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Industrial Policy in the UK

Andrew Hodge and Samuel Pienknagura

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Industrial Policy in the UK
Prepared by Andrew Hodge (EUR) and Samuel Pienknagura (RES)

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ABSTRACT: A key challenge facing the UK is to increase growth, which has slowed down markedly since the Global Financial Crisis. As part of the government’s approach to this challenge, a new industrial strategy was published in June 2025. This paper discusses how to get the implementation of UK Industrial Policy (IP) right, to unlock its potential benefits while navigating the risks involved. IP has some potential to catalyze new investment and economic activity in key sectors, but the bar for getting it right is high. IP will only enhance productivity if well-targeted at overcoming market failures and the scale of IP is not too large, so as to mitigate potential distortions that it might introduce. Targeting IP is difficult because market failures are hard to identify, so an evidence-based approach is best, using quantitative metrics, as discussed in this paper. Monitoring the implementation of IP programs over time, using performance benchmarks to unlock continued funding, is important for ensuring IP’s effectiveness and to limit fiscal costs. While IP can be a useful tool, horizontal policies and structural reforms, particularly in planning, skills and infrastructure remain the primary vehicles to lift UK productivity and are prerequisites for vertical IP interventions to be successful. The extent of what can be achieved with IP is also likely to be curtailed by the limited space for additional public spending, given high debt and interest costs.

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SELECTED ISSUES PAPERS

Industrial Policy in the UK

United Kingdom

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¹ The authors would like to thank Kristina Kostial, Daria Zakharova, Luc Eyraud, Romain Duval, Florence Jaumotte, Aleksandra Zdzienicka, Sergio Rodriguez, Oliver Exton, Maximilien Queyranne, Ed Hearne, Graham Prentice and participants in an IMF internal seminar for helpful comments. The paper has also benefited from excellent suggestions by colleagues at the UK Treasury.



UNITED KINGDOM

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European Department

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INDUSTRIAL POLICY IN THE UK¹

A key challenge facing the UK is to increase growth, which has slowed down markedly since the Global Financial Crisis. As part of the government's approach to this challenge, a new [industrial strategy](#) was published in June 2025. This paper discusses how to get the implementation of UK Industrial Policy (IP) right, to unlock its potential benefits while navigating the risks involved. IP has some potential to catalyze new investment and economic activity in key sectors, but the bar for getting it right is high. IP will only enhance productivity if well-targeted at overcoming market failures and the scale of IP is not too large, so as to mitigate potential distortions that it might introduce. Targeting IP is difficult because market failures are hard to identify, so an evidence-based approach is best, using quantitative metrics, as discussed in this paper. Including academic and industry experts on the new Industrial Advisory Council should help guide the targeting of IP and improve the design of IP programs. In order to limit the scale and fiscal cost of IP, continuing the targeted grant programs used to support UK advanced manufacturing and green industries in recent years can be a good model to follow, in addition to targeted financial investments by the National Wealth Fund (NWF). Monitoring the implementation of IP programs over time, using performance benchmarks to unlock continued funding, is important for ensuring IP's effectiveness and to limit fiscal costs. While IP can be a useful tool, horizontal policies and structural reforms, particularly in planning, skills and infrastructure remain the primary vehicles to lift UK productivity and are prerequisites for vertical IP interventions to be successful. The extent of what can be achieved with IP is also likely to be curtailed by the limited space for additional public spending, given high debt and interest costs.

A. Introduction: A Resurgence of IP in Advanced Economies

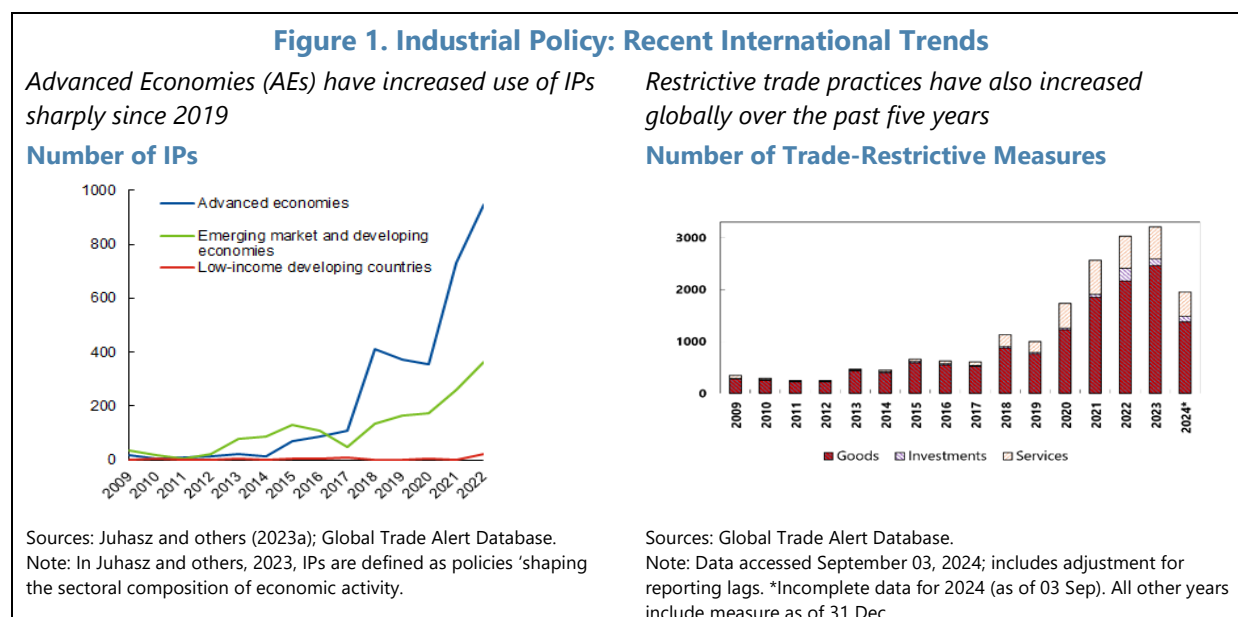
The launch of the UK's new industrial strategy follows increased use of IP by trading partners in recent years, aimed at meeting key challenges including slow growth, energy insecurity and fragmented supply chains.

1. There has been a recent resurgence of IP in advanced economies, while it continues to be a key policy tool in emerging markets (Figure 1). Since 2021, the United States has implemented a large program of fiscal support for manufacturing of electric vehicles, clean energy projects, batteries and semi-conductors, through the Inflation Reduction Act (2022) and CHIPS Act (2022). European countries have also increased use of IP over the past decade via the state aid framework (Figure 2), as well as through European Union (EU) level initiatives such as the Green Deal Industrial Plan, Batteries Strategy and European Chips Act (Hodge and others, 2024). Meanwhile, China has continued its long-standing industrial policy with the Made in China 2025 program, aimed at expanding advanced manufacturing via state-owned enterprises and through the use of government subsidies to targeted sectors (Rotunno and Ruta, 2024).

¹ Prepared by Andrew Hodge (EUR) and Samuel Pienknagura (RES). Kristina Kostial, Daria Zakharova, Luc Eyraud, Romain Duval, Florence Jaumotte, Aleksandra Zdzenicka, Sergio Rodriguez, Oliver Exton, Maximilien Queyranne, Ed Hearn, Graham Prentice and participants in an IMF internal seminar all provided helpful comments. The paper has also benefited from excellent suggestions by colleagues at the UK Treasury,

2. The resurgence of IP is primarily motivated by the need to boost growth, reinforce economic security, and facilitate the green transition.

In Europe, IP is being increasingly used against a backdrop of weak growth, low productivity and an ageing population (IMF2024a). Concerns about economic security have also been a motivating factor, with US initiatives such as the CHIPS Act aimed at onshoring supply chains for critical inputs such as semi-conductors (The White House, 2024). Similarly, the Inflation Reduction Act has special provisions to support advanced manufacturing in regions that were previously dependent on fossil fuel industries (e.g. communities with closed coal mines) (Van Nostrand and Ashenfarb, 2023). IP in both the US and EU has also been used to advance the green transition, as reflected in the US subsidies for electric vehicles, while around half of non-crisis state aid in the EU has been directed to green initiatives on average during 2014–2022 (Figure 2). The recent escalation of trade tensions could further increase concerns about reliance on global supply chains, and prompt IP efforts to protect some affected industries and onshore the manufacturing of critical inputs.



