

fathom
Independent Thinking

Technology transfer, FDI and Europe's cleantech catch-up

September 2026

Executive summary

Europe's economy is falling behind in the race to compete in industries of the future, especially clean technologies (cleantech). Amid weak growth and lacklustre productivity, and against a backdrop of fierce competition from Asian players, Europe's difficulties are exemplified by the failure of the Northvolt battery project and Volkswagen's recent announcement of 100,000 job cuts in Germany.

Technology transfer has been suggested as one way to reverse this decline, but we find no clear evidence that has happened on the largest cleantech investments from South Korea, Japan or China in electric vehicles, batteries, wind turbines or critical minerals mining and recycling into Europe since 2015.

Fathom's Capital Flows Tracker was used to identify €47.5 billion ($52 billion)[1] of greenfield investment announcements in Europe from China, South Korea and Japan, across 196 different cleantech projects since 2015. 70% of this investment, which could potentially serve as a conduit for technology transfer, was announced in the past five years alone, with the bulk concentrated in batteries and EVs. Of the total investment, 60% comes from Chinese firms.

Combined, Hungary, Poland, the UK, Spain and Germany have received over 80% of this investment. Our analysis finds limited evidence that the choice of these locations has been influenced by 'regulatory arbitrage', at least for the time being. Rather, these destinations appear to have been chosen based on a range of factors, including labour costs and countries' relative automotive and cleantech specialisms. That said, **we strongly urge that investment screening and policies attaching conditionalities to foreign investment are made mandatory and Europe wide**, since the absence of this creates incentives for investors to cherry pick the most sympathetic regulatory regime to invest in, undermining European policy objectives and those countries which adopt more stringent conditions.

Among the five largest deals in each of these countries, there has been no formal commitment by investors to transfer technology to Europe, despite more than 70% of projects receiving public support. Instead, our analysis finds only limited and somewhat vague commitments relating to R&D and local workforce training, while a substantial share of jobs have gone to Chinese workers. CATL's Hungarian battery plant, for example, initially promised up to 9,000 jobs in 2022, but only around 1,000 have been created to date, a third of which went to Chinese workers. Its Spanish facility has also drawn scrutiny amid reports that around 2,000 Chinese workers would be brought in to build the plant.

To ensure that technology transfer and European capacity building take place, Europe should focus less on proscribing rules on how to transfer intellectual property and more on ensuring that the conditions are in place for capacity building to occur. These conditions should ensure that production happens in Europe, by Europeans, supported by local suppliers. This recommendation is supported by literature and growing calls by the likes of Mario Draghi for Europe to reduce its regulatory burden to support economic competitiveness.

Europe should prioritise learning-by-doing and development of domestic capabilities among European firms and workers**.** In this regard, Fathom supports the principle behind the IAA's proposed requirement that at least 50 per cent of workers are European, recognising that workforce participation is a key channel through which skills and know-how are transferred. However, we argue that this threshold should be much higher (more than 80%) and

1. As is standard practice in internationally comparable investment datasets, investment values are reported in US dollars at the time of announcement. For the headline figure, we convert this value into euros using the relevant average annual exchange rate, providing an approximate euro-denominated total in the interest of European policymakers. The remainder of the report presents investment values in US dollars.

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should specifically apply to the initial construction phase of projects, not just once operations commence. **Promoting domestic production by Europeans will help Europe's self-sufficiency drive** in these technologies.

Provisions in recent EU regulations including the Critical Raw Materials Act (CRMA), Net Zero Industry Act (NZIA) and proposed Industrial Accelerator Act (IAA) will help ensure that these conditions for capacity development are in place. However, **urgent action is needed to turn the IAA into law, limit use of foreign workers in the construction phase of projects and prevent workarounds to European regulations**.

In the last three years Chinese cleantech investment into Morocco and Türkiye exceeded investment into the whole of Europe, including the UK **($15 billion vs. $11.2 billion)**. The conditionalities that the IAA places on Chinese investment will further disincentivise investment in Europe as long as countries such as Türkiye and Morocco continue to enjoy tariff-free access to Europe and apply no such conditions on Chinese investment themselves. **Closing, or disincentivising, this loophole should be a key priority for European policymakers.** The most obvious policy lever would be to require these countries impose the same conditionalities on Chinese investments to continue enjoying tariff-free access to Europe.

The IAA is formally country neutral, but it requires that investments are screened only if coming from a country with a 40% or more share of global manufacturing in that industry or which does not have an economic partnership or free trade agreement with Europe. Consequently, **the conditions attached to cleantech investments affect China but not South Korea or Japan**, who have a free trade agreement and economic partnership with the European Union. We think it is important for the IAA provisions to apply to Chinese investment for three reasons:

1) **The use of Chinese workers, especially in the construction phase of projects, limits the capacity of European workers to absorb these new technologies**. For example, around one third of the first 1,000 jobs at CATL's Hungarian plant were filled by Chinese workers, while reports indicate around 2,000 Chinese workers will be used to construct its Spanish facility. We found no comparable evidence that Japanese or South Korean firms investing in Europe are relying on workers from their home countries at a similar scale.

2) **Fathom modelling suggests Chinese greenfield investment crowds out domestic investment in Europe, unlike investments from the rest of the world.** The probable reason for this is that investment from China is often associated with practices that are less conducive to technology transfer, including a preference to use Chinese workers and suppliers. There was clear statistical evidence that greenfield investments from China are less beneficial to Europe than investments from the rest of the world in the long run, which was not the case for investments from South Korea or Japan.

3) There is evidence that China's market position has been shaped by extensive state support and other non-market interventions, meaning that observed market outcomes may not reflect underlying comparative advantage. In such circumstances, **the *theory of the second best* suggests that carefully targeted interventions to offset existing distortions can, in principle, improve outcomes relative to a world in which only one distortion (i.e. from China) remains.**

Europe should take a bolder and more unified stance to protect its interests, including using the power of accessing its market to extract concessions from trading partners and investors, as China itself has done for many years. China runs a huge current account surplus, holds substantial foreign assets and has an increasingly limited opportunity to invest in the US. In other words, China has an increasingly large stock of foreign assets with which to invest and a narrower set of investment opportunities, meaning that Europe may have a stronger hand than it might realise. That said, leverage runs both ways: China retains significant control over certain clean technologies and inputs, and it could yet decline to invest in Europe on the EU's terms. Therefore, Europe should pair a firmer stance towards China with efforts to attract investments from other cleantech leaders such as South Korea and Japan.

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Finally, policy should be proactive and not reactive. We recommend that the IAA is expanded to include other sectors where Europe may be losing its competitive edge to competitors, and especially where these competitors are considered to be playing by non-market-based principles.

Policy recommendations

1. Tighten European investment-screening rules
2. Ensure that the Industrial Accelerator Act (IAA) is mandatory and Europe-wide
3. Limit the IAA workarounds for Chinese firms
4. Welcome cleantech FDI from Japan and South Korea
5. Restrict the use of foreign workers to encourage learning-by-doing
6. Expand the sectors covered by the IAA
7. Prohibit foreign-imposed restrictions on licensing agreements

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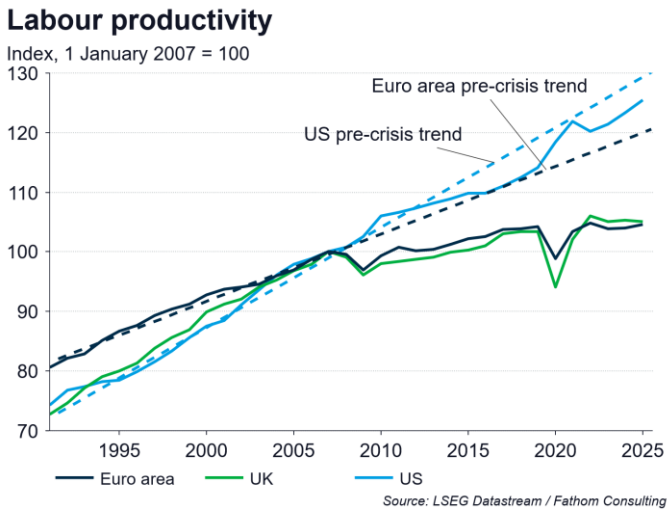
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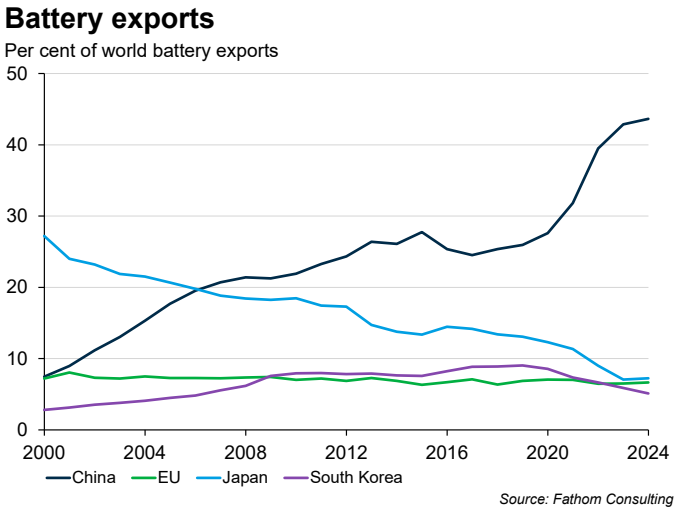
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1. Context and scope

Europe's industrial model is at an important juncture. Over the past two decades, productivity growth has slowed and manufacturing competitiveness has weakened. While Europe retains strengths in scientific research and engineering, it has struggled to translate these advantages into globally competitive firms in frontier industries. These issues are reflected in the left-hand chart below, which shows how European productivity has fallen significantly relative to its earlier trend and to other nations such as the US. In a report on European competitiveness,[2] former European Central Bank president Mario Draghi identified reversing this trend as a key priority and challenge for European policymakers.





Heightened geopolitical tensions and energy-market disruptions arising from the wars in Ukraine and Iran have kept energy security and affordability high on the policy agenda. This has reinforced European policymakers' commitment to the net-zero transition and the long-term economic, political and security benefits of securing domestic cleantech manufacturing capacity.[3] Cleantech refers to products, services and technologies that generate commercial returns while addressing environmental challenges through more efficient use of resources and reduced ecological impact.[4] Within this context, Europe retains strengths in areas such as wind-turbine manufacturing. It is China however that has emerged as the dominant global player across much of the cleantech value chain, now occupying leading positions in exports of key clean technologies including batteries (see the right-hand chart above), electric vehicles (EVs) and the refined critical minerals needed to make them.

China's cleantech dominance was not achieved through market forces alone. Instead, it was underpinned by industrial-policy support, including regulatory barriers to entry, large-scale subsidies and tax breaks, to name but a few.[5] Together, these have translated into significant cost advantages, making it increasingly difficult for European firms to compete at scale. Volkswagen's plans, announced in June, to cut 100,000 jobs and close four plants in Germany are the clearest indication yet of the pressure that this 'China shock 2.0' is placing on European industry, in addition to US tariffs and waning demand in Europe.[6] According to the company, manufacturing costs in China

2. European Commission (2024) *The Draghi report: A competitiveness strategy for Europe (Part A)*
3. Weise (2026) *Fossil fuels? No thanks. Why Trump's Iran war is pushing EU toward renewables.*
4. Cleantech for Europe *What is Cleantech*
5. U.S. China Economic and Security Review Commission (2025) *Made in China 2025: Evaluating China's Performance*
6. Amann and Steitz (2026) *VW weighs up to 100,000 job cuts, four plant closures in biggest overhaul yet, sources say*

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range from €500 to €1,000 per vehicle, while in Europe they can reach up to €4,000; and engineers cost two to three times as much in Germany as in China.[7]

For Europe, this creates a dilemma. While Chinese industrial leadership has delivered global cost reductions and accelerated cleantech deployment, it has also increased Europe's exposure to foreign-controlled supply chains and technologies. Recent Chinese export controls on rare earth elements and battery-related materials have reinforced concerns that such dependence can translate into strategic vulnerabilities.

Europe has already taken steps to strengthen its domestic cleantech industrial base, through regulations such as the Net Zero Industry Act (NZIA), and the Critical Raw Materials Act (CRMA). The 2025 collapse of Northvolt, once considered Europe's flagship battery-manufacturing startup, is however indicative of the broad challenges European cleantech firms face in scaling and competing with established Asian incumbents; although company-specific decisions and mismanagement also contributed to its downfall.[8] At the same time, if China's market position has been shaped by extensive state support and other non-market interventions, as evidence would suggest, observed market outcomes may not reflect underlying comparative advantage. In such circumstances, the *theory of the second best* suggests that carefully targeted interventions to offset existing distortions can, in principle, improve outcomes relative to a world in which only one distortion (i.e. from China) remains.[9]

Against this backdrop, Europe remains reliant on inward foreign direct investment (FDI) to scale domestic cleantech production, reflected in that over 90% of EV and storage batteries are produced by South Korean and Chinese companies in the EU.[10] Chinese, Korean, and Japanese firms are important investors in Europe's battery and EV supply chains, bringing capital, intellectual property (IP) and production expertise. In theory, these investments can support domestic capability-building and supply-chain sovereignty through industrial expansion, employing Europeans and building out domestic supply chains. However, in practice, there are question marks about the extent to which they contribute to these goals.

