceuticals ([134]).

In 2021, goods exports rebounded to such an extent that in most Member States – and the euro area as a whole – they exceeded their 2019 level (as shown by a positive growth rate between 2019 and 2021 in the lower-right pane of Graph III.3). By contrast, in 2021, services exports in most Member States – and in the euro area as a whole – were still below or close to the level of 2019 (as shown in the lower-left pane of Graph IV.3).

([134]) Although its growth eased somewhat it settled at a historically high level in 2021. See Irish Ministry of Finance (2022), *Economic Insights – Spring 2022.*

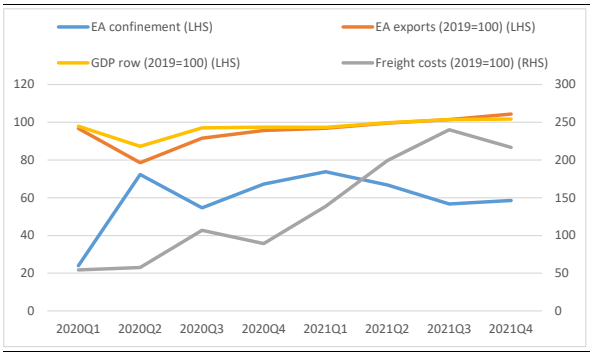
IV.3. Pandemic-specific macroeconomic factors

The COVID-19 lockdown measures ([135]) started to become effective in the first quarter of 2020 and were tightened sharply in the second quarter. In

([135]) The level of lockdown measures has been gauged with the Oxford COVID-19 Government Response Tracker (OxCGRT) prepared by the Blavatnik School of Government of the University of Oxford. This aggregate indicator (with values between 1 and 100) covers (i) lockdown and closure measures (including school closing, workplace closing, cancelation public events, restrictions on gathering size, closing of public transport, stay-at-home requirements, restrictions on internal movement, and restrictions on international travel), (ii) economic response (including income support, debt/contract relief for households, fiscal measures and giving international support) and (iii) health system measures (including public information campaign, testing policy, contact tracing, emergency investment in health, investment in COVID19 vaccines, facial coverings and vaccination policies). See Halle, T. et al. (2020), 'A global panel database of pandemic policies (Oxford COVID-19 Government Response Tracker)', *Nature Human Behaviour*, Vol. 5, pp. 529–538 .

subsequent quarters they were eased but raised again toward the beginning of 2021 to be loosened during the subsequent quarters. Not surprisingly, a strong correlation between exports and the lockdown measures can be detected, as shown for the euro area as a whole in Graph III.4.

Graph IV.4: **Total exports, lockdown measures and freight costs – euro area**

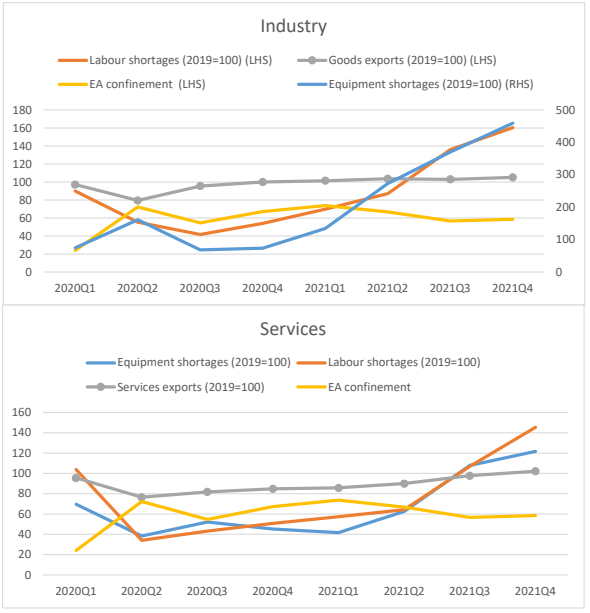


LHS: left-hand side; RHS: right-hand side. EA confinement is EA average of the Oxford COVID-19 Government Response Tracker using population weights (indicator value between 0 and 100). Freight costs are measured by Baltic Dry Index (BDI) deflated by the export prices of the euro area as a whole and rescaled to 2019=100. GDP row is effective real GDP of rest of the world rescaled to 2019=100. Total exports in constant prices rescaled to 2019=100.
Source: The Oxford COVID-19 Government Response Tracker, Baltic Dry Index Historical Rates (BADI) – Investing.com, Eurostat, OECD database, ECB Statistical Data Warehouse.

The pandemic and lockdown measures also had a direct impact on international logistics and the maritime industry. Tanker shipping recorded the hardest hit, while containerised trade, gas shipments and dry bulk commodities fell sharply in the first half of 2020 but rebounded somewhat by the end of 2020 ([136]). Consequently, freight rates also showed strong increases, with the global cost of bulk shipping ([137]) more than doubling between the fourth quarter of 2020 and the fourth quarter of 2021 with a peak in the third quarter of 2021 (Graph III.5) ([138]).

As the pandemic was a global phenomenon, economic activity in the rest of the world also weakened adversely affecting the demand for euro area exports. Effective real GDP of the exports destination countries showed a strong decrease in the second quarter of 2020 and rebounded gradually.

Graph IV.5: **Exports of goods and services and input shortages – euro area**
(scales vary!)



(1) Equipment also includes space.
Source: Business and Consumer Surveys; Eurostat National Accounts.

Focussing on the inputs in the production of goods and services, Graph IV.5–upper panel suggests that equipment shortages in industrial production increased very sharply since the first quarter 2021, reaching unprecedented levels by the end of 2021. This strong shortage of equipment was caused, among other factors, by logistic issues due to impediments to road transports, as seen in the US and China, and to global port congestion, in combination with a lower turnover of empty containers and increased (albeit volatile) demand following the modest rebound in 2021 ([139]).

Labour shortages increased also in 2021 but at a less dramatic pace than equipment shortages (Graph IV.5-lower pane). Beyond contact-intensive services, labour shortages were particularly acute in the information and communication sector as the pandemic accelerated the digital transformation the countries face challenges in digital skills acquisition

([136]) UNCTAD (2021), *op. cit.*
([137]) I.e. the Baltic Dry index which measures average prices paid for the transport of dry bulk materials across more than 20 routes.
([138]) However, a sustained surge in demand for shipping containers combined with no slack capacity in container ships continues to elevate shipping costs. See for instance WTO (2021), 'COVID-19 and rising shipping rates: What are the factors in play and what can be done?', Video conference COVID-19 and Rising Shipping Rates: What Are the Factors in Play and What Can Be Done? – Zoom.

