The resurgence of US industrial policy and Europe's response

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As the result of an agressive government-led industrial policy, China currently dominates most cleantech value chains around the world. This raises many questions about the security of supply of the components, materials and equipment needed for clean technologies. In the United States, the Inflation Reduction Act (IRA) adopted in 2022 aims to trigger a reorganisation of value chains in order to boost America's cleantech sector. It also signals the return of US industrial policy. With one of the most ambitious climate regulatory frameworks in the world, the EU is well-positioned to take advantage of this new industrial revolution. However, the IRA represents a serious threat due to its magnitude, simplicity and long-term reach.

Introduction

"Clean-energy supply chains are at risk of being weaponized in the same way as oil in the 1970s, or natural gas in Europe in 2022," said US National Security Advisor Jake Sullivan [White House, 2023] at Brookings Institutions on 27 April 2023.

Increasing trade tensions between China and the United States, the rising threat of climate change, the vulnerabilities of value chains revealed by the Covid-19 pandemic [Siripurapu and Berman, 2022a] and the Russian invasion of Ukraine have put the issues of energy security, accelerating decarbonisation and European competitiveness at the heart of the political debate.

The exit from fossil fuels calls for the emergence of a new paradigm of energy security centred on clean energy [IEA, 2022]. Defined as the supply of affordable energy to meet demand without interruption, energy security increasingly depends on access to the materials and components needed to produce renewable energy. The emergence of new strategic value chains unveils new vulnerabilities and raises the question of the industrial policy needed to ensure energy security for the transition. Every public policy can be considered as impacting the economic structure of a country, whether it is targeted or not at a sector [Tagliapietra and Veuglers, 2020], but for this article, industrial policy will be defined as a public intervention that aims to reallocate resources to support certain companies or sectors to achieve political objectives. In recent years, environmental protection and fight against climate change, social or regional inclusion, resilience of value chains and national security have been added to the traditional industrial policy objectives of economic development and growth [DiPippo et al., 2022]. The Inflation Reduction Act (IRA) adopted by the United States in 2022 seems to be part of this approach, with the aim to force the reorganisation of value chains to strengthen the US clean tech industry.

What are the challenges posed by the IRA for the EU? To answer this question, this paper will first review the global context, characterised by new geo-economic vulnerabilities and Chinese domination, resulting

from an interventionist industrial policy [Tucker, 2019] (part 1), before analysing the content of the IRA, an American industrial policy with protectionist features based on financial incentives (part 2), then addressing the situation in Europe and the potential impacts of the IRA (part 3), to end with a presentation and assessment of the European response (part 4).

1. A global context dominated by China: the geo-economic challenges of transition

1.1 Changing energy paradigm: new vulnerabilities

Clean technologies are much more intensive in raw material than their conventional alternatives. The green revolution is based on reducing demand through energy sobriety and efficiency and covering the remaining needs with low-carbon energies, particularly renewable energies, and new technologies such as electric mobility. The raw materials required to manufacture these technologies are mainly metals such as cobalt, copper and lithium, but also include non-metallic minerals such as graphite. Their strategic nature depends not only on their physical availability, but also on price and geopolitical factors. While renewable resources are available domestically, unlike fossil fuels which are mainly imported, this is not the case for the value chains relating to the raw materials and components needed to develop this energy. For example, the value chain for solar power comprises six stages: extraction of resources, refining of raw materials, manufacturing of components, assembly, construction of the plant, dismantling and recycling of metals and raw materials.

The need to increase the supply of clean energy is unveiling new vulnerabilities. At the global level, the solar, battery and green hydrogen value chains are the most exposed, according to the IEA, for the resource extraction, production and manufacturing phases. The minerals and metals at risk are copper, cobalt, platinum, graphite and lithium. For the manufacturing and construction stages, high-risk components include cathodes and anodes for batteries, and cells, wafers and modules for PV. Recycling is expected to play a role, albeit modest, in the resilience of these value chains. The IEA estimates, for example, that battery recycling could reduce demand for copper, lithium, nickel and cobalt extraction by around 10% by 2040 [IEA, 2021].

The concentration, both in terms of companies and geography, of producers of critical raw material and refining plants represents a vulnerability for the energy transition. The Democratic Republic of the Congo (DRC) supplies 70% of the world's cobalt production, while Australia and Chile account for 55% and 25% respectively of the world's lithium production. China extracts 60% and refines 90% of the rare earths consumed in the world. This exposes value chains to social, geopolitical and commercial disruptions.

The Covid-19 pandemic and the invasion of Ukraine have put global value chains under pressure. International prices for critical minerals and metals have risen sharply since 2020. Lithium and cobalt have more than doubled, while copper, nickel and aluminium have risen by 25 to 40% in 2021 [IEA, 2022]. There is a risk that the downward trend in the cost of renewables will be reversed. Batteries have risen by 10% in 2022 compared with 2021, after years of steady decline. The cost of manufacturing wind turbines rose by 20% and that of solar panels by 25% outside China in 2022 [IEA, 2023a].

