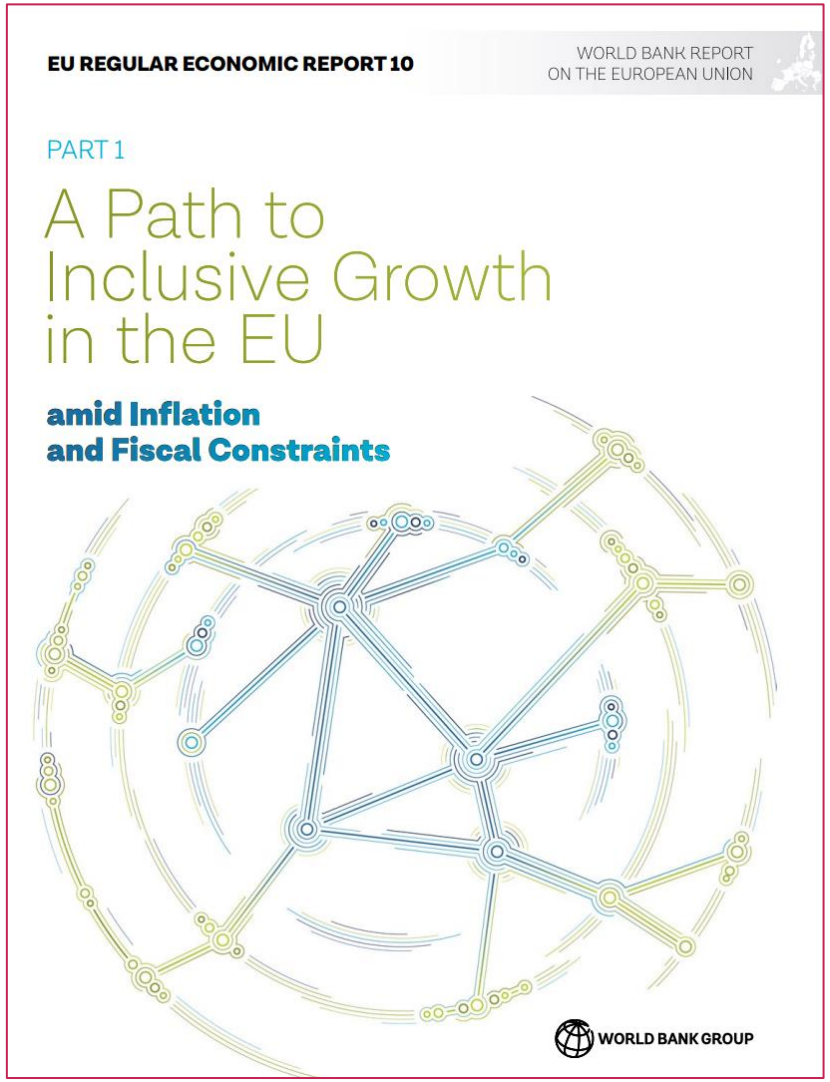
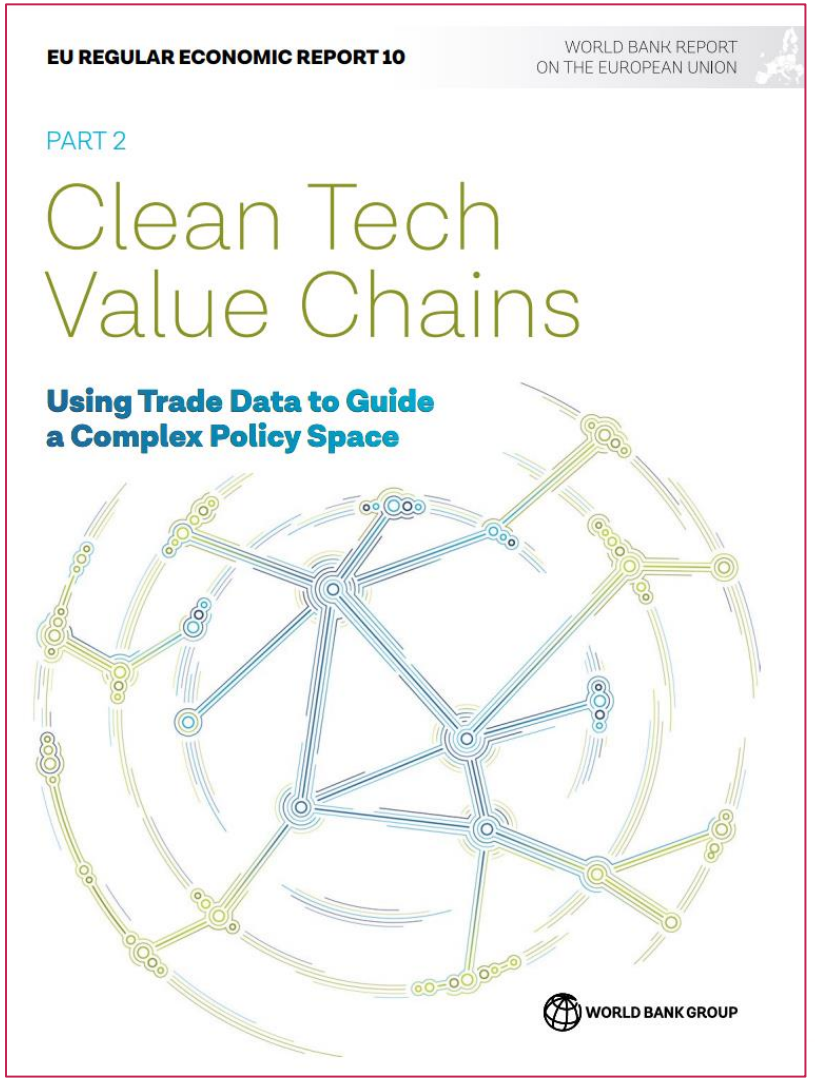
World Bank EU Regular Economic Report – Parts 1 and 2






PART 1

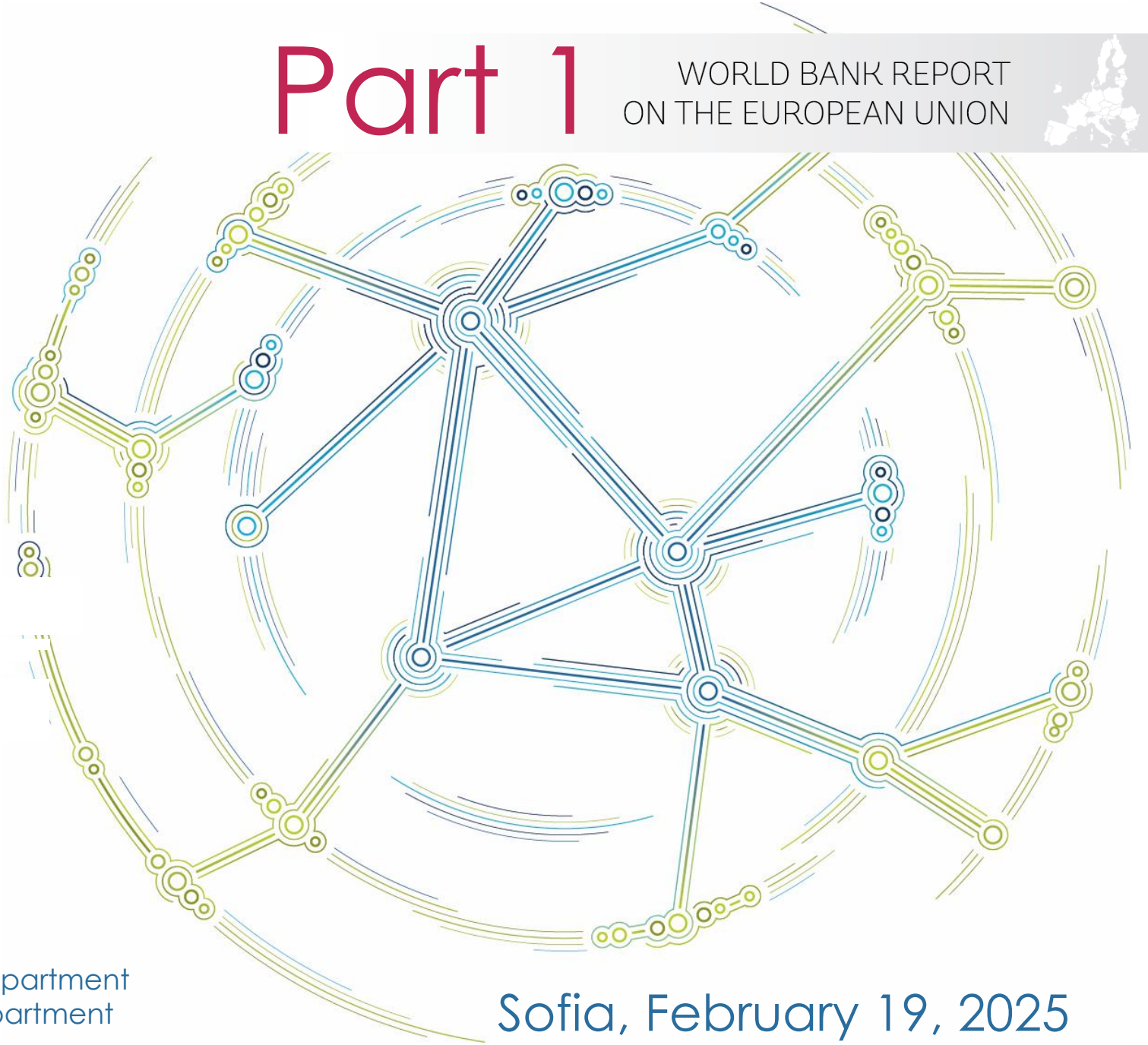
WORLD BANK GROUP

Part 1

WORLD BANK REPORT
ON THE EUROPEAN UNION

A Path to Inclusive Growth in the EU

amid Inflation and Fiscal Constraints



Emilija Timmis, Senior Economist, Economic Policy Department
Monica Robayo-Abril, Senior Economist, Poverty Department

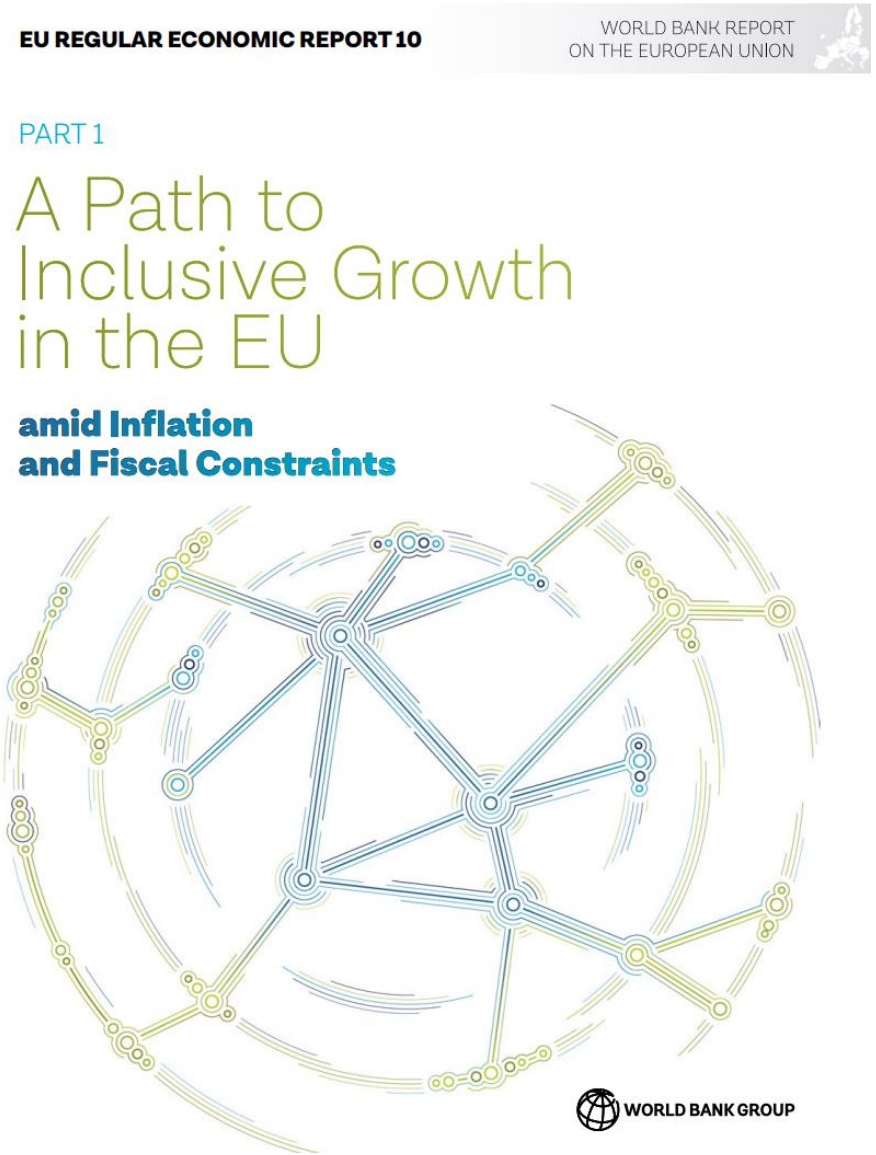
Sofia, February 19, 2025

Outline – Part 1

1. Recent Economic Developments in the EU

2. Recent Labor Market, Poverty, and Inclusion Trends

3. Global developments and Outlook

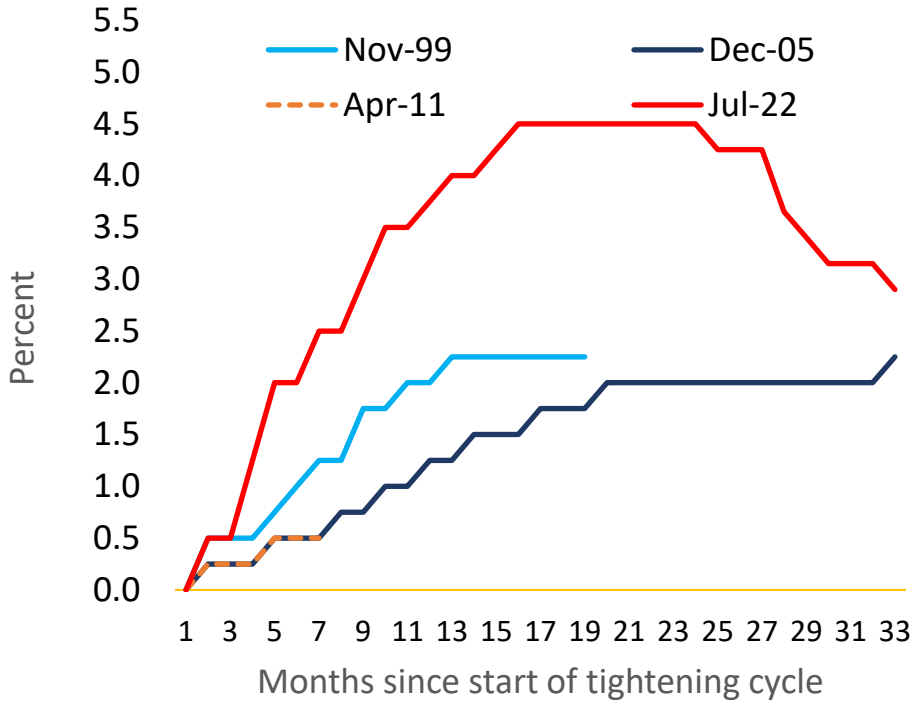


1. Recent Economic Developments in the EU

The EU economy seems poised for a “soft landing”

An unprecedented tightening cycle …

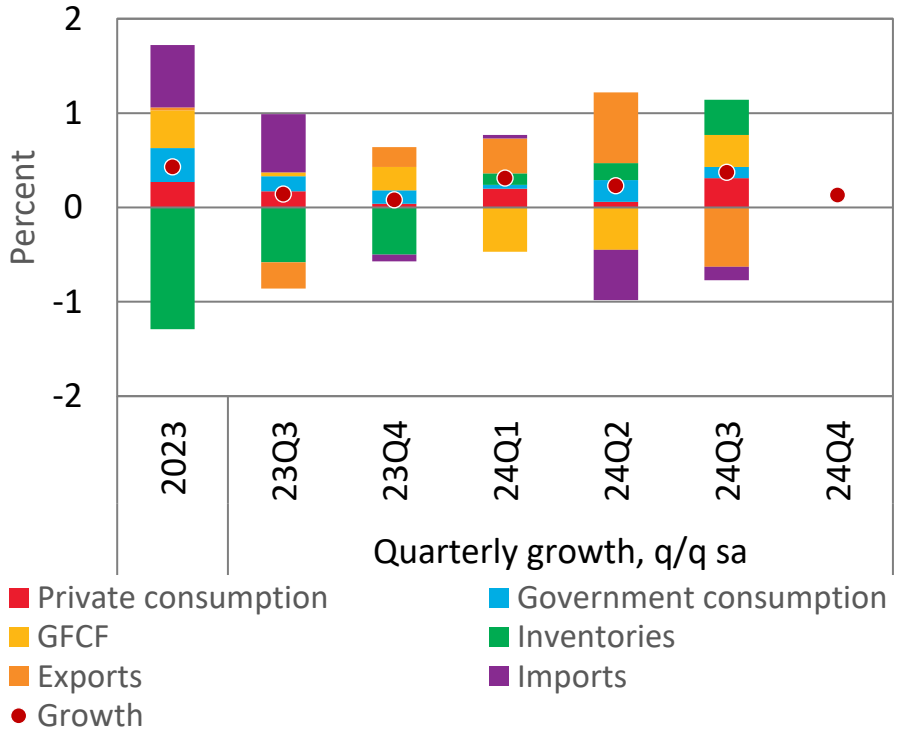
European Central Bank Policy Rate



Source: ECB.

…that avoided both deep recession and widespread job losses

EU GDP growth by expenditure

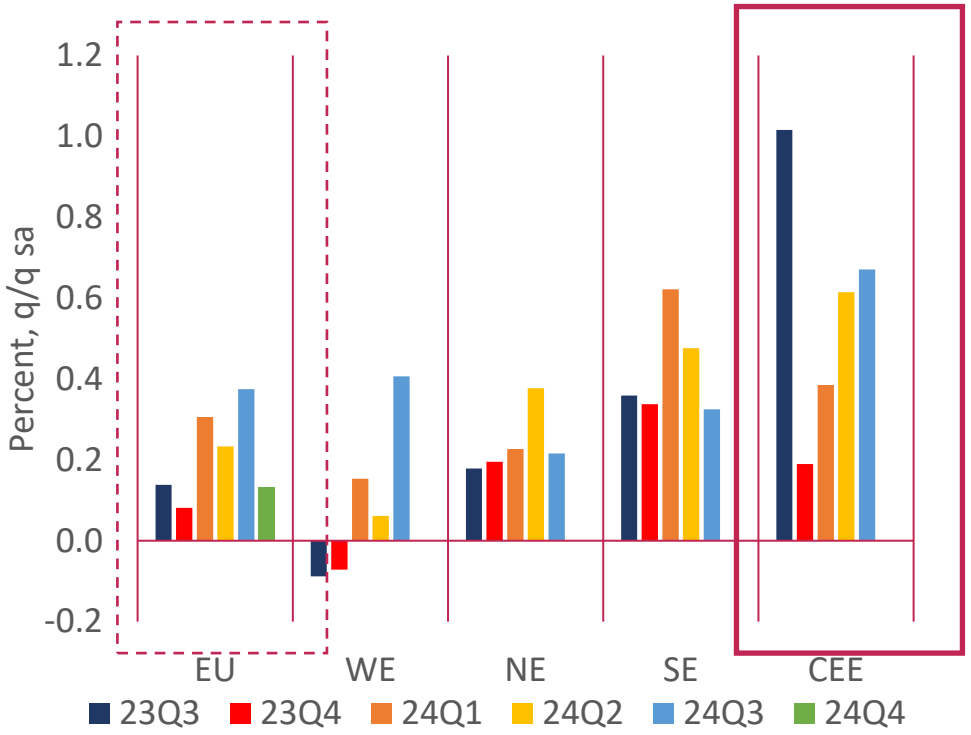


Source: Eurostat.

Growth in the CEEs was particularly resilient, but so was inflation

While the CEEs showcases higher quarterly growth rates throughout the 2024…

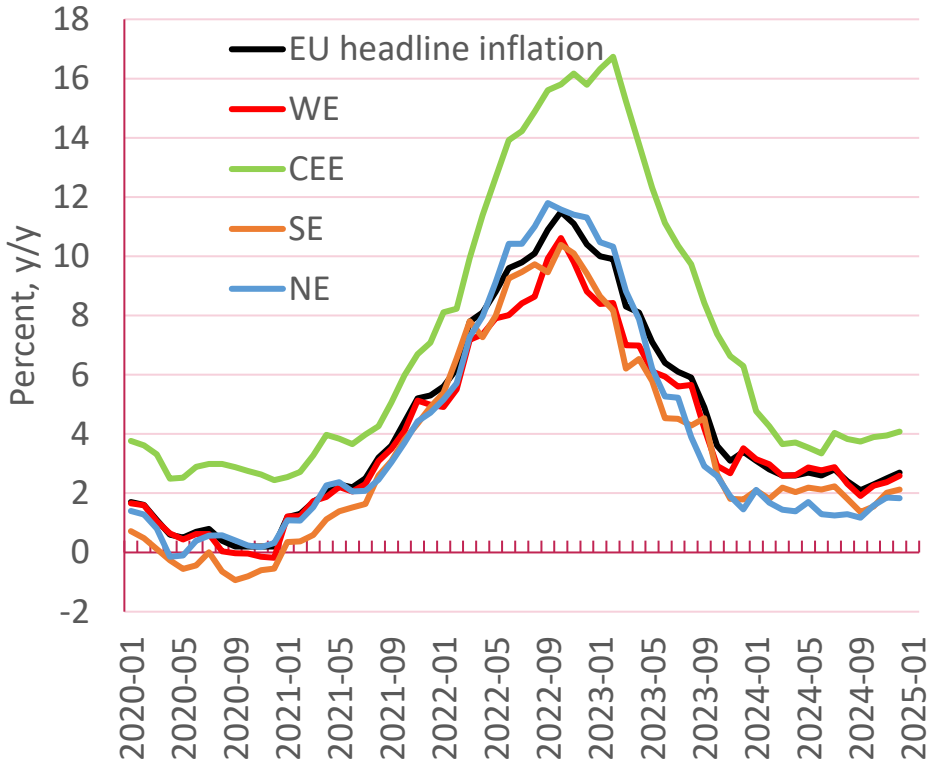
Growth in EU Subregions



Source: Eurostat.

…inflation in the CEEs is systemically above the rest of the EU

EU Headline Inflation by Region

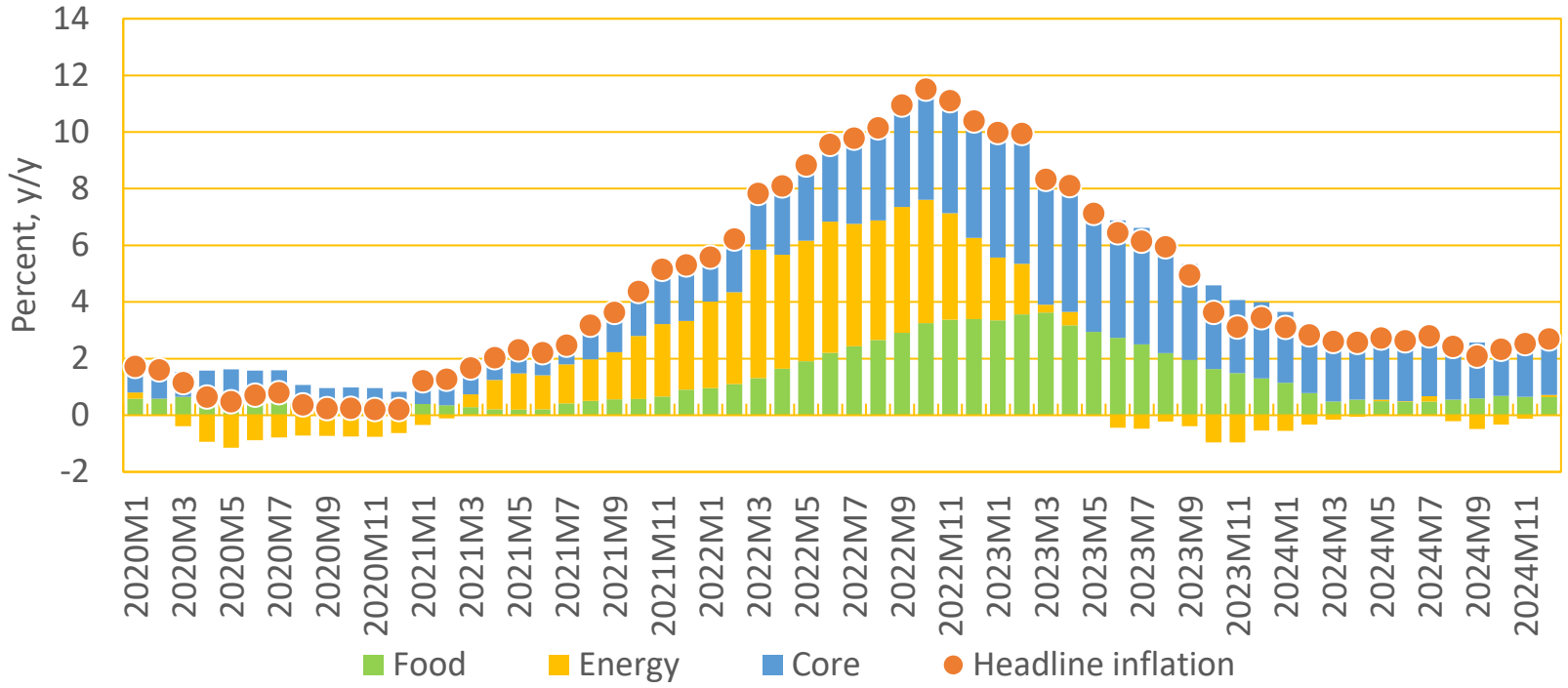


Source: Eurostat and WB calculations based on country weights.

