TRANSIENCE

TRANSITIONING TOWARDS AN EFFICIENT, CARBON-NEUTRAL CIRCULAR EUROPEAN INDUSTRY

May 2026

Unpacking Competitiveness in the European Chemical Industry:

Shaping Markets as the Way Forward

INDUSTRY GUIDE

Wuppertal Institut

Executive Summary

The European chemical industry is at a critical juncture, facing a structural squeeze between high energy and feedstock costs and the urgent requirements of the transformation towards circularity and climate neutrality. This paper aims to conceptually unpack these competitiveness challenges and to enable a systematic discussion and analysis of circular economy measures and their potential contribution to boosting that competitiveness in a changing global landscape. We find that industrial competitiveness – defined as the capability to sustain long-term profitability – cannot be restored through a race to the bottom on input costs. Europe faces a permanent and structural disadvantage compared to fossil-rich regions like the United States and the Middle East. Historically, Europe has been able to compensate for this disadvantage through energy and resource efficiency enabled by deep integration in Verbund clusters. However, further boosting productivity would require massive new investments which are currently hindered by high investment risks and geoeconomic uncertainty. To unlock the necessary capital, policy must provide market-shaping instruments that create predictable, large-scale demand for green materials. To achieve this demand-side policies are necessary that enable markets to value not only the physical properties of the chemicals produced but also environmental and sustainability attributes associated with their production. In contrast to bulk commodities, the specialty chemicals segment requires a distinct approach; as Europe's most innovative and competitive asset, it must be supported by strategies that break its deep dependence on fossil-based supply chains.

Key Insights

- **Structural Cost Disadvantage:** Europe faces a permanent price gap in energy and feedstocks; carbon costs are a secondary factor compared to the fundamental cost advantage of ethane-based rivals in the US and Middle East.
- **Productivity as a Shield:** Enhancing systemic productivity through industrial symbiosis and circular material loops is the only viable internal lever to offset Europe's high input costs.
- **Market-Shaping Regulation:** The 'Green Premium' for sustainable products must be institutionalised through mandatory quotas (e.g., PPWR) and lead markets to provide the financial predictability required for final investment decisions.
- **The Specialty Chemical Paradox:** While specialty chemicals are Europe's competitive strength, they are technically difficult to recycle and critically dependent on the survival of integrated "Verbund" clusters.
- **Single Market Leverage:** The EU Single Market provides the critical mass necessary to sustain the initial, high-cost steps of industrial transformation and allows first-movers to gain global experience.
- **Portfolio Rebalancing:** Prioritising circularity may shift demand for bulk commodities; manufacturers should anticipate that future material choices will be dictated by "circularity performance" (e.g., rise of PET).
- **Innovation-Led Resilience:** Sustaining competitiveness requires targeted R&D to decouple specialty chemicals from fossil-based basic supply chains, ensuring the most innovative parts of the sector can thrive independently.
- **Chemical leasing** should be explored further as a business model that may enable producers to capture some of the economy-wide efficiency gains that a circular economy can provide.

Introduction

The European chemical industry, long a cornerstone of the continent's industrial prowess and a critical provider of high-value jobs, is facing an existential challenge. Caught in a "perfect storm" of structural disadvantages and shifting global dynamics, it is struggling to maintain its footing in an increasingly volatile international market.

Globally, the industry is grappling with low utilisation rates, driven by a surge in production capacity in regions with access to cheaper feedstocks and energy. In Europe, this is particularly pronounced. Since early 2022, utilisation rates linger below 75%, significantly below the long-term average of previous decades[1]. As a result, several major players have decommissioned steam crackers, or announced plans to do so, resulting in 16% capacity decrease across Europe[2]. These are not merely temporary pauses in production; they represent a structural retreat. Furthermore, there is a palpable lack of new investment to replace aging capacities within the EU. Without a clear path to competitiveness, the capital required for the "Twin Transition" (i.e., decarbonisation and circularity) is flowing toward other global regions, raising the very real spectre of deindustrialisation.

Developing a robust perspective to restore the competitiveness of the EU chemical industry is therefore not just an economic necessity, but a prerequisite for achieving climate neutrality and sustainability. This guide aims to address this challenge with two objectives: first, to conceptually unpack the multifaceted competitiveness challenges facing the industry; and, second, to enable a systematic discussion and analysis of circular economy measures and their potential contribution to boosting that competitiveness in a changing global landscape.

BOX 1: Insights from the Rhineland Case Study

The TRANSIENCE research project utilises regional case studies to ground European industrial transformation pathways in regional socio-economic and technical realities. This approach recognises energy-intensive industries are often geographically concentrated in large clusters, where a critical mass of firms, research institutions, and specialised suppliers create powerful synergies. Historically, such clusters have facilitated the exchange of industrial by-products and incremental innovation. However, the high degree of integration within these "Verbund" structures can also create rigid path dependencies that inhibit the disruptive innovation required for deep decarbonisation and circularity.

This industry guide builds on insights from a regional workshop with industry, science, and government stakeholders from the Rhineland region, held in November 2025 and focusing on one overarching question: *How can circular economy measures contribute to strengthening the competitiveness of the chemical industry?* With more than 75,000 jobs, the chemical industry in the Rhineland region is particularly exposed to global challenges, such as feedstock price volatility and infrastructure bottlenecks. As a representative microcosm of the sector, the insights and structural hurdles identified in the Rhineland resonate across the European industrial landscape.