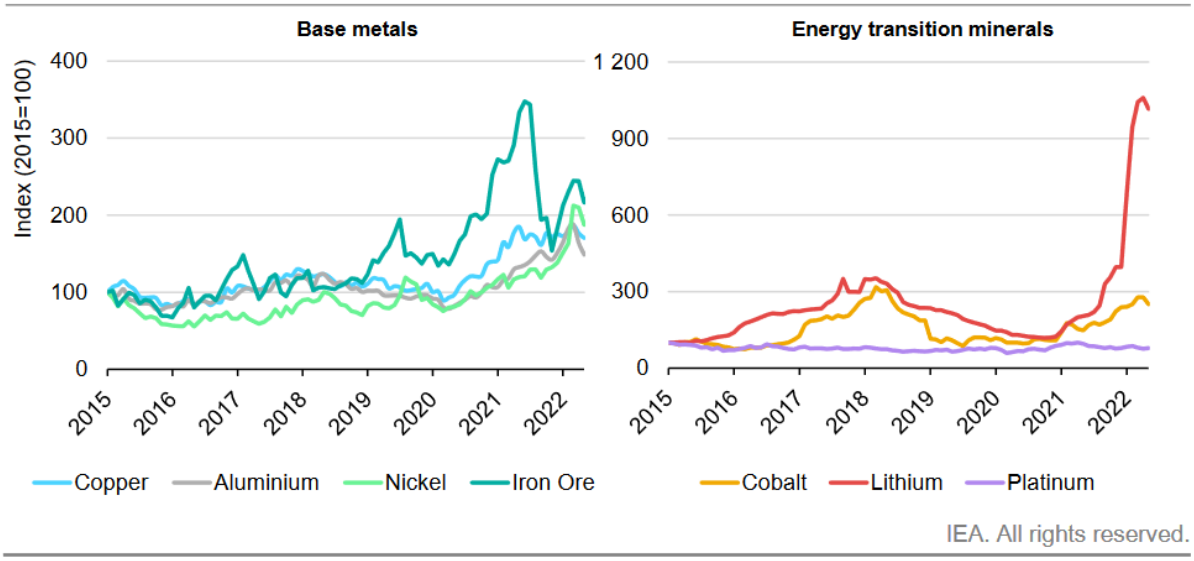


Figure 1. International prices of selected metals and critical minerals for clean energy technologies. Source : IEA 2022

1.2 Geo-economics of value chains: Chinese domination

China is a major player at all stages of the value chain. It accounts for 30% of global production for eight critical minerals and more than 70% for five of them [Bonnet et al., 2022]. In addition to exploiting its rich subsoil, China has implemented a foreign direct investment (FDI) strategy that to maintain a dominant position in markets where its mining production falls short of meet its needs [Bonnet et al., 2022]. For example, it controls almost half of the DRC's cobalt production through infrastructure financing and equity stakes in mines.

More than half of the world's lithium, cobalt and graphite refining capacity is in China, which bears the high environmental costs associated with these activities. The various stages of metal refining are highly polluting and require large quantities of water that would have to be treated to avoid contamination of soil and groundwater. China's low environmental standards mean that the pollution associated with these activities is greater than in Western countries. The dynamism of the Chinese refining sector gives it an advantage in all strategic markets.

Further down the supply chain, the country accounts for three-quarters of the world's production of battery cells, 70% of cathode capacity and 85% of anode capacity, controls 90% of the market for solar components, and 30% of wind turbine manufacture.

Projects under construction or planned point to China's increasing dominance over the next five years. The development plans announced for batteries are mainly in China, which is expected to increase its production capacity sixfold between now and 2030. China largely dominates global investment in clean tech manufacturing capacity (see Figure 2). It should be self-sufficient in lithium by 2024 [Goldman Sachs, 2023a].

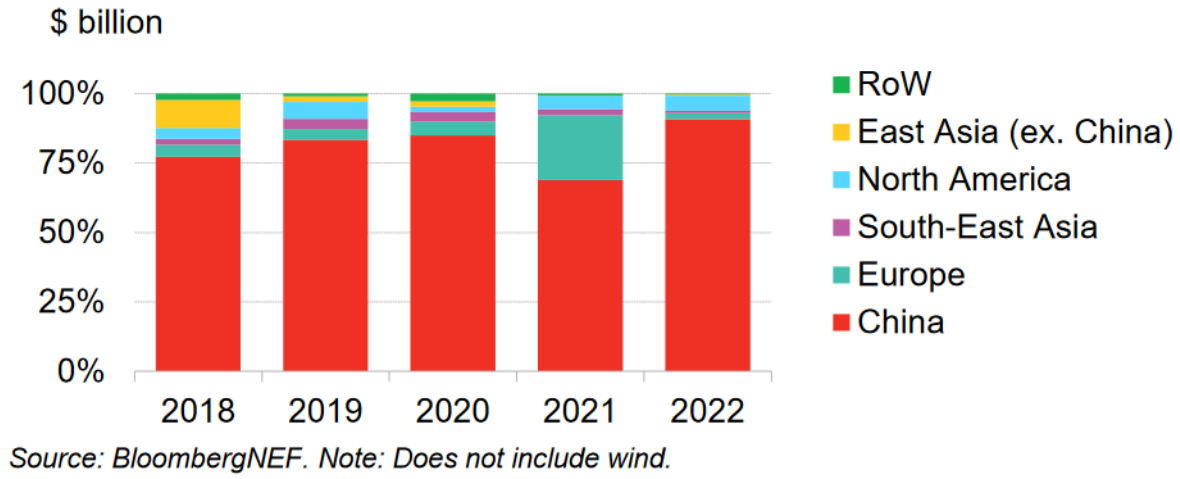


Figure 2. Clean energy factory investment by geography, 2018 - 22. Source: Bloomberg NEF, 2023

China has already taken measures to restrict the export of minerals [Fabry, 2023a]. There is a risk that the country will use its dominant position for other components. In early 2023, its Ministry of Commerce proposed to introduce export licensing requirements for photovoltaic wafers. This could be an export restriction and, if implemented, could be an obstacle to the accelerated deployment of photovoltaics in the EU.