Inflation is inching closer to the target

On average in the EU, inflation has gone down considerably…

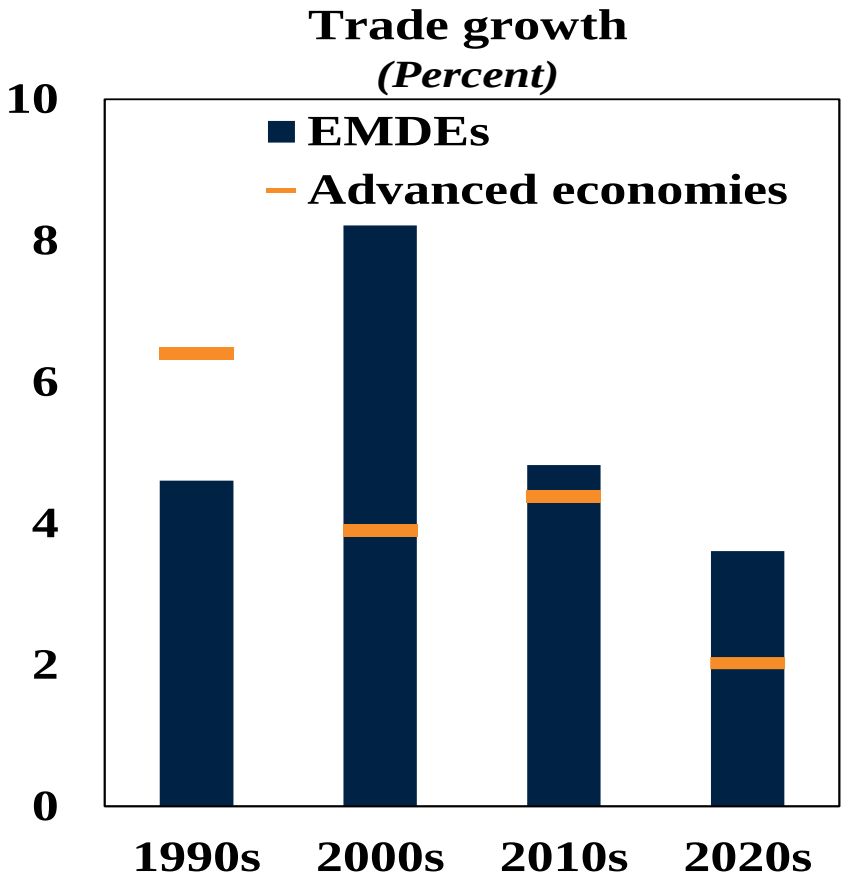
EU Headline Inflation Rate, by Contributor



Source: Eurostat and WB staff calculations.

The trade balances have been improving, but this in part reflects slowing trade, with further uncertainty ahead

Growth deceleration was accompanied by an unprecedented decline in trade

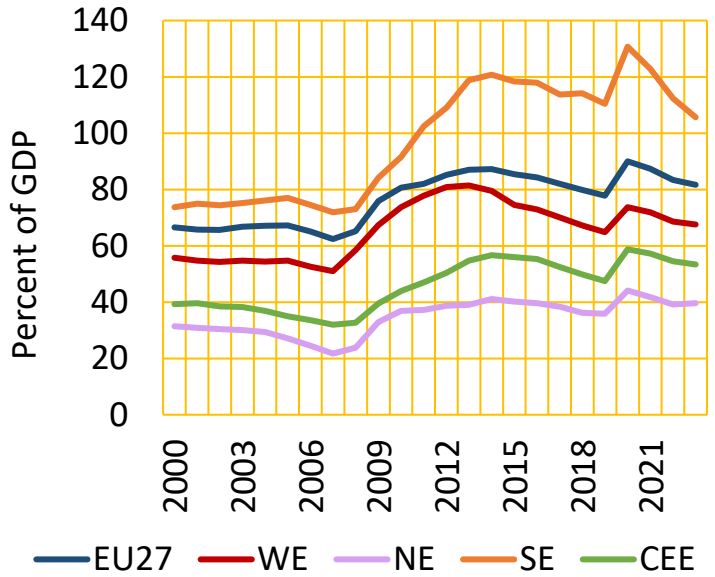


- **Trade volumes declined in 2023 for the first time outside of an annual growth contraction,**
- in part reflecting a slowdown in export growth amid a loss of export competitiveness due to elevated energy prices.
- However, given that imports declined alongside reductions in energy imports, the impact on growth from net exports as a whole was positive due to import compression.
- **There is significant uncertainty ahead**

Increasing debt continues to present risks, and put pressure on the composition of spending

The increases in debt have slowed…

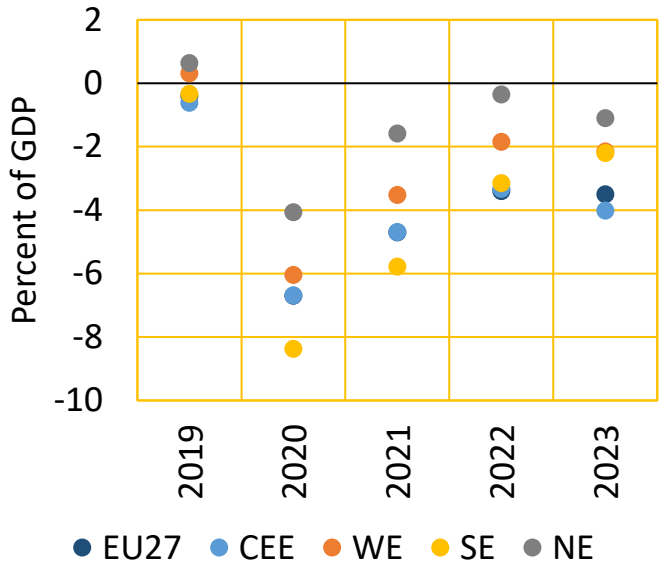
Consolidated Gross Public Debt



Source: Eurostat.

…but fiscal deficits remain across the EU…

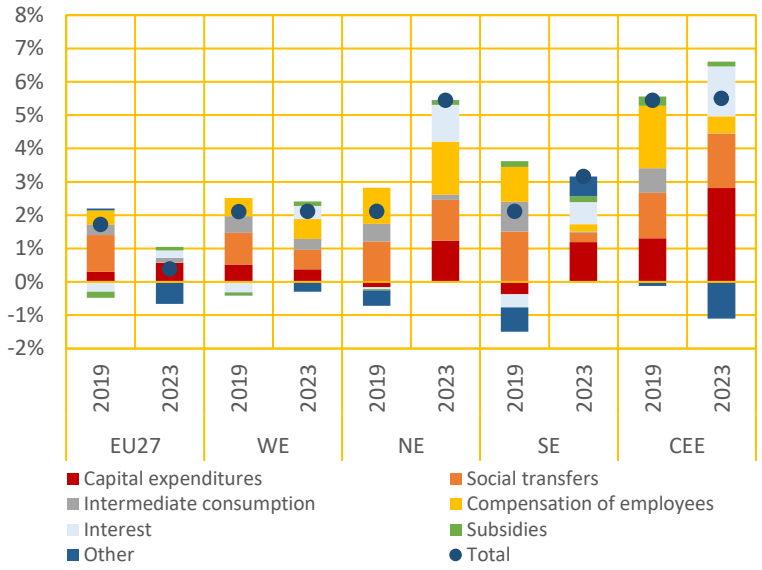
Fiscal Balances



Source: Eurostat.
Note: Unweighted averages.

…with a rising burden of interest rates…

Contributions to Growth in GG Expenditure



Source: Eurostat.

Fiscal consolidation in the EU, after stalling in 2023 and 2024, is poised to gain momentum under the bloc's revamped Economic Governance Framework

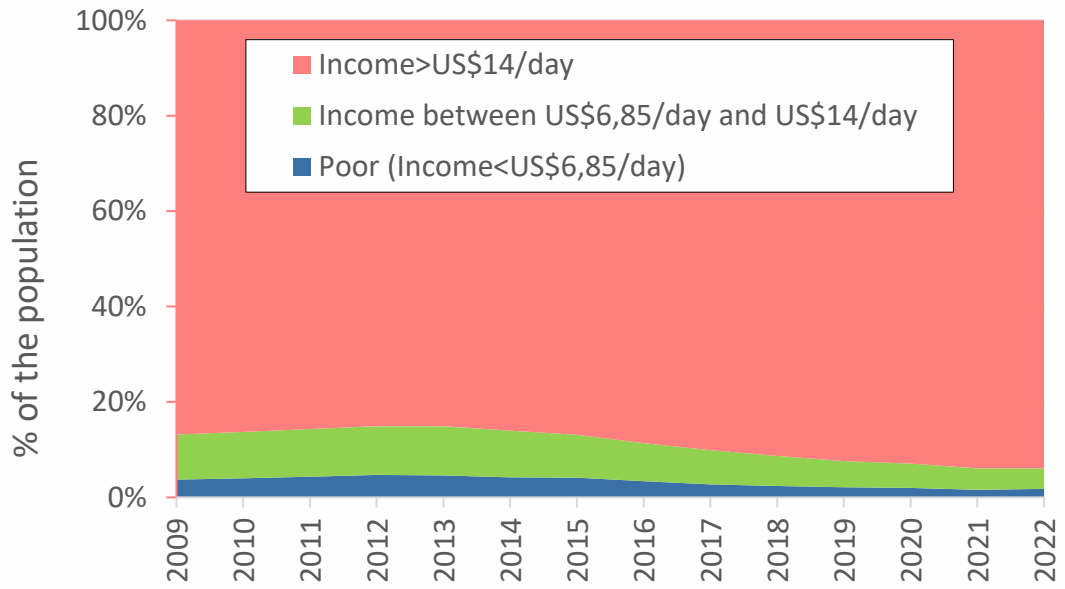
2. Inclusive Growth

Recent Poverty, Labor Market, and Inclusion Trends

Significant Poverty Reduction and Convergence in the EU

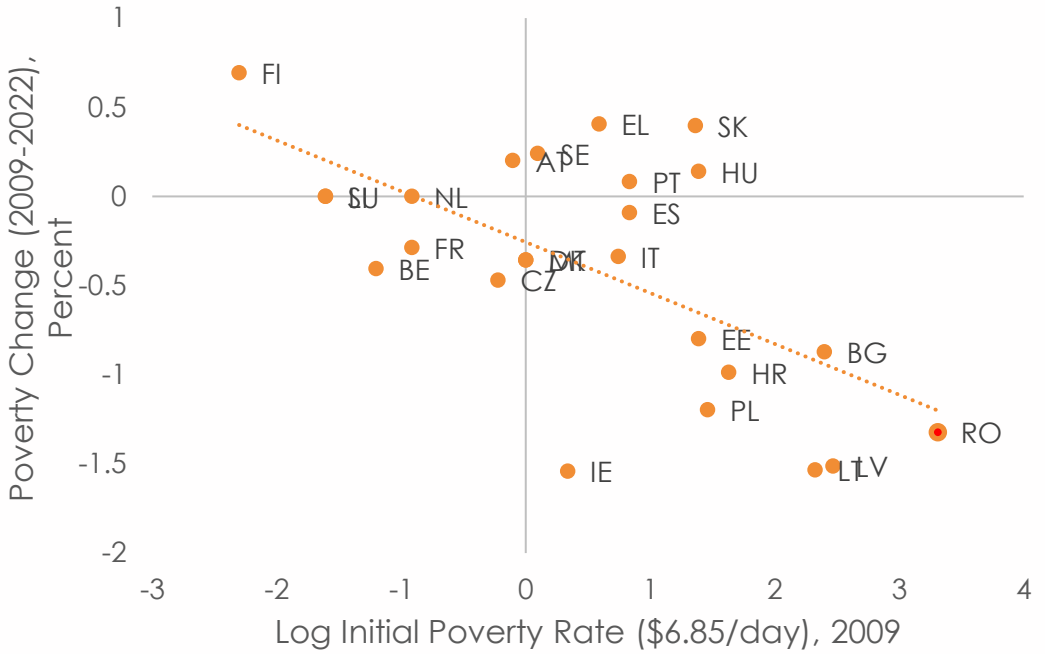
Poverty and Vulnerability Declined in the EU (2009–2022)

- **The poverty rate** (<$6.85/day, 2017 PPP) **dropped from 4% to 2%.**
- **The vulnerable population** shrank **from 10% to 5%.**



Unconditional poverty convergence

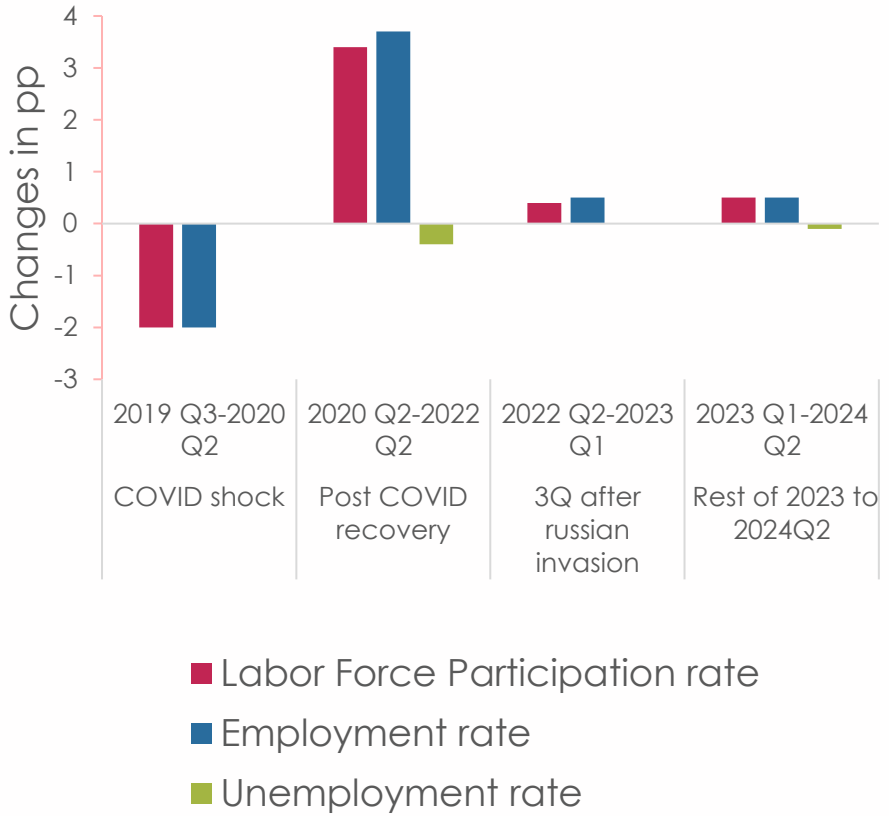
- Countries with **higher initial poverty** often see **faster poverty reduction.**
- Convergence at different rates (e.g., **Romania outpacing Bulgaria**).



Source: EURER10 and World Bank calculation based on EU-SILC 2010 – 2023. The figure excludes Germany. Netherlands is also excluded in 2022

EU Labor Market Resilient to Dual Shocks, But Unequal Employment Recovery

- **Resilience:** EU labor markets showed **strong post-pandemic recovery** with **modest impacts** from the cost-of-living crisis.
- **Asymmetric recovery: Dual shocks** hit **agriculture**, **administrative services**, **accommodation & food services**, and **manufacturing** harder.
- **Disproportionate impacts on less educated and blue-collar workers:**
  - **Less educated** individuals haven't returned to pre-pandemic employment levels, and **employment inequality** is growing.
  - **Blue-collar workers** continue to face **polarized job opportunities**.
- **Youth employment: Young workers** contracted most during the pandemic but **rebounded strongly**.

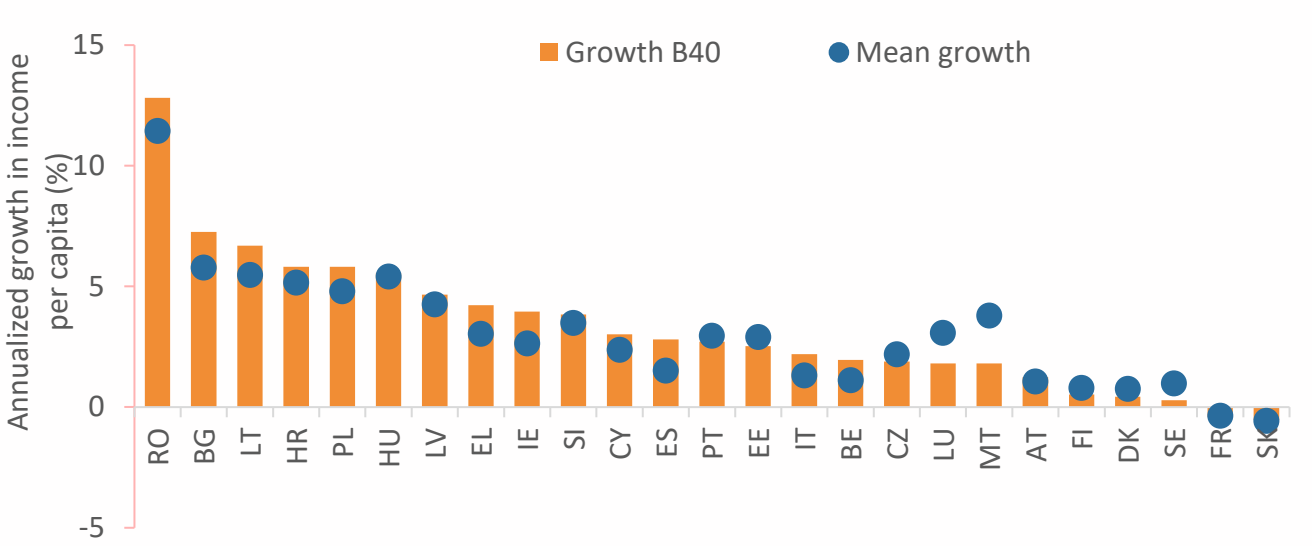


Source: EURER10 and World Bank calculation based on Eurostat.

Bulgaria's Inclusive Growth in Focus: Comparing with EU and CEE Trends

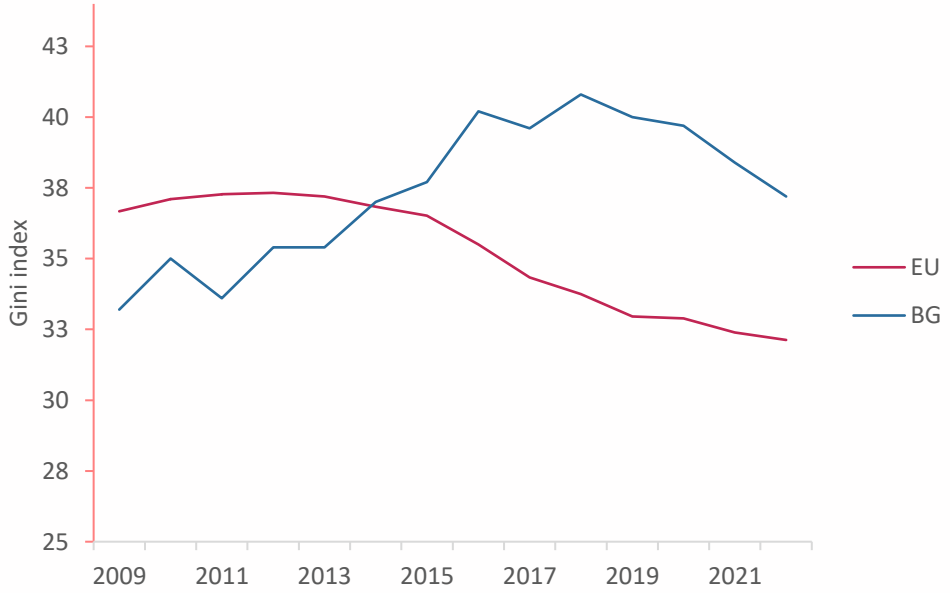
Bulgaria Experienced Fast Poverty Reduction and Income Growth among B40

- Bulgaria experienced **fast poverty reduction** compared to other countries in the region: the poverty rate (<$6.85/day, 2017 PPP) fell from 10.4 to 4.6 percent between 2016 and 2022.
- Like most EU countries, Bulgaria witnessed **substantial income growth** among the less well-off



Bulgaria's Income Inequality Recently Declined, but It Is Still Above the EU

- Bulgaria's Gini index **increased** from 33 to 37 between 2009 and 2022. Highest inequality in EU
- In contrast, in the EU the index fell from around 37 to 32 over the same period.

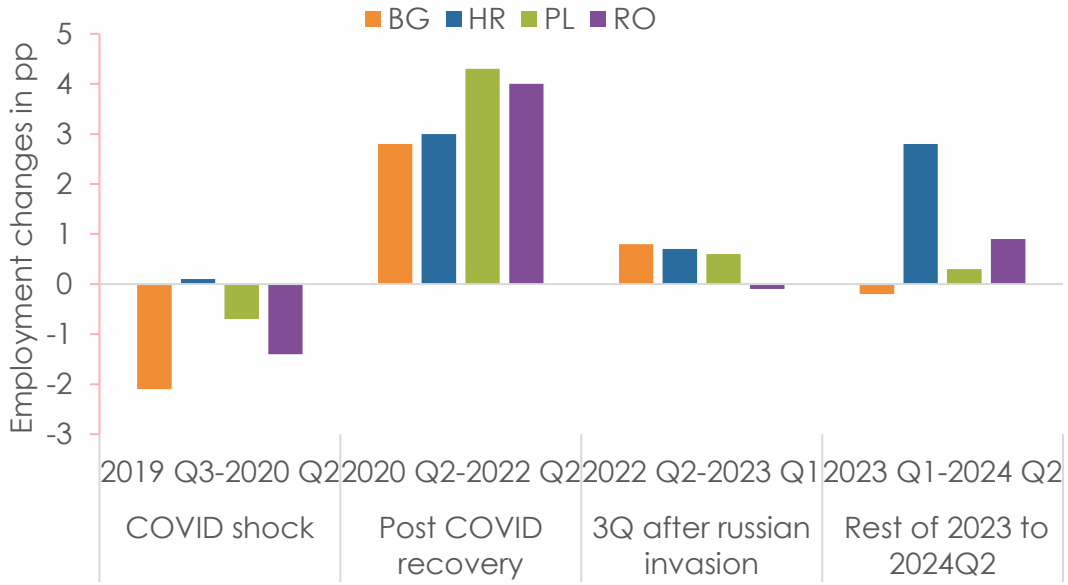


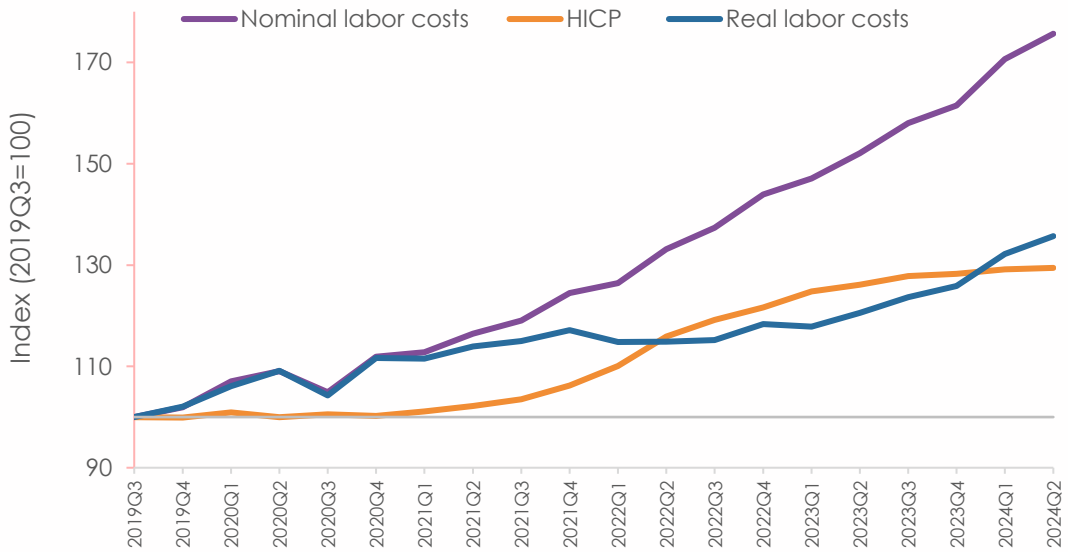
Source: EURER10 and World Bank calculation based on EUSILC 2010-2023.
Note: The Gini index is based on the adult equivalent disposable income, after correcting for negative values, for the EU27, excluding Germany. The 2022 estimate also excludes the Netherlands. A Gini index equal to zero means perfect equality, while a Gini index equal to 100 means complete inequality.

