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EUROPEAN ECONOMY

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The **Quarterly Report on the Euro Area** is written by the staff of the European Commission and coordinated by the Directorate-General for Economic and Financial Affairs under the direction of Maarten Verwey. 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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Quarterly Report on the Euro Area

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Maarten Verwey
Director-General

Last spring, our forecast pointed to moderate growth. Euro area real GDP is projected to expand at a similar pace in 2025 as in 2024, with a modest acceleration expected in 2026. At the same time, disinflation is anticipated to continue, with headline inflation expected to reach the ECB's 2% target by mid-2025 and to average 1.7% in 2026.

The Commission Spring forecast was marked by high geopolitical and economic uncertainty. The abrupt shift in US trade policy and the announcement of sweeping tariff hikes made by the US administration on "Liberation Day", on April 2, shook financial markets. The US dollar weakened considerably, as investors were unnerved by the negative implication of the tariffs for US growth and, more generally, by the increase in US economic policy uncertainty. After our forecast, there were also signs that investors were attaching more risk to US dollar bonds, in particular after the "One Big Beautiful bill" fiscal act was put forward on May 22. Stock markets have recovered since their April collapse, however, volatility can be expected to persist in both US Treasuries and the US dollar, driven primarily by US policy uncertainty. However, the recent trade deal between the US and the EU should to some extent reduce the uncertainty for the EU.

Policies on the other side of the Atlantic have increased pressure on the euro area to take this window or opportunity to reassert itself in the global economy. To do so, Europe must address some persistent internal challenges. This issue of the *Quarterly Review* revisits three areas of structural vulnerabilities that have historically weighed on the euro area's economic performance: household debt, low productivity growth and the resilience of non-financial corporations. Each of these areas shows signs of improvement compared to a decade ago, but important differences across countries and remaining risks mean that policy attention is still needed.

Chapter I revisits the issue of household debt already analysed in issue 3 of the QREA in 2023 by focusing on household debt developments. Excessive household debt is known to pose significant macroeconomic risks, particularly during periods of stress. The euro area has come a long way towards reducing vulnerabilities in this area but differences across member states remain. This chapter examines these cross-country differences in household debt developments, distinguishing between (i) the Fischer dynamics, i.e. automatic debt changes driven by interest rates and income growth, and (ii) new debt resulting from household primary deficits. Using panel data methods, the chapter investigates the key drivers of household primary deficits, with a focus on country-specific factors. The model suggests that household primary deficits—while exhibiting some inertia—are influenced by interest rate movements, income growth, the accumulated debt stock, intentions to purchase housing, and demographic aging. Cross-country variation is primarily explained by differences in household primary deficits and in income growth. Implicit interest rates and the debt stock also played significant roles during specific periods. Unobserved fixed effects—potentially linked to cultural and institutional factors such as homeownership rates, insolvency frameworks, and the justice system—further explain national attitudes toward debt accumulation.

Chapter II explores developments in productivity growth, particularly Total Factor Productivity (TFP), in the EU compared to the US, using the latest EU-KLEMS dataset. TFP growth in both regions has been largely driven by a few key sectors. In the post-GFC recovery (2013–2019), services played a major role in TFP growth on both sides of the Atlantic. However, the drivers differed: in the US, high-skill sectors like IT, professional services, and finance led the way, while in the EU, contributions came more from lower-skill services such as wholesale and retail. The contribution of manufacturing also diverged. In the EU, sectors

like transport equipment, chemicals, and electronics made meaningful contributions to TFP growth, whereas in the US, among manufacturing sectors only computer and electronics had a significant impact. While the share of high-tech and high-TFP-growth sectors in EU value added has been rising, the gap with the US remains substantial—and is not closing. This structural difference continues to weigh on the EU's productivity performance.

Finally, Chapter III assesses financial vulnerabilities among euro area non-financial corporations (NFCs). These firms face tight financing conditions and elevated interest rates, which put pressure on their debt servicing capabilities. However, many NFCs have also built liquidity buffers, thanks to pandemic-related credit and income support, and experienced rising profits in the early phases of the recent inflation shock even if they decreased after. To evaluate corporate risk, this chapter introduces a new composite index of corporate financial vulnerabilities across EU Member States, based on ECB methodology. This index offers a high-level overview of trends and emerging risks. Despite a modest increase in vulnerabilities in recent quarters, the index remains negative in most countries. Even where positive values are observed, current risk levels remain below those seen during the global financial crisis, the sovereign debt crisis, or the early stages of the COVID-19 pandemic. In sum, while corporate vulnerabilities have grown along some dimensions, the sector overall remains resilient.

I. DETERMINANTS OF HOUSEHOLDS DEBT IN EURO AREA COUNTRIES

By Leonor Coutinho, Virgilijus Rutkauskas, Matteo Salto

Abstract: *Excessive household debt can have potentially large negative consequences for the macroeconomy, especially in periods of stress. This chapter analyses in detail cross-country differences in household debt developments, distinguishing between the Fischer dynamics, i.e. the automatic accumulation/decumulation of debt due to changes in interest rates and income growth, and new debt resulting from household primary deficits related to their spending choices. It further uses panel data techniques to identify possible determinants of household primary deficits in the euro area, with particular emphasis on country characteristics. According to the model, household primary deficits show some inertia, and appear related to developments in interest rates and income growth, to the accumulated stock of debt, intensions to buy a house the year before, and the ageing of the population. In terms of cross-country variation, differences in past deficits and income growth, are important to explain variations in household primary deficits across countries. Variations in the stock of debt and in effective interest rates also played a visible whole in particular periods of time. Finally, unobserved fixed effects also explain some of the variation and could be due to cultural and institutional reasons and have possible links to the justice system, homeownership rates and insolvency regimes, determining different attitudes towards debt.*

I.1. INTRODUCTION

High household debt can have large negative consequences for the macroeconomy, especially in periods of stress. The greater the stock of debt, the larger the debt-service payments and the more likely it is that a share of households may face difficulties in meeting them, independently of the asset side of the balance sheet, due to credit and liquidity constraints. ([1]) Debt-service difficulties, caused by a decline in household income, for instance, can have negative implications for household consumption and investment, exacerbating economic recessions. Furthermore, in case of large-scale default, negative spillover effects to the rest of the economy can result in prolonged recessions, as the experience with the global financial crisis shows. ([2])

"Fisher dynamics" (snowball effects resulting from financing needs generated by interest payments on debt accumulated in the past) are important determinants of household debt accumulation. They can contribute to increase debt when the real interest rate exceeds household real income growth. Coutinho et al. (2024) show that these effects have been important sources of euro area household debt accumulation not only in the crisis periods (global financial crisis and COVID-19), mostly due to a collapse in income growth, but also in the run-up to the global financial crisis, when nominal interest rates were relatively high and exceeded nominal income growth. ([3])

([1]) Tirole (2011) argues that gross debts (or leverage measures, such as debt-to-income) matter for financial stability when credit constraints and illiquid assets may prevent agents from achieving their preferred allocation of income across periods, constraints that are likely to hold in financial crises and recessions. Tirole, J. (2011), "Illiquidity and All Its Friends", Journal of Economic Literature 49 (2): 287–325. For additional references see Mason, J. W., and Jayadev, A. (2014). "Fisher dynamics' in US household debt", 1929–2011. American Economic Journal: Macroeconomics, 6(3), 214-234.

([2]) For a brief survey on the relationship between household debt and macroeconomic vulnerability see Coutinho, L., Martins, V. and Salto, M. (2023), "Euro Area Household Debt," Quarterly Report on the Euro Area (QREA), Directorate General Economic and Financial Affairs (DG ECFIN), European Commission, vol. 22(3), pages 35-49, December. See also Jones, C., Midrigan, V., and Philippon, T. (2022), "Household leverage and the recession, *Econometrica*, *90*(5), 2471-2505; Caloia, F. G. (2024), "Borrower-based measures, house prices and household debt", Journal of International Money and Finance, 143, 103051; and Bartscher, A., Kuhn, M., Schularick, M., and Steins, U. (2025), "The distribution of household debt in the United States 1950-2022", Review of Economic Dynamics, 57, 101288.

([3]) Mason and Jayadev (2014), op cit., estimate Fisher dynamics for the household sector in the United States over the period 1929–2011 and show that these have worked to either exacerbate the dynamics or dampen it in an important manner and have also been dominant in particular periods.

The other important determinant of household debt developments is the "primary deficit". ([4]) Making a parallel with government debt accumulation, the household primary deficit corresponds to household current expenditure, including in financial assets, which is not financed by current income and is therefore financed by debt. Coutinho et al. (2024) show that during the European sovereign debt crisis, household primary surpluses were a big determinant of household deleveraging, counter-balancing the unfavourable Fisher dynamics. Conversely, primary deficits contributed to debt accumulation in the run up to the global financial crisis, reinforcing the unfavourable Fisher dynamics in that period. Primary deficits also added to household debt in 2019 and 2021, but counter-balancing favourable Fisher dynamics resulting from very low interest rates.

Euro area household debt as a percent of household gross disposable income has declined significantly since 2021, reaching 86% in 2023, below the pre-COVID ratio of around 94%, and well below the 2010 peak of close to 97%. ([5]) These developments, however, have not been even across euro area countries, with the ratio of household debt to gross disposable income ranging from 30% in Latvia to 187% in the Netherlands in 2023. These differences in the exposure of households to interest rate and income risk, can trigger asymmetric responses to global shocks across the euro area and create important challenges for the common monetary policy and for policy coordination.

This chapter analyses differences in household debt developments across the euro area, taking into account the main components that determine its change over time, including Fisher effects and household primary deficits. The remainder of the chapter is organised as follows. Section I.I characterises the dispersion in household debt developments and interest payments across the euro area. Section I.2 recalls the main elements of the debt accumulation equation and describes their developments for euro area countries. Section I.3 analysis the determinants of household primary deficits using a panel of euro area countries and discusses the main determinants of household primary deficit differentials across the euro area. Section I.4 concludes.

I.2. DISPERSION IN HOUSEHOLD DEBT DEVELOPMENTS IN THE EURO AREA

Household debt in the euro area (EA20) changed from 76% of household gross disposable income in 2002, to a peak of 97% in 2010 (Graph I.1). ([6]) This followed a deleveraging period, with the euro area household debt-to-income ratio declining to around 94%. The deleveraging process was briefly interrupted by the COVID-19 pandemic, when household debt jumped again to around 96% of household disposable income, mostly on account of a significant drop in income. With the swift recovery of

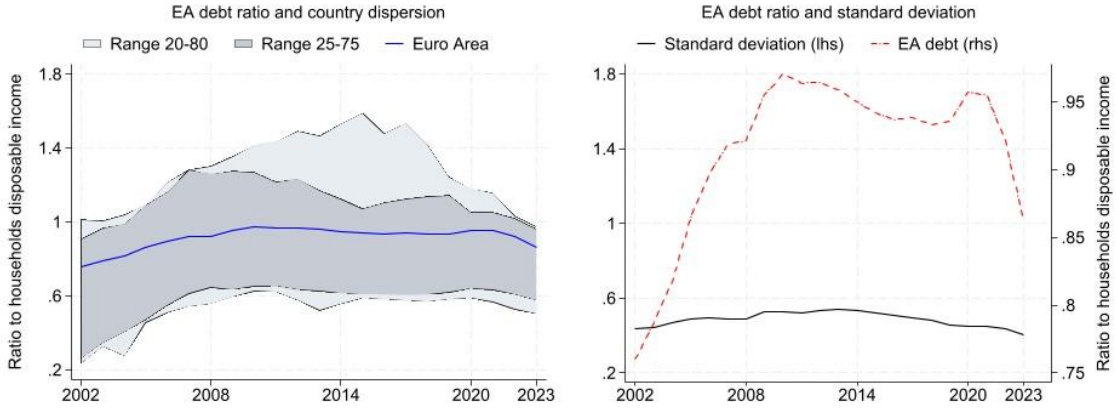
([4]) It is useful to compare the concept of primary deficit used here with households' savings. Gross savings are computed from non-financial accounts by deducting the final consumption expenditure from gross disposable income and adjusting for the change in pension entitlements. When further deducting gross capital formation (mostly new dwellings), capital consumption and the difference between acquisitions and disposals of non-financial non-produced assets, one obtains net lending (B9 in statisticians' parlance), which is also the definition of deficit used to analyse government's debt sustainability. Net lending corresponds to (the negative of) the net financial transactions (B9F in statisticians' parlance), i.e. the difference between net acquisition of financial assets and net incurrence of liabilities, as households use the remaining of their budget constraints after consumption and investment plus the new (net) financial liabilities to acquire new (net) assets. This happens in theory. Unfortunately, in general, as the two data are built from different sources, the two numbers do not coincide. In theory, the household primary deficit can be written as primary deficit=net changes in financial liabilities + interest payments=Y-C-I-net acquisition of financial assets, where Y is household income before interest payments, C is consumption, and I is investment.

([5]) The debt figures throughout the chapter include debt of non-profit institutions serving households (loans and debt securities). Household gross disposable income is adjusted as in Coutinho et al. (2024) to reflect the income households have available to repay debt, including interest, i.e. interest paid is added to the gross disposable income, while FISIM is deducted from the interest received. FISIM is a national accounts concept that allocates an amount for the payment of financial intermediation services partly to borrowers and depositors. See Eurostat (2013), "European System of Accounts ESA 2010", Chapter 14.

([6]) We use the euro area 20 countries aggregate (EA20) throughout the analysis, for consistency, even though not all countries included belonged to the euro area throughout the sample. Several countries joined the euro area after the start of our sample, including, Slovenia (2007), Cyprus (2008), Slovakia (2009), Estonia (2011), Latvia (2014), Lithuania (2015) and Croatia (2023).

household income, supported by decisive policy action on many fronts, the household debt-to-income ratio declined again to around 86% in 2023.

Graph I.1: **Euro area households debt ratio, differentials and standard deviation**



For the definition of disposable income, see footnote (4).

Source: Eurostat sectoral accounts and own calculations

Developments in euro area countries, mimic in general those observed at the aggregate euro area level, but with a significant range of variation across countries (Graph I.1, left panel). The range of variation (between 20th and 80th debt percentiles) increased after the global financial crisis but declined in the aftermath of the European sovereign debt crisis. The standard deviation of debt-to-income ratios across euro area countries was relatively high during the latter period (at around 50 pp) and has since remained high although below the peak observed during the European sovereign debt crisis, reaching close to 40 pp in 2023 (Graph I.1, right panel). The Netherlands has been the country with the highest debt ratio since the inception of the euro area.

Table I.1: **Change in household debt-to-income ratios across the euro area, by period**

	Debt ratio in 2002	*03_08*	*09_14*	*15_19*	*20*	*21_23*	*Change 03-23*
Euro Area	76.0	2.7	0.5	-0.3	2.2	-3.2	1.9
Austria	74.3	1.5	0.3	-0.1	1.8	-4.1	-0.6
Belgium	62.6	3.0	2.7	1.4	1.9	-3.1	5.9
Croatia	30.4	5.7	0.0	-1.3	0.6	-2.8	2.2
Cyprus	116.5	4.9	6.4	-11.6	-2.5	-8.7	-11.5
Estonia	26.1	9.9	-2.6	-0.5	0.5	-1.3	6.1
Finland	64.4	4.9	1.9	1.8	3.8	-2.9	9.5
France	56.4	3.3	2.0	2.0	3.2	-2.2	8.3
Germany	101.4	-2.2	-0.7	0.0	3.0	-2.4	-2.4
Greece	29.9	6.7	4.2	-2.6	0.7	-7.0	2.0
Ireland	110.0	13.4	-2.3	-10.5	-20.7	-3.9	-24.0
Italy	36.4	3.2	1.0	0.0	2.0	-2.1	4.2
Latvia	13.9	8.7	-3.4	-2.4	-0.6	-1.0	1.3
Lithuania	4.8	6.6	-1.4	0.5	-0.7	-0.9	4.2
Luxembourg	81.3	8.2	3.8	3.7	-1.0	-0.5	14.3
Netherlands	171.2	7.5	3.5	-3.2	-1.5	-10.6	-4.4
Portugal	90.8	5.0	-1.6	-4.0	2.4	-4.3	-2.4
Slovakia	9.8	4.5	3.1	3.1	0.9	-0.5	11.1
Slovenia	23.3	3.2	0.6	-0.2	-1.8	-1.2	0.7
Spain	77.9	8.0	-2.2	-4.6	1.2	-5.7	-3.2

(1) Several countries joined the euro area after 2002: Slovenia (2007), Cyprus (2008), Slovakia (2009), Estonia (2011), Latvia (2014), Lithuania (2015) and Croatia (2023). EA20 figures correspond to the current membership. Malta omitted due to data availability constraints.

Source: Eurostat sector accounts

Table I.1 decomposes household leverage in the euro area by subperiods. Over the period up to the global financial crisis (2003-2008), all euro area (EA20) countries except Germany saw an increase in the ratio of household debt to income, with the highest increases, among euro area countries at the time, observed

in Ireland, Spain, Luxembourg and the Netherlands. In the period following the global financial crisis and comprising the European sovereign debt crisis (2009-2014) several euro area countries already started to successfully deleverage (Table I.1). These included Spain, Ireland, Portugal, Estonia, Latvia and Lithuania.

In the subsequent period, household deleveraging broadened to a wider set of euro area countries, which included also Austria, Cyprus, Greece, Netherlands and Slovenia. In 2020, due to the COVID-19 pandemic, debt increased in most euro area countries, with only a few exceptions. Changes in debt in 2020, are affected by the level and type of support provided to households, which included not only income support, which would limit the increase in the debt ratio, but also in some cases credit guarantees and debt payments moratoria, which may have contributed to lower repayments and a temporary increase in debt in some countries. Post-COVID-19, debt adjusted downwards in most countries, driven to some extend by the recovery in real incomes but also by higher inflation.

I.3. DETERMINANTS OF DEBT ACCUMULATION ACROSS THE EURO AREA

This section recalls the equation for household debt accumulation presented in Coutinho et al. (2024), which draws a parallel to the debt accumulation equation typically assumed for the government. Equation (1) decomposes the change in the household debt-to-income ratio into the household primary deficit (d_t), the Fisher dynamics, i.e. the effect of nominal interest rates (i_t), real income growth (g_t) and inflation (π_t) operating on the past stock of debt accumulated (b_{t-1}), and a "stock-flow" adjustment term (sf_t), which captures other changes in debt due to valuation effects, debt renegotiation or write-offs.

$$b_t - b_{t-1} \equiv \Delta b_t = d_t + \underbrace{\frac{(\mathrm{i}_t - g_t - \pi_t)}{(1 + g_t + \pi_t)} b_{t-1}}_{\textit{Fisher dynamics}} + \mathrm{sf}_t \qquad (1)$$

The primary deficit in equation (1) corresponds to debt transactions (net flows) excluding interest payments and can be interpreted as all household expenditure (including expenditure in financial assets) that is not financed by income. In general, it results from conscious decisions of households to accumulate debt. The nominal interest rate corresponds to the effective interest rate paid, on average, by households (interest payments divided by the stock of debt in the previous year). Throughout the analysis "stock-flow" adjustments will be disregarded as averaging out over time, however it is important to note that these can be important to explain changes in debt in some specific periods for some countries. ([7])

Table I.2 summarises the Fisher dynamics coefficient (i-g-p) for the euro area and its member states. For the euro area in aggregate, throughout the period, the effective rate of interest faced by households has been higher than their nominal income growth, except for the high-inflation post-COVID-19 period, when nominal interest rates remained relatively low compared to nominal income growth, implying Fisher dynamics that were supportive of household deleveraging. For all other periods the i-g-p coefficient was positive and it reached the highest average values in the period following the global financial crisis and encompassing the EU sovereign debt crisis (2009-2014). It was also relatively high in 2020 when growth collapsed due to the pandemic shock. This is consistent with movements in the effective interest rate for the euro area, which was higher in the period 2003-2008 for the euro area aggregate, at around 5.4%, while in the same period household gross disposable income growth reached close to 4%. Subsequently, the effective interest rate for the euro area declined steadily up to 2020 to 2.4%, but nominal income growth also collapsed with the global financial crisis and recovered only very slowly up to 2019. The year 2020, was a particular year, when nominal income growth fell abruptly, while effective nominal interest

([7]) Stock-flow adjustment bundles together other changes in debt (which may include, for instance debt write-offs, debt-to-asset swaps or capitalisation of interest due) and valuation effects (which may refer for instance to changes in the value of debt due to exchange rate fluctuations). Isolating other changes in debt from valuation effects is difficult because the data is not available. The stock-flow adjustment is typically small in the case of the euro area, consistent with the fact that the bulk of euro area household debt comprises mortgage loans in euro. For some euro area countries valuation effects have been important in explaining changes in debt, particularly in the period of the global financial crisis due to the capitalisation of interest due on non-performing debt, and in the adjustment period due to debt write-offs and debt renegotiation (in the opposite direction).

