



Green transition, single market and EU's open strategic autonomy: the impact of state aid



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Single Market Economics Briefs

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HIGHLIGHTS

 \rightarrow The implementation of state aid to support net-zero-related strategic industries reinforces the single market and can enhance the EU's open strategic autonomy.

 \rightarrow In fact, the simultaneous support by several Member States to net-zero-related industries results in higher economic impacts both at the EU and Member States' levels compared to individual action by a Member State.

 \rightarrow The simultaneous implementation of state aid increases intra-EU spillovers, reducing the risk of fragmentation and thus strengthening the single market. \rightarrow A simultaneous implementation of state aid has a larger economic impact in non-EU countries than in the rest of the EU in the subsidised green industries, confirming the high "initial" strategic dependence of the EU in those industries.

 \rightarrow Simultaneous implementation of state aid can enhance the EU's open strategic autonomy by expanding the production capacity of non-subsidised industries within the EU, which may be suppliers of the subsidised green technologies, and hence reinforcing the EU's value chain.

 \rightarrow Further analysis will be needed to address firm heterogeneity, production factor mobility across countries, and the longer-term effects of the policy.

1. Background and policy context

Since the onset of Russia's unprovoked aggression against Ukraine, and the energy crises that followed, concerns about competitiveness, resilience, and the desire to have home-grown 'clean-tech' industrial capacity have been central in the EU debate on industrial policy.

Equally central to this debate is the discussion about whether to continue allowing the use of Stateaid measures to support the green transition, particularly to advance initiatives like the Net-Zero Industry Act (European Commission, 2023). In fact, the use of state aid by a Member State could have a negative impact on the integrity of the internal market or the principle of fair competition. Even though the EU is working towards a more standardised regulatory framework to promote net-zero technologies, variations in the fiscal capacity of Member States (i.e. their ability to provide state aid for the support of their clean-tech industry) may lead to unequal opportunities for action among different Member States. Such individual measures can potentially lead to capital and labour shifts from other Member States to the countries implementing the policy¹.

At the same time, there are several reasons that could justify the support of specific industries in the EU. For example, the risk of decreased EU competitiveness may warrant the support of specific

¹ The potential risk of capital, labour and demand shifts across countries is not analysed in this pilot, which focuses on industrial reallocation within countries only, but will be analysed in future studies.

industries, especially if China continues to subsidise and invest in Net-Zero technologies heavily and if the United States follows suit under, for example, the Inflationary Reduction Act. This perceived risk may prompt some EU countries to protect their industries by implementing their own proactive industrial policies while also considering the need to enhance their industrial production capacities to meet the EU's climate neutrality objectives.

This policy brief presents the first results of a pilot study that, using the FIDELIO multi-sector general equilibrium model (Rocchi et al., 2019), evaluates the impact of state aid introduced to support strategic net-zero technology-related industries by three Member States (i.e. Germany, Italy and France) on the EU's green manufacturing capacity and the single market integration. In particular, the study analyses the impacts on value added in two different scenarios, one in which subsidies are introduced individually by each Member State and one in which the three Member States act simultaneously.

To the best of our knowledge, this is the first attempt to analyse the economic impact of State aid support and the risk of fragmentation of the single market, comparing individual and simultaneous policy action, correctly considering the inter-industry linkages that exist among countries within the single market.

In what follows, we firstly describe the relevant policy context and the reasons behind the choice to focus our analysis on a subset of industries (sections 1.1 and 1.2). In the second section, we present the model and the data used, while the third section describes the policy design. Next, we show the main results (section 4), conclusions (section 5) and possible follow-up (section 6) of the pilot study.

1.1 The Net-Zero Industry Act

On May 27, 2024, the European Commission adopted the Net-Zero Industry Act (NZIA) under the Green Deal Industrial Plan pillar. This initiative aims to stimulate technological investments and enhance industrial production capacities for goods crucial in achieving the EU's climate neutrality goals, enhancing the production capacity of the manufacturing industries and the competitiveness of the following green technologies:

- Solar photovoltaic and thermal technologies.
- Blectrolysers and fuel cells.
- Onshore and offshore renewable technologies.

Sustainable Biogas/Biomethane technologies.

- Battery/storage technologies.
- Carbon Capture and Storage (CCS) technologies.
- Heat pumps and geothermal energy technologies.

Grid technologies.

1.2 Financing net-zero technologies

Through a simplified regulatory environment, the NZIA creates the conditions to facilitate investments in net-zero manufacturing projects and technologies, making it easier for investors and project promoters to build net-zero industrial capacity and technological know-how.