[1] CEFIC, '2025 Facts and Figures', in Cefic, December 2025, https://cefic.org/facts-and-figures-of-the-european-chemical-industry/.
[2] Roland Berger, 'European Chemical Closures and Investments Radar 2022-2025', commissioned by CEFIC, December 2025, https://cefic.org//app/uploads/2026/01/European-Chemical-Closures-and-Investments-Radar-2022-2025.pdf.

Unpacking Competitiveness

To navigate this crossroads, we must first unpack what "competitiveness" means in a climate neutral, circular economy. According to the Cambridge Dictionary competitiveness is "the fact of being able to compete successfully with other companies, countries, organisations, etc." In the context of a capitalist global economy, success is ultimately measured in profits. A second pertinent definition is provided by EU legislation, which states that "a competitive economy is an economy whose sustained rate of productivity is able to drive growth and, consequently, income and welfare".

Neither of these definitions is fit for purpose here, as they are either too generic (Cambridge) or too broad (the EU's focus on the entire economy) to be usefully applicable at the industry level. However, there are common features that we can build on to develop our own working definition of competitiveness:

- Competitiveness starts with the ability to maintain profitability within a global economy.
- Competitiveness is a relative concept; it is always determined in comparison to a rival or competitor.
- Competitiveness requires a temporal lens; it is not just about current margins but about the structural capability for sustained profitability.

Combining these key aspects, we propose the following working definition in the TRANSIENCE project:

Competitiveness is the structural capability of an industry to sustain profits and maintain or gain market share against international rivals in a dynamic and changing environment.

To operationalise this definition, we propose three main determinants of profitability that serve as the foundation for our analysis:

1. **Input costs** of energy, feedstocks, and labour, as well as regulatory compliance costs, determine the cost side of the equation.
2. **Productivity** determines how efficiently production factors, including energy and feedstock resources, are turned into marketable products.
3. **Market prices** ultimately determine the margins at which industry can sell their product and generate profits.

To systematically assess the potential of circular economy measures to strengthen industrial competitiveness, we must evaluate how any given measure affects these primary determinants of profitability. Furthermore, this assessment must account for the temporal dynamics of these effects and their differentiated impact relative to major global competitors. The following sections explore how such measures can act as levers across these three components to secure the future of European chemistry.

Curbing Input Cost

The European chemical industry is currently operating at a severe structural disadvantage compared to its global rivals, particularly in the production of primary building blocks. This squeeze is driven primarily by feedstock disparities, as Europe's petrochemical sector relies on a Naphtha-based production route that is inherently less competitive than the Ethane-based production route dominant in the United States (US) and the Middle East. Utility costs are also significantly higher in Europe, especially power prices. For ethylene, this results in variable production cost almost six times higher for naphtha-based production in Europe than for ethane-based production in the US (Figure 1). Meanwhile, production costs in the Middle East remain typically significantly lower than in the US, as they leverage the proximity to massive oil fields to extract associated gas with minimal transport costs, while utilising state-administered pricing to fix ethane feed-stocks at a low, non-market level.

