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EU industrial policy in the evolving geo-political and geo-economic environment

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Abstract

Industrial policy has become a core item in the policy agenda of many governments as well as of the EU which has come up with many policy initiatives over the past two decades. This paper emphasises the important shifts taking place in the global economy with the rise of China but also of other emerging/ed economies that affect the competitiveness of the European economy and challenges its traditional comparative advantages. The challenge to the European economy is compounded by having been left behind in some of the most innovative areas and branches of economic activity (IT, most recently AI, quantum and cloud computing) and also lagging behind in important technological shifts in more traditional industries (such as EVs in the transport equipment industry). On top of this – but also linked to global economic developments – have come rather big ruptures in geo-political relationships such as the decline of multilateral institutions and increasing conflictual relationships amongst the major acting powers on the global political stage. We discuss in this paper the challenges that EU industrial policy has to meet given the trends in geo-politics and geo-economics.

Keywords: EU, industrial policy, geo-economics, geo-politics, industrial restructuring

JEL classification: F02, F42, F51, F6, L5, L16, L52, O25, O31, O33

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EU industrial policy in the evolving geo-political and geo-economic environment

1. INTRODUCTION – AIMS AND CONDUCT OF INDUSTRIAL POLICY

An essay on industrial policy (IP) should start with a definition of what exactly is meant by it. We suggest the following: Industrial policy covers policy instruments that are geared towards influencing the 'structural' composition of an economy, whereby 'composition' can refer to technologies, sectors, the compositions of firms and labour forces working in these sectors, and patterns of economic activity across geographic space. Since this naturally covers a very wide range of structural features of economies, we should narrow down the scope of IP by saying that these instruments also need to aim to achieve the goals of IP.

What are the aims of industrial policy'?

Traditionally, IP has been used – through its 'structural' impact – to improve the growth performance of an economy and, in an open economy context, the 'competitiveness' of an economy. From this, it is clear that an IP pursuing such aims will be dependent on the developmental state of an economy. We can distinguish here between three situations: First, there is the use of IP in economies that are far behind when it comes to employing state-of-the-art technologies. Such economies will direct IPs towards developing institutions and using policy instruments that allow technologies and business practices to be efficiently and effectively transferred from other economies that are already more advanced than themselves. Second, on the other side of the spectrum, there are economies that are already close to the global technology frontier. These will have to direct policies (and design institutions) that are themselves contributing to the advancement of that frontier, thereby reaping the benefits of being a leader in technological development. Then there is a third situation – and one which has become particularly important in the present geo-economic context: when advanced economies are challenged in their technological leadership positions by fast-moving catching-up economies, with China being the most prominent among the latter in today's global economy. It is this third situation that has given particular impetus to the revival of IP in advanced economies and prompted strategic behaviour that is no longer simply guided by the traditional analytical concepts of IP aimed at correcting market failures. Such strategic behaviour increasingly also includes geo-political considerations that go beyond purely economic considerations and that also factor in political/international relations.

The use (and the potential for the effective use) of IP instruments will therefore depend on the international context in which an economy finds itself. This is particularly relevant in the context of the European Union (EU), where an economy that is an EU member state can make use of the coordination possibilities that the bloc's deeply integrated market and institutional policy-making framework provides. This allows it to participate in the setting of common goals, to orientate policies towards providing 'public goods' at the cross-national level, and to reap the benefits of economies of scale and scope in the context of a policy space that is wider than would be possible for a country operating on its own. On the other extreme, there are economies that are isolated in an international context or find themselves in a

conflict situation between major economies (e.g. the current US-China relationship) in which IPs can only be coordinated to a very limited extent, if at all. In this case, IP would be seen as operating mostly in a 'win-lose' context.

What about aims other than 'growth' and 'competitiveness'?

'*Growth'* itself can include narrower or wider definitions. For example, while a narrow definition would refer mostly to growth in GDP per capita, wider definitions could include a number of social targets, such as general health, more widespread levels of education across the population, or access to 'cultural capital', which have been included and operationalised in 'beyond GDP' concepts of growth (see Stiglitz et al. 2009). More recently, ecological/environmental criteria of sustainability have also been emphasised in assessing growth and industrial strategies.

Furthermore, macroeconomic criteria of sustainability will have to be kept in mind when the design and impact of IP are considered. This particularly refers to the development of public and external debt situations that are linked to public expenditure programmes and, hence, to IP as well. However, in both of these domains, IP should be able to alleviate sustainability issues related to both public debt and external accounts through its (intended) impact on growth and competitiveness.

'*Competitiveness'* is traditionally defined using trade indicators (e.g. growth in market shares of tradable goods and services), but it is often also measured in other ways, such as earning high ranks in various types of 'score cards' based on indicators such as patenting, citations, R&D expenditures, or the levels of training and skills of the work force, which would lead to high rates of innovation and more advanced capabilities to work with advanced technologies. It can also refer to the effectiveness of managerial and organisational structures in the private or public sectors (think of the role such structures play in the success of large US or Chinese digital companies or of publicly provided services, such as health or digital infrastructure, in different countries).

What about the range of policy instruments that could be at the disposal of industrial policies?

Bringing the definition and the goals of IP together, one would delineate instruments of IP as those that are aimed at affecting the 'structural composition' of an economy to achieve 'growth' and 'competitiveness' goals. This could, in principle, include a very wide array of instruments, since we have mentioned many categories of 'structures' (e.g. sectors, products, technologies, skills of the labour force, types of companies, and regions), all of which might impact growth and competitiveness in one way or another. And, indeed, researchers' attempts to compile an inventory of IP instruments have come up with a wide array of instruments used (for one of the most recent compilations of such a database, see IMF 2024a).

Traditionally, a distinction has been made between 'horizontal' and 'vertical' instruments. Both of these can influence the 'structure' of an economy aimed at growth and competitiveness. As an example of a horizontal policy, one could cite the incentivisation of R&D spending across the board through tax incentives. Although designed as part of a 'horizontal' policy, such incentives will be taken up in a differentiated manner by different sectors of the economy, by different types of companies, and by different regions, depending on how well-positioned the sectors, companies and regions are to benefit from such tax incentives to drive their innovation and, thereby, their productivity and competitive performances. Looked at it this way, all 'horizontal' policies – be they general tax incentives, provision of

infrastructure, training and R&D support, measures to facilitate exports, etc. – will have an impact on 'structural' change.

Apart from this, there are naturally also policies that explicitly single out specific sectors, technologies, types of companies, regions, or segments of the labour force for specific types of support, including preferential subsidies, access to cheaper finance, support for small and medium-sized enterprises (SMEs), specific training and research programmes, trade and international investment policies, etc. This is what is considered the core of 'industrial policies', which are now compiled in various international databases, such as the New Industrial Policy (NIPO) database (IMF 2024a; see also Juhasz et al. 2023b for a text-based approach that compiles such a database).

Since policies that aim to achieve the goals of IP will have impacts on economic and social developments that are also the targets of other policies (e.g. competition and regional or social policies), trade-offs and conflicts between these different policy aims will have to be explicitly considered. Thus, for example, regional policy might be aimed at the convergence of income levels across regions, while the use of some IPs (e.g. innovation policy) might give impetus to agglomeration tendencies and thereby contribute to the divergence of regional developments. Similarly, competition policy is aimed at constraining the power of leading companies on EU markets, while IP might want to encourage the emergence of European 'big players' in certain sectors that are able to compete with international competitors of a similar size. Furthermore, R&D and training policies aimed at strengthening innovation capabilities will support differentiated skill and remuneration developments, which might conflict with a more egalitarian thrust of social policies.

Another issue of importance in the EU context relates to the policy instruments being deployed at different levels of governance (EU, national and regional), given the multi-level governance structure that characterises the EU. The EU's ability to deploy policy instruments at such different levels and to coordinate them effectively may be one of the great advantages it enjoys compared to other global competitors for which the cross-country integration and coordination of policies is either absent or has reached a much lower level than in the case of the EU. In this respect, a careful elaboration of the principles that should guide the allocation of the domains of IP to different levels of governance is important in addition to putting in place the administrative and monitoring structures that could effectively leverage this potential advantage.

2. THE EVOLVING GEO-ECONOMIC AND GEO-POLITICAL CONTEXT OF THE EU'S INDUSTRIAL POLICY

We currently find ourselves in a period of rapidly changing geo-economic and geo-political constellations, and the increased amount of attention that policy makers are paying to IP reflects these changes to an important extent.

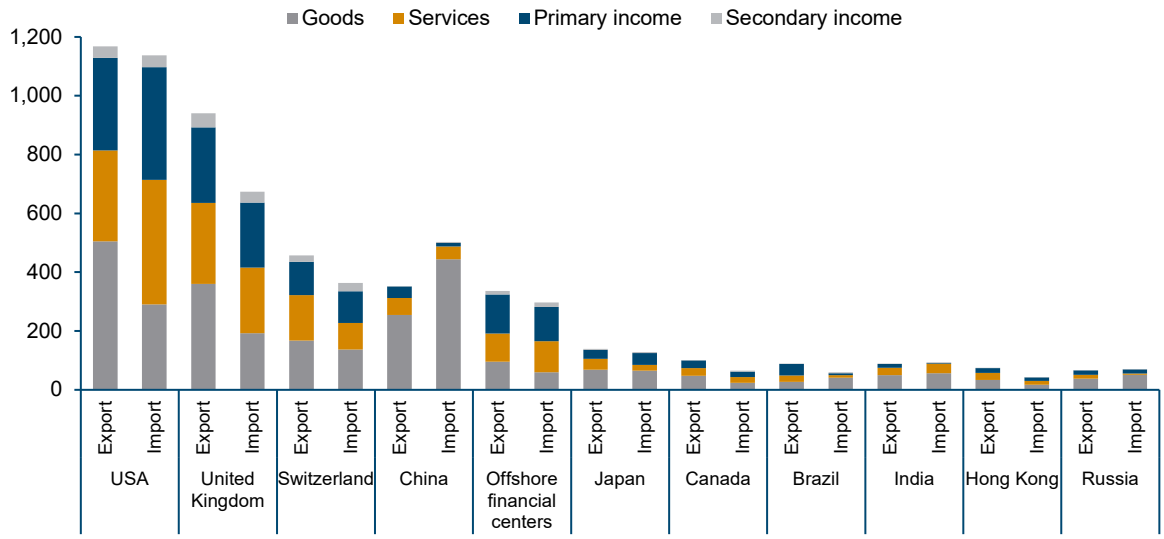
The competitive challenges of China and the US

First, the dynamics of global economic developments over the past decades (i.e. the 'geo-economics') have themselves led to 'multipolarity'. There is no longer an unrivalled dominance by 'the advanced West' (including – without being exhaustive – the US, Canada, the EU, the UK, Japan, South Korea and

Australia) in technology and in commanding global market shares in trade and international investment. This is particularly true in the case of the rise of China, which – in the earlier phases following Deng Xiaoping's liberalising reforms – has mostly benefited from technology transfer and from 'Western' multinationals, which have played a major role in its successfully becoming the dominant global manufacturing powerhouse and exporter of 'Made in China' products. But this stage has been superseded by China's rapid development of its own technological capabilities, which has made it into a major force in some of the most advanced technological fields – as, most recently, in artificial intelligence (AI). Indeed, China now occupies a prime position in international patenting activity and has achieved dominance in a wide range of 'green technology' fields, such as the production of solar panels, batteries and electric vehicles (EVs).