1.3. New industrial policy challenges

China's dominance is the result of almost a decade of industrial policies in favour of integrated domestic value chains for the technologies of the future. The ambition of technological independence and self-sufficiency is at the heart of China's economic strategy, particularly since the ten-year "Made in China 2025" plan published in 2015, which aims to transform "the world's factory" into a "great industrial power" [DG Tresor, 2015]. The objective for 2025 is to achieve 70% domestic content for key components and materials, and to control R&D and the production of high value-added goods. By 2050, for the centenary of the People's Republic of China, the ambition is to be the world's leading power in the technologies of the future (renewables, batteries, artificial intelligence, etc.).

China's industrial policy relies on a comprehensive toolbox: explicit priorities and objectives in terms of sectors and domestic production, direct subsidies, overseas investment and the acquisition of foreign companies, technology transfer requirements as a condition of access to the Chinese market, and funds targeting technologies where there is an identified shortage [McBride and Chatzky, 2019].

Nevertheless, the two instruments that stand out are direct subsidies and concessional loans to state-owned enterprises [DiPippo et al., 2022]. In the absence of official statistics, the assessment of the cost of these measures is uncertain, but *a priori* very high. In 2019, the Center for Strategic International Studies' estimates lied between 1.7% and 4.9% of its GDP [DiPippo et al., 2022], compared with 0.4% for US industrial policy.

The acceleration of China's industrial ambitions through "Made in China 2025" has contributed to increasing trade tensions with the United States. While American consumers have benefited from the sharp rise in Chinese imports over the last twenty years through gains in purchasing power [Siripurapu and Berman, 2022b], this trade relationship has also led to significant job losses in the manufacturing sector. The social consequences are said to have encouraged the rise of Trumpism [Siripurapu and Berman, 2022b; World Bank, 2023]. It has also given rise to other concerns, particularly in terms of national security [Siripurapu and Berman, 2022b].

"Made in China 2025" has only increased tensions between the two blocs. On the one hand, China considers that the United States is holding back its development by imposing "technological containment". On the other, the United States is alarmed by the technology transfers required to participate in tenders, the takeovers of American companies by Chinese public funds, and the lack of respect for intellectual property [Congressional Research Service, 2023]. The priority given by China to political and strategic considerations to the detriment of economic logic would distort international markets. In response to "Made in China 2025", the Trump administration imposed tariffs on most Chinese imports in 2018, which launched a trade war following China's response with similar measures. Despite a truce agreed at the end of 2019, the dispute continues against a backdrop of criticism from Washington of the WTO's dispute resolution mechanisms.

China's industrial dominance raises classic industrial policy questions among its trading partners: what role should the state play in steering the economy, and why, how and to what extent should governments intervene to correct markets? Chinese leaders often retort to critics that they are simply replicating a classic development model. The United States also used tariff barriers to support its industries until the Second World War, while the economic take-off of East Asian countries, particularly South Korea, is closely linked to strong public support for family-owned conglomerates known as "chaebols", the best-known being Samsung. The Korean political elites' clientelist relationship with the chaebols, corruption scandals and lack of transparency have fuelled calls for reform [Albert, 2018]. This is one of the criticisms that can be made of the Chinese model of industrial development, which is not exempt from embezzlement, the financing of inefficient companies and clientelism [Kennedy, 2022].

Thus, the involvement of public authorities in the economy can be required to achieve political objectives not provided by the market (security, cohesion, economic recovery), but creates a risk of private interest's capture. Avoiding this pitfall raises issues of governance, particularly in terms of transparency, public participation and balancing stakeholder's interests, including as regards the distribution of the costs and benefits of this policy.

2. The return of industrial policy in the United States

2.1. General provisions of the IRA

The US Inflation Reduction Act (IRA) is the latest twist in the growing rivalry between the US and China [Fabry, 2023b] and the growing concern over supply chains for the clean transition. Passed by the US Senate in August 2022 and coming into force in January 2023, the IRA aims to reduce the public deficit and combat inflation, while investing particularly in the energy transition and domestic green industry. This law marks the return of American industrial policy.

The IRA is a vast programme of financial incentives for the US energy transition, initially estimated at USD 390 billion over ten years. It consists of federal grants, loans and tax credits aimed at lowering the cost of low-carbon technologies to catalyse private investment, both by businesses and households. Low-carbon electricity production projects are targeted, as well as the development of manufacturing capacity across the entire value chain of strategic transition technologies: solar, wind, batteries and critical metals. The special feature of these incentives is that they can apply to both investment and project operating costs.

The IRA should be financed by an increase in compulsory levies and (theoretically) contribute to the US debt reduction. The implementation of a minimum corporate tax of 15%, the strengthening of the fight against tax evasion, and the introduction of a 1% tax on share buybacks should bring in an estimated USD 740bn over ten years to the federal budget [Committee for a Responsible Federal Budget, 2022], more than enough to cover the cost of the IRA. However, public support could turn out to be two to three times higher than the initial amount, i.e. between USD 800bn (Credit Suisse, 2022) and USD 1,200bn (Goldman

Sachs, 2023b). Two-thirds of the aid is uncapped, which means that a strong corporate interest in the IRA could theoretically result in a much greater demand for tax credits than expected. In this case, additional sources of funding would have to be found, for example through debt.

Together with the Infrastructure Investment and Jobs Act (2021) and the Chips and Science Act[1] (2022), the IRA could double US federal climate funding compared to 2010 [Credit Suisse, 2022]. The Infrastructure Investment and Jobs Act includes a federal investment programme worth USD 550 billion over ten years in transport infrastructure, including rail, the electricity grid and charging stations, while the Chips and Science Act, which was passed in 2022, is a USD 280 billion programme over ten years to support R&D and the production of semiconductors, which will play a crucial role in the transition as they enable renewable energy to be converted, transferred and stored as electricity.

