Charging ahead: Contradictions in the European Union's strategy to promote the EV battery industry

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The electric vehicle (EV) battery sector is identified as one of the strategic industries by the European Commission. Across the European Union, battery gigafactories are rapidly rolled out, showered with subsidies under the bloc's new, more (geo)political industrial policy paradigm. The explicit vision is a full, unbroken EU-based battery value chain, reducing reliance on imports, primarily from China. This is already quite startling, given that parts of the value chain are low value-added, risk environmental damage, and imports could provide a faster and more cost-effective avenue to decarbonize. EU officials' statements and working documents outline three aims for localizing battery production—domestic industry promotion, climate neutrality and open strategic autonomy. However, the hierarchy and precise meaning of these often conflicting, vaguely formulated aims remain unclear. What insights do the available data on the nascent sector provide about them? The inquiry focuses on German-owned automotive firms' pan-European value chains—at the EU-level and in two member states, Germany and Hungary. It finds that in the implementation of the battery strategy, climate neutrality and strategic autonomy are subordinated to industry promotion. The negative environmental impacts of Hungary's 'battery superpower' ambitions are particularly alarming. The small economy is poised to become the fourth-largest producer globally—but heavy reliance on Russian fossil fuels and intentionally weakened environmental protections cast doubt on the efforts' overall climate impact. Both German and Hungarian production is to be covered, to a large extent, by Chinese-owned firms' assembly lines (physically based in Europe), reducing strategic dependencies on China to a limited extent. Hungary's autocratic political regime also presents a paradox: while the EU wishes to decrease reliance on non-democratic external powers, it is ironically increasing dependence on an autocratic member state.

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Introduction

“If we are fast enough, we can always win on technological changes. Take, for example, electric cars. We are making huge battery investments in Hungary, and we will soon become the world's third-largest battery manufacturer, not in percentage, but in absolute terms.” In the summer of 2022, Hungary’s autocratic leader Viktor Orbán proclaimed his ambitions to turn the country into a ‘superpower’ in electric vehicle (EV) battery production. The announcement went largely unnoticed, partly because this was the same speech in which he lashed out against ‘race-mixing’ in Europe – a comment that sparked international outrage. But the scale of the economic undertaking was staggering. It aimed for a dominant position in a key value chain segment, trailing only China and the United States, but competing with Germany; far exceeding what is proportionate to the Hungarian economy’s size, which is roughly equivalent to the Munich metropolitan area. Rhetoric was followed by actions: South Korean and Chinese investors were lured to the country with generous incentives, and Hungary currently boasts a manufacturing capacity of 87 GWh per year, securing 4th place in the global battery race.

The strategy baffled many Hungarian economists, who questioned the economic rationale of betting so heavily on a single, technologically volatile industry, while sorely lacking energy, water and labor force for production at this scale (Győrffy 2024, Éltető 2023a). The agenda conjured up memories of forced industrialization of the Soviet-era, and pipe dreams to turn resource-poor Hungary into ‘the land of iron and steel’ (Győrffy 2023). The ambition also came with devastating ecological costs and a relentless flow of news headlines reporting environmental damages, including toxic chemicals found in groundwater (Éltető and Ricz 2023). This sparked public outrage in local communities, both at existing production sites and at planned ones. After news broke of Chinese giant CATL’s plans to open a gigafactory in the Debrecen area, a public hearing on the factory’s environmental permits descended into chaos and fistfights (Higgins 2023). The regime responded by crushing dissent: scrapping mandatory public hearings by decree, obstructing referendums and public interest data requests, undermining local governments’ rights, harassing and intimidating protesters.

Yet, the Hungarian battery strategy garnered support from an unlikely source: Brussels. The European Union has forged a new and more (geo)political industrial policy paradigm (McNamara 2023, Schmitz and Seidl 2023, Bauerle Danzman and Meunier 2024), where battery production is central. The European Commission has identified batteries as a strategic industry (EC 2019), and the EU aims for a full, “*unbroken value chain in Europe*” (European Battery Alliance 2024). So despite Orbán’s open political conflict with the Commission over breaches of EU fundamental values (Kelemen 2024), EU officials lauded Hungary’s ambitions. Vice President Maroš Šefčovič praised Hungary as a ‘pioneer’ and a ‘champion’ for contributing to decarbonization objectives – and helping the EU “*achieving strategic autonomy”* which is "*all the more important after Russia's unjustified invasion of Ukraine*."

The latter statement – a top EU official praising Hungary's contribution to strategic autonomy – was particularly bizarre. The Orbán government vehemently opposes loosening economic ties with Russia or China, and pursues geopolitical non-alignment (Orenstein and Kelemen 2017). Defying EU policy, they remain steadfast in sourcing natural gas from Russia, which fuels much of the energy-intensive battery production. Hungary has welcomed vast Chinese investment projects (often financed by opaque Chinese loans) and even invited Chinese police officers to patrol the streets of Budapest (Zgut-Przybylska 2024).