Of course, challenges from fast-moving catching-up economies have also arisen before. In particular, Japan, South Korea and other Southeast Asian economies have closed technology and product-quality gaps with US and European producers in the period following the Second World War. However, China's closing of the gaps has been different, specifically in relation to the scale of its production capacity thereby reaping very significant economies of scale. This has given it relatively unparalleled dominance in a number of product areas and allowed it to produce goods at costs that give it a competitive advantage with which European producers cannot effectively compete. For countries in Europe (in particular, Germany) that saw themselves as dominant high-quality producers in many areas of equipment manufacturing (e.g. mechanical, electrical and transport equipment), this challenge is very serious. One should note, however, that this challenge has to date been concentrated on the manufacture of goods but not on tradable services, for which 'the West' (especially the US and the UK) continues to enjoy a strong competitive advantage (Figure 1).

Figure 1 / Balance of payments of the top 10 trading partners of the EU, 2023, EUR bn



Source: Eurostat, own illustration

Over roughly a similar period, beginning in the mid-1990s and especially since the global financial crisis (GFC) of 2008/2009, the EU's position vis-à-vis the US has deteriorated. As is well documented in the so-called 'Draghi Report' (Draghi 2024), Western Europe's efforts to catch up with the US in terms of income

and productivity levels were successful during the period between the end of the Second World War and roughly 1995, when it reached 95% of the (labour) productivity level of the US. But then the gap in productivity levels began to widen again (and is currently estimated to be about 80% of the US level; see Draghi 2024: 15). Since the 1990s, a number of studies (see van Ark et al. 2008; Aiginger and Landesmann 2007) have pointed out that Europe lagged behind the US in the initial digital revolution – specifically in terms of the production and diffusion of information and communication technology (ICT) – in a way that is similar to how it is now lagging behind in the current wave of AI as well as cloud and quantum computing. In these fields, not a single major European company ranks among the top players, which predominantly come from the US and China. This points to a major failure of Europe's innovation and IP over the past decades (see e.g. publications of Veugelers[1]). The evidence presented in the Draghi Report shows a lack of structural change in European industry, with little change in the composition of the main sectors accounting for the bulk of European spending on R&D and patenting activity, while the major productivity growth gaps relative to the US can specifically be found in the ICT sector and in digital services. A number of analysts now speak of the 'middle technology trap' in which Europe's industry, as well as the scale and direction of its innovation activity, is currently caught (see Fuest et al. 2024).

Can Europe successfully counter the enormous scale and network-externality advantages of China and the US?

In China, the EU and Western economies in general are facing an economy with a persistent savings rate of about 50% of GDP, which means that it can afford a lot of inefficient/wasteful investment yet still achieve some of its IP goals. This occasionally gives rise to significant excess capacities, which can exert strong price pressures on international markets. Furthermore, while China's single party-dominated governance structure used to be judged incapable of efficient decision making in comparison to liberal market economies, it has turned out to be effective in steering the economy towards a successful catching-up path while pursuing an IP that has made it a major force in innovation and put it at the forefront of the most recent wave of industrial, green and IT innovations. It remains, however, still an open question whether weaknesses in China's governance structure – which sometimes strongly interferes in the affairs of domestic companies (e.g. Alibaba and Tencent) – will emerge over time and dampen the innovative capacity of its economy.

In comparison with China, Europe and the US have a much lower aggregate savings rate, from which both public and private investments have to be financed. Although international borrowing is an important additional source of finance for the US, this is not true for the EU, which is a net capital exporter. Furthermore, public investment in European economies often falls victim to episodes of fiscal consolidation. Public infrastructure investment projects (which have long gestation periods but are vital public inputs for a well-functioning economy) are often scaled back during such episodes. Hence, when it comes to mobilising the volume of needed investment, Europe faces a clear disadvantage not only to remain competitive in areas of long-term capacity-building in general, but also to deal with the long-term challenges of industrial structural transformation and the build-up of technological capabilities.

Linked to this is also the disadvantage that the EU faces with respect to the expected return on (public and private) investment both in comparison to China and the US, and this has to do with the scale of expected sales and of potential users of the output that results from public and private investment. Since the

[1] https://www.bruegel.org/people/reinhilde-veugelers

European market is more fragmented, the expected (private and social) returns from such investments are lower. This also explains the lower interest of international capital markets in investing in European equities. Although the importance of deepening the integration of the EU's Single Market is the core topic of the so-called 'Letta Report' (Letta 2024) and has been emphasised in numerous European Commission strategy papers, not much progress has been made to date. Furthermore, while there has been continuous emphasis on developing a joint approach to public infrastructure (e.g. by enhancing cross-border transport infrastructure and linking energy grids; see European Commission 2024a, 2024b), the resources devoted to these efforts have been limited and the users of public infrastructure still encounter more segmented access to such assets in Europe than is the case in the US and China.

From a European perspective, it is unlikely – as well as not desirable – to aim to achieve investment rates comparable to those of China. At the same time, however, we do agree with the Draghi Report's recommendation that a significant increase (say, of 4-5 percentage points) in the investment rate (i.e. investment as a share of GDP) would be important to direct Europe's economy to achieve the necessary industrial transformation and to facilitate the required change in technological trajectories (see Sections 3.1 and 4 below). The emphasis must be on the efficient use of savings and investment. Recent considerations to mobilise untapped savings in the European markets to support private and public investment efforts as well as innovation activity that requires risk capital go in this direction (see Walther 2024a, 2024b; Draghi 2024: Ch. 5).

Is industrial policy a 'win-lose' game? Or can the EU aim to strike a balance between cooperation and rivalry?

With multipolarity comes tensions, rivalries and outright conflicts, but also the potential for forming coalitions and cooperation. In such an international environment, the conduct of IP must take into consideration the positions, interests, resources and strategies of a multiplicity of actors as well as the spill-over effects that the EU's conduct of IP has on them and, vice versa, that their strategies have on the EU (see also IMF 2024b).

There are a number of actors or groups of actors that the EU has to consider when it thinks about the consequences of the conduct of its own IP on these actors, how they might react to these consequences, and the actors' conduct of their own IPs.

First of all, there are the two actors already mentioned above: the US and China. How should the EU approach the conduct of IP in a global context that is increasingly shaped by the US-China rivalry, which may in many instances be seen as a non-cooperative conflictual relationship? Should the EU pursue a double-sided cooperative strategy with these two major strategic players while the latter conduct industrial, trade and technology policies that are non-cooperative in nature?

At this stage, it is difficult to predict the evolving characteristics of the US- China rivalry. If it develops into outright conflict (such as one triggered by a Chinese invasion of Taiwan), it will be hard for the EU to avoid taking a position strongly aligned with the US in strategic terms. This could include a sharp turn away from the EU's current careful adjustment of trade and investment policies towards China, which encompasses a 'diversification' strategy to be less dependent on Chinese imports and its market as well as to more strictly monitor Chinese inward investment. Under deteriorating conditions, it could even go

so far as following the heavily restrictive trade and investment policy of the US combined with a strong military alliance with the US, which would also dominate the strategic steps taken by such an alliance.

Although it is difficult to see which scenario will evolve over the coming years, the EU is currently trying to maintain an 'in-between' position – although one not characterised by 'equal distance' – that serves its economic interests in terms of both EU businesses with strong linkages with China as well as EU consumers, who benefit from Chinese imports. Over the medium to longer term, policy will also be driven by the EU's concerns about a possible technology gap opening up – not only with the US but also with China – and about losing further fields in which it has traditionally held comparative advantages.

Second, there are mid-sized emerging powers, with some being in the EU's immediate neighbourhood (e.g. Turkey) and some being farther away (e.g. Brazil, Saudi Arabia and India, with the latter being in the process of becoming a major power). These countries have increasingly been gaining some 'strategic power', which means that they can play a significant role in influencing geo-political alliances and, through their actions, generate positive or negative spill-over effects in the areas of trade policy, access to raw materials, or supporting mutually beneficial migration and mobility schemes (including for skilled workers). Through the choice of their alliance partners, they influence the global supplies of energy and critical raw materials as well as the development and security of global value chains (GVCs), which makes them important to European business strategies. A conflictual relationship with these countries would have negative impacts on Europe's geo-economic position, including its industrial strategy, which has to rely on international linkages. Cooperation vs. non-cooperation with these economies is not just a function of the EU's strategy in a world of 'big power' geo-politics and geo-economics, as it also depends on strategies directed specifically at these countries.

In this context of alliances and rivalries, the EU is manoeuvring in a manner unlike the other two big powers (i.e. US and China). While it must rely mostly on instruments of economic incentives and 'soft power', the other two are also motivated by geo-strategic interests beyond economic interests and can also project military might. This can also be an advantage for the EU, as non-economic geo-strategic interests are not interfering with economic interests, which might even be welcomed by these emerging powers. On the other hand, it might also dent the relative bargaining position that the EU can project.