And, if FDI does not strengthen Europe's economic position, what should Europe do to ensure that it does? Some have raised concerns that these investments create assembly lines for foreign firms that wish to access the European market, while creating little value for Europeans.[11] In response, recent European Commission proposals including the Industrial Accelerator Act (IAA) have emphasised that conditions should be attached to inward investments, including requirements on technology transfer, so that they do contribute to Europe's long-term economic goals. This new policy direction comes with risks, as FDI could be reduced by attaching strings to it, if these conditionalities are not accompanied by measures that limit the option of not investing in Europe, and simply exporting to Europe from somewhere else; but the opportunities it offers include access to best-in-class foreign technologies while capturing greater value-added within Europe.

Accurate data are essential to draw credible policy conclusions. To our knowledge, no clear dataset exists which identifies the investments in question: size, trends over time, where they come from, the countries and sectors into which they are going and whether any technology transfer has occurred. It is in this context that we use our expertise to provide evidence-based findings to inform this discussion, using Fathom's Capital Flows Tracker, which is a proprietary, verified, deal-level dataset of China's overseas investment activity, alongside comparable data for Japan and South Korea.

7. Linden (2026) *Electric motor for cheapest VW comes from China*
8. Tagliapietra and Trasi (2024) *Northvolt's struggles: a cautionary tale for the EU Clean Industrial Deal*
9. Lipsey and Lancaster (1956) *The General Theory of Second Best*
10. Transport & Environment (2025) *Assembly plant or battery powerhouse?*
11. ibid (10)

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2. Policy environment

For Western politicians, the topic of technology transfer has until now largely focused on how emerging Asian economies have tied access to their domestic markets to arrangements designed to facilitate technology transfer from more advanced Western firms. China represents the most prominent and widely criticised example, given the persistence of such policies into the WTO era as a 'quid pro quo' for access to China's market. Technology transfer has also often been associated with, and supported through, restrictions on foreign ownership and requirements for foreign investors to create joint ventures (JVs) with Chinese partners.[12]

The link between JVs and technology transfer is not always automatic, but they create channels through which knowledge can flow – most notably, through collaboration between foreign and domestic firms. In China's case, however, many domestic partners were state-owned or closely connected to the state, allowing technology transfer to take place within a wider industrial policy framework designed to build indigenous capabilities. From Europe's point of view, the clearest example of an industry where Chinese firms acquired strategic knowhow from Europe was in the automotive industry. Evidence suggest that this policy was highly successful for the Chinese auto industry; Chinese automakers adopted "the quality strengths of their JV partners" and a marked quality improvement occurred in vehicles made under a JV, relative to non-affiliated domestic vehicles.[13]

In recent years, technology transfer to Chinese firms has not been limited to western FDI into China, but also via Chinese M&A activity in Europe. Some commentators described the 2010s as a 'garage sale' of European high-tech firms to China.[14] A study of Chinese overseas M&A activity between 2002 and 2017 also found that compared with other investors Chinese investors tended to purchase firms with a significantly lower return on assets but with more patents, which was "consistent with the view that Chinese cross-border M&As are particularly motivated by transfers in technology and know-how".[15] Using our proprietary data, Fathom can explain theoretically and empirically China's strategy to dominate key industries through knowledge acquisition and capacity building, including scaling of foreign greenfield investment. China seems to have followed this strategy successfully for EVs and batteries, where it is now a global leader. For more, see Box 1 on the next page.

12. Sykes (2021) *The Law and Economics of "Forced" Technology Transfer and Its Implications for Trade and Investment Policy (and the U.S.–China Trade War)*
13. Bai et al. (2024) *Quid Pro Quo, Knowledge Spillovers, and Industrial Quality Upgrading: Evidence from the Chinese Auto Industry*
14. Green and Tordoir (2026) *Europe's door to Chinese tech investment is still ajar*
15. Fuest et al. (2021) *What drives Chinese overseas M&A investment? Evidence from micro data*

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Box 1: Fathom's China wave theory

Past work by Fathom has shown how Chinese firms often use FDI strategically to build their own domestic capabilities in strategically important sectors. The typical pattern is as follows:

- First, Chinese firms invest in foreign-owned companies to gain intellectual property from industry leaders — this can be observed in a wave of M&A transactions
- Second, those Chinese firms tweak and optimise that technology to scale it — this is sometimes reflected in a wave of patent filings or research papers
- Third, firms build capacity for future production — this is often observed as a series of greenfield investments (i.e., the setting up of factories overseas), often to sidestep tariff barriers and to locate production geographically close to sources of future demand
- Finally, production is scaled

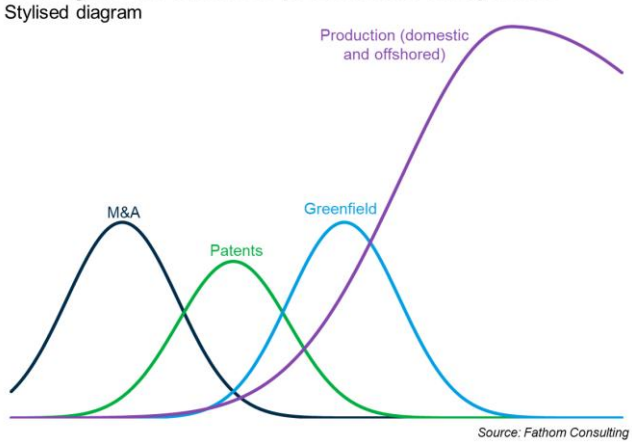
This lifecycle of Chinese product development is laid out stylistically in the left-hand chart below. The framework is not purely conceptual: it is supported by Fathom's verified deal-level capital flows dataset, which shows a similar wave-like investment pattern in practice across several key sectors, most notably the automotive sector, and as illustrated in the right-hand chart below.

China's wave of M&A in the automotive sector peaked in the pre-pandemic period, probably reflecting efforts to acquire automaking knowhow. We can also see the subsequent wave of domestic patent registrations in batteries, and the following wave of greenfield investments in the automotive sector. Finally, we can see the rising wave of EV production.

While this pattern is not unique to China, the country's coordinated industrial strategy, extensive state support for firms and significant state influence over strategically important sectors can both create an uneven playing field and national security concerns.

Life cycle of Chinese product development

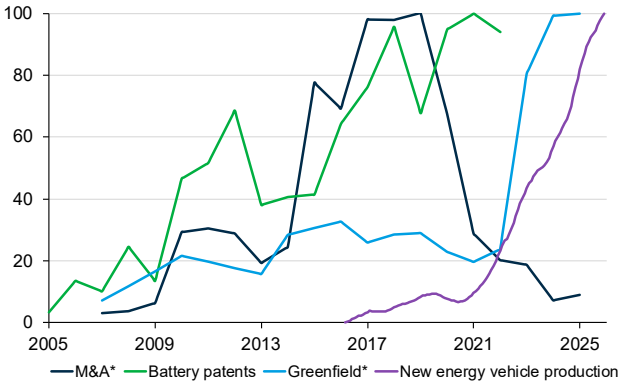
Stylised diagram



Source: Fathom Consulting

China autos

Index, wave peak = 100



*Three-year moving averages

Source: fDi Markets / LSEG / WIPO / Fathom Consulting

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Meanwhile, the wars in Ukraine and Iran have strengthened Europe's resolve to bolster its energy security and to do so by becoming more self-sufficient in key technologies. This comes alongside a strong desire to improve economic competitiveness. At the same time a potential existential crisis is unfolding for European auto manufacturers, who are struggling to compete with foreign manufacturers, especially on EV and battery technologies. The failure of Northvolt has prompted soul-searching among European industry and policymakers, who are turning their attention to ways in which they can regain competitiveness, including through technology transfer on these critical clean technologies: but this time the transfers would not be from Europe to Asia but the other way round.

This issue has been front and centre for the European Commission, which issued in December 2025 a joint communication to the European parliament and the Council stating that inbound investment to the EU should, among other things, support "innovation and technology transfer".[16] The Commission also published an Industrial Action Plan specifically for the European automotive and battery industry, noting that conditions for foreign investments should include "joint venture requirements, senior management requirements, facilitating agreements that support the needs of EU industry…, licensing of technology or intellectual property, commitments to supply critical inputs".[17] The French president Emmanuel Macron has meanwhile called for "mutually beneficial projects" in sectors where China has a technological advantage, like batteries, EVs and solar panels, urging Chinese firms to play a role in Europe's development.[18] The shoe is now on the other foot.

Early evidence suggests, however, that knowledge transfer from Asia to Europe on these technologies has so far not been happening. For example, a study by Transport and Environment (T&E) found that various Chinese-European battery partnerships including VW-Gotion and CATL-Stellantis "lack any meaningful knowledge sharing or local benefits." The report suggests that the power dynamic in these agreements is skewed towards the Chinese battery manufacturers, with the European auto manufacturers requiring a battery partner for their EVs, resulting in limited scope to demand technology transfer.[19] This report helpfully relied on expert views and anecdotes from individuals closely involved in these projects due to a "lack of public data" on this topic. Our report complements that work by providing additional quantitative analysis based on our proprietary and verified dataset of Chinese investments.

The EU's existing regulations go some way towards creating an environment that supports local industries and improves supply-chain security, but fall short of addressing the issue of technology transfer. The NZIA requires that supply of key net-zero technologies originating from a single non-EU country should not "exceed a 50% limit".[20] The CRMA dictates that by 2030, various proportions of extraction, processing, recycling and consumption of critical materials should be supplied from within the EU.[21] These may encourage the reshoring of European manufacturing, but in their current form fall far short of ensuring that these key industries are not just made *in* Europe, but also made *by* Europe. To address the concern that Europe may be reduced to an "assembly-only role, while China dominates upstream production", policy think-tanks like Institut Montaigne have suggested measures that "require or incentivise EU-majority joint ventures with non-EU investors in selected critical cleantech sectors".[22]

16. European Commission (2025) *Joint communication to the European parliament and the council*
17. European Commission (2025) *Communication from the commission to the European parliament, the council, the European economic and social committee and the committee of the regions*
18. Xu (2025) *Macron urges Chinese firms to invest in France, EU as tech gap widens*
19. ibid (10,11)
20. Official Journal of the European Union (2024) *Regulation (EU) 2024/1735 of the European Parliament and of the Council*
21. ibid. (9)
22. Institut Montaigne (2025) *Europe-China: A New Joint Venture Strategy for Cleantech*

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Another issue moving up the policy agenda is the lack of a coherent and unified FDI screening framework. This has implications for technology transfer from Asia to Europe in these sectors, as well as broader implications for European economic and national security and capacity-building. The EU recently revised its framework for screening FDI to harmonise screening rules across member countries for a core set of sensitive and strategic industries, including energy and net-zero technologies.[23] More could be done, however. The introduction of a clearly defined sector list, and the inclusion of investments made through EU-based subsidiaries, represent important steps forward, but this relates to M&A specifically; and the continued discretion afforded to member states over whether to include greenfield investments in their screening regimes remains a significant gap.[24]

The much-anticipated Industrial Accelerator Act (IAA), the draft legislative proposal of which was released in March 2026, ties these proposals together and more directly addresses the question of technology transfer from foreign investment in clean technologies. Licensing is considered by some as a less burdensome way to ensure that technology can be transferred; some literature points to the recent licensing agreements involving Contemporary Amprex Technology Co Ltd (CATL) in the US as a model that Europe should consider adopting. [25] However, this arrangement has been strongly criticised by some in the US, including a lawmaker that Fathom spoke to, who claim that this arrangement increases dependencies on Chinese technology. More details on this, licensing arrangements more broadly and the proposed IAA framework, are discussed in Boxes 2 and 3 that follow.

China has criticised the IAA as discriminatory, arguing that its foreign investment provisions undermine fair competition and market principles. China's Ministry of Commerce (MOFCOM) warned that China could take countermeasures if the legislation harms Chinese firms,[26] while China's auto industry association has similarly opposed the Act's treatment of foreign investors, particularly in strategic sectors such as EVs and batteries.[27] While not explicitly introduced in response to the IAA, China's Regulation on Overseas Investment (Decree No. 837), issued in July 2026, further complicates Europe's ability to rely on technology transfer as a route to domestic capability building, by restricting Chinese firms from transferring certain technologies abroad without authorisation.[28] Such measures highlight the need for Europe to develop its self-sufficiency in these technologies, as well as the potential short-term costs and challenges in doing so. That, in turn, demonstrates the need for well-designed, consistent and effective policies on these issues.