Because of its size and targeting, the IRA is considered as a landmark law in favour of the energy transition and the fight against climate change [Seltzer, 2022]. It could help reduce emissions by 42% by 2030 (compared with 2005) [Jenkins et al., 2022]. If it fails to achieve the target of a 50% reduction in emissions by 2030, this will represent a significant improvement on the current emission trajectory, which is estimated at a 27% reduction. The additional emissions' drop would be mainly due to the accelerated deployment of clean energy and electric vehicles [Jenkins et al., 2022].

As such, the announcement of an ambitious clean energy incentive plan on the other side of the Atlantic is good news for the fight against climate change. Nevertheless, local content clauses for renewable energy projects, manufacturing industry and electric vehicles are at the heart of concerns among US trading partners (see Box 1).

Box 1: "Made in America": protectionist local content clauses

Fulfilling the local content clauses enables you to obtain an increase in tax credits for investment in (ITC) and production of (PTC) renewable energy. The subsidy rate can be as high as 70% of the investment if the project meets other criteria, such as compliance with wage standards and the employment of apprentices, if it is located in an energy community and benefits a low-income neighbourhood.

The IRA provides for around USD 40 billion in tax credits for clean tech manufacturing, broken down as follows: USD 10 billion dedicated to subsidies of 30% of investment in factories manufacturing components and equipment for solar, wind, batteries, electric vehicles, energy efficiency and other clean technologies, and USD 30 billion in operating subsidies to support the expansion of these factories, including factories refining critical materials. For example, if cells and modules are manufactured in the US, battery production would be subsidised up to $45/kWh, or almost a third of the average production cost.

Electric vehicles could benefit from credits worth USD 7,500 on purchase. The electric vehicle must be assembled in North America. Half of the subsidy is conditional on achieving a certain percentage of the value of critical battery metals mined or refined in the United States (or a free trade partner with the United States), and the other half on achieving an increasing percentage of the value of battery components manufactured or assembled in the United States. In addition, vehicles whose battery components come from "foreign entities of concern" (China, Russia, North Korea, Iran) will be ineligible from 2024, and 2025 for vehicles whose critical metals come from these countries.

[1] Like the IRA, the Chips Act aims to redirect advanced technology manufacturing from China to the United States. To qualify for funding under the Chips Act, companies must undertake not to develop certain activities in China, Iran, North Korea or Russia. The Act also includes a social and fiscal component: it requires companies to share their excess profits, not to engage in share buybacks, and to encourage the signing of collective agreements.

2.2 Constraints, risks and impacts

The IRA does not address all the challenges of the US energy transition. The lack of investment funding for new transmission lines does not address the severe constraints on grid development, while building permit procedures still need to be improved to facilitate rapid deployment of announced projects.

Nevertheless, it is a major boost for the American transition. In an April 2023 analysis, Goldman Sachs estimates that the IRA could lead to a new energy revolution, with the potential for USD 3,000 billion in public and private investment in renewable technologies [Goldman Sachs, 2023b].

The manufacturing sector could be the second largest beneficiary of the IRA, just behind the electricity sector [Credit Suisse, 2022]. Subsidies to the manufacturing sector could in fact be 7 times higher than initially budgeted and represent 30% of the IRA in terms of funding, compared with 9% in theory. Thanks to IRA subsidies, some analysts believe that US solar panels could become the cheapest in the world, with a subsidised cost of 20-40% of the unsubsidised cost. Wind turbine manufacturing costs could be cut by more than 50%. The United States could become an exporter of both technologies, covering 90% of its needs by 2030.

However, since the IRA operates solely through financial incentives, its impact depends on the reaction of businesses and households. Just a few months after the IRA came into force on 1 January 2023, most companies are still in the early stages of evaluating new projects in the US, weighing up the pros and cons between US tax credits and the difference in manufacturing costs with other geographies. The real impact of the IRA in terms of manufacturing capacity and federal spending could vary significantly depending on the extent to which companies (re)locate. It is difficult to anticipate and still too early to assess. The projects announced so far tend to involve vehicle assembly plants, component manufacturing and the recycling of critical metals, with very few domestic mining projects, which take much longer to develop and pose environmental problems. Additional policies would therefore probably be needed to achieve certain objectives, in particular the development of socially acceptable and sustainable mines with strong local economic spin-offs.

What's more, the cost of reviving an American industrial ecosystem could be staggering. While the benefits in terms of security of supply and the fight against climate change are real, they would nonetheless be obtained at the cost of massive subsidies to companies that are often profitable, such as Volkswagen or Tesla. For example, Panasonic's battery plant in Nevada could receive more than USD 1 billion in federal government funding each year to produce 38 GWh/year [Panasonic Holding Corporation, 2023]. This raises the question of how to match public funding to the needs of industry, and the conditions to attach to this strong state support to avoid its capture by the most established private interests.

3. In Europe: major climate ambitions create opportunities for the green industry, but IRA is a threat

3.1. The Green Deal is reflected in an ambitious regulatory framework and a strong need for clean technologies

The EU has a much stronger and more ambitious energy and climate regulatory framework than the United States, strengthened by the Fit for 55 package published as part of the European Green Deal. The EU wants to cut its emissions by 55% by 2030 and become carbon neutral by 2050. Raising European targets as part of the finalisation of the new Fit for 55 packages means accelerating the deployment of renewable energies and electric mobility. Following the Russian invasion of Ukraine in 2022, the Commission has proposed a REPowerEU plan to overcome Russia's dependence on fossil fuels as quickly

as possible, which further increases the ambition for renewables compared with the Fit for 55 packages to 42.5% of the energy mix by 2030. The plan aims to triple the installed solar capacity and double wind power capacity in the EU by 2030, giving an annual deployment rate of 60 GW of solar and 40 GW of wind power.

