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Divided we fall – The risks of competitive fragmentation on Europe’s road to net-zero

Executive Summary

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- **The green transition is a motor for economic growth.** In 2023, the clean energy sector alone added USD320bn to the global economy in value added, accounting for 10% of global GDP growth. Worldwide, the momentum toward net zero has pushed up clean energy investments by over 80% in the past decade, surpassing USD2trn in 2024. China and Europe have been leading this transformation. But while China's green investments continue to grow, reaching USD676bn in 2024 (3.7% of its GDP), Europe's investment levels have begun to plateau at almost USD500bn, and even decreased relative to its GDP from 1.9% to 1.8% in the last two years following the onset of the global energy crisis.
- **In green manufacturing, China has leveraged increased investments, economies of scale and low-cost energy, capital and labor to secure a dominant position.** In the photovoltaics sector alone, China accounts for approximately 80% of global production of polysilicon, solar cells and modules, as well as 97% of wafer production. The existing market dominance is reinforced by recent developments for manufacturing capacity additions. In 2023, around 70% of global clean manufacturing capacity was added in China while the EU and the US only added 13% and 8%, respectively. In 2030, China's green manufacturing capacity is likely to be 74% higher than that of the rest of the world. With domestic demand expected to account for only one-third of this supply, it is evident that most of the expanded capacity will target global markets, further cementing China's role as the world's clean tech manufacturing powerhouse.
- **In response to China's dominance in manufacturing and trade, the EU is increasingly adopting green protectionism.** In Europe, the share of green imports from China have increased sharply from 2.3% in 2014 to 13.6% in 2023 while in the US this share remains much lower at 4.6%, the result of its protectionist stance. But Europe, too, is increasingly shifting towards protecting its (green) industries through tariffs and non-tariff measures (NTMs). New green NTMs in the EU surged from just one case in 2017 to 119 by 2023, with the bulk of new green trade restrictions (tariffs and NTM) directed at China, growing from zero in 2017 to 46 in 2023. Tariffs on Chinese EVs are just the most recent example.
- **At the same time, the EU is scaling up its green industrial policy to boost domestic production and safeguard strategic competitiveness.** As a response to the US Inflation Reduction Act (IRA), which pledged over USD360bn in tax credits, grants and loans to enhance clean-tech manufacturing, the EU's Green Deal Industrial Plan aims to boost the competitiveness of Europe's net-zero industry, with REPowerEU allocating over EUR250bn for approvals, tax incentives and workforce reskilling. However, actual green subsidies are even higher than these flagship programs imply. In 2023, the US allocated USD220.5bn (0.8% of GDP) in green subsidies (88% of total subsidies). In comparison, the EU dedicates 62% of its subsidies related to industrial policies to green technologies, amounting to USD156.5bn and constituting 0.9% of total EU27 GDP.

- **The right mix makes the difference.** Protectionist measures to safeguard local industries pose risks to the green transition and international relations. Isolationist approaches could constrain the production and export of essential goods critical for the global green transformation, leading to higher prices and potential delays in decarbonization goals. A +1% increase in tariffs reduces trade flows of green products by an average of 4.3%, with impacts varying significantly from 1.2% for batteries and up to 9.8% for electric vehicles. For solar products, raising EU tariffs on Chinese imports from 0.78% to 10% could cut trade by 12.2%, increasing costs on a EUR19.7bn market and threatening to delay critical decarbonization efforts.
- **In a net-zero scenario, electricity will become the cornerstone of the energy system, rising from 22.8% of the industrial energy mix in 2020 to 40.8% by 2050.** This shift increases vulnerability to electricity price fluctuations, as seen during the 2022 energy crisis when European electricity prices surged, peaking at over EUR200 per MWh. Even as prices have declined, European industries still pay 39% more for electricity than the US and 73% more than China, contributing to declines in energy-intensive sectors like chemicals (-2.3% in France) and non-metallic minerals (-18.8% in Germany). The long-term risks for price stability are even greater in a fragmented climate policy scenario (2.4°C warming), where uncoordinated efforts lead to inefficiencies and heightened costs. In such a scenario, while short-term benefits may arise from localized decision-making and delayed investments in clean energy, the absence of shared commitments and collective action toward a net-zero transition would have significant long-term consequences. Avoiding fragmentation and pursuing a coordinated transition aligned with a below 2°C scenario could generate substantial energy cost savings of USD73.8bn by 2050 across the industrial, residential, commercial and transportation sectors in major European economies.
- **Overall economic losses in a fragmented climate transition dwarf energy costs.** While short-term gains from lower electricity costs may appear advantageous for some, the long-term repercussions of a fragmented transition – stemming from unaddressed climate risks, economic inefficiencies and geopolitical tensions – paint a far more concerning picture. A fragmented transition could cost China an additional USD13.9trn (2017 prices) and the US USD6trn compared to the below 2°C scenario, representing 1.1% (0.7%) of cumulative GDP for the period 2022 – 2050, respectively. These losses are primarily driven by increased geoeconomic risks, such as disruptions in global supply chains, alongside escalating physical damages from unmitigated climate impacts. Though losses in European economies would be lower, ranging from USD0.7trn to USD1trn, no country is immune to the economic consequences of a fragmented climate transition.
- **To prevent a harmful cycle of fragmentation and to restore competitiveness, Europe must strengthen the transition instead of weakening it.** While short-term competitiveness gains from increased protectionism are tempting, governments need to strike a balanced approach in order to avoid green fragmentation, which would delay the transition and harm Europe's domestic industry in the long run due to higher energy costs and diminished global competitiveness. For sustainable green growth, Europe must carefully evaluate which sectors can compete globally, where protective measures are justified and where raising barriers to green trade would cause more harm than good. Wind power and hydrogen are two key sectors where Europe already holds a strong position and can capitalize on green growth opportunities, in particular if it starts thinking beyond its borders.

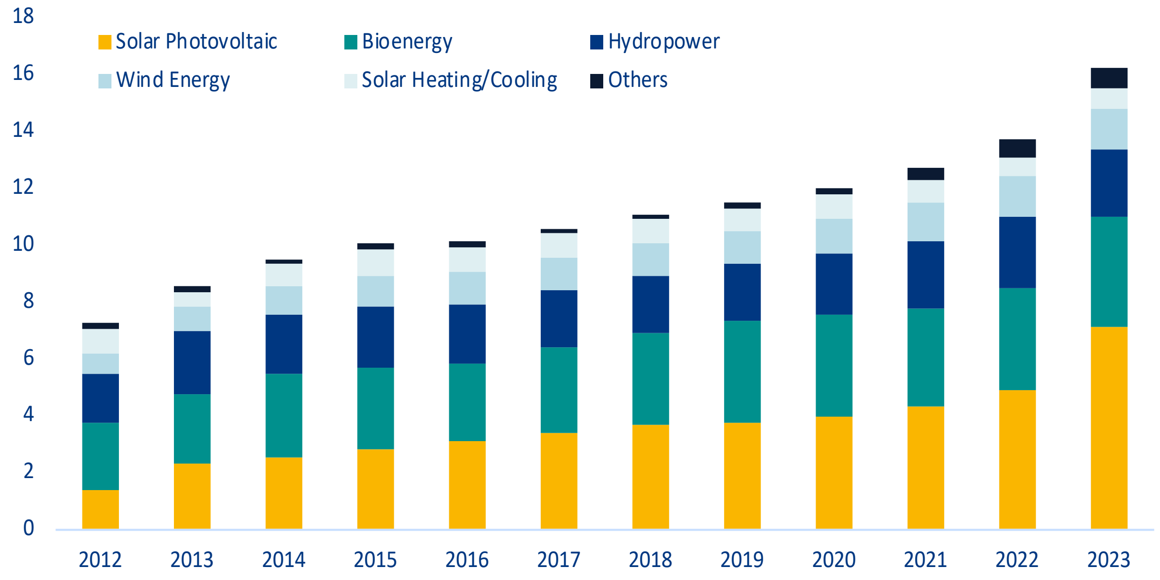
Green sector prospects and supply-chain concentration

In an era dominated by pressing short-term economic and budgetary challenges alongside escalating geopolitical conflicts, the green transition often takes a backseat… A green backlash looms as ambitious decarbonizing targets are seen as contributing to high costs and reduced competitiveness. As countries are concerned about reducing dependencies and strengthening strategic autonomy, international cooperation becomes more challenging in a fragmented world. This was highlighted at COP29 last month, where major advancements on climate financing ended in a deadlock over who should pay and how much. Yet, what is often overlooked in the economic debate on climate change – centered around balancing mitigation gains and transition costs – are the additional co-benefits that a successful transition can bring for economic growth and competitiveness. As Mario Draghi correctly noted in his recent report, enhancing competitiveness in the EU will heavily depend on reducing energy costs – a goal that is intrinsically tied to transforming the region's energy market. While the report highlights the advantages of a unified approach to restructuring domestic energy systems, its focus remains largely intra-European. However, the success of these efforts will also hinge on fostering international collaboration and preventing further fragmentation of the global green transition.