3. Newly-adopted IPs target specific industries with a variety of policy instruments.

Modern IP encompasses any 'vertical' policy targeted at one or more sectors of the economy to achieve government objectives and address market failures (see Juhasz and others, 2023b; IMF 2024b). This contrasts with 'horizontal' policies that aim to improve the general business environment and apply uniformly across the economy, such as tax incentives for business investment. The recent surge of IP is being implemented with a wide range of instruments, including (i) trade policy (e.g. tariffs and export subsidies); (ii) production subsidies or grants to firms; (iii) support for Research and Development (R&D) via grants and tax incentives; (iv) Special Economic Zones (SEZs); (v) financing on non-commercial terms (e.g. concessional loans, equity injections, and guarantees); (vi) regulatory policies such as local content requirements; and (vii) direct government action by limiting procurement to domestic suppliers (see Criscuolo and others (2022a) and (2022b); DiPippo and others (2022) and IMF (2024b). Subsidies nonetheless account for

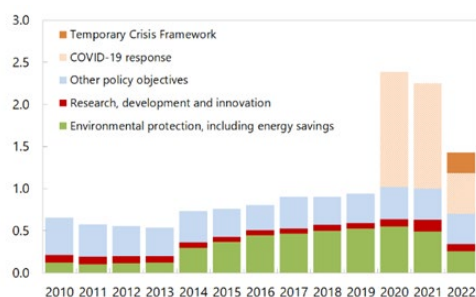
the majority of new IP in advanced economies, in the form of grants and loans to firms (see Hodge and others (2024); IMF (2024b)).

4. This paper provides insights about how to design successful IP under the new UK industrial strategy, drawing lessons from international experience, as well as showcasing empirical and model-based guidance on targeting and productivity impact. Section B contrasts the recent resurgence of IP in Europe with its more limited use in the UK, until the new industrial strategy was announced along with a greater role for the National Wealth Fund (NWF). Section C presents a conceptual framework for the design of IP, based on its benefits and risks. Section D then develops four principles of good IP design based on international experience, consistent with the IMF's approach to IP. Against the backdrop of these design principles, sections E and F use empirical and model-based analysis to identify the sectors of the UK economy where IP may be most effective, while quantifying the benefits to productivity, as well as some potential costs that need to be carefully managed.

Figure 2. Industrial Policy in the EU

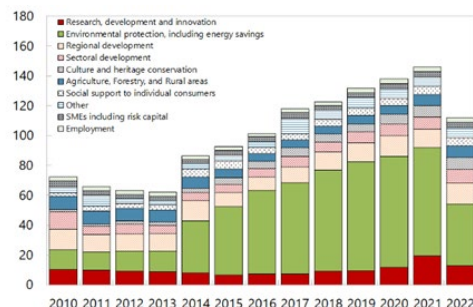
The average EU country spends around 1 ppt of GDP per year more on IP than a decade ago

State Aid by Policy Objectives, 2010–22
(Percent of EU GDP)



Green initiatives account for around half of state aid in the EU

Non-Crisis State Aid by Policy Objectives, 2010–22
(Billion euro, in current prices)



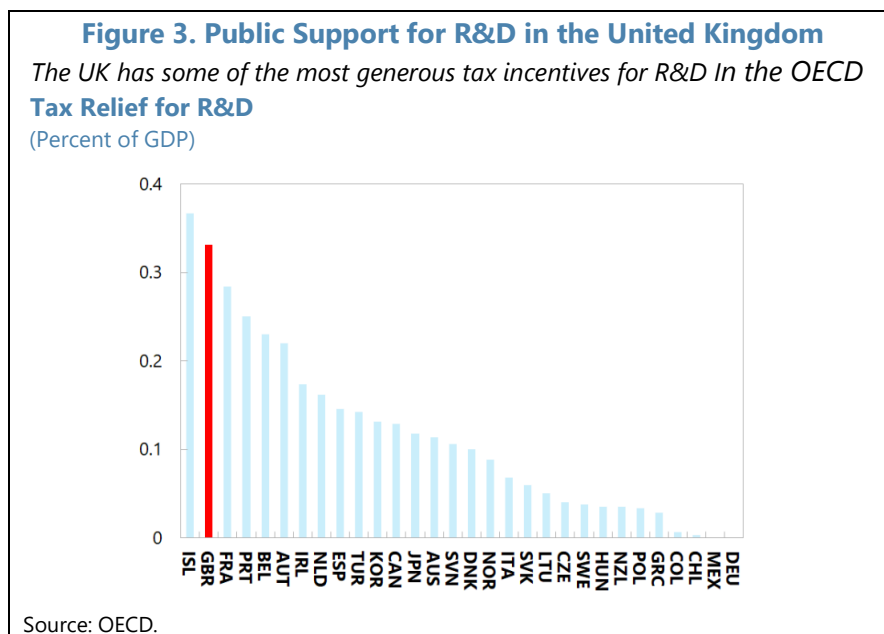
Sources: Eurostat; Hodge and others (2024).

B. The Recent History of IP in the UK

The UK has implemented IP in recent years via targeted grant programs in advanced manufacturing, green and creative industries, along with special economic zones, before the launch of the NWF in 2024 and the publication of the new Industrial Strategy in 2025.

5. Compared to other advanced economies, the UK has pursued a more limited approach to IP, prior to the adoption of the new industrial strategy. The UK authorities have primarily focused on horizontal policy (relative to vertical interventions), such as economy-wide R&D incentives, which are among the most generous in the OECD (Figure 3), and full expensing (accelerated depreciation) of business investment in plant and machinery. Vertical interventions have been more limited since the pandemic, including grants targeted at key sectors, including advanced

manufacturing, creative industries and a Green Industries Growth Accelerator, with a limited fiscal cost of only around 0.1 percent of GDP in FY2023/24.² This is substantially smaller than the fiscal cost of IP in the average EU country, which spends 1.5 percent of GDP per year on state aid, while conservative estimates indicate the total cost of Chinese IP at 1.7 percent of GDP (DiPippo and others, 2022). In the UK, there have also been Special Economic Zones called ‘free ports’, with simplified customs and tax arrangements (Adam and Phillips, 2023), as well as 8 Investment Zones and 48 Enterprise Zones, where businesses can take advantage of additional tax concessions or other forms of public support (Ward, 2024).



6. In June 2025, the UK government published a new industrial strategy to boost investment, create jobs, support the green transition and raise living standards across the country. A public consultation about a new strategy was completed in November 2024. The strategy is focused on eight priority sectors which the government assesses as having growth potential that is not being realized because of market failures and other barriers. The sectors are advanced manufacturing; clean energy; creative industries; defense; digital and technologies; financial services; life sciences; professional and business services. In addition to the overall strategy, there are [sector-specific](#) plans that outline relevant policy initiatives. The ten-year strategy is to be implemented with the support of an Industrial Strategy Advisory Council, comprising members of the business community and other experts, that will oversee monitoring and evaluation.

7. The new strategy encompasses both vertical and horizontal policies, some of which entail fiscal costs. Vertical interventions are envisaged in the eight priority sectors, with a key focus on reducing energy costs for selected businesses, through the British Industrial Competitiveness

² The minimal use of IP in the UK since the pandemic marked a departure from a more interventionist approach that was pursued during 2017–21, called ‘Building a Britain Fit For the Future’, which was based on sectoral strategies and local growth plans, overseen by an economy-wide Industrial Council (Pickett and Hutton, 2025).