The "Fit for 55" also strengthens the European carbon market, the cornerstone of the EU's energy and climate policy. The gradual elimination of free allowances for certain industries will not only send a price signal in favour of decarbonisation but will also make it possible to finance investment in green industry through the Innovation Fund fed by these revenues.

Under the new CO_2 standards for vehicles adopted at the beginning of 2023, by 2030 almost 60% of new cars will have to be electric, and 2035 would mark the end of sales of combustion-powered cars. Electric batteries will also be needed to store renewable electricity. Demand for batteries for electrical storage and electric mobility could increase fourfold by 2030 and more than sevenfold by 2035 [T&E, 2023a].

Electric mobility is the sector with the strongest growth relative to demand in Europe. This has an impact on the consumption of batteries, which require the following strategic materials: lithium, graphite, cobalt, nickel and manganese. Demand for lithium is expected to increase 12-fold by 2030, and for platinum 30-fold.

Faced with these strong needs, the Joint Research Center (JRC) analysis of value chains and demand for materials shows significant vulnerabilities in the 15 strategic technologies and sectors studied, including batteries Li-ion, wind turbines, PV and heat pumps. The raw materials needed to manufacture them are systematically critical: the EU's share of world production never exceeds 7% [JRC, 2023]. For example, the rare earths needed to manufacture wind turbines and motors for electric vehicles face a very high supply risk (see Annex 1 for a detailed illustration by sector and by stage in the value chain). The EU's vulnerability decreases as one moves down the value chain. At the end of the chain (assembly), the EU is better positioned, but on certain technologies such as batteries and PV, vulnerability is high throughout the whole chain. In the case of heat pumps and wind power, Europeans are well positioned, but increasingly in difficulty compared with their Asian rivals [EC, 2023a].

To remedy this, the JRC recommends increasing the production and refining of minerals for batteries to reduce dependence on the Asian market [EC, 2020]. Photovoltaic cell manufacturing capacity should also be increased.

3.2. The EU's industrial position in clean tech: rather ahead of the United States, but the IRA could change the situation.

The EU remains a bigger producer of wind energy components and batteries than the United States and has great potential for development in strategic value chains. Thanks to one of the most ambitious climate policies in the world, and the efforts of the European Battery Alliance, in 2022, 50% of European demand was supplied by domestic factories, mostly in Poland and Hungary. Battery production capacity could reach 70% of demand by 2025 and more than 100% between 2026 and 2028 [T&E, 2023a]. The EU could produce almost 50% of its demand for cathode-active materials by 2025. Finally, in view of the planned projects, the EU could secure 10% of its nickel and cobalt needs, as well as 50% of its lithium needs [T&E, 2023a] from local mines by 2030.

The EU has equivalent or even greater funding available for the deployment of electric vehicles, renewable energies and green industry. Virtually all Member States have introduced subsidies for the purchase of electric vehicles and the production of renewable energy. According to some estimates, European subsidies for renewables would be four times higher than the amounts forecast by the IRA for the period 2022-2032 [Kleimann et al., 2023]. In addition, the average subsidy per electric vehicle in the EU

is around €6,000. This is close to the level of the IRA, although it varies from country to country, and is not conditional on local content rules. Similarly, European subsidies to manufacturing industry are estimated at EUR 35 bn, compared with USD 37 bn for the IRA [Kleimann et al., 2023]. **However, aid to US green industry could be much higher than the theoretical amount, and potentially seven times higher than European aid.**

In addition, EU support for the manufacturing industry is more fragmented and more difficult to access (see Box 2). Beyond the amounts mobilised, the great strength of the IRA is the visibility given to the industry in terms of public support. The vast majority of tax credits will be granted for ten years, i.e. until 2031/2032, and are based on the date of construction, which means that a project started in 2030 could benefit from subsidies until 2040. On the other hand, European funding is less certain. While the post-Covid European recovery plan has enabled Member States to mobilise investment for the green industry, this funding only runs until 2026.

