PART 2

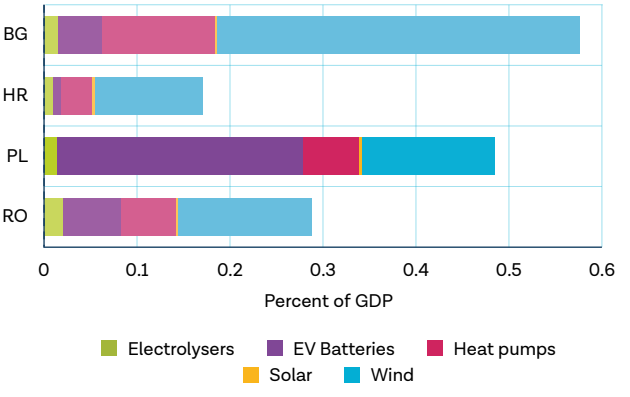
Clean Tech Value Chains

Using Trade Data to Guide a Complex Policy Space

Zooming in on Poland

The EU RER 10 Part 2 *Clean tech value chains: Using trade data to guide a complex policy space* shows that among the 4CEEs[1] studied, Poland is the frontrunner in clean tech value chains,[2] standing to benefit from the opportunities that the green transition may bring. Poland exports more (Figure 1), specializes in more complex segments of the clean tech chains (Figure 2), has achieved export competitiveness in products characterized by strong external demand (Figure 3), and exports more products with high 'onshoring attractiveness[3] (Figure 4). According to the World Bank Group analysis presented in the EU RER 10, with the recent EU policy shifts, Poland is well-positioned to benefit from the EU's green transition and the associated clean tech manufacturing opportunities because of its larger local market, strong export competitiveness, significant onshoring potential, high connectivity of firm networks, attractive investment climate, and government incentives. Despite being the frontrunner in clean tech value chains among the 4CEEs, Poland may face challenges in meeting the demands of clean tech manufacturing: a survey with companies indicates the needs to upskill its workforce, high energy costs, land and infrastructure costs, and a lower resilience to climate change shocks.

FIGURE 1 Exports of Net-Zero Technologies by Value Chain



Source: WB staff calculations.

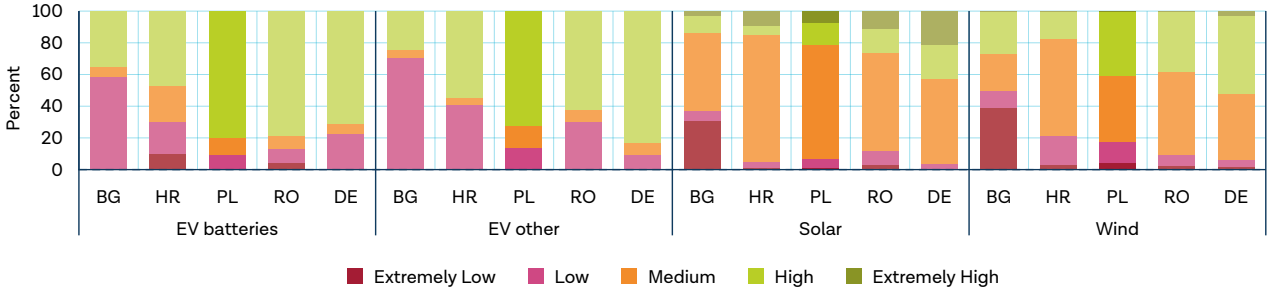
1 World Bank Group EU Regular Economic Report 10 (EU RER) focuses on 4 Central and Eastern European (4CEEs) EU member states: Poland, Romania, Bulgaria, and Croatia.

2 For the purpose of this report, the products that either produce, store or deliver low-carbon energy will be referred to as 'clean energy technologies' in line with the IEA, or 'clean tech' for short. The EU nomenclature includes 'clean technologies', 'net zero technologies', 'green technologies', among others. Note that in line with the emerging nomenclature, 'technologies' here refer to products: capital goods, consumer goods and intermediate goods, and not 'productive' knowledge. The clean tech value chains mapped in this report are electric vehicle (EV) battery, heat pumps, wind, solar PV, and electrolyzers.