...But the green transition is a motor for economic growth. In 2023 the clean energy sector alone added USD320bn to the global economy in value added, accounting for 10% of global GDP growth.[1] This green growth has also spurred significant job creation, with direct employment in renewable energy reaching 16.2mn jobs in 2023 – an +18.3% increase from the previous year (see Figure 1). According to the International Labour Organization, this number could further increase to more than 24mn by 2030 when committing to a 2°C consistent decarbonization path.[2]

Meanwhile, the roll-out of cost-effective renewables and the use of energy-efficient technologies are paving the way for long-term energy cost declines, benefiting the whole domestic economy. One notable example is the significant reduction in levelized costs for solar and wind power, which have decreased by -75% and -60%, respectively, over the past 14 years, highlighting their growing affordability and economic viability.

Figure 1: Global development of renewable energy jobs (in million)

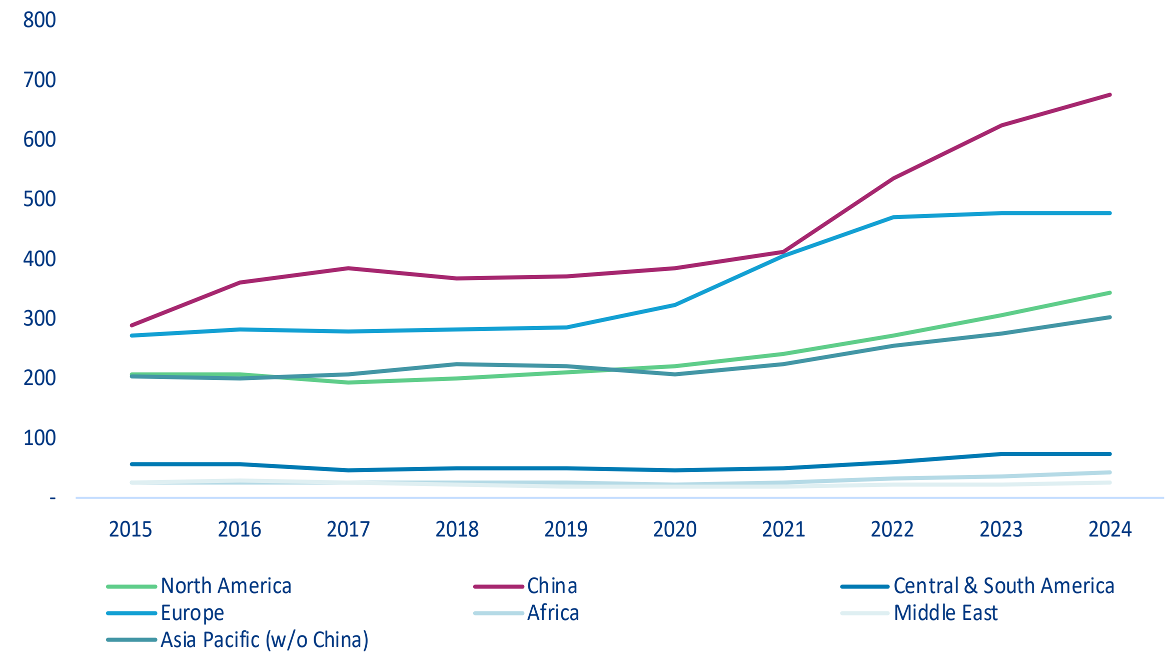


Source: IRENA

To capture the economic and environmental benefits of the green transition, governments are significantly ramping up investments in clean technologies. Landmark initiatives like the US Inflation Reduction Act (IRA) and the EU's Net-Zero Industry Act (NZIA) are prime examples of initiatives designed to accelerate clean energy investments, strengthen domestic manufacturing and accelerate the deployment of green energy and sales of green equipment such as electric vehicles (EVs). Worldwide, the momentum toward net zero has pushed up clean energy investments by over +80% in the past decade, surpassing USD2trn in 2024. China and Europe have been leading this transformation (Figure 2a). But while China's green investments continue to grow, reaching USD676bn in 2024, Europe's investment levels have begun to plateau at almost USD500bn in the last two years following the onset of the global energy crisis. The difference becomes even more pronounced when considering investments relative to the region's GDP (Figure 2b). China invested between 2.3% and 3.7% of its GDP in the energy transition in the last four years while Europe's level only stands at 1.8%-1.9%. In many regions in Africa and Asia, investment levels have increased considerably, catching up with Europe in relative terms. On the other hand, in western economies and the Middle East, expenditure levels have stagnated and even dropped by 0.1pp in Europe.

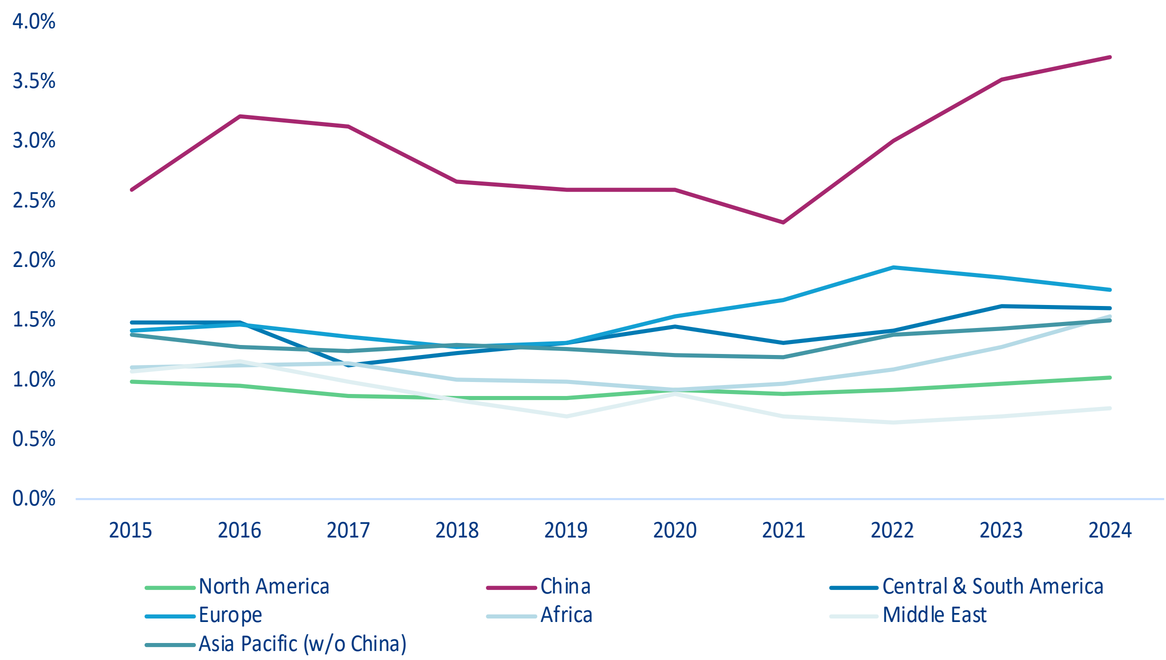
[1] IEA
[2] ILO

Figure 2a: Development of green energy investment (USD billion)



Source: IEA

Figure 2b: Development of green energy investment (% of GDP)



Sources: Allianz Research, IEA and IMF

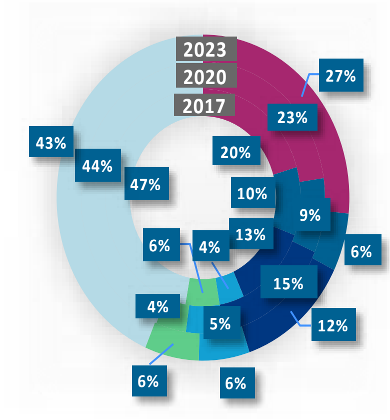
In green manufacturing, China has leveraged increased investments, economies of scale and low-cost energy, capital and labor to secure a dominant position. In the photovoltaics sector alone, China accounts for approximately 80% of global production of polysilicon, solar cells and modules, as well as 97% of wafer production. Similarly, about 80% of wind turbine components are manufactured in China, and the country leads in refining neodymium, a rare earth element critical for permanent magnets used in wind turbines and electric vehicles. The existing market dominance is reinforced by recent developments for manufacturing capacity additions. In 2023, around 70% of global clean manufacturing capacity was added in China while the EU and the US only added 13% and 8%, respectively.[3]

A green China shock is in the making. The market size for clean-tech supply will increase to USD0.5trn in China by 2030 – 74% higher than the entire rest of the world.[4] With domestic demand expected to account for only one-third of this supply, it is evident that most of the expanded capacity will target global markets, further cementing China's role as the world's clean-tech manufacturing powerhouse. Already in recent years, China has notably expanded its share in international green trade (Figure 3). From 2017 to 2023, the country's share in international exports of green products has expanded significantly, increasing by more than 10pps for solar products, electrolyzers and EVs. The most substantial growth, however, has occurred in battery products, where China's trade share surged from 34% in 2020 to 53% in 2023. Other major suppliers of green transition products such as the US, Germany or Japan have lost ground in that same period. A big shift has occurred in the EV market, too, where China and Germany each held a 28% share in 2023. Meanwhile, the US, despite a USD10bn increase in EV exports, has seen its overall market share decline by 21pps to only 6%. Among the transition sectors, only electricity grid supply maintains an overall relatively low market concentration. The emerging market for green hydrogen is a particularly interesting case. Although still in its early stages, supply-chain developments already show signs of following a similar trajectory to solar and battery products, with a notable shift toward Chinese market dominance. According to the IEA, China accounted for over 40% of final investment decisions (FIDs) for new electrolyzer capacity in the past year and currently holds 60% of global electrolyzer manufacturing capacity. This strong foothold positions China well to meet global demand as countries transition away from natural gas.