Table I.2: **The Fisher dynamic coefficient (i-g-n) across the euro area, by period**

	03_08	09_14	15_19	20	21_23
Euro Area	1.5	3.7	0.2	2.2	-4.1
Austria	-0.5	1.3	-0.8	1.3	-5.0
Belgium	0.8	2.2	0.0	0.5	-5.0
Croatia	2.9	8.1	1.6	5.2	-8.0
Cyprus	-8.6	6.0	-1.9	2.1	-6.3
Estonia	-6.1	2.3	-1.3	4.4	-4.8
Finland	-0.9	-0.2	-1.0	0.5	-2.7
France	0.5	2.9	0.3	0.9	-4.4
Germany	3.6	3.2	0.1	2.2	-4.1
Greece	0.0	10.2	2.3	7.2	-5.3
Ireland	-3.4	5.0	-2.8	-1.7	-5.1
Italy	3.5	4.8	1.6	4.6	-2.5
Latvia	-9.6	5.6	1.1	5.2	0.9
Lithuania	-5.8	3.6	-2.5	-5.8	-7.4
Luxembourg	-0.3	-1.4	-2.2	-4.9	-4.9
Netherlands	2.0	4.2	0.1	-0.8	-5.6
Portugal	1.7	4.2	-1.4	2.9	-4.3
Slovakia	-4.1	5.4	-1.2	-2.3	-6.0
Slovenia	2.1	5.0	-1.4	-1.4	-5.0
Spain	-1.8	4.6	-1.2	4.2	-4.2

(1) Several countries joined the euro area after 2002: Croatia (2023), Cyprus (2008), Estonia (2011), Latvia (2014), Lithuania (2015), Slovakia (2009) and Slovenia (2007). EA20 figures correspond to the current membership. Malta omitted due to data availability constraints

Source: Eurostat sector accounts and own calculations

rates remained low. Post COVID, effective nominal interest rates increased only slightly to an average of 2.5%, well below the nominal income growth, which was propped up by high inflation. The relatively low pass-through from monetary policy rates to the effective interest rates paid by household in the euro area in the latter period has been documented in other studies and can be explained to some extent by the lower share of variable interest rate mortgages as well as, the higher liquidity and low level of competition in the banking system, and the lower level of competition (see European Commission Spring Forecast 2025, Box I.4.2.).

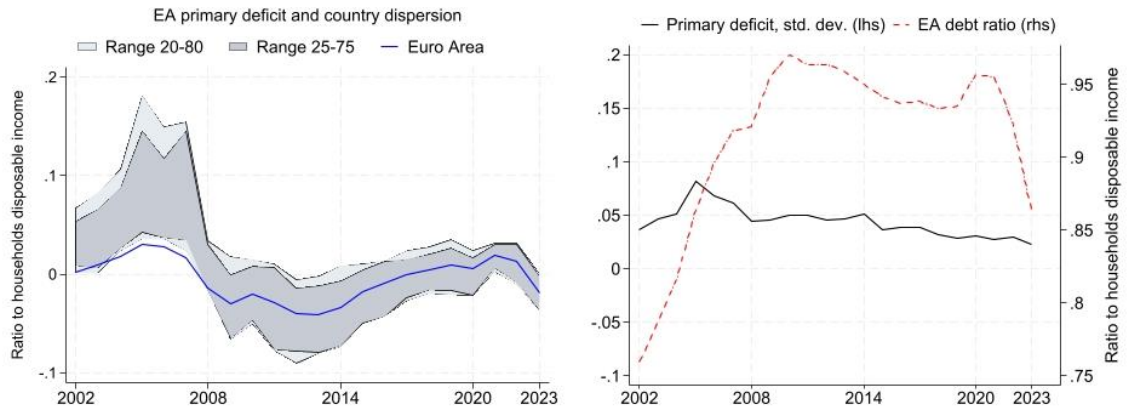
Developments in i-g-p were uneven across euro area countries. In the period up to the global financial crisis, a number of countries in Table I.1 where debt grew relatively fast in the run-up to the crisis (Cyprus, Estonia, Ireland, Lithuania, Latvia, Slovakia and Spain), faced a negative i-g-p. ([8]) Overall, i-g-p was low in this period compared to other periods, with the highest value observed in Germany (3.6%). In the period following the global financial crisis, up to 2014, i-g-p was positive for all EA20 countries except for Finland and Luxembourg, with the highest value observed in Greece (10.2%), where growth collapsed. When income growth started to recover and interest rates remained relatively low, i-g-p turned negative in a number of countries, supporting deleveraging over that period. This reversed for most countries in 2020 due to the COVID-19 growth collapse, but in the period 2021-2023, i-g-p was negative for almost all euro area countries, supporting again a reduction in debt, with the lowest values observed in Croatia (-8%), Lithuania (-7%), Cyprus and Slovakia (-6%).

Household primary deficit developments have been no less heterogeneous across euro area countries. Graph I.2 shows the developments for the euro area and the cross-country variation as measured by the interquartile range and the distance between the 20th and 80th percentile (left panel). To put it into perspective the right panel of Graph I.2 shows the standard deviation of household primary deficits across euro area peaking in 2005 at around 8.1 pp and declining subsequently, almost continuously, likely due to greater awareness of the pernicious effects of excessive household debt but still remaining at around 2.3

([8]) Notice that among these countries, Cyprus joined the euro area in 2008, while Estonia, Lithuania, Latvia and Slovakia joined after 2008.

pp. As well documented, there was a significant increase in deficits in the run-up to the global financial crisis, and an even larger increase in the range of variation across euro area countries. The primary deficit (in percent of income) for the EA20 aggregate subsequently declined up to roughly 2013 and then slowly recovered up to 2021, to roughly the same level in percent of income as in 2007. It adjusted downwards again in 2022 and 2023 due to the effect of high inflation on household nominal incomes, while employment remained resilient.

Graph I.2: **Euro area household primary deficit-to-income ratio, differentials and standard deviation**



(1) For the definition of disposable income, see footnote (4) It should be noticed that the euro area value is below the 20th percentile

Source: Eurostat and own calculations

Table I.3: **Primary deficit and Fisher effect across the euro area, by period**

	03_08	09_14	15_19	20	21_23	03_08	09_14	15_19	20	21_23
Euro Area	1.5	-3.2	-0.3	0.6	0.4	1.2	3.5	0.2	2.1	-3.6
Austria	0.6	-1.6	0.3	0.7	-0.3	-0.4	1.1	-0.6	1.1	-3.9
Belgium	2.3	0.5	1.7	1.4	1.7	0.4	1.9	0.0	0.5	-4.9
Croatia	4.5	-5.0	-1.4	-1.7	1.3	1.1	5.3	0.9	3.0	-3.9
Cyprus	14.2	-4.1	-4.2	1.6	-1.6	-9.4	10.4	-2.5	2.7	-6.8
Estonia	12.9	-4.9	0.5	-2.2	1.6	-3.1	2.4	-0.8	2.9	-2.9
Finland	5.7	2.1	2.8	3.5	0.2	-0.7	-0.2	-1.1	0.5	-3.0
France	3.0	-0.6	2.0	2.6	2.1	0.3	2.3	0.3	0.9	-4.2
Germany	-5.7	-3.6	0.0	1.7	0.8	3.4	2.8	0.1	1.8	-3.3
Greece	6.9	-6.1	-5.2	-4.8	-2.8	0.0	9.6	2.3	6.2	-3.8
Ireland	18.2	-13.7	-7.1	-8.4	-0.6	-5.0	10.2	-4.2	-2.1	-4.7
Italy	2.0	-2.0	-0.7	-0.9	-0.4	1.6	2.9	1.0	2.9	-1.5
Latvia	13.4	-6.6	-2.7	-2.2	-1.1	-4.3	4.5	0.4	1.7	0.2
Lithuania	7.6	-3.0	1.5	1.6	1.7	-1.4	1.7	-0.9	-2.1	-2.5
Luxembourg	8.6	5.8	7.3	6.9	5.9	-0.4	-2.0	-3.5	-7.9	-8.1
Netherlands	3.5	-8.2	-3.5	0.3	0.4	3.7	9.9	0.4	-1.7	-11.0
Portugal	3.0	-6.4	-2.2	-0.2	-0.6	1.6	5.1	-1.3	2.6	-3.6
Slovakia	6.6	1.8	4.0	2.4	3.6	-0.9	2.3	-0.8	-1.5	-4.1
Slovenia	2.8	-1.9	0.6	-0.9	0.9	0.5	2.3	-0.6	-0.6	-2.0
Spain	9.7	-7.4	-2.9	-2.4	-1.9	-1.6	5.9	-1.1	3.9	-3.4

(1) Several countries joined the euro area after 2002: Croatia (2023), Cyprus (2008), Estonia (2011), Latvia (2014), Lithuania (2015), Slovakia (2009) and Slovenia (2007). EA20 figures correspond to the current membership. Malta omitted due to data availability constraints

Source: Eurostat sector account and own calculations

Table I.3 puts side by side the contribution of primary deficits and snowball effects (Fisher dynamics) to the change in the household debt-to-income ratios across countries, by subperiods. In the period up to the global financial crisis, debt grew in several countries despite of favourable fisher dynamics, due to very high primary deficits (e.g. Cyprus, Spain, Ireland, Latvia, among those most affected by the debt overhang). In other countries, snowball effects contributed to the accumulation of debt during this period, despite lower primary deficits (Netherlands, Portugal). In the period immediately following the global financial crisis and encompassing the EU sovereign debt crisis, high snowball effects undermined deleveraging efforts (through primary surpluses) in a number of countries, including Cyprus, Spain, Greece

and the Netherlands. In the subsequent period of 2015-2019 primary surpluses continued in many EA20 countries and Fisher dynamics became in general more favourable to the deleveraging efforts. Deleveraging was interrupted in most countries in 2020, with adverse Fisher effects contributing to this, while in the post-COVID-19 inflation period, a negative contribution from Fisher dynamics ensured household deleveraging in all EA20 countries, despite higher household primary deficits in a number of countries (e.g. Croatia, Estonia, Slovakia, Slovenia).

I.4. DETERMINANTS OF HOUSEHOLD PRIMARY DEFICIT IN THE EURO AREA

Household primary deficits, or credit-financed primary expenditures resulting from consumption and asset accumulation, leading to new household debt, are likely determined by many factors. Coutinho et al. (2024) estimate a synthetic econometric panel data model for the household primary deficit, including EA19 countries (i.e. excluding Malta due to data availability), and show evidence that it is negatively related to the level of interest rates, positively related to household disposable income growth, and negatively related to the level of debt already accumulated, after controlling for inertia (deficit in the previous period). This chapter extends this analysis, extending the time sample and the set of explanatory variables to better capture the cross-country variation, which is the focus of the present chapter. The estimated model is given by equation (2):

$$d_{it} = \alpha_i + \rho d_{it-1} + \beta_i i_{it} + \beta_g \gamma_{it} + \beta_b b_{it-1} + \gamma' X_{it} + \varepsilon_{it} \quad (2)$$

where variable d_{it} is the household primary deficit of country *i* at date *t*,; i_{it} is the effective nominal interest rate, constructed as the nominal effective interest rate obtained from sectoral accounts; γ_{it} is the nominal growth rate of household gross disposable income ($\gamma_{it} = g_{it} + \pi_{it}$); X_{it} is a vector of additional control variables; α_i are unobservable fixed effects; and ε_{it} are independent and identically distributed errors.

Table I.4: **Determinants of household primary deficits (% income)**

	(1) OLS (no FE)	(2) OLS (FE)	(3) 2SLS (no FE)	(4) 2SLS (FE)	(5) GMM2S (FE)	(6) LIML (FE)
primary deficit (lag)	0.58***	0.51***	0.58***	0.38***	0.35***	0.37***
implicit interest rate	-0.45***	-0.55***	-0.86***	-0.84***	-0.89***	-0.84***
income growth	0.35***	0.36***	0.41***	0.53***	0.57***	0.55***
debt ratio (lag)	-0.02***	-0.08***	-0.02***	-0.05***	-0.05***	-0.05***
purchase home (lag)	0.10**	0.12	0.09**	0.19***	0.21***	0.19***
old dep. ratio (change)	-1.82**	-0.48	-2.33***	-2.54***	-2.48***	-2.58***
dummy energy crisis	-0.03***	-0.04***	-0.04***	-0.04***	-0.04***	-0.04***
Obs.	380	380	271	271	271	271
Countries	18	18	18	18	18	18
Overall R2	0.72	0.75	0.71	0.74	0.73	0.74
S-H p-value			0.05	0.26	0.26	0.27

Note: The primary deficit and the debt stock are measured in percent of household gross disposable income. The definition of effective interest rate and household income growth are in section I and in Table I.6. The variable "purchase home" refers to the four quarters average of the balance of the response to the consumer survey question "Are you planning to buy or build a home over the next 12 months?". The old age dependency ratio is the ratio of persons aged 65 and over to persons aged 20-64 (change refers to the first difference of the variable). The dummy energy crisis takes the value 1 in 2022 and 2023, the years when the euro area experienced very high energy prices, and zero otherwise. S-H refers to the Sargan-Hansen test, where the null hypothesis is that instruments are adequate (satisfy orthogonality condition). The null cannot be rejected in this case.

Source: Eurostat, ECB, European Commission and own calculations. Details in Table I.6.

The set of control variables X includes a survey-based assessment of the previous-year intensions of households to buy a house over the following twelve months and the change in the old-age dependency

ratio, which captures the effects of an aging population. ([9]) It also includes a dummy variable to control for the effects of the European energy price shock in 2022 and 2023 (dummy energy crisis), which was unprecedented over the sample period and accompanied by a range of fiscal policy measures which are not easy to capture and might have affected household behaviour. To control for possible endogeneity, the estimation is also carried out using instrumental variables. The estimation sample covers eighteen euro area countries (Malta is excluded due to data availability and Croatia due to a very short sample as a member of the euro area). The baseline regressions include only observations for periods in which the countries are de-facto in the euro area (unbalanced panel) but extending the sample period does not affect the results significant, as will be discussed below.

The methodology used in this analysis differs in several ways from previous studies that investigate empirically the determinants of household debt. ([10]) First, by using household primary deficits, it focuses on new household debt, excluding from the analysis the Fisher dynamics, which works automatically. Secondly, it considers the effective interest rate directly in the set of regressors, using instruments to control for possible endogeneity (see Box I.1). Lastly, it focuses on euro area countries. The last two points imply that a smaller set of macro variables is sufficient to capture most of the variation in the data.

The estimation results are shown in Table I.4, where Columns (1) and (2) are estimated using OLS, with and without fixed effects. The OLS estimates are likely biased due to endogeneity. Columns (3) to (6), use instead instrumental variables to control for possible endogeneity, providing 2SLS, GMM and LIML estimates, respectively. ([11]) When controlling for endogeneity, the presence of fixed effects reduces the estimated degree of inertia in the regression (coefficient of the lagged dependent variable) which is biased upwards when fixed effects are omitted.

The estimated coefficients are relatively robust to changes in the estimator, when instruments are used to control for endogeneity. There is some degree of inertia in household primary deficits, but it is not high when fixed effects are included and instrumental variables estimators are used to correct for the bias (Columns 4-6). The results also indicate that the household primary deficit reacts negatively to interest rates and positively to household income growth. It is not possible to reject the hypothesis that these last coefficients are equal, implying that households in fact react to r-g or equivalently to i-g-p, when both interest rates and income growth are adjusted by the same rate of inflation. This will be further analysed later in this section. The coefficient associated with the past household debt stock is negative and relatively robust around -0.05 when fixed effects are included and instruments are used, indicating that primary deficits eventually adjust to correct for high debt, when it becomes excessive. ([12]) This is also in line with the literature on the convergence of household debt across countries, everything else constant. ([13]) Consistent with the evidence that the bulk of household debt consists of mortgage debt, plans to buy a house increase household primary deficits in the following year, and the effect is robustly significant when fixed effects and instruments are included in the regression. Additionally, there is evidence that population ageing (the change in the old age dependency ratio) is associated with lower household borrowing, in line with the traditional Modigliani view, as well as with financial frictions that prevent older persons to obtain loans easily and consistent with the results found in Coutinho et al (2020) for the change in household debt in a large panel of countries, and with the findings that ageing exerts a downward pressure on the equilibrium real interest rate. ([14]) Finally, the energy crisis dummy is significant

([9]) Intensions to buy a house are measured by the four quarters average of the balance of the response to the consumer survey question "Are you planning to buy or build a home over the next 12 months?", The joint harmonised EU consumer survey, Question number 14. The old age dependency ratio per se is not significant, only the change. For evidence on the impact of this variable on changes in household debt, see for instance, Bricongne, J. C., Coutinho, L., Turrini, A., and Zeugner, S. (2020), "Is private debt excessive?", Open Economies Review, 31, 471-512.

([10]) See Bricongne et al. (2020) op cit.

([11]) 2SLS stands for 2-stage least squares, GMM stands for generalised method of moments and LIML for limited information maximum likelihood. For an explanation of the estimators and of the instruments used see Box I.1.

([12]) After a certain value for the debt-to-income ratio, the impact of past debt will lead to household primary surplus, everything else constant.

([13]) See Bahadir, B., & Valev, N. (2015). Financial development convergence, Journal of Banking & Finance, 56, 61-71, and references therein.

([14]) See Bricongne et al. (2020) op cit; and Bielecki M., Brzoza-Brzezina M., and Kolasa M. (2020), 'Demographics and the natural interest rate in the euro area', European Economic Review, 129, 103535, and references therein.

and is associated with a decline in household primary deficits over 2022-2023, controlling for everything else.

Table I.5: **Robustness checks**

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	baseline	sample 02-21	no BLS as instr.	inequality	exp. unempl.	housing infl.	housing real infl.	dummy COVID	current account
primary deficit (lag)	0.37***	0.36***	0.40***	0.31***	0.39***	0.38***	0.37***	0.39***	0.32***
implicit interest rate	-0.84***	-0.77***	-0.90***	-0.77***	-0.85***	-0.63***	-0.66***	-0.86***	-0.94***
income growth	0.55***	0.55***	0.57***	0.63***	0.50*	0.42**	0.47***	0.52***	0.61***
debt ratio (lag)	-0.05***	-0.05***	-0.07***	-0.05***	-0.05***	-0.04***	-0.04***	-0.05***	-0.06***
purchase home (lag)	0.19***	0.19***	0.16***	0.21***	0.19***	0.18***	0.19***	0.19***	0.18***
old dep. ratio (change)	-2.58***	-2.32***	-1.60**	-2.26***	-2.49***	-2.20***	-2.31***	-2.53***	-2.79***
dummy energy crisis	-0.04***		-0.05***	-0.04***	-0.04***	-0.04***	-0.03***	-0.04***	-0.04***
inequality (lag)				0.01					
expected unempl.					0.00				
housing inflation						0.11*			
housing real inflation							0.08		
dummy COVID								-0.00	
current account									-0.10
Obs.	312	276	380	292	312	312	312	312	312
Countries	18	18	18	18	18	18	18	18	18
Overall R2	0.74	0.77	0.73	0.71	0.74	0.77	0.76	0.74	0.73
S-H p-value	0.27	0.14	0.12	0.53	0.15	0.14	0.21	0.23	0.12

Note: All regressions are done using the LIML estimator and with fixed effects.
Source: Eurostat, ECB, European Commission and own calculations. Details in Table I.6.

Table I.5 shows robustness checks by extending the baseline model in several directions. Column (1) recalls the LIML estimates of the baseline model. This can be compared to the subsequent columns. Column (2) restricts the sample period to 2021 (before the energy crisis) with estimates that remain broadly unchanged. Column (3) extends the baseline sample by excluding the Bank Lending Survey (BLS) variable, i.e. credit standards for loans to households for house purchase, from the set of instruments (see Box I.1), which de-facto constrained the sample period for each country to years in which they were members of the euro area (unbalanced panel). The results remain again broadly unchanged. Column (4) tests for a possible link between income inequality and household debt. The positive coefficient on lagged income inequality is consistent with a "keeping up with the Joneses" also identified in previous studies for the US, but it is insignificant. ([15])

([15]) Rajan (2010) argued that income inequality pressures policy makers to relax financial constraints; see Rajan, R. G. 2010. Fault Lines, Princeton, Princeton University Press. Iacoviello (2008) and Kumhof et al. (2015) use heterogeneous-agents models to show that the increase in household debt in the US over different periods can be explained by rising income inequality because it leads to an endogenous expansion of credit from rich to poor even without policy intervention; see Iacoviello, M. (2008), 'Household debt and income inequality 1963-2003', J. Money Credit Bank., 40 (5) (2008), pp. 929-965; and Kumhof M., Ranciere R. and Winant P. (2015), 'Inequality, leverage, and crises', Am. Econ. Rev., 105 (3) (2015, March), pp. 1217-1245. Empirical studies finding evidence of a positive link between income inequality and household debt include Christen and Morgan (2005) using quarterly U.S. data covering the years from 1980 to 2003 and Perugini et al (2016), who use a panel of 18 OECD countries; see Christen, Markus and Ruskin M. Morgan (2005). "Keeping Up with the Joneses: Analysing the Effect of Income Inequality on Consumer Borrowing." Quantitative Marketing and Economics, 3, 145–173. Perugini C., Hölscher J. and Collie S., 'Inequality, credit and financial crises', Camb. J. Econ., 40 (1) (2016), pp. 227-257.

Box I.1: **Robustness of panel data analysis**

The regressions presented in Table I.6 cover euro area countries over the period 2002-2023, except Malta and Croatia, due to the absence of data. So, as discussed below, the panel dimensions are 18 countries for 22 years, i.e. the panel is characterised by T>N. The estimation proposes two main difficulties. The first is that some regressors are most likely endogenous, in particular the (real) interest rate and growth of (real) income. The second is the contemporaneous presence of the lagged dependent variable and of the fixed effects. This box discusses how these two issues are faced in this chapter.