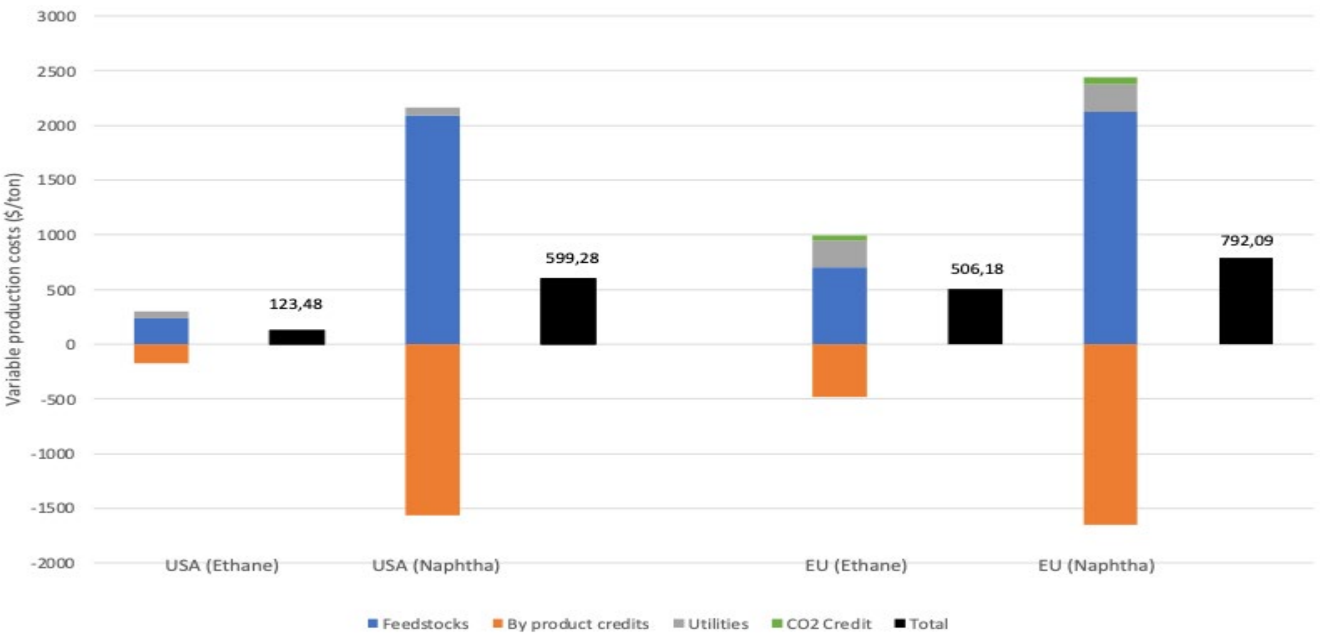

Figure 1 *Comparison of variable production cost of steam cracking for ethylene between Europe and the United States of America and major cost components (2023 data). Source: Selting & Carratta, 2025, p 98.*

Note that, while naphtha-based cracking is structurally more expensive, it generates significant "by-product credits" through the production of propylene, aromatics, and butadiene. A sudden transition to ethane-only cracking would be technically and economically unfeasible for the European system, as its integrated production chains are specifically designed to process these co-products, which could otherwise become critical bottlenecks in the industrial transformation.

Carbon prices are frequently cited as a major competitiveness disadvantage for the European chemical industry. While certainly part of the equation, they are rather small compared to the cost differentials for feed-stocks and utilities. Even in the best case – comparing ethane-based production in the EU and the US –

variable production cost are still almost three times higher in Europe even when excluding CO_2 costs[3].

So how may circular economy measures affect the cost equation? Arguably, higher level R-Strategies like refusal, reuse, refurbishment and repair have only limited positive effect on the profitability of the chemical industry. Closing circularity loops upstream may actually result in lower demand for the basic raw materials produced by the chemical industry. However, recycling may affect the economics of chemical production. By using waste as a feedstock, producers can substitute virgin fossil feedstocks, but there are significant limitations. Although mechanical recycling (recovery of plastic waste through physical processes without changing the polymer's chemical structure) is highly energy-efficient and can successfully limit the consumption of expensive virgin feedstocks, its potential is limited by the availability of high-quality, ideally chemically homogeneous, and uncontaminated waste. Increasing recycling rates therefore typically means increasing efforts for collecting, sorting, and processing waste that, in turn, may lead to higher labour costs across the value chain. Moreover, mechanical recycling is only economically viable for standard bulk polymers, but typically not for specialty chemicals. It may be technically possible for some engineering polymers such as polycarbonate and polyamide, but only if the waste material is extremely pure. For other specialty chemicals including fluoropolymers or silicones mechanical recycling is practically impossible.

Much hope rests on chemical recycling to maximise recycling rates by utilising waste resources that are too heterogeneous or too contaminated for mechanical recycling. Chemical recycling entails the breakdown of plastic waste into its original chemical building blocks through thermochemical or biochemical processes. While it can technically recover a much larger share of plastic waste, however, it is not currently implemented at commercial scale. While several technological options exist, pyrolysis is technology that has the most pilot/demonstrator projects currently being implemented compared to other chemical recycling technologies[4]. Waste pyrolysis, the thermochemical decomposition of organic material at high temperatures in the absence of oxygen, converts mixed plastic waste into a liquid oil (pyrolysis oil) that can replace naphtha as a feedstock in existing steam crackers.

Unfortunately, chemical recycling in general and pyrolysis in particular require large amounts of energy input. Conventional steam cracking requires only minimal external energy inputs in the form of electricity and heat (the latter produced and used internally, via combustion of the tail gas). The listed electricity and heat inputs in **Figure 2** are required for the extraction steps of the aromatics. Meanwhile, waste pyrolysis requires a very large amount of external low-medium temperature heat (almost 14 GJ/t of high-value chemicals produced) but may produce some excess electricity from combustion of by-product pyrolysis gas. This massive energy demand is driven by significant yield losses across the new upstream value chain; specifically, since it takes approximately two tonnes of waste to produce one tonne of pyrolysis oil, and two tonnes of that oil to yield a single tonne of high-value chemicals (HVC), the cumulative energy required per unit of final product increases substantially compared to traditional fossil naphtha routes. Moreover, as chemical recycling is not a mature technology yet, its outlook is marred from significant uncertainties related to cost of providing and processing the waste input, CAPEX, OPEX, and energy inputs (see **Figure 3**).

[3] Selting, B., & Carratta, G. (2025). Ethylene Production in the Petrochemical Industry: Competitive Risks and Impacts of the EU Emission Trading Scheme. Journal of Business Chemistry, 22(2).

[4] Holtz, G., Hullmann, C., Theisen, S., Xia-Bauer, C. (2025). D3.3 – Scale-up paths of chemical recycling (EU), https://www.eu-china-bridge.eu/sites/default/files/2026-02/D3.3_upscaling_pathway_chemical%20recycling_Final%2BDisclaimer%20%281%29.pdf.