This cacophony vividly demonstrates the eagerness with which the EU has thrown itself into the frenzied global battery race (or rather, a desperate catch-up with China). Meanwhile, it largely escaped systematic scrutiny whether, and under what conditions do these ambitious industrial policies serve the desired economic, environmental and supply security aims. European officials tend to portray efforts to foster an EU-based battery industry as simultaneously advancing the climate agenda, promoting strategic autonomy and protecting the bloc's automotive industry and manufacturing jobs. However, the case sketched out above raises doubts about the complementarity of these aims. What happens if the aims are in conflict? Which one gets prioritized? Casting a look at the nascent industry in Europe and the ongoing, state-aided rollout of battery gigafactories can help us understand the trade-off between these objectives, and revealed preferences about their hierarchy in EU industrial policy.

The misalignment between EU objectives and developments in Hungary cannot be understood without the broader context, of course. Hungary's automotive sector is deeply embedded in what Ban and Adascalitei (2022) call the 'German manufacturing complex'. In 2021, German-owned firms produced 58.6% of manufacturing value added in Hungary,[1] and their indirect presence through supplier linkages is even larger. These German conglomerates, in turn, are exposed to a number of global shocks, from the green (and digital) transitions reshuffling production networks (e.g. Dechezleprêtre *et al.* 2023), to geoeconomic competition fragmenting global trade (e.g. Aiyar *et al.* 2023), not to mention the speedy rise of new competitors like China's BYD (Gerbaudo 2024), or the new wave of protectionist industrial policy in their main export market, the United States, symbolized by the Biden administration's Inflation Reduction Act (e.g. Bernoth and Meyer 2023). The selection of the case is further motivated by the role German-owned auto firms play in the EU: automotive manufacturing directly employs around 3 million people in the EU — from this direct employment portion, about one third, 1 million people work in German-owned automotive firms (760,236 in Germany; 257,788 spread out across the EU) – which underscores the systemic importance of these companies when it comes to any EU-level industrial policy intervention.

Therefore, the analysis zooms out to analyze these German firms' pan-European value chains, and assesses battery strategies in both Germany and Hungary, situated at opposite ends of the

[1] Data: Eurostat, Foreign controlled EU enterprises by NACE Rev.2 activity and country of control.

value chain. This nested analytical approach (looking at global shocks, EU-level objectives, value chains and member state units) aims to give a fuller picture about the trade-offs and potential contradictions implied in the EU's battery strategy, and whether or not EU objectives align with developments on the ground.

The paper aims to contribute to multiple ongoing discussions in the literature. Firstly, an important research strand spearheaded by Jonas Nahm (e.g. Nahm 2022, Nahm and Kupzok 2024), in dialogue with the growth models perspective's focus on demand drivers (Baccaro *et al.* 2022), explores how countries with large 'decarbonizable' sectors and an outsized export-oriented manufacturing base can (paradoxically) turn into potential frontrunners on the path towards net-zero, as they can build on existing manufacturing capacities to create green industries; are more likely to implement green industrial policies including green R&D (Driscoll 2024); and can shore up broad(er) supporting coalitions for the climate agenda. The battery industry is a fitting case study, while also shedding light on the limitations of the argument. The significant ecological devastation in the wake of Hungary's battery gigafactory rollout shows that industry development and green goals can and do clash. Europe's battery frontrunner undermining the EU's green goals also highlight the importance of conditionalities and enforcement linked to these objectives, so that green industrial subsidies are not just a way to serve 'corporate welfare' (Bulfone *et al.* 2023).

Secondly, there is a spike in academic interest in Europe's newfound zeal for industrial policy, which took a sharp shift away from neoliberal market-making and prioritizes political and geostrategic aims (McNamara 2023, Seidl and Schmitz 2023, Bauerle Danzman and Meunier 2024). These authors discuss the EU's "geopolitical/ geoeconomic turn" as a new logic governing EU policies. The insights from the nascent battery industry prompt more caution when drawing these conclusions. While the proclaimed goals have indeed shifted, the outcomes on the ground often do not move the needle much on strategic autonomy, defined as reducing dependencies on non-transparent, authoritarian partners. The German manufacturing complex continues to oppose a decoupling from China, and relies on Chinese FDI to foster a domestic battery industry. While the Russian energy link has indeed been severed (not by choice, though), battery production in Hungary continues to be powered by Russian gas, and this exposure is projected to grow. Geopolitics and strategic autonomy seem more like a well-sounding extra to the real objective: the protection of the EU's car industry, the backbone of manufacturing employment. When the two objectives clash, industry trumps strategic autonomy.

Thirdly, while a geopolitical EU is keen to 'friendshore' the EV battery industry and reduce dependence from China, it seems completely blind to the leverage risk posed by an autocratic *member state*. This may add an important layer to the study of choke point control and weaponized interdependence pioneered by Farrell and Newman (2019). In fact, the most likely motivation behind Viktor Orbán's battery superpower ambitions is neither economic nor

ecological; rather, a desire to exert disproportionate control over a key value chain, leveraging it as a political weapon.

The paper proceeds as follows. The first section gives an introduction to Europe's EV battery strategy, discusses the hierarchy between its three main objectives (climate neutrality, strategic autonomy, industry promotion) – to conclude that industry promotion, especially the protection of manufacturing jobs are prioritized to the other two. The second section outlines the EU-wide rollout of battery gigafactories, and the two short country cases, Germany and Hungary – both pointing to misalignments with the EU's stated objectives. Finally, the paper also gives a quick snapshot of a contrasting case, arguing that Sweden's strategy is closest to the EU's stated aims.