To address the endogeneity problem, the following set of instruments is used: households opinion on their future financial situation and the general economic situation, change in the home ownership rate, 1-year euribor rates (contemporaneous and lagged), general economic and financial situation expected by households and credits standards for loans to households for house purchase ([1]) to which lagged growth of income is added. Tests indicate that the quality of those instruments is good. The table only reports the second stage Sargan-Hansen test of overidentifying restrictions. That does not reject the (joint) null hypothesis that instruments are uncorrelated with the error term, and that the excluded instruments are correctly excluded from the estimated equation. The table does not report the test for weak identification, which rejects instrument weakness ([2]) and the underidentification test, which tests if the excluded instruments are correlated with the endogenous regressors, which also reject underidentification. ([3]) The table does not report the first stage tests, which point to a good quality of the instruments used. The Angrist-Pischke (AP) first-stage chi-squared tests for underidentification and the AP first-stage F statistics tests for weak identification of individual endogenous regressors are provided by Stata. None of these point to weaknesses in the instruments, even though the F tests are just above 10, the rule-of-thumb threshold against weakness of the instruments, which is likely to be conservative when more than one variable is instrumented.

Given that IV estimators like the Two-Stage Least Square (2SLS) can perform poorly when instruments are weak, the literature proposed estimators that are more robust to weak instruments, in particular the Limited Information Maximum Likelihood estimator (LIML).([4]) The results with these estimators, which are presented in Column (6), are similar with the results found using the 2SLS estimator and the Two-Stage Generalized Method of Moments (GMM2S), coherently with the indications by the tests that instruments' weakness is not pervasive. On the other hand, the use of instruments, as expected, reduces the downward bias present in the estimate of the coefficients of interest rate and income growth, the variables that presumably are most subject to the endogeneity bias in the OLS estimates, justifying the use of instrumental variables.

Fixed effects (FE), which capture unobservable country differences constant through time, are an important determinant of primary deficit, and are tested to be significantly different from 0, with the usual F-test. As it is known since Nickel (1981), ([5]) the FE are correlated with the predetermined variables, like the lagged dependent variable. This is visible in the estimates presented in Table I.6, that show a large difference in the coefficient of the lagged primary deficit between the non-FE equations in the first three columns and the other equations. A possibility to correct this bias could be to use the Arellano-Bond estimator (AB). However, such estimator is known to be inappropriate when T>N, as in this case. Moreover, Nickel showed that the bias is of the order of (1+b)/(T-1), which in the present case means around 5% of the estimated value, a bias which would fall within the 95% confidence interval. Therefore, we prefer not to correct the bias using AB.

([1]) For a full description see Table I.9

([2]) There is weak identification when the excluded instruments are weakly correlated with the endogeous regressors. In our preferred regression the Cragg-Donald Wald F statistic is 14.14 and the Kleibergen-Paap rk Wald F statistic is 20.41, to be compared to the Stock-Yogo weak ID test critical values at 10% maximal LIML size of 4.06.

([3]) Stata reports a value of 46.73 for the Kleibergen-Paap rk LM statistic, well in the rejection area.

([4]) See e.g., Stock J. and M. Yogo (2005), "Testing for weak instruments in linear IV regression", in Identification and Inference for Econometric Models. New York: Cambridge University Press; 2005. pp. 80–108 or Keane M. and T. Neal (2023), "Instrument strength in IV estimation and inference: a guide to theory and practice," Journal of Econometrics 235, pg 1625-1653. According to Angrist J. and J. Pischke (2008), Mostly harmless econometrics: an empiricist companion, Princeton Univ. Press, LIML is best understood as an average between OLS and 2SLS.

([5]) Nickell S. (1981), "Biases in Dynamic Models with Fixed Effects," Econometrica, Vol. 49, No. 6 (Nov., 1981), pp. 1417-1426

The insignificance result for inequality is robust to instrumenting income inequality (instead of using a lag to control for possible endogeneity) and is consistent with other mixed findings in the literature. ([16]) It is therefore an issue which may require further investigation with the use of microdata for the euro area. Column (5) considers the possible impact of household expectations of future unemployment. ([17]) The coefficient is close to zero and insignificant. ([18]) A possible role for house prices in household debt decisions in the euro area is also explored. Bartscher et al. (2025) show that the rise in household debt in the US after 1980 can be explained largely by home equity extraction, as borrowing against rising house values allowed households to realise capital gains that would otherwise have remained illiquid. However, the estimated coefficients only give a mild support to this effect for the euro area (Columns 6 and 7, respectively). The coefficient for house price inflation, even though positive, is only mildly significant in the case of nominal house price inflation and is insignificant in the case of real house price inflation. ([19]) Column (8) tests whether including a dummy for the year 2020 to control for the effects of the COVID-19 pandemic affects the results, but these are broadly unchanged, and the dummy is not significant. A similar result is obtained when the Oxford Stringency Index is used to control for the stringency of lockdowns during 2019-2022, as in Coutinho and Licchetta (2025). ([20]) Finally, Column (9) tests if there is a negative link between household primary deficits and past current account developments, as previous literature found that net inflows of foreign funds (current account deficits) fuel increases in household debt. ([21]) The estimated coefficient is consistent with this mechanism, but not statistically significant.

I.5. EXPLAINING DIFFERENCES IN HOUSEHOLD PRIMARY DEFICITS ACROSS THE EURO AREA

This section zooms into the differences in household primary deficits across the euro area. As shown in Table I.3 above, primary deficits have differed across euro area countries, with the degree of variation depending on the period analysed. In the period up to the global financial crisis (2003-2008) household primary deficits varied between -5.7% in Germany and 18.2% in Ireland. On average this variability declined in subsequent periods, being the lowest in the period 2021-2023. The model in Table I.4 cannot perfectly track the level of cross-country variation observed in the data, but as shown in Graph I.3, the model prediction for the cross-country variance moves more or less in line with the data. Therefore, Graph I.3 uses the model predictions to infer about the main drivers of differences in primary deficits across euro area countries. This analysis takes into account not only the variance of the different explanatory variables across countries, but also each variable co-variance across variables and countries. A positive co-variance increases the contribution of the variable to the overall variability, while a negative co-variance dampens it.([22])

([16]) Bordo and Meissner (2012) do not find a statistically significant relationship between income concentration and credit growth, questioning the "Rajan, Kumhof and Ranciere" hypothesis; see Bordo, M. D. and Meissner, C. M. 2012. Does inequality lead to a financial crisis? Journal of International Money and Finance, vol. 31, no. 8, 2147–61. Similarly, Coibion et al. (2020) do not find support for the hypothesis that higher inequality leads to higher borrowing by lower income households, looking at regional data; Coibion, O., Gorodnichenko, Y., Kudlyak, M., & Mondragon, J. (2020). Greater inequality and household borrowing: New evidence from household data. Journal of the European Economic Association, 18(6), 2922-2971

([17]) It is measured by the four-quarter average of the balance of responses to the question "How do you expect the number of people unemployed in this country to change over the next 12 months?" in the joint harmonised EU consumer survey (question number 7). See Table I.6

([18]) Note that the current or lagged unemployment rate tends to be correlated with income growth which is already controlled for in the model. Instead, expectations about future unemployment are meant to capture household perceptions of uncertainty. When the unemployment rate is included in the regressions instead of expectations, lagged or instrumented, the associated coefficients are never significant and very close to zero.

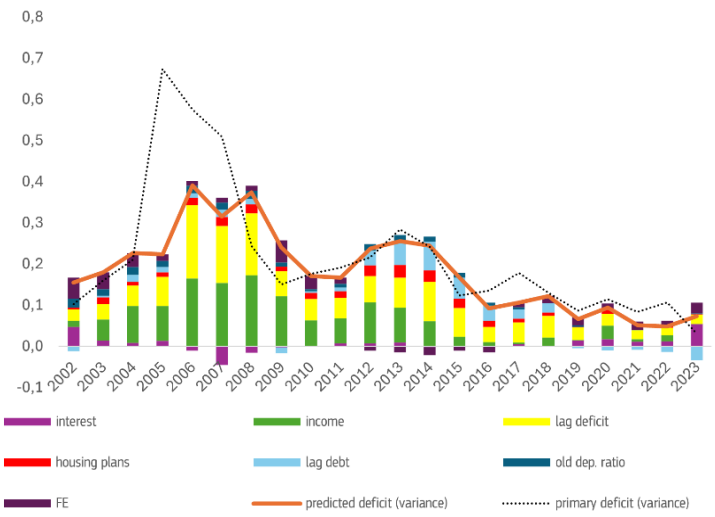
([19]) This result does not depend on the source of the house price data. It is robust to using ECB and OECD house price statistics and also real house price growth rather than nominal house price growth. Interacting the variable with a dummy to filter only positive house price inflation observations, does not affect the conclusions. Financial wealth effects were not tested for lack of good data on financial asset prices at the country level.

([20]) Coutinho L., and Licchetta, M. (2025), "Inflation differentials in the euro area at the time of high energy prices", Open Economies Review, 1-35.

([21]) See Bricongne et al. (2020) op cit.

([22]) In the decomposition we use the formula $V[y_t] = COV[y_t, y_t] = \sum \beta_i COV[x_{i,t}, y_t]$, where $y_t = \sum \beta_i x_{i,t}$

Graph I.3: **Contribution to the cross-country variance of household primary deficits predicted by the model (in %)**



(1) The predicted variance is computed as the sum of the covariances between the variables present in the main regression (last column of Table I.6) and the predicted primary deficit, times the square of the estimated coefficient

Source: Own calculations

Focusing on the contribution of the variances-covariances of the different components of the empirical model to the variance of the model predictions, two elements that stand out are the contribution of the lagged primary deficit and of income growth, especially in the run-up to the global financial crisis, during the crisis and even up to the European sovereign debt crisis, when their contribution was still significant albeit declining. Lagged debt became a significant contributor during the sovereign debt crisis, but its role decreased with the convergence in the debt levels (see Graph I.1). The contribution of interest is estimated as generally small. Interestingly, differentials in interest were more significant to explain household primary deficit differentials in 2002, and 2023, in the middle of the first and last ECB monetary policy cycles since the inception of the euro area and decreased the differentials both in the run-up to the financial crisis and in the period of expansionary monetary policy following the sovereign crisis. It is the only variable whose contribution decreases (somewhat) the variance of primary deficit on a sustained basis. ([23]) The next significant contributor is the variance of the unobserved fixed effects, which indicate that on average households in some countries borrow more than in others. This could be due to cultural or institutional reasons which may be difficult to capture in the regressions. This is further analysed below. There are also variations in intentions to buy a house and in the effective interest rate, but their contributions are of smaller order when compared to other determinants. Finally, differences in changes in the old age dependency do not contribute in any visible way to primary deficit differentials.

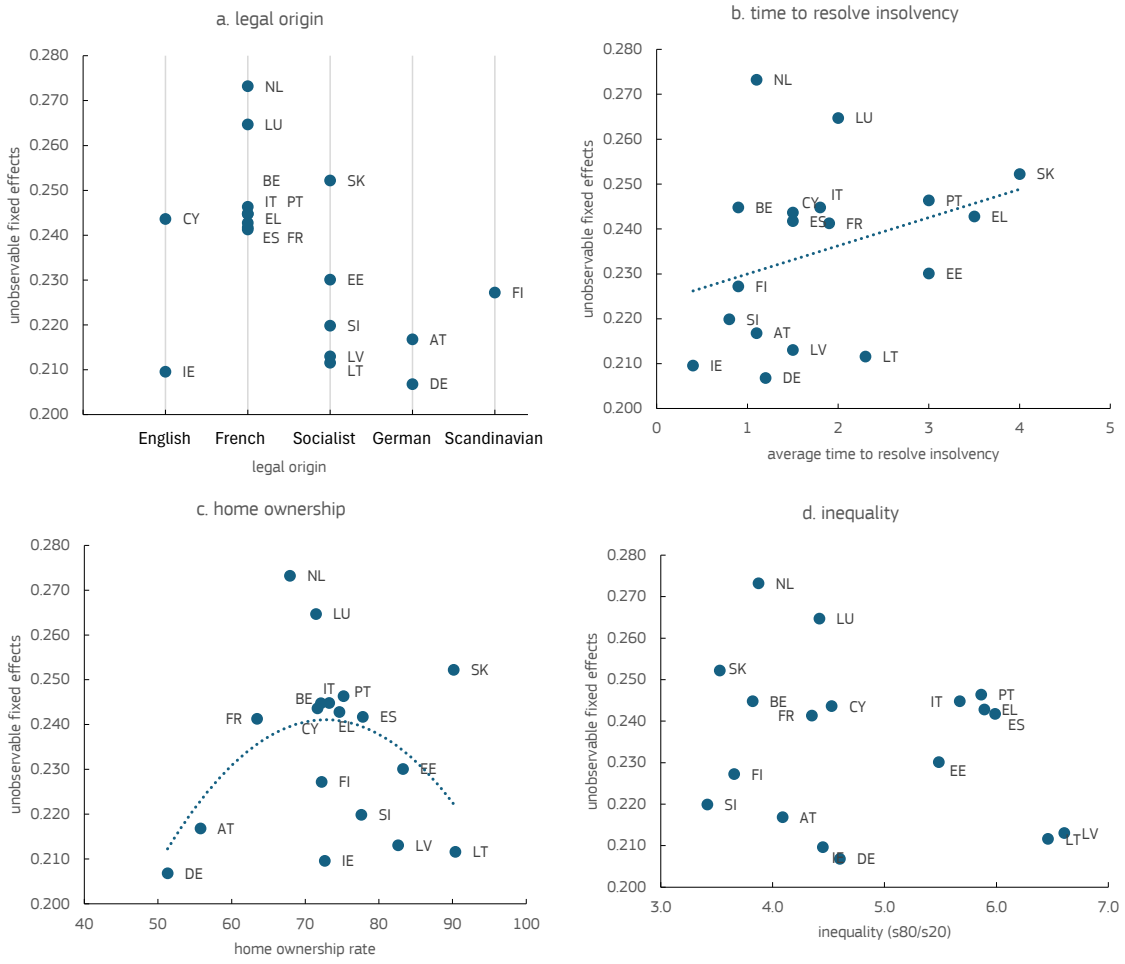
Given the relevance of unobservable fixed effects, the analysis below investigates their possible links to a set of country characteristics and institutional variables (Graph I.4). The links found are not very strong but nevertheless interesting. The first is with "legal origin", as defined in La Porta et al. (2004), which can be also associated with differences in creditor protection and debt enforcement (panel a.). ([24]) Although there are outliers in the analysis, the French legal origin, found in the literature to be associated with lower debt enforcement, appears linked with higher unobservable fixed effects. ([25]) The second link investigated is with the average time to resolve insolvency (panel b). The time to resolve insolvency is positively related to the estimated unobservable fixed effects but the R-square of an OLS regression between fixed effects and this variable is only 11%. It increases to 39%, however, when the Benelux countries are excluded from the analysis, but this would require further investigation. Thirdly the estimated unobservable fixed effects show a non-linear association, albeit imprecise, with the home-ownership rate, suggesting lower average household primary deficits for low and high levels of home ownership. Lastly, the estimated unobserved fixed effects (from the baseline regression which excludes inequality) do not show a very clear unconditional relationship with inequality as measured by the ratio of income held by the top to bottom income quintiles. Unlike previous studies that identified a positive relationship between income inequality and household debt, recent studies find that income inequality is associated with less access to credit by lower income households and lower

([23]) For the dating of euro area monetary policy cycles, see Forbes K., Ha J., and Kose M. A. (2025), "Trade-offs over Rate Cycles: Activity, Inflation and the Price Level" NBER Working Paper 33825.

([24]) La Porta R., Lopez-de-Silanes F., Pop-Eleches C., and Shleifer A. (2004), "Judicial checks and balances", Journal of Political Economy, 112(2), 445-470.

([25]) See La Porta et al. (2004) op cit and references therein for empirical evidence on the link between legal origin and debt enforcement.

Graph I.4: **Factors explaining the difference in fixed unobserved characteristics across euro area members**



(1) Variables in panels b, c and d are averages across the sample period. Fixed effects are the fixed effects of the main regression, presented in the last column of Table I.4. The R^2 of the fitted lines in panels b and c are 21% and 21%, respectively.

Source: See Table I.6 and own calculations

credit on average. However, we do not find strong evidence for either conclusion for the euro area when analysing fixed effects, unconditionally. We also do not find evidence of a clear relationship when including the time-varying counterpart of this variable in the regressions in Table I.5. ([26])

I.6. CONCLUSIONS

It is positive that, on aggregate, euro area households have come a long way in reducing their debt-to-income ratios since the immediate aftermath of the global financial crisis and the European sovereign debt crisis and are in a much better financial position than at than two decades ago. However, developments have been different across euro area Member states, driven by different Fisher dynamics, which imply an automatic accumulation/decumulation of debt by households, and different trajectories of the household primary deficits, or current expenditure financed with new debt.

The estimated econometric panel data model presented above identified possible determinants of household primary deficits in the euro area. According to the model, household primary deficits appear related to developments in interest rates and income growth, and more specifically to their difference, suggesting that Fisher effects are internalised. Primary deficits also seem to adjust downwards when the accumulated stock of debt is high, suggesting a mechanism for sustainability and convergence, all else

([26]) See Coibion et al. (2020) op cit.

equal, despite the presence of some degree of inertia in household's decisions. Household primary deficit levels also appear positively correlated with intensions to buy a house expressed the year before, and negatively related to the ageing of the population (change in the old age dependency ratio). Other factors may of course be relevant, but no robust evidence was found and the estimated relation explains about 74% of the variation in household primary deficits across countries and time.

The chapter shows also the relevance of country characteristics. In particular, looking at cross-country variation, differences in the accumulated stock of debt, are important to explain variations in household primary deficits across countries in a persistent manner. Variations in income growth also played an important role in explaining these cross-country variations, but mostly around the global financial and the European sovereign debt crisis. Differences in effective interest rates have been less significant in explaining cross-country differences in household primary deficits, except for years of hiking policy rates. Interestingly, unobserved fixed effects also explain some of the cross-country variation, despite the relative similarity of euro area countries: such unobserved factors could be related to cultural and institutional factors and have possible links to the justice system, homeownership rates and insolvency regimes, determining different attitudes towards debt. According to the analysis, though, the bulk of household debt developments can be attributed to observable macroeconomic developments.

Table I.6: **Variables used as robustness check**

House price index growth (also real)		Fours quarters average of house price index (2015 = 100), if it takes a positive value	Eurostat; Housing price anc sales statistics; House price and sales index
Inequality	An increase in inequality is associated with a higher debt accumulation (+)	Ratio of income of the top quintile to the income of the bottom quintile	Eurostat, Income and Living Conditions, Inequality
Expected unemployment		Expected unemployent is measured as the four quarters average of the balance to response the consumer survey question "How do you expect the number of people unemployed in this country to change over the next 12 months? The number will..."	Eurostat; Business and consumer surveys; The join harmonised EU consumer survey; Question number 7
Unemployment		Unemploment	Eurostat, unemployment statistics
Dummy for year 2020			
Dummy stringency ratio		The Oxford Stringency Index that measures the impact of lockdown measures, averaged across quarters in 2020 and 2021, is interacted with a COVID- 19 crisis dummy that equals 1 between the first quarter of 2020 and the last quarter of 2022.	See Coutinho L. and · Licchetta M. (2025), "Inflation differentials in the euro area at the time of high energy prices," Open Economies Review, May.
Current account	An increase in the current account is related to smaller savings and relatedly, to smaller debt (-)	Ratio of current account to GDP	Eurostat, national accounts
Variables used for the analysis of fixed effects			
Change in home ownership rate		Home ownership rate presents the share (%) of owned homes by the households	Eurostat; Distribution of population by tenure statu
Legal origin		Legal origin of the Company Law or of the Commercial Code. Five possible origins are identified: English common Law, French Commercial Code, German Commercial Code, Scandinavian Commercial Code and Socialist Laws.	The Quality of Government dataset made available by A. Shleifer, based on LaPorta R., F. Lopez-de-Silanes, A Shleifer and R. Vishny, (1999), "The Quality of Government". Journal of Law, Economics and Organization 15, pg. 222-79
Time to resolve insolvency		Number of years to resolve insolvency	World Bank, Doing Busines Indicators

* For more details on the national accounts abbreviations (F3; F4; D41; etc.) please see: European Commission, 2010. *European system of accounts: ESA 2010.* Luxembourg: Publications Office of the European Union. doi:10.2785/16644

Table (continued)

House price index growth (also real)		Fours quarters average of house price index (2015 = 100), if it takes a positive value	Eurostat; Housing price anc sales statistics; House price and sales index
Inequality	An increase in inequality is associated with a higher debt accumulation (+)	Ratio of income of the top quintile to the income of the bottom quintile	Eurostat, Income and Living Conditions, Inequality
Expected unemployment		Expected unemployent is measured as the four quarters average of the balance to response the consumer survey question "How do you expect the number of people unemployed in this country to change over the next 12 months? The number will..."	Eurostat; Business and consumer surveys; The join harmonised EU consumer survey; Question number 7
Unemployment		Unemploment	Eurostat, unemployment statistics
Dummy for year 2020			
Dummy stringency ratio		The Oxford Stringency Index that measures the impact of lockdown measures, averaged across quarters in 2020 and 2021, is interacted with a COVID- 19 crisis dummy that equals 1 between the first quarter of 2020 and the last quarter of 2022.	See Coutinho L. and · Licchetta M. (2025), "Inflation differentials in the euro area at the time of high energy prices," Open Economies Review, May.
Current account	An increase in the current account is related to smaller savings and relatedly, to smaller debt (-)	Ratio of current account to GDP	Eurostat, national accounts
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Time to resolve insolvency		Number of years to resolve insolvency	World Bank, Doing Busines Indicators

* For more details on the national accounts abbreviations (F3; F4; D41; etc.) please see: European Commission, 2010. *European system of accounts: ESA 2010.* Luxembourg: Publications Office of the European Union. doi:10.2785/16644

II. MID-TECH EUROPE? SECTORAL PATTERNS OF TOTAL FACTOR PRODUCTIVITY GROWTH: EU VS. US

By Plamen Nikolov, Wouter Simons, Alessandro Turrini and Peter Voigt

Abstract: Chapter II explores the evolution of productivity, particularly Total Factor Productivity (TFP), in the EU compared to the US, using the latest EU-KLEMS dataset. TFP growth in both regions has been largely driven by a few key sectors. In the post-GFC recovery (2013–2019), services played a major role in TFP growth on both sides of the Atlantic. However, the drivers differed: in the US, high-skill sectors like IT, professional services, and finance led the way, while in the EU, contributions came more from lower-skill services such as wholesale and retail. The contribution of manufacturing also diverged. In the EU, sectors like transport equipment, chemicals, and electronics made meaningful contributions to TFP growth, whereas in the US, among manufacturing sectors only computer and electronics had a significant impact. While the share of high-tech and high-TFP-growth sectors in EU value added has been rising, the gap with the US remains substantial—and is not closing. This structural difference continues to weigh on the EU's productivity performance.