([139]) VCFI (2021), Annual Report of Valencia Containerised Freight Index.

among workers ([140]). The pandemic has also complicated procedures to apply for and obtain work permits increasing labour shortages in sectors where migrants make up a large part of the labour force such as agriculture and healthcare ([141]). However, Graph IV.5 also suggests that the relation between supply bottlenecks at the world level the lockdown measures at local level is a complex one. While the intensity of bottlenecks peaked almost a year after the intensity of the lockdown measures reached its peak on average, one should consider that the geographical dimension of the two variables differ: at the time the confinement measure was going down in Europe, it was increasing markedly in Asia (in China lasted until the end of 2022: in China, for instance, supply bottlenecks were almost gone at the time lockdown intensity was high) ([142]).

The following subsections will breakdown the impact of these factors on total exports at the level of the euro area countries.

IV.4. Total exports of goods and services: direct effects of pandemic lockdown measures

This subsection provides estimates of the direct impact of the pandemic lockdown measures on the exports of goods and services across the euro area.

IV.4.1. Methodology

The starting point of the analysis is that exports of goods and services are determined by standard macroeconomic factors, such as price competitiveness and real GDP of the export destination countries. This specification is then augmented for the pandemic period with the Oxford COVID-19 Government Response Tracker for the COVID-19 period ([143]). In order to capture the possible impact of measures implemented in the past, the regression equation also includes lags of the variables related to lockdown measures.

First, the direct impact of changes in the aggregate lockdown indicator (as discussed in Subsection III.3) on exports is estimated, which provides an overall assessment of the pandemic's impact. Next, the impact of a selected decomposition of the lockdown measures (i.e., the travel restrictions, economic support and vaccination) is estimated ([144]).

The impact of the pandemic lockdown measures is estimated by pooling the data of the 19 euro-area Member States. Several variants have been estimated with a view to get a better understanding of changes in the transmission mechanisms over time ([145]), across countries ([146]) and between types of lockdown measures such as international travel restrictions and vaccinations. Box IV.1 discusses in more detail the methodology ([147]).

IV.4.2. Exports' responsiveness to COVID-19 lockdown measures

Different variants of the baseline model have been estimated as shown in Table A of Box IV.1. The first set of regressions (i.e., variants S1 and G1 in Table A) shows a significant negative impact of the contemporaneous and lagged lockdown measures on the exports of services. For services the impact of the lockdown measures of the previous quarter is almost half the size of the impact of the contemporaneous measures. For the exports of

([140]) Causa, O., Abendschein, M., Luu, N. Soldani and C. Soriolo (2022), 'The Post-Covid-19 Rise in Labour Shortages', *OECD Economics Department Working Papers* No. 1721.

([141]) Adăscăliţei, D. and W. Tina (2021), 'The pandemic aggravated labour shortages in some sectors; the problem is now emerging in others', EuroFound

([142]) Exports and the shortage indicators show all a positive contemporaneous correlation, while one would expect a negative correlation indicating that exports would decrease as the shortages increases.

([143]) A database with a qualitative description of measures affecting specifically the exports of goods and services during the pandemic is to be found in WTO (2022), *COVID-19: Measures affecting trade in goods* and WTO (2022), *COVID-19: Measures affecting trade in services*. However, translating them into quantitative indicators that can be used in the regression analysis would be beyond the scope of this section.

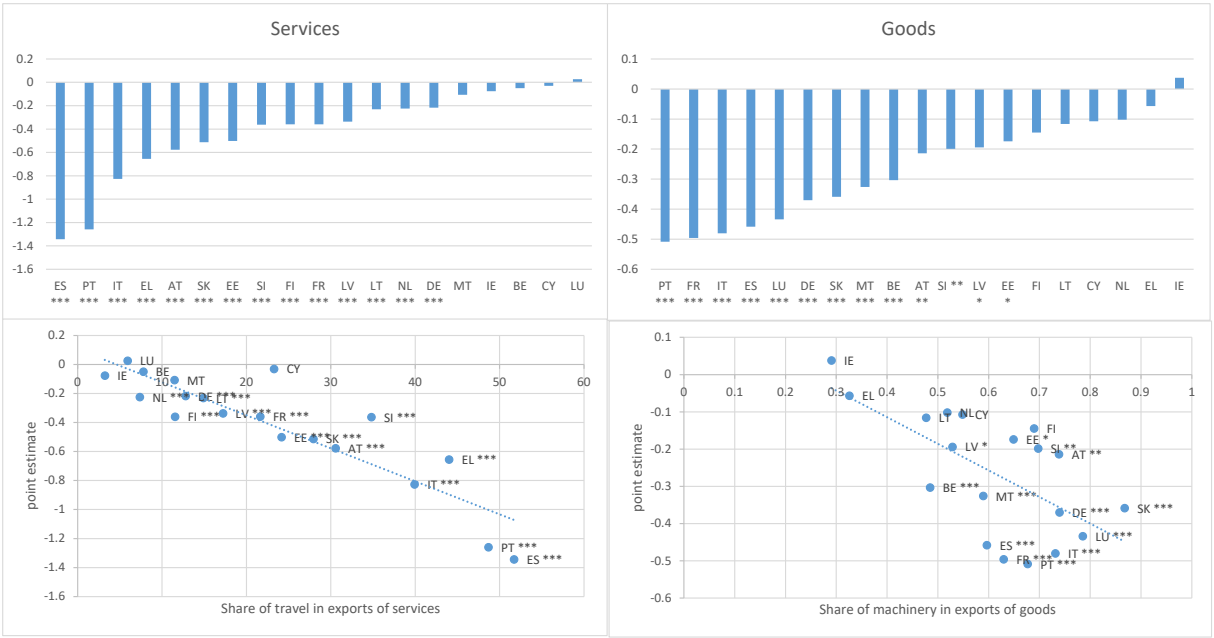
([144]) The subsequent analysis does not cover the indirect channels such as changes in real GDP in the export destination countries induced by lockdown measures Covering also such type of transmission channels would require a complete model also specifying the channels via with the lockdown measures may affect the real GDP of the export destination countries and relative prices. In other words, the explanatory macro-variables are considered to be predetermined in the subsequent analysis. See Box III.1 for some additional comments on possible simultaneity.

([145]) Over time the responsiveness to lockdown measures may change as for instance, exporters learn or uncertainties w.r.t. the impact of the pandemic temper.

([146]) For instance, differences in trade patterns may give rise to differences in Member States' exports responsiveness to the lockdown measures.

([147]) In Box III.1 the reduced form equation also includes a measure of freight costs which may have an impact on the propensity to export. Factors that may affect the production of export products such as labour and equipment shortages are also discussed, but no significant effects of these factors could be found.

Graph IV.6: **Responsiveness to a change in lockdown measures and selected export shares**



(1) Significance *** p<0.001, ** p<0.05 and * p<0.01.
Source: Authors' estimates based on variants S2 and G2 in Table A of Box III.1.

goods only a significant impact could be found for the contemporaneous lockdown measures, at about two thirds of the impact on the export of services ([148]).