Europe's EV battery strategy

EV battery technology is pivotal to the clean industrial revolution, and the European Commission has long set its sights on it. As Di Carlo and Schmitz (2023) document, the sector bears the earliest evidence of the EU's revitalized industrial policy drive. The European Battery Alliance[2], a multi-stakeholder platform to help foster a domestic industry with at least 20-25 gigafactories, was formed as far back as 2017. Viewing the lack of investment in battery technologies as a market failure, Vice-President Maroš Šefčovič, spearheading the EBA, referred to a need for "*the convening power of the European Commission to get the right people in the room*".[3] At that time, automakers largely regarded batteries as mere commodities and were hesitant to invest in their own capacity, citing market uncertainty and funding constraints: the EU's prohibition of state aid contrasted sharply with Chinese state-led development. The Commission intervened with a Strategic Action Plan on Batteries (in 2019), identifying the industry as "*a strategic value chain, where the EU must step up investment*".

Since then, several developments have forcefully propelled the sector forward. Adopted in 2020, the EU Green Deal mandated a 55% net emissions reduction compared to 1990 levels by 2030, and bloc-wide climate neutrality by 2050. Among the over one hundred legislative measures passed to deliver the Green Deal and make the bloc 'Fit for 55', co-legislators have agreed to ban the sale of new polluting vehicles from 2035, further solidifying the inevitability of electric cars. Importantly, the EU significantly relaxed its insistence of state aid prohibition – first as a response to the COVID-shock, and then directly linked to the green industrial transition.

Even before, Article 107(3)(b) of the TFEU did allow for state aid provision, "*to promote the execution of an important project of common European interest or to remedy a serious*

[2] See: EBA250 https://www.eba250.com/about-eba250/
[3] Cited by the FT. (Milne and Hall 2019)

disturbance in the economy of a Member State".[4] In November 2021, the Commission published a new set of guidelines, dusting off the concept of an 'important project of Common European Interest' (IPCEI), and linking it explicitly to the Green Deal and the digital transition, signaling to member states that in those fields, they are open to green-light state aid (EC 2021). All these steps have paved the way for generous subsidies into gigafactory projects across Europe.

The two IPCEIs on batteries were among the first ones to be approved, providing an amount of 6.1 billion EUR to 12 member states' 74 individual projects (EPRS 2022). Beyond state aid support, various EU-level grants and loans also provide funding streams (see Table 1), although the magnitude has been far smaller: EU-financing amounted to 1.6 billion EUR for the entire bloc in the previous 7-year budgetary framework (2014-2020). As a comparison, Germany's single state aid injection into Northvolt's gigafactory in January 2024 was 902 million EUR (EC 2024).

Funding source	**Type of support**	**2014-2020 (m €)**	**2021-2027 (m €)**
EU Framework Programmes for R&I (Horizon)	Grants	873	925
European Regional Development Fund in selected member states	Grants	319	ongoing
Innovation Fund	Grants		161
European Investment Bank	Loans with EU budget guarantees	495	ongoing
Total EU support (grants and loans)		**1,687**	**1,086+**

Table 1. EU funding for battery projects (Data: European Court of Auditors 2019). The Recovery and Resilience Facility provides additional resources.

What objectives drive the EU's battery strategy?

The European Union's explicit aim is a full, unbroken battery value chain within Europe. It has become a rallying cry thrown around matter-of-factly by officials and stakeholders— while receiving little systematic scrutiny. Clearly, battery technologies are vital for a net-zero future. But Europe's shift towards domestic production is still somewhat puzzling, given that imports could be a quicker and cheaper option to decarbonize. China, Japan and Korea, currently

[4] CONSOLIDATED VERSION OF THE TREATY ON THE FUNCTIONING OF THE EUROPEAN UNION. https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:12012E/TXT:en:PDF

holding over 90% of market share in batteries, have a sizable cost-advantage due to energy price differentials. Many of these production segments are low value-added, highly water- and energy-consuming, involve hazardous toxic chemicals, and localizing them may adversely impact other environmental goals.

Why, then, the emphasis on domestic production of batteries? EU officials' statements and working documents reveal three main concerns against relying on battery imports:

1) battery cells produced elsewhere may lack the EU's environmental standards (*the climate neutrality objective*);

2) imported supply may be held up by geopolitical or trade tensions or other disruptions (*the strategic autonomy objective*);

3) without local battery supply, the European car industry may fall behind, and have no replacement for the jobs lost due to the internal combustion engine's phase-out (*the industry-promotion objective*).

These three aims tend to be presented as complimentary – but they can be, and often are conflicting. So what is the EU's hierarchy between these goals?