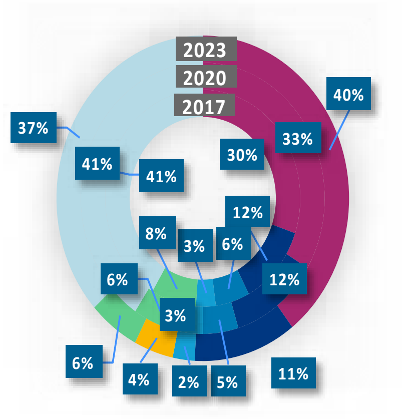
[3] Energy Technology Perspectives 2024
[4] The State of Clean Technology Manufacturing

Figure 3: Export concentration in key transition products (in %)

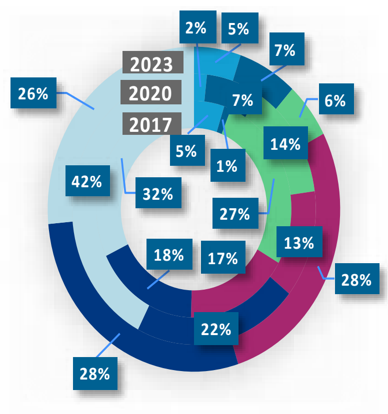
Wind



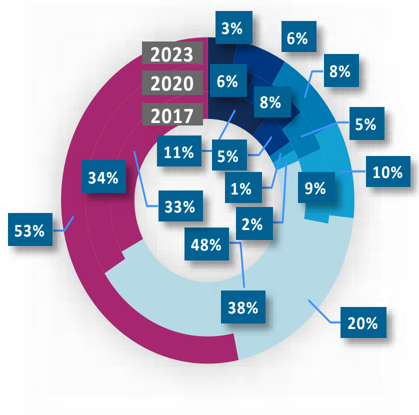
Solar



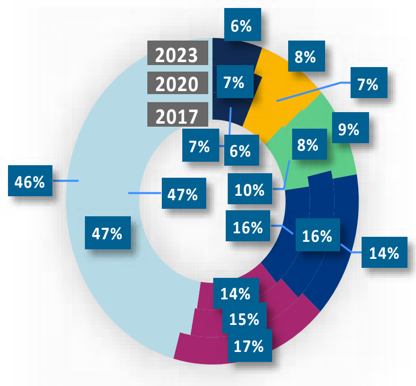
EVs



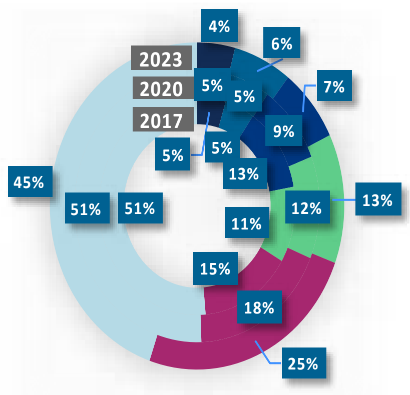
Battery



Grid



Hydrogen

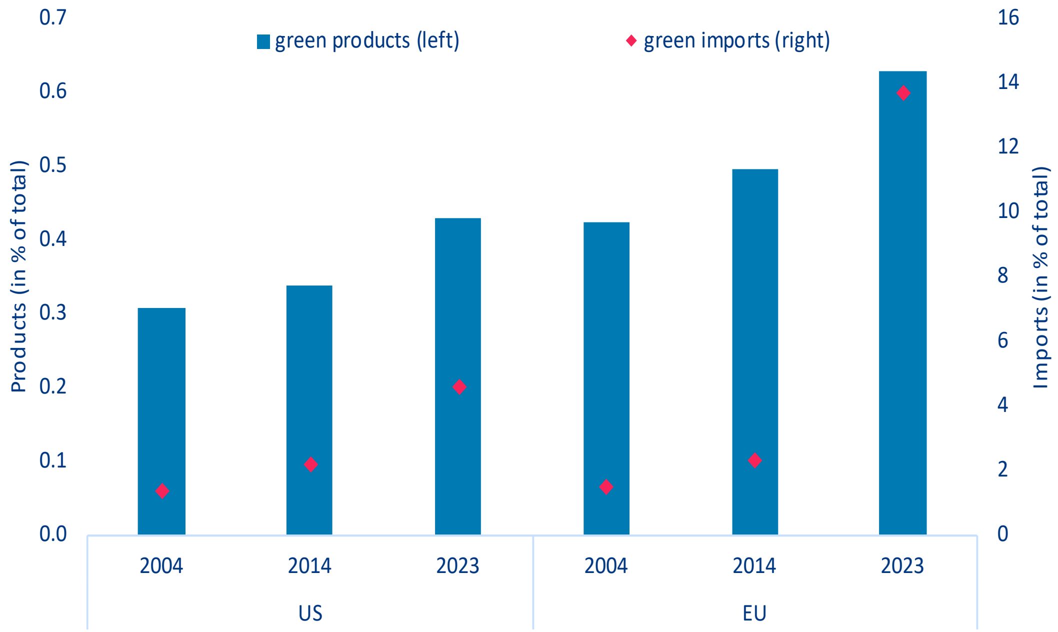


Sources: UN Comtrade, Allianz Research. Notes: Green tech is defined as HS6 products for solar, such as modules, converters, controllers of solar installations, assembled photovoltaic modules or panels, individual and unassembled solar cells, converters or controllers; for wind: complete wind turbines and turbine parts; for EVs: electric cars, buses, trucks, motorcycles and scooters; for batteries: lithium-ion, nickel-metal hydride, lead-acid batteries and electric accumulators; for grids: cables, transformers, control panels, transformer parts or smart grid controllers; for hydrogen: fuel cell motors, electrolysis machines and hydrogen storage tanks.

The risk of isolation

In response to China's dominance in manufacturing and trade, western economies are increasingly adopting measures of green protectionism to enhance domestic investment in green industries and reduce reliance on China. While Europe is not critically dependent on any of the identified final products of green technology from China, green dependencies have increased strongly nevertheless. The number of green products as a share of total products the EU imports from China has increased by +26% over the last decade to 0.63% in 2023 (Figure 4) and by +48% since 2004. Even more so, the share of green imports from China has increased sharply from 2.3% in 2014 to 13.6% in 2023. This is less true for the US where the share of green imports from China has doubled over a decade, but remains much lower at 4.6% as a result of its protectionist stance.

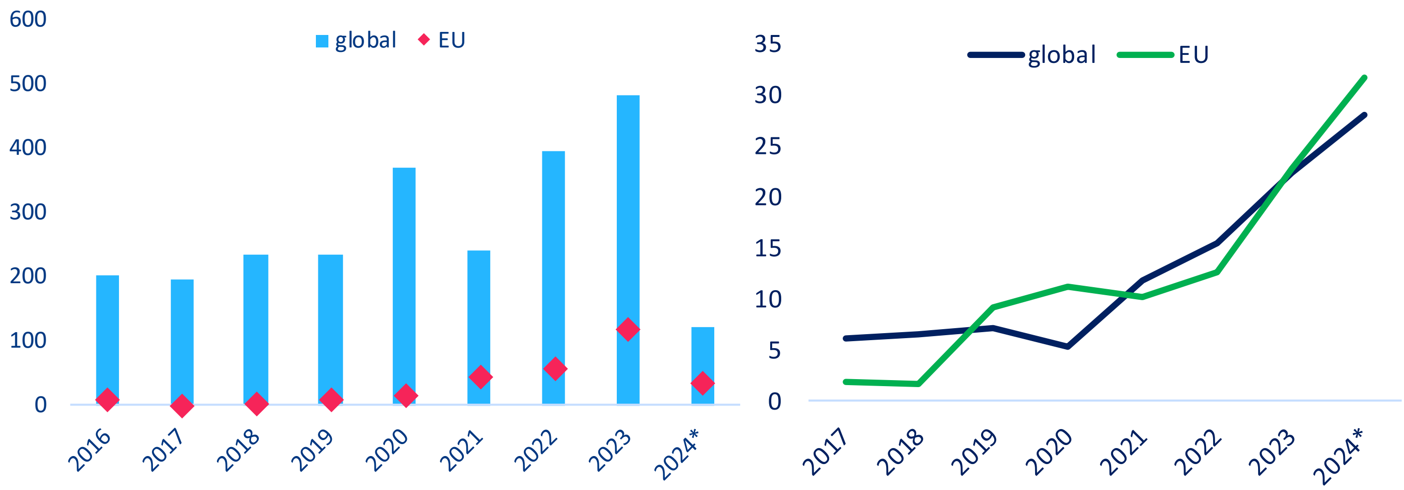
Figure 4: Green-dependent products, in % of total products imported from China and Chinese import shares, in % of total imports from China