Europe's efforts to harness technology transfer through the IAA effectively single out China, which according to Fathom data invests more in cleantech in Europe than both South Korea and Japan combined. Placing restrictions on such investment might deter inflows of capital, and also seems to have prompted a backlash from China. In other words, the restrictions that the IAA places on Chinese investment could carry costs, especially in the short term, which raise the stakes politically and economically. In section 3 of this report we focus our literature review on how technology transfer typically occurs, including China's use of forced technology transfer, with a view to informing whether the IAA might need adjusting or whether other policies are required for Europe to achieve its goals.

23. Council of the EU (2026) *Foreign investment screening: Council signs off on updated framework*
24. This is particularly important given that greenfield investment has accounted for the majority of China's FDI into the EU by number of deals since 2005 (with the exception of 2016), whereas globally this only became the dominant form of Chinese FDI for the first time in 2023. A more consistent approach to screening greenfield investment would therefore better reflect the nature of Chinese investment into Europe.
25. Shapiro (2025) *The Ford-CATL Deal Should Become the Model for China-US Economic Cooperation*
26. Ministry of Commerce, People's Republic of China (2026) *MOFCOM Spokesperson's Remarks on the EU's Proposed Industrial Accelerator Act*
27. Reuters (2026) *China's auto body says it strongly opposes EU's Industrial Accelerator Act*
28. Jennings (2026) *China's new investment law asserts control over offshore tech transfers in landmark move*

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Box 2: How would a licensing agreement work?

A licensing agreement is a contract under which one party (the licensor) allows another (the licensee) to use its intellectual property (IP), technology or products in return for a fee or royalty. For Europe, licensing technology from leading Chinese firms could provide a more direct route to accessing industrial know-how than inward investment alone. Chinese firms gain market access and recurring revenue without bearing the costs of production, while European firms gain access to proven technologies without the costs and uncertainty of in-house development.

Two notable examples of such deals in the US include CATL's deals with Tesla and Ford. The former was in discussion as of March 2024, with no update since, while the latter went ahead. CATL's CEO has said that the licensing model is the "only real way for CATL to compete in the US" given the US's tougher stance on Chinese involvement in the EV supply chain.[29] Some commentators argue that a licensing deal such as this should become the model for cooperation with China: the western firm maintains complete ownership of the plant, the land, equipment and the workforce; while the Chinese firm contributes its battery chemistry and provides engineers to train local workers, after which its involvement ends.

There are several concerns with using a licensing model as the primary solution, however. First, it seems unlikely that China would be willing to let CATL license the most cutting-edge version of its technology. For example, in the context of Ford's deal with CATL, the Chinese government closely scrutinised it "to ensure the Chinese company's core technology is not shared with the US automaker."[30] Second, simply licensing the technology does not create the wider industrial ecosystem needed to manufacture it competitively at scale. The FDI literature highlights that domestic capability-building depends not only on access to the technology itself, but also on acquiring tacit knowledge through production experience, supplier relationships and learning-by-doing. Deeper arrangements such as joint ventures can facilitate these spillovers by embedding foreign firms within local production networks, creating more opportunities for domestic firms and workers to develop domestic capabilities than arm's-length licensing alone could achieve. Third, there are concerns that such an arrangement will not lead to technology being transferred. In the US, for example, several policymakers have pointed to contractual specificities which limit Ford's ability to use the licenced technology more widely, and the expected presence of Chinese workers at Ford until 2038, as evidence of ongoing dependencies and limited technology transfer.[31] And finally, and arguably most importantly, licensing agreements would leave Europe dependent on technology that can be restricted or withdrawn in an instant.

Indeed, this risk may have already materialised as China's Regulation on Overseas Investment (Decree No. 837), issued on 1 July 2026, "prohibits Chinese firms from **transferring restricted technologies,** data, goods, or services abroad without authorisation, including through technical training, personnel deployments, or remote assistance". In effect, this significantly limits the scope for licensing as a stable channel for European technology catch-up.[32]

29. Bloomberg News (2024) *CATL Working With Tesla on Fast-Charing Cells, Supplying Nevada*
30. Shepardson (2026) *US lawmaker scrutinizes Ford battery partnership with chinese company CATL*
31. Tamborrino (2023) *House GOP committee chairs launch probe into Ford-China battery deal*
32. ibid. (27)

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Box 3: The Industrial Accelerator Act explained

The Industrial Accelerator Act (IAA) is a European Commission proposal intended to support EU reindustrialisation by raising manufacturing's share of GDP from 14% to 20% by 2035.[33] To achieve this, the proposal sets out a four-pillar framework, through (i) "Made in EU" and low-carbon requirements in public procurement and support schemes, (ii) conditionality on inbound FDI in strategic sectors, (iii) faster permitting for industrial projects, and (iv) designated industrial acceleration zones to attract low-carbon investment.

Most relevant to this report is pillar (ii), which introduces conditions on manufacturing investments exceeding €100 million in value in specified cleantech sectors where the investor's home country accounts for more than 40% of global manufacturing capacity. These sectors include battery technologies and the wider value chain; electric vehicles (including pure, plug-in hybrid and fuel-cell vehicles, and components related to electrification and digitalisation); solar photovoltaic technologies; and critical raw materials (including extraction, processing and recycling).

Where these criteria are met, investments would require approval from national investment authorities designated by each member state. Approval should only be granted where investments fulfil at least four of six conditions:

1. Foreign investors must not acquire, or establish, more than 49% of the share capital or voting rights in an EU entity;
2. Foreign investors must undertake the investment through a JV with one or more EU entities, structured to ensure meaningful participation by EU partners in management, technology transfer and capacity building;
3. Foreign investors must commit to license their IP rights and know-how to the EU entity
4. Foreign investors must allocate at least 1% of the EU entity's gross annual revenue towards R&D spending in the EU
5. At least 50% of the workforce associated with the investment must consist of EU workers across operational, technical, supervisory, and managerial roles, and be supported by training and capacity-building measures
6. Foreign investors must publish a strategy to strengthen EU value chains, and *aim* to source at least 30% of inputs from within the EU

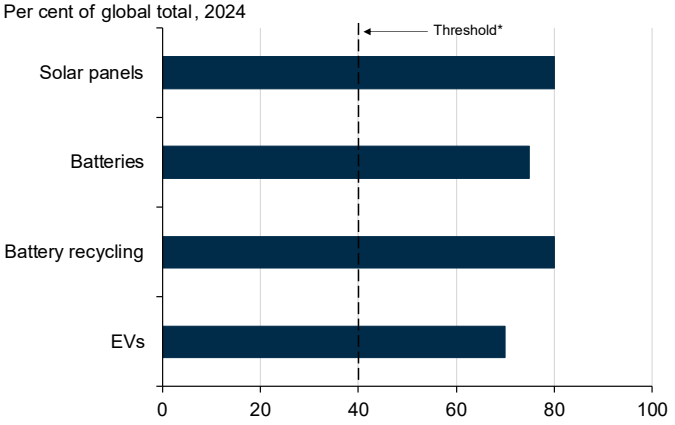
In theory, these measures should all support European capacity-building and knowledge transfer in different ways. In effect, the measure targets China without it being named explicitly. Not only does China account for a lot more than 40% of global manufacturing capacity in these key technologies, but other important global manufacturers of these technologies (such as the US, India, Japan and South Korea) should be exempt, as the rules exclude countries which have "economic partnership and free trade agreements" with the EU.

33. Tabled in March 2026, the proposal is being reviewed by the European Parliament's committees on ITRE (Industry, Research and Energy), IMCO (Internal Market and Consumer Protection), and INTA (International Trade), with Parliament's first-reading vote pencilled in for 14 December 2026. Allowing for any negotiations and formal adoption process, the legislation is unlikely to come into force before 2027 https://oeil.europarl.europa.eu/oeil/en/procedure-file?reference=2026/0068(COD)

Continued

China manufacturing capacity

Per cent of global total, 2024



*Threshold for being subjected to investment screening under Europe's proposed Industrial Accelerator Act

Source: IEA / Fathom Consulting

Continued

3. Literature review

Technology transfer is defined by the UN as "the process by which one party gains access to the knowledge of another party and becomes able to adapt successfully the knowledge in the production processes".[34] It can occur through market-based channels, such as trade in goods and services, FDI, licensing and joint ventures, or through non-market channels, including employee mobility, reverse engineering and knowledge disclosed through publicly available information such as patent applications. Given the focus of this report, we focus on the FDI channel.

Technology transfer (knowledge spillovers): a benefit of FDI

There is a well-established literature on the benefits of FDI in host economies. Recent World Bank reviews conclude that FDI can support productivity growth, higher wages and integration into global value chains.[35] A smaller but equally important strand of this literature focuses specifically on knowledge spillovers, or technology transfer, as a key mechanism through which these broader benefits arise. Because tacit knowledge embedded in production processes is difficult to observe directly, researchers typically rely on indirect proxy measures such as patent activity, productivity differentials, labour mobility and trade patterns, each of which captures only part of the underlying process of knowledge diffusion but is nonetheless a widely used empirical approximation.

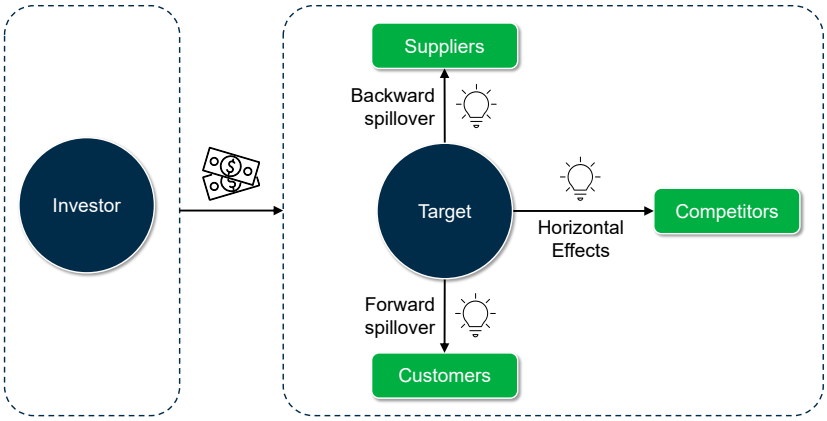
Supply chains are a key driver of knowledge spillovers associated with FDI

There are multiple channels, illustrated in the graphic below, through which knowledge can flow from foreign investors to domestic firms and workers. Several studies, including Javorcik (2004),[36] Aitken and Harrison (1990),[37] and Alfaro-Ureña et al. (2022),[38] suggest that FDI-related knowledge spillovers occur primarily through supply-chain relationships ('backward spillovers') rather than between competing firms ('horizontal spillovers') or downstream customers ('forward spillovers'). Essentially, foreign firms have an incentive to share knowledge with local suppliers to improve input quality and production efficiency, while actively seeking to limit knowledge leakage to competitor firms. Where horizontal spillovers are observed, Havránek & Iršová (2013)[39] find that they are primarily driven by JVs rather than by wholly foreign-owned affiliates, consistent with the greater local sourcing intensity and deeper engagement with domestic firms typically associated with JV structures.

34. Dhar and Joseph (2012) *Foreign direct investment, intellectual property rights and technology transfer the north-south and the south-south dimension*
35. World Bank Group *Foreign Direct Investment in Retreat: Policies to Turn the Tide*
36. Javorcik (2004) *Does Foreign Direct Investment Increase the Productivity of Domestic Firms? In Search of Spillovers Through Backward Linkages*
37. Aitken and Harrison (1990) *Do Domestic Firms Benefit from Direct Foreign Investment? Evidence from Venezuela*
38. Alfaro-Ureña et al. (2022) *The Effects of Joining Multinational Supply Chains: New Evidence from Firm-to-Firm Linkages*
39. Havránek & Iršová (2013) *'Determinants of Horizontal Spillovers from FDI: Evidence from a Large Meta-Analysis'*

Continued

Knowledge spillovers through FDI



Source: Feng (2020) / Fathom Consulting

Evidence suggests JVs can generate greater spillovers than wholly foreign-owned subsidiaries

The advantage of joint ventures is that they create more channels through which knowledge can spread. Because a local firm is directly involved in the operation, it can gain exposure to foreign technology, management practices and production processes. At the same time, foreign investors can benefit from the local partner's existing supplier relationships and employee networks, further helping to embed operations within the domestic economy. And crucially, the knowledge acquired through the JV partnership can extend beyond the individual investment project, as the domestic partner can apply these newly learnt capabilities to their own future operations. By contrast, a wholly foreign-owned subsidiary may be more likely to keep its technology and expertise within the firm, limiting the extent to which local firms benefit.[40] That said, a JV does not *automatically* lead to technology transfer through any of the channels outline above, and some foreign JV partners may be less willing to engage local suppliers and share expertise than others. For this reason, the IAA's linking of technology transfer to JVs, and requiring European control of that JV, seems to be an effective way to ensure that technology transfer happens through this channel.