If the sole priority would be the climate neutrality objective – i.e. to decarbonize road traffic, and do it fast – import-reliance could easily emerge as the preferred policy strategy, based on the fact that Asian producers can currently produce the necessary green goods more efficiently (not only batteries, but also entire EVs). Moreover, as EU member states pour fiscal resources into the personal EV industry, a critical question arises: Is there a comparable commitment to more fundamentally transforming mobility towards more less car-dependent models? A truly sustainable approach would aim not just for more electric cars but for fewer cars overall, which would inevitably mean shrinking the car industry (and prioritizing job creation in other sectors), an option that is anathema for policymakers.[5]

It seems clear that the green objective is a conditional one; the EU pursues it while also protecting domestic industry and car manufacturing jobs, and if the two aims are in conflict, domestic industry tends to come out on top. That said, if imported inputs are produced in a polluting way, they may be more cost-effective, but worse in their overall ecological footprint. Commission President von der Leyen, for instance, expressed her disappointment that Europe relies on batteries made abroad "*with environmental standards that lack our ambition*." However, the assumption that EU-based production will automatically be greener is challenged

[5] Yet another aspect is that decarbonization efforts often produce adverse ecological effects on the periphery. In case of lithium, a key battery mineral, extraction sites in Chile and Argentina saw severe environmental injustices and social tensions triggered by water depletion, as well as toxic chemicals contaminating soil and air—prompting scholars to conclude that green electromobility has a colonial shadow (Jerez *et al*. 2021).

by the Hungarian experience: it is an important case showing that, even within the EU, there are significant laggards in environmental compliance. The availability of renewable energy is a crucial aspect: EV battery manufacturing can contribute significantly to carbon emissions if electricity is generated through fossil fuels. While member states use regulatory forbearance as industrial policy (Dewey and Di Carlo 2022), and engage in a race-to-the-bottom in environmental standards to attract investment, the EU largely lacks the monitoring and enforcement capacities to pursue its pre-set objectives (see also: Kelemen and Pavone (2023) documenting a widening enforcement gap in the EU).

The (open) strategic autonomy objective is more difficult to assess, as it is unclear what its exact meaning and implications are. Schmitz and Seidl (2023) reflect on this problem, and call the term a 'coalition magnet'– deliberately vague to attract as broad a coalition as possible to support it. The strategy reflects a concerted effort to reduce dependence on external, non-democratic sources for critical technologies. By localizing battery production, the EU aims to strengthen its key supply chains and lessen vulnerabilities amid geopolitical tensions and uncertainties in international trade. It resonates with the concept of 'weaponized interdependence' proposed by Farrell and Newman (2019), who explain how economic interconnectivity and dependencies can be transformed into levers of power. Around the globe, these concerns are driving a shift toward geoeconomic fragmentation (Aiyar *et al.* 2023, Baba 2023), or, in the words of IMF Deputy Managing Director Gita Gopinath (2023), an emerging 'Cold War II'. Western democracies have communicated an increasing wariness of non-transparent, non-democratic regimes that might exploit these dependencies for coercive purposes, a concern intensified by Russia's use of the energy weapon. This framing is strongly present in the battery industry, as the EU Court of Auditors (2019) sharply put it: "*The EU must not end up in the same dependent position with batteries as it did with natural gas; its economic sovereignty is at stake*." To put a 'doomsday scenario' into concrete terms—if China were to invade Taiwan, prompting Europe to reply with economic sanctions, severing trade ties with China would be extremely costly, also for the automotive sector.

But what exactly does that imply for battery production? Does a Chinese CATL factory that is physically based in Europe reduce strategic dependencies on China? It does, if supply security is understood in a narrower sense: the recent experience of COVID-19 lockdown measures or the disruption of trade routes could also explain firms' desire to 'secure' suppliers who are less remote (thereby cutting transportation costs). If the concern is a potential political dispute that would prompt China to limit exports to European car-makers, the fact that the production site is in Europe would not help much.

EU considerations about strategic autonomy are completely blind to the potential risks of an autocratic member state. Ironically, in its attempt to reduce dependence on non-democratic external partners, the EU might find itself reproducing a similar form of reliance within its own

borders. Hungary's centrality in a critical supply chain like battery production could endow it with leverage, to be used as a means of exerting pressure.

Beyond climate and strategic autonomy, the economic objective is an obvious one. When discussing the stakes of the global 'battery race,' officials typically highlight the fact that this is a rapidly growing market, and the EU wants a slice of it. This is the most overarching argument for industry promotion: this is a key sector of the new industrial revolution, so specialization in battery production is a growth strategy in itself. The European Battery Alliance projects that "*the market will have an estimated annual value of up to €250 billion by 2025*." This figure has gained almost mythical status (incorporated into the name of the Alliance's key industrial development program, EBA250). The market's potential is an important point, of course. But how can a member state or the EU have a slice of it? If EU countries are to appropriately seize market share, domestic value added will be key.

As the famous 'smiling curve' thesis posits (Baldwin 2013, OECD 2013), value creation in the global value chain is often distributed unevenly: it is highest in pre-production (R&D, design) and post-production (marketing, sales), while lowest in assembly work, that is exactly why they are most frequently offshored. Therefore, rather than batteries 'Made in Europe', the aim should be batteries 'Invented in Europe'. These technologies evolve in fast and nonlinear ways, so European ownership and control of these firms should be at the heart of growth strategies. Luring Chinese assembly lines into Europe with generous state subsidies will unlikely to do the trick.