Sources: ITC, Allianz Research. Notes: Green tech is defined as HS6 products for solar, such as modules, converters, controllers of solar installations, assembled photovoltaic modules or panels, individual and unassembled solar cells, converters or controllers; for wind: complete wind turbines and turbine parts; for EVs: electric cars, buses, trucks, motorcycles and scooters; for batteries: lithium-ion, nickel-metal hydride, lead-acid batteries and electric accumulators; for grids: cables, transformers, control panels, transformer parts or smart grid controllers; for hydrogen: fuel cell motors, electrolysis machines and hydrogen storage tanks.

Europe, too, is increasingly shifting towards protecting its (green) industries through tariffs and non-tariff measures (NTMs) while promoting research and innovation via industrial policy. New green NTMs more than doubled worldwide from 196 cases in 2017 to 483 in 2023 (Figure 5, left). In the EU, measures targeting green tech surged from just one new case in 2017 to 119 by 2023. As a result, the share of green trade restrictions has risen sharply (Figure 5, right). The bulk of new green trade restrictions (tariffs and NTM) is directed at China, growing from zero in 2017 to 46 in 2023, with tariffs on Chinese EVs as the most recent example. Meanwhile, China continues to pursue acquisitions of EU companies, leveraging FDI to enhance its technological capabilities and ensure market access.

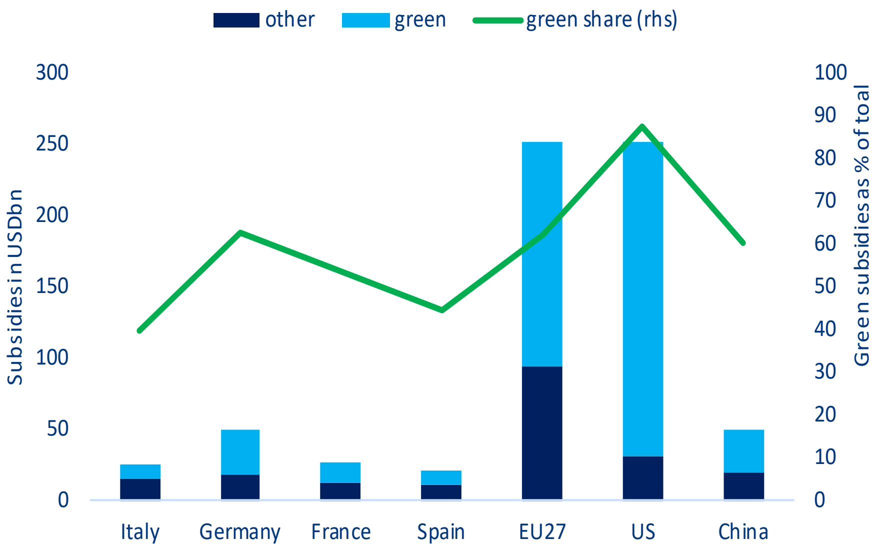
Figure 5: Number of green NTMs (left) and green NTM share (as % of total, right)



Sources: GTA, Allianz Research. Notes: Green tech is defined as HS6 products for solar, such as modules, converters, controllers of solar installations, assembled photovoltaic modules or panels, individual and unassembled solar cells, converters or controllers; for wind: complete wind turbines and turbine parts; for EVs: electric cars, buses, trucks, motorcycles and scooters; for batteries: lithium-ion, nickel-metal hydride, lead-acid batteries and electric accumulators; for grids: cables, transformers, control panels, transformer parts or smart grid controllers; for hydrogen: fuel cell motors, electrolysis machines and hydrogen storage tanks.

At the same time, Europe is scaling up its green industrial policy to boost domestic production and safeguard strategic competitiveness. As a response to the US Inflation Reduction Act (IRA), which pledges over USD360bn in tax credits, grants and loans to enhance clean-tech manufacturing, the EU's Green Deal Industrial Plan aims to boost the competitiveness of Europe's net-zero industry, with REPowerEU allocating over EUR250bn for approvals, tax incentives and workforce reskilling. However, actual green subsidies are even higher than these flagship programs imply. In 2023, the US allocated USD220.5bn in green subsidies (88% of total subsidies) (Figure 6), representing 0.8% of its GDP. In comparison, the EU dedicates 62% of its subsidies related to industrial policies to green technologies, amounting to USD156.5bn and equivalent to 0.9% of total EU27 GDP. China's share stands at 60.5%, slightly lower than that of the EU (USD30.2bn), but overall green subsidies account for just 0.2% of Chinese GDP – a figure which likely underestimates the actual subsidy levels.

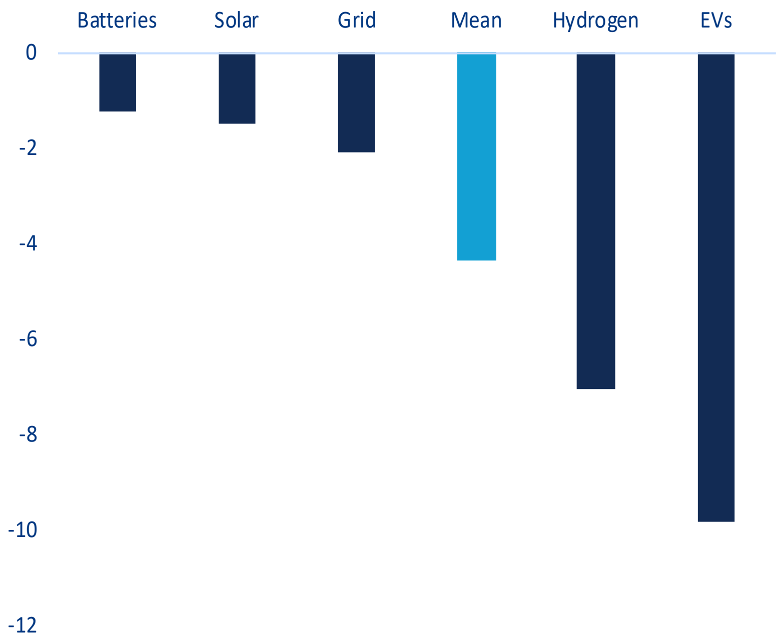
Figure 6: Subsidies (in USD bn, lhs) and green share (as % of total, rhs) in 2023



Sources: GTA NIPO, Allianz Research. Notes: Green tech is defined as HS6 products for solar, such as modules, converters, controllers of solar installations, assembled photovoltaic modules or panels, individual and unassembled solar cells, converters or controllers; for wind: complete wind turbines and turbine parts; for EVs: electric cars, buses, trucks, motorcycles and scooters; for batteries: lithium-ion, nickel-metal hydride, lead-acid batteries and electric accumulators; for grids: cables, transformers, control panels, transformer parts or smart grid controllers; for hydrogen: fuel cell motors, electrolysis machines and hydrogen storage tanks.

The right mix makes the difference. While protectionist measures can help safeguard local industries, they also carry significant risks, including hindering the green transition and straining international relations. Isolationist trade policies risk disrupting the production and export of essential goods critical for the global green transformation, driving up costs and delaying decarbonization goals. Using a gravity model on bilateral green trade, our analysis highlights the potential trade implications of a tariff war on green products. On average, a +1% increase in tariffs reduces trade flows by -4.3% (Figure 7), though the impact varies significantly by product. For example, tariffs reduce trade by -1.2% for batteries but up to -9.8% for EVs, reflecting differences in supply-chain concentration and flexibility. This implies that if European countries raised tariffs on solar products from China from an average of 0.78% in 2022 to 10%, trade would likely decline by around -12.2%. In a more protectionist scenario of a uniform 25% tariff on all green products considered, the effect would be much larger, reducing imports from by -32.6% or EUR28bn.

Figure 7: Tariff elasticity of selected green products



Source: Allianz Research calculations based on UN Comtrade. Note: Individual elasticities: batteries: -1.2; solar: -1.5; grid: -2.1; hydrogen: -7.0; EVs: -9.8. Estimation results for wind were found to be not consistent with trade theory.