II.1. INTRODUCTION

The present chapter compares EU sectoral patterns of total factor productivity (TFP) growth with those of the US. There is consensus that the competitiveness gap of the EU is rooted in a comparatively disappointing productivity growth performance, which is largely due to slow TFP growth and lower capital intensity, particularly in terms of intangible capital. Analysing these patterns on a sectoral basis is key for a better understanding of challenges and policy responses to relaunch EU's competitiveness.([27])

Productivity is key for long-term growth, but its measurement is subject to a number of difficulties. Over sufficiently long time periods, productivity growth, and most notably so-called Total Factor Productivity (TFP), is the most important driver of economic growth among advanced economies. Assessing TFP dynamics is however problematic, as witnessed by the debate surrounding the reasons underlying the productivity slowdown in the EU and the US since the 2000s (e.g., OECD, 2017; Syverson, 2017).([28])

The chapter analyses productivity across the EU on the basis of the latest vintage of the EU-KLEMS database, focusing on TFP. EU-KLEMS originated as an industry level, growth and productivity research project, initially financed under EU research framework programmes. The objective is to allow a more refined breakdown of the sources of productivity growth, capturing the contributions of the changing compositions of labour and capital types, and allowing a more precise estimation of TFP obtained as a residual. The latest vintage of the database, dubbed EU-KLEMS & INTANProd (henceforth simply referred to as EU-KLEMS), compared with previous versions, provides a better disentangling of intangible capital as a contributor of productivity growth.([29])

The analysis covers patterns of productivity growth across the EU and the US, industries, and time periods, with a comparatively fine disaggregation of different sources of productivity growth. The growth accounting uses data for 10 different capital assets (both tangible, such as buildings and machinery, and intangible, such as e.g., software and R&D) and 8 labour force types (based on age, gender, and educational attainment). Disaggregating by industry allows considering up to 42 different industries. As a substantial share of TFP growth originates from relatively narrowly-defined sectors, a sufficiently fine disaggregation is required for a satisfactory analysis of sectoral productivity growth patterns. Comparisons are carried out between the EU and the US.

([27]) As indicated, e.g., in the Draghi report: The Future of European Competitiveness, September 2024, in https://commission.europa.eu/topics/eu-competitiveness/draghi-report_en#paragraph_47059.

([28]) OECD (2017). Can potential mismeasurement of the digital economy explain the post-crisis slowdown in GDP and productivity growth? *OECD Statistics working paper*. Syverson, C. (2017). Challenges to Mismeasurement Explanations for the US Productivity Slowdown. *Journal of Economic Perspectives*—Volume 31, Number 2—Spring 2017—Pages 165–186.

([29]) The EU-KLEMS & INTANProd database was developed by the Luiss Lab of European Economics at Luiss University in Rome, Italy and is available here: EUKLEMS & INTANProd - Luiss Lab of European Economics.

More specifically, the analysis in the chapter aims at:

- describing productivity growth patterns by source, industry, and various time periods; for the EU as an aggregate, the US, and
- assessing of the contribution of each industry to overall TFP growth by sub-periods. This permits in particular to disentangle the extent to which TFP growth differences between the EU and the US were associated with differences in within-industry TFP growth rates or rather linked to different composition of value added across sectors.
- assessing the evolution of industry size, in particular whether industries characterised by higher TFP growth have been growing in relative terms.

The remainder of the chapter is structured as follows. The next section gives a brief introduction to TFP measurement. Section II.3 gives labour productivity decomposition at the industry level. Section II.4 presents a breakdown of total economy total factor productivity (TFP) into contributions from the various industries while Section II.5 provides some econometric results on the association between productivity growth and relative weight of the three groups of industries (low, mid- and high-tech) in the total economy. Section II.6 concludes.

II.2. COMPUTING TFP AND LABOUR PRODUCTIVITY FROM EU-KLEMS DATA

EUKLEMS has become over time the go-to reference when it comes to harmonised, industry-level data to analyse productivity growth across EU, the US, and other high-income economies.([30]) The most recent vintage – the 2023 EUKLEMS & INTANProd - updates previous editions of EUKLEMS incorporating additional measures of intangible investment not accounted for in National Accounts, following the definition proposed in the seminal work by Corrado et al. (2005). ([31]) The database provides data for the 27 EU Member States, the United Kingdom, the United States and Japan across 42 industries and 15 industry aggregates over the timespan 1995 – 2020.

EU-KLEMS allows computing TFP taking into account a fine disaggregation of factor inputs. The first step in computing TFP growth is the estimation of a production function in a neoclassical growth framework:

$$V_j = A_j K_j^{\alpha} L_j^{\beta} \tag{1}$$

where gross value added in an industry j is denoted by V_j, K_j are capital services (buildings, machines, but also intangible capital, such as software), L_j stands for labour services (which is measured either as number of employees, or hours spent working and can be distinguished by type of worker, age, gender, educational attainment and skills of the workforce) and A_j is Total Factor Productivity. The parameters α and β are the output elasticities of capital and labour. Assuming constant returns to scale and perfect competition in the capital and labour markets allows expressing log TFP changes as follows:

$$\Delta lnA_j = \Delta lnV_j - v_{K,j}\Delta lnK_j - v_{L,j}\Delta lnL_j \tag{2}$$

where $v_{K,j}$ and $v_{L,j}$ are the capital and labour shares of income, respectively, summing up to 1.

EUKLEMS data permit to further decompose the contribution of production factors to gross value added by means of a further disaggregation of capital types and changes not only in labour inputs but also in labour composition so the expression for log TFP changes becomes:

$$\Delta lnA_j = \Delta lnV_j - v_{L,j}\Delta lnH_j - v_{L,j}\Delta lnLC_j - v_{ktict,j}\Delta lnCAPTICT_j - v_{ktnict,j}\Delta lnCAPTNICT_j - v_{kint,j}\Delta lnCAPIntang_j \tag{3}$$

([30]) The name EU-KLEMS stands for European Union (EU) levels of capital (K), labour (L), energy (E), Material (M) and service (S) inputs. The original project started in 2003 and involved 18 European research institutes in a joint effort to gather and harmonise the necessary data, under the coordination of the Groningen Growth and Development Centre (GGDC). Subsequently, the database has been updated several times in 2009, 2011, 2012, 2016, 2019, involving a wide network of researchers and institutions. The latest EU-KLEMS vintage was produced at the LUISS Lab for European Economics. Further details are find at: Microsoft Word - EUKLEMS_INTANProd_D2.3.1.docx (luiss.it).

([31]) Corrado, C., Hulten C., and Sichel D. (2005). Measuring Capital and Technology: An Expanded Framework. In C Corrado, J Haltiwanger, and D Sichel, editors, Measuring Capital in the New Economy, volume 66 of *NBER Studies in Income and Wealth*, pages 11–46. University of Chicago Press, Chicago, 2005.

where the v terms are factor shares in value added, ΔlnH_j is the log change in hours worked, $\Delta lnCAPTICT_j, \Delta lnCAPTNICT_j, \Delta lnCAPIntang_j$ denote, respectively, the log change in tangible ICT, tangible non-ICT and intangible capital inputs, while

$$\Delta lnLC_j = \Delta lnL_j - \Delta lnH_j = \sum_l v_{L,lj} \Delta lnH_{lj} - \Delta lnH_j \quad (4)$$

is the log change in the labour composition indicators, which is calculated as the difference between the sum of log change in hours across all l individual labour types weighted by the shares of each type in labour compensation and the log change in unweighted total hours.([32])

Labour productivity growth decomposition is obtained from equation (3) by subtracting the log change of hours worked from both sides, rearranging terms and using the constant returns to scale technology assumption, which leads to the fact that the sum of all output elasticities equals one:

$$\Delta lnV_j - \Delta lnH_j = \Delta lnA_j + v_{L,j} \Delta lnLC_j + v_{ktict,j}(\Delta lnCAPTICT_j - \Delta lnH_j) + v_{ktnict,j}(\Delta lnCAPTNICT_j - \Delta lnH_j) + v_{kint,j}(\Delta lnCAPIntang_j - \Delta lnH_j) \quad (5)$$

Section II.3 will discuss contributions to labour productivity growth by sector. Section II.4 and II.5 will instead focus on TFP growth patterns, analysing first the evolution of the importance of each industry to overall TFP growth, and then whether stronger TFP growth is associated with a relative expansion of the sector on the total economy.

II.3. DISSECTING THE CONTRIBUTIONS TO LABOUR PRODUCTIVITY GROWTH BY INDUSTRY

Productivity growth can originate from different sources. This section presents a sectoral breakdown of labour productivity growth distinguishing by sources and time periods.

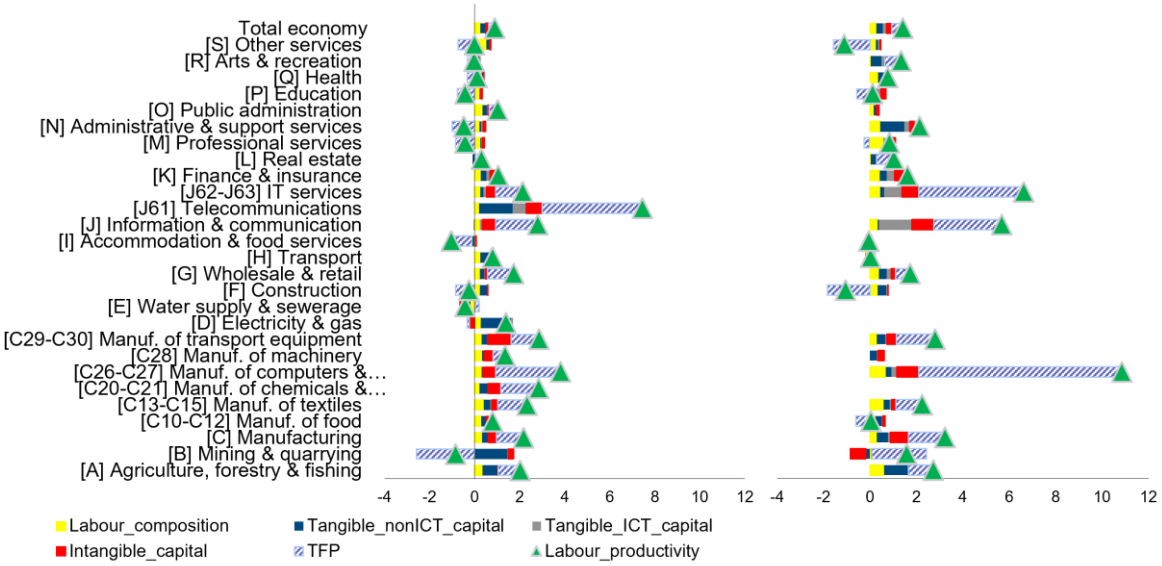
As detailed in Section II.2, the growth of labour productivity, measured as gross value added per hour worked, is decomposed into the contributions of several items: (i) the growth of capital-per hour worked ratios for the different types of capital considered (tangible non-ICT, such as buildings, machines and equipment; tangible ICT, such as computer hardware and communications equipment; and intangibles, such as computer software and databases and R&D); (ii) the change in labour composition, which is calculated as any change in labour services that does not come purely from a change in hours worked;([33]) (iii) TFP growth. Hence, labour productivity grows when capital-per hour (capital deepening) increases, when there is change in labour composition towards more skilled labour, and when TFP increases due to rising production efficiency.

Regarding the industry breakdown, labour productivity growth and its main sources are reported for the total economy and the main sectoral aggregates (manufacturing, agriculture, mining, and the main service categories).

([32]) Since production factors are paid their marginal product, a change in composition of hours towards relatively more remunerated categories would imply an increase in the contribution of labour composition to value added. In EU-KLEMS the labour types are classified by gender categories (male, female), age categories (15-29 years; 30-49 years; 50 years and higher), and educational qualifications levels (high, medium, and low) as well as by eighteen worker types.

([33]) For example, if a more skilled and productive worker, who is also paid more since by assumption she is remunerated her marginal product, spends X more hours working, the labour productivity per hour worked is augmented even if total hours worked remain the same (because another worker works X hours less). In this case total employment remains constant but labour productivity per hour increases because hours worked by a more productive worker replace hours worked by a less productive one. Of course, this restriction is not strictly necessary, so labour services can be augmented by an increase in hours and an increase in labour composition both happening at the same time, or an increase in the labour composition may offset a decrease in total hours, still resulting in an increase in labour services. The labour types in EU-KLEMS are distinguished by age, gender, or educational attainment of the employed workforce, each paid her marginal product, so information about pay reveals information about labour quality and change in the composition of labour.

Graph II.1: **Labour productivity growth and its contributors across sectors. EU vs. US, 2000-2019, in p.p.**



Notes: Average for 2000-2019. EU is the VA weighted average of AT, BE, DE, DK, ES, FI, FR, IT, NL, SE.
Source: Elaborations on EUKLEMS data.

In addition, to capture productivity dynamics taking place at finer level of disaggregation, values are reported at the level of the NACE Rev.2 nomenclature and, for manufacturing and information and communication services, also at the two-digit level of the NACE Rev.2. Hence, the breakdown needs to be interpreted with caution in view of overlaps. For example, the overall manufacturing sector, denoted by C, is reported together with manufacturing of transport equipment, denoted by C29_C30, which is contained in C.

Regarding the geographical breakdown, figures are reported for the EU as a whole (across available countries, largely excluding countries in Southern, Central and Eastern Europe for which data are not available for a longer timespan), and for the US.([34])

Regarding time periods, in addition to showing evidence for the overall period available for both the EU aggregate used in the analysis (see point above) and the US, i.e., post 2000 data, developments after the recovery from the Global Financial Crisis (post 2012) are displayed and discussed. Since the latest available data points, i.e., years coinciding with the COVID-19 pandemic, exhibit highly non-representative productivity dynamics they are excluded from the analysis, and the sample used in the analysis that follows ends in 2019 accordingly.

Graphs II.1 to II.3 present the labour productivity growth breakdown from different sources for the EU and the US distinguishing relevant sub-periods. Several observations stand out:

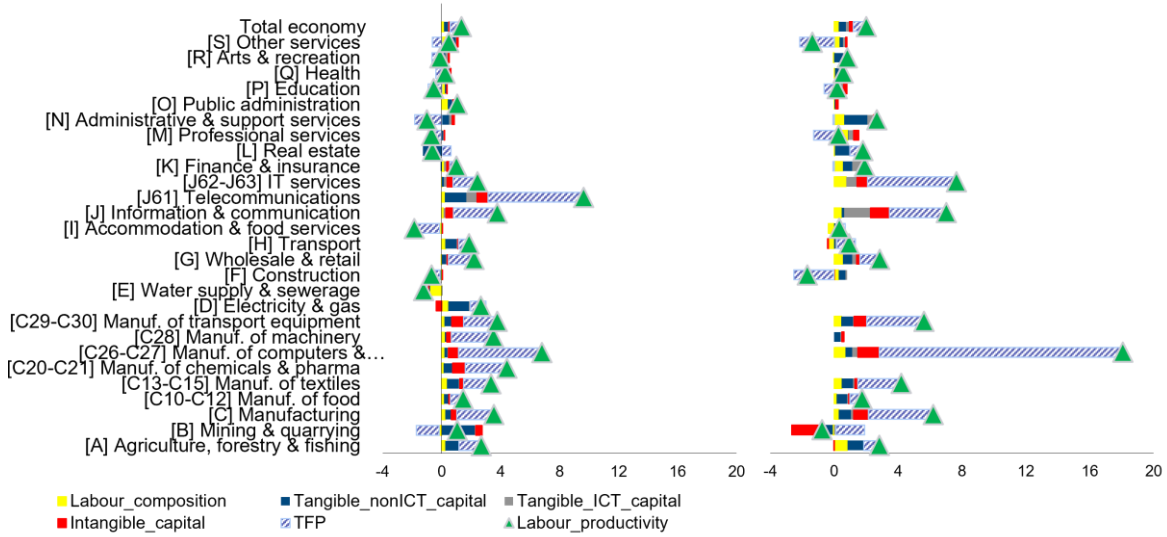
Fact 1. *The main source of labour productivity growth over the period analysed is TFP, although its role has been falling while the contribution of intangible capital has been on the rise.*([35])

For 'total economy', both in the EU and the US, the main contributor to productivity growth generally appears to be TFP, followed by tangible and intangible capital deepening (Graphs II.1 to II.3). TFP growth also explains the bulk of productivity growth dispersion across sectors. The contribution of TFP growth has, however, declined over time, a secular trend that is visible both in the EU and the US. After the Global

([34]) In this paper the EU consists of the following countries for which growth accounting across a broad set of industries is available over a sufficiently long time: Austria, Belgium, Denmark, Germany, Finland, France, Italy, the Netherlands, Spain and Sweden. Labour productivity decomposition is unavailable for certain industries in the US in the growth accounting data: Manufacturing of chemicals & pharma (C20_C21), Manufacturing of machinery (C28), Electricity & gas (D), Water supply & sewerage (E), Telecommunications (J61) and Public administration (O).

([35]) Note that here we abstract from the neoclassical notion that TFP growth in developed countries (where labour force is less dynamic) is the only source of GDP growth. Here we are interested in the short-term dynamics and the growth of labour composition as well.

Graph II.2: **Labour productivity growth and its contributors across sectors. EU vs. US, 2000-2007, in p.p.**



Notes: Average for 2000-2007. EU is the VA weighted average of AT, BE, DE, DK, ES, FI, FR, IT, NL, SE.
Source: Elaborations on EUKLEMS data.

Financial Crisis (GFC) recovery (post 2012), intangible capital provided a stronger contribution, especially in manufacturing in the EU, and notably in sectors linked to the production of transport equipment, while previously tangible capital played a bigger role than intangible capital.

For both the EU and the US, since the GFC, labour composition has become a relatively more important productivity growth contributor (as with depressed demand skilled workers were engaged relatively more than unskilled who were the first to lose their jobs and were not quick to recover them). ([36])

Fact 2. *TFP growth over the whole period appears particularly strong in a handful of manufacturing and services industries, both in the EU and the US.*

The manufacturing sectors generally displaying higher TFP are manufacturing of computers and electronics (with a relevant role played by dynamic scale economies in line with "Moore's law"), transport equipment, and chemicals, while services displaying strong TFP dynamics comprise public utilities, IT, professional and administrative services as well as wholesale and retail trade.

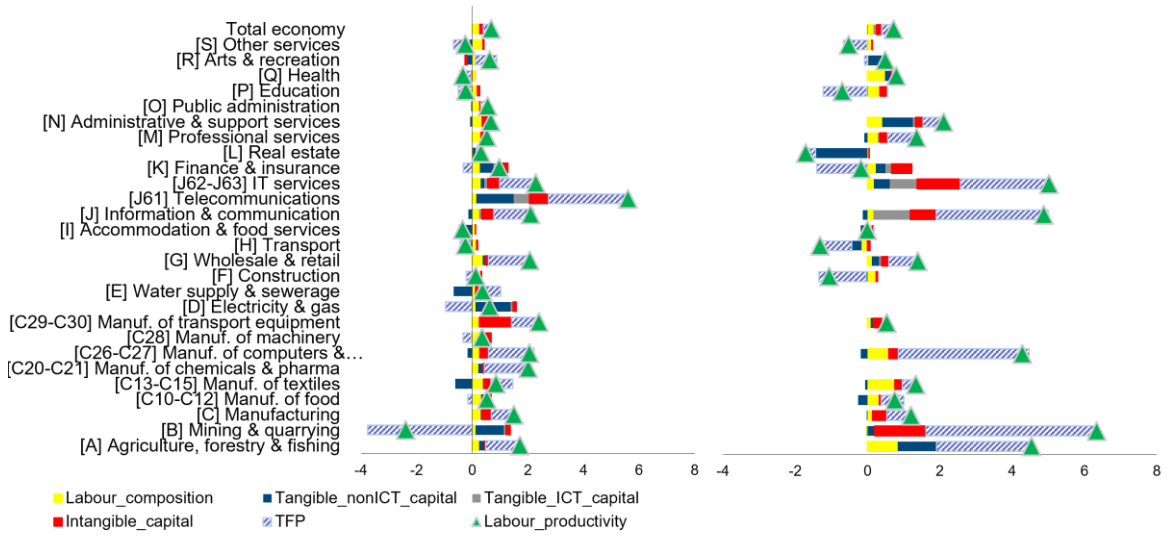
Fact 3. *Sectoral TFP patterns differs to some extent between the EU and the US.*

The most remarkable difference is the much stronger TFP growth recorded in the US for what concerns manufacturing of computers and electronic equipment and IT services. This is not surprising as most IT innovations over the recent decades originated in the US, and in light of the operation of dynamic scale economies linked to Moore's law. A role could have been played also by framework conditions hampering the diffusion of ICT technologies. It is remarkable however that in the most recent years – TFP growth in computer manufacturing has been slowing especially in the US (although remaining above rates recorded in the EU), while a major acceleration was recorded in IT services. The evidence suggests that EU sectoral TFP growth patterns were less responsive to the innovation in the ICT sector.