The number one objective seems to be the protection of European carmakers and Europe's industrial base. It overrides both climate and strategic autonomy considerations. The automotive sector is the backbone of manufacturing employment in Europe – providing direct and indirect employment (through value chain linkages) to 13.8 million people in the EU, which makes up 6.1% of total EU employment.

There are widespread fears that the continent will see its industrial base diminish, with jobs relocating to China in a new wave of deindustrialization driven by China's dominance in green technologies – a pattern German industry saw in the case of the photovoltaic industry. Since the Biden administration's Inflation Reduction Act showered green (and not so green) industries with generous subsidies, the same jobs-leakage fears arose regarding the United States.

Comparing EV battery strategies across EU member states

<u>Europe's rollout of gigafactories</u>

The German car manufacturing complex is strongly export-oriented, relies heavily on the US market (Polyak 2022), and it is spread out around Europe and the globe, with an outsized presence in the CEE region (Ban and Adascalitei 2022). As these firms' EU-based affiliates

transition to electric mobility, how will they be supplied with batteries? Over the next six years, the bloc plans to meet its (largely export-oriented) motor vehicle production demands with domestically manufactured batteries, achieving a total capacity of 1,319 GWh per year, based on data collected by VDI/VDE Innovation + Technik, a consultancy monitoring gigafactory announcements (Bünting *et al.* 2023, p. 2).[6] To put this in context of industry needs, using a rough back-of-the envelope calculation: in 2022, approximately 13 million cars were produced in the EU. If each of these vehicles were equipped with a large 80 kWh battery,[7] the total required battery capacity would be around 1,033 GWh. This is a piece of evidence supporting the assumption that the EU's objective is to keep the automotive industry in its current size.

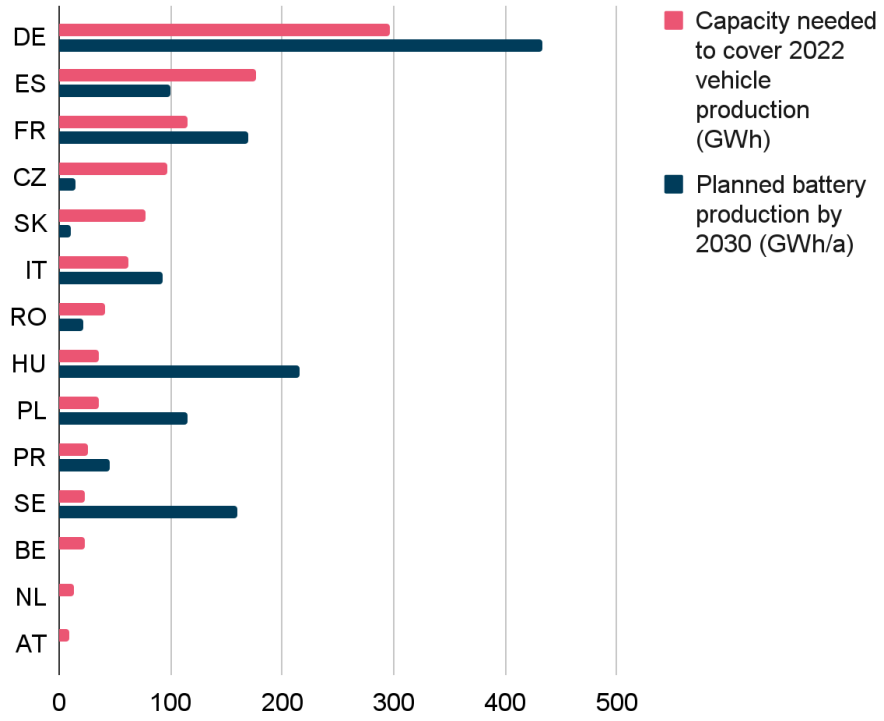

Figure 1. Planned battery cell production capacities by 2030 compared to demand estimates (GWh/a, maximum capacities)

[6] These are multi-year investment projects – investors can deviate from original plans, and even stop projects altogether. IRA subsidies prompted analysts to ring the alarm bell that "two-thirds of European battery production [were] at risk" and call for matching EU funding to save gigafactories. (Transport & Environment 2023)

[7] Average battery size estimate of the International Energy Agency.