Third, there is a large number of other countries in the 'Global South' and, again, some are in the EU's neighbourhood and others are farther away. In many cases, these are low-income countries that have very limited strategic power themselves. They are mainly so-called 'policy takers', meaning that they are affected by the policies of others, be they regional or global powers, while their own policies do not have much impact on the economic or political destinies of others. Nonetheless, a cooperative relationship with countries of the 'Global South' can be of significant importance for industrial cooperation, as it can provide scope for mutually beneficial relationships in the areas of trade relationships, allow the EU to benefit from supporting countries in their development processes as well as support them in their efforts to adjust their economies to meet various challenges (e.g. climate change). Furthermore, as an ageing continent, Europe has a strong interest in exploiting demographic complementarities for mutual benefit and, given the numbers of votes that the 'Global South' commands in international organisations (e.g. the United Nations and the World Trade Organization), it can support or negatively counteract Europe's strategic interests through their collective voting share.

Can the EU's design of industrial policy better exploit the potential of its European and non-European neighbourhood and benefit from intensifying the EU's interactions with the 'Global South'?

At present, the EU is not properly exploiting the potential of its relationship with its European as well as with its non-European neighbourhood to further the aims of its IP. This is apparent in the distinct difference in the pattern of income and institutional catching-up between those countries that have joined the EU and those countries that remain outside the EU but are still strongly linked to it, especially through international trade.

Let us first deal with the group of European neighbourhood countries that includes the Western Balkan countries, Moldova, Georgia, Ukraine and Turkey (we intentionally leave out Russia and Belarus because including them would necessitate a separate analysis, as the current situation indicates a strong economic decoupling given the antagonistic relationship). All of the included countries are candidate countries for EU membership, but the time horizon of accession – and even whether it will finally materialise – is far from clear. Nonetheless, these neighbourhood countries could be much better supported in their development processes than they currently are and, at the same time, they could be drawn more tightly into the EU's IP strategy.

For starters, while these countries are beneficiaries of significant pre-accession support programmes, there is a still a big gap in terms of the resources made available to the countries that are not members of the EU compared to those that are. This is not surprising in itself. After all, non-members are not participants in the main expenditure programmes of the EU (e.g. the common agricultural policy, regional policy, innovation policy and the European Social Fund). All of these are programmes support the pursuit of the goals of IP in one way or another, and for those countries that have become EU members, these programmes contributed significantly to their growth and catching-up processes (see the evidence provided in Landesmann and Szekely 2021).

Given these circumstances, we would support the proposals found in Mihajlović et al. (2023) for a staged accession process, whereby candidate countries can gradually fully participate in such programmes as soon as they have positively concluded negotiations on the linked chapters of the acquis. In addition to supporting their development processes, this would also allow them to contribute to the EU's industrial strategy, which would thereby cover a wider economic space, thereby encouraging their full integration into regional production networks, into training and labour market programmes, as well as into the EU's transport and energy systems.

As regards the non-European neighbourhood programmes, access to the large expenditure programmes of the EU will not be feasible. Nevertheless, tailored support for their economic and institutional development could be intensified, as there is a lot of scope for a more intensive integration of trade and production structures, for exploiting comparative advantages, and for mobility and training schemes that build on demographic complementarities and upgrade human capital and labour market prospects in the EU's non-European neighbourhood, thereby also reducing unwanted migration pressures (for more on this issue, see Section 3.2 below).

3. STRUCTURAL CHALLENGES OF THE EU'S INDUSTRIAL POLICY

We are currently living in an era in which the challenges to be addressed by EU IP are particularly intense and varied. In what follows, we will discuss three particular challenges in turn: (i) the challenge of technological and industrial transformation; (ii) the challenge of designing an 'appropriate industrial policy' that takes into account the very differentiated capabilities and potentialities of the main addressees of IP (i.e. companies, countries/regions, and segments of the labour force); and (iii) the challenge of how to conduct IP in a complex, competitive, conflictual and evolving international environment.

3.1. The challenge of technological and industrial transformation

At this historical juncture, the EU is confronting the challenge of a multiplicity of technological and industrial transformations: the green transition, the digital/AI technological transition, and the need to adjust to Europe's security challenge.

Each of these involves (or, as economists would sometimes say, 'traverses'[2]) rather fundamental industrial transformation processes. However, the IP instruments to be used will be somewhat different, the resistances to be overcome might be different, and the main actors involved (e.g. governments and the private sector) as well as their methods of coordination (e.g. EU-level vs. national- and regional-level interventions) will also be different.

The green transition: Much has been written about the 'green transition', and it is probably the area in which the most work has been done by the European Commission in its various directives to guide EU policies towards this transition (European Commission 2019, 2023; for a critical evaluation, see Tagliapietra and Veugeler 2021, 2023; Tagliapietra et al. 2023). The last Commission developed the Green Deal as a core policy programme (for an overview of the development of the EU's green industrial policy, see Landesmann 2025). More recently – owing to the more immediate pressures of an energy price shock as well as given the evidence of falling behind in competitiveness terms – there are indications that the EU is backsliding on its strong commitment to the Green Deal.

The green transition encompasses a range of domains of industrial transformation: of the energy system; of production processes across the spectrum of industries, especially those that are intensive in terms of energy requirements and CO_2 emissions; and, finally, of the basket of commodities/inputs purchased by consumers and producers, as these commodities directly or indirectly require inputs whose production is intensive in terms of energy requirements and CO_2 emissions.

Why is guidance needed from industrial policy to facilitate the required industrial transformation in all three of these areas?

All of these areas require changes in their 'structures': changes in the composition of different forms of energy generation; changes in the composition of industries that are consuming energy in different forms and emitting CO_2 to different degrees; changes in the techniques of production used (reducing energy

[2] A 'traverse' refers to the move from one structural composition of an economy to another. The concept was introduced into economics by J. R. Hicks (1973).

intensity and changing the energy mix away from those that emit the most CO_2 all the way to a shift towards renewables); and, finally, changes in the commodity baskets consumed.

The difficulty of industrial transformation lies in the 'rigidity of structures'. This involves three things: (i) fixed capital invested, which reflects the existing composition of industries and the use of specific techniques of production; (ii) infrastructure installed as well as the acquired skills of the labour force that are used to work in those industries and with those technologies; and (iii) habitual consumer expenditure patterns. There are important 'sunk-cost' advantages that these existing structures have in comparison to developing new industries, working with different techniques of production, or changing acquired skills. Sunk-cost advantages lead to a 'path dependency' along existing lines of industrial structures, as investments in new industries, production techniques and skills acquisition still have to be made. The bigger the gap between 'old' and 'new' structures (requiring different types of capital equipment, different skills, new or adapted infrastructure, etc.), the stronger the incentive to move along an old trajectory of energy use, composition of industries, production techniques and skills. This explains why 'older' industrial powers or those that were particularly successful in an older set of industries or with an older set of technologies (e.g. Germany in mechanical engineering industries or in fuel combustion technology in the automotive sector) stay on an existing industrial and technological trajectory for longer than would be the case if the sunk-cost advantages of 'older' structures were not present.

The shift towards a new trajectory involves changeover costs that deter such a shift. IP can (and does) intervene in a number of ways. For example, various tax and subsidy schemes can be (and are) used that make the continued operation of old structures (e.g. energy systems and production techniques) more expensive, such as by imposing CO_2 emission charges and/or subsidising the instalment of the 'new' structures (e.g. with preferential financing schemes to install new equipment and to subsidise skills acquisition), both of which are meant to reduce or compensate for the sunk-cost advantages of the 'old' structures. Public authorities can also fully shoulder some of these costs, such as by paying for worker training, investing in or operating new energy systems, providing new infrastructural facilities and financing, and (at times) even operating new start-ups in new industries. However, the pursuit of an 'efficient traverse' by policy makers must counter lobbying powers, which in many instances represent the interests of well-established incumbent industries – a phenomenon well known from the literature on trade policy (see e.g. Grossman and Helpman 2002).

A further important rationale for intervention by public authorities is related to innovation (and learning) processes. Here, too, it amounts to countering features of 'path dependency', as innovation and learning (i.e. skills acquisition) are cumulative processes and innovation, along new technological trajectories, have the comparative disadvantage of being less able to draw on the cumulative advantages of older technological innovation processes. Thus, such changeover processes in innovation also requires incentives, subsidies and/or public goods provision (publicly supported research and training facilities) to support the switchover to new innovation trajectories. Here, as well, the further the new technological trajectory is in terms of being able to draw on the cumulative knowledge stock of the older innovation trajectory, the higher the costs of such a switchover to compensate for the advantages that older technological innovation trajectories have over new ones (see Acemoglu et al. 2023 and Aghion et al. 2016, 2019).

We can see that sunk-cost advantages of old structures and of technological innovation trajectories are an important reason for IP intervention in processes of industrial transformation, such as the 'green

industrial transformation'. It also points to an advantage enjoyed by countries in which 'old structures' and old technological innovation trajectories are not in place and therefore public intervention to incentivise such a switchover might not be needed. This is the advantage of 'greenfield' sites and of catching-up economies, which might be well positioned to 'leap-frog' the more arduous industrial transformation processes in more advanced economies. At times, there is also an advantage enjoyed by older industrial powers that have previously gone through a profound process of 'deindustrialisation' (e.g. the US and the UK as compared to, say, Germany). In such places, since building on older industrial trajectories was no longer feasible, the switch to new activities (e.g. digital industries) has not faced the sunk-cost advantages and lobbying powers of older industries.

Innovation and industrial transformation: IP thus has an important role to play when there is the challenge to achieve a major shift in technological trajectories (e.g. decarbonisation or the use of AI in many forthcoming applications), both in innovation but also in overhauling industrial structures (including invested capacities and skill/training structures). We have argued above that this is the case with the green transition. But it also applies more generally to other types of transitions that require a shift in industrial structures, technological trajectories and qualifications in addition to physical infrastructure and institutions (e.g. new types of regulatory bodies and educational institutions).

Europe has not been very effective in a number of technological innovation waves over the past decades (especially digital technologies) and, more recently, in what seems to be a major technological revolution in the field of AI. Especially in Germany, which occupies a crucial position in European manufacturing production, there has been insufficient intervention to facilitate an overhaul of industrial structures in light of the new technological trajectories, as the timely shift to digital technologies, information technology and EVs was missed. The power of sunk-cost advantages led to the continued investment of a high share of industrial R&D in traditional technologies (e.g. the combustion engine) and the industries in which Germany has traditionally held a comparative advantage (motor vehicles maintained the top position in the share in industrial R&D spending) (see also Tordoir and Setser 2025). Furthermore, as discussed above, the lobbying power of incumbent firms in traditional industries also leads public R&D and IP instruments to be skewed towards powerful incumbent firms and industries.