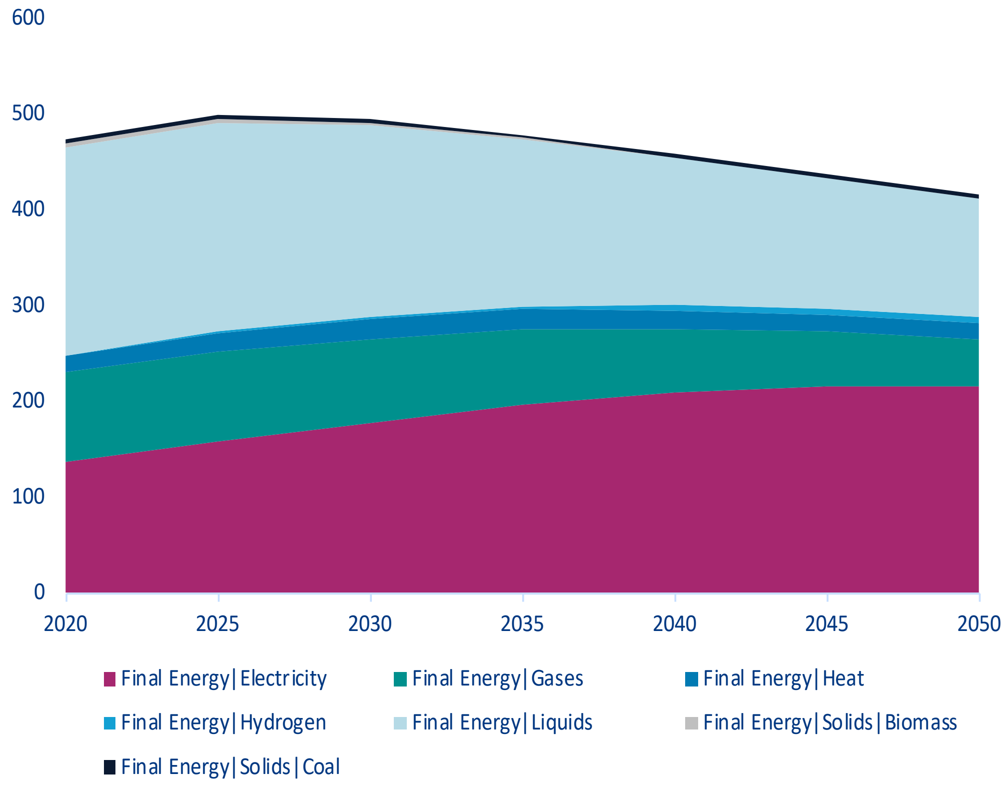
A key determinant of the costs and benefits of raising tariffs is the flexibility of supply chains – specifically, the ease of shifting from one supplier to another. For EVs, global competition means that while EU tariffs would increase prices, much of the effect could be mitigated by a shift to more localized production. In contrast, the solar industry presents a more challenging scenario. With China dominating over 40% of the global solar panel market and accounting for 98% of solar panels imported into the EU in 2023, switching suppliers would be considerably more difficult. This rigidity is reflected in a lower trade elasticity (-1.5), indicating that increased tariffs would directly translate into higher costs. For the European solar transition, raising barriers to trade could result in significant cost increases on over EUR19.7bn of solar imports, heightening the risk of delaying critical decarbonization efforts. Moreover, trade restrictions risk provoking retaliatory measures, exacerbating international fragmentation of green value chains and hindering the global transition. According to the IEA, imposing a 100% tariff on solar PV modules today would effectively cancel out the cost declines achieved through technological advancements over the past five years.[5]

[5] Energy Technology Perspectives 2024

Green fragmentation and implications for competitiveness

In a net-zero climate transition scenario, energy consumption patterns would undergo a profound transformation, with electricity emerging as the cornerstone of the energy system. Overall, final energy demand declines, driven by advancements in efficiency measures and demand-side management (Figure 8). Electricity would become the dominant energy source, propelled by the rapid electrification of key sectors such as transport, industry and residential energy use. This accompanied by a broader shift to renewable electricity generation from wind and solar will be pivotal for achieving deep carbon reductions. On the other hand, fossil-based energy carriers would see a marked decline. The share of gases drops from approximately 20% in 2020 to just 11% by 2050, while that of liquids falls from 45% to 30% over the same period. Hydrogen and biomass would play more limited roles. Hydrogen would primarily support backup power infrastructure and decarbonize hard-to-electrify applications in sectors such as industry and transport, while biomass would act as a supplementary energy source where renewable electricity falls short. Meanwhile, coal usage would decline sharply in line with global efforts to phase out one of the most carbon-intensive fuels. Electrification requires not only substantial investments in renewable energy infrastructure, but also in grid expansion and modernization, and energy storage systems. Moreover, as electricity demand rises, stabilizing (or even reducing) electricity prices will become essential, ensuring economic competitiveness, particularly for energy-intensive sectors like manufacturing and heavy industry.

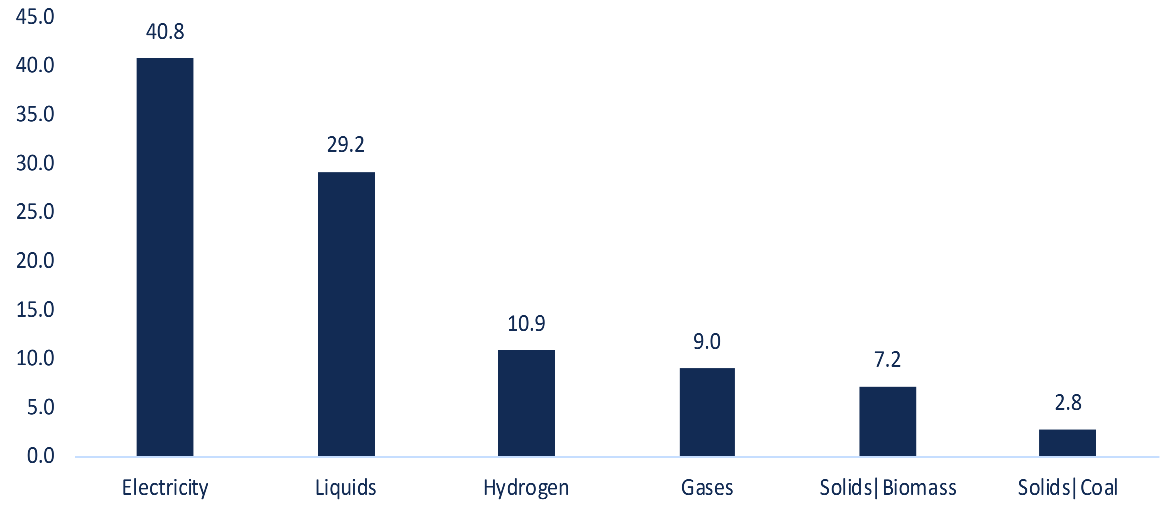
Figure 8: Final energy demand by source in a net-zero scenario (EJ/yr)



Source: NGFS

Figure 9 highlights electricity's crucial role within the industrial sector. By 2050, electricity will dominate the energy mix for industry, accounting for 40.8%, up from 22.8% in 2020. As industries embrace electrification, the need for robust investments will become increasingly urgent. Expanding renewable-energy generation capacity, modernizing electricity infrastructure and scaling up hydrogen production will be essential to support this transition. Hydrogen, although complementary, will play a critical role in decarbonizing hard-to-electrify industrial processes, underscoring the importance of fostering advancements in hydrogen technologies. Moreover, this shift will demand innovation in energy storage systems and grid resilience to accommodate rising electricity demand while maintaining stability. Industries will also need to reimagine energy-intensive processes to integrate cleaner energy solutions seamlessly. The dominance of electricity in the industrial energy mix represents a technological (r)evolution for a cleaner, greener future.