Absorptive capacity matters

The literature also finds that spillovers tend to be largest where foreign investors are technologically close to – but modestly ahead of – domestic firms, consistent with the absorptive capacity literature: when the gap is too small there is little to learn, while when it is too large domestic firms lack the capacity to absorb the knowledge. Researchers at the United Nations[41] argue that absorptive capacity – defined as the ability to recognise, assimilate and apply new knowledge – is closely tied to human capital and R&D investment. Based on these findings, it seems likely that Europe has the absorptive capacity to benefit from technology transfer from China in the cleantech sectors analysed in this report.

40. Javorcik et al. (2008) *To share or not to share: Does local participation matter for spillovers from foreign direct investment?*
41. Jojo and Simone (2015) *Foreign direct investment and technology spillovers in low and middle-income countries: A comparative cross-sectoral analysis*

Continued

Workers also spread know-how

A substantial literature, including Poole (2013),[42] and Stoyanov and Zubanov (2012),[43] highlights labour mobility as another key channel of knowledge diffusion. When employees move from multinational enterprises (MNEs) to domestic firms, wages of their coworkers also tend to rise. This suggests that knowledge carried by former MNE workers diffuses within firms and raises productivity, although it is also possible that these reflect efficiency gains within production processes that are unrelated to technology transfer. This channel, of course, requires foreign investors to hire and train local workers rather than bringing in expatriate workers. This is a particular concern when it comes to Chinese investment; many reports, anecdotal evidence and data show that Chinese-funded infrastructure projects in many parts of the world, especially Africa, often rely heavily on Chinese labour, particularly among skilled positions.[44] We have seen similar concerns play out in Europe recently, with reports that suggest CATL is sending around 2000 Chinese workers to build its battery plant in Spain.[45]

Evidence from China's use of forced technology transfer

China is often cited as adopting a 'quid pro quo' approach to inward FDI: since opening to foreign investment in 1979, it has required foreign firms to transfer technology to local firms in exchange for market access. While WTO accession in 2001 was accompanied by a commitment to eliminate explicit technology-transfer requirements, concerns over indirect or implicit forms of technology transfer have persisted. For example, the United States Trade Representative (USTR) in 2025 found that "China uses joint venture requirements, foreign investment restrictions, and administrative review and licensing processes to require or pressure technology transfer from U.S. companies".[46] Such language is not confined to the current Trump administration – USTR reports from previous administrations, both Republican and Democrat, have levelled similar accusations.

China's automotive sector represented perhaps the most prominent example of using this approach. In its seventh Five-Year Plan (1986-1990), China designated automobile manufacturing a pillar industry and explicitly encouraged the use of FDI and technology licensing to develop manufacturing capabilities.[47] From 1994 onwards, foreign automakers seeking to establish operations in China faced a range of conditions, including mandatory joint ventures with state-owned enterprises (in which the foreign investor's share was capped at 50%), local content requirements and obligations to establish R&D centres. In many cases, the Chinese partner in a JV would require its foreign partner to share technology and knowhow, leading to technology transfer to China.[48] Meanwhile, these measures were supported by tariffs of 110-150% on imported passenger vehicles. The scale of China's domestic market gave its policymakers considerable bargaining power. This, combined with Western complacency and short-termism, enabled China to extract such concessions, helping it to close the gap with – and, in the case of the technologies in question, overtake – its European rivals.

Multiple studies conclude that China's 'quid pro quo' policy generated meaningful technology spillovers. Jiang et al (2018) [49] find that Chinese firms participating in JVs experienced increases in patenting activity of around 5% and productivity gains of 6–15%, alongside broader spillovers to other domestic firms through supply-chain, industry

42. Poole (2013) *Knowledge Transfers from Multinational to Domestic Firms: Evidence from Worker Mobility*
43. Stoyanov and Zubanov (2012) *Productivity Spillovers across Firms through Worker Mobility*
44. Cooper (2019) *The development impact of Chinese development investments in Africa*
45. Jopson et al. (2025) *China sends 2,000 workers to build battery power in Europe*
46. Office of the United States Trade Representative (2018) *Section 301 Investigation Fact Sheet*
47. ibid. (9)
48. *Connor (2019) How Chinese Companies Facilitate Technology Transfer from the United States*
49. Jiang et al. (2018) *International Joint Ventures and Internal Technology Transfer vs. External Technology Spillovers: Evidence from China*

Continued

and geographic channels. Focusing on the automotive sector, where the effectiveness of China's technology transfer strategy has been widely debated, Bai et al (2024)[50] show that Chinese automakers improved most in the areas where their JV partners were strongest, contributing to significant quality improvements relative to non-affiliated Chinese vehicles. Importantly, however, the evidence suggests that these gains were driven less by formal patent transfers or licensing agreements and more by worker mobility, supplier linkages ('backward spillovers') and learning-by-doing within the JV. This is an important finding and one that Europe should learn from.

Learning-by-doing is key

Technology transfer mandates often assume the binding constraint on domestic capability is *access to codified knowledge* (patents, technical processes etc.). However, in some cases the key constraint is instead *embodied human capital* or production experience – tacit knowledge accumulated through learning-by-doing. These are different problems requiring different policy responses.

Learning-by-doing occurs when firms and workers build capabilities through repeated involvement in production activities, rather than simply through access to information or instructions. Arrow (1962)[51] first formalised this idea, arguing that "learning is the product of experience". More recent literature builds on this, with Nübler (2014)[52] arguing that "the productive system is a major site of learning" since the technologies and products produced determine the technical, organisational and practical knowledge that workers and firms develop. Furthermore, the OECD (2021) finds that companies are the main providers of reskilling and upskilling opportunities for employees, highlighting that workplace learning and practical experience are complements to formal education in building skills.[53]

The experience of China's EV and battery industries further illustrates this distinction: while access to foreign technology was important, China's leading firms also had to build the production expertise and industry knowledge required to compete at the global frontier. This finding is supported by Whitfield and Wuttke (2026),[54] who attribute the rise of BYD and CATL to firm-level capability accumulation, including early entry into lithium-ion battery technologies, as well as China's industrial policy, strategic planning and strategic partnerships with global incumbents. Both firms initially lacked the tacit knowledge embedded in incumbent automakers with decades of experience in vehicle design and systems integration. To close this gap, they formed partnerships with Western firms such as BMW and Daimler, which provided structured channels for learning about automotive standards and production processes, while simultaneously investing in domestic R&D, vertical integration and targeted recruitment from incumbent firms.

Europe today faces a similar challenge. While it possesses strong engineering capabilities and research capacity, it has struggled to translate these strengths into large-scale industrial deployment. The reliance on Chinese workers during the construction phase of battery plants in Europe (for more see page 27) highlights these gaps, and illustrates the need for greater learning-by-doing to build domestic manufacturing capabilities.[55]

50. ibid. (9, 45)
51. Arrow (1962) *The Economic Implications of Learning by Doing*
52. Nübler *A theory of capabilities for productive transformation: Learning to catch up*
53. OECD (2021) *Training in Enterprieses: New evidence from 100 case studies*
54. Whitfield and Wuttke (2026), *China's technological catch-up and leapfrogging in electric vehicles: A firm-level study of BYD and CATL*
55. Zajmi (2026) *Europe's battery ambitions struggling to gain industrial scale*

Continued

4. Data

The analysis in this report focuses on investment into Europe (defined as the EU27 countries plus Iceland, Norway, Switzerland and the UK) from China, Hong Kong,[56] Japan and South Korea. Data for China come from Fathom's proprietary Capital Flows Tracker, a verified deal-level dataset covering China and Hong Kong's mergers and acquisitions (M&A), as well as the setting up of new operations overseas or the expansion of existing foreign operations (greenfield investment). See Box 4 below for more information. Equivalent data for Japan and South Korea have been downloaded from fDi Markets and supplemented with publicly available information sourced by Fathom, where required, to validate sectoral classification and project characteristics. We also engaged with a range of industry experts throughout this project and convened a virtual webinar to discuss our preliminary findings. We are grateful for their input, however the conclusions presented in this report are solely those of the authors and do not necessarily reflect participants' views.

Each deal is recorded at announcement date, which forms the basis for all figures and charts presented in this report. However, we also track subsequent project milestones, including the start of construction and completion where available. This allows us to reflect how investments evolve over time, and to update reported investment values and jobs created as the project progresses, to ensure the most up-to-date information possible. All deal statuses are included except terminated transactions. Investment values are reported in US dollars, as is standard practice in internationally comparable investment datasets. We do not have equivalent euro value for individual deals; however, the total investment figure in the executive summary has been converted to euros using the average exchange rate for the year in which the investment was announced, to make the headline figure more accessible to European readers.

Box 4: Explaining Fathom's Capital Flows Tracker

Fathom's proprietary China Capital Flows Tracker sheds light on China and Hong Kong's true investment patterns and strategic motivations, at a time when China faces increased scrutiny over its overseas acquisitions. By reconciling a range of diverse datasets and performing a deal-by-deal verification process, it is the first and only curated and verified measure of China and Hong Kong's true financial footprint since 2005. By removing round-tripping (i.e., Chinese acquisitions of firms located outside China but that are ultimately owned by China) and accounting for pass-through (deals conducted via foreign acquirors), we identify the true origin and destination of investment.

The dataset disaggregates capital flows into M&A and greenfield investment. For each deal, a range of information is collected and verified by Fathom's team of economists, including company, sector, deal summary, status and value. Fathom uses cutting-edge techniques to estimate missing information such as deal size, where such information is not publicly available, and all information is fixed at the point-in-time of the transaction, with that information retained thereafter, regardless of subsequent mergers and acquisitions that take place. This helps avoid both over- and under-estimation of financial flows, including to and from strategic adversaries. Globally, the dataset currently holds over 29,000 deals with an investment value worth $4 trillion.

To subscribe to the tool, or for more information, please contact us here.

56. Since Hong Kong is often used as a conduit for Chinese capital, Hong Kong deals are included in this study, although they account for only a small share of Asian clean-tech investment in Europe. For simplicity, we refer to the combined total as China.

Continued

In this study, we focus on greenfield investment, for a few reasons:

- The policy debate on cleantech investment in Europe and the issue of technology transfer has focused predominantly on greenfield investment, where production, job creation and supply-chain integration effects are more directly observable
- The primary motivation for cross-border M&A is typically either to access or to *acquire* technology, while for this study we are interested in Asian firms *transferring* technology; to sense-check this hypothesis Fathom conducted a small case study analysing some of China's largest cleantech acquisitions in Europe, and did not find any evidence of the Chinese investor committing to transfer technology to the European target
- Globally, China's M&A activity has been on a declining trend, reducing its relative importance in overall investment flows; while greenfield investment has become more important, making up the majority of deals since 2023 both by number and by value

The graphic below summarises the five largest Asian cleantech projects by investment value announced in Europe since 2015.

Asia cleantech greenfield investment in Europe

Top five deals by deal value, 2015-2025

CATL 2022	**CATL** invested **$7.5 billion** to build a **100 GWh battery plant** in **Debrecen, Hungary.** The factory is expected to create **9000 jobs**; of the 1000 already created, **one third are Chinese**. CATL say this will fall to 10% as the plant matures. Reports suggest Hungary's government offered **€800 million in support**.
NISSAN 2022	**$2.5 billion investment** to expand existing facility in **Sunderland, UK**, to support two **new EV models, and fund R&D**. **Nissan** will contribute half, with the remainder from its battery supplier (expected to be China's AESC). **UK government support** is expected to be in the hundreds of millions.
CATL 2024	**$2.3 billion battery investment in Spain** with **Stellantis** (50:50 JV), creating **3000-4000 jobs**. There are reportedly **2000 Chinese workers building the plant**; CATL says the share will fall to 10% once operational. Stellantis received **€298mn in EU NextGeneration funding**. Production expected in late 2026.
CATL 2018	**$2.2bn battery production facility in Arnstadt, Germany**, opened in late 2022, creating roughly **2000 jobs. Includes** a testing centre and **joint R&D**. Supported by local government ($8.8m), the share of Chinese workers has reportedly fallen to 10% since completion.
CALB 2022	**$2.1 billion battery cell factory in Sines, Portugal.** Construction started in Feb 2025 and production expected in 2028. **€350 million** in Portuguese government incentives **and granted 'national interest' status**, accelerating build-out and grid connection. **1,800 jobs** expected, with 497 of those highly qualified.

Source: fDi Markets / Fathom Consulting

Significant effort has been made to screen the dataset and identify cleantech deals from China, Japan and South Korea into Europe that would be suitable candidates for technology transfer. The underlying source of greenfield data is not designed with sufficient granularity at the sector level to isolate greenfield investments directly in selected cleantech sectors. For example, automotive investments do not differentiate between internal combustion

Continued



engine (ICE) and electric vehicle (EV) production, while mining and metals classifications do not differentiate between transition-related materials and general extraction activity. To address this, a manual classification exercise was undertaken by Fathom to identify investments in the following clean-tech sectors: EVs; batteries (including battery recycling); wind turbines; and transition minerals (including mining, processing and recycling).