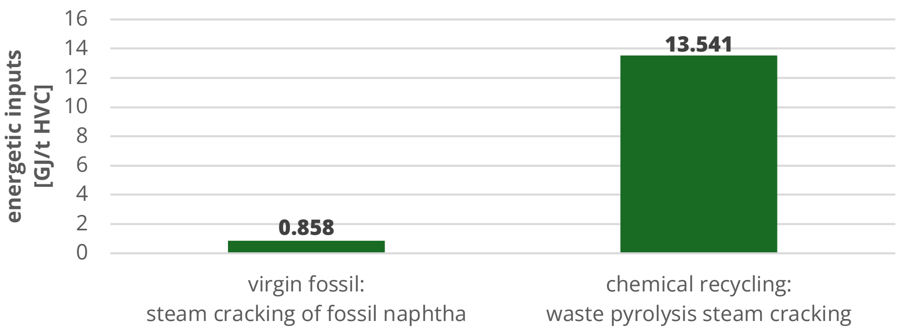

Figure 2 *Comparison of specific energy consumption of conventional steam cracking versus waste pyrolysis steam cracking. Source: based on Zelt et al, 2025.*

Overall, substituting fossil feedstocks with circular feedstocks seems to have a very limited potential to improve the competitiveness of the European chemical industry. Mechanical recycling may play a role but is limited to bulk commodity polymers that see particularly fierce international competition. Meanwhile, with its very high energy input requirements, chemical recycling is unlikely to reduce input costs for the chemical industry, even when accounting for potential efficiency improvements made via optimisation and upscaling. In an outlook, in which Central Europe faces energy cost disadvantages with respect to not only fossil fuels but also renewable energy, due to limited renewable energy potentials, it is therefore unlikely that chemical recycling will be able to close the cost gap on its own without increasing the cost of conventional fossil production routes and/or politically (re-)distributing the additional cost of the recycling route across the value chain (see section below).

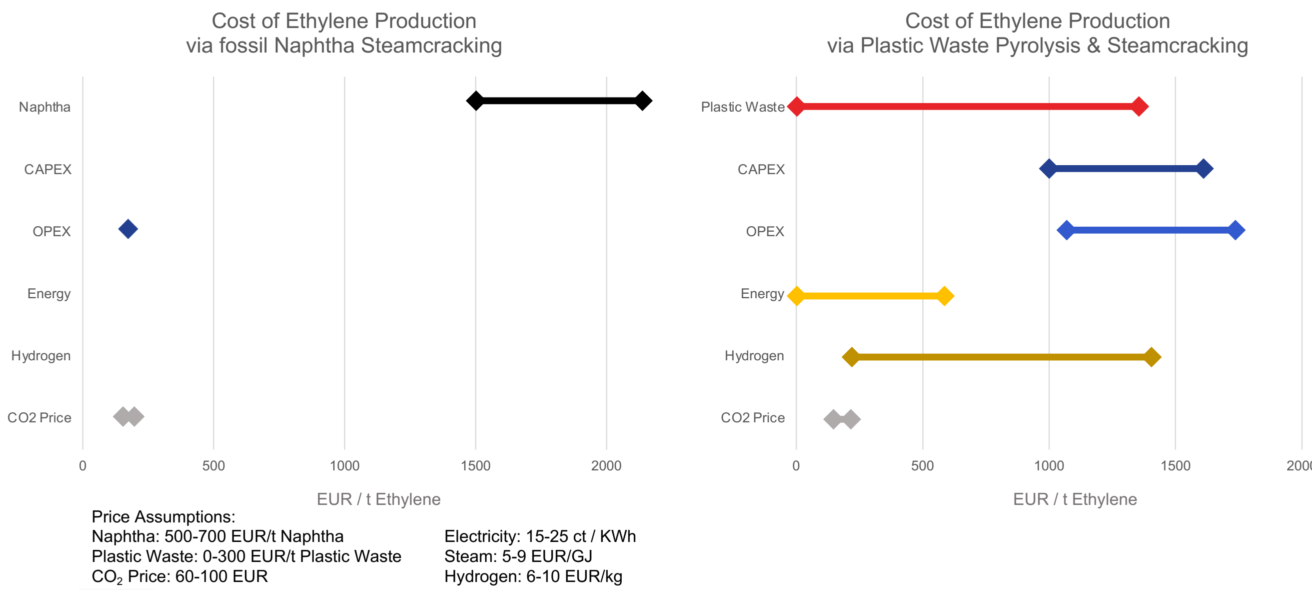

Figure 3 *Cost components of conventional ethylene production vs. waste pyrolysis and steam cracking. Source: own analysis based on Zelt et al. 2025.*[5]

[5] Zelt O. et al. (2025) , EU-CHINA BRIDGE: D3.1 – Two EU-China Technology Inventories on Promising Low-Emission Technology Options for EIIs: Summary and Documentation, 30 April 2025, https://doi.org/10.5281/zenodo.15325168.

Enhancing Productivity

In the context of industrial competitiveness, productivity is defined by the efficiency with which production factors, most notably energy and feedstock resources, are converted into marketable products. While the previous section established that circular economy measures offer limited potential to lower absolute input prices, their impact on the productivity side of the profitability equation is potentially significant.