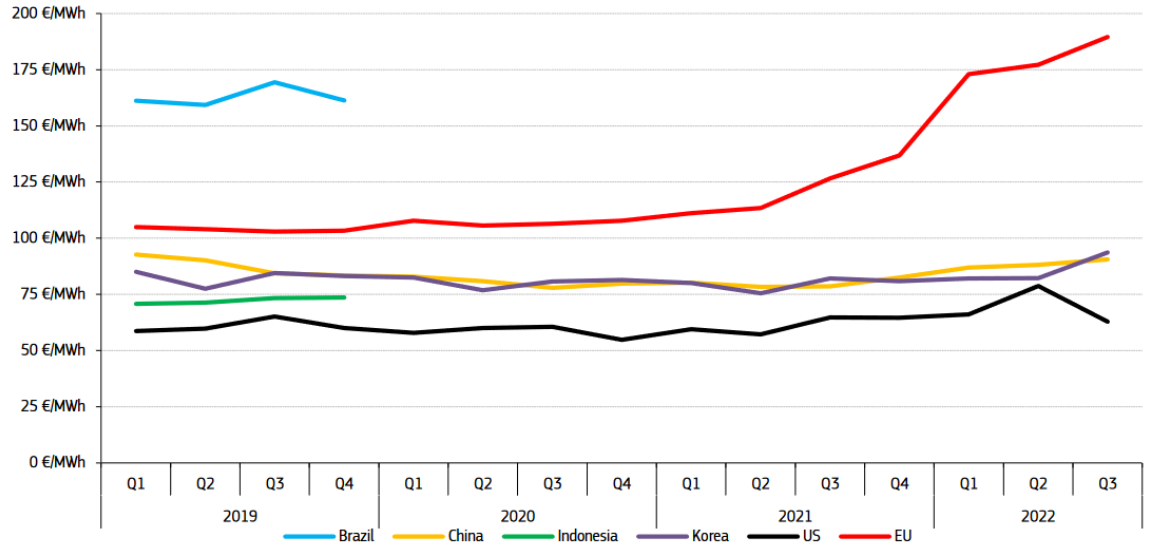
Box 2. European funding for industry

Among the various sources of funding are the Important Projects of Common European Interest (IPCEI), projects led by groups of companies and Member States that can benefit from national public subsidies that are normally strictly governed by State aid rules. The Innovation Fund, financed by part of the revenues from the carbon market, subsidises demonstration projects for innovative technologies for industrial decarbonisation. European start-ups and SMEs can receive funding from the European Innovation Council (EIC) Accelerator. For more mature projects, the European Investment Bank (EIB) can offer loans, and the InvestEU programme provides European guarantees. In contrast to the IRA, the Commission itself admits that European subsidies focus mainly on the demonstration stages and do not sufficiently cover the deployment of these technologies.

This support is also more complicated to access and can accentuate existing inequalities. For example, obtaining IPCEI status is subject to a lengthy administrative process, which contrasts with the simplicity of access to IRA support based on tax credits. In addition, IPCEIs are funded at national level, which accentuates inequalities in access to subsidies for businesses, because it will depend on the financial, technical and administrative capacities of the Member States [Eisl, 2022].

Finally, the challenge of European competitiveness goes beyond the challenge posed by IRA subsidies. The gas shock linked to the post-Covid recovery, the Russian invasion of Ukraine and the interruption of most Russian gas deliveries in 2022 has accentuated the difference in energy prices between the EU and its main competitors (see Figure 3). While electricity is a major vector in the energy transition, industrial tariffs are twice as high in Europe as in the United States or China.

Figure 60 – Retail electricity prices paid by industrial customers in the EU and its main trading partners



Source: Eurostat, IEA, CEIC, DG ENER computations. The latest data for Brazil and Indonesia is not available. Industrial prices in the EU are represented by the ID consumption band for the purposes of international comparison.

Figure 3. Retail electricity prices paid by industrial customers in the EU and its main trading partners. Source : EC, 2023b.

In this context, the IRA seems to threaten several European manufacturing capacity projects . The Swedish group Northvolt is said to be reconsidering a battery factory project, initially envisaged in Germany, in favour of the United States, notably because of energy prices. More generally, two-thirds of the lithium-ion battery production planned in Europe between now and 2030 could be delayed, reduced or cancelled because of the IRA [T&E, 2023b]. In addition to batteries, the solar and green hydrogen industries in Europe face a significant risk of loss of competitiveness due to the IRA [Jansen, Jäger, Redeker, 2023].

Box 3. The thorny issue of local content clauses

The EU has begun negotiations with the United States to make European manufacturers eligible for these subsidies for electric vehicles, as free trade partners. However, the EU is also highly dependent on China for the critical raw materials needed for electric vehicles, notably rare earths.

In fact, very few European or American cars would be eligible for the IRA because of China's domination of all components, as neither the US nor the EU produce enough to meet the IRA's eligibility criteria. The prospects for the deployment of domestic mines and battery recycling are insufficient to meet the IRA conditions and illustrate the challenge of diversifying the transition value chains. Furthermore, the United States currently accounts for just 7% of European car sales, so the short-term impact of an exemption would be minimal. A possible European exception for electric vehicles would not solve the problem posed by US protectionist measures.

In any case, replicating a European local content clause would raise the question of a subsidy race that could potentially be dangerous for the energy transition. If the United States and Europe agree on discriminatory industrial subsidies, and only China can compete, what message would this send to the rest of the world? Under such unequal conditions of competition, companies located outside these countries would have little

chance of developing. A situation in which third countries are forced to choose between European or American technology for their energy systems would put a brake on decarbonisation [Posen, 2023].

4. The Green Deal industrial plan: an essentially regulatory response

4.1. Contents

Regulations

In March 2023, the EU proposed a new regulatory package to implement its Green Deal industrial plan and thus meet the joint challenge of industry competitiveness and supply chain security for the green transition. It includes two new laws, the Net Zero Industry Act (NZIA) and the Critical Raw Material Act (CRMA), as well as a reform of the European electricity market.

The main instruments introduced by the NZIA and the CRMA are as follows:

- **Targets and a European industrial strategy** (see Box 4).

Box 4. 2030 targets for green industrial policy under the NZIA and CRMA

The Commission is proposing that the European manufacturing industry should be able to cover 40% of Europe's clean technology needs to meet the 2030 targets. It defines the strategic technologies needed to achieve carbon neutrality: solar, wind, batteries, heat pumps and geothermal energy, electrolysers (to produce hydrogen), sustainable biogas and biomethane, carbon capture and storage, and electricity networks[2] .

The regulation on critical raw materials also proposes new indicative targets for 2030, namely: 10% of European needs in critical raw materials covered by European mines, 40% by European refining capacities, 15% by European recycling capacities.