As a general principle, activities exclusively involved in battery production, such as cathode active materials (CAM), precursor materials (pCAM) and battery-grade copper foil, are classified under 'batteries'. By contrast, commodities with broader industrial applications (e.g. copper, silicon) are classified under 'transition minerals'.

Not all greenfield investment will be suitable or realistic for technology transfer. Our analysis therefore excludes projects where the likelihood of knowledge diffusion is limited, including investments such as sales offices, marketing hubs, showrooms, brand experience centres and maintenance-only facilities. Such investments, where clearly identified and stand-alone, were removed from the dataset used in the analysis presented in this report.

The final dataset is therefore restricted to investments that plausibly involve manufacturing production, engineering, R&D, assembly or operational activity, where the transfer or deployment of technical knowledge is most relevant and where Europe could reasonably expect capability-building that supports the ability to develop and produce these clean technologies domestically over time. No comparable dataset currently exists. By manually verifying, filtering and classifying investments at the deal level, we provide the first granular and reliable picture of Asian cleantech investment in Europe upon which policymaking can be based.

We consider investment by both deal value and number of deals, as value alone can be distorted by a small number of very large projects in a particular sector, country or year. Since policymakers are typically more focused on the scale of capital committed (and jobs created), the main discussion focuses on investment value, although in some instances both measures are referenced and included in the charts.

To identify whether technology transfer has happened, we assessed 25 of the largest Asian cleantech investments in Europe since 2015 (specifically the five largest investments in Hungary, Poland, UK, Spain and Germany – which are the five European countries that received the most Asian cleantech investment since 2015) using publicly available information including company announcements, government statements and media reports. We used these sources because deal-specific investment agreements and contractual commitments are generally not disclosed. We looked for explicit commitments to transfer technology, as well as factors which could indirectly support technology transfer, including local workforce training commitments, collaborations with local firms or universities, commitments to undertake R&D in the recipient country and whether or not investments were conducted via joint ventures with European companies. We complemented this with econometric analysis to assess whether total greenfield investment from China, Japan and South Korea crowd in domestic investment in Europe using gross fixed capital formation (GFCF) data for each European country from the World Bank. While we could not isolate an impact from cleantech investment due to a limited number of observations, the aggregate results are assumed to be broadly indicative of effects within the cleantech sector. Like elsewhere in this report, data on Chinese investment used for modelling purposes come from Fathom's proprietary Capital Flows Tracker, with equivalent data for Japan and South Korea sourced from fDi Markets.

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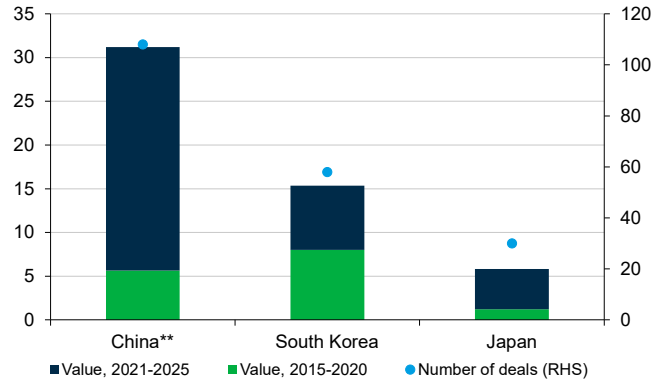
5. Key findings

Europe has become a key market for Asian cleantech investments

Since 2015, greenfield investments worth $52 billion from China, South Korea and Japan across 196 different cleantech projects have been announced in Europe, including 16 so-called mega projects where investments exceed $1 billion. Most (70%) of this investment has occurred in the past five years and is shown by the blue sections of the bars in the left-hand chart below. As the right-hand chart below shows, investments in batteries account for most of these deals, followed by investments in EV-related facilities.

Asia cleantech* greenfield investment in Europe

Value, USD billions, 2015 - 2025 — Number of deals

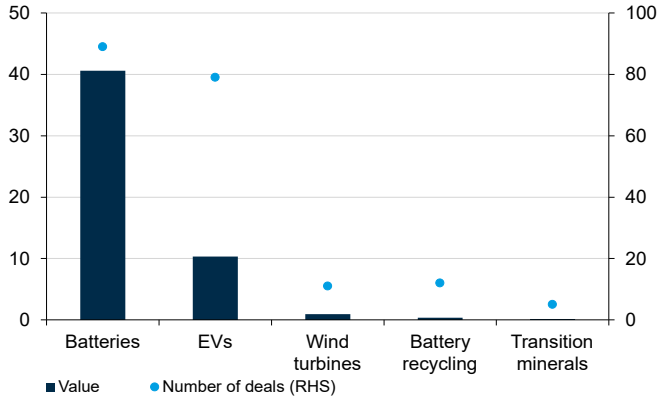


*Batteries, EVs, wind turbines and transition minerals
**Includes Hong Kong

Source: fDi Markets / Fathom Consulting

Asia* cleantech greenfield investment in Europe

Value, USD billions, 2015 - 2025 — Number of deals



*China, Hong Kong, Japan and South Korea

Source: fDi Markets / Fathom Consulting

Europe is especially important for China, which gives Europe leverage

Most of the investment described above comes from China. Inspecting our broader dataset, we see that investment into these cleantech sectors accounts for 50% and 55% of China and South Korea's total greenfield investment in Europe respectively between 2021 and 2025 (compared with just 9% for Japan). After China, Europe is the world's biggest EV market, making it an important export market and attractive investment destination, especially with growing barriers to the US market. In other words, with the US market increasingly closed to China, it would be hard for China to find a replacement to the EU. Not only that, but with China doubling down on an export-led growth model (its current account surplus was $730 billion last year, while its goods trade surplus exceeded $1 trillion) it has an increasingly large pool of foreign assets. With investment opportunities in the US narrowing due to ongoing political tensions, Chinese citizens and firms (whose actions are often state directed) have more assets and fewer attractive investment opportunities, meaning that they may be more incentivised to invest in Europe than many perceive.

But Asian cleantech FDI is only a small share of total FDI into Europe

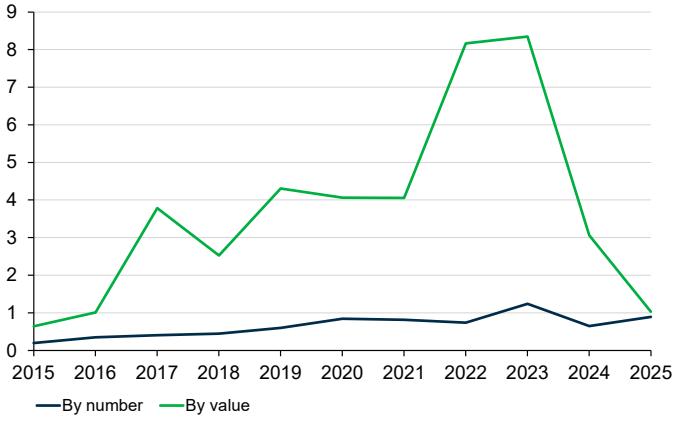
From Europe's perspective, these investments make up a relatively small share of total inbound greenfield investment: around 1% by number of deals and deal value in 2025, but down from a peak of more than 8%, by value, in 2022–23. It is likely that the timing of this surge reflected firms positioning themselves ahead of the EU's anti-subsidy investigation into Chinese EVs (September 2023) and the introduction of tariffs of up to 45% on Chinese EVs in October 2024 (compared with the standard EU car import tariff of 10%). Despite the tariffs, Chinese-branded EVs remain around 21% cheaper than their European counterparts, according to a recent report

Continued

by T&E.[57] If the IAA conditions are too stringent and materially reduce the attractiveness of investing in Europe, this would strengthen incentives for Chinese firms to access the European market by exporting to Europe (either from China or a third country) rather than by manufacturing in Europe. The objective should therefore be to maximise the value of investment without making European it so unattractive that firms choose to export to Europe instead. This risk should be considered alongside the EU's wider policy toolkit.

Asia* cleantech greenfield in Europe

Per cent of total cross-border greenfield in Europe



*China, Hong Kong, Japan and South Korea

Source: fDi Markets / Fathom Consulting

Investment announcements have peaked, while deals have become smaller

The charts below show that **the value of announced Asian cleantech deals into Europe has declined in recent years, driven by a fall-off in battery-related projects.** The value of EV-related investment announcements rose in 2025, but was still some way below its 2023 peak. Meanwhile, the total number of deals announced has also declined after peaking a few years ago, although the decline has been a lot less than when measured by value, indicating that the average size of deal announced has become smaller. The most plausible explanation for this is that battery demand is growing more slowly than expected, reducing the need for further investment; according to the IEA, EV battery demand in Europe stalled in 2024, while battery manufacturing capacity that was already operational or otherwise committed was almost sufficient to meet projected battery demand by 2030.[58]

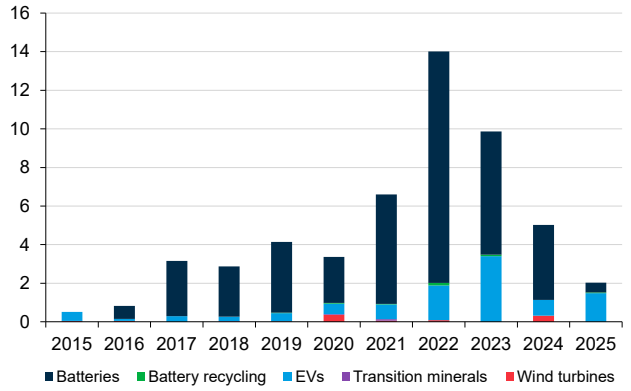
57. Transport & Environment (2026) *Are the EV tariffs working? Western carmakers shifted production to EU, but Chinese brands continue to grow – analysis*

58. IEA (2024) *Global EV Outlook 2024: Outlook for battery and energy demand*

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Asia* cleantech greenfield investment in Europe

USD, billions

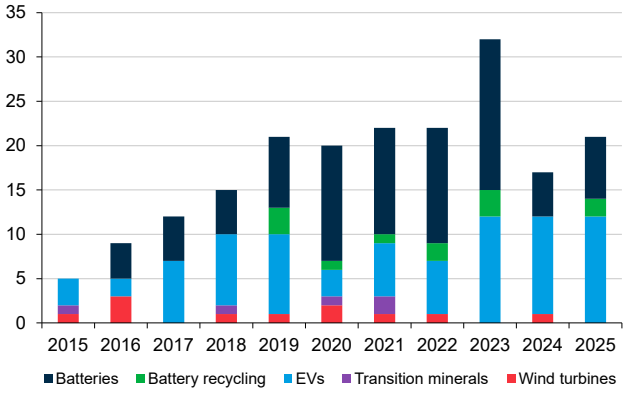


*China, Hong Kong, Japan and South Korea

Source: fDi Markets / Fathom Consulting

Asia* cleantech greenfield investment in Europe

Number of deals



*China, Hong Kong, Japan and South Korea

Source: fDi Markets / Fathom Consulting

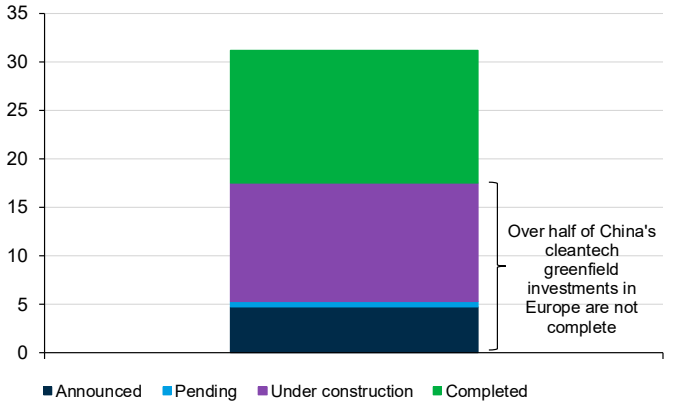
Construction is ongoing and so is the potential for capacity-building

Over half of the cleantech greenfield investments by China into Europe announced since 2015 have not yet been completed. Most are under construction, but in some cases, work has not yet started. This distinction is important. Announcements reflect investment intentions, whereas capability-building occurs during implementation. As highlighted in the literature review, worker mobility, supplier linkages ('backward spillovers') and learning-by-doing are key channels for knowledge diffusion. The construction, commissioning and scale-up phases are therefore critical, as firms recruit workers, embed production processes and develop local supplier relationships.

This implies that many projects remain at the stage in which their long-term impact can still be influenced by policy. European policymakers therefore retain leverage over a significant pipeline of investments that have not yet reached their most knowledge-intensive phase. That said, enforcing technology-transfer requirements retroactively on previously announced investments could be legally complex and difficult to implement in practice, but Europe should be able to change laws – for example, restrictions on foreign workers involved in construction projects – which would be applicable to pre-existing contracts.