TFP growth was remarkably stronger in the EU compared with the US in few sectors, telecommunications and other network industries before the GFC, and some manufacturing sectors like transport equipment over the years of the post GFC recovery.

([36]) For evidence on employment composition effects over the business cycle with impact on labour productivity during the COVID-19 pandemic see e.g. Anderton, R., V. Botelho, A. Consolo, A. D. Da Silva, C. Foroni, M. Mohr, and L. Vivian (2021) The impact of the Covid-19 pandemic on the euro area labour market. *ECB Economic Bulletin* 8/2020., Christodoulopoulou, S. and O. Kouvavas (2022). Wages, compositional effects and the business cycle. *ECB Working Paper* 2653, European Central Bank and Howard, S., R. Rich, and J. Tracy (2022). Real wages grew during two years of Covid-19 after controlling for workforce composition. *Dallas Fed Economics* February 15, 2022, Federal Reserve Bank of Dallas.

Graph II.3: **Labour productivity growth and its contributors across sectors. EU vs. US, 2013-2019, in p.p.**



Notes: Average for 2013-2019. EU is the VA weighted average of AT, BE, DE, DK, ES, FI, FR, IT, NL, SE
Source: Elaborations on EUKLEMS data.

Fact 4. *Sectoral TFP dynamics evolved over time, driven partly by structural transformations, and partly by cyclical effects linked to fluctuations in capacity utilisation.* The latter played a particularly strong role over the GFC.

In the EU, over the years preceding the GFC, relatively strong TFP growth in telecommunication and other network industries was linked to liberalisations and pro-competitive reforms. Over that period TFP growth in wholesale and retail trade was partly due to changing average scale of retail firms and better exploitation of scale economies, and partly because of cyclical effects related to capacity utilisation.([37])

The post GFC recovery (2013-2019) is characterised by milder labour productivity and TFP growth rates compared with pre-GFC years (Graph II.3). The deceleration is visible where TFP growth was typically stronger, notably manufacturing of computers and electrical equipment and in network industries for what concerns the EU. Negative growth rates are recorded in services where capacity contracted after the crisis such as transport, energy, and finance.

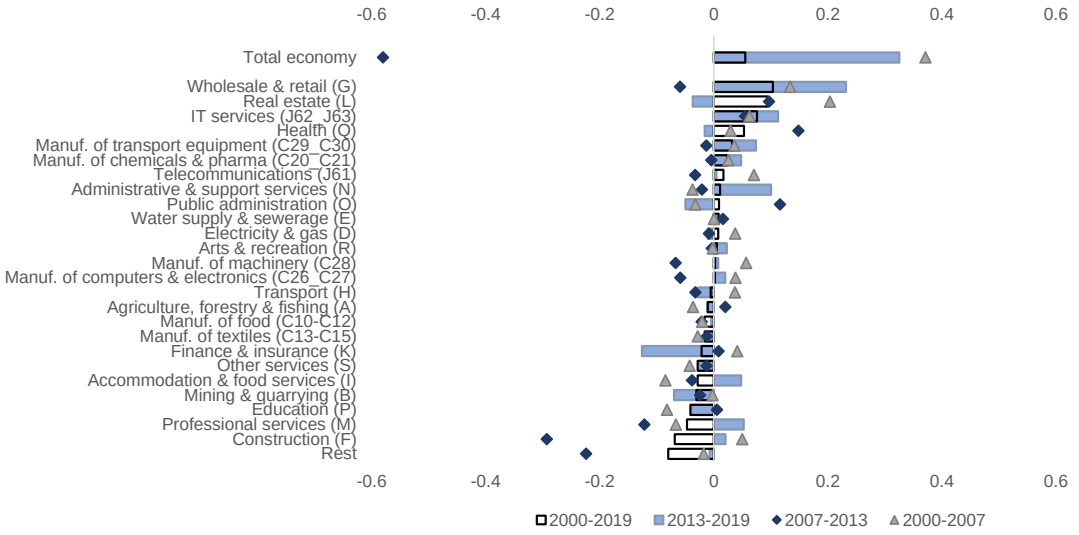
II.4. DISENTANGLING THE INDUSTRY CONTRIBUTION TO AGGREGATE TFP GROWTH

This section aims at disentangling the contribution of each industry to aggregate TFP growth.([38]) Accordingly, what needs to be analysed is not only the change in TFP in each industry, but also the contribution of each of the industries' TFP change to the TFP change of the total economy (a weighting factor).

([37]) See Mc Morrow, K., W. Roeger and A. Turrini (2010). Determinants of TFP growth: A close look at industries driving the EU–US TFP gap. *Structural Change and Economic Dynamics* 21 (2010), 165-180 and Planas, C., W. Roeger and A. Rossi (2013). The Information Content of Capacity Utilisation for Detrending Total Factor Productivity. *Journal of Economic Dynamics and Control*, (37) 2013, 577-590.

([38]) Aggregate EU TFP growth figures mask considerable differences among EU countries, while disaggregated EUKLEMS TFP data support the hypothesis of productivity convergence. In fact, countries with a lower starting level of TFP in PPP terms generally displayed faster TFP growth, as it would be expected because of intersectoral reallocation taking place during transition and following the "neo-Schumpeterian" growth models where laggard countries benefit from a higher rate of adoption of new technologies (e.g., Aghion and Howitt, 2008). This is confirmed both over the pre-crisis period and over the post GFC recovery, but not during the Global Financial Crisis itself (a period characterised by large cyclical developments masking longer-term convergence dynamics). For further details and also an illustration, see Nikolov, P., W. Simons, A. Turrini and P. Voigt (2024). Mid-Tech Europe? A Sectoral Account on Total Factor Productivity Growth from the Latest Vintage of the EU-KLEMs Database. *European Economy Discussion Paper 208*, July 2024.

Graph II.4: **Contribution to the annualised growth (%) in total economy TFP in the EU between 2000 and 2019 by industry**



Notes: EU is the GDP weighted average of AT, BE, DE, DK, ES, FI, FR, IT, NL, SE
Source: Elaborations on EUKLEMS data.

The analysis presented below relies on an industry disaggregation that differs from the one used in the previous section since it excludes overlaps. While the sectoral breakdown of labour productivity growth presented in the previous section shows overlaps due to different levels of aggregation reported in the same graph, in this section the change in the total-economy TFP is decomposed into the contributions of different industries in such a way that the contribution of all industries sum up to the total.([39]) A set of relatively small industries is grouped in a residual category labelled "Rest".([40])

Graphs II.4 and II.5 report the contributions to total-economy TFP growth of across industries for the EU and the US, respectively, distinguishing by sub-periods.

Fact 5. *It is visible from the graphs that the contributions of some industries were strongly affected by cyclical factors.* In particular, the drop in capacity utilisation over the GFC years resulted in large swings in TFP in sectors like retail, construction, professional and administrative services. The reduction of the EU TFP growth gap with respect to the US in the post GFC period is partly linked to the recovery from more protracted and profound cyclical TFP reductions over the GFG in Europe.

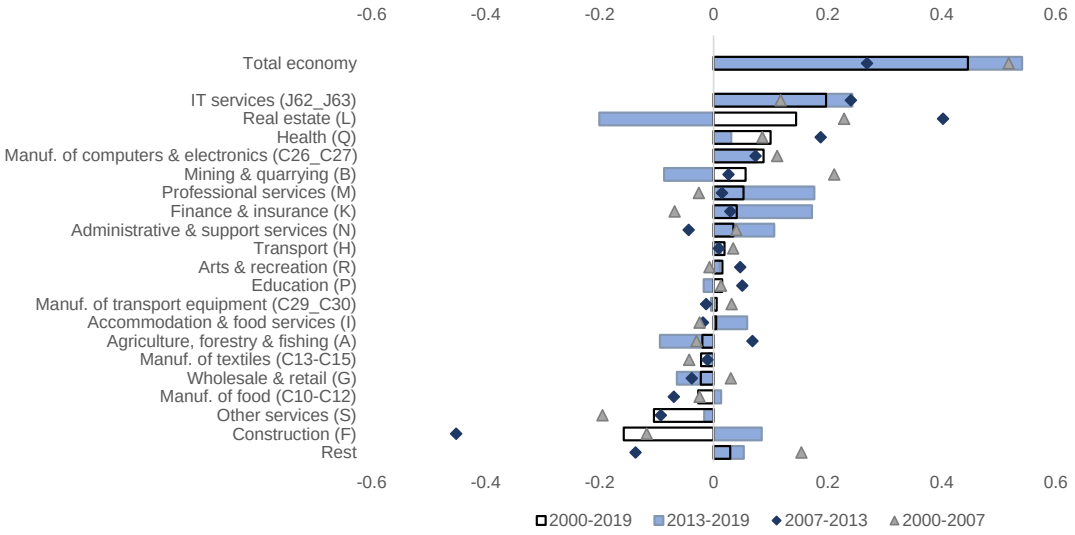
Fact 6. *Since the post GFC recovery in the US the bulk of overall TFP contribution comes from IT and professional services while in the EU manufacturing still plays a role.*

([39]) We compute the sectoral contributions to the total economy TFP change over the period between *t* and *T* by first computing the annualised change (%) in total economy TFP between *t* and *T* as follows: $\Delta_t^T TFP_{agg} = 100 * (\left(\frac{TFP_{agg}^T}{TFP_{agg}^t}\right)^{\left(\frac{1}{T-t}\right)} - 1)$, where TFP_{agg}^T measures aggregate (total economy) TFP in period *T*. The annualised change in aggregate TFP between *t* and *T* ($\Delta_t^T TFP_{agg}$) is then decomposed into industry contributions, by attributing to each industry *i* the following proportion: $\frac{s_i^T * TFP_i^T - s_i^t * TFP_i^t}{TFP_{agg}^T - TFP_{agg}^t}$, where s_i^T measures the share of industry *i* in total economy value added in period *T* and TFP_i^T measures industry *i*'s TFP in period *T*. Since $\sum_i (s_i^T * TFP_i^T)$ equals TFP_{agg}^T, it is easy to see that these proportions sum up to 1. Therefore, in the final step, the contribution of industry *i* to the annualised change in total economy TFP between *t* and *T* is computed as $contrib_{t\ i}^T = \left(\frac{s_i^T * TFP_i^T - s_i^t * TFP_i^t}{TFP_{agg}^T - TFP_{agg}^t}\right) * \Delta_t^T TFP_{agg}$. These industry contributions, shown in Graphs 4 and 5, sum up to the change in total economy TFP between *t* and *T* (i.e. $\sum_i contrib_{t\ i}^T = \Delta_t^T TFP_{agg}$).

Nikolov, P., W. Simons, A. Turrini and P. Voigt (2024). Mid-Tech Europe? A Sectoral Account on Total Factor Productivity Growth from the Latest Vintage of the EU-KLEMs Database. *European Economy Discussion Paper* 208, July 2024.

([40]) In addition, industry coverage for the EU and the US is not completely identical, as data for certain industries (Manufacturing of chemicals & pharma (C20_C21), Manufacturing of machinery (C28) Electricity & gas (D), Water supply & sewerage (E), Telecommunications (J61) and Public administration (O).) for the US are not available. Aghion, P. and P. Howitt (2005), 'Appropriate growth policies: A unifying framework', *Journal of the European Economic Association*, Vol. 3, Issue 2–3.

Graph II.5: **Contribution to the annualised growth (%) in total economy TFP in the US between 2000 and 2019, by industry**



Source: Elaborations on EUKLEMS data.

In both the EU and the US, the contribution coming from services is growing over time as compared with that coming from manufacturing. In both the EU and the US, it is noteworthy the increase in the contribution of IT, professional and administrative services. However, while in the US the strongest role is played by IT and professional services and finance, in the EU there is a remarkable growth in the contribution of the wholesale and retail sector, partly driven by cyclical effects and partly by structural transformations in the industry allowing more room for exploiting scale economies in analogy with what was observed previously in the US. In the US instead retail services exhibit a falling contribution, mainly due to its falling share in the total economy.

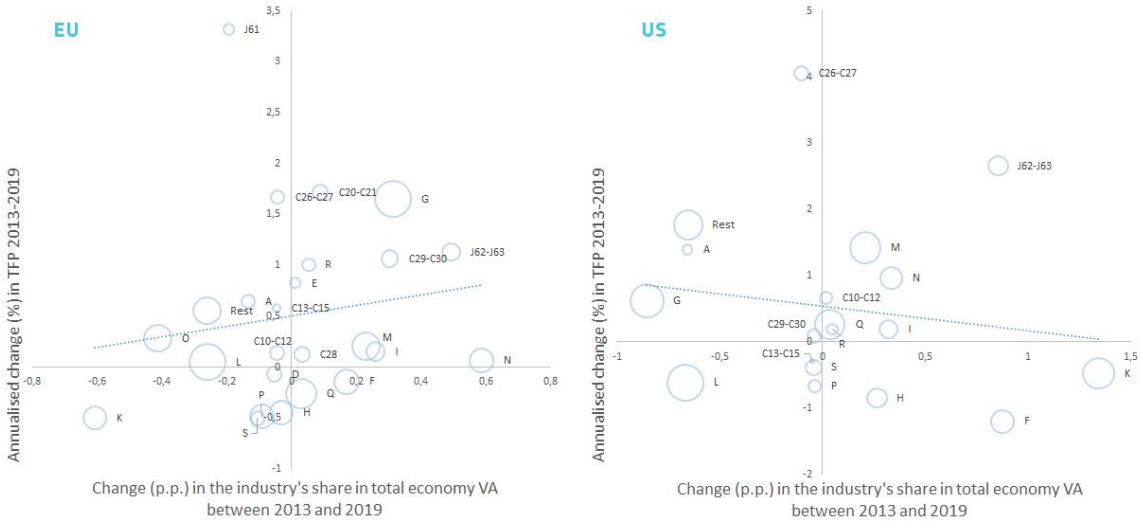
There are more manufacturing sectors providing a positive contribution to total-economy TFP growth in the EU than in the US. While in the EU a few manufacturing sectors, including transport equipment, chemicals, computers, and electronic equipment, provided a positive contribution to overall TFP growth, in the US the only manufacturing sector with a non-negligible and positive contribution to aggregate TFP growth is manufacturing of computers and electronics. In the US, the manufacturing of computers and electronics accounted for a big part of the TFP growth between 2000 and 2007 while it has been contributing less after 2013. Nonetheless, the role of this sector in the US for total TFP growth remains larger than in the EU. The finding is both due to the higher rate of TFP growth in this sector in the US as well as the fact that the share of this sector on total value added is higher in the US than in the EU.

II.5. TFP, TECHNOLOGY AND CHANGING RELATIVE INDUSTRY SIZE

Graphs II.6 and II.7 help providing prima-facie evidence whether the sectors that grew in relative terms are the same as those that displayed stronger TFP growth, or a stronger TFP growth acceleration.

The EU and the US have about the same number of industries where TFP is growing between 2013 and 2019 (bubbles above the horizontal axis, Graph II.6). In the EU, industries that have become relatively larger have also generally shown a comparably stronger TFP growth (positively sloping fitting line in Graph 6), while the corresponding relation for the US appears weakly negative. In particular, in the EU, wholesale and retail (G) has grown in relative terms, while the size of this industry has decreased in the US. Manufacturing of transport equipment has grown in the EU but remained broadly stable in the US. IT services have been one of the fastest growing sectors in relative terms both in the EU and in the US. However, in light of the sheer size of TFP growth gap and of the stronger growth rate recorded in the US, the contribution of IT services to the overall TFP growth gap EU vs. US has further magnified in the post GFC period.

Graph II.6: **Change in industry's share in total economy VA vs. change in industry's TFP between 2013 and 2019**

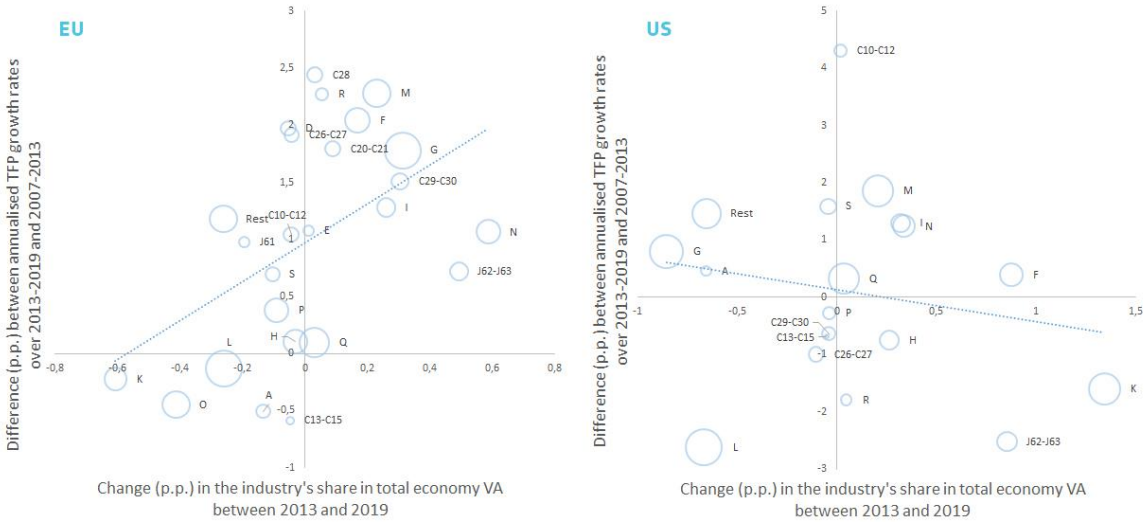


Notes: EU is the GDP weighted average of AT, BE, DE, DK, ES, FI, FR, IT, NL, SE. Bubble size represents industry's share in total economy VA in 2019. Agriculture, forestry & fishing (A), Mining & quarrying (B), Manufacturing of food (C10-C12), Manufacturing of textiles (C13-C15), Manufacturing of chemicals & pharma (C20_C21), Manufacturing of computers & electronics (C26_C27), Manufacturing of machinery (C28), Manufacturing of transport equipment (C29_C30), Electricity & gas (D), Water supply & sewerage (E), Construction (F), Wholesale & retail (G), Transport (H), Accommodation & food services (I), Telecommunications (J61), T services (J62_J63), Finance & insurance (K), Real estate (L), Professional services (M), Administrative & support services (N), Public administration (O), Education (P), Health (Q), Arts & recreation (R), Other services (S), Rest – all the rest.

Source: Elaborations on EUKLEMS data.

Graph II.7 shows the relationship between the increase in the relative share of industries between 2013 and 2019 and TFP growth acceleration between two separate 6-year periods – 2007-2013 and 2013-2019. EU industries appear to be growing especially in sectors with stronger TFP accelerations, while such relation is weakly negative for the US. Overall, the evidence suggests that inter-sectoral reallocations have recently been playing in favour of TFP growth in the EU.

Graph II.7: **Change in industry's share in total economy VA vs. difference between industry's TFP changes over 2013-2019 and 2007-2013**



Notes: See notes to Graph II.6

Source: Elaborations on EUKLEMS data.

Assessing whether the relative size of a particular industry was driven by TFP growth requires going beyond scatterplots in Graphs (II.6) and (II.7). We therefore explore this relation in the cross section of country/sector groups by means of between-effects panel regressions as follows:

$$\Delta s_{c,s,t} = \alpha + \beta_1 \Delta \ln a_{c,s,t-1} + \gamma_1 D_c + \varepsilon_{c,s,t} \quad (6)$$

where $\Delta s_{c,s,t}$ is the change in the share in total economy value added of an industry s, in country c, during time period t, $\Delta \ln a_{c,s,t-1}$is the lagged change in the log TFP index, D_c are country dummies and $\varepsilon_{c,s,t}$ are country-sector-time error terms for which the usual assumptions apply. The sample covers the 10 EU countries and the 25 industries described above, and regressions are run for the overall period 2000-2019 and for the most recent post-recovery time period 2013-2019. Panel between regressions estimate the relation across time averages of country-sector groups. The inclusion of country fixed effects permits to capture the cross-section variation mainly across sectors.

Results for the specification (6) above are reported in columns (1) and (2) of Table II.1. The estimated coefficient in column (2) indicates a positive association between lagged TFP growth and the change in the industry's share in total economy value added for the period 2013-2019. This is consistent with the positively sloping fitted line in the left panel of Graph 6. In contrast, when the whole period 2000-2019 is considered (column 1), the estimated association is negative and statistically significant. This means that the association between relative growth of industries and past TFP performance has turned positive in relatively recent times, after years where the sectors with lower TFP growth were growing in size while those with higher TFP growth were shrinking. It is also to observe that, despite the significant regression coefficient for TFP, low R-square statistics indicate that TFP provides an overall limited contribution to the explanation of the cross-sectional variation of sectoral shares.

Next, we modify equation (6) to include dummy variables that indicate whether an industry is considered high-tech (D_h) or middle-tech (D_m), in analogy with the taxonomy provided in Fuest *et al.* (2024). ([41]) This specification aims at checking the often-argued claim that mid-tech industries fare comparatively well in the EU, while high-tech industries are not growing as strongly. Equation (7) below permits to assess whether industries being mid or high-tech matters for their relative growth on top of their productivity performance.

$$\Delta s_{c,s,t} = \alpha + \beta_1 \Delta \ln a_{c,s,t-1} + \gamma_1 D_c + \gamma_2 D_h + \gamma_3 D_m + \varepsilon_{c,s,t} \quad (7)$$

The results are shown in columns (3) and (4) in Table II.1. The negative association between TFP growth and the change in industry's share between 2000-2019 (column (3)) and the positive one between 2013-2019 (column (4)) persists. The signs of the coefficients γ_2 and γ_3 indicate that the high-tech industries tend to grow as a share of the total economy, while middle-tech ones tend to decline, controlling for TFP growth. This is valid not only in the latest period – 2013-2019, but also during the whole period in consideration.