The Bulgarian labor market has shown resilience to dual shocks, with strong employment rebound and rising Real Wages

- In line with the EU, Bulgaria labor markets proved resilient amid COVID-19 and the energy crisis, with **strong post-pandemic employment recovery** and limited short-term and muted impacts more recently from the cost of living crisis

- **Positive real Wage growth in Bulgaria -** In contrast to the EU average- driven by **tight labor markets**, firm demand, and rising employment among highly educated workers.



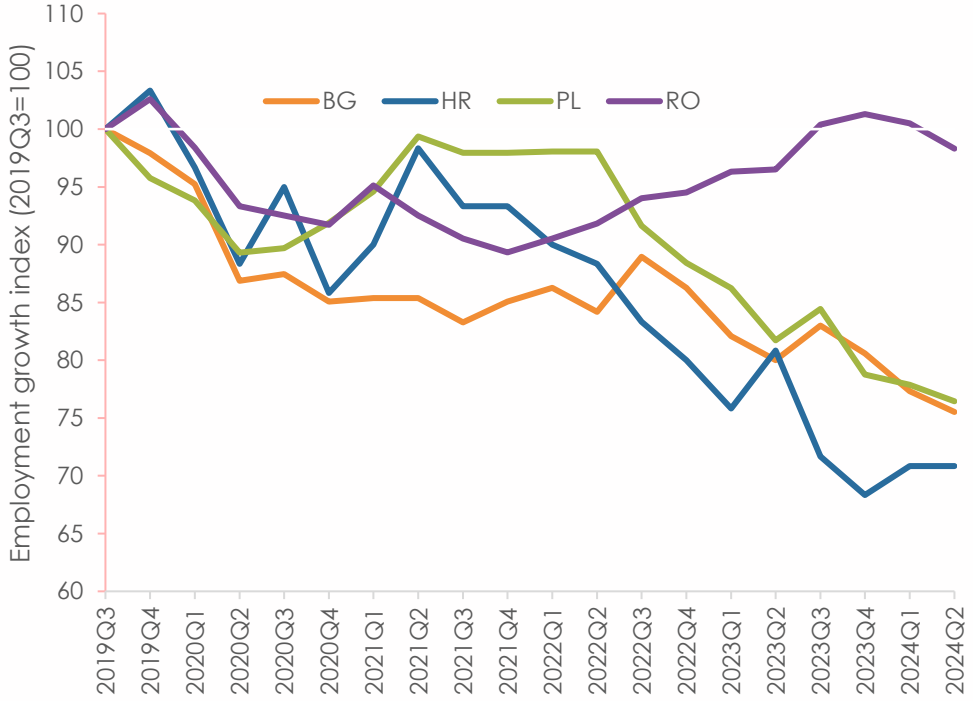


Source: EURER10 and World Bank calculation based on Eurostat. Participation and employment rates are calculated for individuals aged 15 to 64, while unemployment rates are determined for individuals aged 20 to 64. These figures are derived from the seasonally adjusted Labor Force Survey series.

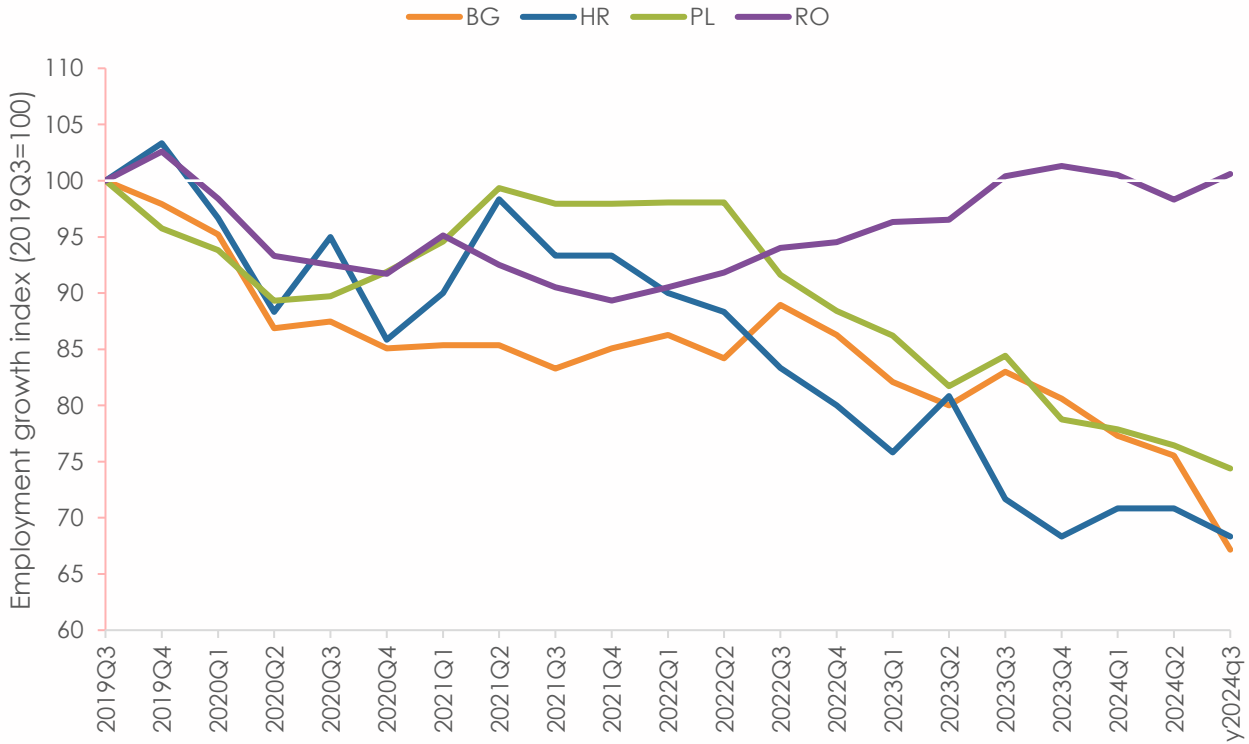
Note: The real labor costs are constructed by deflating the labor cost index with the HICP index. This index assumes a consumer basket that is representative of the entire EU. Labor costs refer to wages and salaries in the sectors of services, industries, and construction. Labor costs are seasonally and calendar adjusted. Source: Eurostat (lc_lci_r2_q and prc_hicp_midx), 2019Q3-2024Q2.

Heterogenous Recovery: In Line with the EU, Disproportionate employment impacts on less educated and blue-collar workers in Bulgaria

- Bulgaria's **least educated** have not returned to **pre-pandemic employment** levels.
- This is **in line with EU trends**



- Another dimension of the **unequal employment recovery** is the polarization of job opportunities with **low skill blue-collar worker**s falling behind.
- This is **in line with EU trends**



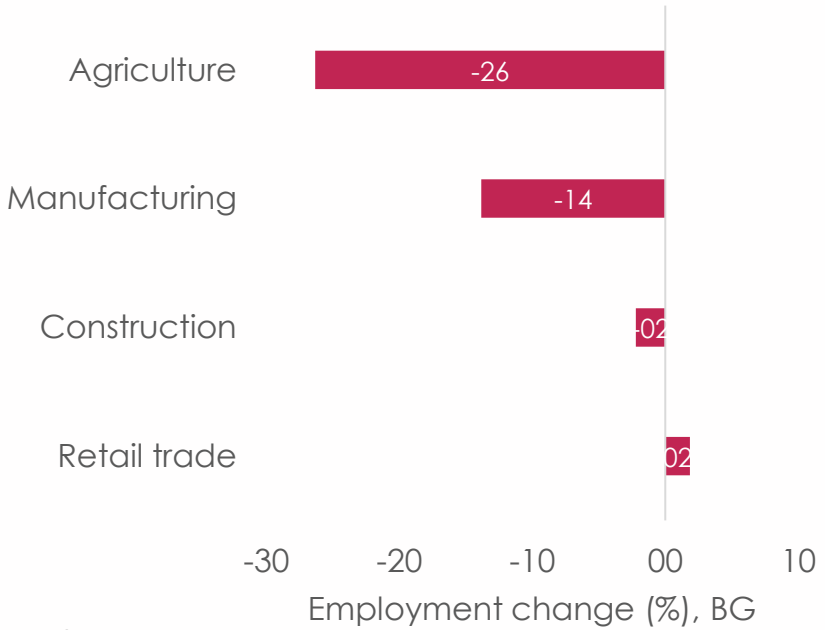
Source: EURER10 and World Bank calculation based on Eurostat.

Note: Employment for individuals between 15 and 64 years. The least educated are those with less than primary, primary, and lower secondary education. These statistics are based on seasonally adjusted LFS series.
Source: Eurostat (lfsi_educ_q), 2019Q3-2024Q2.

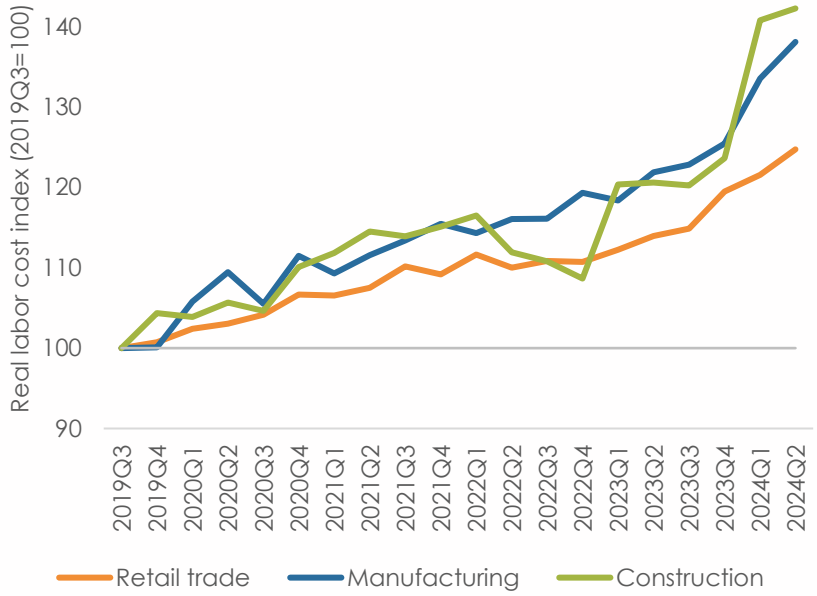
Sectoral Shifts Hurt Bottom 40% of Households in Bulgaria, similarly to other CEE Countries

- In 2022, the **working poor (B40)** in Bulgaria were predominantly concentrated in a few **key sectors…**

…So employment decline in key sectors (**agriculture, manufacturing and construction**) since 2019 disproportionately affects the poor in Bulgaria.



- …though these sectors have **rapid real wage growth** (retail, manufacturing , and construction).
- **Rapid Minimum Wage** increases can also play a role at the bottom.

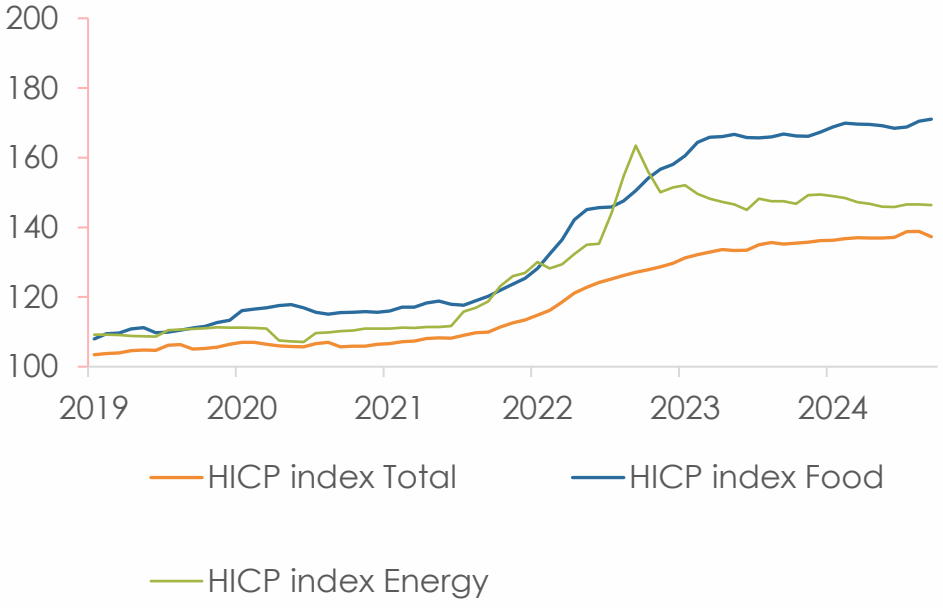


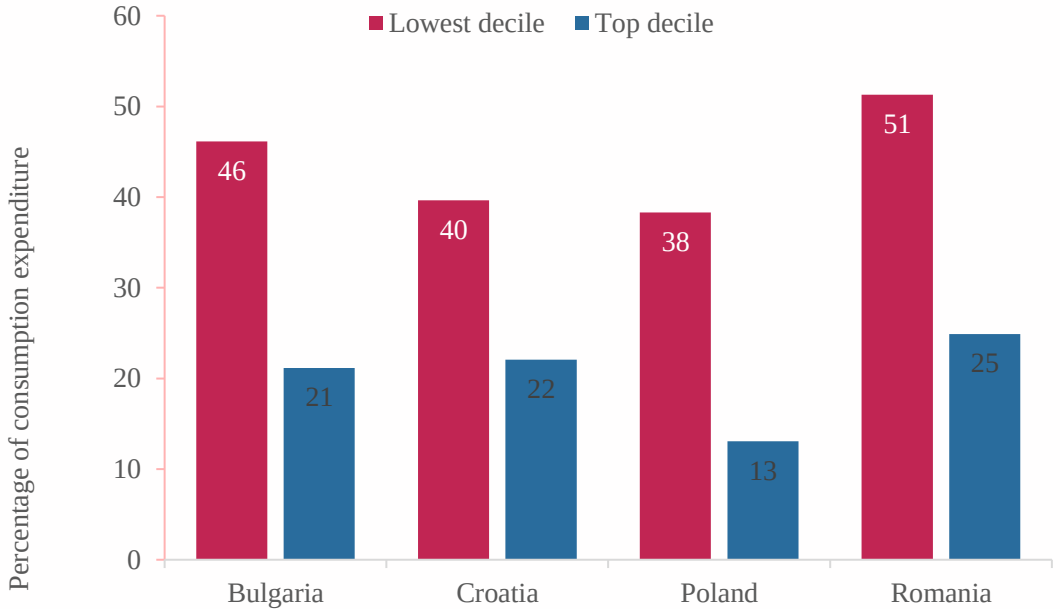
Source: EURER10 and World Bank calculation based on EU-SILC 2023 and Eurostat.

Note: The real labor costs are constructed by deflating the labor cost index with the HICP index. This index assumes a consumer basket that is representative of the entire EU. Labor costs refer to wages and salaries in the sectors of services, industries, and construction. Labor costs are seasonally and calendar adjusted. Source: Eurostat (lc_lci_r2_q and prc_hicp_midx), 2019Q3-2024Q2.

Cost-of-Living Crisis Intensifies Burden on Poorest Households...

- After the **economic rebound** in 2021, **food prices** in Bulgaria **increased substantially**—over 42 percent—between September 2021 and September 2024, similar to other CEE countries.
- Despite the **recent reduction in food inflation**
  - Current price levels remain **historically high**, making it a critical issue for the poor.
  - Food inflation can affect **the less well-off relatively more**, given consumption patterns.
  - Despite declining headline inflation in 2024, **domestic price pressures in the EU remain strong.**



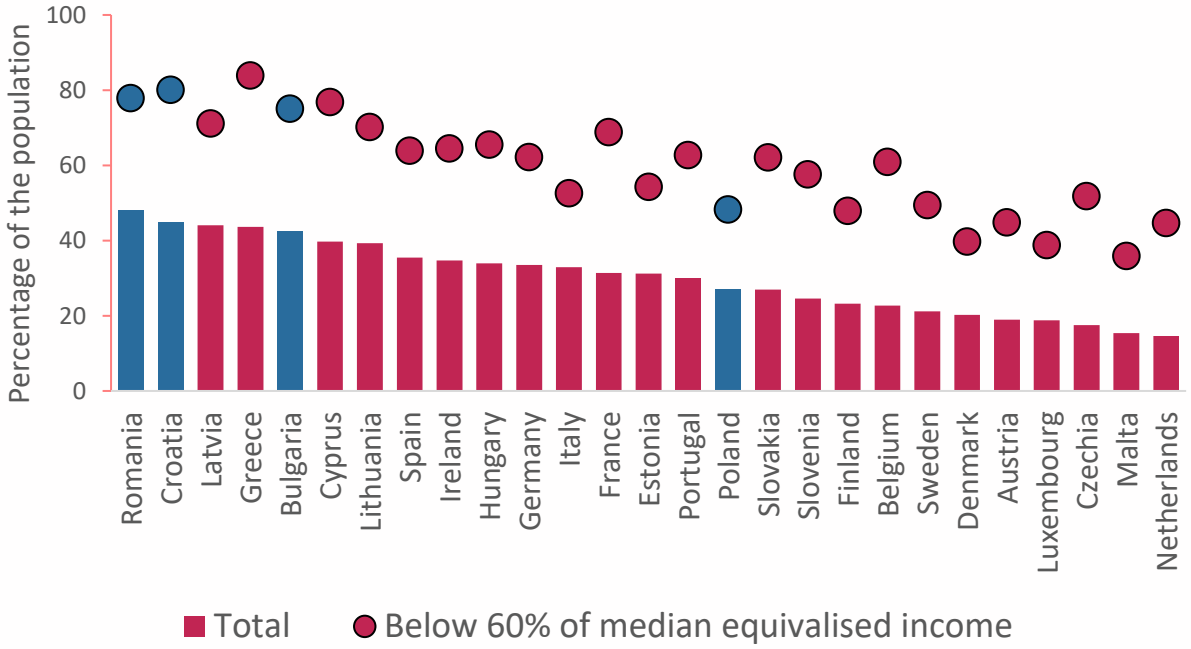


Source: Left Graph: EURER10 and World Bank calculations based on Eurostat (prc_hicp_midx), 2019M1-2024M9. The HICP Food is COP01, and HICP Energy is COP045. Right Graph: World Bank calculations using harmonized HBS data.
Note: Years are: Bulgaria 2019, Croatia 2017, Poland 2019, and Romania 2019.

Households Struggle to Safeguard Against Price Fluctuations and Food Inflation Likely Pushed Vulnerable Households into Poverty

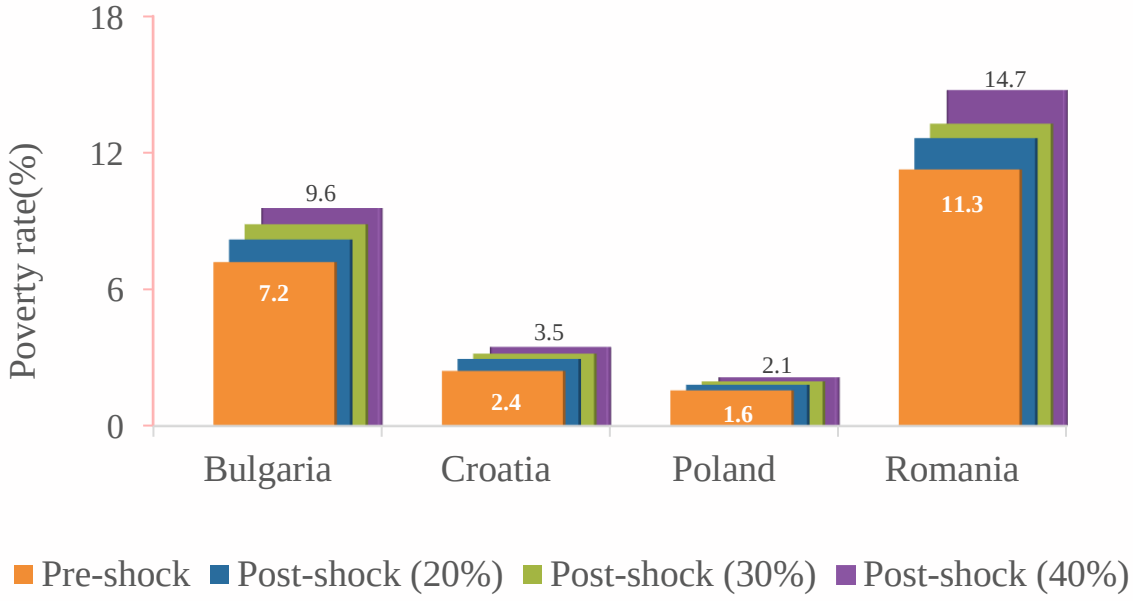
- In Bulgaria, **over 40% of households** expressed their **inability to manage unforeseen expenses**.
- The situation is **more dire** for those with **lower incomes**.

Inability to face unexpected financial expenses, 2022



- Microsimulations reveal food inflation is expected to have pushed a non-negligible **share of the vulnerable into poverty.**
- A hypothetical **food price hike of 20%** can lead to an increase in poverty rates of **1 pp** in Bulgaria.

Simulated poverty rate levels due to food inflation, US$6.85 poverty line (2017 PPP)



Source: Left: EURER10 based on Eurostat (ILC_MDES04), 2022. *Right: W*orld Bank staff simulations based on HBS-2019 and EUSILC-2020 for Bulgaria and Romania, while for Poland is based on HBS and EUSILC of 2019 and for Croatia is based on HBS-2017 and EUSILC-2020 surveys. *Note:* Welfare is estimated in U.S. dollars using 2017 PPPs in all countries. "Pre-shock" refers to poverty rates before food prices increase, and "Post-shock" refers to a simulated poverty rates after food price increases of 20 percent, 30 percent, and 40 percent. The figure does not assume government support.

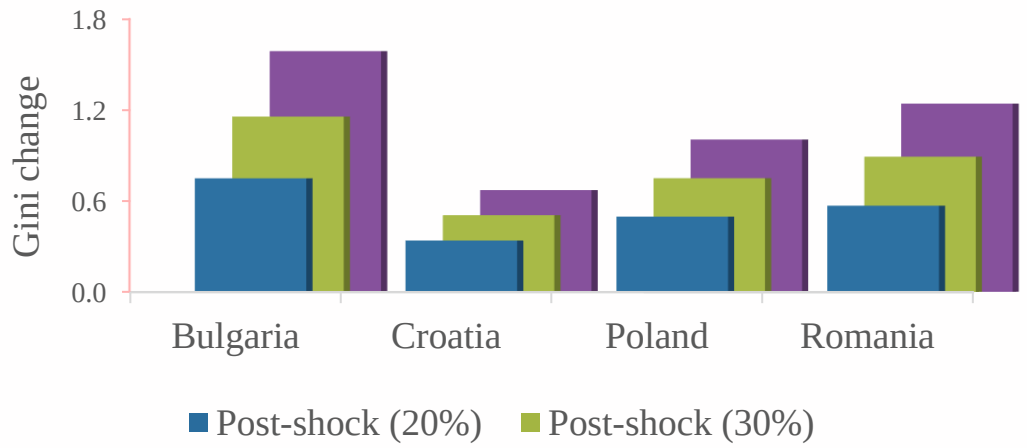
Rising Food Prices expected to Worsen Income Inequality, But Expansion of Social Assistance Can Alleviate Unequal Impacts

Estimated Impacts on Gini

Income inequality is expected to **increase** in the absence of government measures. A hypothetical 20% price hike in Bulgaria would increase the Gini index by 0.75.

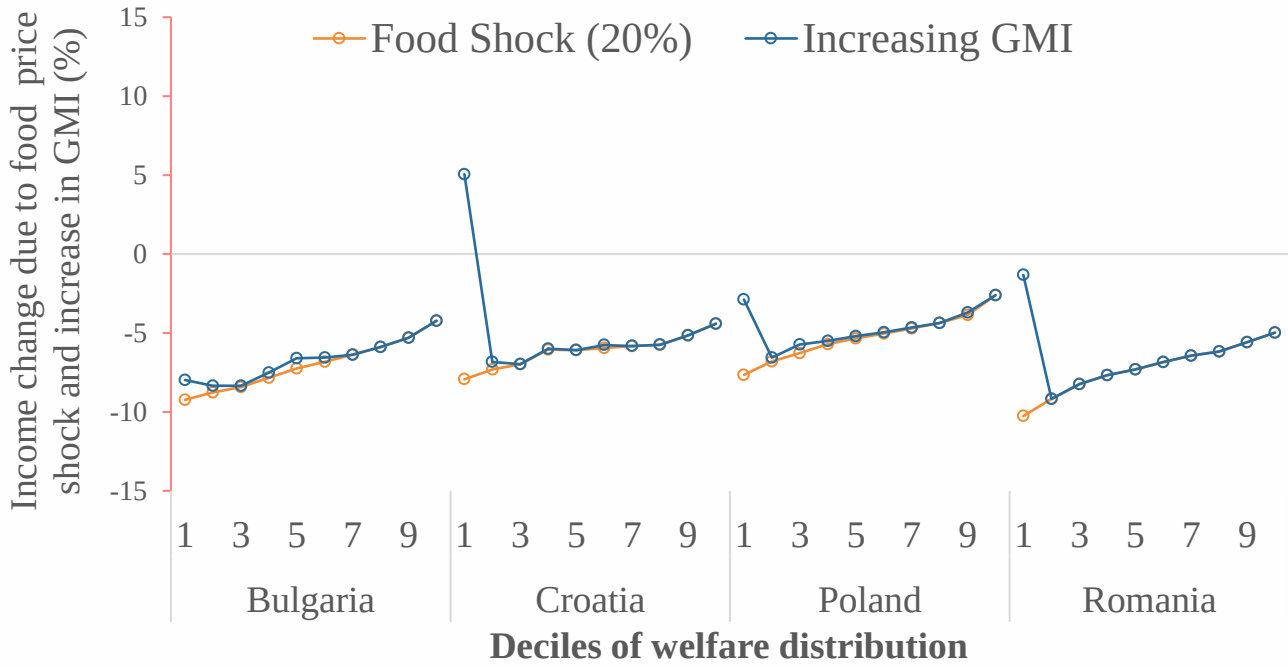
This results from an **asymmetric impact on welfare** across the entire income distribution.