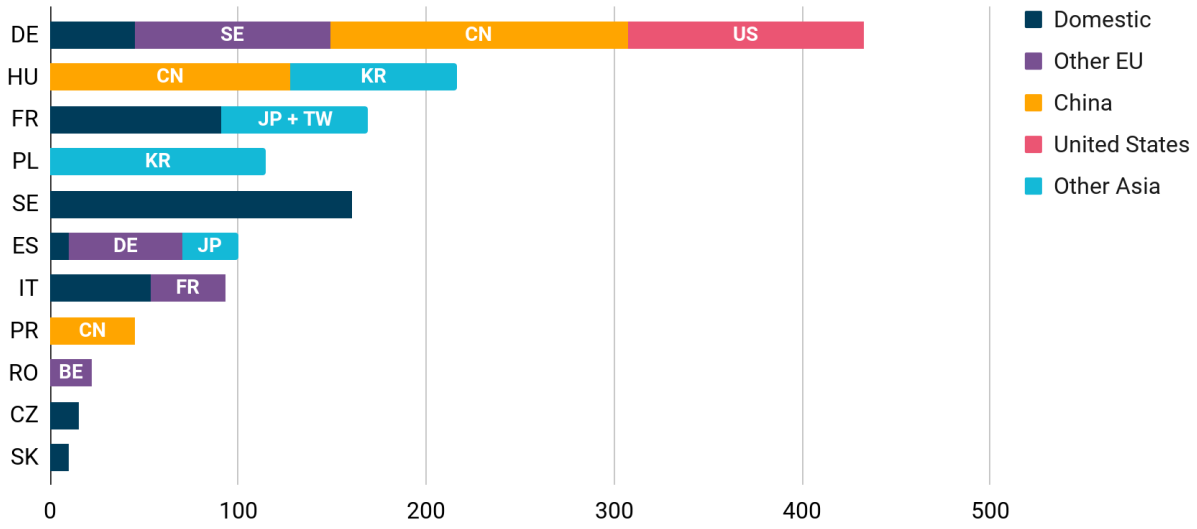

Figure 2. Ownership patterns of planned battery gigafactories (GWh of capacity)

Figure 1 also shows that there are varying strategies and levels of commitment to developing production capacities. The largest EU economies, Germany, France, and Italy have announced gigafactory projects, aiming to supply battery cells sufficient for about 150% of their current production volumes (importantly, these are maximum capacity numbers, factories can always produce less). Ownership profiles of these planned investments vary greatly, however (Figure 2).

Industry needs don't explain the variation patterns: Spain, Europe's second-largest automobile producer, plans to achieve only 57% of its projected battery capacity needs. Czechia and Slovakia, significantly integrated into the same German automotive value chain as Hungary, also foresee modest investments—these volumes are, however, produced by domestic firms. Two countries stand out distinctly, Hungary and Sweden, with a planned capacity/demand ratio of 600% and 700%, respectively. However, there are critical distinctions between Hungarian and Swedish strategies, to be discussed below.

Again, thinking in terms of the German automotive value chain is more instructive than staying on the level of country units. In contrast to Hungary, for instance, Slovakia and Czechia, two countries deeply integrated into the same German value chains, foresee modest investments (around 15%), albeit from domestic firms. However, it would be premature to conclude that the Czech and Slovak car industries are doomed. Firms see the region as one big unit: SK Innovation set up its Komárom factory right next to the Slovakian border, to supply (as they explain) "*German, Czech, Slovak, and domestic automotive plants*". While Slovakia and Czechia are projected to have fewer battery manufacturing jobs, they are also spared from the

ecological and fiscal burden. As for German-owned firms' pan-European value chains—they are set to be covered by the region's combined capacities.

The case of Germany

In light of the above considerations, how can we assess the German battery strategy's alignment with the EU's original objectives – climate neutrality, strategic autonomy and industry promotion? As seen above Germany is committed to fostering a domestic battery industry to meet its industry needs, with a planned capacity/demand ratio of 150%.

Gigafactory location	Company name	Company ownership	Start	Capacity			Invest-ments in million EUR	Jobs
City				Available (2022 Q4)	Build-up (Planning 1st phase)	Maximum		
Flintbek	UniverCell	Germany	i.o.	1.5		1.5		
Erfurt	CATL	China	i.o.	8	14	100	1,800	2,000
Ottendorf-Okrilla	LIACON	Germany	i.o.	0.5		0.5		
Willstatt	Leclanché	France	i.o.	0.5	1	4	48	
Göttingen	Gotion High-tech	China	i.o.		3.5	18		
Kirchentellins-furt	CellForce	Germany	2024		0.1	1		
Salzgitter	PowerCo (VW)	Germany	2025		20	40	2,000	2,500
Lauchhammer	SVOLT	China	2025		16	16		
Kaiserslautern	ACC	France	2025		13.4	40	2,168	2,000
Heide	Northvolt	Sweden	2026			60		3,000
Ellwangen	VARTA	Germany	2026			2	1,000	500
Überherrn	SVOLT	China	2027		6	24	1,700	2,000
Salzgitter	Quantum Scape	United States				21		
Berlin	Tesla	United States				105	5,000	2,000

Table 2. Planned gigafactories in Germany. Data: VDI/VDE Innovation + Technik. (i.o.: in operation)

When it comes to the German battery industry's alignment with the climate neutrality objective – the picture is mixed. Environmental justice movements raised serious concerns about Tesla's gigafactory in the Berlin-Brandenburg area (Krantz 2024). Activists and experts rallied against the excessive water use of the factory, comparable to a city of 30,000 (Allyn 2022), and the fact that the plant is located in a water-scarce area (Leibniz Institute 2021), which already faces frequent droughts that will only exacerbate with climate change. In a similar dynamic to the Hungarian case, investments are challenged by local communities and climate activists. Given that the manufacturing of EV batteries is an extremely energy-intensive process, energy use will also be an important breaking point in the German case, and the country is lagging behind on its ambitious targets on a public investment drive into renewables.