The relatively weak position of the EU as a whole in supporting innovation can be seen in overall R&D spending. The figures for 2022 show that the share of R&D in GDP in the US is about 3.5% compared to 2% in the EU (China's R&D share in GDP of 2.4% was already above the EU's). If we look at the breakdown of public vs. private spending on R&D, we find that the discrepancy between the US and the EU lies almost exclusively with private-sector funding: while government-financed R&D amounted to 0.66% percent in the EU and 0.6% in the US, business-financed R&D was 1.22% in the EU and 2.4% in the US (see Veugelers 2024).

To explain this difference, analysts specifically point to four factors: (i) the factor already discussed above, namely, the insufficient market integration, as emphasised in the Letta Report (Letta 2024; also European Commission 2021); (ii) the different financing structures of European capital markets, especially the under-provision of venture capital (for a recent assessment, see Walther 2024a, 2024b); (iii) the tighter and more effective relationship in the US between research institutions, universities and innovation activity in the business sector; and (iv) the role the military sector plays through public procurement and innovation spill-overs for the innovation process in the civilian sector (see Mazzucato 2013). While the four items above have been well explored when it comes to comparing the EU with the

US, the comparative analysis of the Chinese system in relation to these factors (especially (iii) and (iv)) has been less explored.

We would also like to mention two additional items that are important for a sustained dynamic of innovation in these three economies: (v) competition policy and (vi) migration policy and international attractiveness for highly skilled workers.

Competition policy has been much discussed in relation to a new direction of European IP (see EPSC 2019 and Bundesministerium für Wirtschaft und Energie/ Ministère de l'Économie et des Finances 2019). The issue here is one of a distinct trade-off that the EU is facing in the evolving geo-economic and geo-political environment. On the one hand, there is the important role of competition policy to constrain the market power of incumbents, thereby supporting the entry and growth of new innovative companies (see Veugelers and Cincera 2010). On the other hand, there is the tendency in the global economy – and especially in the most high-tech digital and AI industries – for oligopolistic market structures to emerge in which a handful of companies dominate the industry.

This is not a new phenomenon, as the international car industry, the pharmaceutical industry, the duopoly of aircraft production, and the computer industry (think of IBM) have also shown such high levels of concentration in the past. Hence, European competition policy must adjust to the reality of this global competitive pressure, especially in high-tech industries.

The dominance of the 'global players' in high-tech industries is currently very strong, and a breakthrough for European producers to be present in such industries with their own 'champions' will only happen if a coordinated effort is made at the cross-national European level (as happened with the Airbus project). However, it does not have to mimic the US or the Chinese model in this respect, as the EU can design its own way of nurturing highly competitive companies that have the innovative capacity and can achieve sufficient scale to contend with global competitors.

The European model can thereby rely on its own comparative advantages. For example, there could be a more state-guided cooperative effort at the EU level (e.g. the already ongoing Important Projects of Common European Interest (IPCEIs)), support for 'infant industries' through financing schemes, a continuous effort to bring down barriers within the Single Market, the incentivisation of much closer university-business linkages, the utilisation of public procurement policies, the provision of infrastructure, and the establishment of state-sponsored training and 'innovation labs', all of which can support efforts to reach the required scale and innovative capacity to meet the global competitive challenge.

Since many of the 'knowledge-based' industries are characterised by strong 'network externalities', breaking into these markets with well-established incumbents requires up-front support from a differentiated but targeted portfolio of IP measures. This does not exclude cooperative joint ventures with some of Europe's global competitors, and the pooling of resources through cross-European IPCEI business ventures and EU support packages should provide the basis for negotiating such joint ventures not from a subordinate position.

Nevertheless, competition policy will continue to have a role to play in controlling the power of nascent 'European champions' on the European market to ensure that innovative new entrants, especially in highly innovative branches, are protected from early takeovers. They could be supported through

(competitive bids for) finance and venture capital, the encouragement of university spin-offs, and a migration policy that eases the hiring of highly qualified international personnel (both technical and commercial). Competition policy will also remain important to make sure that one of the strengths of European industry – namely, the medium-sized companies (the 'Mittelstand') that are prevalent in Germany, Austria and some countries in Northern Europe – continue to receive support, as quite a few of them are technology leaders in global market niches.

Migration policy, and especially providing conditions to attract highly qualified personal (i.e. the so-called 'race for international talent'), is also one of the relevant factors for a successful EU IP. Given the demographic dynamic, with a declining labour force as a share of the population and the already visible labour shortages in important fields, it will become an even more important factor for growth, productivity and innovation performance in the decades to come – not only in Europe, but also in the US. A policy that follows the rationale of economic necessity, however, is countered by political processes that are increasingly dominated by populist pressures; these enforce an increasingly restrictive stance on migration policy. To date, policy makers have not found a recipe for successfully resolving this contradiction.

The security dimension of industrial policy: Over the post-war period, Europe has benefited from a military-industrial security umbrella provided by the US, which has allowed most EU member countries (with the exceptions being France and, when still an EU member, the UK) to neglect to build up and maintain a robust defence industry of their own. With the Russia-Ukraine war and the intensified pressure from the US (especially with the second Trump presidency) for Europe to meet a much higher share of its security needs, the situation has changed. There is now a general acknowledgement that significant resources must be devoted to this task. In addition to the mobilisation of more (public and private) resources, this will also require much more intensified coordination efforts – not only among EU member countries, but also with European allies that have joint security interests (e.g. the UK, Switzerland, Norway and – in future – Ukraine, with Turkey being a more complex case).

The target of moving towards 2.5% or 3% of GDP in defence spending is not the only issue here, as achieving some degree of independence from the US in terms of security policy- related decision making will also entail developing production and innovation capacities in the security field in areas that are currently not sufficiently covered in Europe (e.g. satellite and intelligence capacities). This also goes back to the importance of pooling resources and strongly increasing coordination and cooperation within Europe. Alternatively, a significant share of the spending could go towards purchasing weapons and relying on innovation in the defence field from other partners, most prominently the US.

How does EU IP in the defence field differ from the conduct of IP in other areas, such as innovation policy more generally or the public-private efforts to achieve industrial transformation in areas like the Green Deal?

First, there is the issue of how to deal with technology transfer outside the EU and restrictions related to supplying defence equipment (including 'dual use' goods and services) to countries that are potential foes in geo-strategic relationships.

Second – and this also applies at the domestic and intra-EU level – public authorities need to have stricter control over the defence industry, as allowing private actors to have fundamental decision-making authority (take the example of Elon Musk's SpaceX Starshield) would not be acceptable.

Third, harmonisation and scale are likely to play more important roles in many parts of the defence industry than in other areas of industrial production and innovation. The 'love of variety', which is an important feature of differentiated demand in civilian areas of production (both consumers' expenditure, but also in the demand for tailor-made intermediate inputs and capital equipment), plays much less of a role in defence and is, in many cases, a hindrance to achieving efficiency in this sector. Hence, exploiting scale and making strategic decisions with respect to production sites at the European level can play a particularly important role in this area compared to other fields in which EU IP has to be active.

Apart from direct public procurement at the European level, the relatively successful concept of coordinating cooperation among European businesses through IPCEIs applies here as well. Just like in the successful Airbus project, there are a number of important similarities: (i) long lead times will be required for planning, and there will be a significant gap between when initial investments (in innovation and production facilities) are made and when returns on that investment materialise; (ii) cooperation can and should exploit comparative advantages across European partners in innovation and production capabilities; and (iii) effective coordination at each stage (e.g. long-term planning of defence requirements as well as the development and use of defence capabilities) is important (see also Engberg 2025).

The defence sector is not isolated from other sectors of the economy, and this applies to both innovation and production. There are spill-overs in both directions, and these have to be encouraged and exploited, although due attention has to be paid to the issue of overall public (state or EU-level) control of decision making over sensitive aspects of such spill-overs. In the current context, since the expected spill-overs of AI development between military and civilian uses will be particularly high, it will be important to have robust monitoring and effective control mechanisms in place.

3.2. The challenge of designing an 'appropriate industrial policy'

Heterogeneity and differentiation across the European continent and its neighbourhood can be seen as an important advantage, a characteristic which it shares with the Asian continent (particularly South and Southeastern Asia). It is a continent with widely diverse productivity levels (as reflected in income and wage levels), resource endowments, climate conditions and demographic characteristics (the latter with the non-European Middle Eastern and African neighbourhood). Together with this also comes a constrained diversity of institutional structures due to the impact of the EU on its members states as well as on associated and candidate countries. Although the EU's well-known 'Unity in Diversity' motto mainly applies to its members, it can also be extended to the European continent as a whole (though the conflict with Russia limits the scope to include this country as well as Belarus). While the institutional anchorage is definitely much looser, from an economic-integration point of view, this concept can also apply to Europe's neighbourhood, the Middle East and Northern Africa (and, beyond that, to the African continent as a whole), which are all strongly linked with the EU through trade, although in different ways and to different degrees.

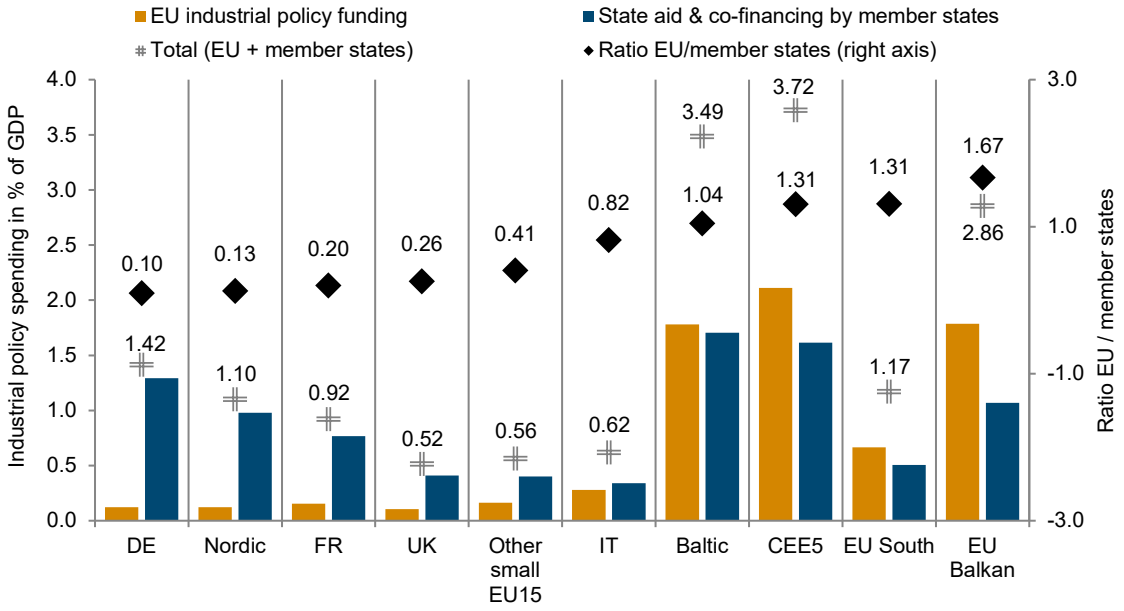
This differentiation in resource endowments, demographics and production conditions across a wide economic space gives Europe an enormous opportunity in a geo-economic/geo-political environment in which there is a strong trend towards 'regionalism'. This refers to tighter economic linkages across a neighbouring group of countries supported by preferential trade and investment policies within a wider global region. At the same time, the linkages across these regionalist entities become subject to geo-

political tensions, potentially leading to 'regional bloc' formations, which go against a world ruled by multilateralism.