Historically, Europe has been able to compensate for cost disadvantages through both resource and energy efficiency, facilitated by close integration of supply chains in "Verbund" clusters. While this industrial symbiosis was very effective in leveraging marginal improvements, the mutual dependencies arising from the integration may become an impediment for more disruptive technological change. In a detailed study on the Chemelot chemical cluster in the Netherlands Janipour et al. find that "industrial clustering may offer opportunities to accelerate deep greenhouse gas emission reductions, but it could also cause carbon lock-in because of increased physical and organizational interdependency, which favours incremental changes, short-term focus, and solitary actions rather than collective actions, at the cost of deep greenhouse gas emission reductions"[6].

Despite the historic advantages Europe has had over its global competitors, some of them slowly turn into disadvantages. Europe's steam crackers are relatively old, and the sites draw on infrastructure that is in many instances decades old. Of course, those systems have been maintained and updated over time but there is still a disadvantage compared to new green-field mega clusters, e.g. in China. For example, BASF's new green-field site in Zhanjiang, China, features electric compressors in its internal pipeline network, and the (steam) pipe runs are designed with efficiency as a matter of priority to be short and well insulated. Finally, the site is also the first site to feature a complete Digital Twin enabling automation, predictive maintenance, and real-time AI-enabled process optimisation. All of this cannot be easily retrofitted to a legacy industrial complex in Europe[7].

[6] Janipour, Z., de Gooyert, V., Huijbregts, M., & de Coninck, H. (2022). Industrial clustering as a barrier and an enabler for deep emission reduction: a case study of a Dutch chemical cluster. *Climate Policy, 22(3)*, 320-338. https://doi.org/10.1080/14693062.2022.2025755.

[7] Wyns, t. (2025). The Greenfield Revolution: Why the European Chemical Crown Is Moving East, December 2025, https://www.linkedin.com/pulse/greenfield-revolution-why-european-chemical-crown-moving-tomas-wyns-5knte/?trackingId=uf2oZXWdh50ZWNfrbw4ZMw%3D%3D.

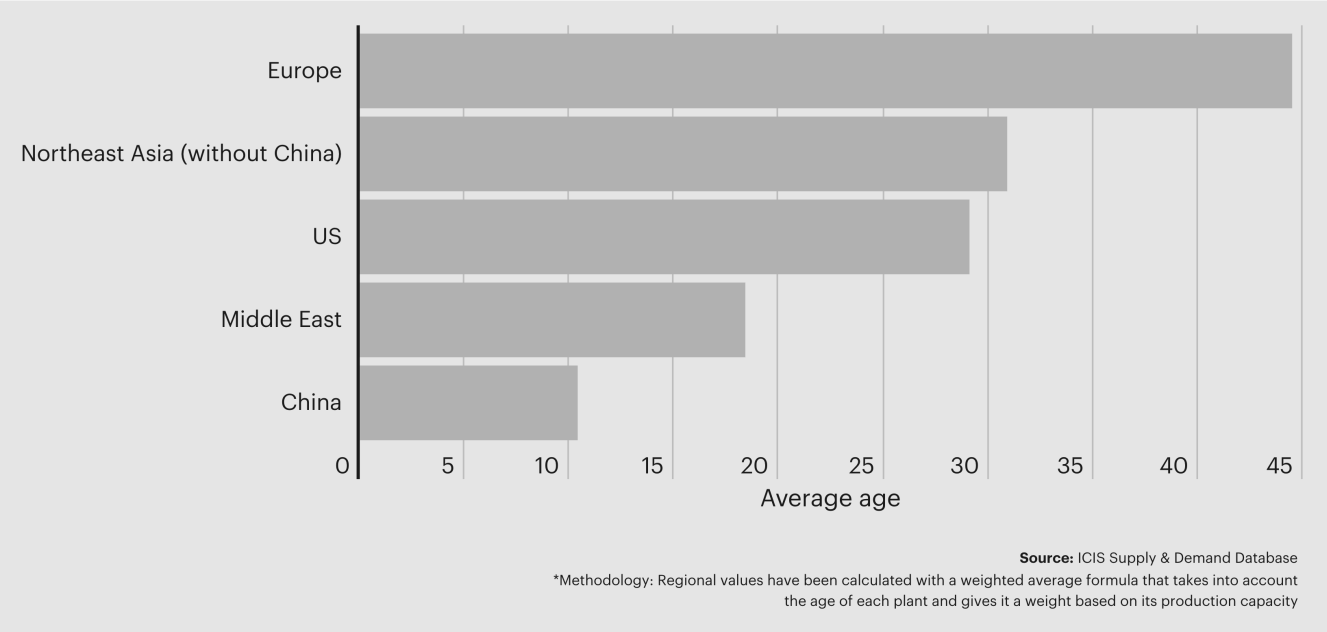

Figure 4 *Average age of crackers by region. Source: ICIS*[8]

A key advantage for the European chemical industry, however, is the strong innovation systems in Europe that can help to drive innovation processes – which, in turn, can leverage resource and energy efficiency[9]. However, to leverage this advantage, large investments are necessary yet currently missing due to competitiveness concerns and (geo)political uncertainty.