However, private funding alone may not be enough, and the effective rollout of green industrial projects may require public support in the form of state aid. State aid can mobilise national resources, offering ample prospects to crowd-in private investments and effectively roll-out net-zero industrial projects. State aid can create conditions for price decreases in subsidised technologies. In competitive markets, the increase in price competitiveness attracts demand and production from other areas. Concurrently, the adoption of subsidised technologies fosters capital accumulation and innovation, thereby enhancing overall productivity within the subsidised industry and, indirectly, in the rest of the economy via spillovers². Shifts in supply and demand also affect job creation across various industries as well as the environmental performance of the economy, its export performance and trade balance. Overall, spillovers derived from existing trade relationships across all countries will influence the degree to which demand, capital, and labour would be shifted due to the granted subsidies.

The way the Government finances the state aid may also matter in assessing its economic impact, as the money could be sourced from higher taxation³, increased debt or increased deficit,

² Spillovers are defined as indirect effects in all industries of the economy, also including those industries affected directly by the subsidies (e.g. feedback effects).

³ This study assumes that the total State aid intervention is financed by a lump-sum tax proportional to the GDP weight of each Member State in the EU economy and spread over a 30-year period.

which may hamper the aforementioned positive effects on the real economy.

1.3 Strategic net-zero-related manufacturing industries

Using the EU taxonomy⁴ as a guide, we identified the following three manufacturing industries as those more likely to be significantly impacted by the NZIA⁵: C25 (fabricated metal products), C27 (electrical equipment) and C28 (machinery and equipment), as the strategic net-zero related industries that will receive the state aid. As shown in Table 1, C25, C27 and C28 are those industries with three or more check marks across strategic net-zero technologies, with the exception of repairing services.

Selected economic activities (NACE Rev. 2		Strategic Net-Zero technologies							
		Ē	H2	¥		\$			
Products of wood and cork	C16						~		
Chemical products	C20						~		
Rubber and plastics products	C22						~		
Other non-metallic mineral products	C23						~		
Fabricated metal products	C25		~	~			~		
Computer and optical products	C26					~			~
Electrical equipment	C27		~	~		~			~
Machinery and equipment	C28		~	~			~		
Motor vehicles	C29					~			
Other transport equipment	C30					~			
Repairof machinery and equipment	C33					~	~		~

Source: own elaboration based on the EU Taxonomy.

2. Model and Data

FIDELIO (Rocchi et al., 2019) is a multi-sector general equilibrium economic model covering 45 countries (EU 27 Member States, its main 18 EU trading partners – e.g. G20, and an aggregate region of the rest of the world), with a breakdown of 64 NACE industries. The model is based on official statistics from the Eurostat's FIGARO⁶ global input-output tables, National Accounts, Institutional Sector Accounts and OECD data.

Since the model provides a unique detailed industry resolution and models firms, households and the public sector behaviour, it is suitable⁷ to assess how the economy reacts to industrial policy shocks and how economic impacts propagate globally and across industries through interindustry linkages. Therefore, it is also well suited to analyse global value chains and strategic dependences, accounting correctly for direct and indirect effects within the country and the global economy.

Regarding the data used, the source of the total amount of state aid granted by each country to their economy is the Eurostat's institutional sector accounts⁸. For each Member State, such total amount was broken down by NACE Rev. 2 activity using firm-level data⁹ - for 2021 from the State Aid Transparency Database. The resulting breakdown was further used to calculate the amounts of subsidies received by each of the aforementioned technology related manufacturing net-zero industries (i.e. fabricated metal products, electrical equipment and machinery and equipment) in Germany, France and Italy, as initial shocks of the simulation.

Accordingly, over a period of five years the total amount of government support to these three industries was 10.2 billion EUR in Germany, 4.4 billion EUR in Italy and 3.6 billion EUR in France. Under the simultaneous scenario, a total amount of 18.2 billion EUR of state aid was granted to the selected net-zero industries in these three countries at the same time, with the same industry allocation, and time path.

⁴ In March 2020, the European Commission published the EU Taxonomy, a classification system of environmentally sustainable economic activities. This classification system identifies those economic activities and investments that contribute to climate mitigation and climate adaptation. This is aligned with the EU's climate and environmental objectives of the European Green Deal. The EU Taxonomy is developed by the European Commission, with input from a Technical Expert Group (TEG) on Sustainable Finance. The TEG is comprised of experts from the private sector, academia, and civil society, and is responsible for providing technical advice to the Commission on the development of the taxonomy.