Scheme and British Industry Supercharger. The strategy will also include horizontal policies to strengthen the business environment, such as skills development, access to finance, competition, business regulation, planning and the availability of affordable energy (Department for Business & Trade, 2025). While the authorities are committed to accommodating the medium-term fiscal cost of the strategy's policy initiatives within the spending review's envelope, the total cost over ten years will need to be assessed with precision over time. Among the larger initiatives described in the strategy is £4.3 bn in public support for advanced manufacturing (0.15 percent of FY2025/26 GDP), including £2.8 bn in funding for R&D.

8. The NWF and other public financial institutions are to have a key role in delivering the industrial strategy, including by catalyzing private investment. The public financial institutions are designed to provide access to finance for UK firms of different sizes and stages of development. Moreover, to minimize the fiscal costs, the portfolios of projects supported by these institutions are required to generate a return at least equal to the cost of government borrowing, according to the government's [Financial Transactions Control Framework](#). The following institutions each have a different focus:

- The **NWF** is designed to catalyze private investment at scale in key sectors, including clean energy, digital and technologies, advanced manufacturing, and transport. The NWF is the successor to the UK Infrastructure Bank, established in 2021, and has an endowment of around £27.8 billion (approximately 1 percent of 2025 GDP). It will use these funds to support projects using loans, guarantees and equity investments, with the target of crowding in private investment with a 3:1 mobilization ratio. The key objective of the NWF is to generate 'additionality', meaning that its interventions should unlock projects that would not go ahead otherwise (Carter and others, 2018; Winckler Andersen and others, 2021). This could be because of market failures that cause barriers to private investment, such as high upfront costs (e.g. Research and Development (R&D)).
- The **British Business Bank** is a state-owned bank supporting Small and Medium Enterprises (SMEs). It will be allocated an additional £4 bn of capital to support access to finance in the eight priority sectors, also targeting a 3:1 mobilization ratio, bringing its total endowment to £25.6 bn.
- The **UK's Export Finance Agency** is well-established and will be provided with an additional £3 bn of lending capacity, bringing to £13 bn the funds available to incentivize foreign demand for UK exports.

C. Designing IP: A Conceptual Framework

IP has the potential to support the development of productive firms and boost growth, while posing significant economic and fiscal risks (Table 1).

9. The ultimate goal of IP is boosting productivity and growth in sectors that will not reach their potential without public intervention, because of market failures. In some sectors, the private sector alone will deliver inefficient outcomes and an insufficient level of production, even in an otherwise ideal business environment. This is because of market failures, that are structural

features that depress the risk-adjusted return on projects and deter firm entry and investment. Successful IP helps overcome these market failures, so as to crowd in additional private investment and economic activity that would not have otherwise occurred, boosting sectoral productivity and economic growth. For other IMF staff analysis of the role of IP and associated risks, see IMF (2024b) and Eyraud and others (2021).

10. IP can promote business activity, investment, and finance by overcoming the many forms of markets failures. Market failures can be numerous and sector-specific, resulting in the risk adjusted-return on investment being too low (Eyraud and others, 2021; Hodge and others, 2024). This can discourage firm entry and investment, and it also will deter investors from providing finance to projects in these sectors. The following are some examples of market failures:

- **Externalities.** There are a range of positive spillovers from private investment that individual firms may fail to take into account in their decision-making. For example, agglomeration effects exist in some industries, causing productivity to rise as more firms enter, because knowledge is more likely to be accumulated when there are more firms competing with each other. This is particularly the case in nascent industries where firms are competing through innovation at the technological frontier, such as in green industries. A prominent example of IP aimed at exploiting positive externalities is the regime of production subsidies offered to electric vehicle and semiconductor manufacturers by the Inflation Reduction Act and CHIPS Act, given significant knowledge spillovers in these sectors.
- **Imperfect Competition.** Some industries also exhibit natural monopolies, with too few entrants and insufficient competition, so that the industry does not develop to its potential and output prices are too high. Natural monopolies can develop because of high fixed costs of production, that create economies of scale for one or a small number of producers. These kinds of monopolies often arise in utilities industries, including the electricity grid. IP can play a role in providing finance to cover these large fixed costs, incentivize firm entry and promote greater competition.
- **Information Asymmetries.** Information asymmetries can prevent firms in nascent industries from accessing finance. The asymmetries may arise because of uncertainties about new technology that the firms are trying to develop and which may fail. This can occur in industries where firms are operating close to the technological frontier, and face large fixed costs such as R&D, while markets on the demand-side may not be fully developed. In these cases, the risk-adjusted return on investment may be too low for firms to attract private finance. IP can play a role providing concessional loans, equity investments or guarantees to facilitate access to finance, such as the support of the solar panel industry by the German Development Bank (KfW) in the early 2000s.
- **Delayed Returns.** There can also be delayed and uncertain returns for financial investors in nascent industries, because of the time needed for R&D, which investors can perceive as too long. Therefore, private projects may not materialize due to a lack of funding. Guarantees, equity investments, grants and loans from the public sector can raise the risk-adjusted return for financial investors and incentivize them to participate.

- **Coordination failures.** Nascent industries may require complex supply chains, all parts of which need to be developed simultaneously, or else a fledgling industry may fail. There can be a coordinating role for government in supporting the development of these supply chains. The establishment of the Airbus Consortium by UK and European governments is a key example of how an international supply chain was developed through government coordination.

11. Another motivation for IP is onshoring supply chains that are critical for national security in times of emergency. There are several industries critical in times of national emergency, including defense industries, energy, food and pharmaceutical supplies. An example that became apparent during the Covid pandemic was the capacity to develop and manufacture vaccines domestically, as well as deliver other critical medical supplies, like personal protective equipment, when international supply chains were under stress. Public interventions to onshore these capabilities have the potential to mitigate human, social and economic costs in times of emergency, such as pandemics.

Table 1. United Kingdom: The Benefits and Risks of IP

IP has the potential to overcome market failures in some industries, while carrying the risk of economic distortions, technological failures, governance failures and large fiscal costs

Benefits	Costs
Overcome market failures <ul style="list-style-type: none"> - Scale externalities - Coordination failures - Information asymmetries that are barriers to <ul style="list-style-type: none"> - Unlocking financing for investment - Start-ups by new firms - Faster technological progress - Higher productivity - Onshoring supply chains 	Picking losers <ul style="list-style-type: none"> - Supporting unproductive firms - Investing in technology that fails - Creating dependence on public support Governance failures ... <ul style="list-style-type: none"> - Firms supported for political reasons - Rent-seeking behavior by firms Distortions to production & trade <ul style="list-style-type: none"> - away from comparative advantage ... which can lower productivity ... and incur large fiscal costs

Source: Hodge and others, 2024.

12. Poorly designed IP can nonetheless create significant economic and fiscal risks. IP can create economic distortions, particularly if poorly designed, and can fail to boost productivity. It can also involve large fiscal costs:

- **Picking losers.** Directing public resources to firms close to the technological frontier can backfire, if R&D is unsuccessful and firms fail, providing no boost to productivity (Hufbauer and Jung, 2021). Alternatively, providing public support to established firms may shield them from competition, disincentivize innovation and displace private investment, particularly if the firms do not face barriers associated with market failures. In both cases, there will be little, if any, boost to sectoral or economy-wide productivity.
- **Severe market distortions.** IP that favors particular firms, such as through grants or subsidies, can distort markets by drawing resources towards these firms and providing them with competitive advantages. While IP may boost productivity and profitability of the supported

firms, it can be harmful to their competitors and crowd out unsubsidized projects. This could even result in non-supported firms exiting the industry, shrinking its market size. This was confirmed by IMF staff analysis of IP implemented under the EU state aid framework, which included UK data pre-2020 (Brandao-Marques and Toprak, 2024).