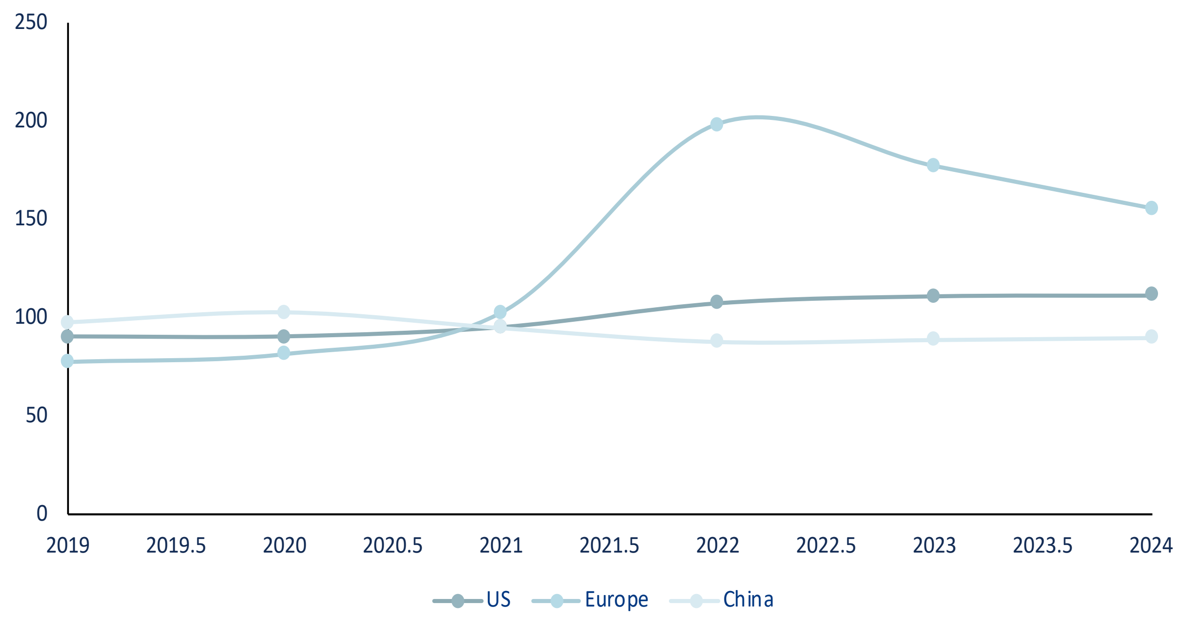
Figure 9: Final energy demand of the industry sector by source in 2050 (EJ/yr)



Source: NGFS

But this reliance on electricity will introduce a critical challenge: the risk of electricity price fluctuations, particularly in Europe. The recent energy crisis underscored the vulnerability of energy-intensive industries to volatile electricity costs. Between 2022 and 2024, electricity prices for commercial customers in Europe surged, peaking at over EUR200 per MWh during the 2022 crisis. While costs have since declined, they remain elevated compared to pre-crisis levels (Figure 10). In 2024, European industries still pay 39% more on average for electricity than their US counterparts and 73% more than their Chinese counterparts. However, there are disparities across Europe. Nordic countries benefited from electricity prices up to 37% lower than US averages in early 2024, thanks to their reliance on renewable energy (mainly hydro) and minimal use of natural gas (6.4%). In contrast, nations such as Germany, Austria and Ireland faced electricity costs exceeding US levels by over 50%, driven by a dependence on natural gas, which accounted for 29.3% of their energy mix. The shift from Russian pipeline gas to costlier Liquefied Natural Gas (LNG) further amplified these challenges. As industries move toward electrification to meet net-zero targets, exposure to electricity price volatility could undermine economic competitiveness, especially in energy-intensive sectors.

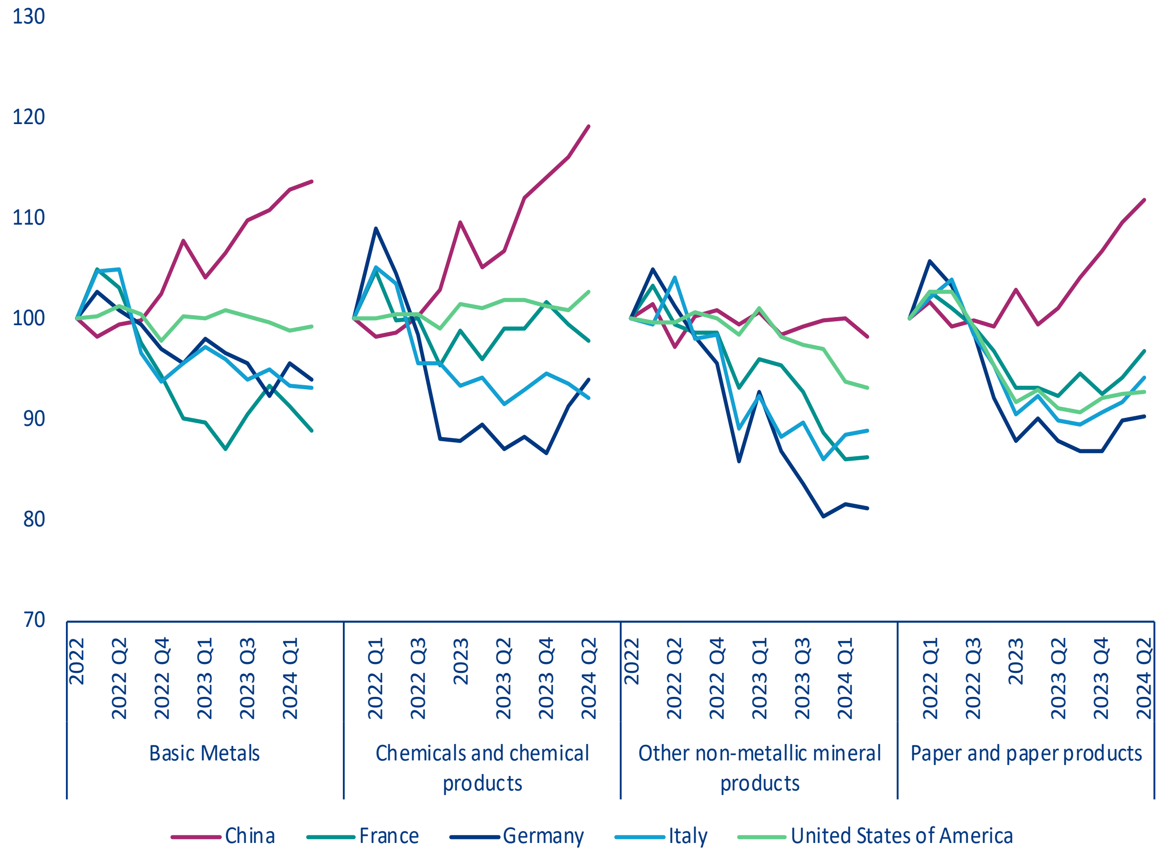
Figure 10: Electricity price development for commercial customers (in USD/MWh)



Sources: European Commission, EIA

A persisting differential in energy costs could drag down Europe's growth prospects, particularly for energy-intensive industries. This becomes evident when comparing the performance of selected European manufacturing sectors since the onset of the energy crisis with their counterparts in China and the US (Figure 11). In China, manufacturing output grew across most sectors, with the exception of non-metallic mineral products, which experienced a general output decline. In the US, manufacturing output more or less stagnated in some sectors, such as basic metals (-0.8%) and chemical products (+2.6%), while production fell in non-metallic minerals and pulp and paper. In contrast, Europe faced substantial declines across all energy-intensive manufacturing sectors. These ranged from only -2.3% for chemical production in France to a steep -18.8% for non-metallic minerals in Germany. While this cannot be fully attributed to energy costs alone, with supply-chain disruptions and a general economic slowdown in Europe being relevant factors, the declines in energy-intensive manufacturing were notably steeper than the overall changes in total manufacturing output. During the same period (Q1 2022- Q2 2024), total manufacturing output ranged from a slight increase of +0.05% in Spain to a -4.5% decline in Germany, highlighting the disproportionate impact on energy-intensive sectors. Recent IMF research reveals that the surge in energy prices following the outbreak of war in Ukraine has cost the German economy approximately 1.25% of its GDP. This impact has been felt most acutely in energy-intensive industries, which bore the brunt of the price increases, while non-energy-intensive industries demonstrated a degree of resilience[6].

Figure 11: Manufacturing output in energy-intensive industries (Index 2022=100)