⁵ These industries account for around 4.2% of the value added in the EU, 2.2% in France, 6.9% in Germany, and 5.0% in Italy.

⁶ <u>https://ec.europa.eu/eurostat/web/esa-supply-use-input-tables/data-base#figarotables</u>

⁷ The FIDELIO model is suitable for modelling simulations, such as the introduction of market-based instruments (taxes and/or subsidies) and the evaluation of the economic impacts of external/ natural shocks and changes in tariffs and/or transit costs (e.g. free trade agreements). See for example, Rocchi et al. (2019), Salotti et al. (2019), Albizzati et al. (2022) and Barbero et al. (2022).

⁸ <u>https://ec.europa.eu/eurostat/cache/infographs/sectoraccounts/in-dex.html</u>

⁹ Given that the firm data on State aid was not exhaustive (i.e. slightly higher than 50% of the European's total), we assumed the same industry breakdown as those that were available. The industry coverage was similar for France, Germany and Italy and for the whole period considered.

3. Policy design

To analyse the economic impact of simultaneous state aid supporting strategic net-zero technologies compared to individual actions, we have assumed the implementation of a multi-year state aid strategy targeting the aforementioned three netzero-related technology industries in the top three EU countries by GDP size: Germany, France, and Italy. In particular, the policy design assumes four different scenarios: (1) Germany as the only country providing government support; (2) same for France; (3) same for Italy; and (4) Germany, granting France and Italy state aid simultaneously¹⁰. We assume that each country grants state aid to the three aforementioned industries over a period of five years¹¹.

As in Christensen et al. (2019) and EIB (2022), we assume that state aid is introduced in the form of investment grants¹², so these will have permanent effects through long-term higher productivity levels. State aid aims to support innovation activities, which are expected to increase productivity, industrial capacity and know-how in each country's granted industries. As a result, cost reductions triggered by state aid may support a price reduction (under competitive markets), possibly attracting increased production and demand towards the countries granting the funds¹³.

At the same time, there will be growing spillover effects in other EU countries and industries, as well as in the rest of the world. This is because the subsidised industries have strong connections among themselves and with non-subsidised industries in the EU and non-EU countries across their value chain. For example, machinery and equipment may rely on metal products (subsidised) and plastic products (non-subsidised). Similar to water ripple effects, spillovers become more significant in the long term, extending beyond the initial shock effects.



¹¹ The evolution of the granted funds over the five-year period follows a similar pattern to that of the Horizon Europe Program, with fewer funds allocated during the early and final stages of the period, and peaks during the mid-term years.



4. Gains from State Aid, Single Market, and Open Strategic Autonomy

In Table 2, we present both the impact of State aid to support net-zero-related industries on value added and the extra gains of a simultaneous policy action vis-à-vis individual policy actions over a period of 10 years. As in a globalised economy the effects of the policy extend beyond the boundaries of the subsidising country, total impact of state aid would be distributed between EU and non-EU countries. This is why results on value added and extra gains are reported not only for each one of the three countries analysed, but also for the EU27 and the rest of the World at different levels of industrial disaggregation (all industries, subsidised and non-subsidised industries).

First of all, 10 years after its introduction, the total economic impact from simultaneous state aid on the EU27 would amount to 33.8 billion EUR, which is 3 times the total impact of the same amount of State aid in the rest of the World (11.0 billion EUR). A simultaneous policy intervention strengthens the single market as the extra-gains for the rest of the EU are higher than those for the rest of the World (1.3% *versus* 1.1%). Moreover, over the same period, a simultaneous introduction of state aid to support net-zero-related industries is always beneficial for all three Member States taken individually. In fact, the extra gains of simultaneous State aid with respect to individual actions range from 1.6% in France to 0.7% in Italy.

This is also confirmed for the subsidised industries, where, for instance, if Germany would act

¹² Investment grants consist of capital transfers made by governments to other resident or non-resident institutional units to finance all or part

of the costs of their acquiring fixed assets (par. 10.208, 2008 System of National Accounts, UNSD).

¹³ However, the current version of the model FIDELIO reallocates inputs across industries within countries (reallocation) rather than across countries (relocation), by using spare capacities and price induced changes due to the State aid received by the subsidised industries. For this reason, these results may be slightly overestimated for non-subsidising countries, due to the fixed cross-country factor mobility and slightly underestimated for the rest.

individually, the economic impact in its territory after 10 years (8.8 billion EUR) would be lower than it would have been if the 3 countries would have acted together (9.0 billion EUR). Even more interestingly, the extra gains of a simultaneous action are significantly higher than in the case of individual actions, especially for the rest of the EU (1.2% vs 0.4%). Therefore, a simultaneous policy action would reduce the risk of fragmentation of the single market in the subsidised industries.