- **Governance failures.** Pressure on political decision-makers to support particular industries or sectors can lead to rent-seeking behavior by firms (Criscuolo 2022a). This can distort the allocation of public support away from where it may be most beneficial, to firms that do not face market failures. In this case, IP can crowd out private investment and fail to boost productivity.
- **Fiscal costs and inflation.** IP can have substantial fiscal costs, particularly if it takes the form of production subsidies that are not subject to strict budgetary limits. The cost of the US CHIPS Act, Inflation Reduction Act and Infrastructure Investment and Jobs Act will likely be around 0.3 percent of GDP per year on average in direct government spending (Seydl, Matthews and Schaeffer, 2023), while the cost of Chinese IP was estimated to be around 1.5 percent of GDP in 2019 (DiPippo and others, 2019). If IP takes the form of trade measures such as tariffs, it can also be inflationary.
- **Trade distortions and retaliation.** IP can distort the sectoral make-up of the economy away from what underlying comparative advantage may suggest (Hodge and others, 2024; Ossa, 2011). This can create supply gluts in supported sectors, which can have adverse spillovers to trading partners, who may retaliate with trade policy, or other competing IP, starting a counter-productive ‘subsidy race’ that can undermine the benefits of IP.

D. Successful IP: Lessons from International Experience

IP must be carefully designed to unlock its potential benefits and manage its risks. Past international experience with IP provides a guide for UK policymakers on what works and what to avoid, as the new UK industrial strategy is implemented in coming years.

13. International experience reveals four key lessons for policymakers about IP targeting, governance, fiscal costs and the supporting role of horizontal policies. While market failures provide a sound economic justification for IP, identifying these failures in practice is challenging. Past experience with IP, particularly in recent decades and in advanced economies, provides an important guide for the UK on IP design (see also IMF (2024b)). The first lesson draws on international experience with targeting IP at firms facing market failures, while also managing risks associated with concentrating IP in too few firms and sectors. The second lesson concerns the institutional arrangements for designing and implementing IP programs, to ensure the right firms are chosen for support. Third, international experiences provide examples of best practices to contain the fiscal costs of IP. Finally, international experience shows the benefits of having strong horizontal policies in place, including skills and high-quality public infrastructure, in order for vertical IP interventions to be successful.

Lesson #1. IP should be targeted based on evidence of market failures, while taking care to manage concentration risks.

14. IP is most likely to support productivity if implemented using evidence-based targeting, rather than providing support widely across sectors, which may be wasteful and ineffective. As a general rule, public support to firms should be targeted and temporary. Providing blanket support to all firms in an industry is unlikely to target market failures precisely and risks subsidizing economic activity that would occur without government intervention. This suggests a waste of public resources and will likely make IP less effective in boosting sectoral or economy-wide productivity. It may even crowd out private sector investment, making firms more reliant on public assistance and less likely to innovate. Instead, firms selected for IP support should be chosen based on a rigorous evaluation process, including analysis of where market failures exist, so that IP catalyzes new economic activity.³ An example of best practice is the Advanced Research Projects Agency (ARPA) model, used to provide public support to firms in health, energy and defense industries in the US. ARPA programs are run by a director selected from academia or industry, who selects programs based on extensive consultation with firms and researchers (Juhasz, Lane and Rodrik, 2023b).

15. Nonetheless, it is essential to refrain from "picking winners" to mitigate concentration risks linked to targeted IP. Picking only one or two firms to receive public support increases the risk of mistake and failure. This is particularly the case if recipient firms are seeking to develop new technology. Unsuccessful examples include the US government formation of an SOE to develop the shale oil industry in the 1980's (Synthetic Fuels Corporation), and a US government guarantee to Solyndra Corporation in 2009, to provide solar energy through new technology (Hufbauer and Jung, 2021). Both initiatives failed, partly because of falls in oil prices and in the price of more conventional solar technology, which made the respective investments in shale oil and new solar technology too expensive in comparison. A more favorable outcome was achieved by Operation Warp Speed in 2020, which swiftly and successfully supported the development of Covid vaccines, by diversifying support across multiple potential vaccine researchers and manufacturers, which managed concentration risk and increased the chances of success.

Lesson #2. IP programs should be managed with strong governance arrangements, to avoid discriminatory practices and enhance the selection of supported projects with technical expertise.

16. Enlisting academic and industry expertise when selecting firms to support can improve IP's targeting and effectiveness. IP support provided on the basis of political economy considerations, in order to support favored sectors or regions, is likely to be less effective in boosting productivity and wasteful. Incorporating academic or industry advice into decision-making, or even delegating decisions to experts outside of government, can help ensure the targeting of IP support remains evidence-based. Examples include the US ARPA model, where programs of public

³ The appraisal process entails other important steps, such as cost-benefit analysis, tests for value-for-money, financial viability, assessment of fiscal costs and risks, and impact analysis.

support are supervised by a director chosen from academia or industry. Similarly, IP in Peru in the mid-2010s was based on a series of sectoral roundtables where industry leaders interacted with public officials to discuss market failures and areas where public support would be most beneficial (Juhasz, Land and Rodrik 2023b).

17. Considering all firms for IP support, irrespective of age, size or ownership, helps ensure that firms with the greatest potential for success are not excluded. Discrimination based on these factors can reflect political economy considerations and is unlikely to ensure that IP support is provided to firms where it can be most beneficial (IMF 2024b). First, it is worthwhile to consider both *new entrants and existing firms* for IP support, since firms that are already well-established may be less likely to face market failures and less disposed to engage in innovation, relative to new firms. For this reason, IP that prefers existing firms could be more likely to cause crowding out, rather than catalyze new investment. It may also reduce incentives for innovation and create reliance on public support. For example, Chinese IP in the early 2010s focused on EVs, which was a nascent industry with large fixed costs of R&D, rather than providing significant support for hybrid or internal combustion engine vehicles, given that these industries were already well-established and foreign manufacturers were more dominant in world markets. Similarly, *small and big firms* should both be considered for IP support, since new entrants are often small firms that may be more innovative, developing new technology from its infancy, so should not always be overlooked in favor of bigger firms. Third, both *domestic and foreign-owned firms* should be eligible for IP support, so that IP does not shield domestic firms from competition, nor disincentivize foreign investment (IMF 2024b).

Lesson #3. Fiscal costs can be limited by making support time bound, while subject to financial limits and ongoing monitoring, which can also facilitate firms eventually becoming independent of IP support.

18. Fiscal costs can be contained by making IP support to firms subject to financial limits, rather than open-ended. This could be achieved by providing grants to selected firms up to a set limit. Financial support in the form of equity investments, loans or guarantees also has a limited direct cost, although there can be contingent liability risks for the public sector (see Annex 1 on the NWF). In contrast, open-ended subsidy programs, where subsidies are available to all who meet eligibility criteria, make fiscal costs difficult to project, complicating medium-term budgeting and risking fiscal costs that are far larger than anticipated. For example, Electric Vehicle (EV) subsidy programs in China and the US have proved more popular and costly for the budget than originally envisaged (IMF 2024a). This likely reflects the open-ended design of the subsidy programs, with consumers receiving subsidies for purchase of EVs in China based on vehicle range, during 2013–22, while the US government allows tax credits for purchase of EVs.

19. Periodic monitoring of and time limits on IP programs can help facilitate eventual independence from public support, while also limiting fiscal costs. This involves formulating IP so that recipients are required to meet performance benchmarks over time, to unlock financial support, which should be designed to expire after the objectives of the policy have been achieved.

Time limits are usually inherent in grants, loans or guarantees provided to new firms or start-ups. Tax incentives and subsidies can also be made subject to explicit time limits or subject to periodic review, so that they can be suspended once a new firm or project becomes well established, having overcome market failures. Under the ARPA model in the US, supported projects have pre-defined milestones that need to be met to ensure continued public support (Juhasz, Lane and Rodrik, 2023b). Imposing these limits can be preferable to providing indefinite support, such as through ongoing tax incentives and subsidies, which can shield recipient firms from competitive forces and disincentivize productivity-enhancing innovation.

Lesson #4. Horizontal policy and structural reforms need to be in place before vertical IP interventions can be successful, and can also amplify the benefits of IP.