3 Please refer to EU RER 10 Part II for more details. Onshoring attractiveness is a composite index that summarizes 18 demand, supply, and ease of market access variables, and is generated using Principal Component Analysis (PCA). PCA reduces the dimensionality of the dataset by transforming a large set of variables into a smaller set still containing most of the information. We select the maximum number of components (eigenvectors or factors) with eigenvalues greater than one.

FIGURE 2 Exports of Clean Technologies by Complexity

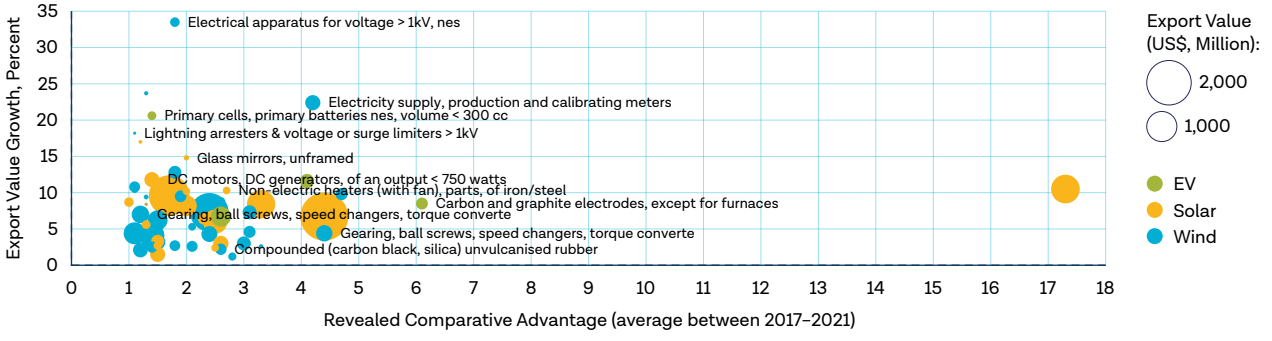
Share of respective technology's exports, 2022



Source: Green Value Chain Explorer (WB internal) and WB calculations.

Note: for panels a and b, the results are shown for three out of five clean tech manufacturing exports: EV, solar PV, and wind, in line with the current functionality of the GVCE tool. b. Extremely Low=-3<PCI<-1, Low=-1<PCI<1, Medium=1<PCI<3, High=3<PCI<5, Extremely High=5<PCI<7.

FIGURE 3 Polish Product with clean tech export competitiveness (RCA ≥1), selected sectors

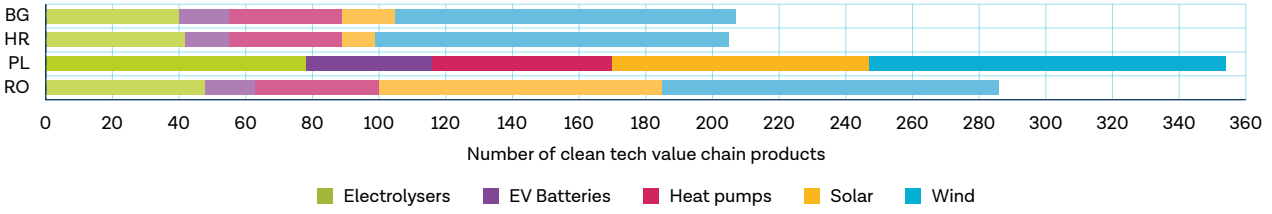


Source: Green Value Chain Explorer

Notes: EV results shown for EV battery only (excluding other EV components); growth rates truncated at 50 to exclude minor outliers showcasing high growth rates from a small base.