The estimation results also suggest that the impact of the lockdown measures was strongest at the onset of the pandemic, decreasing over time (i.e., variants S3 and G3) which may suggest that economic agents learned with each new wave of infections or may be related to the fact that in certain countries, like China, the refinement of COVID-19 measures focused on guaranteeing the smooth operation of supply, with the bulk of containment imposed on consumption.

Rising freight costs had only a limited significant negative impact on the exports of goods, while no significant effects was obtained for labour or equipment shortages (variant S6 and G6) ([149]).

Large variation across Member States

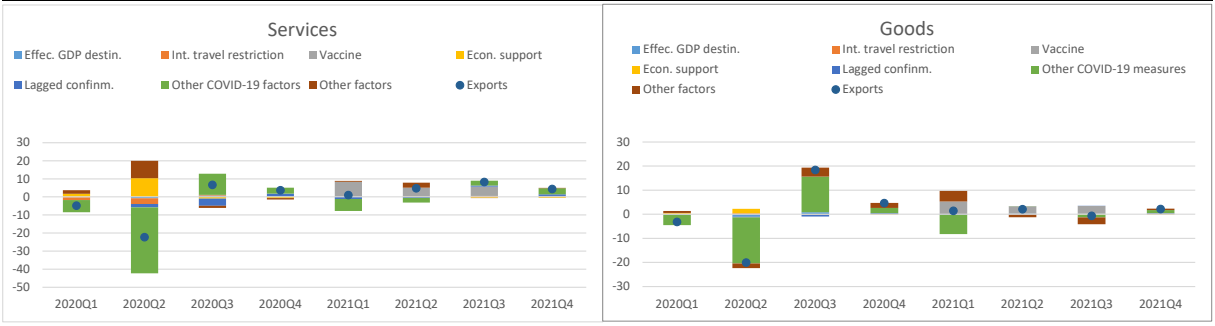
Examining country differences, the regression analysis (i.e., variants S2 and G2) suggests that the impact of lockdown measures differed strongly across Member States (top left-hand side pane of Graph IV.6). For services exports, the strongest and very significant negative responsiveness is recorded by Spain and Portugal, followed by Italy and Greece, which are all Member States with an important tourism sector. Belgium and Cyprus ([150]) recorded the lowest responsiveness and the estimated coefficients also show a low statistical significance.

Overall, the responsiveness to changes in the lockdown measures is weaker and less significant for goods exports, with Italy, Portugal, France, and Spain recording the strongest negative responsiveness (top right-hand side pane of Graph IV.6). Greece and Lithuania recorded a weak responsiveness, with Ireland even recording a positive responsiveness ([151]).

The strong correlations in the two lower panes of Graph IV.6 suggest that these cross-country differences in responsiveness reflect to a large extent differences in the size of the share of travel

([148]) Rising freight costs was found to have only a significant negative impact on the exports of goods after 3 quarters.
([149]) Remember that subsection III.3 indicated that these shortages seem to have reacted with a stronger lag to the outbreak of the pandemic and its lockdown measures.
([150]) Luxembourg is the outlier with a positive point estimate, but not significant.
([151]) Due to the large export share of pharmaceuticals used to contain the spread of the COVID-19 virus.

Graph IV.7: **Impact of vaccination, travel restrictions and economic support**
euro-area averages



(1) See footnotes (36) to (38) for an explanation of the selected COVID-19 measures. The label "Other COVID-19 factors" refers to a (0,1) dummy for each of the quarters from the first quarter of 2020 until the fourth quarter of 2021. It is a general measure for all other COVID-19 related factors affecting exports.
Source: Authors' estimates based on variants S4 and G4 in Table A of Box III.1.

in services exports and of the share of machinery in the goods exports, albeit to a lesser degree ([152]).

Selective decomposition of lockdown measures

Many measures have been implemented to stop the spread of the virus and speed up the recovery. The left-hand pane of Graph IV.7 zooms in on three specific factors that have been crucial for the rebound in especially services exports (variants S4 and G4). In these variants the aggregate indicator related to all lockdown measures has been decomposed into three specific indicators (i.e., vaccination ([153]), intentional travel controls ([154]) and economic support ([155])) and a dummy variable (labelled "other COVID-19 factors") for each of the quarters from the first quarter of 2020 until the fourth quarter of 2021 ([156]). While the vaccination ([157]) became only in full swing as of early 2021, the within sample simulations suggest that it had a notable impact on exports, especially the exports of services (grey bar in the chart).

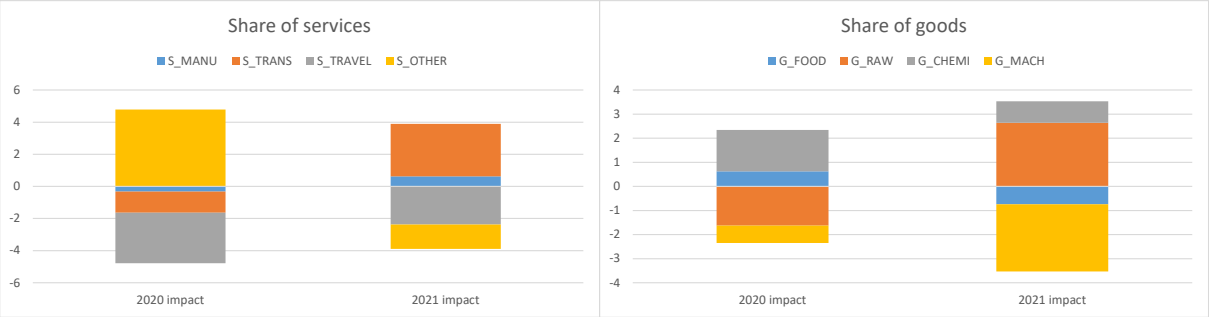
The apparent low contribution of the international travel control variable (dark orange bar) seems to suggest that people were imposing themselves voluntary self-control not to travel with or without explicit travel bans. The contribution of economic policy support was especially important for export growth in the first quarters (light orange bar).

The factor labelled 'Other COVID-19 factors' shows a very strong impact in the second quarter of 2020, but it reverses in the third quarter of 2020 and peters out in subsequent quarters. This factor captures the channels related to the pandemic that are not explicitly covered by the three specific lockdown measures discussed in this subsection. Factors not explicitly modelled that have driven the switch in the third quarter of 2020 may include economic agents increased reliance on technological solutions to facilitate their working and shopping from home ([158]), changes in lockdown measures not covered by the ones included in the regression equation and export restrictions associated with COVID-19 that contributed to supply chain disruptions in specific secotors like medical devices or pharmaceuticals.

The right-hand pane of Graph IV.7 shows a similar impact of these measures on the exports of goods, although the statistical significance of the underlying point estimates is less strong.