Simulated changes in the Gini due to food inflation shock



Policy Simulations

Expanding benefit generosity of the social transfers (GMI) serves as a coping measure to mitigate the income reduction experienced by the **less well-off.**



*Source: Source: W*orld Bank staff simulations based on HBS-2019 and EUSILC-2020 for Bulgaria and Romania, while for Poland is based on HBS and EUSILC of 2019 and for Croatia is based on HBS-2017 and EUSILC-2020 surveys. *Note:* Welfare is estimated in U.S. dollars using 2017 PPPs in all countries. "Pre-shock" refers to poverty rates before food prices increase, and "Post-shock" refers to a simulated poverty rates after food price increases of 20 percent, 30 percent, and 40 percent. Expansion of GMI generosity by 50%

CEE Countries Implement In-Kind Support and Tax/Non-Tax Measures to Protect households and firms from Rising Prices

Policy Response: Several EU countries implemented in-kind support (e.g., food vouchers) and tax/non-tax measures (e.g., reduced VAT, energy price caps) to protect households and firms from rising food and energy prices.

- **Romania**
  - Launched *Support for Romania* program **food vouchers** to offset rising food costs (June 2022).
  - **Energy Price capping scheme** (effective until April 2025).
- **Bulgaria**
  - Increased monthly ceiling for **tax-exempt food vouchers** from BGN 80 to BGN 200 (start-2022) and encouraged more employers to offer food vouchers as a fringe benefit.
  - Introduced **electronic meal vouchers** under Corporate Tax Law amendments (Jan 1, 2024).
  - Implemented **energy relief measures**, including tax reductions, subsidies, VAT cuts, and energy price caps.
- **Croatia**
  - **Capped electricity and gas prices** (2021), expanding measures in 2023.
  - **Reduced VAT on energy** products and **lowered fuel excise duties**.
  - Expanded **social benefits** for disadvantaged groups.
  - Imposed an **export ban on natural gas** to secure domestic supply.

Source: EURER10

Policy Effectiveness: Household Resilience Relies on Mitigating Rising Food and Energy Prices

Fiscal incidence analysis in the four countries shows that some policy measures **help maintain living standards** in inflationary environment, but **vary in effectiveness**.

Targeting Challenges in Romania & Croatia

- **Preferential VAT rates** in Romania and Croatia **reduce poverty** but disproportionately **benefit wealthier households**.

Coverage Challenges:

- Expanding social transfer programs like the Guaranteed Minimum Income (GMI) to newly impoverished groups **remains a challenge.**

Energy Subsidies in Bulgaria and Romania

- **Implicit electricity subsidies** in Bulgaria are large and reduce poverty but **not well-targeted,** so they have minimal impact on inequality reduction (Robayo and Cabrera, 2024).
- **Implicit energy subsidies** in Romania increased purchasing power but **lacked progressivity**.

Food Vouchers & In-Kind vs. Cash Transfers

- **Effectiveness of food vouchers** in Romania and Bulgaria **remains unevaluated.** Global evidence shows mixed results:
  - **Cash transfers** allow **flexibility** but may raise local food prices.
  - **In-kind transfers** protect against price volatility, especially for food-insecure households.
- Cash recipients typically maintain nutritious diets without misuse, questioning the need for in-kind aid.

Source: EURER10

Targeted Social Safety Nets and Adjustments to Social Protection Systems Are Crucial for Mitigating the Impacts of Food and Energy Inflation

- **Targeted Social Safety Nets Mitigate Food Inflation Impacts**
  - **Fiscal** constraints require **cost-efficient, well-targeted interventions** to maximize impact.
  - Expanding **well-targeted** social assistance programs offsets income losses for low-income households (see microsimulations) and **limit negative impacts of inflation on inequality**. Tend to be more effective than universal or untargeted programs.
- **Adequacy of programs and better links to consumption basket**
  - In addition to enhancing targeting mechanisms, addressing **restrictive eligibility thresholds**, and **linking programs to absolute poverty measures** are potential improvements.
- **Adjusting Social Protection & Tax Systems for Inflation is Essential**
  - Delayed or **infrequent benefit updates** weaken support during inflation spikes.
  - Fixed tax thresholds without inflation adjustments can **increase tax burdens** unintentionally.
  - **Regular indexation** ensures purchasing power and **social support keep pace** with rising prices.

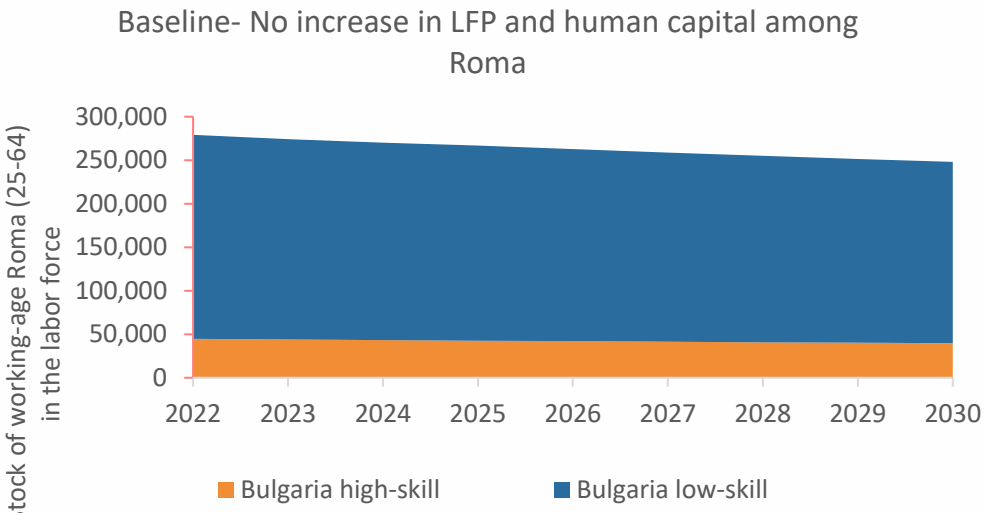
Source: EURER10

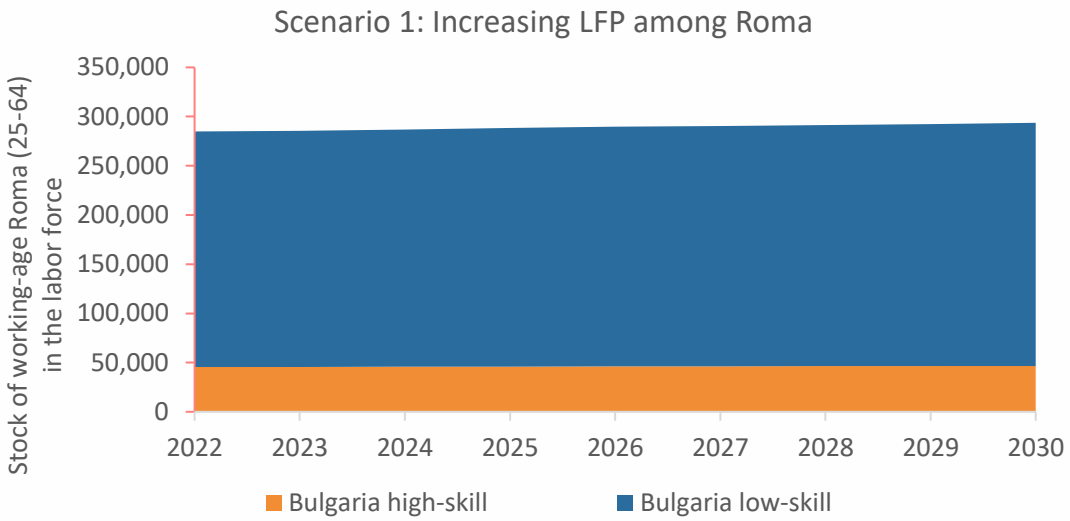
Strengthening Social Protection and Financial Inclusion to Support Vulnerable Groups

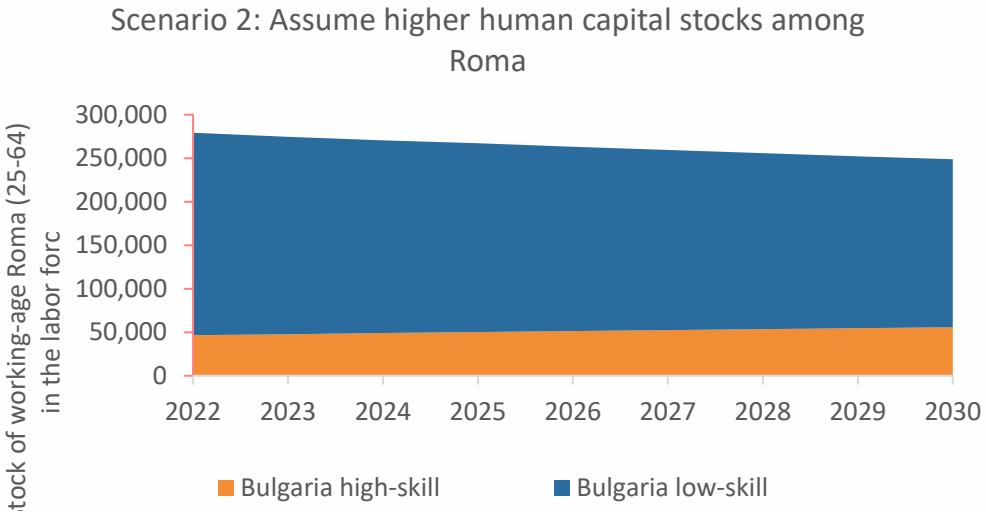
- **Good examples of recent Country-Specific Social Protection Reforms**
  - **Romania:** Introduced Minimum Inclusion Income (VMI) and raised the Social Reference Indicator (SRI), increasing benefits for families with children and the unemployed.
  - **Bulgaria:** Expanded social support by indexing benefits to changes in the relative poverty line but faces constraints from restrictive eligibility thresholds.
  - **Poland:** Focuses on non-means-tested benefits, limiting redistributive effects and highlighting coverage gaps for the working poor.
- **Other Non-Social Protection Measures are also important - Advancing Financial Inclusion**
  - Providing tools for low-income households to manage finances and smooth consumption can help cushion economic shocks.

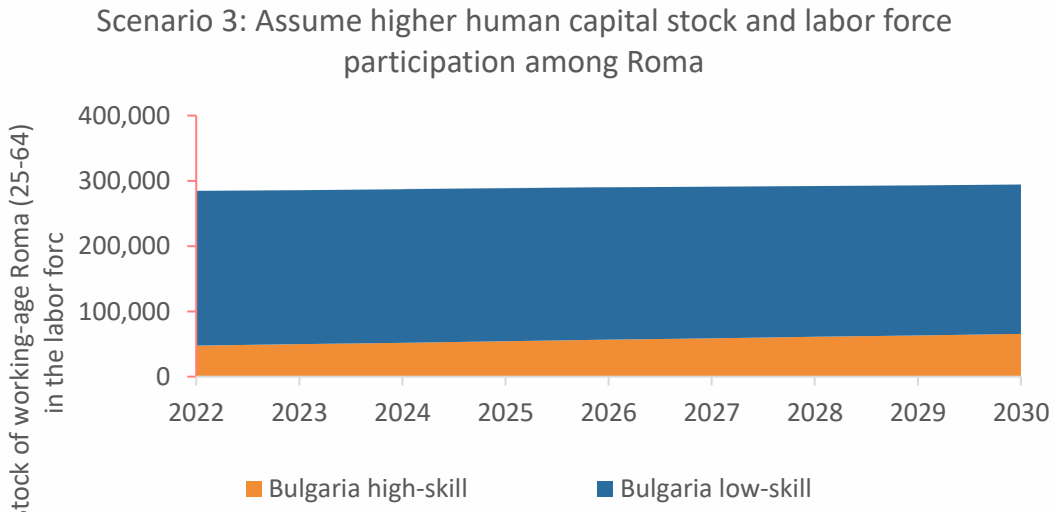
Source: EURER10

Policy: A potential increase in workforce participation among the Roma population in Bulgaria is beneficial from an inclusion perspective and for the aggregate economy









Source: Forthcoming EURER10 and own estimates based on Bulgaria, 2021 National SILC (2020 Income year). Low-skill is defined as having a primary education or less, while high-skill is defined as having a secondary education or more.

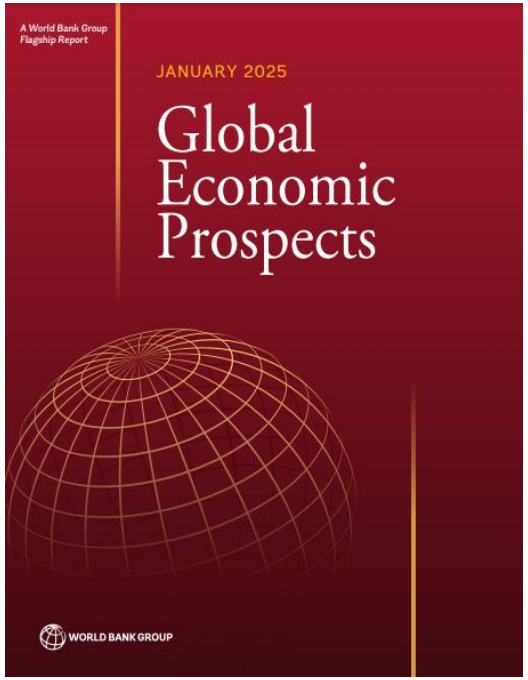
3. Global developments

Uncertainty

Slowing Global Growth: Lower Than the 2010s Average, with uncertainty ahead

GDP growth
(Percent)

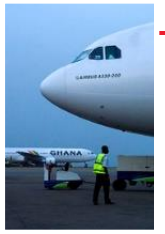
	2010-19	2023	2024e	2025f
World	**3.1**	**2.7**	**2.7**	**2.7**
Advanced economies	**2.0**	**1.7**	**1.7**	**1.7**
Excluding the United States	***1.8***	***0.9***	***0.9***	***1.4***
EMDEs	**5.1**	**4.2**	**4.1**	**4.1**
Excluding China	***3.8***	***3.5***	***3.5***	***3.8***
East Asia and Pacific	**7.2**	**5.1**	**4.9**	**4.6**
Europe and Central Asia	**3.2**	**3.4**	**3.2**	**2.5**
Latin America and the Caribbean	**2.2**	**2.3**	**2.2**	**2.5**
Middle East and North Africa	**3.3**	**1.7**	**1.8**	**3.4**
South Asia	**6.7**	**6.6**	**6.0**	**6.2**
Sub-Saharan Africa	**3.6**	**2.9**	**3.2**	**4.1**



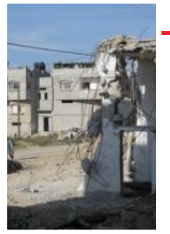
Source: World Bank.
Note: IDA = IDA-eligible countries. Aggregate growth rates are calculated using GDP weights at average 2010-19 prices and market exchange rates; e and f refer to estimates and forecasts, respectively.
http://www.worldbank.org/gep

Risks to the Global Outlook
Multiple Downside Risks but Some Upside Risks Too

Adverse policy shifts and heightened uncertainty



Trade fragmentation



Conflict and geopolitical tensions

Persistently high interest rates

Financial stress

Climate-related disasters

Faster monetary easing with lower inflation

Stronger-than-expected growth in major economies

PART 2

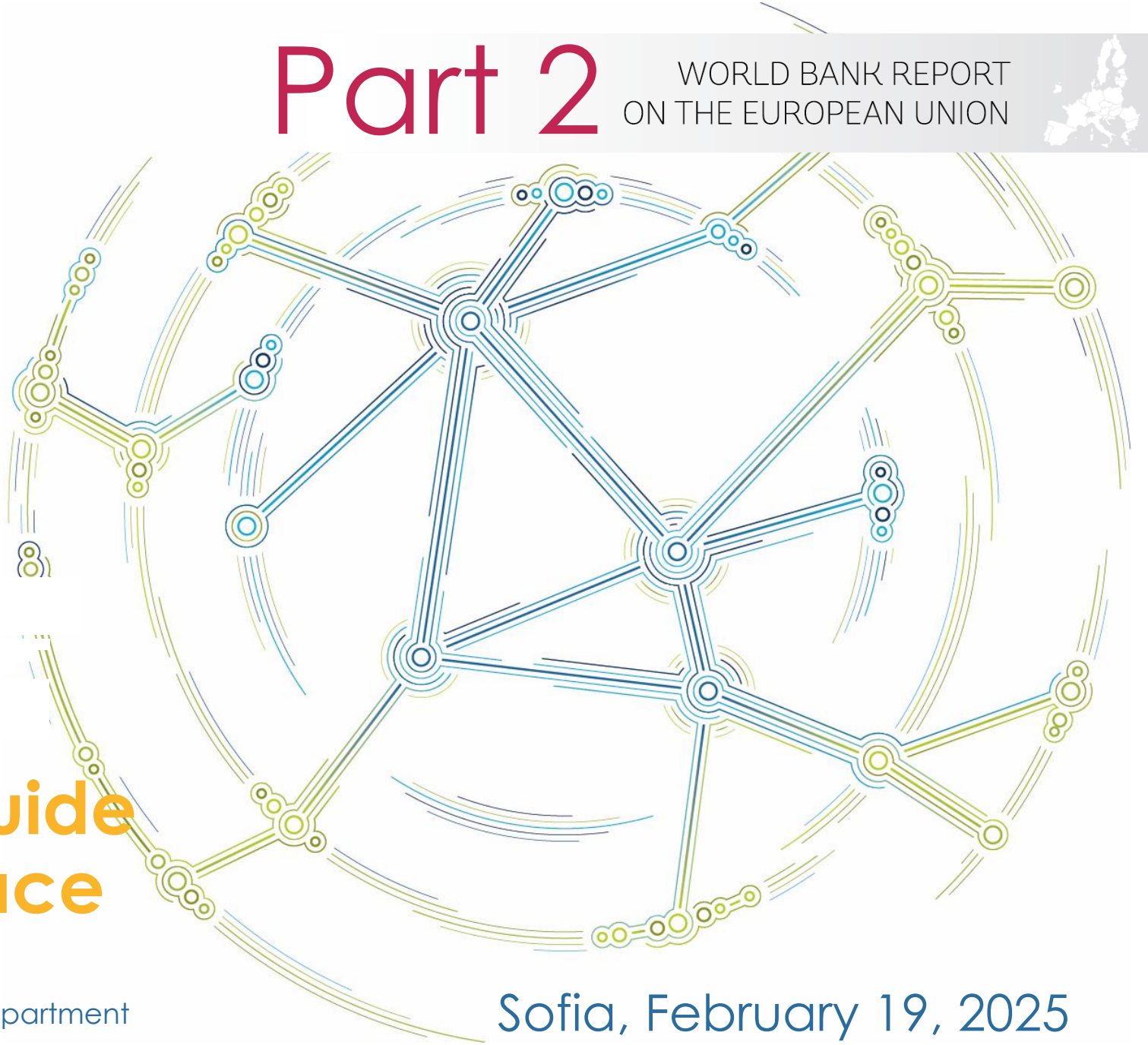
WORLD BANK GROUP

Part 2

WORLD BANK REPORT
ON THE EUROPEAN UNION

Clean tech value chains:

Using trade data to guide a complex policy space



Samuel Rosenow, Economist, IFC
Emilija Timmis, Senior Economist, Economic Policy Department

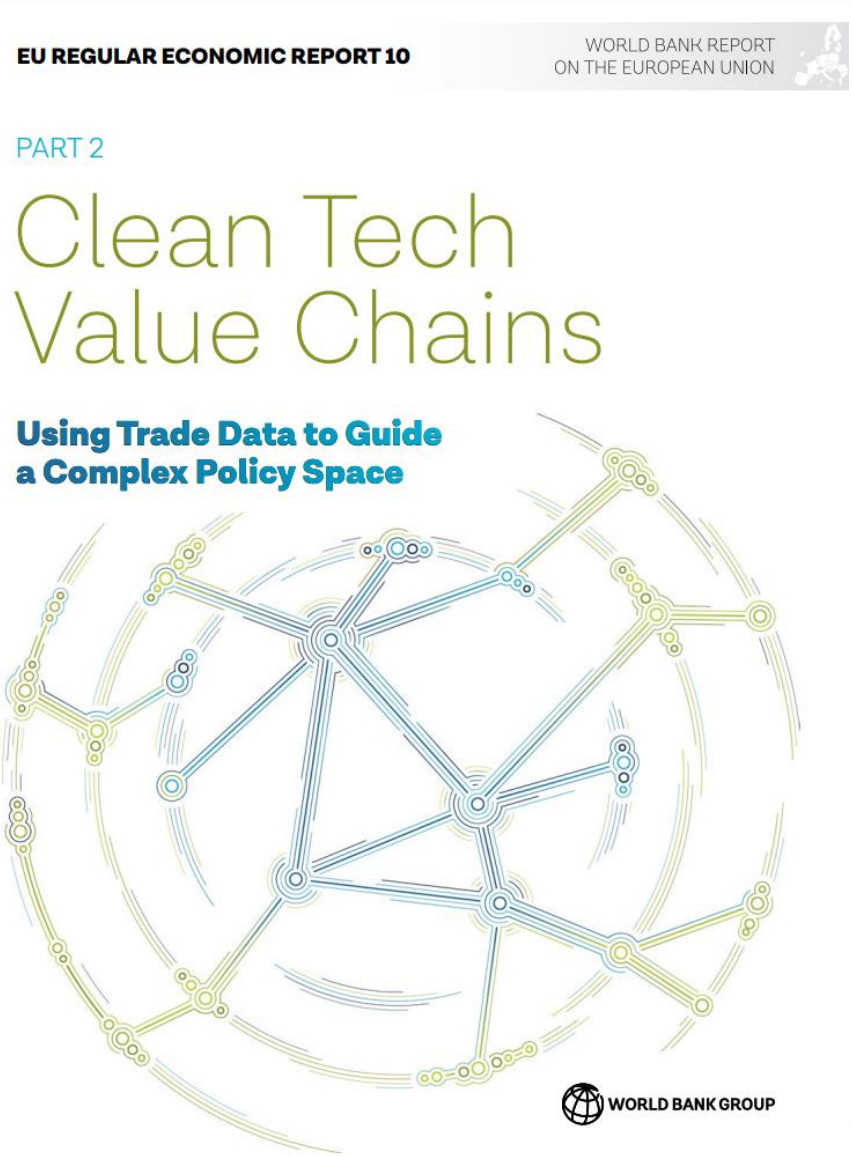
Sofia, February 19, 2025

Outline – Part 2

1. Policy shifts and their impact

2. Analytical findings of the clean tech value chains
   - Trade data
   - Firm data
   - Investor survey data

3. Options for (green) industrial strategies

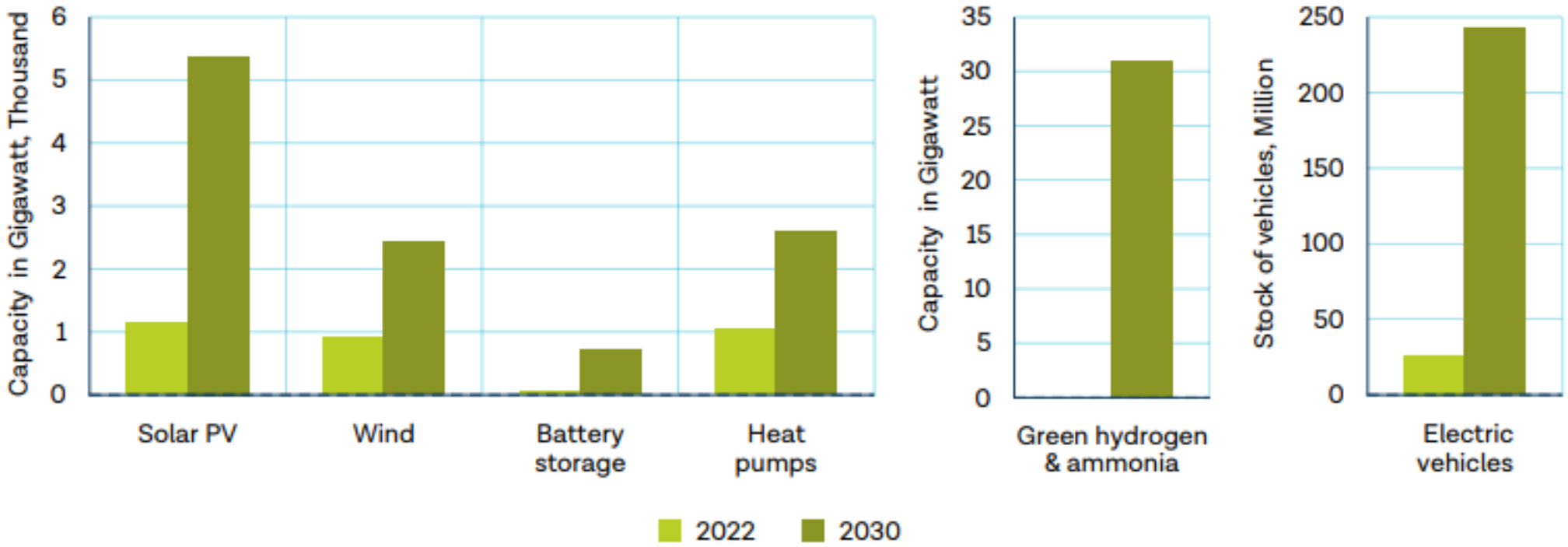


1. Policy shifts

And their impact

Clean energy technologies present an estimated global growth market worth trillions of US dollars (US$) a year