20. High-quality horizontal policies are a pre-requisite for successful IP, by improving the general business environment through the elimination of policy distortions. Vertical interventions are rarely a substitute for strong horizontal policies, which have been found to have a larger impact on industry performance (Baquie and others, 2025). In general, sequencing matters and vertical IP should only be considered if strong horizontal policies are in place and prove insufficient to address market failures. As discussed in IMF staff's 2025 Article IV report, a strong business environment, with policy certainty, stable tax and regulatory regimes, including planning laws, will help ensure that firms supported by IP will thrive once market failures are overcome.

21. Horizontal policies can directly complement vertical IP interventions in some sectors, amplifying their effects by providing a skilled workforce and critical infrastructure. While horizontal policies are a prerequisite for the success of vertical IP interventions, by delivering a business environment conducive to innovation and investment, horizontal policies can also be directly complementary to some IP initiatives. In particular, horizontal policies that boost skills and deliver high quality public infrastructure can be directly beneficial for firms receiving IP interventions. Since IP often supports firms operating close to the technological frontier, access to a skilled workforce is a critical input. Strong education and training policies, with a focus on technical skills can provide this. Active labor market policies and immigration policies also contribute to the supply of skilled workers to supported firms (IMF 2024b). Some forms of public infrastructure can also be critical for the expansion of firms benefiting from IP. This will include access to the electricity grid, as well as EV charging infrastructure. For example, US and Chinese IP subsidies for purchase of EVs are complemented with nation-wide public investment in EV charging infrastructure, which increases the utility of EVs for users.

E. Targeting of UK IP: An Evidence-Based Approach

Identifying market failures and demonstrating 'additionality' of IP is sound in theory but challenging in practice. An evidence-based approach can be used to guide policymakers, the NWF, and other public financial institutions, complementing less formal methods. Applied to the UK, one metric proxying for market failures points to advanced manufacturing as among the appropriate targets for IP.

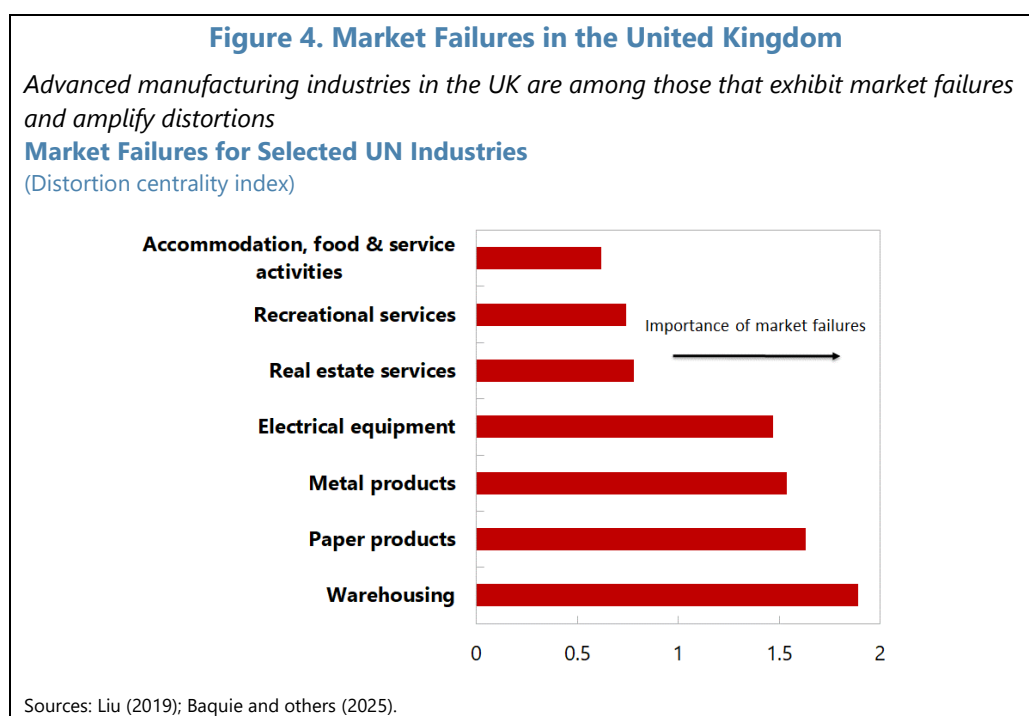
22. Quantitative methods are useful to identify firms facing market failures, which can be appropriate targets for IP. While market failures provide a sound economic justification for IP, they are difficult to identify in practice (Winckler Andersen and others, 2021). In cases where firms are reluctant to enter nascent industries, it can be difficult to determine whether there is a market failure or whether firms are simply insufficiently innovative or productive to compete, which can occur even when private markets are functioning correctly. These types of indicators can be a helpful guide for policymakers in pinpointing the extent of market failures across various sectors and demonstrating ‘additionality’ of IP programs, in the sense that the programs support private investment that would not otherwise have occurred.

23. These approaches can estimate additionality directly based on the impact of IP support relative to the counterfactual, or take the form of proxies for the existence of market failures, and can be used alongside less formal methods. Of the two broad *quantitative approaches* to identifying market failures, the first involves measures that *directly test the effectiveness of IP*, by estimating the impact of IP on firms, relative to a counterfactual outcome without public support. If this shows a positive impact, the existence of market failures can reasonably be inferred. This can be done with econometric models (Hiroyuki and Yasumura, 2021),⁴ or less formally by comparing similar firms that differ mainly by whether or not they receive IP support (Murphy and others, 2003). By using econometric methods or requiring a counterfactual, these quantitative methods are data intensive and can be difficult to apply ex ante, before IP support to a firm or project is approved. The second approach is more indirect and uses metrics that proxy for the *existence of market failures*. An example presented in this paper is a metric that gauges the degree of competition in an industry, since low levels of competition can be caused by market failures (Liu 2019). This approach can be applied ex ante and is firmly grounded in economic theory. These quantitative methods could be supplemented by more *descriptive analyses* explaining which specific market failures impact a group of firms or a subsector of the economy, and justify IP. Multilateral development banks have useful experience with these approaches, since they require additionality in all supported projects that involve private sector participation. These institutions generally include an account of relevant market failures in project descriptions, potentially with some quantitative metrics, based on a harmonized approach across institutions (African Development Bank and others, 2018).

24. The indicator of Liu (2019) is a proxy for the extent of market failures in each sector based on the degree of price markup, and suggests that advanced manufacturing and industries critical for supply chains exhibit market failures in the UK. The presence of market failures in an industry is more likely if there is evidence of distortions that cause market prices to deviate from marginal cost (i.e. mark-ups). The industry-level ‘Distortion Centrality (DC)’ metric of Liu (2019) takes account of mark-ups at the industry level *and* the industry’s links with other parts of the economy, so that industries with a higher DC index (close to 1 and above) propagate distortions throughout the economy (see Annex II). Data for the UK suggest that manufacturing of electrical

⁴ For instance, a diff-in-diff estimation of the impact of IP interventions on desired outcomes (e.g. private investment) could be conducted.

equipment, metal products, paper products, as well as warehousing, which is critical for supply chains, have among the largest distortions (Figure 4). These industries are likely to exhibit market failures and the most-affected firms could be appropriate targets for IP. Services industries such as accommodation, food services and real estate display the least evidence of distortions (Baquie and others, 2025) and likely exhibit fewer market failures, so that IP would risk crowding out private investment in these sectors. While the DC index helps pinpoint sectors where market failures are most acute, such as UK advanced manufacturing, it is important to build on this analysis by adding a descriptive diagnostic of what particular form the market failures take, to allow appropriate IP to be designed.



F. Modeling the Impact of UK IP on Productivity

Structural modeling shows that IP can be effective if well-targeted at firms facing market failures, contributing to higher productivity in these sectors. IP can also introduce distortions that need to be carefully managed, through limits on the scale and cost of IP.

25. The UK's weak productivity is a significant constraint on growth, and IP has the potential to be part of the policy mix to address this challenge. As discussed in the 2024 and 2025 IMF Article IV reports, the UK has experienced a sharp slowdown in trend growth of per capita income since the Global Financial Crisis (GFC), that has left the level of UK GDP about a quarter below what the pre-GFC trend would imply. A key driver of this slowdown has been the drop in labor productivity growth, which has declined from around 2 percent pre-GFC to approximately ½ percent since then, a larger decline than in some other advanced economies. Part of this decline can be attributed to chronic under-investment and a lack of innovation at the firm level (see 2025

SIP on UK Productivity). If well-designed, IP has the potential to help address the shortfall in both of these areas.