([152]) I.e. a coefficient of correlation equal to -0.89 for services exports and equal -0.64 for goods exports.
([153]) The OxCGRT vaccination indicator (h7) is based on vaccination of different groups ranging from key workers and clinically vulnerable groups to universal coverage.
([154]) The OxCGRT international travel controls indicator (C8) covers policies such as a PCR test and quarantine of visitors, and entry prohibition for non-vaccinated non-residents.
([155]) The OxCGRT economic support indicator covers announced economic stimulus spending including direct cash payments to people who lose their jobs or cannot work, debt relief, etc. The variable "economic support" does not measure money effectively spent, but reflects ordinal indicators whereby policies are ranked on a simple numerical scale, e.g. the income support sub-indicator is equal to 0 if no income support, equal to 1 if the government is replacing less than 50% of lost salary, and equal to 2 if the government is replacing 50% or more of lost salary (includes payments to firms if explicitly linked to payroll/salaries).
([156]) I.e. dummy variables equal to 1 in the corresponding quarter and equal to zero in the other quarters.
([157]) For the case of services exports the point estimates of vaccination and economic policies are at a 0.01 confidence level different from zero.
([158]) See for instance WTO (2020), World trade volume rallies in third quarter after COVID-19 shock.

Graph IV.8: **The impact of lockdown measures on the allocation within total exports of services and goods – euro area**
(euro area averages – scales vary)



(1) Point estimates of tables A3 and A4 are evaluated for the euro-area unweighted average value of the aggregate lockdown indicator for the exports of goods and the international travel restrictions indicator for the exports of services.
Note: Services - S_TRANS refers to transport services, S_TRAVEL refers to travel services, S_MANU refers to manufacturing services on physical inputs owned by others and maintenance and repair services; and S_OTHER refers to all other services.
Note: Goods - G_FOOD refers to food, drinks and tobacco, G_RAW refers to raw materials and also mineral fuels, lubricants and related materials; G_CHEMI refers to chemicals and related products, and G_MACH refers to machinery.
(2) Estimates for services include BE, DE, EE, IE, EL, FR, IT, LV, LU, NL, AT, PT, SI, and SK.
(3) Euro averages.
Source: Estimates based on point estimates reported in Table B in Box III.1.

IV.5. The composition of total exports of goods and services: direct effects of the COVID-19 lockdown measures

The previous subsection analysed developments in total exports of goods and services, this subsection shows how the pandemic affected the allocation ([159]) among the various types of exports of goods and services ([160]) – within the limits set by data availability ([161]).

The point estimates in Table B of Box III.1 suggest that the contemporaneous and lagged lockdown measures had a significant direct impact on the composition of exports of goods and services ([162]).

Such direct impacts may be explained by various factors induced by the pandemic such as breakdowns in international logistics, changes in consumption preferences or increased uncertainty.

Graph IV.8 summarises these point estimates by showing how the composition of the exports of goods and services changed on average as a direct consequence of the confinement measures in 2020 and 2021 ([163]). Most striking, but not unexpected, is the sharp drop in the share of international travel ([164]) in total exports of services (grey bar in left-hand pane of Graph IV.8) in 2020, which was offset by a rise in the share of other services which include telecommunications, computer and information services, and financial services (light orange bar).

The share of exports of raw materials in total goods exports (dark orange bar in right-hand pane of Graph IV.8) experienced the strongest decrease in 2020 as a direct result of the implementation of

([159]) Technically speaking, the econometric approach in this section assumes a representative economic agent for each Member State who in a first stage decides the total export volume of goods and services and in a second stage the allocation of this total volume.

([160]) In the absence of price changes and changes in total exports, the export shares should be constant in normal times. However, during the pandemic there was an additional factor (as measured by the Oxford COVID-19 Government Response Tracker) that affected these budget shares. It is the latter effect that is discussed in more detail in this subsection. This specification using export shares is inspired by the seminal paper (using budget shares) Deaton, A. and J. Muellbauer (1980), 'An Almost Ideal Demand System', *The American Economic Review* , Vol. 70, No. 3, pp. 312-326 - albeit that (due to data limitations) in this subsection relative prices of the individual items are replaced by an aggregate relative price (i.e. price of exports of respectively goods or services relative to the GDP deflator of the export destination countries).

([161]) In particular data are only available at annual level, and for services exports limited to 14 Member States covering the 2010-2021 period. No data is available for Spain that was hardest hit in terms of exports of services! See Box IV.1 for more details.

([162]) However, as the available data have only an annual frequency it was not possible to establish the richness of the dynamics of this impact.

([163]) Graph III.8 does not cover the impact of price changes that were for instance notable for the exports of raw materials in 2020 and 2021. However, such price developments may also affect the changes in the export shares. It would be beyond the scope of this section to investigate to what extent these price changes were caused by the pandemic.

([164]) In the statistics of international trade in services travel encompasses goods and services consumed by non-residents in the economy that they visit. Travel is defined as covering goods and services for own use or to be given away, acquired from an economy, by non-residents during visits to that economy. It covers stays of any length, if there is no change in residence.

the lockdown measures ([165]) but increased in 2021. While the share of food (blue bar) increased in 2020 in the wake of the lockdown measures, it decreased in 2021 partly reflecting the lagged impact of past lockdown measures. Such lagged impacts may reflect that exporters or export destination countries wanted to correct past overreactions to the unexpected and dramatic events.

IV.6. Conclusions

Immediately following the worldwide outbreak of the pandemic and the ensuing lockdowns, global trade contracted at an unprecedented rate, down by about 9 per cent in 2020 compared with the level in 2019.

While goods trade rebounded quickly, trade in services started to recover only slowly in the second half of 2021, to a large extent supported by effective vaccination campaigns and a gradual lifting of the lockdown measures in the developed countries.

However, against this background of deteriorating international trade, not all euro-area Member States were affected in the same way. Member States with a strong tourism sector experienced the sharpest decreases in exports of services, while other Member States, especially Ireland with a strong medtech industry, experienced a sharp rise in exports of goods.

Thus, all in all, the estimation results in this section do not allow to conclude that the pandemic will have permanent effect on exports.

([165]) The graph only shows the changes in the export shares triggered by changes in preferences, logistics and similar factors in the wake of the pandemic. The graph does not show the effects of price changes during the pandemic (including possible price changes induced by the pandemic.).

Box IV.1: Estimation results

Within the limits set by data availability, this box provides estimates of the impact of the COVID-19 lockdown measures on (i) the total exports of goods and services and (ii) the composition of the exports of goods and services. The starting point of the analysis is that the exports of goods and services are affected by standard macroeconomic factors, such as the real GDP of export destination countries and the real effective exchange rate, and by specific COVID-19 related factors such as the measures implemented to contain the spread of the virus. Moreover, rigidities prevent an immediate adjustment of the export volumes to the desired volumes.