FIGURE 4 Unique value chain components with high onshoring attractiveness score

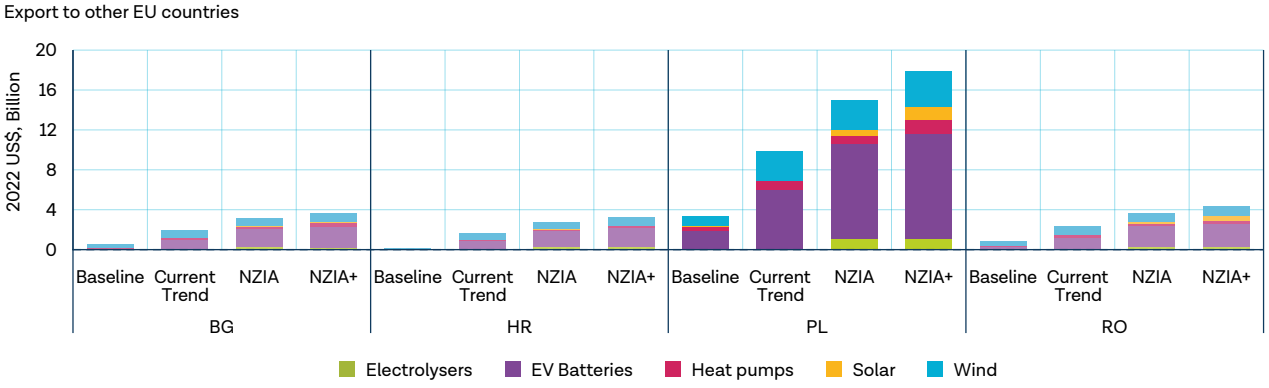
Exports to other EU countries



Source: World Bank calculations.

Poland could potentially triple its exports in clean tech value chains by 2030 if it maintains its current market share; and quintuple them if the ambitious EU targets under its Net Zero Industrial Act are achieved, all else being equal. However, there are downside risks to these export projections due to insufficient coordination and financing at the EU level, and constrained domestic fiscal space. Moreover, the diversity of manufactured products at various stages of production in the clean tech value chains makes the use of targeted policies challenging. Poland has the highest estimated future clean tech export potential among the 4CEEs, with the corresponding high investment needs. Poland's exports to other EU countries could increase fivefold under an NZIA scenario, increasing from US$ 3 billion (0.5 percent of GDP) in 2022 to US$ 15 billion (1.7 percent of GDP) by 2030, with almost two thirds of clean tech exports being EV battery technologies and almost 20 percent wind technologies (Figure 5).

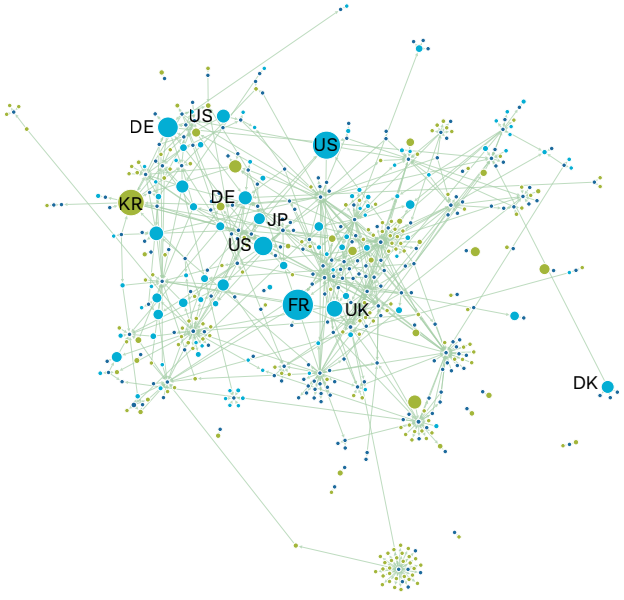
FIGURE 5 Annual exports to EU27, by value chain, 2022 actual and 2030 simulations



Source: World Bank calculations.

Firm network analyses conducted in the EU RER IO shows that Polish firms are well integrated into the global clean tech value chains. Poland clean tech firms stand out for their large and diversified number of direct connections to other countries, having the largest buyer/supplier network among the 4CEEs with connections to suppliers in 34 distinct economies and buyers from 35 countries, including North America and East Asia (Figure 6). In fact, Poland's criticality to the clean tech network is similar to that of Australia and Singapore in the global perspective.[4] Moreover, Poland has a strong link between value chain companies and the domestic supplier base, signaling a higher potential impact from government policy as, for example, subsidies under the Temporary Crisis and Transition Framework (TCTF) or other state aid schemes would activate domestic supply chains, trickle down to domestic suppliers, and create more jobs and attract more investment, compared to other 4CEEs. However, this higher global connectivity also exposes Poland to the risks of more inward-looking trade policies, not only from the EU but also from the US, which is the most important individual supplier for Polish firms in the clean tech value chain.

FIGURE 6 Polish intermediation in clean value chains



Source: World Bank calculations using FactSet.