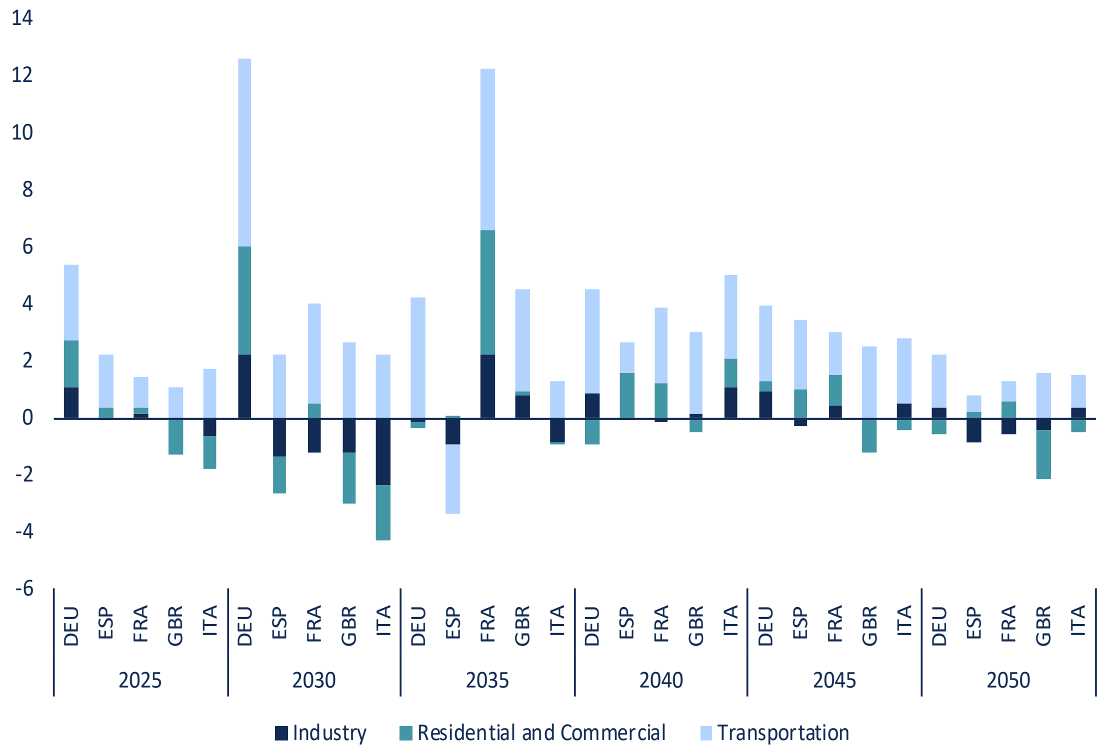


Sources: UNIDO, Allianz Research

[6] Impact of High Energy Prices on Germany's Potential Output

The long-term risk of electricity-price instability becomes particularly pronounced in a fragmented climate policy scenario (2.4°C warming), where countries prioritize national agendas over coordinated global efforts. In such a scenario, while short-term benefits may arise from localized decision-making and delayed investments in clean energy, the absence of shared commitments and collective action toward a net-zero transition would have significant long-term consequences. For example, by 2030, industries in Europe's leading economies – Germany, France, Italy, Spain and the UK – could collectively save USD3.94bn, while the residential and commercial sectors could benefit from savings of USD0.7bn (Figure 12). These cost savings depend significantly on total energy consumption and the extent to which fuel switching, process electrification and lower electricity prices can drive down overall costs. Germany's large energy-intensive industrial sector, combined with a transport system where electric and plug-in hybrid vehicles represent just 24% of the market, presents significant opportunities for cost reduction. Globally, China and the US stand to gain even more substantial short-term cost reductions, with projected savings of USD98.4bn and USD47.3bn, respectively, over the same period. However, the long-term economic outlook tells a different story. By 2050, a coordinated transition aligned with a below 2°C scenario would yield substantial energy cost savings. Under this scenario, industries, the residential and commercial sectors and transportation in major European economies could accumulate savings of USD73.8bn compared to the fragmented transition. For the US, the cost of remaining in a fragmented world would be severe, with projected losses totaling USD546.2bn over the 2020–2050 period. These long-term costs are easy to understand. A fragmented approach would hinder the global energy transition, leaving the world increasingly dependent on volatile fossil fuel markets. Over time, electricity prices would rise worldwide, driven by supply-chain disruptions, continued reliance on expensive non-renewable energy and the failure to scale renewable technologies effectively. The ripple effects of such price instability would exert mounting pressure on the global economy. Industries and consumers alike would bear the burden of escalating costs and reduced economic resilience as uncoordinated climate actions would exacerbate climate change impacts, such as extreme weather events, further straining energy systems. In contrast, a unified global approach to the net-zero transition offers the most sustainable path forward. By aligning policies, fostering collaboration and investing in renewable energy at scale, nations can mitigate price instability, enhance energy security and ensure a more equitable and resilient global economy.

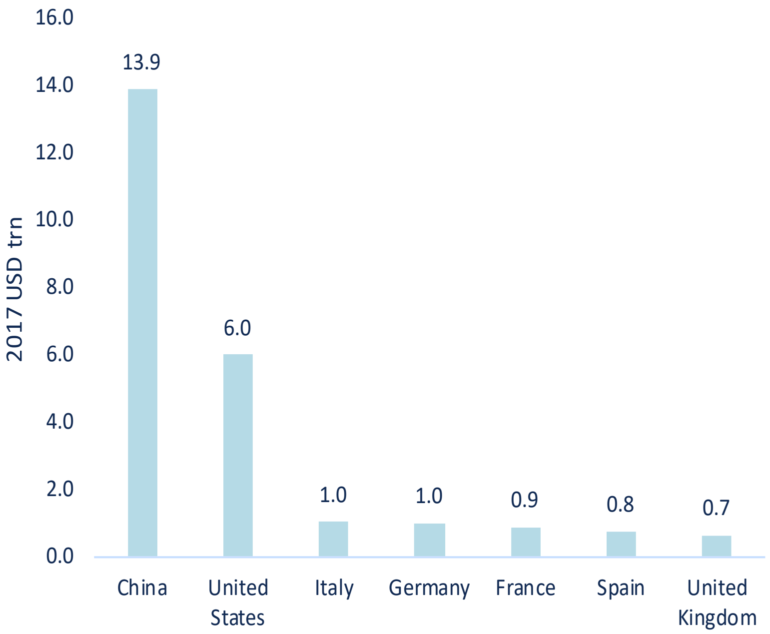
Figure 12: Annual energy cost advantage of the 2°C warming scenario over the fragmented world scenario (in USD 2010 billions)



Sources: NGFS, Allianz Research

Overall economic losses in a fragmented climate transition dwarf energy costs. While short-term gains from lower electricity costs may appear advantageous for some, the long-term repercussions of a fragmented transition – stemming from unaddressed climate risks, economic inefficiencies and geopolitical tensions – paint a far more concerning picture. China, despite the potential energy cost savings of USD381.8bn by 2050, would face the largest economic losses under a fragmented transition (Figure 13) – an additional USD13.9trn (2017 prices) compared to the below 2°C scenario, representing 1.1% of cumulative Chinese GDP for the period 2022-2050. These losses would primarily be driven by increased geoeconomic risks, such as disruptions in global supply chains, alongside escalating physical damages from unmitigated climate impacts. The US, the second most affected economy, would incur an additional USD6.trn in losses under a fragmented transition, representing 0.7% of its 2022-2050 cumulative GDP. The largest European economies could face additional economic damages amounting to USD4.4trn in a fragmented scenario, equating to 0.3% of their cumulative GDP over the period from 2022 to 2050. This can largely be attributed to their high dependence on energy imports. The 2022 energy crisis already showcased the economic strain caused by volatile energy markets, making Germany particularly exposed to the risks of an uncoordinated global response to climate change. These losses reflect the cumulative impact of climate-related economic inefficiencies, reduced competitiveness in global markets and mounting physical damages from extreme weather events.

Figure 13: Cumulative (2022 – 2050) GDP losses in a fragmented transition scenario vs. below 2°C scenario (in USD 2017 trillions)



Sources: NGFS, Allianz Research

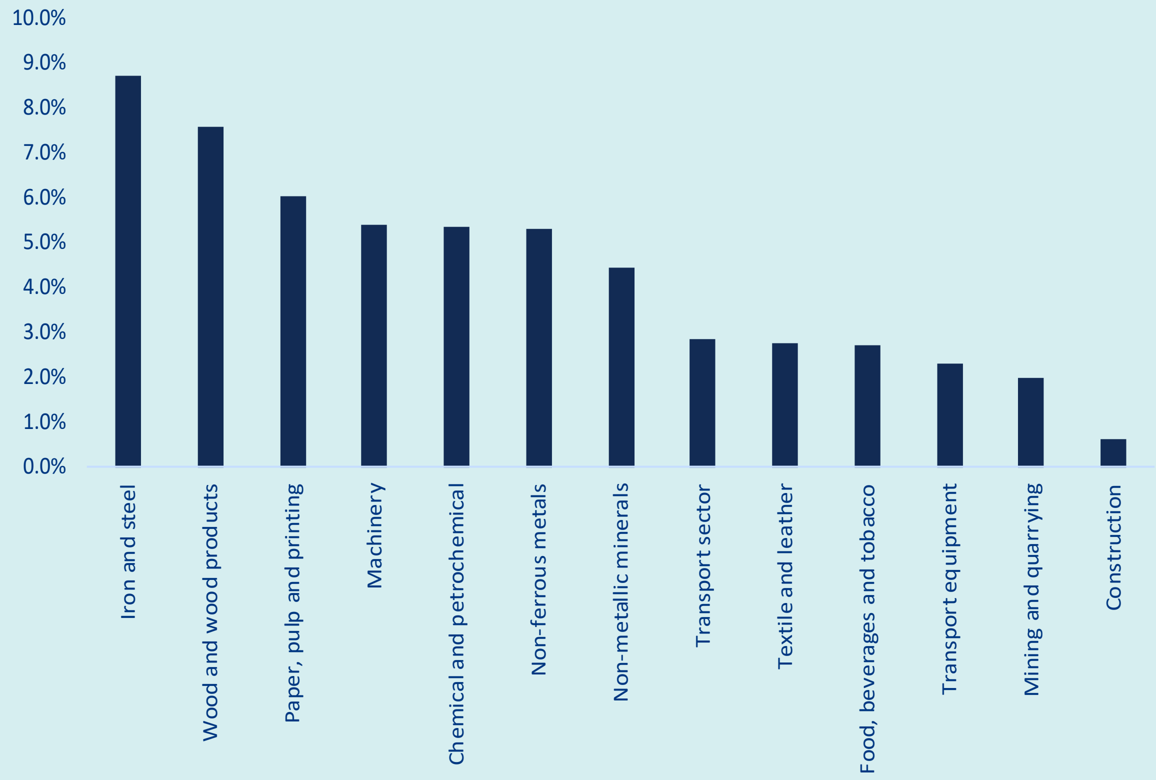
Implications for the future of energy-hungry services