I. Total exports of goods and services

After pooling the data of the 19 euro-area Member States and assuming that short-term dynamics are driven by an error-correction mechanism, the short-term equations for goods (q=G) and services (q=S) read as follows:

$$(1)\quad \Delta \ln(EXP_{q,i,t}) = \alpha_{q,i} + \beta_q \Delta ln(EGDP_{q,i,t}) + \gamma_q \Delta \ln\left[\frac{P_{q,i,t}\ NEER_{q,i,t}}{EGDP\_P_{q,i,t}}\right] + \sum_{j=0}^{T} \delta_{q,j}\ \Delta ST_{i,t-j} + \sum_{j=1}^{n} \tau_{q,j,t} \Delta X_{i,j,t} + \varphi_q ECT_{q,i,t-1} + u_{q,i,t}$$

for q =S, G , i= BE, DE, EE, IE, EL, ES, FR, IT, CY, LV, LT, LU, MT, NL, AT, PT, SI, SK and FI and t=2001Q3, …, 2021Q4.

- $EXP_{q,i,t}$ stands for exports of product q (in constant prices) by Member State i in quarter t;
- EGDP is the effective real GDP of export destination countries;
- P is the price of the exported product (in euro);
- EGDP_P is the effective GDP deflator of export destination countries (in foreign currency);
- NEER is the nominal effective exchange rate (number of foreign currency per euro);
- ST is the Oxford COVID-19 Government Response Tracker;
- ECT is the error correction term ([1]).

The current and lagged lockdown measures ST are included as it is assumed that in quarter t exports will still be adjusting to measures taken in previous quarters ([2]). u is a random component. X covers any other relevant factor such as shipping costs in the case of goods exports, as well as shortages of input factors in production (i.e. the variables discussed in subsection III.3).

A. The data

Data on total exports of goods and services are retrieved from the Eurostat national accounts. The effective real GDP and GDP deflator of export destination countries and the real effective exchange rate are constructed based on data retrieved for the OECD database, with the export weights for goods and services

([1]) ECT is obtained from the long-term equation that reads: $\ln(EXP_{q,i,t}) = \alpha_{q,i} + \beta_q ln(EGDP_{q,i,t}) + \gamma_q \ln\left[\frac{P_{q,i,t}\ NEER_{q,i,t}}{EGDP\_P_{q,i,t}}\right] + \sum_{j=1}^{n} \tau_{q,j,t} X_{i,j,t} + w_{q,i,t}$. For services exports, the null hypothesis of no cointegration can be rejected at a fairly high confidence level by applying the Kao residual cointegration test (augmenting the equation with a trend variable), with the Dicky-Fuller p-val equal to 0.0059. The long-run point estimates are $\beta_q = 0.16$, $\gamma_q = 0.69$, and the parameter associated with the trend is equal to 0.01. For goods exports, the null hypothesis can be rejected at 0.0020 confidence level. In this case, the long-run point estimates are $\beta_q = 0.11$, $\gamma_q = 0.68$, and the parameter associated with trend isequal to 0.01. In both cases the γ_q does not have the expected negative sign.

([2]) The long-term equation (1) does not include the lockdown measures ST implying that the lockdown levels do not leave a permanent trace in equilibrium. This does not exclude that the pandemic may have indirect effects such as a decrease in the potential output of the countries that import euro area products.

(Continued on the next page)

retrieved from the ECB Statistical Data Warehouse ([3]). The COVID-19 Government Response Tracker is obtained from the Blavatnik School of Government department of the University of Oxford. This indicator varies between 1 and 100 (1= very loose, 100 = very tight) and covers (i) lockdown and closure measures; (ii) economic response and (iii) health system measures ([4]). The Baltic Dry indicator, which measures the cost in US $ of one metric tonne of cargo shipped is obtained from Investing.com ([5]). The data on labour and equipment shortages are obtained from the Business and Consumer Survey database.

B. Estimation results

Table A summarises the estimation results of the short-term dynamics, showing six variants. These variants have been estimated assuming that the explanatory variables are predetermined. It is in fact common practice in the literature to assume that the random component of the exports of a country is not correlated with the real GDP of export destination countries ([6]). This is a necessary condition to avoid simultaneity bias in the point estimates. No country fixed effects are included as the dependent and explanatory variables are demeaned. This is needed because variants S5 and G5 include interactions between variables. The sample covers 19 euro-area Member States for the period from Q3 2001 until Q4 2021.

Table A: Impact of COVID-19 on short-run exports dynamics

Dependent variable: first difference of logarithm of exports in constant prices

([3]) Apart from the other EU countries, the effective foreign variables also cover Australia, Canada, Japan, New Zealand, Norway, Switzerland, the UK and USA. The same weights apply for real GDP and GDP deflator of the export destination countries, and the nominal effective exchange rate. Depending on the product type, the weights contain information on exports of goods or services.

([4]) Components of this indicator that measure factors such as the level of vaccination and international travel bans have also been retrieved to estimate more refined variants of equation (1) – see variants S4 and G4 below. See Halle, T. et al. (2020), 'A global panel database of pandemic policies (Oxford COVID-19 Government Response Tracker)' for more details on this indicator.

([5]) In the regression analysis these shipping costs have been deflated by the price of exports.

([6]) See for instance Senhadji, A. and C. Montenegro (1999), 'Time series analysis of export demand equations: a cross-country analysis', *IMF Working Paper WP/98/149*.

(Continued on the next page)

Box (continued)

(one quarter compared to the previous quarter)