26. Structural modeling can be used to assess the impact of UK IP on productivity and household income in general equilibrium, since IP support to firms can create spillovers and spillbacks across industries and across international borders. Modeling can quantify the direct impact of UK IP on productivity across sectors, as IP overcomes market failures in the model. A key insight of general equilibrium modeling is also to quantify offsetting costs created by spillovers and spillbacks from IP. These arise because IP can draw labor and other resources to supported firms and away from their competitors. Furthermore, IP can have international spillovers and spillbacks, caused by distorting the pattern of trade away from underlying comparative advantages.

27. The analysis using the Krugman-style model of Lashkaripour and Lugovskyy (2023) implies that UK IP can contribute to an increase in the productivity of supported firms, with the impact differing across sectors depending on the extent of market failures. Although there are many forms of market failures in practice, the multi-industry, multi-country model embodies a type of market failures common in industries close to the technological frontier, in the form of scale externalities of firm entry (see Annex III).⁵ These industry-specific scale externalities reflect agglomeration effects of entry by new firms, attributable to knowledge spillovers, that individual firms fail to take into account when making decisions about whether to enter an industry. The scale externalities differ significantly by industry and are calibrated based on evidence from micro-data. The model implies that industrial production subsidies targeted at industries with significant scale externalities can overcome these market failures and increase productivity, by incentivizing firms to internalize the externality when making entry decisions. While increases in labor productivity in the model are indistinguishable from increases in total factor productivity, since labor is the only production input, it is important to note that this is a convenient simplification for ease of modeling. In practice, labor productivity gains can be caused both by higher total factor productivity *and* by raising capital intensity (see SIP on productivity). Empirical analysis by IMF staff has indeed shown that IP can have a greater effect on capital accumulation than total factor productivity of firms (Baquie and others, 2025).

28. The model reveals that subsidies targeted at advanced manufacturing industries in the UK, that exhibit large scale externalities, will support sectoral and economy-wide productivity, while subsidies directed at other sectors will be less effective. The model is simulated using industry-level data for the UK, EU and selected G20 countries. Production subsidies correcting market failures in an advanced manufacturing industry with large externalities, like the UK electrical and optical equipment sector, incentivize firm entry into the sector, increasing its share of production and total employment. Given the large scale externalities, the productivity of the expanded electrical and optical equipment sector increases by 1½ percent in the long-run, raising economy-wide productivity (Table 2). In contrast, production subsidies that correct market failures in

⁵ While scale externalities would differ between firms in reality, they are assumed to be the same for all firms within each industry in the model, which is a convenient modeling simplification.

sectors with smaller externalities, such as transport and plastics, as well as agriculture, will expand these less-productive industries while failing to increase their productivity significantly. The effects of supporting sectors with smaller externalities can be viewed as adverse cross-industry spillovers, by drawing resources towards less productive sectors (see Hodge and others (2024) for further discussion of these effects).

Table 2. United Kingdom: The Productivity Impact of United Kingdom IP

IP production subsidies to correct scale externalities can boost sectoral productivity

Model-Implied Impact of Externality-Correcting IP Subsidies in Selected UK Industries

	IP Subsidy (in percent of output price)*	Improvement in industry productivity (ppts, weighted by industry share)**
Electrical & Optical Equipment	55	1.4
Chemicals and Chemical Products	23	0.8
Basic Metals & Fabricated Metal	21	0.3
Rubber and Plastics	14	0.1
Transport Equipment	13	0.2

* Larger subsidies are required when scale externalities are higher.

** Denotes productivity improvement in the model's steady state. Dynamic effects are beyond the scope of the model.

Sources: Lashkaripour and Lugovskyy (2023); Hodge and others (2024).

29. While IP can play a role supporting productivity growth in the UK, it can cause unintended international spillovers and spillbacks through trade channels. While IP may lift productivity of sectors with large market failures, it can also create an expansion of production in these sectors that may cause supply gluts in export markets, particularly considering IP may be directed towards niche industries, such as advanced manufacturing of differentiated products close to the technological frontier. These supply gluts can depress export prices and worsen the terms of trade (Lashkaripour and Lugovskyy, 2023; Hodge and others, 2024). This is illustrated by using again the model, in a simulation where industry-specific production subsidies are implemented by the UK to *completely eliminate* scale externalities in *every* sector of the economy. While not realistic, this is a hypothetical benchmark case where IP is comprehensive in the UK, while other countries do not respond with any distortive policies. In this extreme case, the productivity benefits of correcting market failures are *outweighed* by the losses through the trade channel, generating an overall income loss for households. This exercise can be repeated for every country in the EU and G20, showing that household income could decline in many countries, particularly those more open to trade, such as the UK, because of spillbacks through trade channels (Figure 5). Although the results are not shown in this paper, retaliation by trading partners, including with trade policy, could further reduce welfare (see Lashkaripour and Lugovskyy (2023) for further details), including globally.

30. Careful targeting of UK IP, under strict financial controls, with international cooperation on the design of IP policies, can help manage spillovers and spillbacks and maximize the benefits of IP. Spillovers and spillbacks of IP become large the more is spent on IP, as the hypothetical benchmark case presented in Figure 5 illustrates. Careful targeting of IP at firms facing the largest market failures and imposing tight financial controls on the amounts committed

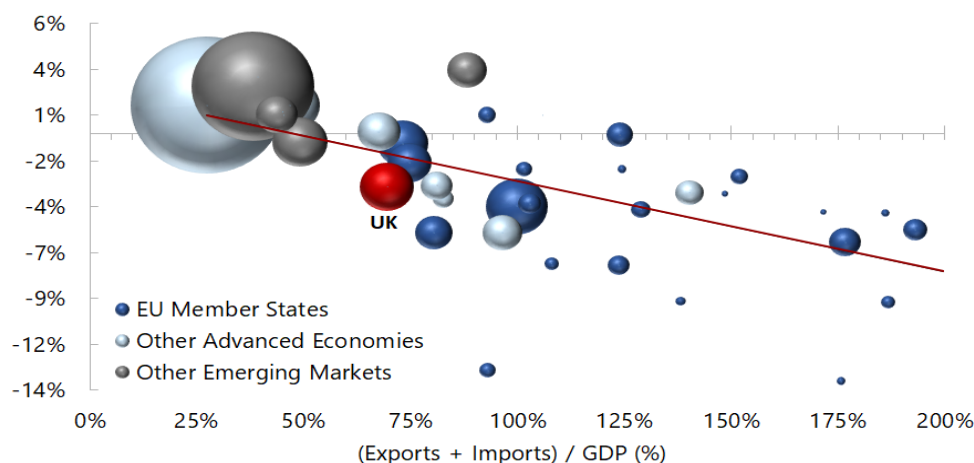
can help minimize these costs, while still catalyzing additional investment and supporting productivity. Cooperating with other countries on the scale of IP programs, in the spirit of the EU state aid rules, can also help to create a level playing field, limiting some of the distortions of IP through trade channels (see Hodge and others, 2024).

Figure 5. Spillovers and Spillbacks of United Kingdom IP

*Because of **international spillovers and spillbacks**, Krugman-style modeling implies that deploying IP across all sectors can reduce overall household income, if not carefully managed.*

Welfare Impact of Scale-Correcting Production Subsidies

(Relative to status quo of zero subsidies, percent)



Sources: Lashkaripour and Lugovsky (2023); Hodge and others (2024).

Note: The chart shows the welfare gain (percent) when each country unilaterally implements scale-correcting production subsidies, while other countries maintain zero subsidies. The size of the bubbles corresponds to each country's nominal GDP (in USD) for 2023.