The conceptualisation of IP across a continent (and its neighbourhood) that is characterised by such diversity in income, productivity levels and institutional/political economy conditions has to take into consideration that the design and application of any IP factors in the different conditions in the different parts of this economically highly integrated continent (plus its neighbourhood). Roman Stoellinger and I (Landesmann and Stoellinger 2019) have coined the concept of '*appropriate industrial policy*', which is analogous to the concept of '*appropriate technology*' that is well-known in development economics (e.g. Los and Timmer 2005). There, it refers to the importance of having technology transfer from more advanced to developing countries take into account the conditions and levels of economic development in the countries that should be the beneficiaries of this technology transfer. In the same way, the design and application of the instruments of IP across a differentiated regionalist economy must factor in the differentiated requirements of participating economies and regions.

In the following, we first discuss the differentiated use of IP programmes across the EU member states. As already discussed, IP programmes are financed and implemented at both the national and EU levels. Let us first look at the differences across EU member countries regarding national- vs. EU-level funding of IP.

Figure 2 / Spending on industrial policy by the EU and its member states, by country group, average for the 2014-2017 period



Note: EU Balkan = HR, BG, RO; Other small EU15 = AT, BE, NL, LU, IE; CEE5 = HU, CZ, SK, PL, SI; Baltic = EE, LT, LV; EU South = CY, EL, ES, MT, PT. For the EU regional funds, the total actual financing flows are assigned to individual funds by the European Structural and Investment Funds (ESIF) using the shares of these funds in the planned budget allocations in the MFF 2014-2020. Co-financing amounts by member states are calculated using the ratio of planned allocation of EU spending to actual spending by member states in the MFF 2014-2020. National state aid by member states is the subsidy element contained in national state aid, which is also expressed as a percentage of GDP.
Sources: European Commission (various sources; for details, see Appendices A.1 and A.2.) The calculations have already been compiled in Landesmann and Stoellinger (2020a, 2020b).

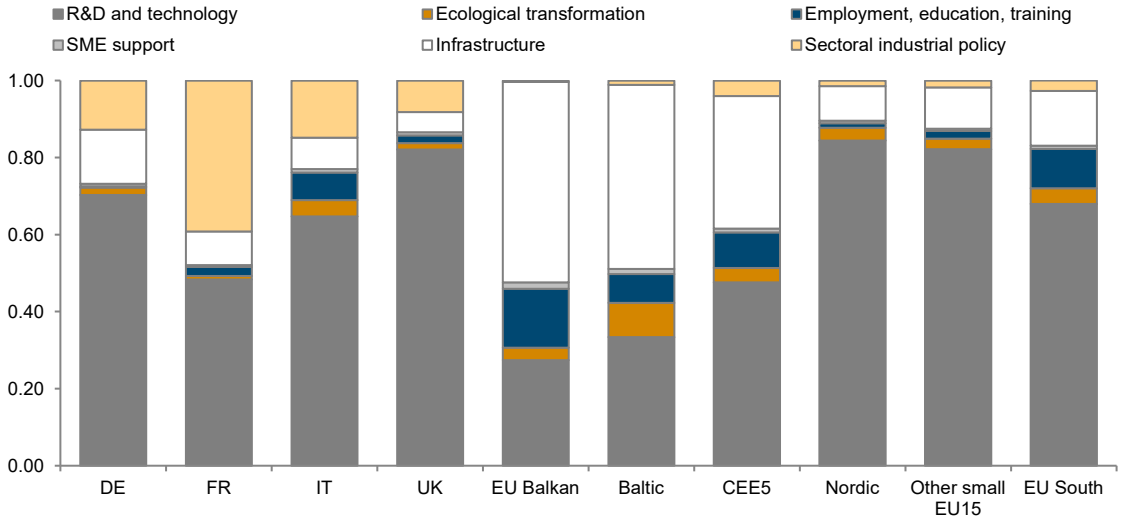
Although we are already in the midst of the 2021-2027 Multiannual Financial Framework (MFF), which outlines the detailed expenditure plans of the EU's budgetary spending for the current period, we have to limit ourselves here to the previous financing period (2014-2020), as information regarding actual (rather than planned) spending is not yet available for the current period (here we draw on an earlier analysis by Landesmann and Stoellinger 2020a, 2020b; for details on how the data were compiled, see Appendices A.1 and A.2). An important feature that is apparent from an analysis of *financing of industrial policy at the EU and national levels* is that different EU member countries rely to very varying degrees on EU policy programmes to support their own efforts. Figure 2 shows that, over the 2014-17 financing period, the lower-income countries (i.e. those in Eastern and Southeastern Europe as well as the Southern European countries) drew to a much higher degree on EU funding for their IP efforts than was the case for the more advanced EU member states. This is a particular consequence of the important role that EU Structural and Investment Funds (ESIF) programmes play in EU-level financing of IP. In this respect, the 'cohesion' aspect does play an important role when considering EU-level financing of IP.

In Figure 3, we then show the *composition of spending from EU programmes*: spending from programmes other than the ESIF programmes in panel a) and spending from ESIF programmes – i.e. regional policy – in panel b). This again shows significant differences between the more advanced EU member countries (the UK is still included in the 2014-2020 financing period) and the lower-income countries, especially those in Eastern and Southeastern Europe. What is most striking is that, as regards funding from central and ESIF budgets, the advanced economies spend a considerably higher share of EU funding on R&D and technology support than the lower-income economies in Eastern and Southeastern Europe (ESEE). Although this is what one might expect, it nevertheless conflicts with the aim of closing gaps in 'innovation capacities' between the two groups of economies. Also evident is the high share of spending on infrastructure by the ESEE group of economies, with relatively little spending on SME support from ESIF funding (see panel b) compared with the more advanced economies.

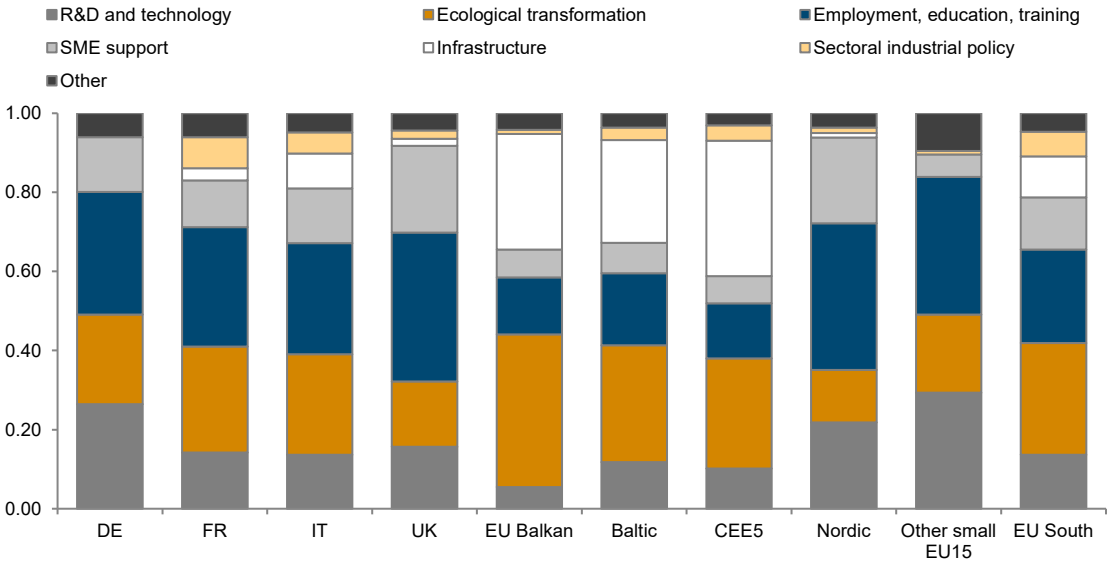
Our first conclusion from this analysis of spending on IP efforts by EU member states is that, regarding the distribution between national- and EU-level funding, there is much more dependence of the 'cohesion countries' (i.e. countries that are distinctly stronger beneficiaries of ESIF programmes) on EU-level funding than is the case for the more advanced economies, which finance a greater part from national sources. In this respect, there is evidence that IP funding through EU-level programmes supports the lower- and medium-income countries to different degrees and, therefore, that the cohesion aspect is reflected in the allocation of EU funds for IP purposes. The second conclusion, however, is that a more detailed analysis of different countries' participation in the sub-components of overall EU-financed programmes shows that the less advanced economies spend considerably less (in share terms) on R&D-related programmes than the more advanced ones. Thus, this aspect reveals that EU funding that targets the build-up and support of innovation capabilities across the EU member states is more skewed towards the advanced economies and therefore potentially reinforces agglomeration tendencies of such capabilities in those economies.

Figure 3 / Spending on industrial policy from the EU budget, by country group and theme, average for the 2014-2017 period

a) Funding of IP from the central EU budget



b) Funding of IP from European Structural and Investment Funds (ESIF)



Note: EU Balkan = HR, BG, RO; Other small EU15 = AT, BE, NL, LU, IE; CEE5 = HU, CZ, SK, PL, SI; Baltic = EE, LT, LV; EU South = CY, EL, ES, MT, PT. The numbers are the shares of the respective IP theme in a country or country group's total EU policy spending, funded by either the central budget or the ESIF.
Sources: European Commission (various sources; for details, see Appendices A.1 and A.2.) The calculations have already been compiled in Landesmann and Stoellinger 2020a, Figure 4.