A swift transition can drive growth in emerging fields like big data and artificial intelligence. Since ChatGPT's launch in 2022, the number and scale of AI models have soared, pushing data capacity and computing power to new heights. This has led to a sharp rise in electricity demand from data centers, growing to 460TWh in 2022 – roughly the electricity consumption of Germany in 2023 – and is projected to nearly double by 2026. Meeting future data center needs and sustaining AI innovation will require a steady supply of cost-effective, stable and low-carbon energy. In the short term, nuclear power offers a bridge for many tech companies to support this growing demand. However, as AI scales further, and with a continued increase in renewable capacity, much of this demand growth will be met by renewables like wind, solar and hydro. Long-term sustainability will, hence, depend on significant investment in capacity expansions and the infrastructure to support them such as grids and storage. These renewables not only represent the most affordable options but also align with environmental goals needed for responsible growth in AI and data-driven technologies.

From a European perspective as well, renewables offer the best competitiveness to the EU27 energy-hungry industries. In 2020 (see Figure 14), energy costs represented a significant portion of the value-added in several EU27 industrial sectors, with iron and steel being the most energy-intensive at nearly 10%, followed by wood and wood products, the paper and pulp industries and machinery. Under climate transition scenarios, these costs are projected to decline by 2035 compared to 2020 levels, with a sharper reduction under a coordinated 2°C transition compared to a fragmented transition. A 2°C scenario implies coordinated global action, where investments in renewable energy, energy efficiency and clean technologies are prioritized – a segment in which the EU already has a head start relative to the rest of the world. Global alignment on the clean energy transition would encourage economies of scale and reduces the costs of energy production both in the EU and the rest of the world. By leveraging global cooperation, the EU27 would also benefit from more stable and predictable energy markets, with lower costs for fuels and decarbonization technologies. The most substantial reductions (see Figure 15) are expected in energy-intensive sectors like iron and steel (1.7% under 2°C scenario vs 1.4% under fragmented transition), wood products (1.5% under 2°C scenario vs 1.2% under fragmented transition), paper (1.2% under 2°C scenario vs 1.0% under fragmented transition) and machinery (1.1% under 2°C scenario vs 0.9% under fragmented transition) reflecting the benefits of global cooperation in driving down energy costs through efficiency gains and decarbonization technologies.

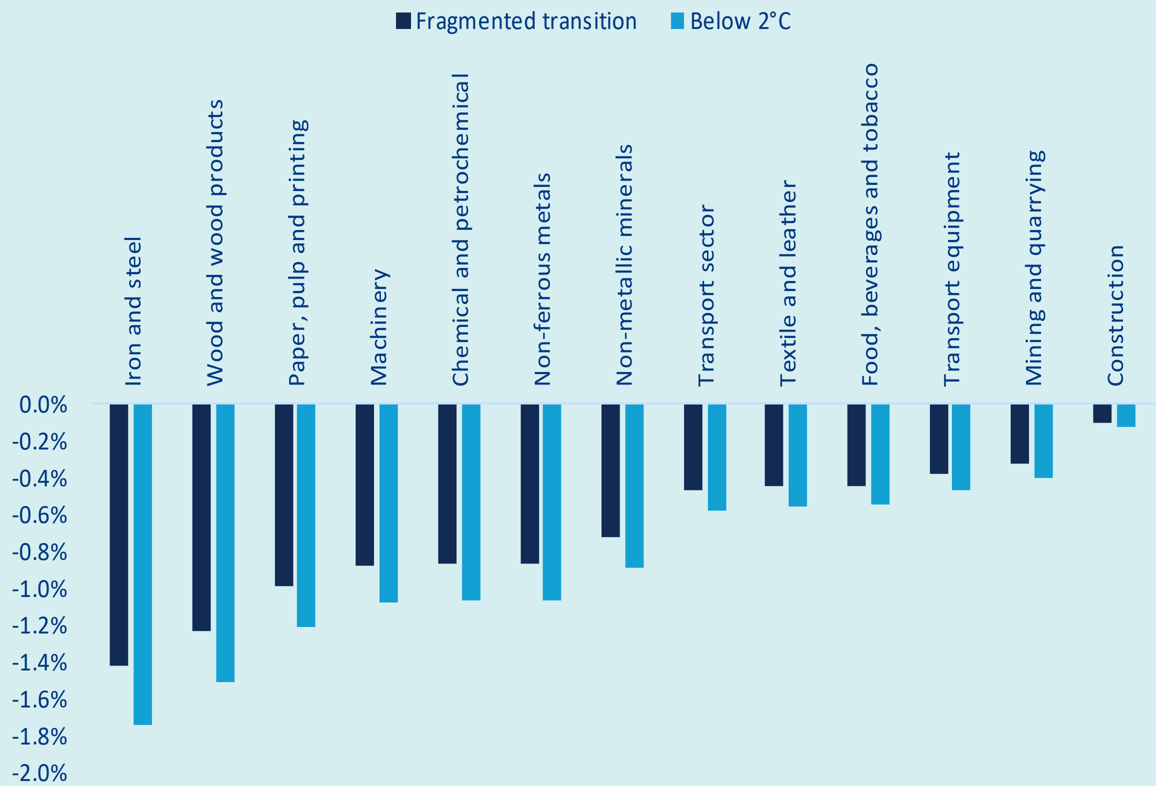
In contrast, a fragmented transition involves disjointed policies and uneven progress across regions. Furthermore, the lack of global coordination could limit access to affordable renewable energy technologies and increase reliance on fossil fuels in less cooperative regions, leading to inefficiencies and a higher energy cost compared to the coordinated approach under the 2°C scenario.

Figure 14: Energy costs as a percentage of value-added for industrial sectors in EU27 in 2020



Sources: NGFS, Eurostat and Allianz Research

Figure 15: Projected 2035 energy-cost reductions for industrial sectors across climate scenarios (vs 2020)



Sources: NGFS, Eurostat and Allianz Research

The way ahead: Avoiding fragmentation and creating shared prosperity

To prevent a harmful cycle of fragmentation and to restore competitiveness, Europe must strengthen the transition instead of weakening it. This entails increasing domestic investment and cooperation particularly for building up the continent's energy infrastructure. Europe has substantial energy generation potential, but it is used sub-optimally as long as electricity flows between regions of high generation and those of high demand are restricted. To finance this infrastructure, Europe must expand funding for Important Projects of Common European Interest (IPCEI). This could be achieved for instance by enabling more private sector participation in financing this infrastructure. While short-term competitiveness gains from increased protectionism are tempting, governments need to strike a balanced approach in order to avoid green fragmentation which would delay the transition and harm Europe's domestic industry. A similar principle applies to Europe's carbon taxation framework. Avoiding necessary adjustments or expansions in carbon taxation to temporarily reduce energy costs may bring short-term relief, but it merely shifts the burden to the future. A delayed transition could leave the economy facing higher energy costs and diminished global competitiveness. For sustainable green growth, Europe must carefully evaluate which sectors can compete globally, where protective measures are justified and where raising barriers to green trade would cause more harm than good. Wind power and hydrogen are two key sectors where Europe already holds a strong position and can capitalize on green growth opportunities.

Regaining energy competitiveness will require thinking beyond Europe's borders. High solar potentials in Northern Africa, for instance, could be harnessed to supply cheaper renewable electricity and green hydrogen to the continent. Projects like Xlink's UK-Morocco interconnectors or the SouthH2 that strengthen and diversify European energy supply should therefore be further expanded. However, achieving this necessitates substantial investments in energy infrastructure abroad. Improving energy transmission in developing nations would not only support their decarbonization efforts and mitigate global climate change but also reignite growth in advanced economies by providing access to low-cost energy imports. To channel the USD1.3trn in annual transition investment flows recently discussed at COP29, international cooperation will be essential. While the new USD300bn financing target marks progress, successfully transitioning emerging markets will demand even greater collective effort. Further exploring frameworks of international carbon taxation such as taxes on shipping or aviation could provide sizeable resources – estimated at USD200bn annually – without distorting global competition. Such measures could also reduce reliance on compensatory mechanisms like Europe's Carbon Border Adjustment Mechanism, facilitating a fairer and more effective energy transition.

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