Circularity can create economy-wide efficiency gains by reducing aggregate primary resource demand and lowering the systemic costs associated with waste management and environmental externalities which are typically paid for through fees and taxes outside of the market. Furthermore, it serves as a critical lever for enhancing economic resilience by curbing dependencies on fossil imports – a vulnerability underscored by the geopolitical instability resulting from the war in Ukraine and more recently the Iran war. Despite these societal advantages, it remains uncertain whether and how the chemical industry itself can capture and benefit from these systemic improvements. The structural reality of chemical value chains means that many productivity benefits accrue to downstream sectors rather than the chemical producers who must invest in the complex recovery infrastructure. Without mechanisms to internalise these systemic benefits, the industry risks bearing the higher operational complexity and capital expenditure of circularity while the actual competitive advantage is harvested elsewhere in the economy. New business models implementing the concept of chemical leasing may be a way to achieve this[10].

For Europe's chemical industry, the path to sustained profitability does not lead through a race to the bottom on input costs, where it cannot win. Instead, competitiveness must be built on the structural capability to outperform rivals on resource productivity. By leaning into the strengths of integrated clusters and technological leadership, circular economy measures provide a framework to transform the industry from a volume-based commodity business into a high-productivity, high-value circular system. This shift prepares the

[8] ICIS, 'Europe Cracker Closures', ICIS Explore, n.d., accessed 27 March 2026, https://www.icis.com/explore/resources/cracker-closures-europe/.
[9] Cefic and Advancy, The Competitiveness of the European Chemical Industry (Brussels, 2025), https://cefic.org/app/uploads/2025/05/Cefic-Advancy-study-The-Competitiveness-of-the-European-Chemical-Industry.pdf.
[10] Moser F. et al., 'Chemical Leasing in the Context of Sustainable Chemistry', Environmental Science and Pollution Research 22, no. 9 (2015): 6968–88, https://doi.org/10.1007/s11356-014-3926-0.

industry for a future where resource efficiency, rather than resource abundance, is the primary determinant of global success.

As earlier analysis of input costs makes clear, it is effectively impossible for European producers to compete with global rivals on the price of raw materials and energy. The only viable way forward is to significantly enhance productivity via energy and resource efficiency. At its core, the transition to a circular economy is an exercise in maximising resource productivity. In a linear model, value is lost at every stage of the lifecycle, from processing waste to the eventual disposal of products. Circularity seeks to re-capture this lost value by ensuring materials remain within the economic loop at their highest utility for as long as possible. The industry must find ways to fairly share and extract value from the efficiency gains that a circular economy creates for society as a whole. Resolving these challenges likely requires shaping markets through strategic regulation. For instance, transparently and consistently differentiating products by the origin of the carbon – virgin fossil vs. non-fossil – may be a first necessary step towards markets that value the sustainability and circularity attributes.[11] Moreover, realising technical potentials for efficiency gains and leveraging Europe's innovation advantage requires unlocking massive industrial investments, which is currently extremely difficult given the prevailing economic uncertainty.

Shaping markets

While input costs and productivity define the efficiency of production, the ultimate profitability of the European chemical industry hinges on the margins realised at the point of sale. In a globalised economy, these margins are not merely a function of internal efficiency but rather dictated by the intensity of international competition and the degree of product differentiation. As European producers face a structurally higher cost base, a central question for the industry's future is whether its survival depends on a strategic shift away from price-sensitive commodity markets and toward high-value, politically shaped "lead markets" where sustainability and origin carry a premium.

The ability to sustain margins varies significantly across the chemical value chain. In commodity markets – such as those for basic chemicals like polyethylene or ethylene – products are chemically identical regardless of origin. Here, competition is driven almost entirely by price, and European producers are directly exposed to low-cost imports from regions with cheaper feedstocks. In contrast, specialty plastics and high-performance chemicals operate in markets with a much more limited number of competitors. In these segments, margins are driven by functional superiority and technical innovation rather than raw material costs alone, providing a clear space where European manufacturers can leverage their strategic competitive advantage in terms of innovation.

Furthermore, a critical distinction exists between domestic and international export markets. While European firms may still find success in global specialty markets due to their superior innovation capacity, their ability to compete in international commodity markets is rapidly eroding. Thus, the industry's profitability is increasingly tied to the strength of the domestic European market and the regulatory framework that governs it.

Policy and regulation are not just administrative burdens; they are powerful instruments that can shape market conditions and protect industrial margins. A range of measures can be deployed to ensure that the "Green Premium" for sustainable products is recognised and paid for by the market. Trade measures, such

[11] Dietz, C. and Egenhofer, C., *Policy Options to Create Lead Markets for Clean, Sustainable and Circular Feedstocks in the Chemical Industry* (CEPS, 2026), https://cdn.ceps.eu/2026/04/2026-04-ERCC-chemical-industry-formatted.pdf.

as tariffs and non-tariff trade barriers, can limit the extent to which global competitors – who may not face similar carbon or environmental costs – can access the European domestic market. Simultaneously, public authorities can use their significant purchasing power to incentivise 'lead markets' for green products or products of domestic origin by setting specific criteria for low-carbon or circular materials in infrastructure and public works, providing the stable demand necessary to justify industrial investments. Furthermore, regulations such as the Packaging and Packaging Waste Regulation (PPWR) and the End-of-life Vehicle Regulation create artificial demand for circularity through mandatory recycled content targets and Extended Producer Responsibility (EPR) schemes. These quotas effectively decouple segments of the market from virgin fossil prices, allowing circular products to compete on a more level playing field.