- **Regulatory framework: simplification of procedures to facilitate the development of strategic projects.** The NZIA aims to improve the conditions for investment in these technologies, including the creation of "strategic net zero emission projects", which designates projects crucial to strengthen resilience and competitiveness of European industry. This status would give access to simplified and accelerated procedures for granting permits. The CRMA also introduces a "strategic project" status, giving access to accelerated permitting times: 2 years maximum for extraction projects, 1 year for refining and recycling projects.
- **Governance: the EU is setting up new coordination bodies to ensure implementation.** The Commission is proposing the creation of a Net Zero Europe Platform made up of representatives of the Commission and the Member States to coordinate their action and support the implementation of the law. Following the same model, a new body, the European Critical Raw Materials Board, has been created to support the Commission and the Member States in implementing the CRMA.

The CRMA also includes security of supply measures inspired by the existing framework for gas: coordination of strategic stocks, minimum levels to guarantee EU security, periodic stress tests. The most

[2] Nuclear power is not one of these strategic technologies, but it is included in the European taxonomy defining green investments as transitional energy.

innovative measure is the proposal to set up a joint purchasing platform, although the materials involved, the transformation stage and the minimum levels of demand concerned have not yet been defined.

Finally, to address high electricity prices, a revision of the EU electricity market is underway. It focuses on existing mechanisms, notably long-term contracts to ensure greater visibility and price stability.

Financing

For the time being, the financial pillar of the Green Deal's industrial plan is limited to a potential flexibilization of State aid. The new temporary framework adopted by the Commission in March extends until the end of 2025 several exemptions already granted following the war in Ukraine, in particular as regards national subsidies for renewable energy production projects and decarbonisation of industry projects. The Commission is introducing new exemptions for the manufacturing industry for strategic climate technologies (solar, wind, etc.), including refining and recycling plants for strategic raw materials, also until the end of 2025.

3.2. Assessment: a regulatory pillar that goes in the right direction but lacks concrete measures

The NZIA sparked little enthusiasm in the political and industrial ecosystem, due to the lack of concrete instruments to achieve the new target of 40% of European production in clean technologies, a figure that is, moreover, unsubstantiated. Apart from carbon capture, the law contains no quantified targets by sector, even though vulnerabilities and the need to deploy new industrial capacity vary greatly from one technology to another and depend on the stage in the value chain under consideration. A recent IEA analysis estimates that EU manufacturing capacity in heat pumps, electrolysers and batteries could be sufficient to cover domestic demand by 2030 [IEA, 2023b]. On the other hand, more efforts are needed in the solar and wind power sectors.

In addition, the lack of resources allocated to the Net Zero Europe Platform and the European Critical Raw Materials Board in relation to their numerous tasks (analysis, monitoring and coordination of funding measures, reinforcement of labour requirements and, more generally, achievement of objectives) **may raise doubts on their effectiveness in meeting the challenges of Europe's green industry**. The creation of these new bodies demonstrates the need for greater coordination and monitoring of these policies by both national and European administrations. The local level is also an essential link in the chain of governance, being as close as possible to the environmental costs, but also a potential beneficiary of positive economic and social spin-offs. It is still insufficiently integrated in many Member States, such as Portugal [Patuleia and Waliszewska, 2023].

In view of the high environmental impact of mining projects, and their difficult social acceptability, the acceleration of the granting of permits could meet with strong political opposition and must absolutely preserve the highest social and environmental standards. The "public interest" that can be invoked to override negative environmental effects opens the prospect of disputes and contradictory positions among stakeholders, especially as the definition of public interest is open to interpretation for lack of precision in the proposed regulation. To reconcile high environmental standards with the efficiency of permit-granting procedures, it seems necessary to examine the need to strengthen the human and technical capacities of the relevant administrative authorities.

To avoid a mining boom, the circular economy and sufficiency should also be strengthened. Only 12% of the materials used in European industry come from recycling. Diversification of value chains, while

ensuring high environmental and social standards in partner countries, will also remain a key element in improving the EU's security of supply.

Finally, the reform of the electricity market is rather modest, though welcome. In the absence of further electrification of industrial processes, it is unlikely to have a major impact on the root cause of the crisis, namely the high dependence on gas and the need to encourage the acceleration of renewable projects. A more far-reaching reform should be planned for the Commission's next term of office from 2024.

3.3. A financial pillar that is insufficiently ambitious in relation to the issues at stake

While it is not necessary to respond to the IRA with perfectly equivalent amounts because of the robustness of the European regulatory framework, the latter does not resolve the financial issue [Pellerin-Carlin, 2023]. Fit for 55 already sends a strong signal to industry, with targets for greening the economy in all sectors and a high carbon price, currently around €80 per tonne of CO2. However, the differences in funding between the United States and Europe are far from trivial.

The Commission estimates that achieving the objectives of the NZIA will require additional investment of around EUR 90 billion over the period 2023-2030 [EC, 2023a], including EUR 16-18 billion of public funding. This figure does not consider the extraction, refining and recycling capacity requirements set out in the regulation on critical raw materials. This figure comes on top of the additional financing required to achieve the Fit for 55 targets by 2030 (EUR 477 bn per year) and the REPowerEU plan by 2027 (EUR 35 bn per year).

However, the use of more flexible State aid rules raises fears of a new fragmentation of the single market. By leaving the way open for Member States to subsidise their industry, there is a risk of accentuating inequalities in the treatment of businesses from one country to another, especially as the response to these growing challenges comes at a difficult time for national public investment in Europe.