As for the strategic autonomy objective – the biggest portion of capacity based in Germany is to be produced by China's CATL, the same firm that has ignited strong local political pushback in Hungary. It is yet another piece of evidence for Germany's preference against a 'decoupling' from China, and against a broader, more geopolitical understanding of supply security. In case of a serious geopolitical fallout, the only option would be to expropriate these factories – which is highly unlikely, Given Germans' insistence on rules-based trade, also shown by their reluctance to seize Russian assets. As Joe Biden announced a 100% tariff on Chinese EVs, German Chancellor Scholz was quick to respond by calling for a "different perspective" from Europe (DPA 2024). This is partly motivated by German firms' outsized presence in China as an investor.

Given Chinese firms' dominance in the entire EV industry (and other green technologies), many analysts argue that embracing Chinese FDI is inevitable (Mackenzie and Sahay 2024). In fact, it is no longer accurate to speak of a battery race—it is a landslide victory for China. If Europe wants to catch-up, mimicking East Asian development models, low value-added manufacturing could pave the way for further development. Welcoming market-leading firms like CATL can foster dynamic production networks (Bridge and Faigen 2022): joint ventures with local partners, technology transfer and eventual upgrading or leapfrogging.

This will not happen automatically – substantive state investment into battery research, skills training, and targeted industrial policy to ensure technology transfer will be key. But surely, Germany will have a better chance of the optimistic upgrading scenario compared to Hungary, given their place on top of the value chain, where most high value-added activities are located. While German ownership does not seem to be a priority for gigafactories (domestic battery firms are set to contribute to a smaller extent than in France or Italy), there are a number of German-owned firms among the Important Projects of Common European Interest, signaling a strong nascent domestic ecosystem of battery producers.ű

There is a clear commitment to retain manufacturing jobs, which is also strongly supported by IG Metall, the biggest manufacturing sector union (IG Metall 2024). The commitment was clearly shown by the decision to inject 902 million EUR to keep Northvolt's gigafactory

investment in Germany – which was green-lit by the Commission as the first case of 'matching aid', allowing Germany to make a counter-offer to IRA subsidies. The justification was the protection of Europe's jobs and industrial base.

German policymakers were quick to pour almost a billion euros into the personal EV industry – while notoriously reluctant to finance (green) public investment — chronically underfunded railways are a case in point — even though sustained higher levels of infrastructure development and maintenance could also serve as jobs engines.

The case of Hungary

The breakneck rollout of gigafactories in Göd, Komárom and Iváncsa is a straightforward case of undermining the EU's climate neutrality objectives. Because the EU leaves monitoring and enforcement of its climate standards to member states, they can easily disobey– pursuing what Dewey and Di Carlo call 'regulatory forbearance as industrial policy' (2022). In fact, investors were drawn to Hungary by explicit promises of relaxed regulations, including streamlined permit procedures and exemptions from mandatory environmental impact assessments (Éltető 2023b).

Similarly to the German Tesla case, water use is causing severe anxieties in Hungary. CATL's Debrecen plant is set to be located in a rapidly desertifying area, where droughts are already frequent. The water infrastructure development for the Samsung factory in Göd was designed to provide 21,000 cubic meters of water per day and to manage 11,000 cubic meters of wastewater. Győrffy (2022, p. 257) puts this into context: the average daily water usage and wastewater discharge per user in Hungary, according to the Hungarian Water Utility Association, is 0.24 and 0.25 cubic meters, respectively. The daily water usage for the factory is equivalent to the water consumption of a city with 87,500 inhabitants. This high demand for water for battery production competes with the needs of local populations, agriculture, and environmental conservation.

The substantial energy requirements for EV battery production is set to increase Hungary's dependency on energy imports, particularly natural gas, which already constitutes a significant portion of the energy mix for battery production. This leads us to the strategic autonomy objective. Before the invasion of Ukraine, 95% of Hungary's natural gas imports were sourced from Russia, and 100% of nuclear fuel imports. It does not appear that Hungary intends to divest from this source of supply in the near future, apart from slow steps to increase LNG, Azeri, and Romanian gas imports (Csernus 2023). Orbán consistently blocked EU efforts to sanction Russian energy, and while EU partners made efforts to decouple, his government did the opposite: Budapest signed another agreement with Moscow for additional supplies in September 2022. The majority of Russian natural gas (approximately 3.5 bn out of the 4.5 bn cubic meters, as well as the additional quantity) arrives in Hungary via the TurkStream pipeline (Simeonova 2023).

Gigafactory location	Company name	Company ownership	Start	Capacity			Investments in million EUR	Jobs
City				Available (2022 Q4)	Build-up (Planning 1st phase)	Maximum		
Komárom	SK Innovation	South Korea	i.o.	18		18	1,500	1,410
Göd	Samsung SDI	South Korea	i.o.	40		40		3,600
Iváncsa	SK Innovation	South Korea	i.o.		30	30	1,980	2,500
Debrecen	CATL	China				100	7,340	
Debrecen	EVE Energy	China				28	1,000	1,000

Table 3. Planned gigafactories in Hungary. Data: VDI/VDE Innovation + Technik. (i.o.: in operation)

Ironically, in its attempt to reduce dependence on non-democratic external partners, the EU might find itself reproducing a similar form of reliance within its own borders. Hungary's centrality in a key value chain could give Orbán leverage to shield his autocratic regime from EU-level censure, ensure the flow of EU funds, and continue to pursue geopolitical misalignment by ever stronger ties to Russia and China. It is a concerning political exposure, given Orbán's demonstrated propensity for open blackmail–and exactly the type of risk the EU's pursuit of strategic autonomy aimed to counteract.