Let us now turn to the issue of integration with the EU's neighbouring regions (both within and outside of Europe), which we partly covered in Section 2 when we addressed the question '*Can the EU's design of industrial policy better exploit the potential of its European and non-European neighbourhood?*'

These neighbouring regions have the potential to be more tightly integrated into a development strategy that exploits complementarities between them and the European economy along a set of different dimensions: through trade, international production linkages, foreign direct investment (FDI), and education and labour mobility programmes, including training schemes.

The opportunities that – from an economic point of view – exist for a wider region with considerable differentiation within it and strong complementarities (most importantly demographic complementarities, but also in terms of natural resource endowments, skills, and technological and organisational know-how) should also shape the design of IP not only within the EU itself, but also across the continent and with its neighbouring regions.

Deepening trade and production integration with this wider region is of mutual benefit, and there are still considerable protectionist barriers in place, particularly as regards exports of agricultural goods from the non-EU neighbourhood, which is an important sector with considerable potential for quality upgraded food production. Bringing down such barriers will incentivise more FDI and a more intensive integration into international production networks, which can extend to a wider range of industries, including manufacturing but also tradable services. This, in turn, will stimulate employment possibilities in the region, which suffers from considerable youth unemployment, including of the better educated. Combined with circular mobility and training schemes, this could make an important impact on the labour market situation in these neighbouring regions, which currently suffer from brain drain of the young and more highly educated. This is also true for the EU neighbouring region, in the Balkans and in Ukraine (where there are special circumstances due to the war, but we expect this to persist even after the war), as is the case in the non-EU neighbouring regions of Northern Africa and the Middle East.

Among the well-known constraining factors are institutional deficiencies, including poorly functioning legal and administrative structures, which act as a deterrent to international investment and a more intensive inclusion in international production networks (this particularly affects sectors where reliance on the rule of law is important). If this is not tackled, international trade specialisation is distorted, which leads neighbouring regions to remain stuck in a development trap of supplying mostly raw materials and commodities that cannot otherwise be sourced along with low chances for upgrading in the direction of processing, higher value-added stages of production, and more extensive global value chain (GVC) integration.

The use of IP instruments in EU neighbouring regions is also important when it comes to linking up their energy systems and transport infrastructure with those of the EU as well as reducing regional trade and (business) entry barriers within the regions to provide a wider and more attractive economic space for international investors. But it is also important in terms of nudging these regions to improve their legal and administrative structures through monitoring and incentive mechanisms. In some cases, it might be necessary to set up dual structures that cover export processing zones (EPZs) with better functioning and monitored administrative and fast-track legal mechanisms.

An important additional lesson, which has been learnt from past development processes in pre-accession countries, is that while FDI-led industrial development has made important contributions to economic upgrading, the spill-overs to the domestic company sector were rather low and – at times – negative, as resources were withdrawn from the domestic business sector and concentrated in multinational corporations (MNCs). Here, it is important to use instruments to also strengthen the

domestic business sector through public support for the supply of skilled labour, supporting spin-offs from the operations of MNCs, managerial and technical training programmes, etc.

3.3. The challenge of how to conduct industrial policy in a complex, competitive, conflictual and evolving international environment

The global environment has become much more challenging for the EU. How does EU IP adapt to such an environment? The more challenging environment involves:

› Much less power of multilateral organisations

› Fragmentation of international trade and GVC relations (regional bloc formation)

› Developing policies of 'resilience' and 'open strategic autonomy'

› The requirement to build up military capacities (part of industrial transformation)

› The 'competition for talent' and the need for a migration and integration policy

Since the failure of the Doha Round of international trade negotiations, the world has moved away from multilateral trade agreements, and regional and bilateral trade agreements are now prevalent. The EU has been very active in moving in this direction, reflecting its importance as - what continues to be - the largest trading bloc, although China now rivals it in terms of the number of countries for which it is the most important trading partner (see Figure 4, though note that it only covers trade in goods). China is now the largest trading partner (in goods) of 71 countries (data for 2023), whereas the figure for the EU is 68 and that for the US is 32.

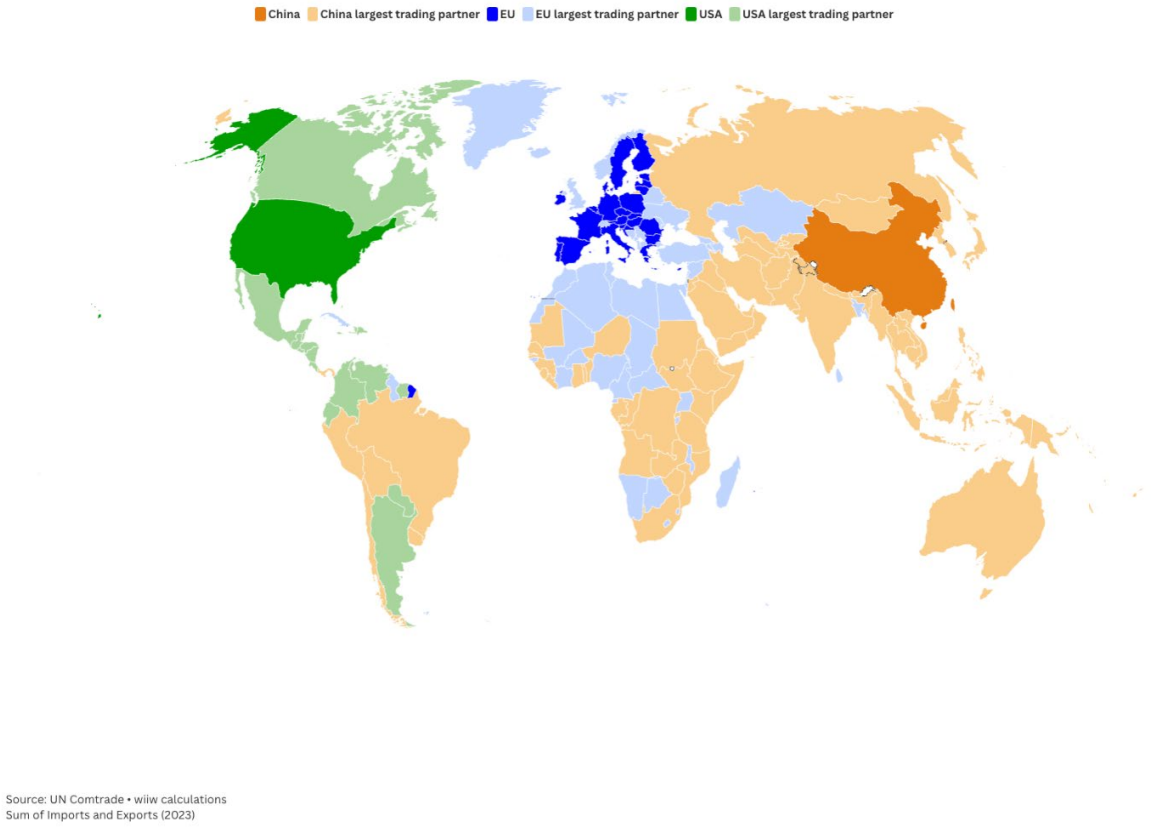
Two longer-term structural issues will dominate the perspective for the future of the EU's position in the global economy. One is the worry about the persistence of a trajectory of low productivity growth and innovation compared to its two main global rivals (i.e. the US and China); this also does not equip it well in relation to the expected additional pressures from other catching-up economies (e.g. India) that are challenging Europe's economies in their traditional areas of comparative advantage. The other is that the EU, in the currently evolving global setting of strategic actors, does not speak with a forceful and unified voice. This means that it is at a disadvantage compared to unitary nation states (specifically the US and China[3]) to act in a world that is increasingly characterised by strategic policy-setting and that has moved away from an international rules-based setting as multilateral organisations (e.g. the World Trade Organization) have been severely weakened. The heterogeneity and differences in positions of EU members on crucial issues of international relations (e.g. its stances towards China or the Ukraine-Russia conflict) prevent the EU acting with the same power and determination as these unitary nation-states. To complicate things further, this problem is becoming much more severe during the second Trump presidency.

The EU has responded to a number of 'shocks' (e.g. the global financial crisis of 2008/2009, the COVID-19 pandemic, the energy crisis, cyber-attacks and IT/AI-generated fake news challenges) by

[3] The US is, of course, a federal state. However, when it comes to foreign and security policy, it acts as a unitary state, which is a far cry from how decisions are being taken at the EU level in these crucial areas.

strengthening its regulatory frameworks as well as developing and operationalising concepts of ‘resilience’ and ‘open strategic autonomy’.

Figure 4 / Countries for which the EU, the US or China is the top trading partner, 2023, goods only (sum of imports and exports)



Source: UN Comtrade; own calculations

On the issue of ‘*resilience*’: During the COVID-19 crisis, it became apparent that the cost-minimising strategies pursued by internationally operating companies in their effort to establish and maintain global supply chains showed severe signs of vulnerability. It was not only the pandemic, with its lockdowns and interruptions of supply lines, but also the behaviour of suppliers of strategically important inputs that revealed that strong dependency relationships can be problematic. Hence, the policy response was three-fold: (i) diversification of supplies from multiple potential sources; (ii) more friend- and near-shoring; (iii) and building up a safety margin of production facilities in critical product areas within the EU. All of these meant that one moved away from a pure cost-minimising strategy of supply lines built on the principle of comparative advantage. This involved changes in the strategies of internationally operating companies and – in a number of areas – the need for state subsidies, with the latter falling into the realm of IP. Furthermore, the thinking went that in important, sensitive areas (e.g. medical equipment and pharmaceuticals), one had to rethink the importance of investing in domestic (or EU-wide) production facilities that had previously been outsourced as part of the earlier globalisation drive.

International trade policy is now dominated by bilateral (or group and regional) trade agreements rather than multilateral agreements, which have not been revived after the failed Doha Round. Countries are

now increasingly employing instruments of strategic IP to influence industrial developments and the innovation dynamic in their countries or regions. These are not coordinated at the international level and lead to counter-actions by other global players, such as the EU's reactions to the measures undertaken during the Biden presidency, specifically the Inflation Reduction Act (IRA), which attempted to support the return of manufacturing capacities to the US, and the CHIPS and Science Act. Retaliatory measures in response to Chinese subsidies (e.g. to support EV and battery production) led to protectionist trade policy reactions and battery-support programmes by the EU (two rounds of IPCEI initiatives[4]). The shift towards IP is thus strengthened by having to react to other countries' use of industrial and trade policy instruments. The actions of all three global actors (i.e. the US, China and the EU) have led to a situation in which the active use of trade and IPs plays an increasingly prominent role in shaping the system of international economic relationships.