The primary limitation of these instruments is their geographic scope. Generally, policy can only shape domestic markets; in the absence of specific international arrangements like a 'climate club', European producers still face the full weight of global price competition when exporting to third countries. This limitation is particularly evident when attempting to apply market-shaping tools to the most competitive part of the industry: specialty chemicals. While it is highly challenging – albeit likely achievable – to define standards and carbon thresholds for a bulk commodity like polyethylene, it is virtually impossible to do the same for the estimated 75,000 different specialty products produced by the industry. The extreme breadth and technical complexity of these products make traditional regulatory instruments like quotas or product-specific standards difficult to implement. While the EU's advanced innovation system provides a natural competitive advantage in this segment, helping sustain leadership through constant product innovation, a strategic policy gap remains. We must find ways to leverage policy to support "green" specialty chemicals without drowning the sector in unmanageable administrative complexity.

Conclusions and Recommendations

Industrial competitiveness is defined by the ability of an industrial system to sustain profitability over the long term against global rivals. **Figure 5** graphically synthesises the main determinants of competitiveness of the European chemical industry and their interactions. For the industry, the findings of this guide indicate that this ability is under severe pressure. Europe faces a structural disadvantage regarding input prices, persisting regardless of whether the industry utilises fossil or alternative feedstocks. Contrary to common perception, carbon costs currently play only a minor role in this price gap; the primary driver is the fundamental availability and cost of energy and raw materials in competing regions.

Historically, Europe has compensated for these disadvantages through world-leading resource efficiency and deep integration of its "Verbund" sites. While further technical improvements to enhance productivity are possible, realising them requires massive, long-term capital investments. At present, these investments are being stifled by unpalatable geoeconomic and political uncertainty, leaving the industry in a defensive posture.

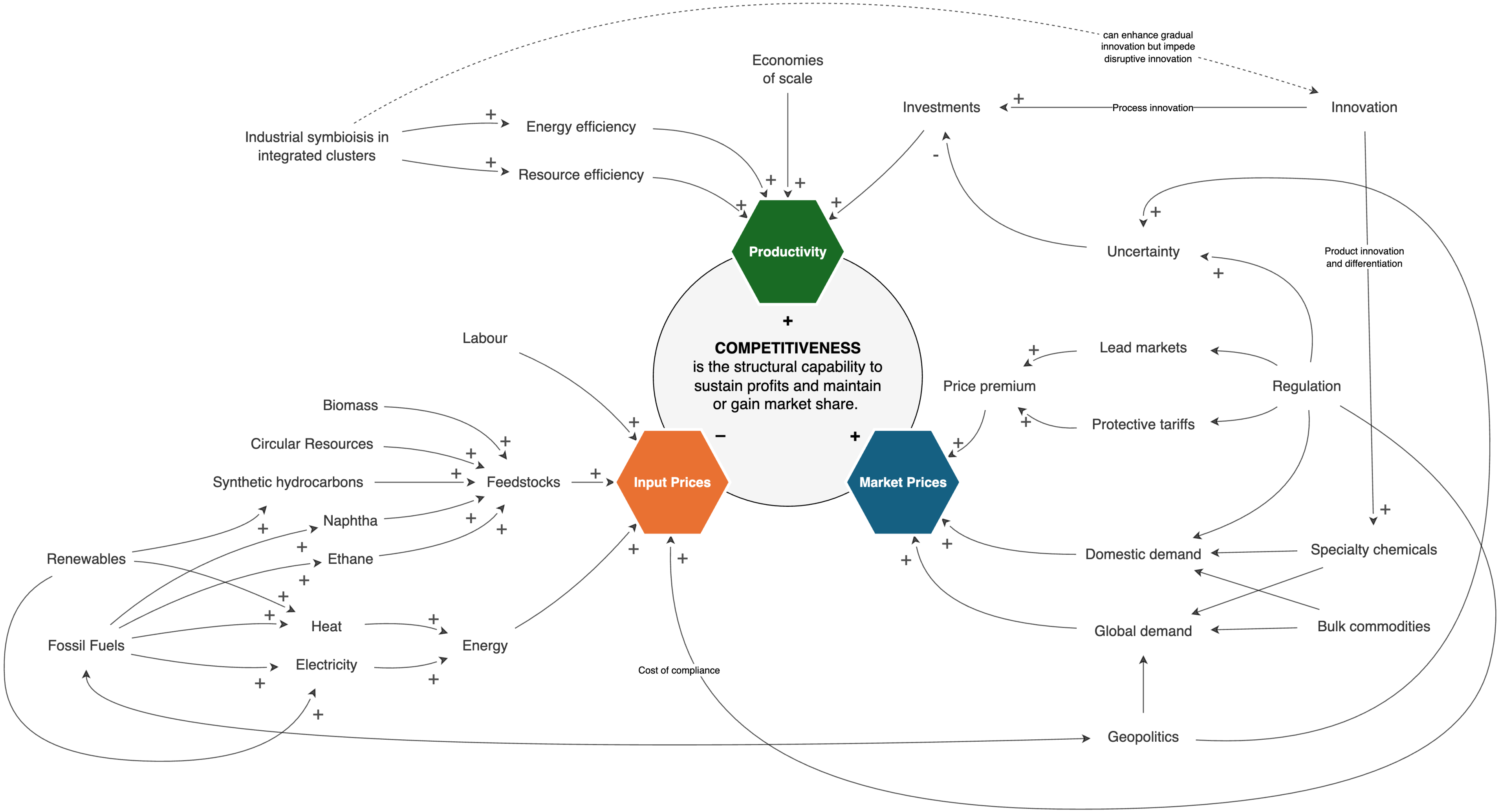

Figure 5 *Schematic illustration of key determinants of the competitiveness of the European chemical industry. Source: own illustration.*