	Services						Goods					
	S1	S2	S3	S4	S5	S6	G1	G2	G3	G4	G5	G6
Effective foreign GDP (EFG)	0.24 ***	0.20 ***	0.07	0.07	0.20 ***	0.26 ***	0.17 ***	0.15 ***	0.08 *	0.08 *	0.21 ***	0.31 ***
EFG*Confinement 2020-2021					3.00 ***						2.65 ***	
Real effective exchange rate (REER)	-0.31 ***	-0.28 ***	-0.29 ***	-0.33 ***	-0.27 ***	-0.37 ***	-0.24 ***	-0.23 ***	-0.27 ***	-0.28 ***	-0.24 ***	-0.15 **
REER * Confinement 2020-2021					-0.93 ***						-0.76 **	
Confinement 2020-2021	-0.38 ***	See Graph III.6			-0.06 *	-0.36 ***	-0.24 ***				0.03	-0.20 ***
Lagged Confinement 2020-2021	-0.18 ***	-0.14 ***		-0.08	-0.19 ***		0.03	0.04 *		-0.02	0.02	
Confinement 2020 Q1			-0.35 ***						-0.20 **			
Confinement 2020 Q2			-0.26 ***						-0.04			
Confinement 2020 Q3			-0.12						0.15			
Confinement 2020 Q4			-0.21 **						-0.17			
Confinement 2021 Q1			-0.12						-0.39 **			
Confinement 2021 Q2			0.08						0.10			
Confinement 2021 Q3			0.36 ***						0.14			
Confinement 2021 Q4			-0.32 **						0.11			
Lagged confinement 2020 Q2			-1.17 ***						-1.16 ***			
Lagged confinement 2020 Q3			-0.33 ***						-0.17 **			
Lagged confinement 2020 Q4			-0.19 *						0.19			
Lagged confinement 2021 Q1			-0.21						0.39 **			
Lagged confinement 2021 Q2			-0.30 **						-0.07			
Lagged confinement 2021 Q3			-0.39 ***						-0.06			
Lagged confinement 2021 Q4			0.35 **						0.01			
Economic support				0.16 ***						0.03		
Vaccination				3.81 ***						2.42 *		
Travel restictions				-0.15 *						0.02		
Other COVID-19 factors 2020 Q1				-0.07 ***						-0.04 **		
Other COVID-19 factors 2020 Q2				-0.36 ***						-0.19 ***		
Other COVID-19 factors 2020 Q3				0.12 ***						0.15 ***		
Other COVID-19 factors 2020 Q4				0.03 *						0.02		
Other COVID-19 factors 2021 Q1				-0.07 **						-0.08 **		
Other COVID-19 factors 2021 Q2				-0.03						0.00		
Other COVID-19 factors 2021 Q3				0.03						-0.01		
Other COVID-19 factors 2021 Q4				0.03 **						0.01		
Shipping cost							-0.09 ***	-0.09 ***	-0.05	-0.04	-0.05	-0.08 **
Shortage of input materials						0.09						-0.02
Shortage of labour						0.06 **						0.02
GFC dummy	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.04 ***	-0.04 ***	-0.04 ***	-0.04 ***	-0.04 ***	-0.04 ***
Error correction term (ECT)	-0.07 ***	-0.07 ***	-0.04 ***	-0.04 ***	-0.04 ***	-0.07 ***	-0.10 ***	-0.10 ***	-0.09 ***	-0.09 ***	-0.10 ***	-0.10 ***
ECT*Confinement 2020-2021					-0.07 **						0.04	
Adjusted R-squared	0.27	0.43	0.36	0.36	0.35	0.26	0.15	0.17	0.21	0.20	0.20	0.15
Durbin Watson	1.93	1.91	1.99	2.16	1.91	1.93	2.18	2.15	2.19	2.22	2.20	2.16
Total number of observations	1596	1596	1596	1558	1596	1153	1558	1558	1558	1558	1558	1453
Total number of explanatory variables	6	24	19	16	9	7	7	25	20	17	10	8

Note: sample: 2001Q3-2021Q4; demeaned dependent and explanatory variables; OLS estimates; shipping costs 3 quarters lagged; significance *** p<0.001, ** p<0.05 and * p<0.01.
Note: in variants S4 and G4 the indicators Other COVID-19 factors 2020Q1, ..., Other COVID-19 factros 2021Q4 are dummies equal to 1 in the corresponding quarter and equal to zero in the other quarters. They implicitly capture the confinement measures other than vaccination, travel restrictions and economic support. Shipping cost is Baltic Dry indicator deflated by export price. REER is defined as the export price deflated by GDP deflator of export destination countries adjusted for nominal exchange rate.
Note: no country fixed effecst as dependent and explanatory variables are demeaned. All variables (except confinement measures, shortages and dummies) in natural logarithm.

The variants with the prefix S refer to services exports and those with the prefix G to goods exports. The variants differ according to the way the impact of the lockdown measures is specified. Variant S1 and G1 show the baseline export function (1) with the current and one quarter lagged lockdown indicator. For this variant the current lockdown measures show a significant negative impact for the exports of both goods and services, with the latter two-thirds the size of the former. Lockdown measures one quarter lagged show only a significant negative impact for services exports. The other variants allow for more flexibility in the parameters associated with lockdown measures. Variants S2 and G2 which are discussed in more detail in the main text allow the parameter of the current lockdown indicator to vary across the 19 Member States (7). Variants S3 and G3 allow the responsiveness to vary from Q1 2020 to Q4 2021 (8), suggesting that the responsiveness to lockdown measures weakened somewhat over time. This may indicate that when time progressed economic agents learned to respond to the lockdown measures and that global uncertainty was ebbing away. Variants S4 and G4 provide a further disaggregation of the lockdown measure into measures that affect international travel, economic support and vaccination. In these variants the indicators Other_ COVID-19_factors_2020Q1, …, Other_COVID-19_factors_2021Q4 are dummies equal to 1 in the corresponding quarter and equal to zero in the other quarters; they implicitly capture the pandemic related factors other than vaccination, travel restrictions and economic support. These variants are discussed in the main text. Variant S5 and G5 are variants with the parameters of effective foreign GDP, the real exchange rate and the error correction term that interact with the lockdown indicator (9). These variants suggest that the pandemic

(7) However the same parameter across countries for the lagged lockdown indicator in order to save on the limited degrees of freedom.
(8) Similar variation in the lagged lockdown measures.
(9) As some variants allow for interaction between the lockdown measures and the macroeconomic variables, the dependent and explanatory variables have been demeaned (to avoid possible biases in point estimates).

(Continued on the next page)

Box (continued)

amplified the impact of real GDP decreases in export destination countries ([10]) ([11]). Variant S6 and G6 also include variables that measure shortages in labour and equipment. No significant point estimates with the expected negative sign were found for these variants ([12]).

II. The composition of total exports of goods and services

This part investigates how the pandemic affected the composition of the exports of goods and services, whereby a distinction is made between 4 types of goods ([13]) and 4 types of services ([14]). The starting point is an econometric allocation system ([15]) whereby the budget share of the different product types is explained in terms of a scale variable, prices and a stochastic component - along with some shift variables that capture changes in preferences ([16]). Focusing on the short-run dynamics, the equation for goods is specified as

$$(2)\quad \Delta(SHARE_{q,i,t}) = \alpha_{q,i} + \gamma_q \Delta ln(EXP_{G,i,t}) + \rho_q \Delta \ln\left[\frac{P_{G,i,t}\, NEER_{q,i,t}}{EGDP_{P_{q,i,t}}}\right] + \delta_q\, \Delta\, ST_{i,t} + \sum_j \tau_{q,j} \Delta X_{j,t} + \sum_{j=1}^{3} \varphi_{q,j} \left(ECT_{q,j,t-1} - ECT_{q,4,t-1}\right) + u_{q,i,t}$$

where subscript q refers to the goods as specified in footnote 15, the subscript i refers to the country, and SHARE refers to the budget share of a good q in the total export of goods. $\alpha_{q,i}$ is a country fixed effect for country i's product q. A similar equation holds for the composition of total services exports.