Finally, to trace which industries drive the association between TFP growth and the change in the industry's share in total economy value added, we estimate a specification where we interact the dummy variables for high- and middle-tech industries with the TFP growth variable as follows:

$$\Delta s_{c,s,t} = \alpha + \beta_1 \Delta \ln a_{c,s,t-1} + \gamma_1 D_c + \gamma_2 D_h + \gamma_3 D_m + \gamma_4 \Delta \ln a_{c,s,t-1} * D_h + \gamma_5 \Delta \ln a_{c,s,t-1} * D_m + \varepsilon_{c,s,t} \quad (8)$$

The results are shown in columns (5) and (6) of Table II.1. The interpretation of coefficient β_1 in this case applies only to industries that are neither hi- or mid-tech, while the relation between TFP growth and industries' relative size is given by $\beta_1 + \gamma_4$ and by $\beta_{1+}\gamma_5$ for mid- and high-tech industries, respectively. It is visible that for industries that are neither mid- nor hi-tech the link between shares and TFP growth is non-significant for the whole sample and positive after 2013. For mid-tech industries the relation with TFP is also non-significant for the whole period, turning however negative after 2013. Conversely the share of high-tech industries shows a negative relation with TFP growth for the whole period, which however turns non-significant after 2013. It seems therefore that the tendency observed after the GFC

([41]) The industries that are considered high-tech are: Manufacturing of computers & electronics (C26_C27), IT services (J62_J63), and Professional services (M). Mid-tech industries are defined as: Manuf. of chemicals & pharma (C20_C21), Manuf. of machinery (C28), Manuf. of transport equipment (C29_C30), Transport (H), Telecommunications (J61) and Finance & insurance (K). The inclusion of health in the hi-tech group or moving chemicals and pharma from mid to hi-tech does not modify the qualitative conclusions of the analysis.

recovery that industries with a relatively high TFP growth that started expanding in relative terms was not associated with these industries being mid- or high-tech.

Table II.1: **Regression results for relationship between TFP growth and industry shares in total economy in the EU**

Dependent variable: change in share of total value added	(1)	(2)	(3)	(4)	(5)	(6)
Explanatory variables	2000-2019	2013-2019	2000-2019	2013-2019	2000-2019	2013-2019
TFP growth, lagged	-0.00532***	0.0125***	-0.00545**	0.0124***	-0.00415	0.0155***
	[-2.671]	[5.334]	[-2.505]	[5.269]	[-1.446]	[5.462]
Dummy mid-tech			-0.00005	-0.000262**	-0.000146	-0.0002
			[-0.535]	[-2.057]	[-1.294]	[-1.523]
Dummy high-tech			0.000247**	0.000419***	0.000433***	0.000440**
			[2.140]	[2.725]	[3.442]	[2.383]
TFP growth, lagged* Dummy mid-tech					0.00381	-0.0104*
					[0.810]	[-1.957]
TFP growth, lagged* Dummy high tech					-0.0195***	-0.00582
					[-3.001]	[-0.523]
Country dummies	Yes	Yes	Yes	Yes	Yes	Yes
Observations	4,936	1,736	4,936	1,736	4,936	1,736
Number of sectors/countries	248	248	248	248	248	248
R-squared	0.029	0.107	0.053	0.16	0.098	0.173

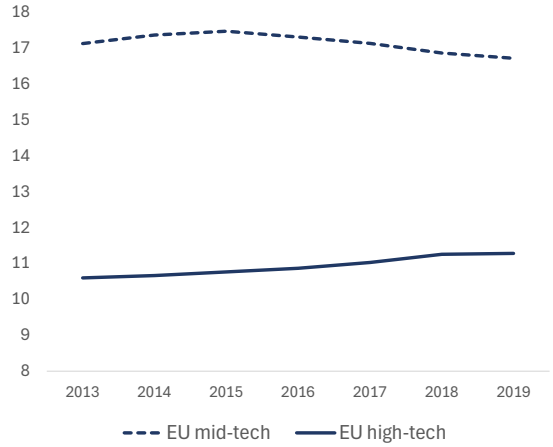
Notes: T-statistics in brackets; *** p<0.01, ** p<0.05, * p<0.1. Results display between regressions across country/sector groups over the time period reported. Dummy middle tech and high tech are equal to 1 if the sector is considered, respectively, middle tech or high tech (see Fuest et al. (2024)). The sample includes the following countries: Austria, Belgium, Germany, Denmark, Spain, Finland, France, Italy, Netherlands and Sweden and the following sectors: Agriculture, forestry & fishing (A), Mining & quarrying (B), Manufacturing of food (C10-C12), Manufacturing of textiles (C13-C15), Manufacturing of chemicals & pharma (C20_C21), Manufacturing of computers & electronics (C26_C27), Manufacturing of machinery (C28), Manufacturing of transport equipment (C29_C30), Electricity & gas (D), Water supply & sewerage I, Construction (F), Wholesale & retail (G), Transport (H), Accommodation & food services (I), Telecommunications (J61), IT services (J62_J63), Finance & insurance (K), Real estate (L), Professional services (M), Administrative & support services (N), Public administration (O), Education (P), Health (Q), Arts & recreation(R), Other services (S).

Source: Elaborations on EUKLEMS data.

As shown in the result in Table II.1 high-tech industries have been growing while mid-tech industries have been shrinking, irrespective of their TFP performance. This is visible from Graph II.8. Despite the increase in the relative share of high-tech industries, its size remains much below that recorded in the US. As shown in Graph II.9, the EU and the US both display a remarkably steady increase in the share of high-tech industries between 2013 and 2019. Yet, the gap between the two major economies, already evident in 2013, has further widened over time. What is most remarkable from Graph 9 is the difference in TFP growth for high-tech industries between the EU and the US. As shown in the previous sections, the EU-US

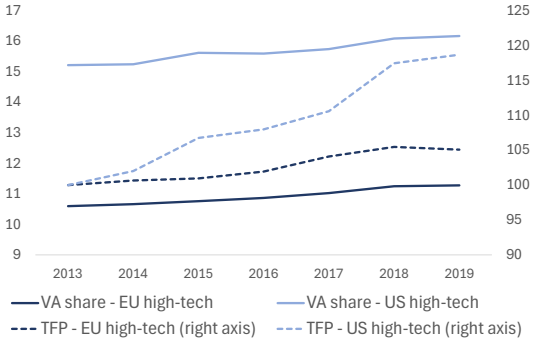
TFP growth gap is concentrated in ICT manufacturing and services, and some other high-skill services. The implication is that over time the gap in terms of TFP levels between the EU and the US has been widening mainly in high-tech industries.

Graph II.8: **Industry's share in total economy VA EU between 2013 and 2019**



Notes: EU is composed of AT, BE, DE, DK, ES, FI, FR, IT, NL, SE. See Footnote 15 for definition of hi and mid-tech industries.
Source: EU-KLEMS

Graph II.9: **Evolution of TFP (indexed at 100 in 2000) and VA share over 2013-2019, high-tech industries**



Notes: The graph shows the evolution of TFP (indexed at 100 in 2000) for the high-tech industries. TFP for this technology level is computed as a weighted average across Manufacturing of computers & electronics (C26_C27), ICT services (J62_J63) and Professional services (M) (using sectoral value added as weight). EU is composed of AT, BE, DE, DK, ES, FI, FR, IT, NL, SE. See Footnote 15 for definition of hi-tech industries.
Source: EU-KLEMS

II.6. CONCLUSIONS AND IMPLICATIONS FOR POLICY

This chapter discusses EU Total Factor Productivity (TFP) growth in comparison with the US, relying on the EU-KLEMS database**.** The analysis unveils sectoral patterns of productivity growth with a comparatively fine disaggregation of different sources of productivity growth. Such patterns are analysed across different time periods between 2000 and 2019, with a view at illustrating how sources of productivity growth have been changing over time and to understand how the different industries have been playing a different role over time. Comparisons are made across sectors and between the EU and the US.

The analysis permits distilling several key messages as follows:

TFP is in general the component that accounts for the biggest share of productivity growth in the EU and the US and sectors, followed by tangible and intangible capital deepening. TFP growth also accounts for the bulk of labour productivity growth dispersion across industries. However, both in the EU and the US, the contribution of TFP growth has been declining over time, while that of intangible capital and labour composition has been growing since the Global Financial Crisis (GFC).

The bulk of aggregate TFP growth is recorded in relatively few industries. Over the post GFC period (2013-2019), total TFP growth across the EU is mostly driven by services, such as wholesale and trade; IT services; and administrative, support and professional services. Among manufacturing, large contributions originate from manufacturing of transport equipment, chemical, computer and electronics. TFP growth rates in network industries have strongly declined if compared with values recorded in previous decades (in many cases linked to one-off improvements in scale economy exploitation in light of liberalisation processes).

EU sectoral TFP patterns differ from those of the US in several respects. Notably, the US displays much higher productivity growth in IT services and manufacturing of computers and electronics (linked to the origination of innovations benefiting from Moore's law). Strong TFP spurts in the US are followed with some lags from TFP acceleration in the same sector in the EU.

The US TFP growth advantage over the EU is linked both to higher TFP growth rates in sectors generating large TFP gains e.g., IT services, and to larger shares of these industries in total value added.

Overall, even though the industries that are expanding their share on value added in the EU are generally those exhibiting higher and accelerating TFP growth rates, it appears that the transition towards the services sectors where TFP is growing the fastest in the EU is taking place at much slower pace as compared with what happened in the US.

In general, despite the share of hi-tech industries exhibiting TFP gains from radical innovations is growing across the EU, the gap compared with the US is not narrowing. Moreover, these industries exhibit much more moderate TFP gains in the EU as compared with the US. Sectors that belong to mid-tech manufacturing like manufacturing transport equipment, manufacturing chemicals and manufacturing machinery are not growing in share across the EU. However, it is in these sectors that R&D and intangible capital has grown comparatively strong since the post GFC period, and where contribution to TFP growth has been comparatively strong. In this respect, Fuest et al. (2024) describe the EU as being in a middle technology trap, whereby it is mid-tech sectors that absorb a comparatively large share of total R&D, unlike in the US where firms in high-tech services such as e.g., ICT and manufacture of electronics are the largest R&D spenders.

The results from the present analyses have a number of implications for policy which are broadly in line with recent Commission initiatives included in the Competitiveness Compass a medium-term strategy for EU-level initiatives to boost EU competitiveness, which builds on the assessment in the Draghi report. ([42]) Some policies are in the hands of Member States. In this respect the Commission has recently refocused country surveillance notably in the context of the European Semester towards competitiveness objectives.

The fact that TFP growth rates differ substantially across industries has implications for policies which may pave the way for improving the allocation of resources (both within as well as across industries). Supportive policies and regulatory frameworks can make a difference by facilitating the reallocation of corresponding resources according to their most efficient use. Relevant policy levers in this regard are, inter alia, regulations affecting firm entry and exit and labour mobility, policies to enhance access to capital, and policies addressing obstacles for investment, especially those holding back the most dynamic sectors.

Persistent *differences in TFP growth* within the same industries across the EU and the US largely reflect differences in the innovation performance. Existing innovation gaps require inter alia mobilising private capital towards investment in R&D and innovative activities, adequate effective and well-targeted government support to fundamental research, R&I systems endowed with strong governance and able to retain and attract talent, school systems providing adequate supply of high-level human capital. ([43]) Recent Commission initiatives aim at enhancing the contribution of investment (Saving and Investment Union) and skills (Union of Skills) to competitiveness objectives. ([44])

The evidence suggests that the sectoral patterns of TFP dynamics in the EU were to a lesser extent driven by radical innovations. The EU was in a lagging position in industries linked to ICT in past decades and is currently lagging in ICT services as compared with the US. These are industries where the potential of productivity gains via innovation is particularly strong. Conversely the EU has a relative TFP growth advantage in industries characterised by more stable and mature innovation trajectories. Consistently, only a small share of fast-growing companies in high-tech sectors, so-called “unicorns”, are based in

([42]) See A Competitiveness Compass for the EU, Brussels, 29.1.2025, COM(2025) 30 final in https://commission.europa.eu/topics/eu-competitiveness/competitiveness-compass_en.

([43]) See in this regard: *Euro Area Competitiveness: Addressing the Knowledge Gap*, Commission note to the Eurogroup (13/05/2024; LINK). Fuest, C., D. Gros, P. Mengel, G. Presidente, and J. Tirole (2024), EU Innovation Policy – How to Escape the Middle Technology Trap?. A Report by the European Policy Analysis Group: CesIfo, Institute for European Policymaking at Bocconi, Toulouse School of Economics https://iep.unibocconi.eu/publications/eu-innovation-policy-how-escape-middle-technology-trap.

([44]) See Savings and Investment Union, A Strategy to Foster Citizen’s Wealth and Economic Competitiveness in the EU, Brussels, 19.3.2025, COM(2025) 124 final in https://finance.ec.europa.eu/publications/savings-and-investments-union-strategy-enhance-financial-opportunities-eu-citizens-and-businesses_en and The Union of Skills, Brussels, 5.3.2025, COM(2025) 90 final in https://ec.europa.eu/commission/presscorner/detail/en/ip_25_657.

Europe. ([45]) Arguably, the still underdeveloped EU equity, venture capital, and public venture financing requires further strengthening to overcome this gap. ([46])

This peculiar specialisation pattern of the EU is not only linked to a different cultural attitude towards risk but is rooted also in different institutions and policy frameworks; addressing such institutions and policies may create the conditions over time also for a more supportive cultural attitude. For instance, the still underdeveloped EU equity, venture capital, and public venture financing requires further strengthening to overcome the EU gap in terms of young innovative firms. ([47]) The EU Startup and Scaleup Strategy aims to make Europe a better place to grow innovative companies. ([48]) the Savings and Investment Union initiative contains provisions to strengthen the role of equity and joint venture capital for small innovative companies.

([45]) Very few European firms are classified as "unicorns", i.e. private start-ups valued above 1 billion dollars. In 2021, about 68% of all unicorns worldwide were located in the US or in China. For more details and reflections on unicorns in Europe, see Testa, G., Compano, R. and E. Rückert (2022). In search of EU unicorns - What do we know about them? *JRC Tech. Rep.* (EUR 30978 EN).

([46]) The following priority areas for action can be mentioned: better integration for infrastructure of equity markets, including via harmonisation of listing requirements; well-designed national tax incentives to help overcome the debt-equity bias; improved conditions for investment in equity, in particular in venture capital, and better matching the needs of firms that have grown beyond the venture capital stage.

([47]) The following priority areas for action can be mentioned: better integration for infrastructure of equity markets, including via harmonisation of listing requirements; well-designed national tax incentives to help overcome the debt-equity bias; improved conditions for investment in equity, in particular in venture capital, and better matching the needs of firms that have grown beyond the venture capital stage.

([48]) See The EU Startup and Scaleup Strategy, Choose Europe to start and scale, Brussels, 28.5.2025, COM(2025) 270 final in https://ec.europa.eu/commission/presscorner/detail/en/ip_25_1350.

III. HOW RESILIENT ARE EURO AREA NFCS? A LOOK INTO THE FACTORS DRIVING CORPORATE FINANCIAL RISKS AT THE COUNTRY LEVEL

By Mirjam Salish

Abstract: *Despite recent improvement, Euro area non-financial corporations (NFCs) face tighter financing conditions than in 2022, which negatively affected their debt service capacity. At the same time, firms have accumulated liquidity buffers, due to credit support and other income support measures during the pandemic and the inflation shock, and were able to partially passthrough higher energy and commodity prices to their final output prices, despite the slowdown in economic activity. To understand whether, all taken into account, recent developments have led to higher corporate vulnerabilities in the euro area, this study uses a new composite index of corporate vulnerabilities for the Member States, based on an ECB methodology. This index serves as an instrument for an initial, high-level assessment of trends and risks across the euro area. Despite an increase in recent quarters, the vulnerability index currently remains in negative territory in most countries, indicating a low-risk scenario. Even in countries with positive index values, risks continue to be contained when compared to periods that severely tested corporate financial stability such as the great financial crisis, the sovereign debt crisis or the onset of the COVID-19 pandemic. Despite the overall increase in vulnerabilities along several dimensions, in most countries the corporate sector has remained resilient.*

III.1. INTRODUCTION

The non-financial corporate (NFC) sector plays an important role in maintaining financial and macroeconomic stability, as imbalances within this sector can have considerable spillover effects on the broader economy. For instance, excessive corporate debt may constrain investment and reduce employment, ultimately leading to a decline in economic growth and increasing the economy's vulnerability to shocks. Furthermore, if companies struggle to service their debt and default on their loans, this may weigh on banks' financial health and undermine financial stability. Consequently, monitoring the financial soundness of the NFC sector is central for pre-empting systemic risks and preserving macroeconomic stability.

During the great financial crisis, euro area NFCs were highly leveraged and therefore more exposed to financial shocks. Since then, corporate debt levels have decreased in many euro area countries, but other risk factors have emerged. The COVID-19 pandemic led to contracting activity and low profit margins, initially causing liquidity shortages in the corporate sector. Support measures cushioned the downturn allowing NFCs to accumulate cash buffers. While profit margins recovered during the inflationary episode that followed, the unprecedented monetary policy tightening, which started in summer 2002, raised corporate interest burdens. These burdens remained high in 2024 and 2025 despite the gradual decline in policy rates since mid-2024.

Given the relevance of corporate vulnerabilities both for the euro area and its individual members, this chapter extends the methodology proposed in Gardó et al (2020) to construct a vulnerability index adapted to individual euro area countries. ([49]) These country-specific indices examine the factors that have been driving corporate financial risks with the aim to provide a comprehensive snapshot of the state of euro area NFCs and their ability to withstand future challenges.

The remainder of this chapter is structured as follows. In Section III.2, the data and methodology used to construct the index are described. Section III.3 contains a cross-country analysis of developments in non-financial corporate risk across the euro area and shows how the corporate vulnerability index can be used to analyse the importance of different risk factors over time. In Section III.4, the leading indicator properties of the composite index are assessed. Section III.5 concludes.

([49]) Gardó S., Klaus B., Tujula M. and Wendelborn J. (2020) Assessing corporate vulnerabilities in the euro area (europa.eu) published as part of the Financial Stability Review, November 2020. We would like to thank Jonas Wendelborn from the ECB for support and guidance in reconstructing the index at the country level.

III.2. MONITORING CORPORATE VULNERABILITIES AT THE COUNTRY LEVEL: THE CONSTRUCTION OF A COMPOSITE INDICATOR

Given its importance for financial and macroeconomic stability, several national and international institutions closely monitor the corporate sector to identify and address potential vulnerabilities. On a global scale, the OECD dedicates an entire chapter in its annual Global Debt Report to NFCs, while the IMF publishes part of its surveillance on corporate debt dynamics in its Financial Stability Report.([50]) At the European level, central banks, the European Systemic Risk Board (ESRB) and the European Commission (EC) keep a close eye on corporate balance sheets to detect, prevent and mitigate systemic risks that may arise within the financial system. ([51]) Apart from financial stability experts, corporations are also monitored under the Macroeconomic Imbalance Procedure due their potential to create spillovers and risks of macroeconomic imbalances. ([52]) The ECB, for surveillance purposes, developed a composite index for the euro area capturing the relative and time-varying importance of the factors driving corporate financial risk. ([53]) Many factors influence the financial soundness of the corporate sector and to gauge potential vulnerabilities, the economic literature typically proposes variables related directly to financial stress and to activity indicators. ([54])

The corporate vulnerability index proposed for the euro area aggregate by Gardó et al (2020), which is the point of departure for this analysis, combines measures along the following five dimensions, each reflecting important aspects of potential NFC financial vulnerabilities as reflected in the sub-indicators used:

- *Activity:* measures reflect the sector's ability to generate revenue, manage working capital, and maintain a healthy cash flow. ([55]) Sub-indicators used: sales growth, trade creditors ratio and change in accounts receivables turnover ratio ([56]);
- *Profitability:* captures the cash flow generation which impacts the firms' debt servicing capacity as well as their financial flexibility to respond to changing market conditions or absorb shocks. ([57]) Sub-indicators used: return on assets, profit margin, and market-to-book value ratio;
- *Debt service capacity*: reflects the ability of NFCs to meet their debt obligations. Weak debt service capacity is associated with lower financial resilience, a higher likelihood of default and consequently a higher risk of bankruptcy. ([58]) Sub-indicators used: interest coverage ratio, corporate savings, and revenue generation;

([50]) OECD (2024), Global Debt Report 2024; and IMF (2024), *2024 Global Debt Monitor* .

([51]) See e.g. European Financial Stability and Integration Review (EC DG FISMA), ECB Financial Stability Review or the ESRB Risk Dashboard.

([52]) 2025 European Semester: Alert Mechanism report - European Commission. In addition to monitoring financial vulnerabilities, the corporate sector is assessed in other dimensions, such as investment (see e.g. EIB Investment Report 2023/2024: Transforming for competitiveness, European Investment Bank.), supply chains, or trade to name a few.

([53]) See Gardó et al (2020) op. cit.