In this context, the concept of '*open strategic autonomy*' (OSA) is directed towards the strategic build-up of technological and production capabilities that would allow some degree of self-reliance in strategic areas. Here are two quotations from EU documents that highlight the complexity in the design and implementation of this concept, which is still at an early stage of operationalisation in the EU context:

'[…] the EU should pursue a model of "Open Strategic Autonomy". This simply means strengthening the EU's capacity to ***pursue its own interests independently and assertively, while continuing to work with partners around the world to deliver global solutions to global challenges****. It is as unlikely that the EU would be self-sufficient in producing certain complex critical health products, as it is impossible to tackle global climate and environmental challenges on our own.'* (author's bolding) (Source: European Commission 2020: 3)

'The Commission will … ***make full use of trade defence instruments (TDI) to defend the Single Market****, and rules-based international trade, from unfair trade practices like dumping and distortive subsidies.'* (author's bolding) (Source: European Commission 2023: 2)

International production and trade relationships are thus subject to probably the most fundamental changes since the Second World War, for both longer-term economic and strategic political reasons. The longer-term economic factors are changing comparative advantages following the dynamics of productivity and catching-up processes in product quality and innovation capabilities of emerging economies and particularly of China. The strategic political factors generate conflictual relationships in which trading partners rethink dependency relationships regarding reliance on specific supply lines and critical inputs.

The shift in strategies also manifests itself specifically in the intensification of competition in the development of high-tech industries. In addition to being at the forefront of the innovation process, these are crucial for the diffusion of new technologies across a wide range of industries and, thus, are highly relevant for overall longer-term productivity performance. While international cooperation in the area of scientific development used to be widespread and international businesses could draw on an evolving pool of scientific knowledge, stronger restrictions are now imposed on access to such a pool. The issue of technology transfer is no longer just seen as of general benefit for global development but also in terms of how it affects the strategic (and military) capacities of countries. Reducing or severing

[4] https://competition-policy.ec.europa.eu/state-aid/ipcei/approved-ipceis/batteries-value-chain_en

international production and technology linkages will negatively impact global growth performance, and it will especially affect countries that have traditionally been net beneficiaries of such knowledge transfer. In the more advanced countries, international competition in technology races leads to manifold duplication of efforts. Those who have missed the early advances in crucial areas of technological developments – as European producers are now experiencing with their attempts to catch up with the AI advances made by the US and China – can only recoup technology leads that they have lost to one of the other actors with the help of highly resource-intensive public supports.

The deteriorated geo-political scenario is apparent in a number of areas: more trade conflicts, more regionalist bloc formation, frictions in international scientific research collaboration and knowledge transfer, and a strong increase in resources devoted to expanding and upgrading military capacities. All of these pose major challenges to the EU economy, as it has traditionally relied on trade openness and the effectiveness of multilateral agreements, in addition to having benefited from having opted out of the international arms race in the past.

4. FISCAL ISSUES RELATED TO THE CONDUCT OF EU INDUSTRIAL POLICY

Like (almost) any policy area, IP requires fiscal resources. Thus, a careful assessment must be made regarding which of these resources should be mobilised, allocated and employed at the cross-national (i.e. EU), national and regional levels.

First of all, there is the question regarding the scale of the financial resources needed to conduct an effective IP at the cross-European level. This depends on what we want to include within the realm of 'industrial policy'. We have taken a wider view of what would be included here, which includes the tasks of: (i) tackling the major three challenges of industrial transformation that were discussed in Section 3.1 (e.g. the continued push towards the Green Deal); (ii) making the innovation system in the EU more effective so as to enable the bloc to become a serious contender in the most advanced technology areas (e.g. AI and quantum computing) and to remain at the innovation frontier in some of the areas in which European economies are or used to be leaders (e.g. pharmaceuticals and transport equipment); and (iii) building up an effective military industry that can look after the security interests of Europe without a strongly asymmetric dependence on US armament supplies. Of course, the three areas are related and, in many ways, there will be synergy effects of supporting one area on the other areas (e.g. green transformation and the build-up of military capacities inducing new innovation trajectories), and these in turn will initiate patterns of new lines of industrial production and employment. Furthermore, the impact of these innovation trajectories will impact price and cost structures and, as a result, affect the evolution of demand.

The above three areas of industrial structural transformation – which includes substantial support for basic and applied research, start-up costs, and needs associated with scaling up new production lines until they become fully self-supporting – will require a substantial net investment push. I concur with the recommendation of the Draghi Report (Draghi 2024) that a 4-5 percentage point increase in the investment share in GDP over the coming 10 years (from currently about 22% to 27%) would be an appropriate target to reach such a goal. The Draghi Report makes the point that the savings volume in Europe would be available to reach such a target (EU household savings were EUR 1,390bn compared

to EUR 840bn in the US in 2022; ibid.: 55), and that could be mobilised. The Report also makes a number of recommendations regarding how reforms in capital markets could lead to a more effective mobilisation of such savings to achieve the ambitious goals of industrial transformation and overhauling the innovation systems in Europe.

The Draghi Report also discusses the role of public vs. private investment in such a major sustained investment push:

'*Historically in Europe, around four-fifths of productive investment has been undertaken by the private sector, and the remaining one-fifth by the public sector. Delivering [additional] private investment of around 4% of GDP through market financing alone would require a reduction in the private cost of capital – by approximately 250 basis points in the European Commission model. Although improved capital market efficiency (e.g. through the completion of the Capital Markets Union) is expected to reduce private financing costs, the reduction will likely be substantially smaller. Fiscal incentives to unlock private investment therefore appear necessary to finance the investment plan, in addition to direct government investment*.' (Draghi 2024: 63)

Apart from the many reforms in capital markets that the Draghi Report mentions to mobilise financial resources and specifically also risk capital, there is the additional demand for public investment and, specifically, the type of public investment that supports projects at the EU level:

'*Joint funding for specific projects will be key to maximise the productivity gains of the strategy, such as investing in breakthrough research and infrastructures to embed AI into the economy. At the same time, there are other public goods identified in this report – such as investing in grids and interconnectors, and financing the joint procurement of defence equipment and defence R&I – that will be undersupplied without common action and funding. Finally, for Member States to converge more closely in their policies – be it the Single Market or more generally in the policies described in this report such as climate, innovation, defence, space and education – both regulation and incentives will be required. Incentives will also require common funding.'* (ibid.: 64–65)

To achieve the ambitious goals outlined in the Report, there will also be the need for more public borrowing at the EU level, along the lines of the Next Generation EU (NG-EU) programme,[5] which responded to the emergencies triggered by the COVID-19 pandemic. This will also include the issuing of common debt instruments to finance joint investment projects, which will also have the positive side effect of creating a deeper and more liquid market in EU bonds, which in turn will play an important role in the integration of Europe's capital markets (ibid.: 66). The issuing of more debt at the European level will be all the more important, as the earlier EU borrowing for the NG-EU programme will have to start being repaid beginning in 2028, which would unduly constrain the envisaged EU expenditure programmes for the next MFF.

The bulk of Europe's economics experts have argued in favour of such recommendations, which implies pursuing reforms of fiscal arrangements at the EU level and continuing along the paths of strengthening the coordination of fiscal policies between the EU and national levels that had already been set in motion

[5] https://next-generation-eu.europa.eu/index_en

during the InvestEU[6] and the NGEU programmes. Both of these programmes tried to address the issue of financing 'common public goods' but also to counter centrifugal tendencies linked to the uneven 'fiscal capacity' faced by different EU economies, which require joint financing schemes.

5. SOCIAL INCLUSION AND INDUSTRIAL POLICY

The task of industrial restructuring while also boosting the innovation performance of the EU involves significant demands for a changed skill/qualification set and for educational/training institutions that equip the labour force with such qualifications. This is a traditional area in which public investment is needed, as private human capital investment would be sub-optimal, especially in areas that are at the risky early stages of innovation and then production. We emphasise that this area has to be seen as an integral component of an 'appropriate industrial policy' and should aim at exploiting the potential of training, education and employment possibilities across the entire spectrum of capabilities of the labour force and across all age groups. Furthermore, tailoring such policies to the differentiated needs across the spectrum of companies (with different technological capabilities) and across regions should be seen as a central concern of such a policy.

The use of instruments of IP has to be sensitive to the distributional and 'social cohesion' implications of the impact of IP. There are two dimensions of a 'cohesion-sensitive IP' (CS-IP): (i) the regional aspect and (ii) the social-structural aspect.

The *regional aspect* is, in principle, well covered by EU Cohesion Policy. This policy has been an important pillar of the EU's policy-making framework for a long time, accounting for about one third of spending from its community budget, and it has been going through multiple stages of reform. At present, EU Cohesion Policy centres around the concept of 'smart specialisation' (S3), which requires (NUTS 2) regions to submit plans regarding the direction in which they see their economic structure evolving in the context of the intra-European and global division of labour. In this way, EU Cohesion Policy builds on existing capabilities (endowments) of the regions and interacting with the various stakeholders within the region in designing such a plan (Foray 2013; Foray et al. 2009). Regional policy should thus be directed towards strengthening physical and human capital infrastructure, providing support to businesses and the regional innovation systems, and assisting the labour market through active labour market policy. The European Commission has gained a lot of experience in the domain of regional policy over the years, and the implementation of the S3 strategy shows that the 'competitiveness' target is now foremost in its design. Nonetheless, there is the issue that 'backward regions' often do not have the institutional capacity to design and effectively implement S3 plans, which is why we also find critical assessments of the strategy in the literature, such as:

"[…] the regions which appear to be the most conducive and favourable for the operation of smart specialisation-type processes are the buoyant core regions, and as such precisely the types of regions which EU Cohesion Policy does not prioritise." McCann and Ortega-Argilés (2015: 12).