As the sum of the changes in the shares add-up to zero, and the same explanatory variables appear in each of the equations, the adding-up constraints for the 4 types of goods and 4 types of services read as $\sum_{q=1}^{4} \alpha_{q,i} = 0$, $\sum_{q=1}^{4} \gamma_q = 0$, $\sum_{q=1}^{4} \rho_q = 0$, $\sum_{q=1}^{4} \delta_q = 0$, $\sum_{q=1}^{4} \tau_{q,j} = 0$, $\sum_{q=1}^{3} \varphi_{q,j} = 0$ and also that $\sum_{q=1}^{4} w_{q,i,t} = 0$. ([17])

The error correction term ECT is derived from the long-run equation ([18]). The point estimates of the lagged own-error-correction term (with an expected value between 0 and -1) measures how much of the disequilibrium in the previous quarter is carried over to the present quarter. Past disequilibria in a specific component will also spill over to the other components of the allocation system, hence their inclusion in the other equations. ([19]) Their point estimate is expected to be between -1 and +1.

A. The data and estimation results

Annual data for the various components of goods exports and services exports are obtained from Eurostat ([20]). The sample for goods exports covers the 19 Member States from 2002 until 2021, while the sample for services exports covers 14 Member States ([21]) from 2010 until 2021. No data for services exports in constant prices are available. In other words, in equation (1) the price effect is captured by the price of total goods and services exports respectively to the effective GDP deflator of export destination countries (converted by nominal effective exchange rate). The scale effect is captured by the total exports of goods or services. While the aggregate Oxford indicator has been used for the composition of the export of goods to measure the level of

([10]) A further disaggregation of these macroeconomic variables did not change the qualitative nature of the major findings.
([11]) The inclusion of the lockdown measures of export destination countries did not provide significant point estimates with the expected negative sign. This may be due to multicollineartiy.
([12]) See subsection III.3 for a discussion of possible reason for this low statistical significance.
([13]) Labelled G_FOOD refers to food, drinks and tobacco , G_RAW refers to raw materials and also mineral fuels, lubricants and related materials, G_CHEMI refers to chemicals and related products, and G_MACH refers to machinery.
([14]) Labelled S_TRANS refers to transport services, S_TRAVEL refers to travel services, S_MANU refers to manufacturing services on physical inputs owned by others and maintenance and repair services, and S_OTHER refers to all other services include telecommunications, computer and information services, as well as financial services.
([15]) In line with the specification proposed by Deaton, A. and J. Muellbauer (1980), 'An Almost Ideal Demand System', The *American Economic Review*, Vol. 70, No. 3, pp. 312-326.
([16]) For the subsequent analysis the lockdown measures
([17]) See for instance Theil, H. (1971), *Principles of Econometrics*, John Wiley and Sons, Inc.
([18]) The long-run equation in levels has a similar structure $SHARE_{q,i,t} = \alpha_{q,i} + \gamma_q ln(EXP_{G,i,t}) + \rho_q \ln\left[\frac{P_{G,i,t}\, NEER_{q,i,t}}{EGDP_{P_{q,i,t}}}\right] + \delta_q\, ST_{i,t} + u_{q,i,t}$
([19]) However, as there is perfect multicollinearity between the error terms, they have been introduced in relative terms.
([20]) International trade by Standard Interntional Trade Classification product group (cods ext_lt_intertrd) for goods and international trade in services (since 2010) (code: bop_its6_det) for services.
([21]) BE, DE, EE, IE, EL, FR, IT, LV, LU, NL, AT, PT, SI, SK.

(Continued on the next page)

Box (continued)

lockdown measures, the sub-indicator covering the level of international travel controls ([22]) has been used for the exports of services.

Table B summarises the estimation results by pooling the data and estimating the equations of the systems with least squares ([23]). The point estimates of the current and lagged lockdown measures show a strong significance. These point estimates are discussed in the main text. The point estimates of the total export volumes show a fairly high significance, especially for services. As total exports grows (in normal times), only the share of travel increases while the share of the other services decreases. These shifts are much smaller for the shares of goods components. Overall the point estimates of the real effective exchange rate are insignificant, except for the strong significance of machinery and raw materials, which have an opposite sign indicating that (in normal times) a real appreciation lowers the share of exports of machinery and increases the share of raw materials. Rising shipping costs induce a decrease in the share of exports of chemicals and raw materials. The point estimates of the lagged own error correction terms are all significant and have a value between 0 and -1. Most of the point estimates of the other error correction terms are also significant ([24]).

Table B: The impact of COVID-19 on exports composition
Dependent variable: change in share of service/good i in total exports of services/goods

	Services				Goods			
	S_MANU	S_TRANS	S_TRAVEL	S_OTHER	G_FOOD	G_RAW	G_CHEMI	G_MACH
Total exports (goods or services)	-0.05 ***	-0.12 ***	0.26 ***	-0.08 ***	-0.04 ***	0.06 ***	-0.03 **	0.01
Real effective exchnage rate	0.04	0.10	-0.06	-0.07	-0.02	0.16 ***	0.02	-0.16 ***
Confinement	-0.14	-0.56	-1.35 ***	2.05 ***	0.01 **	-0.03 ***	0.03 ***	-0.01
Lagged confinement	0.29 *	1.47 ***	-0.85 *	-0.90 **	-0.02 ***	0.06 ***	0.01	-0.05 ***
Shipping costs					0.00	-0.01 ***	-0.00 *	0.01 ***
A Error correction term	-0.24 ***	-0.09	-0.30 *	0.62 ***	-0.26 ***	-0.01	0.14 ***	0.13
B Error correction term	0.11 ***	-0.20 ***	0.29 ***	-0.19 ***	0.08 ***	-0.19 ***	0.10 ***	0.01
C Error correction term	0.08 ***	0.16 ***	-0.05	-0.18 ***	0.11 ***	0.12 **	-0.28 ***	0.05
D Error correction term	0.06 *	0.13	0.06	-0.25 ***	0.06 ***	0.08 ***	0.04 *	-0.19 ***
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R-squared	0.38	0.27	0.75	0.62	0.30	0.25	0.19	0.10
Durbin Watson	2.10	1.91	1.70	1.80	1.78	1.97	2.14	1.76
Total number of observations	135	135	135	135	361	361	361	361
Total number of explanatory variables	21	21	21	21	27	27	27	27

Note: sample goods: 2003-2021; sample services: 2011-2021; OLS; significance *** p<0.001, ** p<0.05 and * p<0.01.
Note: see footnotes 11 and 12 in this box for details on product labels; services covers BE, DE, EE, IE, EL, FR, IT, LV, LU, NL, AT, PT, SI, SK

([22]) The OxCGRT international travel controls indicator (C8) covers policies such as a PCR test and quarantine of visitors, and entry ban for non-vaccinated non-residents.