([54]) See IMF (2025), Corporate Sector Vulnerabilities and High Levels of Interest Rates. Financial indicators include measures of indebtedness, indicators of debt service capacity (like interest coverage ratios, cash buffers, financing conditions), outstanding debt maturity, liquidity levels, credit quality, the share of non-performing loans or bankruptcies. Other indicators used are sales growth, trade credit ratios, profitability measures (such as profit margins or return on assets) and economic sentiment indicators.

([55]) For instance, high sales growth suggests that firms can adapt to market conditions and execute their business strategy, while low trade creditors ratios or accounts receivables turnover rates may lead to liquidity problems and financial distress. See e.g., Myers, S. C. (1977). Determinants of corporate borrowing. Journal of Financial Economics, 5(2), 147-175, Richards, V. D., and Laughlin, E. J. (1980). The cash flow approach to liquidity analysis. Journal of Accounting and Public Policy, 9(2), 131-144, Deloof, M. (2003). Does working capital management affect profitability of Belgian firms? Journal of Business Finance & Accounting, 30(3-4), 573-588, Lee, S. Y., and Kim, B. (2018). The impact of sales growth on firm performance: Evidence from Korean listed companies. Journal of Business Research, 82, 247-256.

([56]) This corresponds to net credit sales divided by average accounts receivable and measures how fast firms manage to collect their receivables.

([57]) More profitable firms also often have higher credit ratings and lower borrowing costs. Graham, J. R., and Harvey, C. R. (2001). The theory and practice of corporate finance: Evidence from the field. Journal of Financial Economics, 60(2-3), 187-243.

([58]) Altman, E. I. (1984). A further empirical investigation of the bankruptcy cost question. Journal of Finance, 39(4), 1067-1089. Molina, C. A., and Preve, L. A. (2012). An empirical analysis of the effect of working capital management on the financial distress of SMEs. Journal of Business Finance & Accounting, 39(7-8), 943-963.

- *Financing*: access to capital markets and securing financing is essential for economic growth, and financial stability. ([59]) Also relevant is the company's debt maturity profile, including the timing and amount of debt repayments, which can influence financing needs and the ability to meet debt obligations. ([60]) Sub-indicators used: short-term to long-term debt ratio, quick ratio ([61]), and costs of borrowing;
- *Leverage (or indebtedness)*: high debt levels may limit the firm's ability to respond to changing market conditions, invest in new opportunities, or weather economic downturns. They may also affect financing costs and risks. ([62]) Sub-indicators used: debt-to-equity ratio, net debt-to-EBIT ratio, and gross debt-to-income ratio.

This chapter enhances this methodology not only by computing the index for euro area countries individually, but also by adding a sixth dimension:

- *Economic sentiment*: it can be an early indicator of the buildup of (financial) risk as firms' behaviour and decision-making are influenced by sentiment and expectations about future developments. Optimism or pessimism have a bearing on the behaviour of firms. Higher confidence is associated with lower risk, while more severe perceived financial constraints are associated with higher risk. ([63]) Monitoring the risk of the corporate sector often involves the surveillance of "soft" indicators based on survey data that reflect economic sentiment. ([64]) Sub-indicators used: economic confidence in the manufacturing sector, the services sector, and the retail sector, as well as access to finance as a factor limiting production in services and industry. ([65])

([59]) The cost of borrowing can significantly impact the financial performance of NFCs and their ability to service debt. Rajan, R. G., and Zingales, L. (1998). Financial dependence and growth. American Economic Review, 88(3), 559-586.

([60]) Guedes, J., and Opler, T. (1996). The determinants of the maturity of corporate debt issues. Journal of Finance, 51(5), 1809-1833.

([61]) The quick ratio is defined as the ratio of current financial assets to current financial liabilities. See Table III.1 in Annex.

([62]) For the first aspect, see e.g. Molina, C. A., and Preve, L. A. (2012). An empirical analysis of the effect of working capital management on the financial distress of SMEs. Journal of Business Finance & Accounting, 39(7-8), 943-963. Additionally, a highly leveraged corporated sector is more susceptible to changes in interest rates, as shown in Auer, S., M. Bernardini and M. Cecioni (2021), Corporate leverage and monetary policy effectiveness in the euro area. European Economic Review (140). Moreover, high indebtedness entails higher costs of capital, reduced access to credit, and a limited ability to refinance its debt See e.g. Almeida, H., Campello, M., and Weisbach, M. S. (2011). Corporate financial and investment policies when future financing is not frictionless. Journal of Corporate Finance, 17(3), 675-693., Falato, A., & Li, D. (2015). The impact of interest rate changes on corporate debt. Journal of Financial Economics, 115(2), 273-291. Finally, high debt can result in a significant interest burden, which can erode profitability and cash flows making it more challenging to invest in operations, pay dividends, or repay debt. See Kayo, E. K., and Kimura, H. (2011). The impact of debt on R&D investment: Evidence from Japanese firms. Journal of Business Finance & Accounting, 38(1-2), 143-164, Li, D., and Wang, Y. (2020). The impact of debt on firm performance: Evidence from Chinese listed companies. Journal of Business Research, 108, 241-251, Bae, S. C., and Wang, Y. (2020). The impact of debt on firm performance during the COVID-19 pandemic. Journal of Corporate Finance, 60, 101247.

([63]) See e.g. Buchheim et al. (2022), Sentiment and firm behavior during the COVID-19 pandemic - ScienceDirect, *Journal of Economic Behavior & Organization*; Boubaker and Harnza (2014) Does managerial overconfidence matter in explaining debt financing policy?, *Economics Bulletin*. Benhabib and Wang (2015) Sentiments and aggregate demand fluctuations, *Econometrica*

([64]) Sentiment indicators based on survey data might capture (market) information and firms' expectations that are not (yet) reflected in the other sub-indicators particularly when focusing on the most recent developments. They provide information about business conditions and trends and may be a leading indicator of economic activity. Examples for these survey data include, e.g., the monthly and quarterly indicators of European Commission Business and consumer surveys (Business and consumer surveys - European Commission), the ECB Survey on the access to finance of enterprises (SAFE, Survey on the access to finance of enterprises) or the Purchasing Manager Index. Besides this, the Bank Lending Survey (Euro area bank lending survey) or the EIB investment survey (EIB Investment Survey (EIBIS)) provide useful information on supply and demand-side factors influencing corporate financing and investment.

([65]) Data are taken from the EC Business and Consumer Survey (Teibs020 or ei_bcs_bs in eurostat). (Monthly) services, industrial and retail confidence indicators reflect overall perceptions and expectations.; for each surveyed sector, the Commission calculates confidence indicators as arithmetic means of answers (seasonally adjusted balances) to a selection of questions closely related to the reference variable they are supposed to track. (i) The industrial confidence indicator is the arithmetic average of the balances (in percentage points) of the answers to the questions on production expectations (How do you expect your production to develop over the next 3 months? It will....), order books (Do you consider your current overall order books to be ...) and stocks of finished products (the last with inverted sign). (ii) The services confidence indicator is the arithmetic average of the balances (in percentage points) of the answers to the questions on the past business situation and on recent and

A comparison of the times series of the index with and without sentiment, for the euro area aggregate is visible in Graph III.1. It shows that, while they exhibit a similar risk profile with peaks during the great financial crisis and the beginning of the pandemic, sentiment seems to react a bit earlier than other dimensions to changing market conditions which (together with the fact that this data has a smaller publication lag) suggests that timeliness would be one of the main advantages of including this dimension. A deeper discussion of these differences is beyond the scope of the present chapter. A precise definition of the sub-indicators and the variables used for their computation can be found in Table III.1 in the annex.

III.2.1. The computation of the composite index

First, standard-scores also known as z-scores (66) are computed for every sub-indicator (i) listed in Table III.1 in each of the six dimensions and then averaged with equal weights. Each normalised series $\tilde{x}_{i,t}$ is calculated by deducting the mean, μ_i, from each value and dividing by the standard deviation s_i:

$$\tilde{x}_{i,t} = \frac{x_{i,t} - \mu_i}{s_i}.$$

At each time t the mean and standard deviation of variable x_i, which are computed from time 0 to time t, change, which implies that all values of the normalised series $\tilde{x}_{i,t}$ also change over time. When averaging across subindicators to obtain the value for the parent dimension, missing values are removed such that if subindicator i is not available at time t, then the indicator at parent level is calculated as the average of the remaining subindicators for which values are available. In a second step, the simple average of the six dimensions is taken to arrive at the composite index. In the construction of the composite index, all subindicators and indicators receive equal weight. While simple, using equal weights for each (sub)indicator might not adequately reflect the importance of the sub-indicators in gauging corporate financial risks. Which (sub)indicators are more useful to assess corporate vulnerabilities may vary across countries and across time. When averaging across dimensions, activity, profitability, and debt service capacity enter with a negative sign as higher values along these dimensions are associated with lower risks.

Note that each dimension is meant to represents a distinct aspect of financial vulnerabilities. However, dimensions that are highly correlated with others receive de-facto more weight in the composite index, despite providing limited additional insight. Calculations of the correlation coefficients across countries for each combination of dimensions have been performed. At the euro area aggregate level, almost all the correlations have a median in the range [-0.4, 0.4], and the strongest negative correlation is found between financing and debt service capacity (-0.68) and the highest positive correlation between activity and profitability (0.64). This suggests that, for the euro area as a whole, all the main dimensions add specific information to the overall indicator. However, at the country level, we observe considerably stronger linear relationships for some dimensions e.g. between debt service capacity and profitability or debt service capacity and leverage. ([67])

The sentiment indicator exhibits, on average, only weak contemporaneous correlations with the other dimensions, suggesting that its inclusion provides additional information not captured by the other dimensions. However, an analysis at the country level shows that for certain countries, sentiment is strongly correlated with activity and profitability, indicating that more optimistic firm sentiment is associated with higher levels of activity and profitability.

It should be noted that, by construction, the composite indicator is measured in standard deviations from historical means and must be interpreted as such. Higher values of the index imply increased overall

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expected evolution of demand. (iii) The retail trade confidence indicator is the arithmetic average of the balances (in percentage points) of the answers to the questions on the present and future business activity, and on current stocks (the last with inverted sign). (iv) Factors limiting production: What main factors are currently limiting your production? This survey assesses firm sentiment and expectations in monthly and quarterly modules on a sectoral level for all EU Member States. The data is available for a comparatively long time period, and the time lag with which the data is published, is short. There is no recent data for Ireland.

([66]) These z-scores are a statistical standardisation and not related to the Altman Z-score, a formula used to predict the probability of a firm going bankrupt within two years based on work by Altman (1968).

([67]) Country-specific weights could be one way to mitigate this problem.

financial risk and corporate vulnerabilities in each country. However, the measurement in standard deviations does not contain any level information meaning that the index values cannot be directly compared across countries but should only be evaluated against a country's own historical values.

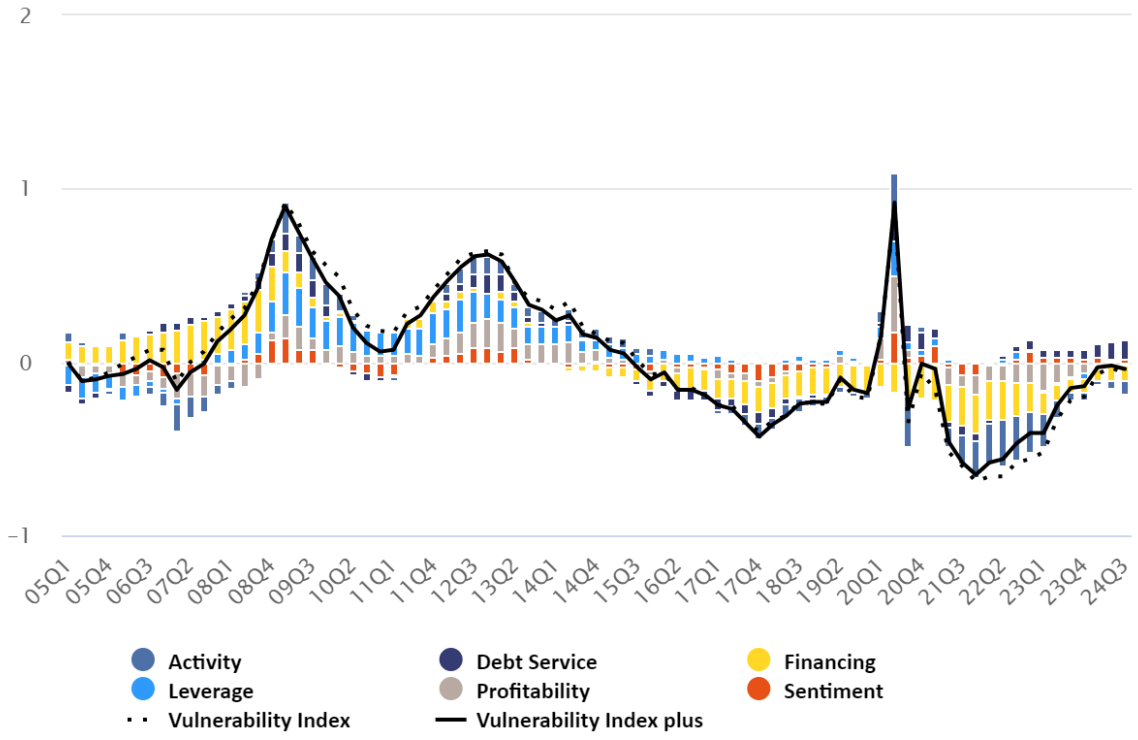
III.3. CORPORATE FINANCIAL VULNERABILITIES IN THE EURO AREA: TRENDS AND RECENT DEVELOPMENTS

The assessment of firms' vulnerability is a complex task, as different relevant indicators may provide conflicting signals about the level of risk. For instance, in the period between the beginning of 2021 and the end of 2023 the different sub-indicators sent inconsistent signals: there was a decline in the interest coverage ratio (indicating heightened financial risks), a V-shaped behaviour of profit margins and profit shares, and a decline in leveraging (pointing to lower financial risks). A certain heterogeneity across euro area countries added to that. This indicates the complexity of assessing firms' vulnerability and the necessity to put together the large number of indicators in a single one, still looking at the different dimensions, as it is done in the rest of this chapter.

III.3.1. Risks remain contained according to corporate vulnerability index

Graph III.1 plots the vulnerability index plus (including sentiment) and the contribution of the subindices. It also compares it to the vulnerability index excluding sentiment. As the two indices do not differ significantly in terms of dynamics the analysis focuses on the vulnerability index plus. Vulnerabilities are measured by positive index values. The graph shows that the vulnerability index plus for the euro area became negative in 2015 and that, despite an increase during 2022 and 2023, it remained negative up until the third quarter of 2024 except for the COVID crisis. The long-term average of the vulnerability index plus is 0.02. ([68])

Graph III.1: **The corporate vulnerability index for the euro area (in standard deviations from long-term average)**



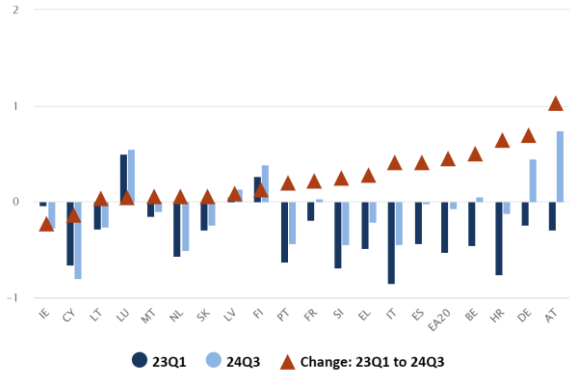
Source: European Commission Calculations based on BIS, ECB, Eurostat. Last observation: 24Q3.

([68]) Notice that at each time t a different mean and standard deviation is computed from time 0 to t, hence the long-term average of the index differs from zero if the mean and standard deviations vary over time.

The index took particularly high values during the global financial crisis, the sovereign debt crisis, and the COVID-19 pandemic. In 2021 and 2022 the index was not only negative but reached its lowest values within the last two decades. Starting from the end of 2022, the vulnerability index plus for the euro area increased continuously. Following this steady increase, the index recorded a value of around 0.3 by mid-2024. This means that risks have increased as of late, but the reading of the index in 2024Q3 remained significantly below peak values reached during previous crisis, pointing to limited corporate financial risk.

The increase over 2023-2024 was not only observed for the euro area aggregate but also across most euro area countries (Graph III.2). Data for all countries, except Estonia, are available until 24Q3. At this moment, although the index remained in negative territory for more than half of the countries, it had not only increased but also transitioned to positive values in a few countries, such as Austria, Belgium, France and Germany. In Finland, Latvia and Luxembourg, vulnerabilities increased further from an already positive index value in the beginning of 2023. Only in two euro-area countries, namely Ireland and Cyprus, did the index decline.

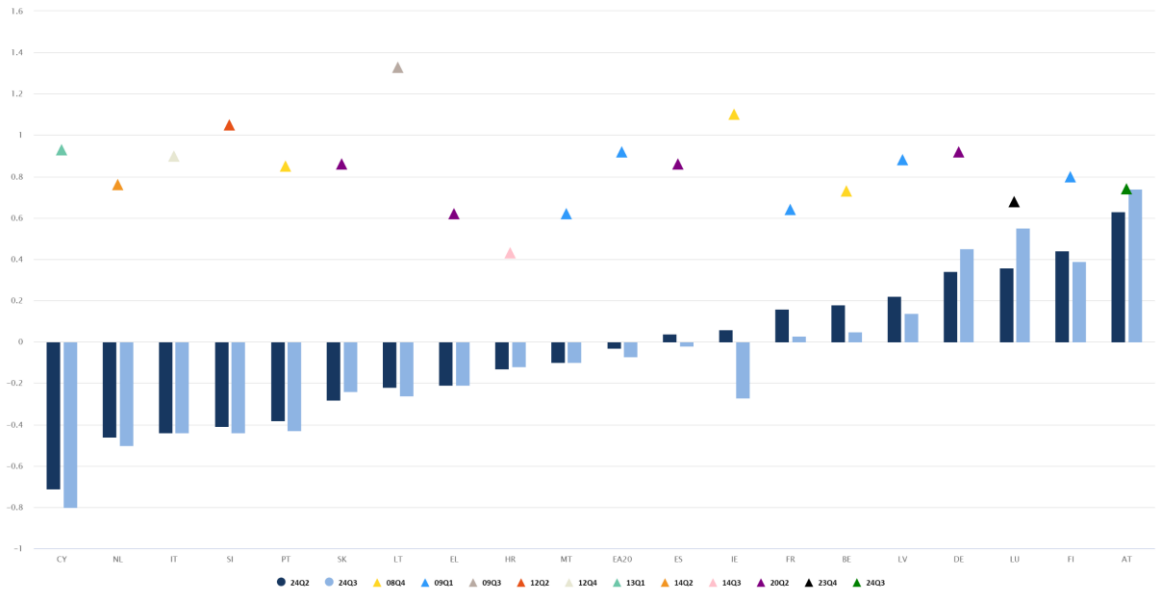
Graph III.2: **Vulnerability indices+ for 23Q1 and 24Q3 and changes at the country level**



Source: European Commission Calculations based on BIS, ECB, Eurostat. Estonia omitted because data not available for 2024.

As indicated above, the index can only be read correctly by comparing its evolution over time in each country. Thus, to understand the indication given by the index, a comparison with the values of the past two decades is necessary. Graph III.3 shows that the financial risk remains low relative to past periods that severely tested corporate financial stability such as during crisis episodes. Thus, not only in more than half of the euro area countries the vulnerability index remained negative in 24Q3 indicating a low-risk scenario, but even for countries posting a positive index value by mid-2024, the value was below its historical peak, except for Austria and Luxembourg for which the index peaked only recently.

Graph III.3: **The corporate vulnerability index in 2024 Q2 and Q3 compared to peak values (standard deviations from long-term average)**



Source: European Commission Calculations based on BIS, ECB, Eurostat.

As indicated above in Graphs III.1 in the euro area, the index of financial vulnerabilities has been the highest during the global financial crisis, the EU sovereign debt crisis and the beginning of the COVID-19

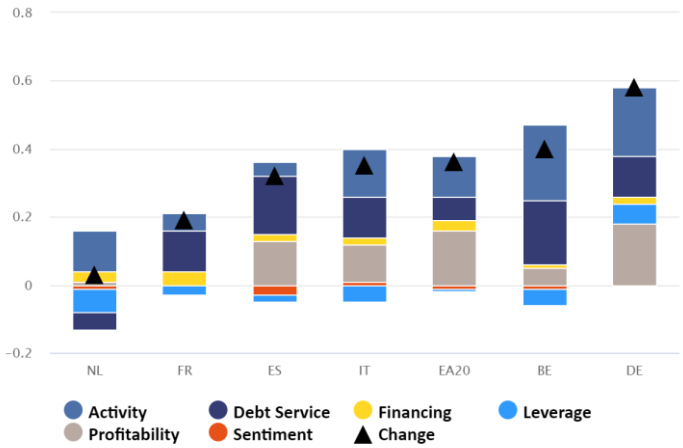
pandemic. The decomposition of the composite index into the factors driving risk in each of these episodes, shown in Graph III.1, indicates that financing and to a smaller degree leverage and sentiment played an important role at the onset of the great financial crisis, while activity, profitability and debt service capacity concerns contributed to high risks at a slightly later point during the crisis. During the sovereign debt crisis, vulnerabilities were associated primarily with high leverage but also with weak profitability and a deterioration in debt service capacity.