G. Conclusions: Making the New UK IP Strategy Successful

31. The UK's new industrial strategy has real potential to unlock private investment and boost UK productivity in key sectors. While horizontal reforms delivering policy stability, higher investment through planning reform and investment in skills, will be the main policy tools to lift UK productivity, IP can play a supporting but important role. Using IP to overcome market failures can help incentivize firm entry and investment in key sectors. The UK's new industrial strategy rightfully takes a strategic approach, directing public support to where it will be most effective, given limited fiscal space in the UK.

32. The bar for implementing IP well is high and will require a rigorous approach to targeting, sound institutional arrangements, and fiscal controls, with support of horizontal policies. While there is a sound economic justification for IP that targets market failures, they take many forms and are hard to identify in practice. Effective targeting requires strong governance arrangements, to take an evidence-based approach to selecting the right firms to support, without arbitrarily favoring particular firms. International experience suggests a role for academic and industry experts in IP design and implementation. IP programs that are time bound and subject to strict financial limits can help manage fiscal risks and support medium-term budgeting, together

with transparent risk reporting. Horizontal policies that eliminate distortions and provide a stable policy environment also remain a pre-requisite for successful IP.

- **Targeting.** UK IP will have the greatest chance of success if targeted at firms and projects exhibiting market failures, which quantitative evidence suggests are most likely to exist in sectors like advanced manufacturing and industries critical to supply chains. Quantitative metrics provide a useful guide for decision-makers to demonstrate additionality of IP support, which can be targeted accordingly. For the UK, a metric that proxies for market failures using evidence of market distortions, suggests a role for UK IP in industries close to the technological frontier, where there can be large upfront investment costs, including for R&D. This would include digital and technology industries, green industries, including clean energy, which are among the priority sectors for the new industrial strategy.
- **Institutional Arrangements.** Targeting can be improved by harnessing participation of academic and industry experts in the UK's Industrial Advisory Council, to design IP programs and select firms and projects to support. The UK Industrial Advisory Council, which will be established by legislation as a permanent body, can use its academic and industry experts to help identify market failures in particular industries, and suggest metrics that could guide the selection of firms to receive IP support, as well as overseeing performance monitoring. A further step would be to mimic some aspects of the ARPA model of IP used in the US, where academic or industry experts are employed to manage IP programs, selecting firms to support and identifying performance milestones that unlock additional financial support.
- **Fiscal controls.** Fiscal costs can be contained by continuing the UK's recent approach to IP, through targeted grant programs that are time bound with a fixed budget allocation. The UK's recent experience with IP has incurred minimal fiscal cost, with programs in advanced manufacturing, clean industries and creative sectors. Rigorous monitoring of the implementation of these programs, for instance through clear performance benchmarks, can also limit costs and ensure continuous effectiveness. This approach is preferable to open-ended tax incentives or subsidies, available to all firms or consumers that meet eligibility criteria, since these programs can often exceed their anticipated cost significantly. Lump sum grant programs may facilitate firms benefiting from IP to become independent of public support, since the public financial support is not ongoing. This approach will help ensure that the cost of the strategy can be accommodated within the medium-term expenditure envelope announced at the spending review.
- **Horizontal policies.** Structural reforms in the areas of planning, skills and infrastructure, as outlined in the new strategy will help provide a strong business environment. If horizontal policies alone prove insufficient to overcome market failures, vertical policies could then be considered. High-quality horizontal policies will be critical to the success of these IP interventions and can even be directly complementary. Past experience has shown that firms benefiting from IP support generally need access to a skilled workforce. Ongoing UK investment in skills and training, including the announced approach of developing skills for the eight priority sectors in partnership with businesses, as well as continued skilled migration, will help

develop the workforce needed by firms in advanced manufacturing, clean energy and other sectors close to the technological frontier. Infrastructure investments, such as the announced focus on developing ports, will likely also be required to support firms targeted by IP. The ongoing reforms to planning laws will help ensure that firms receiving IP support are able to proceed with investment as quickly as possible. These complementarities between horizontal policies and IP are important examples of synergies between the pillars of the UK's growth mission.

33. Despite the potential of IP, it is important to maintain realistic expectations about its impact on the economy, and other policies will be needed to support productivity growth. The UK has limited fiscal space, given high debt and interest costs, with ageing-related spending pressures set to mount in the longer term. Difficult fiscal choices may be needed to accommodate IP spending within the medium-term expenditure envelope announced at the recent spending review, given other competing priorities. Furthermore, the impact of horizontal reforms, particularly in planning and skills, as well as ensuring a stable policy environment, are likely to be substantially more important for boosting productivity than IP, which is most effective when narrowly targeted at tackling market failures.

34. In particular, the NWF's investment mobilization ratio is ambitious, given the difficulty of establishing additionality of projects and the importance of strict financial controls and fiscal risk management. The NWF is rightly focused on additionality and a more formalized approach to identifying projects facing market failures would help prioritize projects that would not go ahead without public support. The robust Financial Transactions Control Framework appropriately limits costs to the public sector, by requiring that the NWF's portfolio generate a return that covers government borrowing costs. However, projects meeting these criteria will likely be those that are *close* to proceeding on purely commercial terms, without public support. This is likely a narrow range of projects, so that a determined effort will be needed to achieve the 3:1 catalyzation ratio.

Annex I. The United Kingdom's National Wealth Fund

The UK's National Wealth Fund (NWF) has the potential to catalyze new investment, but faces the key challenges of achieving 'additionality' while covering financing costs and managing fiscal risks. An optimal approach to NWF investment would include rigorous appraisal processes, require evidence of additionality and satisfy robust risk management and reporting procedures.

Key Objectives of the NWF

1. **As a policy bank, the NWF is faced with three competing objectives.** First, the role of a policy bank is to unlock truly "additional" investment, by supporting projects that would not occur without public support, to crowd in private investment, rather than substitute for private investors. Second, the projects supported should generate a sufficient return to cover the government's financing costs, to limit the burden on the public sector. Third, fiscal risks need to be minimized, including contingent liability risks, if projects fail, and statistical re-classification risks, in case the project's debt is treated as being entirely that of the public sector.
2. **The range of projects that satisfy additionality tests and generate returns covering the NWF's financing costs is likely to be relatively narrow.** While there may be many projects that would not happen without public support, some of these may fall entirely within the traditional role of government (e.g. defense industries, public highways). In order to generate a return to cover the NWF's financing costs, with the NWF being a minority investor in the project, the projects will need to be close to being commercially viable without public support.

Enhancing the NWF's Policy Framework

3. **A rigorous appraisal process can help ensure that all supported projects are successful.** The NWF already has a practice of completing detailed impact assessments of supported projects, which are helpful to gauge their effect on priority sectors, such as the environmental impact of clean energy projects. This could be complemented with more detailed ex ante appraisal processes, including cost-benefit analysis, financial viability studies, and analyses of fiscal risks.
4. **An evidence-based approach to demonstrating 'additionality' can also support good project selection.** There are many types of market failures that make a project unattractive to financial investors without public support. Quantitative methods can be used to demonstrate additionality, such as proxies based on whether an industry exhibits low levels of competition or methods to directly estimate the value of IP interventions. These rigorous methods can be used alongside more informal, narrative-based approaches. Requests by private investors for public participation in a project are encouraging, but do not in themselves constitute evidence of market failures.
5. **The NWF has a robust risk management framework, with quantitative risk controls.** The NWF's financial framework includes quantitative thresholds for different categories of risk and the NWF will inform HMT when thresholds are breached. In setting quantitative

benchmarks, the current controls of the UK Export Finance Agency provide a good guide, including limits on the maximum commitment in a single project. The financial transaction control framework also provides for at least annual engagement between NWF with HMT, which will facilitate monitoring of emerging risks. An economic capital limit of £7 billion will also ensure that losses on unsuccessful projects can be absorbed without requiring additional HMT financial support.

6. A detailed and transparent *risk reporting* regime will help manage contingent liability and statistical reclassification risks. Reporting the full range of liabilities associated with each supported project helps reveal the maximum potential liability of the public sector, in the event of project failure (contingent liability risks) or if the statistical agency classifies the entire project as within the public perimeter (reclassification risks). The NWF's risk reporting could be integrated into HMT reporting, and also studied as part of the OBR's fiscal risks reports, which are at the frontier of sound risk management practices.