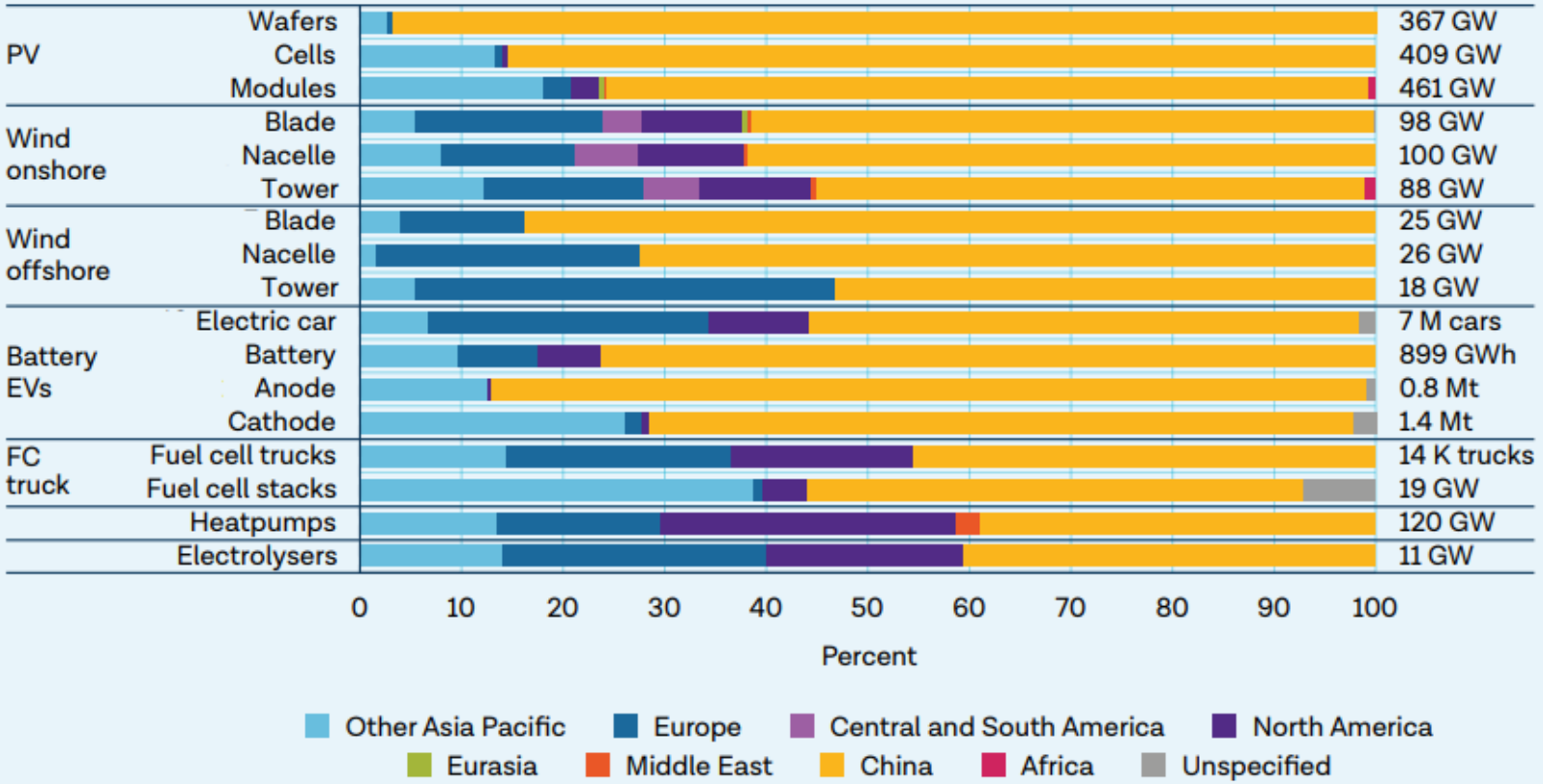
FIGURE I.1 Global cumulative manufacturing capacity for selected clean energy technologies in 2022, and a 2030 scenario in which governments fulfill their stated decarbonization pledges



Source: Data from IEA, World Energy Outlook 2023; IEA, "Renewables 2023 Analysis and forecast to 2028"; IEA, "The Future of Heat Pumps", World Energy Outlook Special Report, 2022; IEA Global EV Data Explorer. 2030 data is from the IEA's announced pledges scenario, which projects deployment if governments fulfill their own pledges up to 2030 (e.g., the EU's Fit for 55). Historical data for heat pumps is from 2021, for batteries from 2020.

Currently, clean tech manufacturing is regionally concentrated

FIGURE BI.1.1 Regional shares of manufacturing capacity for selected mass-manufactured clean energy technologies and components, 2021 (IEA)



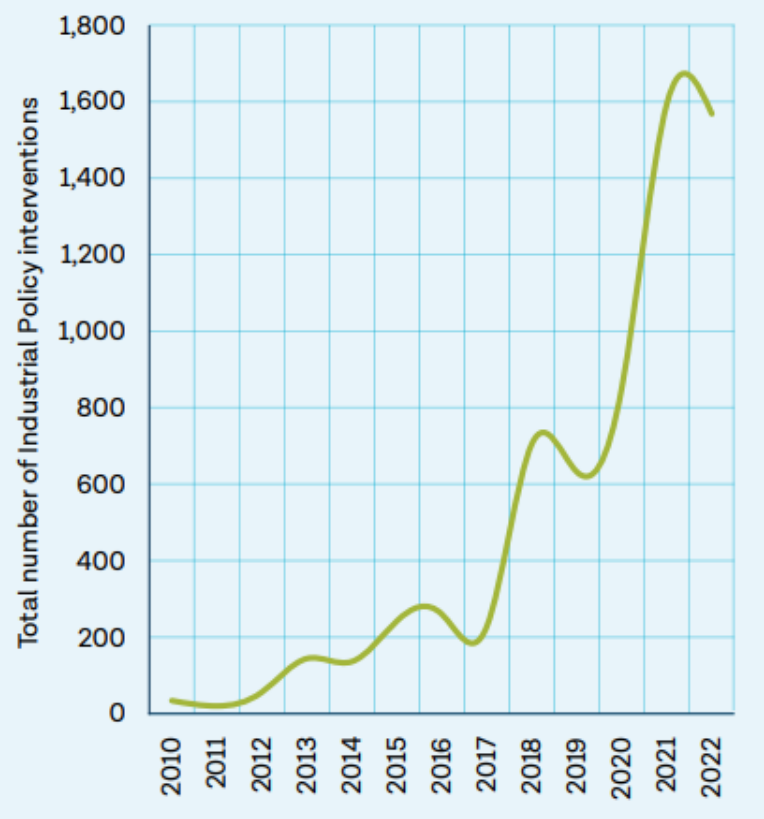
Sources: IEA, Energy Technology Perspectives, 2023, based on InfoLink (2022); BNEF (2022); BNEF (2021b); Benchmark Mineral Intelligence (2022); GRV (2022); UN (2022a); Wood Mackenzie (2022).

Notes: FC = fuel cell. Heat pumps capacity refers to thermal output.

Recent policy shifts are redirecting FDI

The use of industrial policy is on the rise globally

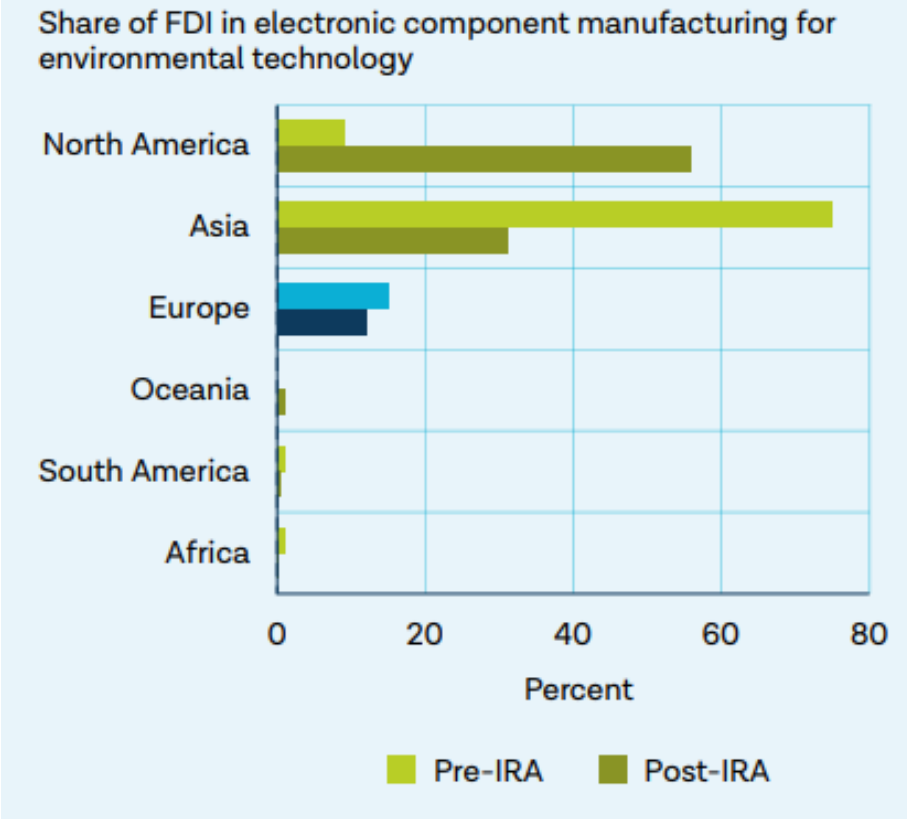
Annual industrial policies passed globally



Source: World Bank using Juhasz, Lane & Rodrik (2024).

There are notable shifts in FDI flows after the announcement of the IRA

Share of FDI in electronic component manufacturing for environmental technology



Source: World Bank calculations using FT FDi Market data, Environmental Technology Cluster. 'Pre-IRA' corresponds to January 2019-August 2022; 'post-IRA' to September 2022-November 2023.

The EU policy leaves the policy and investment decisions – as well as financing – to the member states

The EU policy response includes:

- **The Green Deal Industrial Plan (GDIP)**
- **The Net Zero Industry Act (NZIA)**
- **The Temporary Crisis and Transition Framework (TCTF)**
- **The Strategic Technologies for Europe Platform (STEP)**
- **The Critical Raw Materials Act**
- **Others**

But the financing to come mainly from member states

The 4CEEs so far have not made use of the more relaxed state-aid rules, instead prioritizing energy subsidies.

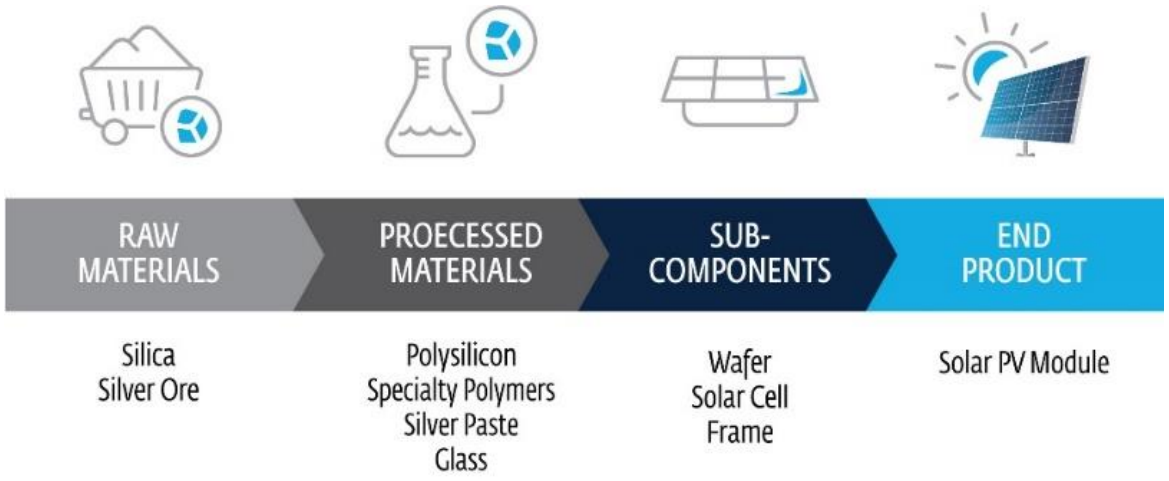
- While the EU strategic sectors are listed in the NZIA and the related legislation, they remain broad…
- in line with the breadth of objectives and technologies available for decarbonizing the energy sector,
- necessitating further selection at the member states level.

EU Strategic net-zero green technologies in the NZIA include:
• Solar photovoltaic and solar thermal technologies • Onshore and offshore renewable technologies • Battery/storage technologies • Heat pumps and geothermal energy technologies • Hydrogen technologies, including electrolyzers and fuel cells • Sustainable biogas/biomethane technologies • Carbon capture and storage (CCS) technologies • Grid technologies

2. Clean tech analysis

Focus of the report: 5 value chains, 4 countries, 3 types of data, 2 concepts, 1 report

- The selection of the **five (5) clean tech value chains** is a subset of NZIA strategic technologies, focusing on those that are technologically complex but manufactured *en masse* (as opposed to custom-made technologies used in individual large projects) :
  - **Solar PV,**
  - **Wind,**
  - **EV (with focus on batteries),**
  - **Heatpumps**
  - **Electrolyzers**
- Mapped with economists, engineers, customs experts.
- At HS6 trade data, across 4 stages of production



- **4** Eastern and Central European **countries** (4CEEs): Romania, Bulgaria, Poland, and Croatia
- **3** types of data:
  - Trade (gross);
  - Firm relationships (FactSet);
  - investor surveys

Leveraging **2 concepts** of complexity and value chains

- **Economic complexity** aims to capture the knowledge in an economy as expressed in the products it makes, calculated based on the diversity of exports a country produces and their ubiquity. Higher complexity is associated with higher income.
- **Value chains:** global trade patterns have shifted over time, with the fragmentation of production of goods (in its parts and components) across countries, with important connection across firms, contributing to productivity and income growth

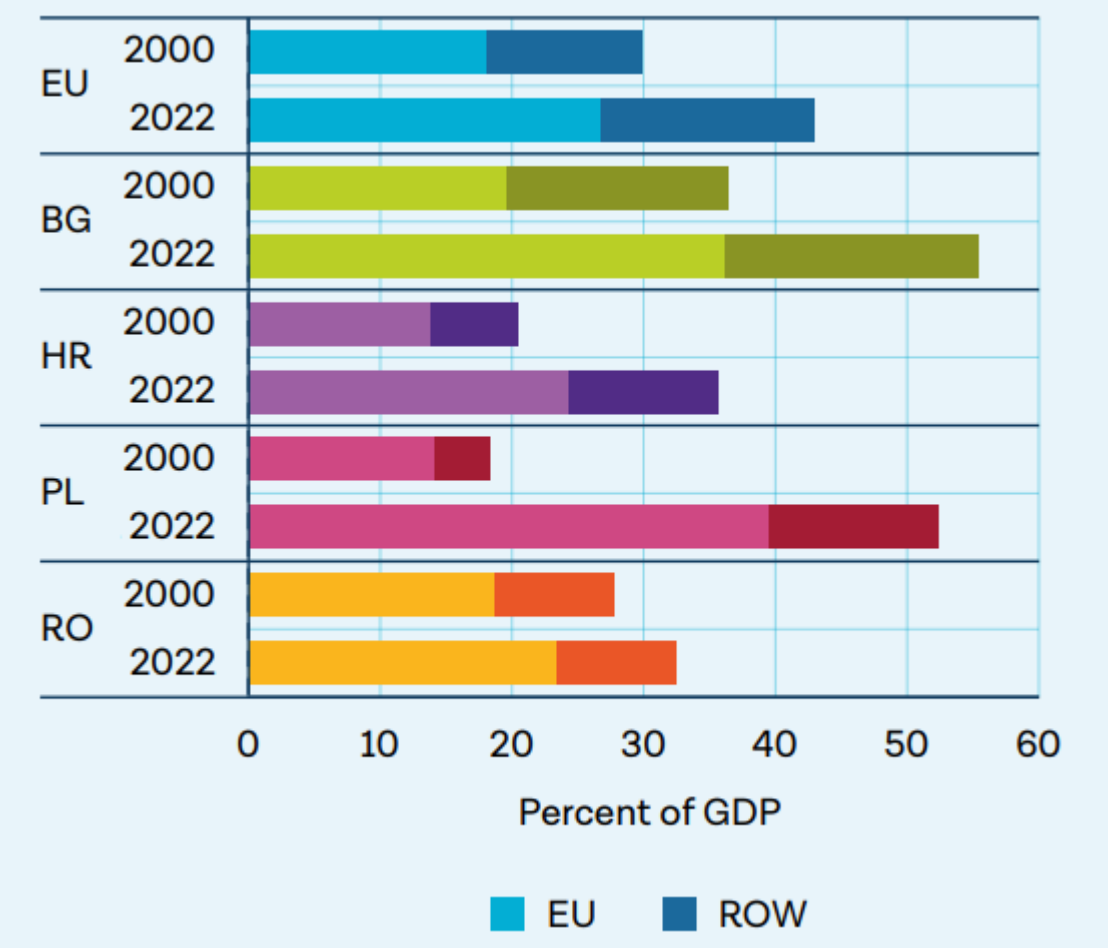
Source: Rosenow and Mealy (2024).

2a. Using trade data to understand current involvement in clean tech value chains

Exports (especially to the EU) important for growth and jobs

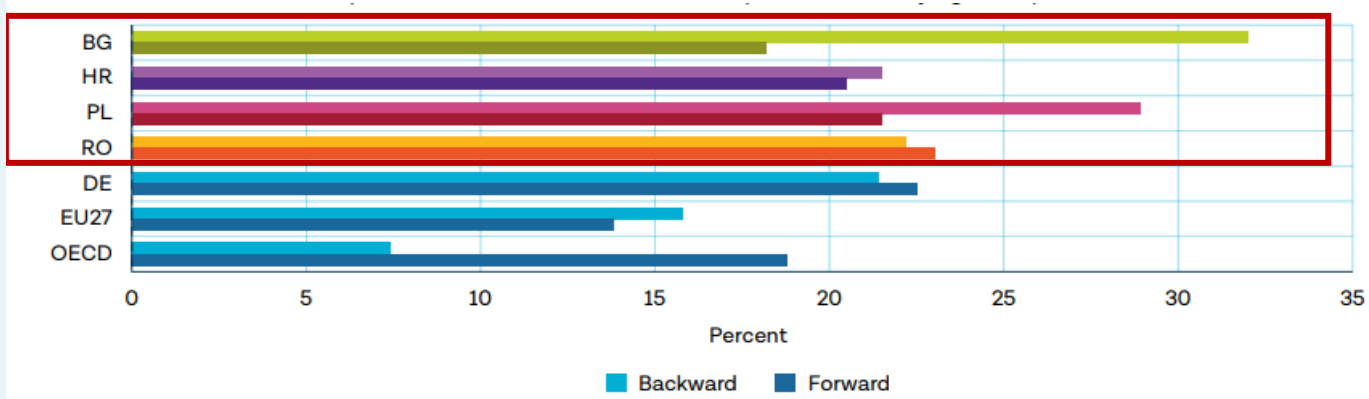
Integration with the EU continues

Exports to the EU versus ROW, 2000-2020



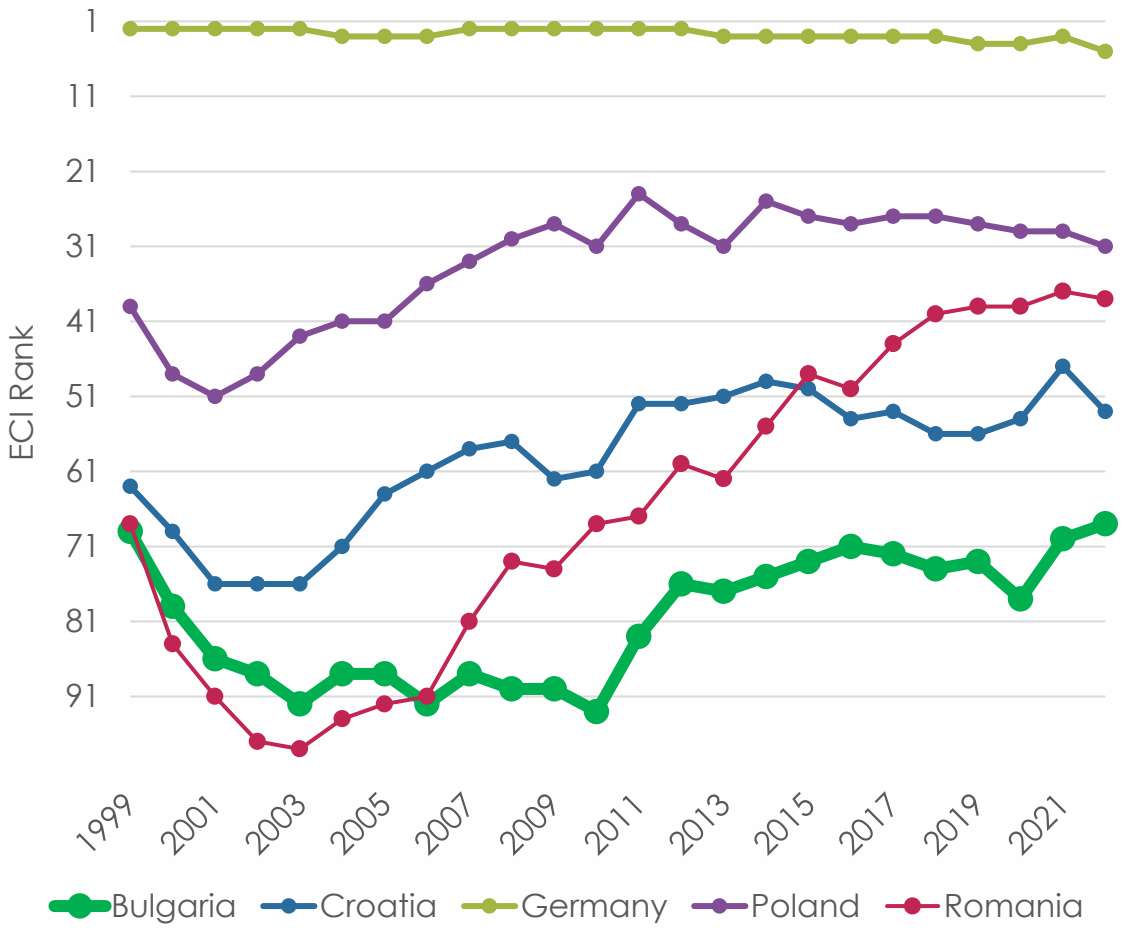
The 4CEEs are highly integrated in the Global Value Chains

Forward and Backward Participation in Global Value Chains, 2020, in percent of country's gross exports

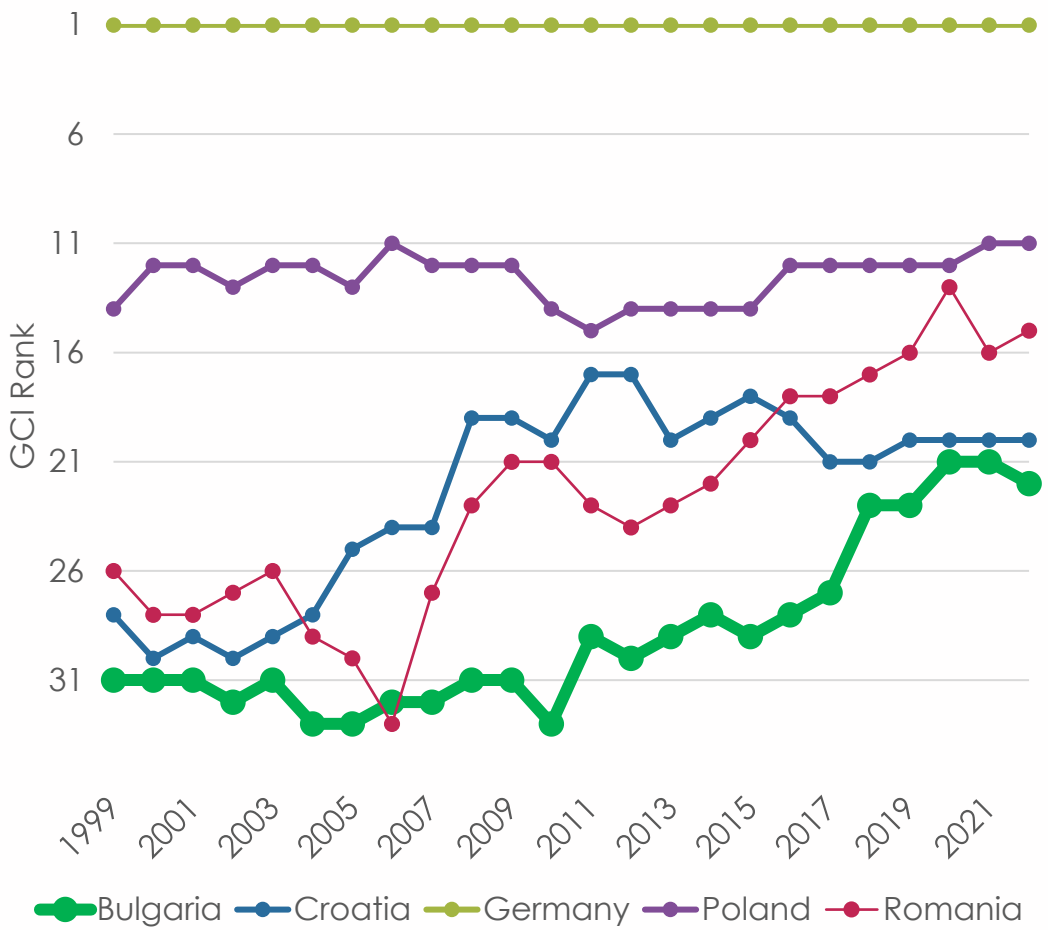


Bulgarian firms increased its capabilities in more technologically sophisticated products, including green