The Path Forward: Market-Led Transformation

This analysis suggests that the only viable path forward is to move beyond price-based competition. European profitability must be anchored in politically shaped markets that value not only the physical properties of a chemical product but also the environmental and circular attributes of its production process. By creating a credible and stable "green premium" demand, policy can provide the financial predictability necessary to unlock the productivity-enhancing investments currently on hold. The outlook for the European chemical industry is increasingly defined by the effectiveness of EU regulation as a competitive advantage. The large European Single Market is the industry's greatest asset; it provides the scale to sustain at least the first steps of the circular transition and enables first movers to gain important experiences. Recent major investments in the chemical industry are mostly driven by the anticipation of politically shaped markets; for example, through the PPWR. Creating such markets can therefore be a critical first step to unlocking efficiency gains through investment.

A critical challenge in this transition remains the specialty chemicals segment. As the most competitive and innovation-intensive part of the European sector, its success is a strategic asset and a field where manufacturers can leverage their unique innovation capacity. However, specialty chemicals are fully integrated into basic chemical supply chains. To break the dependence of specialty producers on fossil steam crackers, alternative technological pathways must be scaled. Against the backdrop of the scheduled decommissioning of the central steam cracker in the Middle German Verbund Cluster, a recent study analyzed future options to sustain production there.[12] The findings suggest that a shift toward new platform chemicals may be necessary. Methanol-based pathways offer a versatile opportunity to sustain existing value chains, though they remain highly dependent on the availability of competitively priced green hydrogen and CO2. Alternatively, biotechnological pathways – such as the fermentation of biogenic waste or synthesis gas – present a promising route for high-value specialties. While such decentralized bio-based approaches do not represent a full-scale substitute for large-scale primary chemicals, they open up additional room for maneuvering. Through higher selectivity, functional substitution, and regional raw material coupling, they can reduce dependencies while simultaneously opening up new perspectives for regional value creation. Furthermore, because domestic specialty markets are relatively small and the products so diverse, they are less susceptible to traditional policy instruments like quotas or standard setting compared to bulk commodities. A key challenge for future policy is, therefore, to identify ways to support the development of green specialty chemicals specifically.

For bulk commodities, companies should expect that policies enhancing circularity may also lead to changing demand resulting in a shifting portfolio of bulk chemicals – e.g., demand for PET has increased significantly over the last decade precisely because of its beneficial properties for recycling and circularity. When designers create products with circularity in mind, they might request different properties resulting in different material choices.

[12] Weiße, A. et al., *Der Mitteldeutsche Stoffverbund 2035 – Rohstoffwende in der chemischen Industrie* (Fraunhofer IKTS, 2026), https://www.ikts.fraunhofer.de/content/dam/ikts/downloads/environmental_and_process_engineering/technology_economics_and_sustainability_analysis/technology_and_operations_management/Studie_Der_Mitteldeutsche_Stoffverbund_2035.pdf.

Strategic Recommendations

To secure long-term viability of the European chemical industry, the following policy actions are recommended:

- **Ensure Regulatory Stability**: Maintain a consistent and predictable political framework to reduce the investment-stifling uncertainty that currently plagues the sector. Frequent shifts in policy direction increase the risk premium on the large-scale investments required for the transition.
- **Scale Up Green Demand via Lead Markets**: Implement mandatory quotas and green public procurement in key downstream sectors (packaging, construction, automotive, etc.). These are key to guarantee demand for low-carbon, circular materials, allowing first-movers to recover the higher cost of sustainable production.
- **Explore performance-based "chemical leasing"** as a new business model allowing producers to retain material ownership and potentially capture value from circularity and incentivizing resource efficiency across the product lifecycle.
- **Decouple Specialty Chemicals through Research and Development (R&D)**: Significantly increase R&D investment, specifically targeted at producing specialty chemicals from non-fossil feedstocks. This is necessary to break their dependence on integrated fossil supply chains and ensure that Europe's most innovative segment can remain competitive in a decarbonised economy.
- **Foster Global Alliances**: While domestic policy is the primary lever, the EU should actively pursue international arrangements, such as "climate clubs," to harmonise green standards and protect the competitiveness of European exports in global markets.

TRANSIENCE

Industry Guide

Unpacking Competitiveness in the European Chemical Industry:

Shaping Markets as the Way Forward

Author(s):	Project Coordination
Lukas Hermwille	Alexandros Nikas
lukas.hermwille@wupperinst.org	anikas@epu.ntua.gr
Miriam Ruß	TRANSIENCE

Partners

Follow us

transience.project

transience_eu

Transience_project

transience-project

Transienceproject.bsky.social