Member States are facing a triple financing challenge: debt has increased, interest rates are higher than expected, and investment needs are more pressing [Zettelmeyer et al., 2023]. Because of the energy price crisis, massive national public funding has been provided to support energy bills over the period 2021-2022, totalling over €600 billion [Sgaravatti et al., 2023]. This is now jeopardising the viability of public finances and the ability of Member States to invest in the green transition, against a backdrop of rising ECB interest rates. Since March 2022, it is mainly France (24% of the total) and Germany (53%) that have benefited from the relaxation of State aid.

European funding would make it possible to limit the divergences between Member States. To this end, a European Sovereignty Fund to support domestic industry has been floated around by the Commission but recently abandoned. Few details were available on this measure, which was mentioned by Commission President Ursula von der Leyen in September 2022 and repeated in the communication on the Green Deal's industrial plan in February 2023. The Commission hoped to take advantage of the mid-term review of the EU budget to open this subject, but given the low political appetite for such a proposal among some Member States, on June 20 the Commission proposed a Strategic Technologies for Europe Platform (STEP) to support European leadership on critical technologies, instead of the envisaged EU Sovereignty Fund. STEP mostly builds on existing financing programmes and brings little fresh money to the table.

Opinions differed on the size of a potential EU Sovereignty Fund and its possible sources of financing. STEP is close to the minimum option of reorganising existing funds within the European budget without additional expenditure. However, the Commission considers that the current European budget is not sufficient to support the EU's industrial objectives for its Green Deal, while ensuring a level playing field between Member States [EC, 2023a].

The response to the IRA only fuels a wider debate on the lack of investment (including public investment) in climate action. While the EU's climate targets have doubled in ambition since 2020, its budget remains limited and the European recovery plan only runs until 2026. Under current European budgetary rules, only four Member States would have enough fiscal space to meet the new European investment targets [Mang, Caddick, 2023]. To meet the climate and industrial challenges in an inclusive way, a more ambitious option would be to take out a new European loan [Abraham et al., 2023] and give the European Sovereignty Fund the resources to support the strategic sectors most exposed to the IRA.

Yet, around €225 billion of loans are still available under the Next Generation EU recovery plan and still need to be spent over the next three years, and the crucial issue of new own resources for the EU budget - needed to repay the EU's common borrowing - has still not been agreed politically. Against this backdrop, the advocates of new borrowing still have a long way to go to convince the more frugal.

Without additional funding and a clear, targeted strategy, a new fund would have little added value. To avoid the pitfall of a potential Sovereignty Fund being captured by the most powerful private interests, it should be guided by a solid governance framework and a clarified European strategy regarding the sectors that will receive public support. Particular attention should be paid to the inclusion of vulnerable Member States and regions, as well as smaller players, especially SMEs, to generate positive redistributive impacts for European cohesion. However, given the significant differences in political appreciation of this issue in the Member States and the lack of consensus on the approach to be adopted at European level, it is difficult to know what can be expected from a potential Sovereignty Fund proposal. With the European elections in 2024 approaching and the Commission's term of office coming to an end, it may be forced to choose its battles. In any case, the debate should continue with a view to the next term of office.

Conclusion

Just as the European gas shock marks a turning point in EU policy with a more interventionist approach to energy markets and international energy trade, the IRA marks the return of industrial policy in the United States.

The issue of Chinese domination of value chains is at the heart of both American and European discussions on industrial policy, as illustrated by the recent statements by the Dutch Trade Minister that European transition would be impossible without China. While total decoupling is neither possible nor desirable, the debate is more about the extent and sectors in which partial decoupling would be possible, through targeted relocation and diversification of suppliers.

At a time when the energy transition is gathering pace, the EU and the United States are facing similar challenges: increasing Chinese and international competition, the fragility of new strategic value chains, labour shortages, slowness in granting building permits, high public sensitivity to activities with a high environmental impact, and the demand for a fair and equitable transition.

The IRA presents a serious threat to European industry because of its size, simplicity and long-term perspective, but it is not without its critics. For example, it relies almost entirely on financial incentives. The EU does not need to perfectly replicate the amounts of the IRA, and even less those deployed by China, which may raise questions about their scale and lack of targeting and contribute to a subsidy race that is deleterious for third countries.

With one of the most ambitious climate regulatory frameworks in the world, the EU is not without assets in the new industrial revolution currently underway but does not yet have the tools needed for an industrial policy to match its ambitions. To respond to the IRA, the EU will need to take more decisive action to provide more generous, faster and more targeted support to certain sectors of its industry,

including small businesses; to promote training and the creation of high-quality jobs to make up for labour shortages; to simplify and green public procurement; and to meet the challenge of critical metals for the transition, both domestically and abroad. This industrial transformation could also be the source of greater economic convergence within the EU, offering opportunities for local development in vulnerable regions.

To do this, the EU needs a clear vision of future investment needs and must improve its long-term planning tools. This raises the issue of the appropriate administrative capacity at European, national and local level to manage a potentially more integrated European energy and green industry policy. The response to the IRA raises the question of the EU's fiscal capacity needed to finance the transition in a socially equitable way, and reveals the imbalance in the EU's institutional development, between extensive legal and regulatory powers and weak fiscal, administrative and enforcement capacities. More generally, it raises the question of what governance the EU needs to implement ambitious regulations and to bridge the democratic deficit that will only widen if EU integration is to go ahead.

Appendix 1

Supply risk by technology (from top to bottom: Li-ion batteries, fuel cells, wind turbines, electric traction motors, solar panels) and by stage in the value chain (from left to right: materials extraction, refining, components, assembly). Source : JRC 2020.

Figure 3. Identified supply risks for the EU and EU shares of production

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