The primary incentive driving the EU's support for Orbán, then, appears to be the protection of European carmakers and industrial base. It is unclear, however, why the EV industry has been singled out as the continent's jobs engine. If taxpayer resources are used to create jobs and prop up industries, ensuring high domestic value-added and the ability of local firms to join the value chain should be guiding principles. This was the traditional aim of industrial policy: to move up the value chain. Hungary's EV battery industry, by contrast, generates three-shift assembly line jobs in foreign-owned battery factories—a far cry from high quality jobs creation.

Again, upgrading could also be an optimistic scenario for Hungary, but there are reasons to doubt it would come to fruition on the lower end of the value chain. Upgrading would require upskilling—and decades of defunding education in Hungary severely undermines any such hopes. Leapfrogging failed to materialize in case of Western-European (mainly German) FDI, and it appears more challenging with Chinese or Korean investors, known for tightly guarding technology and R&D. Hungarian businesses complain about access to the value chain, with one CEO saying these firms "have their suppliers from the Far East lined up for the next 17 years." What further sours the economic calculus is the fact that the state foots a significant bill, covering on average 15% of the investment value in subsidies and requiring additional sums in infrastructure development.

Hungary's bid for battery supremacy is political, not economic. Throughout the past fourteen years, Viktor Orbán has learned that catering to the German automotive industry can shield his regime from censure on the EU-level (Panyi 2020). Hungary transitioned into an autocracy, marked by an increasing crackdown on civil rights and widespread corruption, yet German FDI kept flowing (Bohle and Regan 2021). R. Daniel Kelemen (2020) argues that the alignment of interests between Orbán and German industry has contributed to the 'EU's authoritarian equilibrium,' in which the German conservative CDU/CSU parties shielded Orbán in exchange for favors to their key industry.

After a decade of inaction, in 2022, the EU has shifted to a more proactive stance against democratic backsliding in Hungary. As a historic first, it resulted in financial sanctions: the bloc suspended 34.1 billion euros in development funds, citing breaches of the rule of law (Kelemen 2024). In this openly contentious relationship, Orbán surely sees the value in controlling a critical input (a choke-point) for German car-makers. While national borders often lose economic significance in value chain geography, a critical production segment clustered under Hungarian jurisdiction can hold political relevance. This opens the door to leveraging and weaponizing the value chain, for instance, by holding up battery cells' export permits or applying other punitive administrative measures—which is far from an unthinkable scenario.

Contrasting case – Sweden

To present a contrasting case – Sweden's strategy is built around domestic ownership, through Swedish-owned battery giant Northvolt, and the Northvolt-Volvo joint venture, NOVO. This ensures that higher value-added activities like research and development also happen locally, promising a more viable growth engine. Győrffy's analysis (2024) delves into this comparison, highlighting that, while Hungary notably lacks all important production factors, particularly energy and water, Sweden's strategy is further strengthened by local access to raw materials and crucially, a robust renewable energy sector. The cold climate in Sweden reduces the need for extensive cooling in battery production, leading to lower water usage and overall reduced environmental impact. In contrast to Central and Eastern Europe's race-to-the-bottom to attract investment, the Nordic Battery Belt is a collaborative project of Swedish, Norwegian and Finnish regions.

The Swedish case also attest to the fact that under the right conditions, the EU-based battery value chain can indeed fulfill the desired aims – it can provide a viable growth impetus through a 'national champion' firm like Northvolt, its environmental footprint can be mitigated if renewables are used to cover the production's energy needs, and an EU-based firm can contribute to strategic autonomy goals.

Conclusion

A closer look at the nascent battery industry along German automotive manufacturers' pan-European value chains holds important lessons for policymakers. Efforts to foster a European battery industry are of course crucial for both decarbonization and jobs protection (and can be in line with EU objectives, as the Swedish example shows)—but there are important caveats.

First and foremost, Hungary's case raises concerns about the EU's new 'geopolitical' industrial policy, which seems blind to the leverage risks posed by an autocratic member state, closely aligned with Russia and China.

Also, if the EU is serious about its environmental pledges, it needs to strengthen its monitoring and enforcement capacities. There are stringent and progressive regulations in place, also on the carbon footprint of batteries and their mandatory recycling, but enforcement remains weak. Strengthening it might entail the creation of a new EU Environment Authority or better corporate due diligence frameworks to sanction environmental and labor rights violations.

As many have pointed out, EU member states outbidding each other to attract investment is detrimental to citizens, and instead of relaxed state aid rules, a common European subsidy scheme would be preferable. In these subsidy wars, fiscally weak and small member states lose out. In Hungary's case, the added insight is that an autocratic regime can more successfully play race-to-the-bottom: squeeze the public sector to reorient funds, or lift environmental or labor protection standards, without facing political accountability.

The academic literature often links the effectiveness of industrial policy to state capacity—while overlooking the role of democratic oversight. This case highlights that without transparent and inclusive processes, industrial policies risk being derailed. It is essential that various stakeholders, like environmental NGOs, local governments, academics, and journalists, have a seat at the table.

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