China* cleantech greenfield investment in Europe

Value, USD billions, 2015 - 2025



*Includes Hong Kong

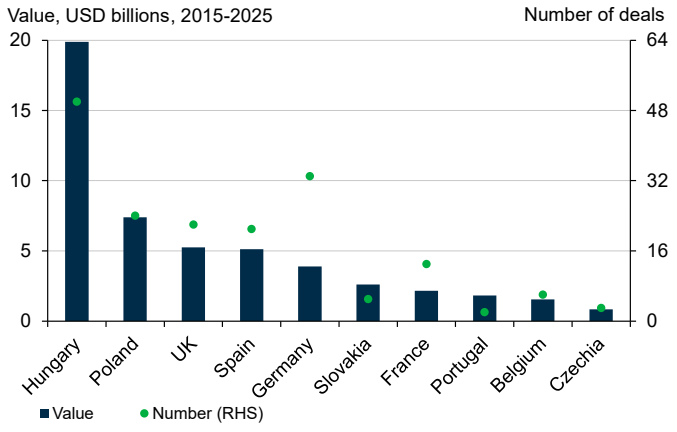
Source: fDi Markets / Fathom Consulting

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Location choices do not reflect ‘regulatory arbitrage’

With the lack of a harmonised European investment screening programme and many cleantech greenfield investments taking place in Hungary, it has been suggested that Asian investors may have been homing in on countries with weaker regulations and less stringent screening frameworks, indulging in so-called ‘regulatory arbitrage’. It is true that Asian cleantech investment into Europe has been concentrated, with 80% of all clean-tech investments announced since 2015 focused on just five recipient countries: Hungary, Poland, UK, Spain and Germany. After closer inspection, however, we find little evidence that Asian cleantech investment is driven by such behaviour. For example, three of the top five recipients (Hungary, Spain and the UK) have formal powers in place to screen inbound greenfield investments, while most other European countries do not. Even so, greenfield investment faces much less scrutiny than M&A activity in these countries.[59]

Asia* cleantech greenfield investment in Europe



*China, Hong Kong, Japan and South Korea
Chart shows top ten destinations in Europe, by value

Source: fDi Markets / Fathom Consulting

Instead, they seem to be driven by competitive advantages

Investment location decisions seem to be driven less by regulation and more by factors including market size, labour costs and automotive and cleantech specialisation. For example, Hungary and Poland are attractive destinations for battery and EV manufacturing plants as they combine lower labour costs (reflected in the table by lower ranks on GDP per capita) with specialisations in batteries and EV manufacturing. By contrast, despite hosting Europe’s largest automotive industry, Germany ranks only fifth by investment value, while Czechia and France are lower than one might think based on their auto manufacturing employment, and in Czechia’s case high comparative advantages in battery and EV production and exports.

59. The UK, for example, does not require mandatory filing for standard greenfield investments, but authorities can 'call in' or scrutinise any transactions if they suspect they pose a risk to national security. In contrast, greenfield investments are not screened in Poland and are, in principle, also outside the scope of German FDI screening.

Continued

Battery and EV specialisation, ranking in Europe*										
	Hungary	Poland	UK	Spain	Germany	Slovakia	Portugal	France	Belgium	Czechia
Battery RCA**	1	2	22	12	7	8	17	16	11	3
EV RCA**	4	15	8	6	3	1	19	11	5	2
Automotive manufacturing employment	9	2	8	7	1	11	12	3	14	4
GDP per capita	29	25	12	18	11	24	23	14	10	20

*Table shows the top ten recipients of Asian cleantech greenfield investment in Europe since 2015, ranked by investment value. RCAs and GDP per capita (used as a proxy for wages) rankings are based on the 31 European countries in our sample. Automotive employment rankings are based on the EU27 plus the UK due to data availability.

**Revealed comparative advantage (RCA)

Source: ACEA / ONS / LSEG Datastream / Fathom Consulting

No explicit evidence of technology transfer to Europe

Based on our assessment of 25 of the largest Asian cleantech investments in Europe (i.e. the five largest deals in the five largest recipients) **we found no explicit commitment to transfer intellectual property to Europe.** This is not entirely surprising, since until now there has been no legal requirement to transfer technology, or any commercial incentive for firms to transfer technology beyond what is necessary for the efficient operation of their European operations.

Broader conditions for European capacity building appear limited too

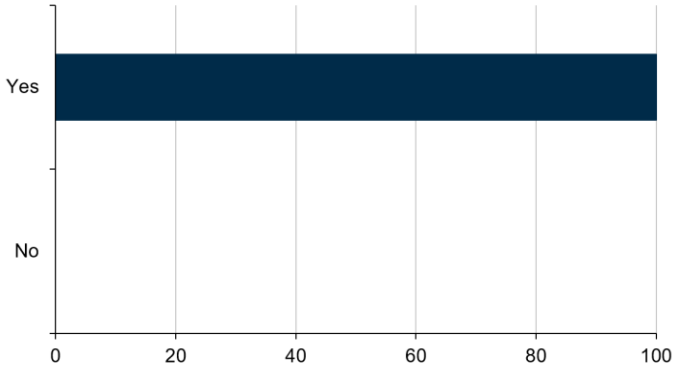
Our assessment found that roughly half of these 25 projects include commitments by the foreign investor to train local workers or collaborate with domestic firms and universities. Such commitments sound good to recipient communities and European policymakers, but they are typically vague and inherently difficult to verify and enforce once investment decisions have been made, limiting their scope for technology transfer. We also found that l**ess than 30% of these projects involve a commitment to undertake R&D activity in Europe and fewer than 10% are structured as a joint venture with European partners.** These findings are consistent with analysis by industry experts, including T&E which examined technology transfer provisions in two Chinese-EU battery partnerships and found no evidence of comprehensive technology transfer. [60] As part of our study, we consulted more than a dozen stakeholders including government officials responsible for investment screening and think tanks, who unanimously agreed with our preliminary finding that no technology transfer from Asia to Europe was happening in the cleantech sector.

60. ibid (10, 11, 19)

Continued

We found little evidence of technology transfer from Asia to Europe. Do you agree with this finding?

Per cent of respondents



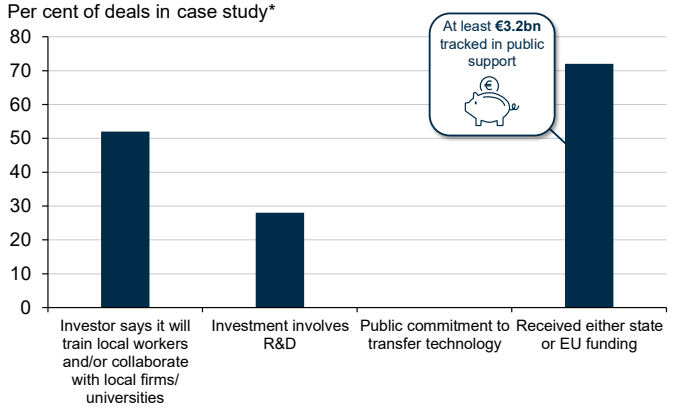
Source: Fathom Consulting

A good use of taxpayer funds?

Despite the vagueness of the commitments and the limited scope for technology transfer to happen, across this subset of 25 projects, over 70% of projects received public support (totalling at least €3.2 billion). This raises questions about the scale of benefits accruing to host economies relative to the incentives offered to foreign investors.

Is Europe benefiting from this investment?

Per cent of deals in case study*



*Top five deals since 2015 in each of Asia's top five European destinations for cleantech greenfield investment (Hungary, Poland, UK, Spain and Germany)

Source: fDi Markets / Fathom Consulting

Foreign worker involvement reduces scope for technology transfer

Some foreign worker involvement is inevitable and necessary when a foreign investor sets up a manufacturing facility in a new country. However, the high number of foreign workers involved in setting up operations in Europe, especially on Chinese investment projects, reduces the scope for European workers to learn the skills needed for Europe to develop self-sufficiency in manufacturing these technologies competitively. For example, **around a third of the 1,000 jobs created by CATL's announced investment in Hungary in 2022 have been filled by Chinese workers. CATL's Spanish facility has also attracted scrutiny, following reports that around 2,000 Chinese**

Continued

workers would be flown in to build the plant. One Stellantis employee commented: "I don't think CATL want to give us the knowledge to set up a battery factory."[61]

CATL argues that this is temporary, and points to its German battery plant – where production began in 2022 and around 90% of the workforce is now local – as evidence that operations are eventually localised. However, **local involvement during the construction, installation and commissioning phases is arguably just as important as once the plant is operational, since these stages provide opportunities for the learning-by-doing and capability-building needed if Europe is to develop greater long-term self-sufficiency in cleantech manufacturing.** This matters because Europe's stated policy objective is not simply to host production facilities in Europe, but to develop the capability to build and operate them independently over time.

Technology might be flowing the wrong way

Germany is the fifth top destination in Europe for Asian cleantech investment when measured by deal value, but it ranks second by deal number. (For more, see the chart on page 25). This discrepancy reflects a divergence in the type of investment being undertaken by Asian, and especially Chinese, firms in Germany: **approximately 40% of investments announced in Germany involve research and development (R&D) activities, compared to just 10% in the rest of Europe**. Moreover, roughly three-quarters of the deals in Germany originate from Chinese firms. R&D investments are typically smaller in value than manufacturing investments.

This pattern raises an important question for policymakers about the direction of knowledge flows: R&D activity located in Germany may reflect Chinese firms seeking access to specialised engineering expertise, automotive know-how and understanding of the local regulatory system, rather than an opportunity for Europe to learn from Chinese firms. This hypothesis is supported by deal-level evidence including Li Auto's German R&D investment, which, according to Chinese media will help the company "gain insights into the European market and establish development and testing capabilities based on European automotive regulations". Previous Fathom analysis explains how knowledge acquisition is a core part of China's international investment strategy and has identified Germany as the top destination for China's acquisitions in the automotive sector for this reason (for more see Box 1 on page 9).[62]

The IAA is no silver bullet

The IAA is likely to prove a positive step. It holds the potential for Europe to develop more effective and harmonised investment screening across member states and to attach conditions to investments that meet these screening criteria; and these changes should support technology transfer to take place. The policy is not a silver bullet, however. One potential obstacle is that China's Regulation on Overseas Investment (Decree No. 837), issued on 1 July 2026, "prohibits Chinese entities from exporting or transferring restricted technology via technical training, cross-border staffing or remote technical assistance".[63] A second is that investment in the selected sectors seems already to have peaked, and the conditions imposed may deter further investment. A third reason for caution is that the minimum value threshold of €100 million for deals to fall within the scope of the IAA means that potentially three-quarters of Chinese cleantech greenfield projects will not be covered by the regulation, either because no investment value is reported or because the investment value falls below the threshold.

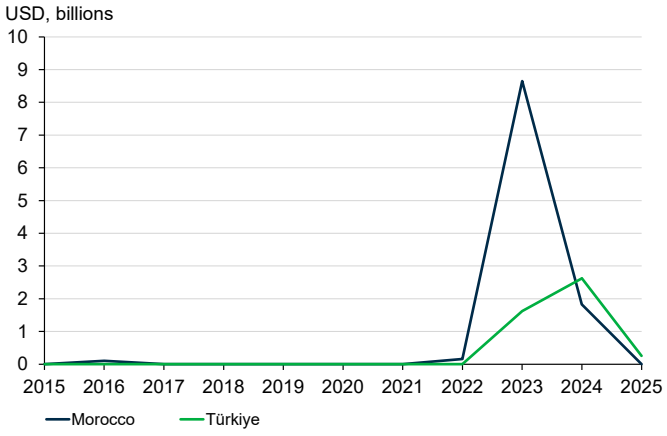
61. ibid. (45)
62. Zhang (2025), *'Li Auto opens its first overseas R&D center in Germany'*
63. ibid. (26)

Continued

IAA workarounds undermine Europe's self-sufficiency drive

Another critical problem is that **there are currently no provisions in place to prevent Chinese firms from producing batteries or EVs in countries like Morocco or Türkiye and exporting them to Europe.** These countries have preferential access to the EU market, including tariff-free trade in most industrial goods, as well as geographic proximity and cheaper labour costs, creating an incentive for foreign investors to locate production there and export to Europe. For Chinese investors, these incentives are bolstered by the IAA as it means they will have fewer investment restrictions and less pressure to share their technology with third parties than they would if they invested in Europe. Furthermore, the cost advantage enjoyed by Chinese producers means that, even at current tariff rates, manufacturing in China and exporting directly to Europe can be cheaper than producing equivalent goods within Europe. These workarounds undermine Europe's efforts to support investment, create jobs and develop autonomy; if it loses jobs as a result, Europe will retreat even further away from self-sufficiency in these technologies. Cleantech investment into Morocco and Türkiye from China in particular has surged in recent years.