Economic Complexity Index Ranking



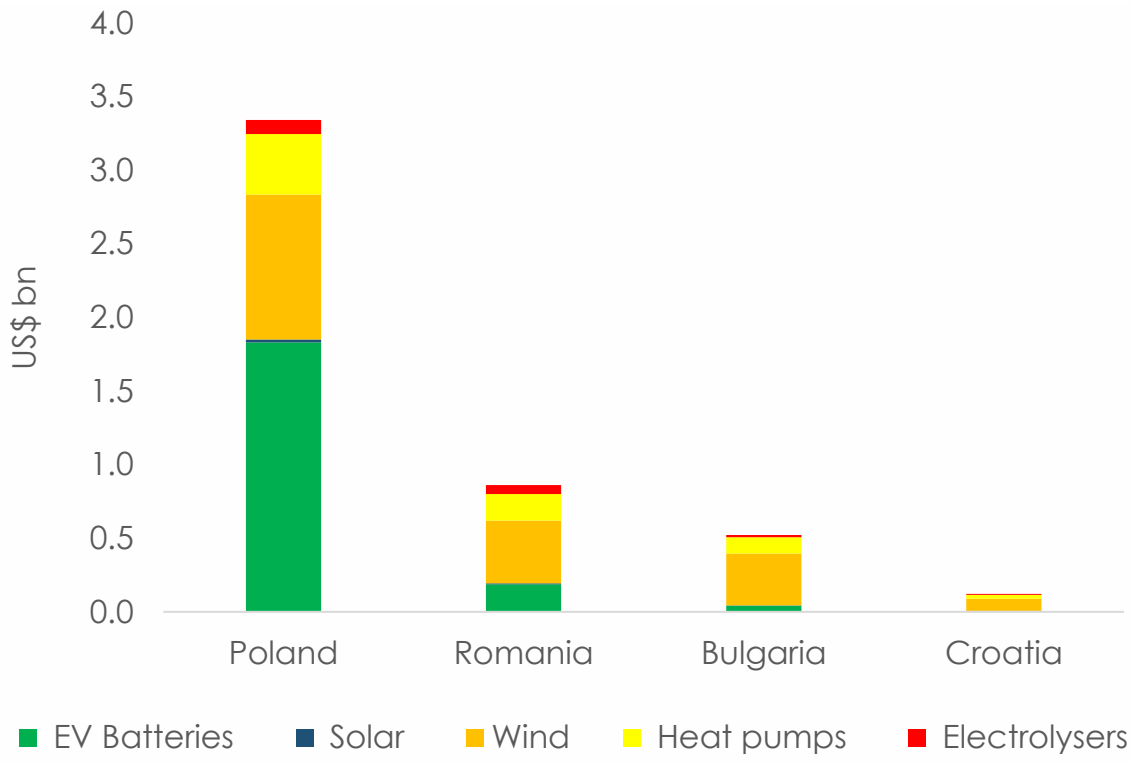
Green Complexity Index Ranking



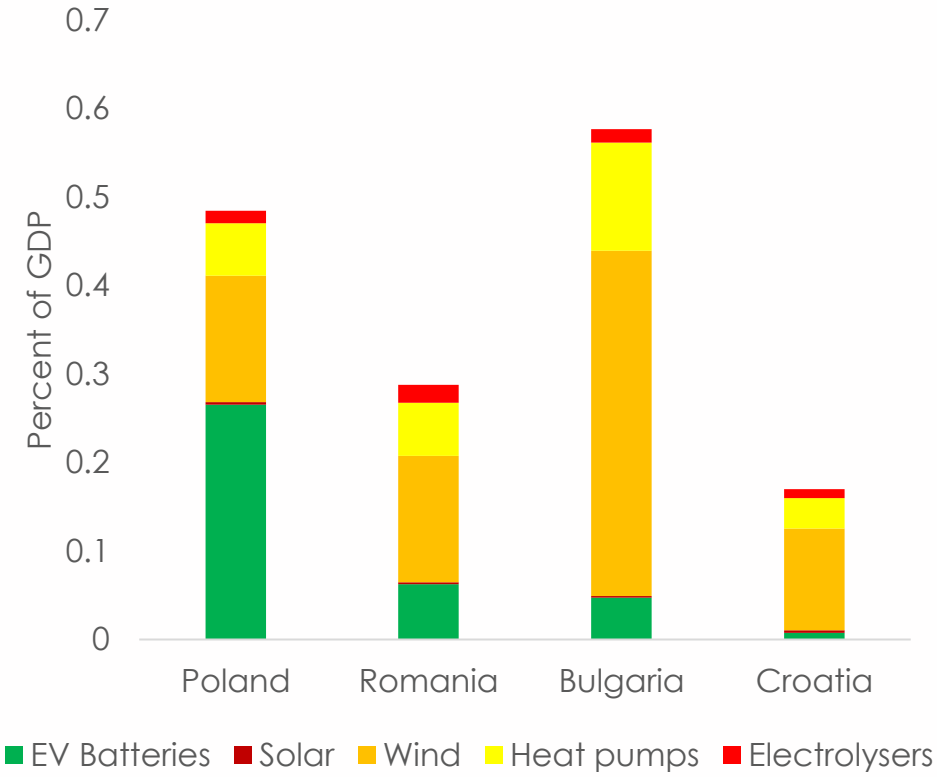
Source: Green Transition Navigator.

Bulgaria already participates in clean tech value chains

Exports of Clean Value Chain Technologies in 2022 US$ billion



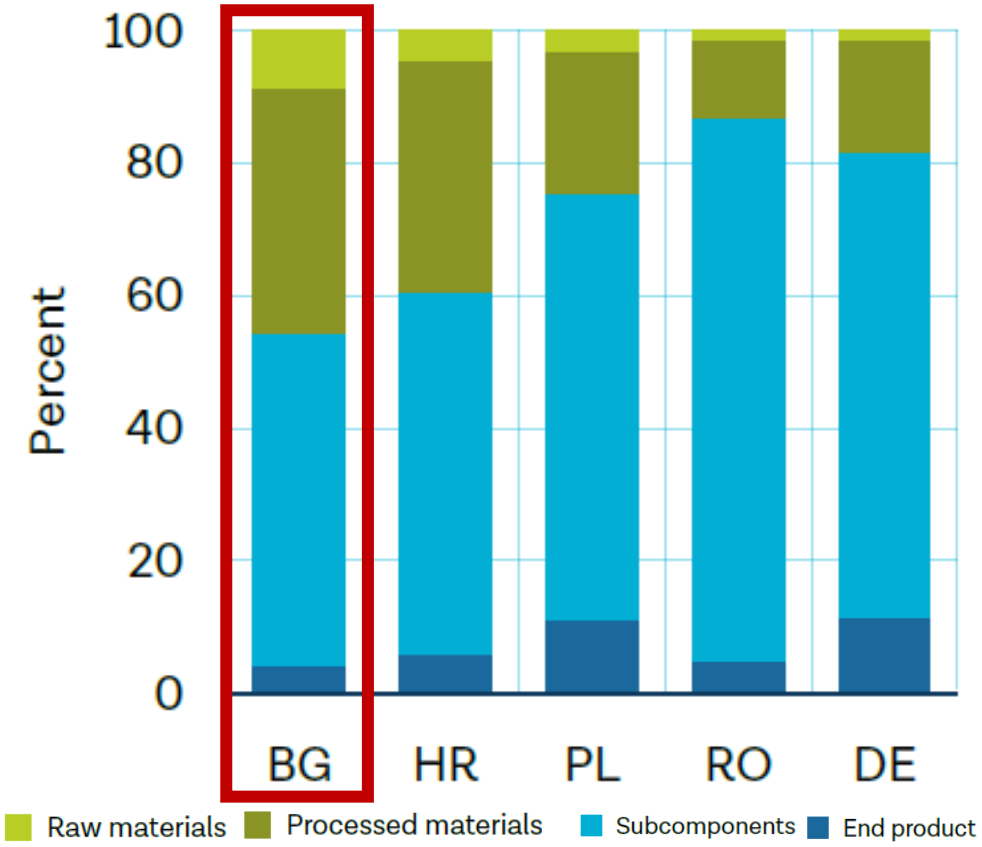
Exports of Clean Value Chain Technologies in 2022 percent of GDP



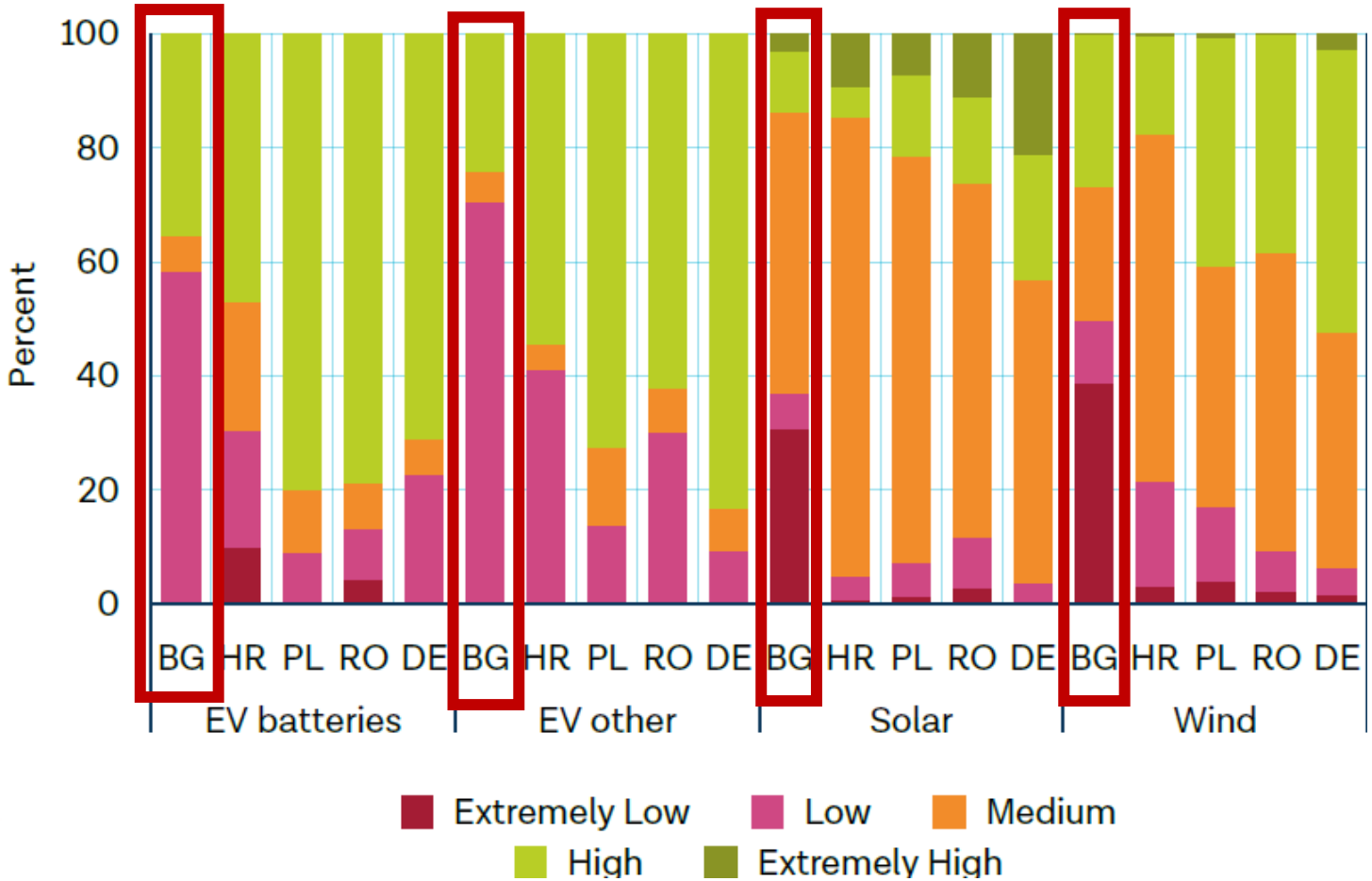
Source: Green Value Chain Explorer (WBG internal).

…primarily in subcomponents, with low sophistication

Exports of Clean Value Chain Technologies by Segment, in % of clean tech exports, 2022)

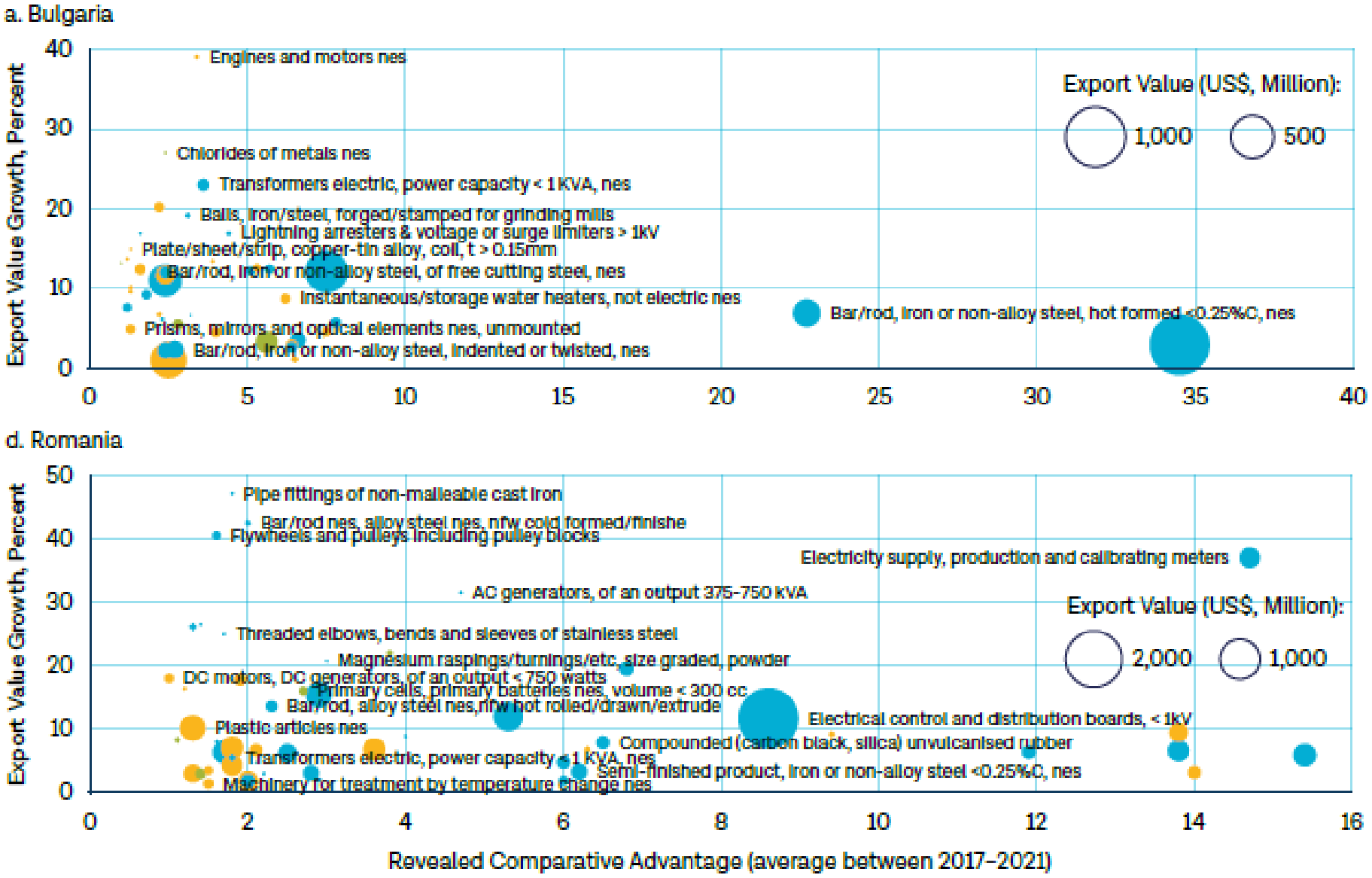


Exports of Clean Value Chain Technologies by Product Complexity
In % of country's respective technology exports



Source: Green Value Chain Explorer (WBG internal).

… allowing a comparison of product-specific strengths



Source: Green Value Chain Explorer (WBG internal).

Looking ahead – sizing opportunities in clean tech

1. Scenario analysis to understand the size of the market in the EU in 2030:

- what product and segments in the five clean tech value chain 4CEE countries could potentially onshore, given the EU's scenarios of market growth.
- 3 scenarios based on the EU NZIA targets
  - Current trend
  - NZIA
  - NZIA+
- a scenario is not a prediction but rather a "what if" analysis

Domestic production share in EU27 deployment and multiplier, by value chain and scenario

	Domestic production share in EU27 deployment (in 2024 in %)			EU27 manufacturing capacity multiple to meet 2030 deployment objectives		
Net-zero technology	2022	NZIA scenario	NZIA+ scenario	Current trend	NZIA scenario	NZIA+ scenario
Wind	85	85	100	2.7	2.7	3.3
Solar	3	45	100	1.4	23	52
Battery	54	90	100	4.4	7.3	8.1
Heat pump	60	60	100	2.2	2.2	3.6
Electrolyzer	10	100	100	1.1	10.6	10.6

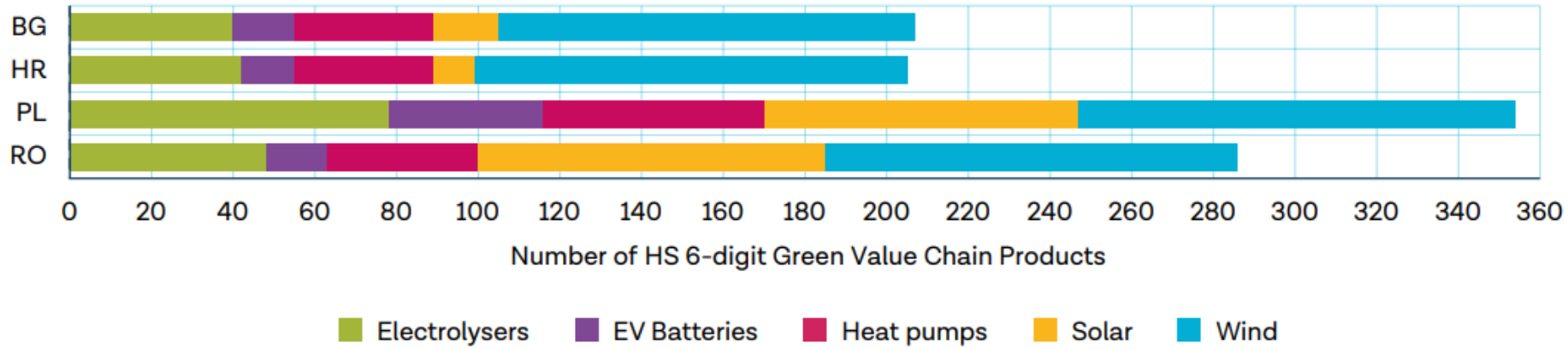
Source: European Commission (2023).

Looking ahead – sizing opportunities in clean tech

2. Create onshoring attractiveness index to share the bigger pie across 4 member states

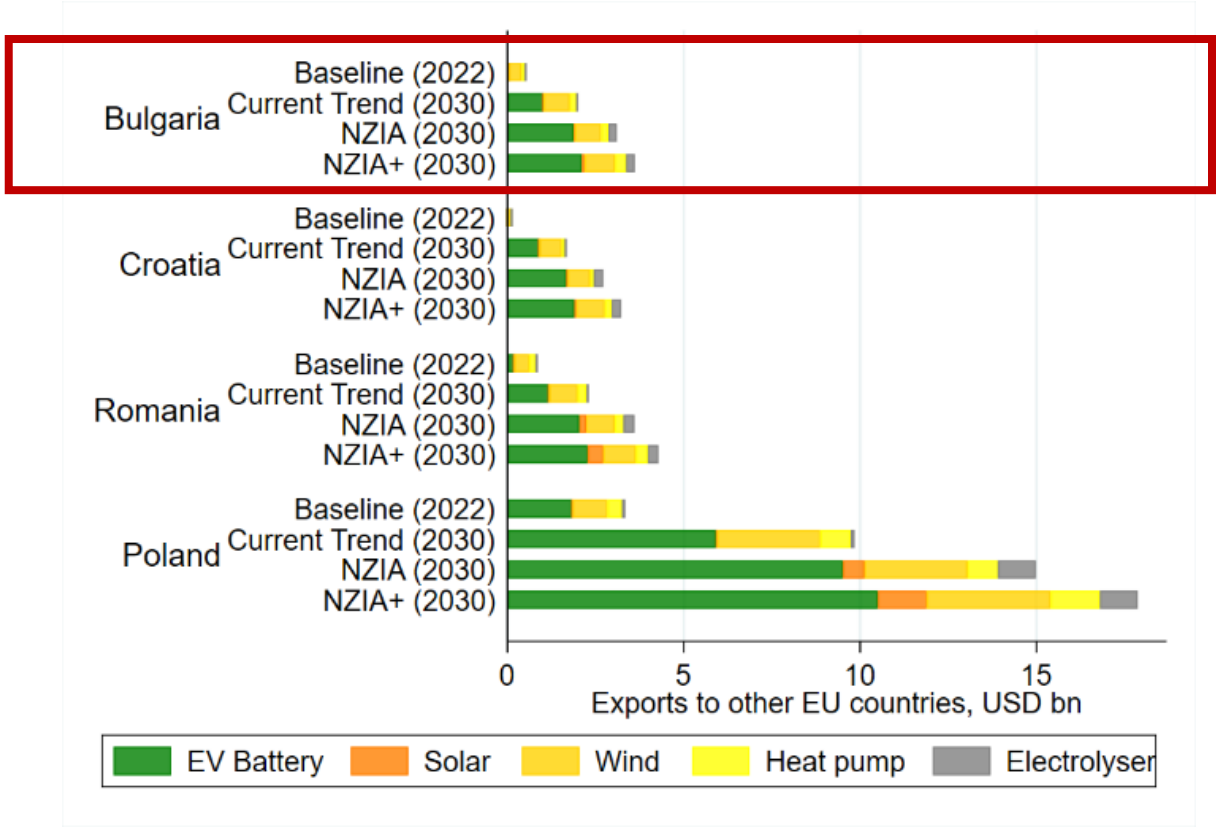
- Onshoring attractiveness is based on three dimensions and 18 indicators: ?
  1. **Demand**/pull factors driving the relocation of clean tech value chains within the EU27.
  2. **Supply indicators** assess the ability of 4CEE countries to support the EU's transition toward more localized clean tech value chains
  3. **Ease of market access** indicators related to the ease of market access measure how easily 4CEE producers can connect with and supply EU27 manufacturers in clean tech value chains
- Defined for each exporting country, HS-6 product and destination market
- To simplify interpretation, categorized scores into three clusters: high, medium and low attractiveness
  - Those with 'high' attractiveness are considered export opportunities, all else being equal