Annex II. Identifying Market Failures Through Distortion Centrality

1. **Liu (2019) metric.** As a proxy for market failures or distortions, the distortion-centrality (DC) index by Liu (2019) combines sector-specific distortions with the sector's interconnections with other sectors, computed using input-output tables. The extent to which a sector's distortions propagate through the economy will depend on its connections to the rest of the economy.
2. **Alternative measures.** IMF staff have constructed the index for 141 countries, measuring distortions using markups within a sector to gauge economies of scale (Akerberg and others, 2015). The analysis is robust to using the sector's external financial dependence (Rajan and Zingales, 1998) as an alternative measure. Input-output information is sourced from the Global Trade Analysis (GTA) Project. For further details see Baquie and others (2025).
3. **Results.** The metrics based on either measure of distortions are correlated, and sectors like electricity production and biotech research rank high on both dimensions. Staff finds that the number of protectionist IPs targeting a sector correlate positively with its DC, with this relationship strengthening in recent years. It is also found that the positive correlation between IPs and DC is stronger for AEs.

Annex III. A Structural Model of United Kingdom IP

1. Model Description. The multi-country, multi-industry model of Lashkaripour and Lugovskyy (2023) used in this paper is from a recent strand of literature in which industrial policies are modelled as subsidies that remove distortions arising from external economies of scale at the sectoral level (Bartelme et al. 2019; Haaland and Venables; 2016). In this Krugman-style model, industries differ by the degree of scale economies or elasticity of trade volumes to prices. Each country $i \in \bar{C}$ has population of L_i individuals who each supply one unit of labor inelastically. Labor is the sole factor of production in each country.⁶ Workers are perfectly mobile across industries within countries, but cannot cross international borders, so are paid country-specific wage w_i .

2. Consumers. The representative consumer in country i maximizes utility subject to a budget constraint. The consumer chooses a vector of industry-level product bundles from each $k \in \bar{K}$ industries. Each industry-level product bundle has a corresponding price index $\tilde{P}_{i,k}$ and may contain goods sourced from multiple countries. Each industry-specific product bundle is an aggregation over various country-specific varieties, each of which is itself an aggregation over firm-level varieties from that country. The within-industry utility aggregator has a nested CES structure, so that the parameter determining the elasticity of substitution between country-specific varieties differs from the parameter determining the elasticity of substitution between firm-specific varieties. The former parameter σ_k determines the degree of price-elasticity of foreign demand in industry k (i.e. the higher the market power, the lower is price-elasticity of foreign demand), while the latter parameter γ_k determines the degree of firm-level market power and 'love-of-variety' preferences, with $\gamma_k > 1$.

3. Firms and Production. Each country $i \in \bar{C}$ is populated with a mass $M_{i,k} = \Omega_{i,k}$ of monopolistically competitive firms producing a single product in industry $k \in \bar{K}$, using labor as the only factor of production. Under the assumption of free entry of firms, a pool of ex ante identical firms can pay an entry cost $w_i f_k^e$ to operate in industry k from country i . Each firm $\omega \in \Omega_{i,k}$ draws a random productivity $z(\omega) \geq 1$ from distribution $G_{i,k}(z)$ and faces a marginal cost $\tau_{ij,k} w_i / z(\omega)$ for producing and delivering goods to destination $j \in \bar{C}$, where $\tau_{ij,k}$ is a flat, iceberg transport cost. Given these assumptions, the average unit labor cost in origin i is declining in the number of firms and varieties. One way to demonstrate this is to note that the elasticity of the Producer Price Index (PPI) of the composite good in industry k , produced in country i , is negative: $-\mu_k = \partial \ln P_{ij,k} / \partial M_{ik} < 0$ and its absolute value μ_k is the industry-level scale elasticity, being the elasticity of the PPI to the number of firms. It is equivalent to observe that μ_k is the elasticity by which variety-adjusted total factor productivity increases with industry-level employment, which is proportional to firm mass $L_{i,k} \propto M_{i,k}$. The scale elasticity is exactly equal to a constant firm-level mark-up within that industry, $1/(\gamma_k - 1)$, which also determines the extent of love of variety.

4. Policy Instruments. The simulations presented in this paper are based on a version of the Lashkaripour and Lugovskyy (2023) model where the only policy instrument available to a government in each country i is an industry-specific production subsidy applied to industry k 's

⁶ The model can be extended to introduce intermediate goods.

output produced in country i , irrespective of where the output is sold. The subsidy is financed via lump sum taxes to consumers.

5. Welfare Implications of IP. The welfare implications of unilateral industrial subsidies are quantitative questions, depending on the calibration of parameters, notably the scale elasticity μ_k and the price-elasticity of foreign demand σ_k . Lashkaripour and Lugovskyy (2023) find that σ_k and μ_k are negatively correlated empirically⁷ (see Table III.1). This implies that production subsidies (i) correct misallocation, by expanding output in high returns-to-scale (high μ_k) industries, while also; (ii) worsening the terms of trade by expanding exports in these same industries which have lower price-elasticity of foreign demand (low σ_k).

6. ‘Immiserizing’ Growth. Under these parameter values, it also follows that unilateral implementation of Pigouvian industrial subsidies worsens the terms of trade, which can offset some or all of the welfare gains from establishing allocative efficiency. This is referred to as an ‘immiserizing’ welfare effect.

7. Data for Calibration. Observable data used to calibrate the model include data from 43 countries (including all EU member states and the UK) on production and expenditure across 56 industries, from the 2014 World Input-Output Data (WIOD) (Timmer and others, 2015). Following the methodology in Costinot and Rodriguez-Clare (2014), the 56 industries in the WIOD are aggregated into 15 traded industries (for which Lashkaripour and Lugovskyy (2023) have estimated trade σ_k and scale elasticities μ_k , plus a services sector (assumed to have $\mu_k = 0$ and $\sigma_k = 11$) (see Table III.1). Data on bilateral applied import tariffs (i.e., the status quo for import tariffs) are constructed following the methodology of Kucheryavyy, Lyn and Rodriguez-Clare (2023), based on information from the UNCTAD Trade Analysis Information System (TRAINS), using latest data available (mainly from 2022). Following Lashkaripour and Lugovskyy (2023), the status quo for export subsidies and industrial Pigouvian subsidies is assumed to be zero.

⁷ Lashkaripour and Lugovskyy (2023) estimate σ_k and μ_k using micro data and their results align with others in the literature.

Table III.1. United Kingdom: Industry-level Trade Elasticities and External Scale Parameters

Econometric Estimation Results Used for Model Calibration
(Standard errors in parentheses)

	Trade Elasticity: of Export Prices to Output	External Scale Parameter
Agriculture and Mining	6.2 (2.3)	0.1 (0.1)
Food	2.3 (0.8)	0.4 (0.1)
Textiles, Leather & Footwear	3.4 (0.4)	0.2 (0.02)
Wood	3.9 (1.9)	0.2 (0.1)
Paper	2.6 (1.1)	0.3 (0.1)
Petroleum	0.6 (0.5)	1.2 (0.9)
Chemicals	4 (0.4)	0.2 (0.02)
Rubber & Plastic	5.2 (1.2)	0.1 (0.03)
Minerals	5.3 (1.7)	0.2 (0.06)
Metals	3 (0.5)	0.2 (0.03)
Machinery	7.8 (1.3)	0.1 (0.02)
Elec. & Optical Equip.	1.2 (0.3)	0.6 (0.1)
Transport Equip.	2.8 (0.9)	0.1 (0.04)
Recycling and others	6.2 (1)	0.2 (0.02)

Source: Lashkaripour and Lugovsky (2023), based on Colombian trade data at level of Harmonized System 10-digit product category, 2007–13. In the model's calibration, the services sector is assumed to have a trade elasticity of 11 and an external scale parameter of zero.

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