 Table 2 – Economic impact of different state aid scenarios over

 10 years, by region and industry

	A. Stat	e Aid (mil	I€)			
	Germany	Italy	France	Simult.		
State aid (mill €)	10,232	4,379	3,561	18,172		
		Extra-				
Regions/Industries	Germany	Italy	France	Simult.	gains (%)	
All industries						
EU27	18,305	9,117	6,051	33,828	1.1%	
Germany	15,566	510	430	16,677	1.0%	
Italy	471	7,680	275	8,484	0.7%	
France	489	257	4,749	5,582	1.6%	
Rest of the EU27	1,780	670	597	3,085	1.3%	
Rest of the World	5,805	2,862	2,259	11,050	1.1%	
Subsidised						
EU27	9,253	3,345	2,604	15,271	0.5%	
Germany	8,813	133	98	9,083	0.4%	
Italy	112	3,076	61	3,263	0.4%	
France	53	32	2,365	2,461	0.4%	
Rest of the EU27	274	103	81	464	1.2%	
Rest of the World	500	233	173	919	1.4%	
Non-subsidised						
EU27	9,053	5,771	3,447	18,557	1.6%	
Germany	6,753	376	332	7,594	1.8%	
Italy	359	4,604	214	5,221	0.9%	
France	436	225	2,385	3,121	2.5%	
Rest of the EU27	1,505	567	517	2,621	1.3%	
Rest of the World	5,305	2,628	2,085	10,131	1.1%	

Source: own elaboration based on FIDELIO model simulations

Nonetheless, the spillovers to the rest of the World are larger than to the rest of the EU (1.4% vs 1.2%), which confirms the higher dependence of these three strategic net-zero related industries on third non-EU countries. As the main products produced in these industries have been classified as "strategically dependent" by DG GROW (European Commission, 2023), our results suggest the need to strengthen the resilience of such value chains with appropriate EU industrial policies.

Results for non-subsidised industries confirm the trend of the higher gains associated with a simultaneous action vis-à-vis individual ones for all three countries in the analysis (ranging from the extra gain of 2.5% in France to the 0.9% registered in Italy). However, they also point out that, differently from what was observed in subsidised industries, extra gains from simultaneous State aid

are higher in the rest of the EU than in the rest of the World. The results show evidence of an improvement in the EU's open strategic autonomy in non-subsidised industries due to the higher economic impact of simultaneous state aid in the EU27.

5. Conclusions

This policy brief presents the results obtained using, for the first time, the FIDELIO multi-sector general equilibrium model to analyse the impact on the single market of simultaneous state aid compared to individual country actions.

The pilot project revealed that simultaneous state aid to support net-zero-related industries by multiple Member States result in **higher economic impact at both the EU and country levels** over a ten-year period, compared to individual actions by a single Member State. Moreover, simultaneous state aid **strengthens the single market** through its larger indirect impacts on the rest of the EU, which are larger than in the rest of the world.

Once we disaggregate the effects at industry level, however, we find different results for subsidised and non-subsidised industries. Subsidised industries emerge as **dependent**, in line with the recent DG GROW's assessment of strategically dependent products (European Commission, 2023), which are mainly produced by the subsidised industries.

Our analysis suggest that simultaneous state aid can **enhance the EU's open strategic autonomy** by expanding the production capacity of nonsubsidised industries within the EU, which may serve as suppliers to the subsidised 'clean-tech' industries.

Overall, state aid would contribute to increase the production capacity of the green manufacturing industry in the EU, thus likely improving the EU's open strategic autonomy position and potentially reducing dependencies on non-EU countries.

The results further enrich the current debate on how to support the EU green transition protecting the level playing field in the single market and enhancing the EU's open strategic autonomy.

6. Way forward

Even though the conclusions seem to point to one direction, the analysis could be improved by evaluating the impact in other variables such as employment, trade and/or emissions. Besides, by considering a scenario where all 27 Member States introduce state aid simultaneously, even if not in an optimal manner, we would expect that the high integration of all Member State economies in the single market would generate more significant intra-EU spillovers, which is in line with our analysis for three Member States, and improve EU's open strategic position in critical manufacturing industries for the green transition.

Long-term effects, including factor relocation, should also be taken into consideration to improve the results for specific countries. Ultimately, it may be pertinent to include more detailed data on netzero technologies, account for the differential behaviour of large and small-medium enterprises, as well as introducing alternative financing schemes for a more realistic and comprehensive analysis.

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