Number of onshoring product opportunities, by 4CEE country and value chain

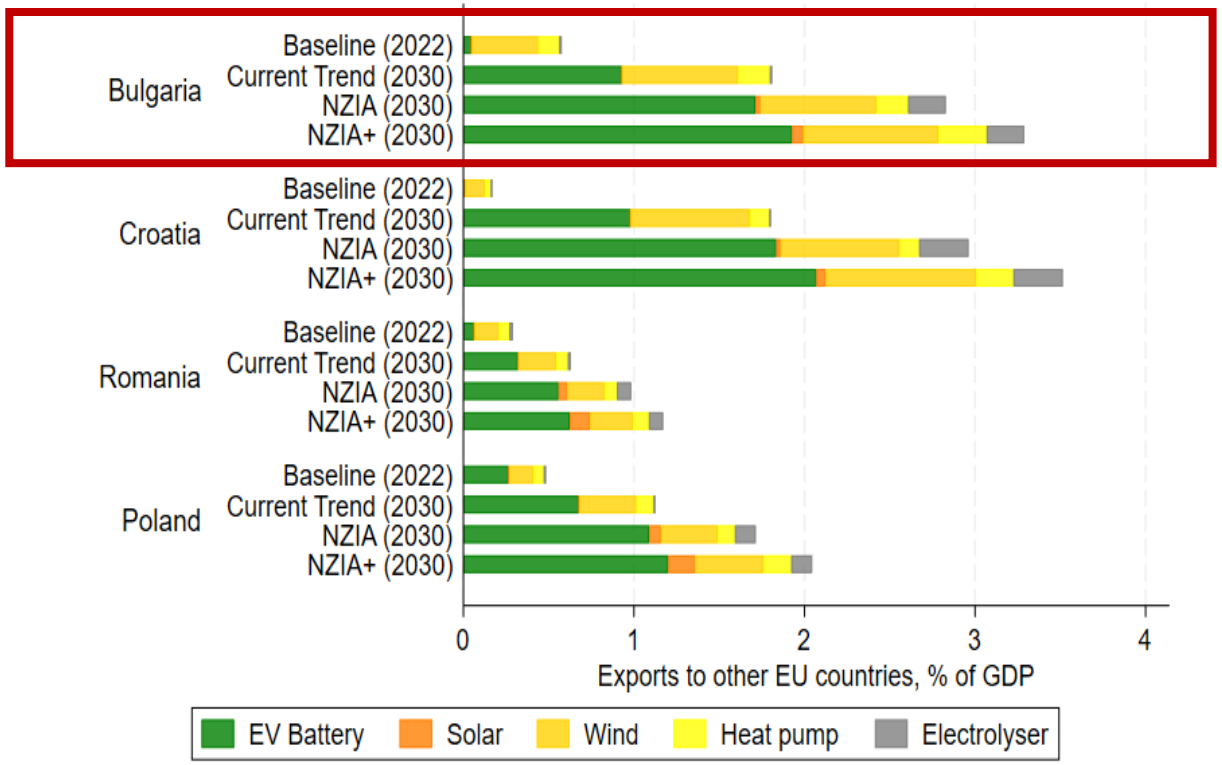


Simulations show that clean tech value chain exports from the 4CEE countries to the EU27 could increase considerably by 2030

Export simulations in 4CEEs, by value chain (in 2022 USD billion)

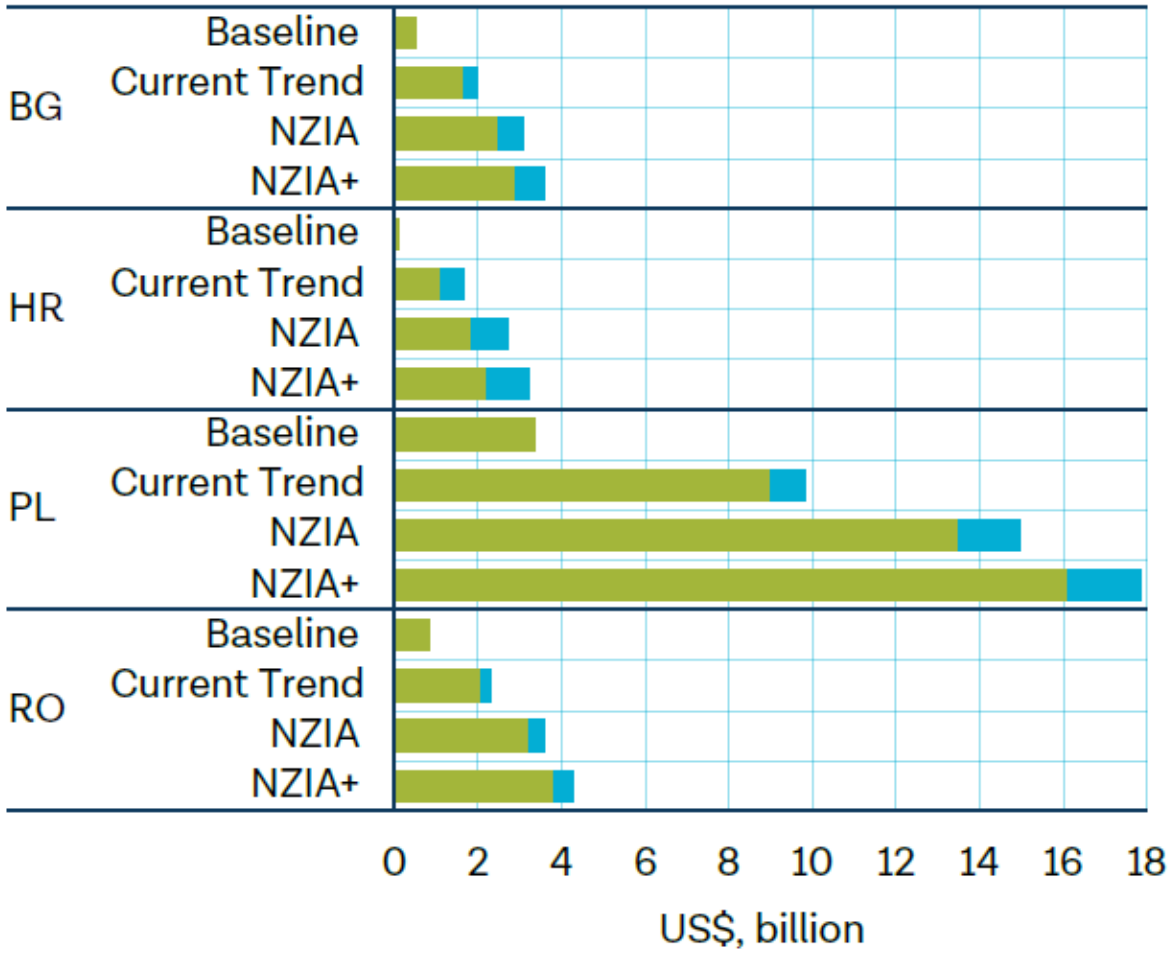


Export simulations in 4CEEs, by value chain (percent of GDP)

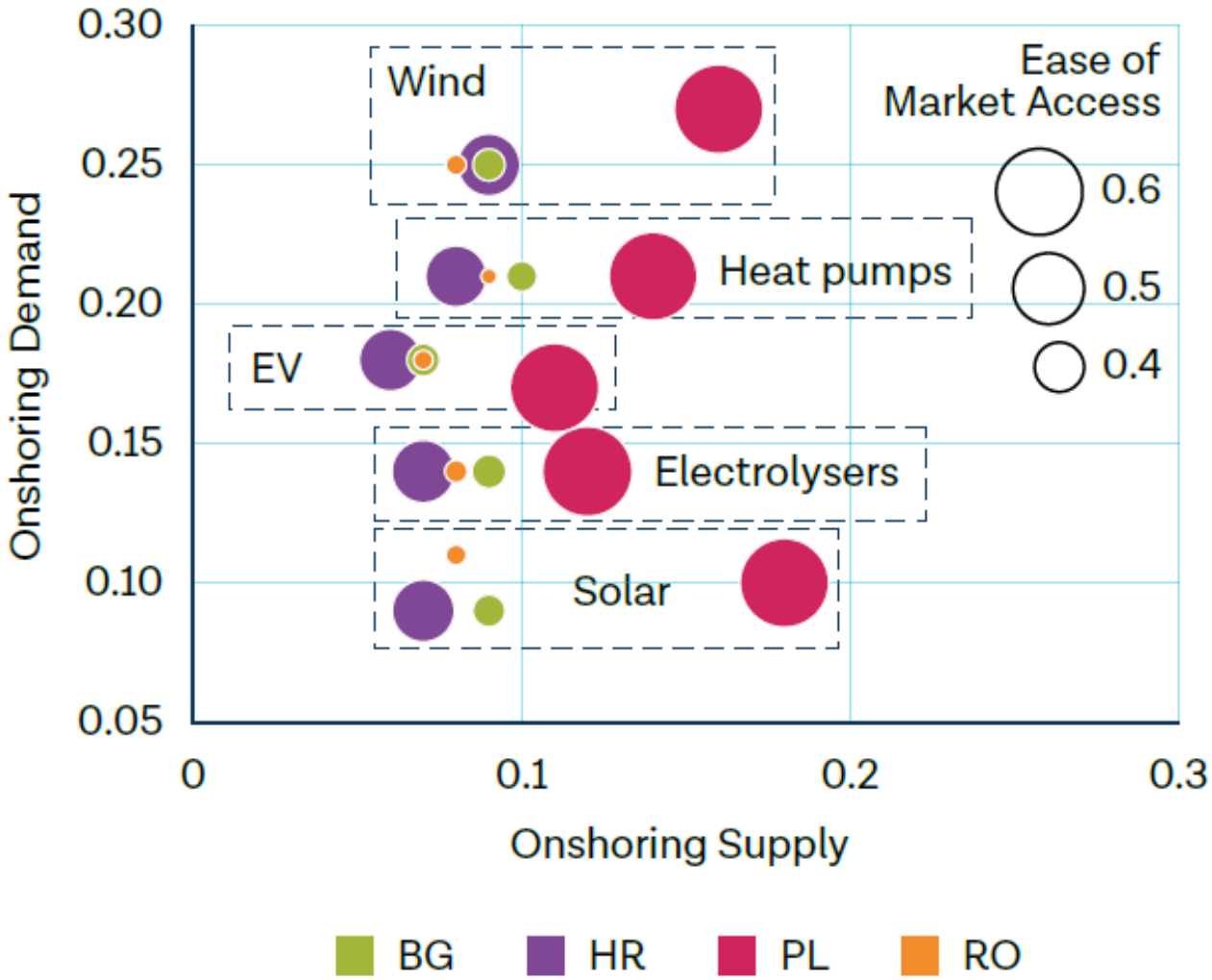


… which can be decomposed by margin and onshoring drivers

a. Existing vs. new markets, by margin



d. Drivers of onshoring attractiveness, by 4CEE country

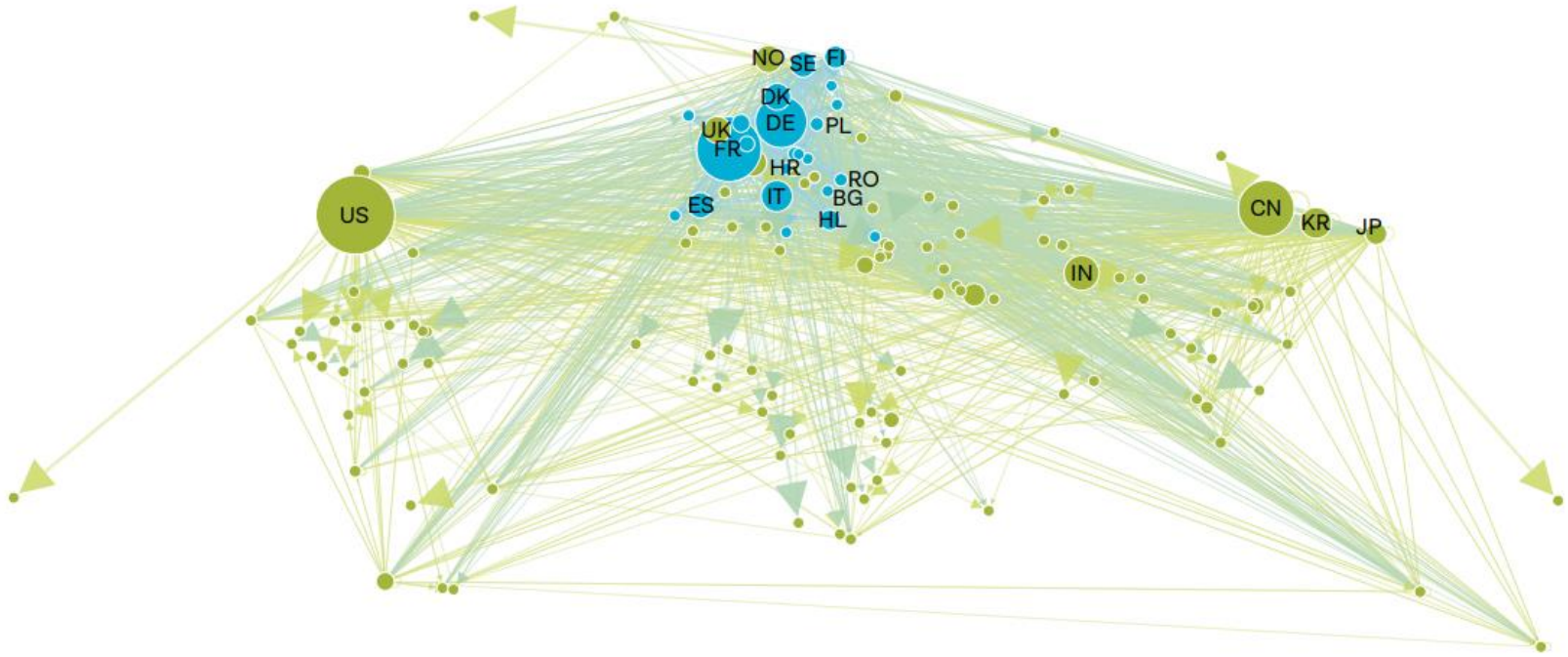


2b. Firm data and network analysis

The global clean tech value chains are highly intertwined

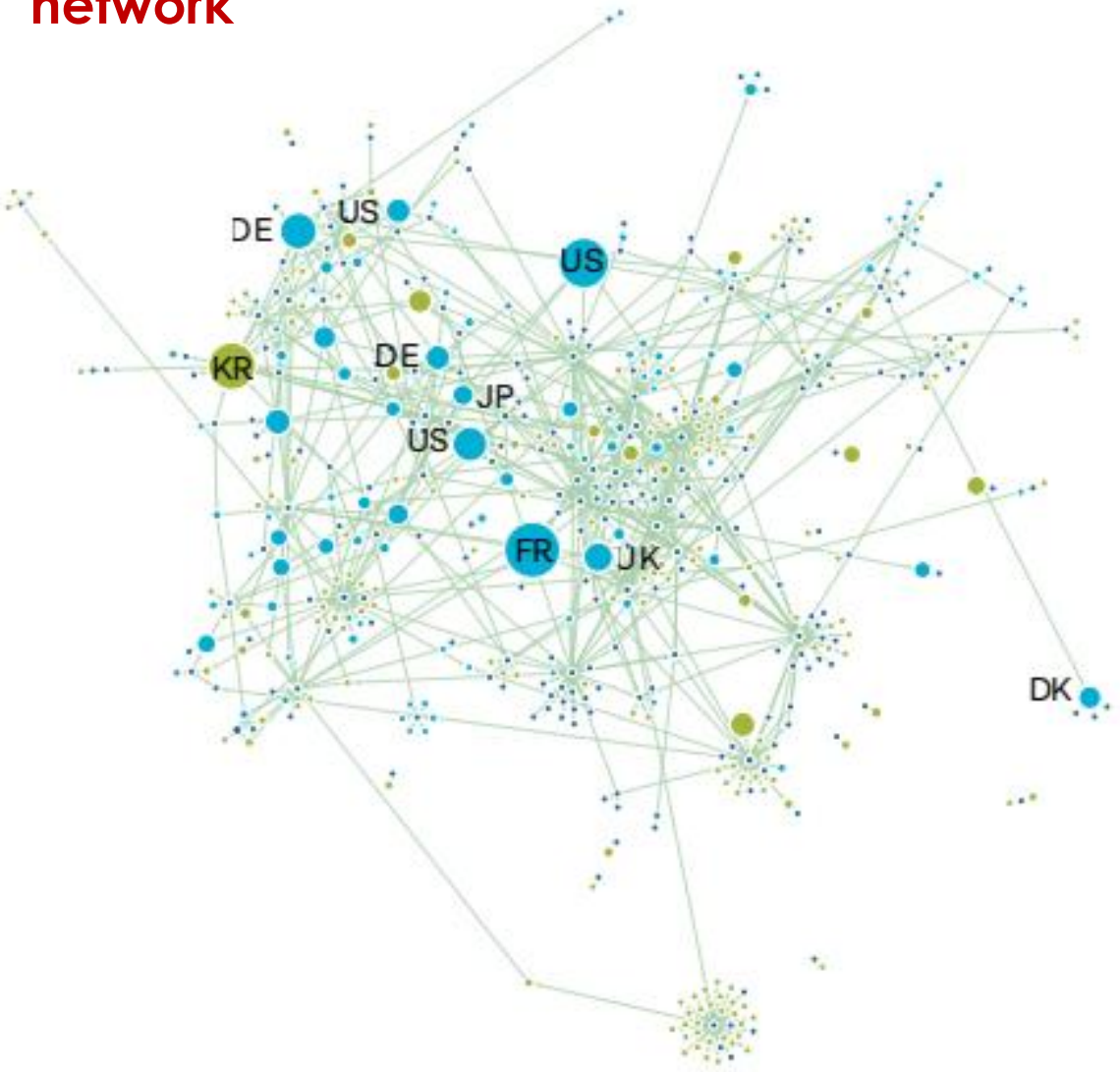
- Ultimately, value chains operate at the company level
- Network analysis helps understand more dynamic and complex underlying trade patterns in increasingly intertwined global value chains. COVID
- This part of the analysis leverages network analysis to describe the interconnectedness of firms within the global clean tech value chain, focusing on the integration of Bulgarian, Croatian, Polish, and Romanian firms in these supply chains

Network representation of buyer-seller relations, country aggregates, global level

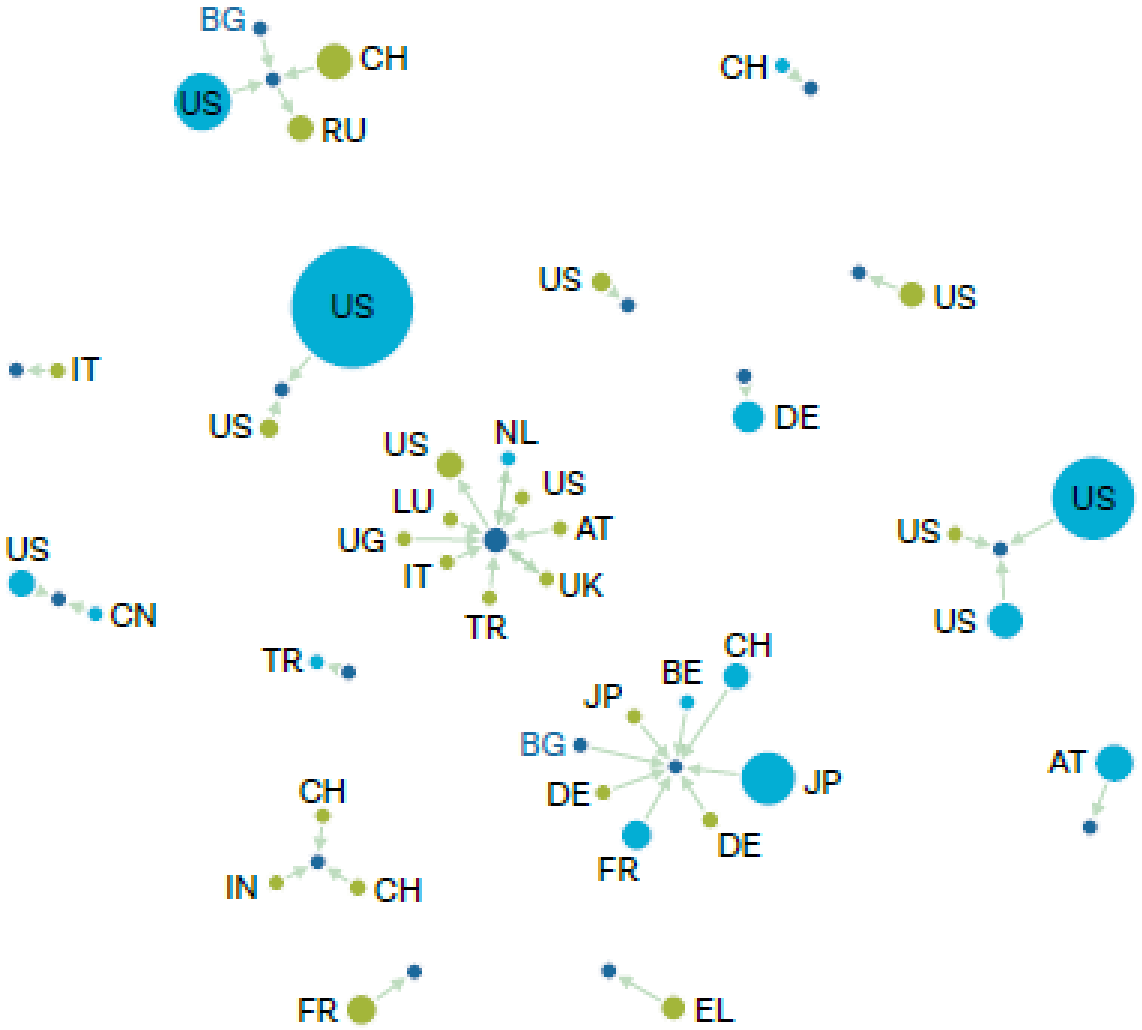


Polish firms emerge as important intermediaries in the clean tech value chains; Bulgaria less so

Polish firms are at the core of the green tec network



Bulgarian firms operate on disconnected islands



2c. Investors' perspectives

The 4 CEEs show varied attractiveness in foreign investors' surveys for attracting investment in clean tech manufacturing

Heat map of reported investment attractiveness in the 4CEEs across identified drivers

Driver (ranked)	**Bulgaria**	**Croatia**	**Poland**	**Romania**
1. Market Size and Prospective Trends	Low	Medium	High	Medium
2. Energy Costs	Medium	High	Medium	High
3. Labor Cost/Availability	Medium	High	Medium	Medium
4. Connectivity and Infrastructure Quality	Low	High	High	Medium
5. Ease of Obtaining Licenses	Medium	Medium	High	High
6. Direct Government Incentives	Medium	Medium	High	Medium
7. Supplier Network Strategy	Low	Medium	High	Medium
8. Technology and Innovation Ecosystem	Medium	High	High	Medium
9. Cost/Availability of Land or Infrastructure	Low	Medium	Medium	Medium
10. Climate Resilience	Low	Low	Medium	Medium

- High: Strong presence and favorable conditions
- Medium: Moderate presence and somewhat favorable conditions
- Low: Weak presence and less favorable conditions

3. Policy Options

For green industrial strategies

The Why, the What and the How of industrial strategies & plans

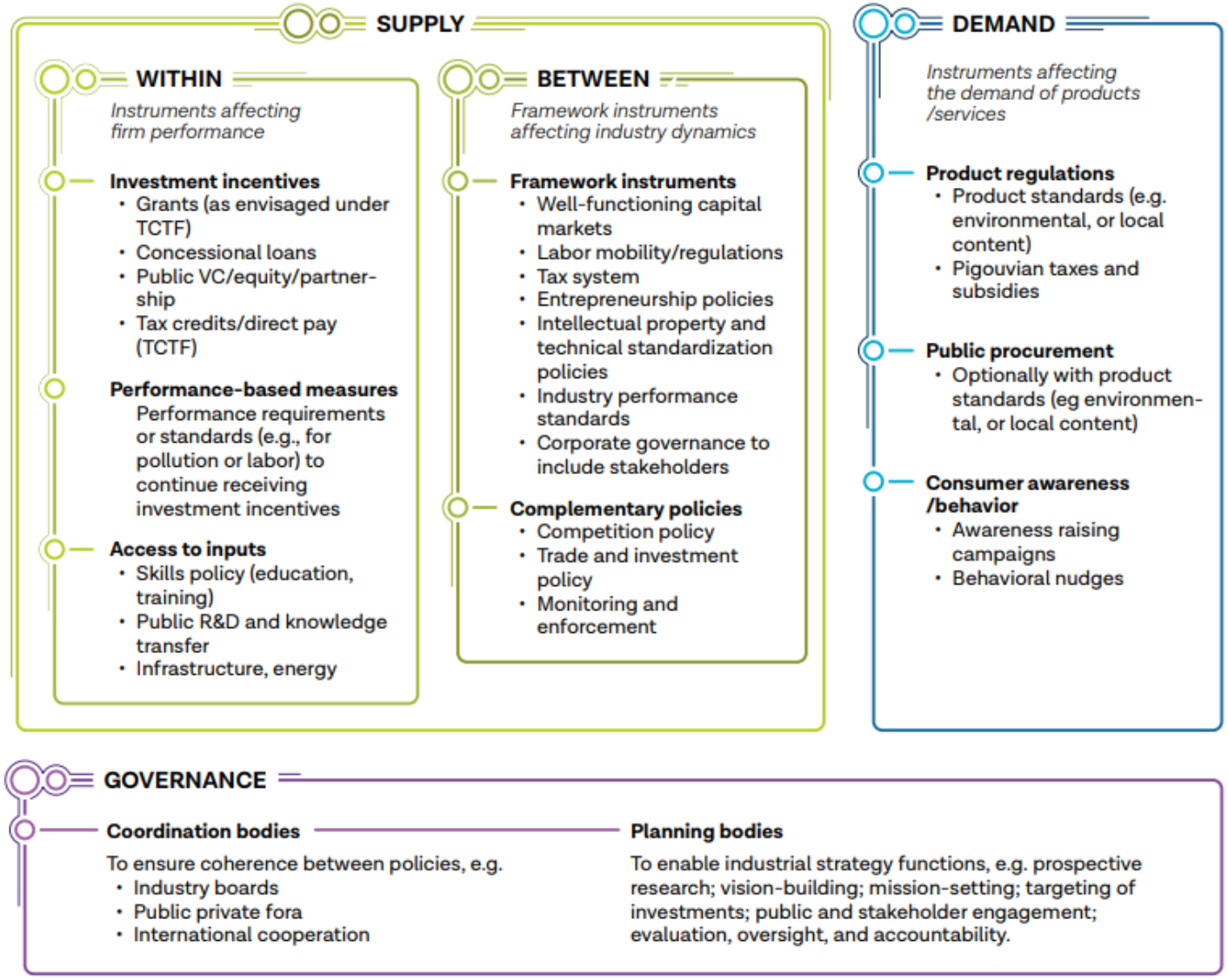
- **From a practical perspective, three key questions of an industrial strategy are paramount - the Why, the What, and the How:**

1. **Why**: What is the purpose of the industrial strategy? What vision, goal or mission guides the selection of strategic industries?