III.3.2. Weak activity and worsening debt service capacity are main contributors to recent increase in corporate vulnerability

At the onset of the COVID-19 pandemic, the composite index for the euro area surged quickly but fell back to its pre-pandemic values within half a year. Up until the end of 2022, vulnerabilities decreased even further driven by low-risk readings across all dimensions. In the course of 2023, risks increased, albeit from historically low levels and by the beginning of 2024, the composite index showed a value of close to zero. Past reforms such as macroprudential measures and joint supervision, and government measures, have supported the resilience of the corporate sector. The rise in risk since 2022, and particularly since 2023 was driven by almost all dimensions as activity and profitability indicators deteriorated, debt service capacity declined, and financing conditions worsened, even if their contribution to the index always remained in negative territory, contrary to what happened during the great financial crisis. Financing conditions deteriorated driven by an increase in borrowing costs, however, a comparatively high quick ratio reduced risks in this dimension. Overall, increases in vulnerabilities in 2023Q1-2024Q3 were somewhat mitigated by the historically low levels of corporate indebtedness. ([69])

During the high-inflation period of 2022-2023, profitability, driven by strong profit margins contributed to historically low vulnerabilities. Since then, vulnerabilities related to profitability measures have increased, due to the decline in profit margins in 2024 and the further decrease of the return on equity, only partially compensated by a high market-to-book value ratio. Debt service capacity (revenue generation) has been low by historical standards in recent years, but the recent deterioration in debt service capacity was largely driven by a decrease in the interest cover ratio (ICR) and a strong decline in corporate savings which had been at historically high levels in 2021 and the beginning of 2022.

Graph III.4: **Decomposition of changes in corporate vulnerabilities from 23Q1 to 24Q3 across the six largest euro area countries and the euro area aggregate.**



(1) The graph shows the decomposition of the change in the vulnerability index from 23Q1 to 24Q3 for the six largest euro area countries.

Source: European Commission Calculations based on BIS, ECB, Eurostat.

A look at the behaviour of the index across countries shows how vulnerabilities varied across the region, also in response to policy measures. Financing costs have increased across the euro area, also related to the common monetary policy, but have done so at different rates in different countries and have reached levels whose deviations from the historical average differ across Member States. Despite the increase in borrowing costs, financing conditions remained overall favourable by historical standards. Other factors have also contributed to increased vulnerability. Activity has weakened and contributed to a rise in the composite index in almost all countries and in more than half, activity fell below its long-term average in 2024. Similarly, the majority of euro area countries faced a deterioration in debt service capacity with the exception of Croatia, Slovenia and Slovakia, where revenue generation increased in recent quarters and corporate savings recovered relative to 2022.

([69]) A low net debt to EBIT measure offset a comparatively high (even compared to the GFC) debt to equity.

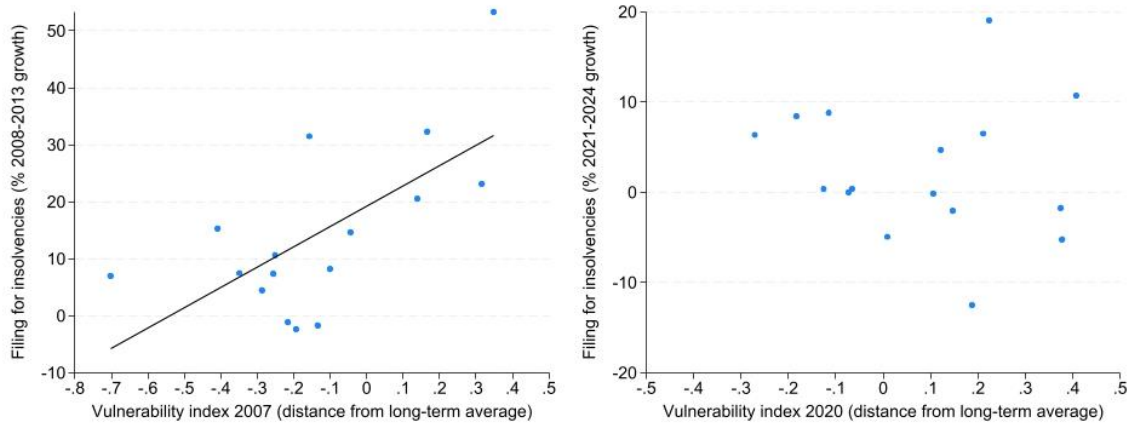
Graph III.4 presents the decomposition of the change in the index for the six largest euro area countries during 2023 and up to 2024 Q3. ([70]) For most countries, risk factors were predominantly associated with weak activity and a deterioration in debt service capacity. The deterioration in debt service capacity was the dominant factor driving up risk in France, Spain and Belgium, among the largest 6 euro area countries. Low profitability contributed more significantly to the increase in the vulnerability index in Italy, Spain and Germany. Worsening activity raised risks in Belgium, the Netherlands and Germany. Sentiment did not contribute significantly to changes in the index for the six largest euro area countries over this period, but it had important contributions for some of the remaining countries as shown in Graph III.6 Annex. ([71])

While the vulnerability index suggests that overall vulnerabilities remain contained compared to historical standards, as shown in Graph III.3, it must be noted that the index comes with an average time lag of three quarters. This means that in 25Q2 the last available index value for all countries is for 24Q3, and this conceals the fact that due to missing data at the sub-indicator level, the index in 24Q3 might be based on fewer sub-indicators. Therefore, any conclusions about the state of the corporate sector, must be carefully assessed in light of this time lag, particularly during episodes which suggest an uptick in risks.

III.4. LEADING INDICATOR PROPERTIES OF THE CORPORATE VULNERABILITY INDEX

An analysis of the leading properties of the vulnerability index conducted over the entire sample suggests that the composite index and its dimensions possess leading indicator properties for some countries, in terms of being informative about non-performing loans or insolvencies. However, this varies considerably across countries and periods. While there is no single indicator or dimension that systematically outperforms others, the index seems to work better in crisis periods.

Graph III.5: **Predictive capacity of the vulnerability index for insolvencies in the Great Financial Crisis (left) and in the COVID crisis (right)**



(1) The vulnerability index is the value taken by the index in the year before the crisis in difference from the country-specific long-term average (2007 and 2020 respectively). Insolvencies are computed as the average growth rate of insolvency filings during the two crisis periods (2008-2013 and 2021-2024 respectively). The p-value of the slope of the regression in the left panel is 0.006 and on the right panel the slope coefficient is insignificant.

Source: Data for filing for insolvencies are from the Allianz Global Insolvency Report. Own calculations

More precisely, leading indicator properties were tested through the correlations of the lagged values of the indicator with outcome variables and through a simple forecast exercise consisting in testing whether

([70]) Data availability allows for building the index for all euro area countries until 2024 Q3. A decomposition of the change in the index for the remaining euro area countries can be found in the appendix.

([71]) As indicated in the previous section, the vulnerability index is measured in standard deviations from long-term averages and therefore must be interpreted relative to the whole time series. The values of the index or the indicators do not contain any information on the level of the indicator. That is, a high reading on the (contribution of the) leverage indicator for a certain country means that in this country the corporate sector is more leveraged compared to its own historical standards. This does not imply that corporates in this country are more (or less) leveraged than in other countries and does not allow us to draw conclusion about the level of NFC indebtedness in this country. This implies that country specificities are imbedded into the construction of the index. However, care must be taken when interpreting the index and risk factors across countries.

including the index into a time series forecasting model helps to improve out-of-sample forecast accuracy for the share of NPLs and bankruptcies. This exercise shows that for some countries, the index seems to have predictive power. Even though there is no model that consistently improves forecast accuracy across countries and/or horizons, the analysis shows that the leading properties tend to be more robust at longer horizons, namely for outcomes 4-quarters ahead, than at shorter horizons, namely for outcomes 1-quarter ahead and that some dimensions (e.g. leverage) seem to be more useful than others (e.g. activity) in this respect.

The absence of a systematic relationship between the index and non-performing loans and insolvencies, for all countries, may be related to non-linearities in the relationship, which may imply that the index could be more informative in periods of crisis. In addition, policy intervention may affect outcomes. Indeed, Graph III.5, panel (a) shows, that there is a highly significant cross-country correlation between the deviation of the vulnerability index from its long-term average just before the crisis (2007) and the average growth rate of insolvency filings during the period of the global financial crisis and EU sovereign debt crisis (2008-2013). However, this correlation disappears during the COVID crisis as shown in Graph III.5, panel (b), when comparing the index (in deviations from the long-term average) in 2020 (at its peak) and subsequent growth in insolvencies. ([72]) Most likely, the absence of a positive correlation is due to the elevated number of measures taken at the EU level and at the member state level, that prevented insolvency filings despite vulnerabilities. ([73])

III.5. CONCLUSION

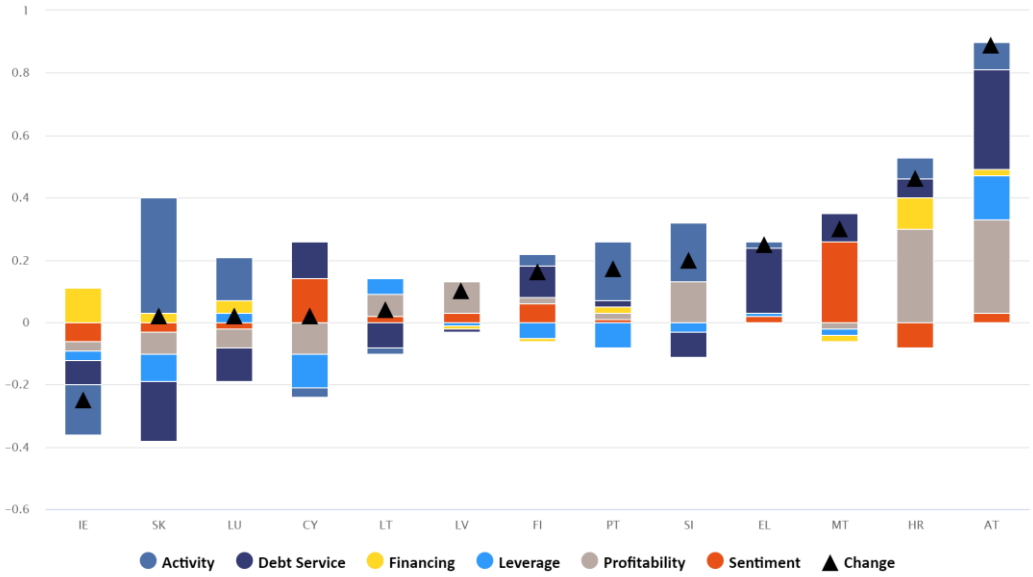
This chapter has presented a composite index of non-financial corporate sector financial vulnerabilities. The index shows that vulnerabilities increased substantially in the euro area during the global financial crisis and the sovereign debt crisis and again during the COVID-19 pandemic. These episodes were temporary and particularly short-lived in the case of the COVID crisis. Corporate financial vulnerabilities in the euro area have increased again starting from the end of 2022, as financing conditions tightened and debt service capacity deteriorated. Weak activity and low confidence have further aggravated risks, while lower indebtedness has provided some relief. Despite an increase in risks along several dimensions, according to the vulnerability index, financial vulnerabilities remain contained relative to historical standards.

([72]) A similar result holds if the value for the index in 2019 is considered and subsequent growth in insolvencies, but the values in 2019 were generally low as vulnerabilities only built up suddenly in 2020, as the shock was truly exogenous. In general, it seems that for years not marked by a substantial deviation of the indicator from its average, the correlation also tends to be low.

([73]) For a discussion of the issue and a list of the measures see Coutinho L., Kappeler A. and A. Turrini (2023), "Insolvency Frameworks across the EU: Challenges after COVID-19", Economic papers 182, DG ECFIN

ANNEX

Graph III.6: **Decomposition of changes in corporate vulnerabilities from 23Q1 to 24Q3 for other euro area countries**



Source: European Commission Calculations based on BIS, ECB, Eurostat.

Table III.1: **Definition of subindicators**

Dimension	Subindicator	Definition
Activity	Sales growth	Gross value added q-o-q growth
	Trade creditors ratio	$\frac{trade\ credit\ liabilities}{gross\ value\ added}$
	Change in accounts receivables turnover	$\frac{\sum_{i=1}^{4} other\ accounts\ rec.flows_{q-i}}{\frac{1}{4}\sum_{i=1}^{4} other\ accounts\ rec.stocks_{q-i}}$
Debt service capacity	Interest coverage ratio	$\frac{Gross\ operating\ surplus}{Interest\ paid}$
	Corporate savings	$100\frac{Gross\ savings - depreciation}{Gross\ value\ added - depreciation}$
	Revenue generation	$\frac{Gross\ value\ added}{Total\ financial\ assets}$
Leverage	Debt-to-equity ratio	$\frac{Debt\ liab.notional\ stock}{Equity\ notional\ stock}$
	Net debt-to-EBIT ratio	$\frac{Total\ debt - nfc\ loans\ to\ nfcs - currency\ deposits}{Gross\ operating\ surplus}$
	Gross debt-to-income ratio	$\frac{Total\ debt - nfc\ loans\ to\ nfcs}{Gross\ value\ added}$
Financing/ rollover	Short-term to long-term debt ratio	$\frac{Trade\ credit\ liab. + st\ loans + st\ debt\ secur.}{lt\ loans + lt\ debt\ secur. + pension\ liab.}$
	Quick ratio	$\frac{Current\ financ.assets}{Current\ financ.liab.}$
	Costs of borrowing	
Profitability	Return on equity	$100\frac{Gross\ operating\ surplus - depreciation}{Total\ equity}$
	Profit margin	$100\frac{Gross\ operating\ surplus - depreciation}{Gross\ value\ added - depreciation}$
	Market to book value ratio	$\frac{Equity\ stock}{Equity\ notional\ stock}$
Economic sentiment	Confidence	(i) manufacturing, (ii) services, (iii) retail
	Financial constraints	Share of firms reporting financial constraints as factor limiting production in (i) services and (ii) industry.

Source: See main text

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. This issue covers developments in the first half of 2025.

On 4 June, the Commission published a Convergence Report that paves the way for Bulgaria to join the Euro. ([74]) Following the approval of the Council and the European Parliament on 8 July, Bulgaria will be the 21st Member State to join the monetary union as of 1st January 2026. Together with the Convergence Report, the Commission has also adopted the proposals for the Council to approve the respective legal texts. The ECB adopted a Convergence Report on Bulgaria. The Eurogroup welcomed the positive conclusions of the Reports ([75]) that confirmed Bulgaria has met all the necessary criteria for euro area membership. The Commission and the Eurogroup have consistently supported Bulgaria's ambition to join the euro area and will continue to work closely with the Bulgarian government on the next steps of the euro accession process. Bulgaria's euro area membership will mark a significant achievement for the country with important benefits for its economy, but will also reinforce the strength, resilience, and voice of the euro area. This also reflects the enduring stability and attractiveness of our common currency.

The Commission's Spring Package of macroeconomic surveillance analysed the key economic and social challenges across the EU and offered policy guidance to Member States with the aim of strengthening competitiveness, prosperity and resilience. ([76]) It includes country-specific recommendations (CSRs), to promote reforms and investments which are aligned with those EU priorities. The policy guidance comes at a time of volatile trade and security environment. It is closely linked to the Competitiveness Compass, ([77]) the Commission's roadmap to boost the EU's resilience and global standing. The package also comprises the first assessment of Member States' progress under the revised economic governance framework and their medium-term fiscal-structural plans. Amid rising security challenges, the national escape clause (NEC) under the Stability and Growth Pact is triggered in a coordinated manner for several Member States, as a follow up to the previous Commission's proposals and discussion by Ministers and Leaders. ([78]) The whole package, and in particular the country-specific recommendations, reflect the scale and urgency of required action, across three key areas: *(i)* fiscal policy, including reforms to increase the effectiveness of tax policy and public expenditure, *(ii)* implementation of the national recovery and resilience plans (RRPs) and cohesion policy programmes, and *(iii)* outstanding and/or newly emerging structural challenges, in line with the Competitiveness Compass. In addition, building on a number of in-depth reviews ([79]) the Commission discussed developments in macroeconomic imbalances: economic developments over the past year have helped ease some imbalances in several Member States, but rising uncertainty in shifting trade context is compounding risks. ([80])

([74]) https://economy-finance.ec.europa.eu/document/download/5ebf870c-1871-4359-a076-25b4dd29ff26_en?filename=ip320_en.pdf.

([75]) https://www.consilium.europa.eu/en/press/press-releases/2025/06/04/bulgaria-has-now-met-all-the-necessary-criteria-for-euro-area-membership-statement-by-the-eurogroup-president-paschal-donohoe/

([76]) https://ec.europa.eu/commission/presscorner/detail/en/ip_25_1388

([77]) https://commission.europa.eu/topics/eu-competitiveness/competitiveness-compass_en

([78]) Under the ReArm Europe Plan/Readiness 2030 presented in March 2025, the Commission proposed activating the national escape clause, underscoring the flexibility of the revised framework to respond to unexpected challenges. This allows Member States to temporarily exceed maximum growth rates of net expenditure to boost defence spending. At the request of 16 EU Member States (Belgium, Bulgaria, Croatia, Czechia, Denmark, Estonia, Finland, Germany, Greece, Hungary, Latvia, Lithuania, Poland, Portugal, Slovakia and Slovenia), the Commission adopted recommendations to the Council for the activation of the national escape clause for 15 of the countries concerned. The Commission will assess the request from Germany together with the German medium-term plan, when the latter has been submitted.

([79]) https://economy-finance.ec.europa.eu/economic-and-fiscal-governance/macroeconomic-imbalance-procedure/depth-reviews_en

([80]) The Commission concluded that Estonia is not experiencing imbalances as vulnerabilities relating to deteriorating price and cost competitiveness and house prices seem to be contained at present. Cyprus is reclassified as 'no imbalances', as vulnerabilities related to external and private debt are receding, partly due to strong economic growth, while government debt is being reduced thanks to continued budgetary surpluses. Germany is also reclassified as experiencing 'no imbalances' as vulnerabilities related to the large current account surplus have declined over the years, and significant policy progress has recently been announced. In the euro area, Greece, Italy, the Netherlands, and Slovakia continue to experience imbalances, as their vulnerabilities remain overall relevant.

The Spring Package concluded the first cycle of macroeconomic surveillance under the revised governance framework. Due to recent formations of the new governments, Lithuania and Austria submitted their national medium-term fiscal structural plans this spring. These plans have been positively assessed by the Commission. (The German plan is to be submitted and assessed in the coming weeks.) Moreover, the Commission assessed progress by each Member States in implementing their medium-term fiscal-structural plans and evaluated compliance by comparing projected net expenditure growth with the ceilings set by the Council. ([81])

The Commission decided on a number of steps in the context of excessive deficit procedure (EDP). It considered that France, Italy, Hungary, Malta, and Slovakia were implementing the corrective path recommended by the Council and that no further steps need to be taken under the EDP for these countries at this stage. At the same time, following the submission of the medium-term plan for Belgium, the Commission recommended a new corrective path. The Commission also prepared a Report under Article 126(3) of TFEU to assess compliance with the Treaty's deficit criterion for four euro area Member States: Austria, Finland, Latvia and Spain. After considering the opinion of the Economic and Financial Committee, the Commission proposed the Council to open a deficit-based excessive deficit procedure for Austria and adopt the appropriate corrective path with a deadline for correction of the excessive deficit by 2028.

In the same day of the publication of the Spring Package, the Commission issued a Communication taking stock of what the RRF has achieved so far and what must be done to bring the RRF to a successful conclusion. ([82]) Aside from important country-specific advancements in areas like renewable energy, digital transition, promotion of education and training opportunities, it has also had important spillover effects across Member States, given the deep integration of EU economies. The Commission provided a clear menu of options to amend Member States' plans and guidance to prepare the final payment requests in 2026. Hence, when revising their plans, Member States can consider options such as scaling up successful measures, establishing financial instruments to boost private investment, splitting RRF projects to continue with national or other EU funds (e.g. cohesion funds), prioritising grants over loans, and reducing oversubscribed plans, use RRF funds to support capital injections into National Promotional Banks, or to contribute to the future European Defence Industry Programme.

By June 2025, €277.8 billion have been disbursed under the RRF to euro area Member States. Disbursements to the Member States under the RRF continued, surpassing half of the total amount of support committed under the RRF for those Member States (EUR 531 billion). Of the total disbursed amount until now, EUR 185.4 billion were in grants and EUR 92.4 billion as loans. In the first half year of 2025, 13 revisions to plans of euro area Member States have been approved by the Council. The changes generally aim to implement better alternatives that reduce the administrative burden and clarify certain procedural elements while ensuring the objectives of the respective RRP measures are met.

Later in June, the Council and the European Parliament reached a political agreement on the reform of the EU's Crisis Management and Deposit Insurance (CMDI) framework. ([83]) This agreement delivers on a key commitment made in the Eurogroup statement of June 2022 on the future of the banking union - to strengthen the EU's framework for managing bank crises and improve the use of deposit guarantee schemes in bank resolution. This is a major milestone needed to further strengthen and complete the banking union, to building a more stable, more resilient, and more competitive financial system for all Europeans.

([81]) In the euro area, Austria, Croatia, Estonia, Finland, Greece, Latvia, Lithuania, and Slovenia are projected to be compliant with the recommended maximum net expenditure growth, considering flexibility under the national escape clause, if relevant. Portugal and Spain were broadly compliant, with limited deviations from their recommended paths. For Cyprus, Ireland, Luxembourg and the Netherlands, the Commission identified a risk of deviation from the recommended maximum growth rates set by the Council.

([82]) https://ec.europa.eu/commission/presscorner/detail/en/statement_25_1417

([83]) https://www.consilium.europa.eu/en/press/press-releases/2025/06/25/bank-resolution-council-and-parliament-strike-deal-to-strengthen-the-eu-crisis-management-framework/

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