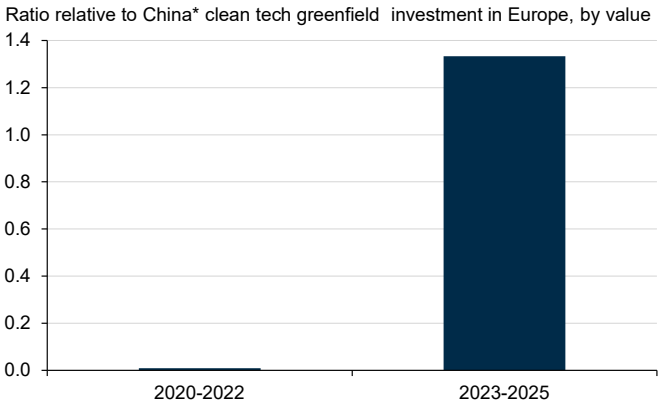
China* cleantech greenfield investment



*Includes Hong Kong

Source: fDi Markets / Fathom Consulting

China* cleantech greenfield investment in Morocco and Türkiye



*Includes Hong Kong

Source: fDi Markets / Fathom Consulting

Chinese investment delivers fewer benefits

One of the controversies surrounding the IAA is that it effectively targets China without explicitly naming it. China has criticised the proposal as discriminatory and contrary to market principles. Supporters of the IAA argue that this is justified by China's extensive use of industrial subsidies and other non-market interventions, which have distorted competition in global cleantech markets. Our analysis finds that **Chinese investments are often associated with practices that are less conducive to technology transfer and European capacity building than investments from South Korea and Japan, and additionally that Chinese investments are more likely to crowd out domestic investment** in Europe. This could justify the effective targeting of China in the IAA, and is supported by evidence including:

1. **Anecdotal reports and deal-level analysis by Fathom.** Numerous reports document that Chinese investments in Europe use a large number of Chinese workers, especially in the construction phase, which limits the capacity of European workers to develop the skills needed for Europe to achieve self-sufficiency in these technologies[64]. We found no comparable evidence of widespread concerns about the use of Japanese or South Korean workers. Furthermore, our own analysis of the 25 largest Asian cleantech

64. ibid. (45, 60)

Continued



investments in Europe **found evidence that investments from South Korea and Japan may be more conducive to technology transfer**. For example, Nissan's (Japan) $2.5 billion investment in Sunderland includes plans for the UK team to design, engineer and manufacture two new EV models, creating opportunities for technology and skills transfer. Another example is documented in a T&E study, which contrasted CATL's (China) battery plant in Hungary with LG's (South Korea) investment in Poland and found that the latter was more conducive to technology transfer through R&D initiatives like the Electromobility Research Center.

2. **Fathom modelling suggests Chinese greenfield investment crowds out domestic investment in Europe, unlike investments from the rest of the world.** There was clear statistical evidence that greenfield investments from China are less beneficial to Europe than investments from the rest of the world in the long run, which was not the case for investments from South Korea or Japan. For a more detailed explanation of this analysis and results, see Box 5 that follows.

Box 5: Chinese investment less conducive to technology transfer

The analysis in the previous section identifies the trends in Asian cleantech investment in Europe and whether we have found evidence of formal technology transfer linked to these investments. What it cannot tell us is whether:

a) increased greenfield investment crowds in domestic investment, and by extension, whether it creates the conditions for European capacity building and technology transfer to occur over time

b) if those benefits do exist, whether they vary dependent on the origin of those funds

The distinction in point b) matters for industrial policy. If all greenfield investment contributes equally to Europe's productive capacity, policymakers should focus primarily on attracting more of it, irrespective of where it comes from. If, however, the economic effects differ depending on the source of investment, then the design of investment policy – including any conditions attached to it – becomes important.

To examine this question, we modelled the impact of greenfield investment from various source countries on European gross fixed capital formation (GFCF). Put simply, GFCF captures spending on fixed assets such as factories, infrastructure and machinery that expand an economy's productive capacity. Inbound greenfield investment contributes directly to GFCF because new factories and production facilities require physical capital to be built. It can generate wider economic benefits too, if it encourages greater domestic investment ('crowding in'), but may have little net effect if it displaces domestic investment that would otherwise have taken place ('crowding out'). Understanding which effect dominates is key to assessing the long-term impact of inward investment on Europe's economy.

The results from this modelling are as follows:

- in line with a) above, there is evidence that increased greenfield investment crowds in domestic investment in both the short and long run
- With regards to b) above, there is some evidence that these effects vary dependent on the origin of those funds:
    - We cannot reject that greenfield investment from **Japan** or **South Korea** has the same impact on European GFCF as greenfield investment from the rest of the world

Continued

- By contrast, **Chinese greenfield investment** appears to have a **weaker (and possibly even negative) impact** on GFCF in the long run

- While we could not isolate cleantech investment due to a limited number of observations, the aggregate results are assumed to be broadly indicative of effects within the cleantech sector

To illustrate the economic implications of these differences, we modelled a scenario in which total inbound greenfield investment into Europe increases by 10% ($31 billion) in 2026 and remains elevated through to 2030.

If this additional investment comes from the rest of the world, it raises European annual GFCF by around 0.3% ($13.7 billion) in the first year and 1.5% ($68 billion) by 2030 – a crowding-in ratio of roughly 1:1, and a net positive contribution to GDP (reflected in the green line in the chart below).[65]

If we rerun that same exercise but instead assume that the $31 billion increase in greenfield investment came exclusively from China, then the central estimate from Fathom's model implies more than one-for-one crowding-out (i.e., that any increase in Chinese greenfield investment is more than offset by weaker domestic investment elsewhere). However, the confidence band around this estimate is wide, and we cannot confidently reject the alternative that Chinese investment simply displaces domestic investment one-for-one, leaving total GFCF unchanged.

Technical details of the model specification and results are provided in Appendix 1.

Impact of a 10% increase in total inbound greenfield investment to Europe on European GFCF*

Percentage changes

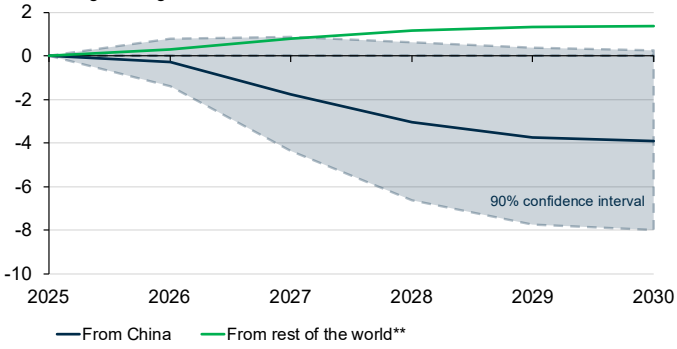


*Chart shows the impact of the same dollar increase in investment based on the source it is coming from
**Excludes intra-European greenfield investment, as well as investment from China, Japan and South Korea

Source: Fathom Consulting

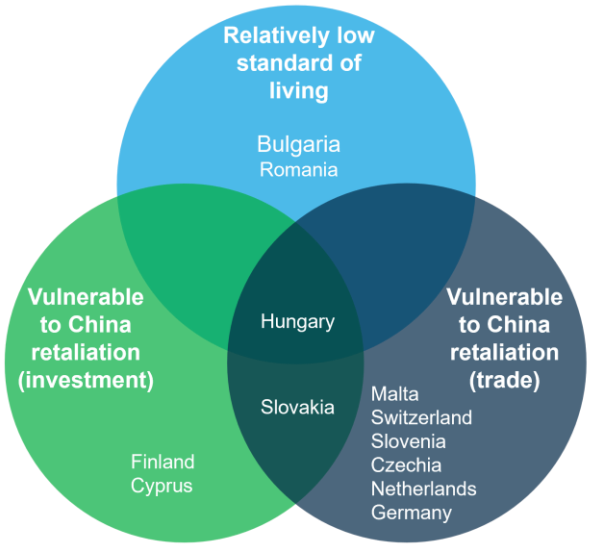
65. Measured in 2015 prices

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Chinese retaliation will hurt some member states more than others

Opposition within Europe to the IAA is likely to come from countries with the most to lose from Chinese retaliation or from reduced inward greenfield investment. Germany has already expressed concerns that a robust 'Made in Europe' strategy could provoke retaliation against its export-oriented manufacturing model, particularly given the importance of the Chinese market for its automotive sector.[66] Fathom's analysis suggests that Hungary is the most exposed country (illustrated in the diagram below), given its dependence on existing Chinese investment and trade with China, and its strong need for more inward investment to support growth and jobs as a relatively poorer European economy. More broadly, countries that face disproportionately high adjustment costs may require European financial support or alternative investment sources if political support for the IAA is to be maintained.

A framework for identifying which countries may get hurt



How the different bubbles are defined:

- A country is vulnerable to Chinese investment retaliation if its average z-score across two metrics – 'Chinese greenfield investment as a share of GDP' and 'Chinese greenfield investment as a share of total inbound greenfield investment' (implying fewer alternative sources of investment are available) – is at least 0.3, meaning its dependence on China is materially above the European average.
- A country is vulnerable to Chinese trade retaliation if its average z-score across two metrics – 'exports to China' and 'imports from China' (both as a share of GDP) – is at least 0.3, meaning its dependence on China is materially above the European average.
- A country has a relatively low standard of living if its GDP per capita falls within the bottom 10% of European countries in our sample

Source: Fathom Consulting

66. The Guardian (2026) *The Guardian view on Volkswagen's crisis: another wake-up call for Germany and the EU*

Continued

6. Policy recommendations

1) **Tighten European investment screening rules**
2) **Ensure that the IAA is mandatory and Europe-wide**
3) **Limit the IAA workarounds for Chinese firms**
4) **Welcome cleantech FDI from Japan and South Korea**
5) **Restrict the use of foreign workers to encourage learning-by-doing**
6) **Expand the sectors covered by the IAA**
7) **Prohibit foreign-imposed restrictions on licensing agreements**

1) Tighten European investment screening rules

The lack of a clear, mandatory and harmonised investment screening process across Europe opens the door to foreign investors to engage in 'regulatory arbitrage' and undermine European policy objectives. To prevent this, screening should be standardised and mandatory across all European countries. Fathom's discussions with EU policymakers responsible for investment screening highlighted that existing screening regimes are primarily designed to address national security and public order considerations, rather than to pursue industrial policy objectives such as technology transfer or capability-building. Rules also typically cover M&A only, rather than greenfield investments. With investment screening now being used as an industrial policy tool through the IAA, screening policies should include greenfield, especially since greenfield projects have long accounted for most Chinese investment in the EU, unlike in other regions where this trend is more recent.

2) Ensure that the IAA is mandatory and Europe-wide

For the same reasons stated above, it is important that the proposed IAA is turned into legislation quickly and applies to all European countries to ensure that the policy is effective. Spain is a case in point: while actively courting Chinese investment, it is also pushing for tough EU-wide rules to ensure that member states can compete for investment without undermining each other through weaker conditions[67]. Common EU-wide rules would also reduce the scope for investment to become a source of political leverage. For example, Spanish Prime Minister Pedro Sánchez called on the European Commission to "reconsider" tariffs on Chinese EVs in September 2024, around the same time that Envision Energy announced plans to invest $1 billion in a green-hydrogen industrial park in Spain[68]. The IAA is currently in a proposal stage and is being reviewed by the European Parliament's Committees on ITRE (Industry, Research and Energy), IMCO (Internal Market and Consumer Protection), and INTA (International Trade), with the Parliament's first-reading vote provisionally scheduled for 14 December 2026.

67. Reuters (2026) *Spain courts Chinese firms but looks to EU for ground rules*
68. Reuters (2024) *Spanish PM urges EU to reconsider tariffs on Chinese EVs*

Continued

Given the subsequent negotiations and formal adoption process, the legislation is therefore unlikely to enter into force before 2027.[69]

3) Limit the IAA workarounds for Chinese firms

The provisions in the IAA which place conditions on Chinese investment will incentivise China to invest in countries that have tariff-free access to Europe and where such conditions are not in place. It will be important to ensure that such workarounds are disincentivised – for example, by insisting that trading partners place similar conditions on Chinese investment in the sectors in question and making tariff-free access to Europe conditional on this; increasing import tariffs on cleantech goods exported to Europe directly from China; or bolstering local content requirements. Otherwise, the IAA could ultimately reduce investment and employment in Europe, lead to more imports of these technologies and undermine its goal of creating strategic autonomy in these sectors. Facing a similar issue, the US is preparing legislation to prohibit the import of Mexican-made, but Chinese-owned, automobiles altogether.[70] That Chinese cleantech greenfield investment announcements in Morocco and Türkiye have exceeded those in the *whole* of Europe (the EU27 plus Iceland, Norway, Switzerland and the UK) over the last three years should serve as a warning sign.