([23]) The values of the point estimates should not be affected if they would have been estimated as a system that takes explicitly into account that the stochastic components are correlated across equations, as in the case of – for instance – the SURE (seemingly unrelated regression equations) estimator. In that case, the standard errors and t-values are affected. It is worth noting that the covariance matrix of the stochastic components is singular because these elements meet the adding-up constraint. This implies, that one equation of the system has to be deleted when estimating the equations as a system, but the estimation results should not depend on the equation deleted if properly specified. See Theil (1971), *op.cit.*

([24]) In an allocation system, past disequilibria in the other goods categories will also spill over to the other goods categories of the allocation system, hence their inclusion in the other equations.

Annex. The euro area chronicle

The Commission, the Economic and Financial Affairs Council and the Eurogroup regularly take decisions that affect how the Economic and Monetary Union works. To keep track of the most relevant decisions, the QREA documents major legal and institutional developments, presented in chronological order with references. This issue covers developments between mid-December 2022 and mid-March 2023. Over the winter, Croatia adopted the euro and further funds from the Recovery and Resilience Facility (RRF) were disbursed while the Commission provided fiscal policy guidance for 2024 ([166]).

Croatia adoption of the euro. On 1 January 2023, Croatia joined to the euro area, bringing the number of EU countries using the single currency to 20. The euro area now represents 85% of the EU's economy. Adoption of the euro followed a period of thorough preparation and substantial efforts by Croatia to meet all the necessary requirements. The country's national central bank became a member of the Eurosystem, and Croatia's central bank governor will be participating to the ECB's Governing Council. Croatia now participates in the Euro Summit and Eurogroup meetings and is more heavilyinvolved in the coordination of fiscal and structural policies. As a euro area country, Croatia also formally became the 20th member of the European Stability Mechanism on 22 March 2023.

A Green Deal industrial plan. On 1 February 2023, the Commission presented the industrial plan for the net-zero age ([167]). Several strands of the plan (a predictable regulatory environment, boosting skills and supporting open trade for resilient supply chains) have an EU dimension. However, the strand of promoting faster access to sufficient funding has elements relevant from the point of view of the euro area. It underlines the importance of further developing the Capital Markets Union at the EU level to improve financing and investment opportunities for individuals and companies, including those operating in clean tech. In addition, full implementation of the plan through innovation and promoting fledgeling green technologies would support dynamism and resilience of the euro area economy and its energy independence. The Commission also published guidance on how to integrate the REPowerEU initiative into national recovery and resilience plans. Member States will be able to use the remaining RRF loans, an additional EUR 20 bn in resources from the EU Emissions Trading System and transfers from other funds and instruments to promote the greening of industry and assist energy-intensive industries in the face of high energy prices.

Disbursements under the Recovery and Resilience Facility to Malta, Spain and Lithuania. In winter 2022/2023, the Commission continued to disburse funds under the RRF. On 19 December 2022, Malta submitted to the Commission its first payment request for EUR 52.3 million of grants based on the achievement in 16 milestones and three targets. On 27 January 2023, based on progress in reforms and investments including measures such as the adoption of a strategy to reduce waste through recycling in the construction sector, reforms to boost industrial research and investments, a national anti-fraud and corruption strategy and reforms to digitalise the justice system, the Commission endorsed a positive preliminary assessment of the request ([168]). Following the Economic and Financial Committee's opinion and agreement in the Economic and Financial Affairs Council, the Commission disbursed EUR 52.3 million of grants to Malta. A similar process was followed with other Member States. On 11 November 2022, Spain submitted its third request for EUR 6 billion in grants under the RRF. On 17 February 2023, based on progress in reforms and investments, the Commission endorsed a positive preliminary assessment of the request ([169]). The reforms include the entry into force of the law on telecommunications to facilitate the deployment of high capacity network infrastructure, reforms to accelerate the installation of electric charging infrastructure in car parks, a reform to improve the efficiency of insolvency procedures, a reform to improve the vocational training system and make it more attractive, the law against tax evasion and fraud, a reform of the social security system for the self-employed and the review of the current supplementary pension system. On 30 November 2022, the

([166]) Annex compiled by Jakub Wtorek. The cut-off date for this annex is 31 March 2023.
([167]) https://ec.europa.eu/commission/presscorner/detail/en/ip_23_510
([168]) https://ec.europa.eu/commission/presscorner/detail/en/IP_23_369
([169]) https://ec.europa.eu/commission/presscorner/detail/en/ip_23_922

Commission received the first payment request from Lithuania for over EUR 565 million in grants, corresponding to 33 milestones. On 28 February 2023, the Commission considered that 31 milestones covering reforms and investments in the areas of vocational education, support of innovation and science, social protection or digital-data storage has been satisfactorily reached. It also found that two milestones related to taxation had not been reached. In line with the 'payment suspension' procedure, the payment for the milestones reached is now being prepared, while Lithuania received more time to reach the outstanding milestones ([170]).

Disbursements under the Recovery and Resilience Facility to Slovenia and Austria. A similar process was followed with Slovenia and Austria. On 20 October 2022, Slovenia submitted to the Commission its first payment request based on the achievement of 12 milestones, including reforms enabling the digitalisation of businesses and strengthening governance for the digital transformation of public administration, as well as reforms of the labour market and of the business environment. On 8 March 2023, the Commission endorsed a positive preliminary assessment of the request ([171]), and following the agreement in the Council, EUR 50 million of grants were disbursed to Slovenia. On 22 December 2022, Austria submitted to the Commission its first payment request based on the achievement of 44 milestones and targets, including reforms such as a law to accelerate the roll-out of renewable energy sources or a reform to making public transport more attractive, together with investments in the areas of energy efficiency or digital education. On 10 March 2023, the Commission endorsed a positive preliminary assessment of the request ([172]), and following the agreement by the Council, EUR 700 million of grants were disbursed to Austria.

Guidance for Member States on fiscal policy in 2024. On 8 March 2023, the Commission adopted a communication providing Member States with preliminary fiscal policy guidance for 2024 ([173]). The guidance is provided agaist the background of the general escape clause being deactivated in 2024 and the need for prudent fiscal policies. Member States are invited to set out medium-term fiscal plans in their April stability and convergence programmes, which will then be assessed by the Commission. In May 2023, the Commission will propose country-specific recommendations in the fiscal area that include a quantitative requirement as well as qualitative guidance on investment and energy measures. The recommendations would be differentiated based on Member States' public debt challenges.

([170]) https://ec.europa.eu/commission/presscorner/detail/en/ip_23_1286
([171]) https://ec.europa.eu/commission/presscorner/detail/en/ip_23_1529
([172]) https://ec.europa.eu/commission/presscorner/detail/en/IP_23_1534
([173]) https://ec.europa.eu/commission/presscorner/detail/en/ip_23_1410

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