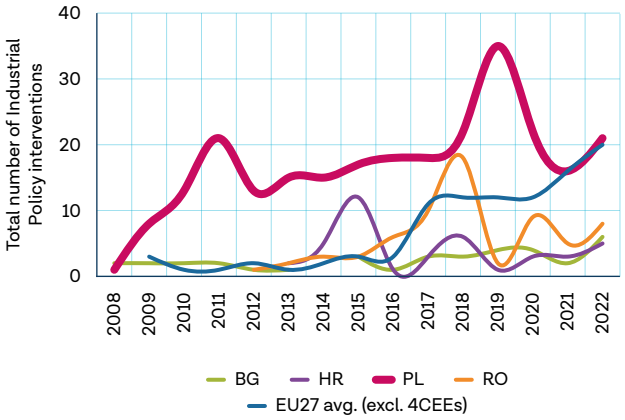
Note: Segments of the global green tech value chain that involve 4CEE firms. The green nodes represent a company located in the respective country; the blue nodes represent key companies in the clean tech sector, while the size of each node reflects the betweenness centrality of the companies in the overall network.

To realize its potential and scale up production and exports in the five clean tech value chains the report focuses on, Poland requires substantial upfront investments — particularly from the private sector. Simulations anchored in the EU policy targets suggest that US$5 billion in investments are required to meet Poland's production and export potential. To mobilize these investments, surveys conducted by the World Bank indicate that investors may need assurances that they can find suitable workers, low-cost energy, land, and infrastructure and more confidence in Poland's climate resilience. Upskilling of the labor force and expanding the labor force is essential given the challenges of declining working-age populations.

4 Measured by 'Betweenness Centrality' (critical intermediaries): Quantifies how often a firm appears on the shortest paths between other firms, highlighting its role as a critical intermediary in the network.

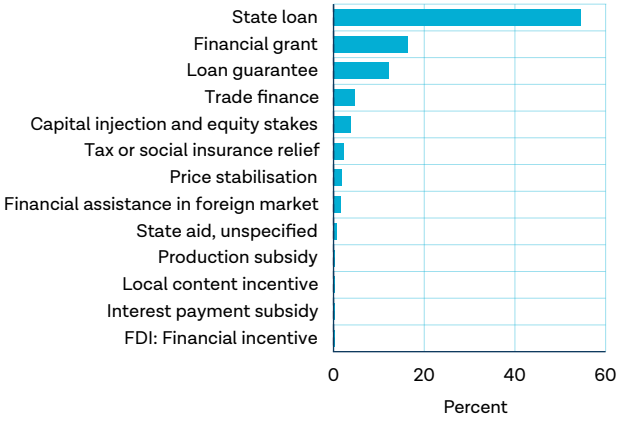
Poland has room to make use of the broader industrial policy toolkit. The analysis of the types of industrial policy used by countries in the EU and globally shows that Poland deploys industrial policy more often than the EU average, and when it does, the toolkit almost exclusively relies on domestic subsidies, especially in the form of state loans (Figures 7 and 8). The use of the broader policy toolkit presented in the EU RER 10 could complement subsidies with tools targeting the supply side, demand side and governance. On the supply side, this includes performance standards, where subsides for specific firms come with conditions; and policies targeting all firms such as improving the availability of skills, well-functioning capital markets, entrepreneurship and innovation policies, the latter already strongly supported by the EU. On the demand side, available policies include strengthening product standards, improving consumer awareness, and public procurement to conditions. As with the selection of sectors to target, if at all, the selection of policies should be done carefully and in a coordinated fashion, with a view to implementing complementary policies that can help make any individual policy more effective. Strengthening the governance (coherence between policies, and enabling bodies), and the overall state capacity is therefore important for creating the conditions for such coordinated policy implementation.

FIGURE 7 Annual industrial policies passed in each of the 4CEEs and the EU average (simple)



Source: World Bank calculations based on Juhasz et al. 2022.

FIGURE 8 Composition of industrial policy interventions in Poland



Source: World Bank calculations based on Juhasz et al. 2022.

More knowledge about the domestic and international policy space would help, and so would a coordinated policy approach at the EU level. The analysis of global clean tech value chains and the specific types of participation by individual countries is currently difficult to capture given the limitations of the existing data. The EU RER shows some ways in which these value chain relationships can be approximated, but Polish policy makers could benefit from investing in getting a detailed understanding of the existing and potential participation in global value chains to inform a targeted policy strategy. EU level coordination would also help in that it could help minimize the fallacy of composition risks (too many countries crowding into the same product space) while overlooking other critical parts of the value chains.