4) Welcome cleantech FDI from Japan and South Korea

The failure of battery maker Northvolt and the struggles of Europe's automotive sector highlight how the continent needs access to cutting-edge clean technologies to bolster its manufacturing capability. It should therefore welcome manufacturing investment from the leading nations in these sectors, especially if the IAA disincentivises such investments from China. We did not identify widespread concerns that Japanese or South Korean firms use practices that reduce the scope for technology transfer, including use of foreign workers, unlike China. Moreover, while there was clear statistical evidence that greenfield investments from China are less beneficial to Europe than investments from the rest of the world in the long run, this was not the case for investments from South Korea or Japan. Both countries are market economies and political allies of the EU, which should make it easier to negotiate arrangements which promote the transfer of technology.

5) Restrict the use of foreign workers to encourage learning-by-doing

There are widespread criticisms across many countries that China's use of its own workforce when investing reduces the economic benefits to the recipient country. One reason for this is that it limits the learning-by-doing and capacity-building of the domestic workforce. The academic literature highlights that this is an important way through which technology transfer occurs, especially in the construction phase of projects. If Europe wants to develop self-sufficiency, it should therefore limit the number of foreign workers involved in the construction of these projects. One of the six provisions in the IAA says that at least 50% of the workforce employed in the context of the investment shall be made up of EU workers across all categories of the workforce.

While some foreign worker involvement is inevitable and can be necessary when a foreign investor sets up a manufacturing facility in a new country, Fathom believes the 50% threshold is too low to ensure meaningful technology and skills transfer; instead, it should be more than 80%. We recognise that some flexibility may be needed for highly specialised roles where the necessary expertise is not yet available within the EU. Europe could draw on the precedent of Canada's Labour Market Impact Assessment (LMIA) system, requiring foreign investors to demonstrate that suitably qualified European workers are not available before recruiting from abroad. Crucially,

68. Legislative Observatory European Parliament (2026) *Acceleration of industrial capacity and decarbonisation in strategic sectors (Industrial Accelerator Act)*

69. US Congress (2026) *H.R. 9162: Protecting America from Chinese Cars Act of 2026*

Continued

the requirement should apply specifically from the beginning of the project, including in the construction phase, rather than simply once production begins. Labour laws could be altered so that these limits apply to already-announced projects where construction has not yet begun or is still ongoing, as is the case for a substantial share of China's cleantech investments in Europe.

6) Expand the sectors covered by the IAA

The cleantech sectors covered by the IAA are ones where Europe has already ceded leadership to Asian rivals. To avoid being in a similar situation over other industries in future, policymakers should consider expanding the sectors covered by the IAA to include electrolysers, fuel cells, battery-electric aircraft, hydrogen-powered aircraft, low-carbon fuels, small modular reactors, wind turbines and other clean technologies. European policy should be proactive, not reactive. Maintaining technological leadership, both in cleantech and other sectors, is another reason that inbound investment screening rules should be bolstered and harmonised.

7) Prohibit foreign-imposed restrictions on licensing agreements

Anecdotal evidence, including discussions with US policymakers responsible for investment screening, suggest that the Ford-CATL licensing agreement is not a desirable model to follow, despite what some of its European proponents suggest. Fathom was told that many of the provisions in this contract limit the benefits to the licensee and recipient country, including restrictions on the future use of the technology and requirements to have Chinese CATL personnel on site. Whether true or not, Europe should limit the potential for such stringent conditions to be attached to licensing agreements, especially as this is one of the six requirements included in the IAA. Licensing agreements should only be considered to meet the IAA's conditions where they allow the licensee to use the technology freely within the EU now and in future (including across different vehicle models and production plants) and do not require foreign personnel to remain onsite indefinitely. In addition, an acceptable license agreement should include a commitment to train local staff, with a clear timeframe and the ability to be verified by a European authority or independent auditor.

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Appendix 1: model explanation and specification

Motivation

Beyond direct technology transfer from Asian clean-tech greenfield investment into Europe (for which, as outlined in this report, we found limited evidence) we also examined a second channel: whether greenfield investment stimulates domestic investment, and by extension whether it creates the conditions for European capacity building and technology transfer over time. The logic is that a rise in domestic investment alongside greenfield FDI would signal that these enabling conditions are falling into place. As the report's literature review and analysis both show, capacity building and technology transfer occur primarily through learning-by-doing and the backward integration of supply chains. Therefore, a positive domestic investment response is a reasonable proxy for whether that process has room to start.

Methodology

To test this, we used a quantitative approach to examine whether greenfield investment from China, South Korea and Japan affects European domestic fixed investment (GFCF) and whether that effect differs from other sources of investment – i.e. from Europe and the rest of the world. Specifically, we used a country-level pooled error-correction model (ECM), which allows us to distinguish between the immediate and long-term effects of changes in greenfield investment on domestic fixed capital formation, capturing both the short-term boost associated with new investment and whether those effects are sustained over time.[71] Like elsewhere in this report, data on Chinese investment come from Fathom's proprietary Capital Flows Tracker, with equivalent data for Japan and South Korea sourced from fDi Markets. GFCF data are from the World Bank. We base the analysis on all greenfield investment rather than cleantech-specific greenfield investment alone, as restricting the sample to cleantech flows would leave too few observations per country to support robust estimation. This appendix sets out the technical specification behind the model and discusses the results in more detail. The regression outputs are presented in the table below.

71. A dummy variable is also included to control for the 2020 COVID-19 pandemic.

Continued

Impact on European gross fixed capital formation (GFCF)			
Dependent variable: $\Delta Log(GFCF_t)$			
Variable*	Coefficient	t-Statistic	p-Value
$\Delta Log(GFCF_{t-1})$	0.356	8.945	0.000
$\Delta Log(\text{greenfield investment from Europe}_t)$	0.024	3.808	0.000
$\Delta Log(\text{greenfield investment from rest of the world}_t)$	0.012	2.752	0.006
$\Delta Log(\text{greenfield investment from Japan}_t)$	0.006	1.855	0.064
$\Delta Log(\text{greenfield investment from South Korea}_t)$	0.005	1.436	0.152
$\Delta Log(\text{greenfield investment from China}_t)$	-0.001	-0.416	0.678
$Log(GFCF_{t-1})$	-0.409	-13.557	0.000
$Log(\text{greenfield investment from Europe}_{t-1})$	0.038	4.387	0.000
$Log(\text{greenfield investment from rest of the world}_{t-1})$	0.021	3.157	0.002
$Log(\text{greenfield investment from South Korea}_{t-1})$	0.007	1.397	0.163
$Log(\text{greenfield investment from Japan}_{t-1})$	0.001	0.191	0.849
$Log(\text{greenfield investment from China}_{t-1})$	-0.006	-1.544	0.123
Covid dummy_t	-0.055	-3.161	0.002

Total pool (balanced) observations: 558
Adjusted R-squared: 0.31
*Country-level constant terms and trends were also used

Source: Fathom Consulting

Rows two to six in the table above capture the short-run effects of changes in inbound greenfield investment on GFCF. The coefficients in these rows can be interpreted, for example, as follows: a 10-percentage-point increase in intra-European greenfield investment growth would be expected to raise GFCF growth by 0.24 percentage points (10 * 0.024).

The next six rows collectively capture the long-run relationship through the lagged levels of these variables. The coefficient on the lagged log of GFCF (row seven) is known as the speed of adjustment coefficient, and reflects the rate at which GFCF will 'correct' towards its implied long-run equilibrium. Its value reported in the table below suggests that over 40% of the disequilibrium reported at time t will be eroded by time $t-1$, absent any additional shocks. Meanwhile, the long-run relationship between the level of European GFCF and the levels of inbound greenfield investment can be derived by dividing the coefficients (rows eight through twelve) by the negative of the coefficient on the lagged log of GFCF (row seven). For example, a 10 per cent increase in intra-European greenfield investment would be expected to raise the level of GFCF by 0.9 per cent (10 * 0.038 / -(-0.409)).

Economists use statistical significance tests to assess whether an estimated relationship is likely to reflect a real pattern in the data (i.e., how confidently we can distinguish the estimated effect from zero). Statistical significance is typically assessed using a **p-Value** or **confidence interval**; in the table above, coefficients are considered significant where p-Value (column four) is less than 0.10.

Hypothesis testing

In line with the hypotheses flagged in Box 5, we first tested whether increased greenfield investment crowds in domestic investment in both the short and long run. We find positive and statistically significant effects for both inter-European investment and investment from the rest of the world, suggesting that these investments are associated with higher levels of European GFCF (rows two, three, eight and nine in the table above).

Continued

Second, we then tested whether the effects of investment from Japan and South Korea differ from those of inter-European investment or investment from the rest of the world. Using a Wald test, which tests whether two or more regression coefficients are statistically different from each other, we did not find sufficient evidence to reject the hypothesis that Japanese or South Korean greenfield investment has a different impact on European GFCF.

The results are different for **Chinese greenfield investment**. Its estimated effect on European GFCF is weaker – and potentially negative – in both the short and long run (represented by the negative coefficients in rows six and twelve in the table above). The Wald test indicated that the effect of Chinese investment is statistically different from that of both intra-European investment and investment from the rest of the world, suggesting that Chinese greenfield investment may be less effective at crowding in domestic investment.

The negative coefficients on Chinese greenfield investment are not statistically significant (both p-Values are above 0.1). This means we cannot rule out the possibility that Chinese investment simply displaces domestic investment one-for-one, leaving total GFCF unchanged.

Could crowding in be proof of technology transfer?

The model does not seek to evaluate why non-Chinese greenfield investment crowds in domestic investment, but it could be consistent with the narrative of technology transfer. In particular, we point to two key channels for this:

1. **Productivity/knowledge spillovers:** Investment from overseas enables firms and workers to learn new technologies and production practices that can subsequently be applied elsewhere in the economy – consistent with the technology-transfer and learning-by-doing literature outlined in this report
2. **Direct capital accumulation:** If local suppliers are being drawn in to meet the requirements of new investment we would expect this to show up as additional domestic investment beyond the footprint of the foreign investment itself

Importantly, our finding that Chinese investment does not crowd in domestic investment in Europe, implies that it is less conducive to support European capacity building and technology transfer than investment from other sources. This is consistent with the findings presented elsewhere in this report, which suggest that Chinese investment is often associated with practices that are less conducive to technology transfer.

Considering China

Finally, we also re-estimated the model with China as the recipient country to assess whether China's economy benefits from greenfield investment from Europe. Here we found no evidence that the effect of inbound greenfield investment on Chinese GFCF differs significantly from the effect observed in Europe — consistent with foreign greenfield investment making a positive contribution to China's GFCF. This test has less statistical power: annual data are only available from 2005 (a period that postdates China's formal 'quid pro quo' technology-transfer policy) and many Western firms invested in China well before this window.

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About the authors of this report

Fathom Consulting is an independent consultancy based in London specialising in the intersection between macroeconomics, financial markets and geopolitics. We have advised policymakers in different countries on various climate-related topics and China's overseas financial footprint for many years. We engaged with a range of industry experts throughout this project and convened a virtual webinar to share and discuss our preliminary findings. We are grateful for their input, however the conclusions presented in this report are solely those of the authors and do not necessarily reflect the views of participants. We look forward to continued engagement with policymakers and stakeholders on this important topic.



Erik Britton, CEO

Erik is responsible for designing and implementing the company's strategy, for guiding its research, and for leading major projects in macro, finance and geopolitical analysis.

Prior to joining Fathom in 2007, Erik was a director at another leading economic consultancy and ran the Bank of England's UK macro model.

Brian Davidson, Director of Macroeconomic Forecasting and Energy



Brian joined Fathom Consulting in 2016 as the firm's US economist. He is now a Partner and recently assumed the role of Director of Macroeconomic Forecasting and Energy where he continues to work with clients in the aerospace sector and those interested in the geopolitics of the energy transition.

Prior to Fathom, Brian worked for a decade in financial markets, including economic analysis, financial model development, investment strategy, credit and equity.



Ellen Ó Fríl, Economist

Ellen contributes to various research and bespoke consultancy projects including managing Fathom's Capital Flows Tracker, a verified measure of Chinese outbound investment. She is a subject-matter expert in M&A, greenfield and venture capital activity.

Ellen joined Fathom on a year-long placement from August 2020 to 2021 and returned in September 2022 after graduating from the University of Bath with a first-class Economics degree.

Vijay Krishnan, Economist



Vijay is an Economist at Fathom Consulting. He works primarily on climate-related consultancy projects. He also contributes to Fathom's research output, specifically working on update notes about the UK's macroeconomic environment.

Vijay joined Fathom in 2024, after completing an MSc. in Economics for Development at the University of Oxford.

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Fathom Consulting
47 Bevenden Street
London
N1 6BH
Tel: +44 (0)20 7796 9561

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