2. **What**: What sectors are strategic? How can the policy makers identify strategic industries, or collections of productive capabilities?

3. **How:** Through what collection of policy interventions can those strategic sectors be effectively supported?

While much of the public attention falls to production subsidies, the industrial policy toolkit is very broad, across both vertical and horizontal interventions



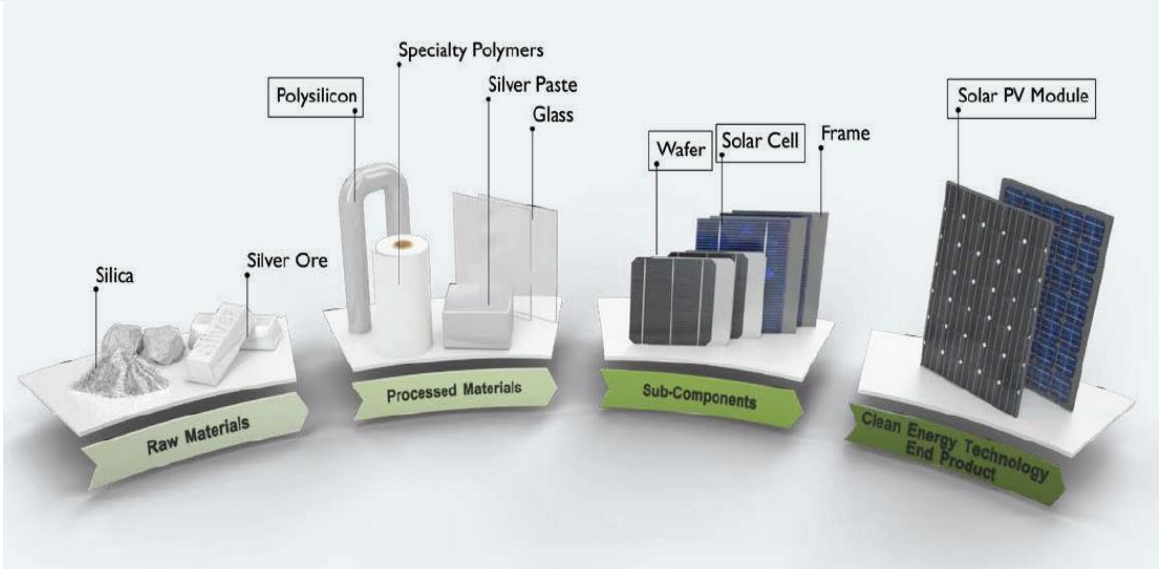
Source: Adapted from Criscuolo et al. (2022a) for Estevez (2024).

Note: The groupings and examples are illustrative and not exhaustive.

Appendix

Methodology

- Rosenow and Mealy (2024) collated a new dataset of end products, subcomponents, processed and raw materials, classified under the 6-digit Harmonized System (HS).
- The 6-digit HS is a standardized classification of traded products used by customs authorities around the world.
- Validated with industry associations and IFC industry specialists
- Limitation: a HS 6-digit product code is not a single product but an average of differentiated product varieties. As a result, even the most granular product definition may be too generic/broad to clearly identify products embedded in green value chains



Not set | Official Use | Confidential | Strictly Confidential

	A	B	C	G	H	I	J
1	VC	VC_segment	HS92	Description	source	notes	HS92_description
2	Solar	End product	854140	Photosensitive Semiconductor Devices; Light Emitting Diodes	Jing et al 2020		
3	Solar	End product	854140	photovoltaic cells, modules and panels	SolarPower Europe		
4	Solar	End product	854140	Diodes, transistors and similar semiconductor devices;photosensitiv	IRENA 2021	PV cells - components of PV modules	
5	Solar	End product	854140	Photosensitive Semiconductor Devices; Light Emitting Diodes	Kuick et al 2019		
6	Solar	Processed materials	381800	Chemical element/compound wafers doped for electronic	NREL 2021		
7	Solar	Processed materials	700510	Float glass and surface ground or polished glass, in sheets, having an	SolarPower Europe	solar inverters, solar glass	
8	Solar	Processed materials	711590	Other articles of precious metal or of metal clad with precious metal	Jing et al 2020		
9	Solar	Processed materials	711590	Other articles of precious metal or of metal clad with precious metal	Kuick et al 2019		
10	Solar	Processed materials	721090	Flat rolled iron or non-alloy steel, clad/plated/coated, w >600mm, n	Jing et al 2020		
11	Solar	Processed materials	900190	Other: prisms, mirrors and other optical elements, of any material, u	Jing et al 2020		
12	Solar	Processed materials	900190	Other: prisms, mirrors and other optical elements, of any material, u	Kuick et al 2019		
13	Solar	Raw materials	280461	Silicon; containing by weight not less than 99.99% of silicon	SolarPower Europe	polysilicon	
14	Solar	Subcomponents	700719	Toughened "tempered" safety glass (excl. glass of size and shape sui	SolarPower Europe	solar inverters, solar glass	
15	Solar	Subcomponents	700991	Unframed Glass mirrors	Jing et al 2020		
16	Solar	Subcomponents	700991	Unframed Glass mirrors	Kuick et al 2019		
17	Solar	Subcomponents	700992	Framed Glass mirrors	Jing et al 2020		
18	Solar	Subcomponents	700992	Framed Glass mirrors	Kuick et al 2019		
19	Solar	Subcomponents	730890	Structures and parts of structures, iron or steel, nes	Jing et al 2020		
20	Solar	Subcomponents	732290	Non-electric heaters (with fan), parts, of iron/steel	Jing et al 2020		
21	Solar	Subcomponents	830630	Photograph, picture or similar frames; mirrors; and parts thereof, of	Jing et al 2020		
22	Solar	Subcomponents	830630	Photograph, picture or similar frames; mirrors; and parts thereof, of	Kuick et al 2019		
23	Solar	Subcomponents	841280	Other Engines and Motors	Jing et al 2020		
24	Solar	Subcomponents	841280	Other Engines and Motors	Kuick et al 2019		
25	Solar	Subcomponents	841919	Other Instantaneous or Storage Water Heaters, Non-electric	Jing et al 2020	solar water heaters	
26	Solar	Subcomponents	841919	Other Instantaneous or Storage Water Heaters, Non-electric	Kuick et al 2019	solar water heaters	

870310	Snowmobiles, golf cars, similar vehicles
870321	Micro Cars
870322	Small Sized Cars
870323	Medium Sized Cars
870324	Large Sized Cars
870331	Small Diesel Engine Cars
870332	Medium Diesel Engine Cars
870333	Large Diesel Engine Cars
870390	**Other Vehicles Including Gas Turbine Powered**

Definition of segments in clean tech value chains

Value Chain Segment	Definition
Raw Materials	Basic materials that are mined, extracted or harvested from the earth. Also referred to as 'unprocessed material', examples include raw biomass and iron ore. In thi link of the supply chain, value added comes from extracting, harvesting, and preparing raw materials for international marketing in substantial volumes.
Processed Materials	Materials that have been transformed or refined from basic raw materials as an intermediate step in the manufacturing process. Processed materials include steel, glass and cement. In this link of the supply chain, value added comes from processing raw materials into precursors that can be easily transported, stored and used for downstream subcomponent fabrication.
Subcomponents	Unique constituent parts or elements that contribute to a finished product. Clean energy technology examples include generation sets for wind turbines and crystalline wafers for crystalline silicon PV modules. Note that what is considered a component by the manufacturer may be considered the finished product by its supplier. In this link of the supply chain, value added comes from fabricating processed materials into subcomponents that can then be assembled (with other subcomponents) into end products
End Products	The finished product of the manufacturing process, assembled from subcomponents and ready for sale to customers as a completed item. Value added comes from assembling components into a marketable product that customers value.

All results are hosted in the Green Value Chain Explorer

Green Value Chain Explorer

The Green Value Chain Explorer enables you to explore countries' competitive strengths and potential opportunities in products associated with the solar, wind and electric vehicles value chain.

The global transition to a green economy presents unprecedented opportunities for growth, development, and technological upgrading.

With a growing number of countries making net-zero emissions pledges and adopting climate-friendly policies, global demand is beginning to shift away from fossil-fuel based production and towards cleaner technologies and more environmentally friendly products.

As new growth opportunities in green product markets open up, cultivating competitiveness in these areas is an important way in which countries can achieve greater economic benefits from the transition to the green economy.

Solar photovoltaics, wind turbines and EVs are technologies that will experience immense growth as countries around the world decarbonize.

Many of the associated inputs and components are technologically sophisticated and associated with greater knowledge spill-overs.

Developing the capabilities to competitively produce these products and associated components can consequently help countries achieve greater economic growth and export diversification prospects.

Strategically leveraging opportunities to participate in green global value chains offers important economic advantages.

The globally distributed nature of supply chains means that countries can now specialize in a particular stage of production, rather than having to produce all parts of a product's value chain themselves. Participation in global value chains has also shown to be beneficial in terms of productivity improvements, technological transfer, market expansion for traded products and components, and more highly paid jobs for workers.

As global value chains for technologies critical for the green transition such as solar photovoltaics, wind turbines and electric vehicles offer similar advantages, identifying opportunities to participate in green global value chains (GGVCS) can enable countries to reap further benefits from the immense increase in global demand projected for these technologies over the coming years.

Indicators used in the Onshoring Attractiveness Index

#	Dimension	Indicator	Time Period	Unit of Analysis[7]	Unit of Measurement	Source	Share in OA Index
1	Demand	Foreign Input Reliance (FIR)[8] of EU27 countries from non-EU 27 importers, by HS 6-digit product[9]	2020	j-p-t	% share	OECD	4.4%
2	Demand	Import value by EU27 countries, by HS6-digit product	2022	j-p-t	USD	CEPII BACI	4.1%
3	Demand	Share of the import market value of EU27 countries from non-EU countries, by HS 6-digit product	2022	j-p-t	% share	CEPII BACI	6.2%
4	Demand	Growth of imports in the EU27 from non-EU countries, by HS 6-digit product	2017-2022	j-p-t	% growth	CEPII BACI	5.5%
5	Demand	EU27 local content baseline, by value chain	2022	J-vc-t	% share	EU Commission	8.5%
6	Demand	EU27 local content target, by value chain	2030	J-vc-t	% share	EU Commission	6.2%
7	Demand	CBAM tariff equivalent of HS6-digit product policy impact in EU27 countries, weighted by its respective non-EU exporters	2026	j-p-t	% value	World Bank	4.0%
8	Demand	Cumulative spending in EU27 countries, by value chain[10]	2017-2021	j-vc-t	Euro	IEA	6.2%
9	Demand	EU27 renewable technology deployment gap, by value chain	2022-2030	J-vc-t	Percentage Point	EU Commission	8.7%
10	Demand	Total FDI inflows from EU27 countries to 4CEE, by value chain	2019-2023	i-j-vc-t	USD	fDI markets	4.6%
11	Supply	Share of EU27's HS 6-digit product imports from 4CEE country	2022	i-j-p-t	%	CEPII BACI	4.1%
12	Supply	Export unit price of each 4CEE country, by HS 6-digit product	2022	i-p-t	USD per unit	CEPII BACI	2.3%
13	Supply	Export growth of 4CEE countries to EU27, by HS 6-digit product	2017-2022	i-j-p-t	%	CEPII BACI	4.4%
14	Supply	Capability alignment of 4CEE countries and HS 6-digit product[11]	2022	i-p-t	Probability	CEPII BACI	7.2%
15	Supply	Capability alignment using XG Boost of 4CEE countries and HS 6-digit product[12]	2022	i-p-t	Probability	CEPII BACI	6.9%
16	Supply	Cumulative investment in each 4CEE country, by value chain[13]	2017-2021	i-vc-t	USD	IEA Renewables	5.9%
17	Ease of Market Access	Bilateral Logistics Performance Index (LPI_{ijt}) $= LPI_{it} * LPI_{jt}$	2023	i-j-t	Index score	World Bank	6.1%
18	Ease of Market Access	Driving time from 4CEE capitals to EU27 production sites of clean tech value chains	2024	i-j-vc-t	Hours	Bruegel and Google	4.7%

Definition of export potential and investment needs

1. Export potential

$$\widehat{\text{Export}}_{ijp} = \text{Scenario Factor}_{vc} \times \text{Weight}_{ijp} \times \text{Output}_{i,vc,2022}$$

$$= \text{Production Multiplier}_{vc}^{EU27} \times \frac{OA_{ijp}^{normalized}}{\sum_{vc} OA_{ijp}^{normalized}} \times \text{Manufacturing Capacity}_{EU27,vc,2022} \times \text{Price}_{vc,2022} \times \frac{\text{Exports}_{i,global,vc,2022}}{\text{Exports}_{EU27,global,vc,2022}}$$

where i refers to 4CEE exporter, j to EU27 destination market and p to HS 6-digit product of clean tech value chain

2. Investment needs

$$\widehat{\text{Investment}}_{ijvc} = \widehat{\text{Export}}_{ijp} \times \text{Capital Intensity}_{vc}$$

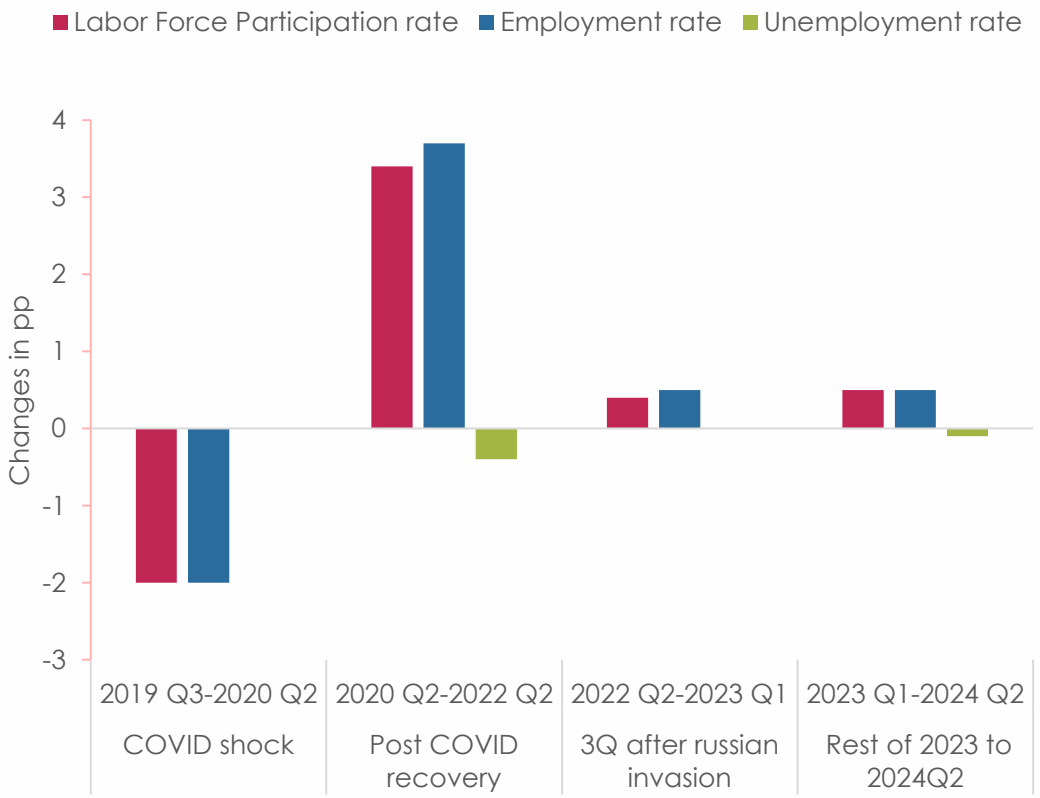
$$\frac{\text{Capex investment per unit of power}_{vc}}{\text{Export per unit of power}_{vc}}$$

Inclusive Growth

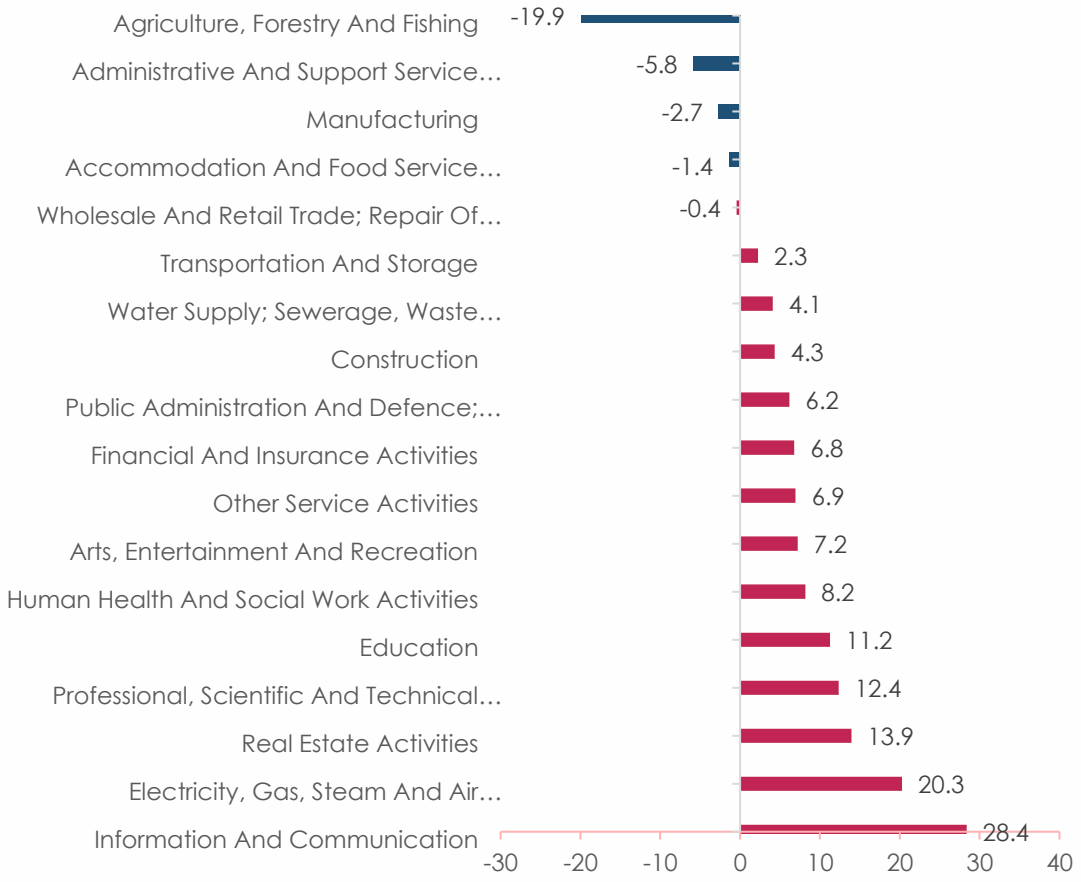
Annex

The EU labor market has shown resilience to dual shocks, with sectoral reallocation highly visible..

- EU labor markets proved resilient amid COVID-19 and the energy crisis, with strong post-pandemic employment recovery and limited short-term and muted impacts more recently from the cost of living crisis



- Asymmetric sectoral employment recovery: dual shocks impacting agriculture, administration services, accommodation and food services, and manufacturing more.

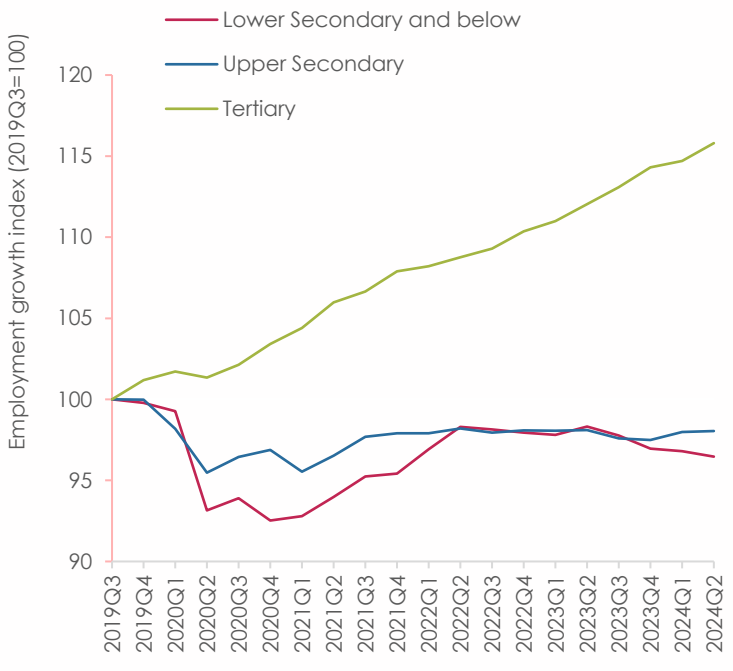


Employment growth by sector (percent), EU27, 2019 Q3-2024 Q2

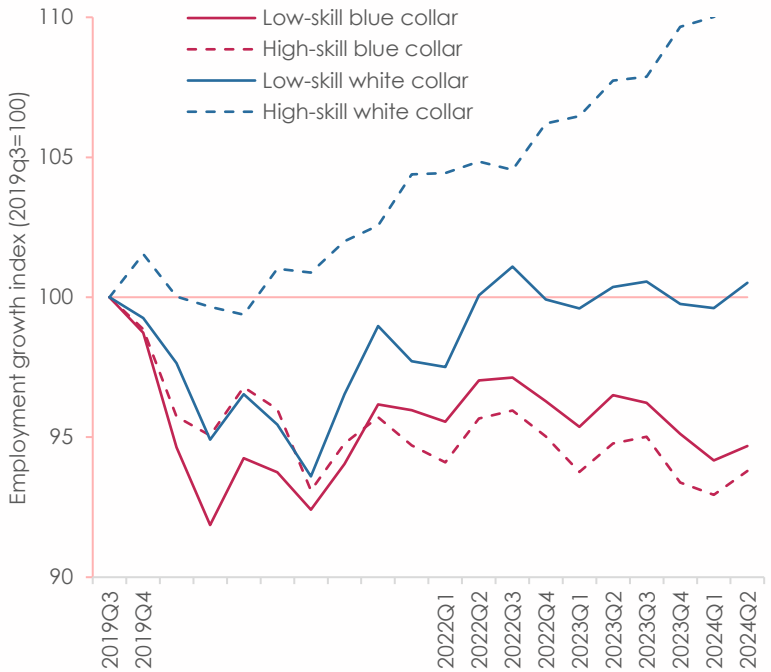
Source: EURER10

Labor: Disproportionate employment impacts on less educated and blue-collar workers in the EU

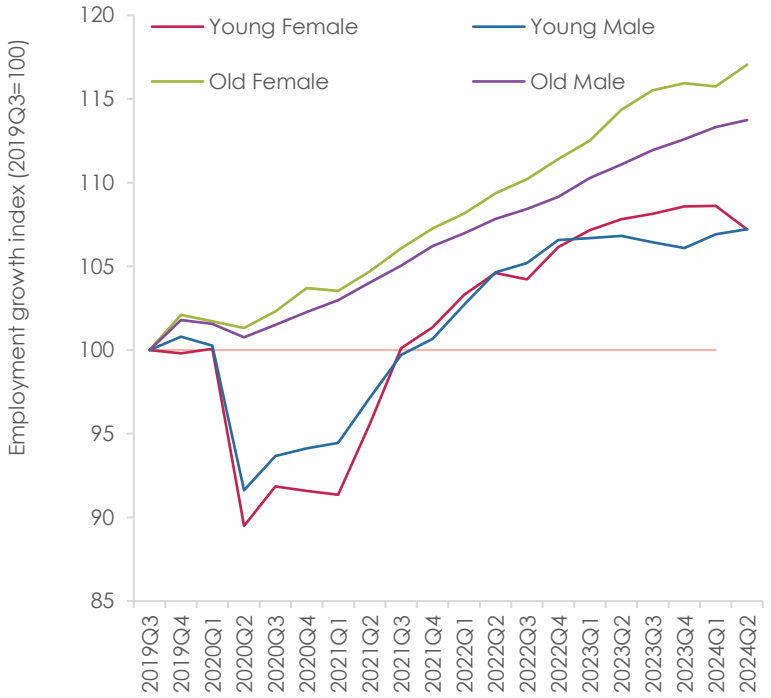
- After two crises, those with less education have not returned to pre-pandemic employment levels, and employment inequality among workers with varying educational backgrounds is increasing.



- Another dimension of the unequal employment recovery is the polarization of job opportunities as blue-collar workers fall behind.



- By age, young workers faced the most significant employment contraction during the pandemic but rebounded stronger.



Source: EURER10

Note: Employment for individuals between 15 and 64 years. Lower secondary refers to less than primary, primary, and lower secondary education; upper secondary refers to upper secondary and post-secondary non-tertiary education; and tertiary refers to tertiary education. These statistics are based on seasonally adjusted LFS series. Source: Eurostat (lfsi_educ_q), 2019Q3-2024Q2.