In our own analysis in Section 3.2, we also pointed out that EU financing schemes that particularly target innovation activity are much less used in the countries of Central-Eastern and Southern Europe than in the more advanced Northern and Central European countries, which means that EU Cohesion Policy

[6] https://investeu.europa.eu/investeu-programme_en

does not necessarily foster convergence in the area of regional innovation capacity. Agglomeration of top-level research and innovation might be a necessary feature of an efficient innovation policy, but it would detract from the ultimate goal of boosting overall productivity performance if sufficient attention is not paid to designing a policy in such a way that it also supports (and specifically targets) the innovation and productivity potentials across the entire spectrum of regions and businesses.

The *social-structural aspect* has to be covered not necessarily by IP itself but in part by accompanying policies. The EU has provided some policy initiatives to deal with the social challenges posed by the industrial transformation process involved in the Green Deal, such as through the so-called 'Just Transition Fund'.[7] However, the resources devoted to these efforts have been relatively small, and the visible tendencies of social disparities emerging in most European economies have clear political implications, as evidenced by the strong rise of right-wing populist parties (see Rodriguez-Pose 2018). This demonstrates that the tasks of dealing with the social implications of industrial structural change and adjusting to the challenges of rapid technological change are very formidable. As the use of AI will speed through many sectors of the economy, such challenges will only grow more daunting. A stronger emphasis of industrial and accompanying policies on tackling these social-structural aspects of industrial transformation will definitely be necessary both from a social cohesion point of view as well as when it comes to providing sustainable support to address the core targets that industrial and innovation policy aims to achieve (i.e. boosting the growth and competitiveness performance of the EU's economy).

6. CONCLUDING REMARKS: HOW SHOULD EU INDUSTRIAL POLICY BE DIRECTED?

It is clear that EU IP is operating in a world that has been changing significantly over the past decades both in economic terms and – in an accelerated manner more recently – in geo-political terms.

In economic terms, over the past few decades, we have witnessed a significant decline in the share that 'the West' – but particularly the European economy – accounts for in global GDP, in global trade, and in global (inward and outward) investment. This comes along with an even longer-run decline in its share in the global population. From a once dominant bloc, Europe now only represents one of the larger regional entities in the global economy, albeit still a significant one. These trends are likely to continue over the coming decades.

More worrying are the trends in productivity and in Europe's contribution to global technological dynamism, which has been well pointed out in the Draghi Report. This is exactly the area that industrial and innovation policy is supposed to target (at the EU, national and regional levels). The worrying trends seem to point to a less-than-satisfactory record of these policies in Europe.

The factors behind this track record have been addressed in numerous studies over the past few decades. These include: (i) the insufficient completion of Single Market integration, which affects particular sectors (e.g. services and public utilities) more than others, as these sectors in particular suffer from not being able to exploit the potential of a large and integrated domestic market;[8] (ii) the ineffective

[7] https://commission.europa.eu/funding-tenders/find-funding/eu-funding-programmes/just-transition-fund_en

[8] Furthermore, in many of the 'knowledge-based industries and services', network externalities are very important, and exploiting these determines the market power of then-dominating companies in high-tech industries.

mobilisation of Europe's considerable savings volume for productive investment purposes and particularly for investments with a high innovation potential, such as through venture capital finance; (iii) the insufficient interaction between research undertaken in universities and research institutions and the business sector (note, for example, that high patenting rates in Europe are not reflected in the volume of start-ups in high-tech areas); and (iv) barriers to the growth of 'yollies' (young leading innovators; Veugelers and Cincera 2010), which again is a function of having less access to finance and up-scaling opportunities in European markets.

All of this is reflected in a rather slow transformation of industrial structures in Europe, with the principal traditional sectors (and incumbent companies) accounting for the bulk of R&D spending, as well as in the lethargic adaptation of Europe's industrial specialisation and international trade performance to new technological opportunities, as compared to a faster change in the dynamic and reallocation of resources across sectors (and companies) in the US and China. The end result is that Europe is lagging behind in the innovation, production and diffusion stages of important waves of essential new technologies, most prominently digital technology and AI. In these technologies, Europe has missed out on taking leading positions in pushing the technological frontier, and there are also indications that Europe's position is weakening in fields in which it has traditionally been strong (e.g. pharmaceuticals).[9]

Although, some observers would also point to the factor of 'over-regulation', I would argue that the real issue is not the extent of regulation but the need for careful screening and for designing a regulatory framework that can reconcile the achievement of various targets (e.g. consumer protection, health and safety, and environmental concerns) with contributing to achieving competitiveness. Since this has definitely become more difficult than it was in the past, as fierce competitive pressures have intensified in an increasingly fragmented global setting, Europe's strategy has to adapt and confront this new reality. The reduced geo-economic weight of Europe, combined with the decline of multilateralism, means that the power of the so-called 'Brussels effect', which led trading partners to adopt European regulations due to the incentive effect of Europe's large market, has become weaker (Bradford 2020). The trends are globally heading in the direction of a multiplicity of regulatory frameworks (e.g. technical standards) that are in competition with each other and are adopted by different regionalist entities in different combinations. In addition, geo-political pressures are increasingly influencing this adoption process.

Coming to the issue of Europe's presence in geo-political terms, we have pointed out that the EU is a collection of nation-states with a commitment to economic integration and the coordination of economic policies in important areas. This kind of coordination happens to a very high degree in some areas, such as competition, trade and monetary policy (for members of the Economic and Monetary Union) and much less in other areas (e.g. social policy). There are attempts to move further in the direction of harmonisation and coordination in other policy areas (e.g. migration/asylum, foreign and security policy), but we have seen that this is not an easy task. The cumbersome decision-making processes, complexities of voting procedures, and blocking/vetoing powers of individual member states all lead to a constrained ability to act in a decisive way in an era of 'big power' politics. On the other hand, the slow-moving evolution of legislative structures and institutional set-ups (to which the EU has committed itself through the various treaties and delegations of powers to the supra-national level) also means that rolling these back would be

[9] The Draghi Report points out that EU public-sector spending on pharma R&I currently stands at less than half the level of the US, while total private R&I investment is about a quarter as large as that of the US (Draghi 2024: 24).

very difficult. This, in turn, makes it a more predictable player in the international sphere (in contrast to the erratic shifts of the Trump administration in foreign policy positions).

The current set-up of the EU (in comparison to, say, the US or China) also means that the resources allocated for policy conducted at the supra-national/EU level are very small compared to those still commanded at the national levels (about 1% of gross national income (GNI) at the EU level compared to 40-45% at the national levels). This not only means that the financing of EU-level projects faces severe restrictions (e.g. to engineer a major boost to cross-European public investment), but also that strategies that are commonly designed and agreed will very often have to be financed from resources at the national level, which means that different countries are then constrained to different extents by the fiscal and financial resources they have at their disposal. This is why most economists now agree that the budgetary resources that are allocated to the supra-national level to support the financing and supply of 'Europe-wide public goods' as well as common industrial and geo-political/geo-economic strategies should be increased (by another 1-2 percentage point of EU GDP). A wide range of proposals have been put forward on how to finance such an expansion of the EU budget (e.g. increasing own resources taxation, issuing common bonds, and expanding the lending possibilities of the European Investment Bank).

There is both an economic and geo-political rationale for such a move. Making more resources available at the EU level and extending 'qualified majority voting' to a wider set of policy fields would give the Commission more room for more effective strategic action in a world in which less complex and quick decision making is required, which in turn would more effectively translate Europe's economic power into influence in geo-political terms. In the current global geo-political context, the urgency for more streamlined coordination, quick decision making and joint financing in a number of policy areas at the EU level has undoubtedly increased. Although the time horizon of IP should be long, there are areas (e.g. trade policy, adapting and responding to pressures on regulatory frameworks, and responding to international refugee and migration crises) where decisive and quick action may be required.

Pointing to the above-mentioned weaknesses should, however, not deflect from the fact that Europe also has important comparative advantages that could help it to succeed in today's changing geo-economic and geo-political context.

Let us start with an advantage that the EU enjoys precisely because of the constitutional and institutional nature of its construction, and that (in the discussion above) has also been interpreted as constituting a disadvantage: appearing on the global stage mostly as a 'soft power' allows the EU to display a more differentiated behaviour towards global partners that are worried about the increased use of 'hard power'. This might particularly be an advantage in relation to countries in the 'Global South' that do not want to be coerced by the exercise or threat of 'hard power' to comply with the interests (e.g. in trade, investment, finance, regulations and security) of other global or regional powers.

Furthermore, the heterogeneity of the EU's membership (and of Europe more generally) can be beneficial in a number of ways. First, it can help the EU to exploit comparative advantages for production location and specialisation within the European continent, thereby reaping 'gains from trade' of cross-continental value chains, which is of particular benefit in a world that fragments into 'regional bloc' formations. Second, differences in institutional structures can also lead to differentiated experimentation

of what works better or worse[10] and, in a highly integrated market, this would combine with competitive selection pressures enforced by capital flows and the mobility of people. The other side of the coin, however, is that such competitive processes could also lead to a cumulative divergence of performances and the emergence of regions and countries trapped in a 'low equilibrium' situation from which it is hard to escape. Assistance for the transfer of 'best practices' as part of EU Cohesion Policy is therefore a necessary component of such a strategy.

A multi-level governance structure is, in principle, an important feature of the EU and, through the application of the 'subsidiarity principle', it could be a major advantage in terms of the efficient operation of the EU. However, an effective application of this principle has to be continuously reviewed in light of changing (economic, technological and geo-political) circumstances. It is clear that certain areas will require efforts to harmonise and mobilise resources at the pan-European level, such as an overhaul of cross-European energy and transport systems as well as the selection and support of world-class research infrastructure. Other areas will require a bottom-up design and implementation of innovation and IP at the local levels in order to exploit the location and evolving comparative advantages of regions and interconnected districts. In this field, the S3 strategy is the appropriate one, although insufficient attention has been given in its implementation to support and strengthen institutional capacities of weak regions so that the intended structural change and growth targets can be achieved as a result of the design and execution of these strategies. Stronger EU-level technical and financial support, as well as careful monitoring of the different phases of execution, could boost the performance of these regions. The multi-level monitoring ability of the three-tier governance structure (EU, national and regional) should be seen as an important lever for controlling the proper use of resources as well as for ensuring that regional S3 programmes are embedded in a wider strategy regarding specialisation structures and growth trajectories across European regions. After all, regional development processes are interlinked through spill-over effects, supply interdependencies, and the mobility patterns of labour and capital.

The European economy is still a large entity (especially if the potential of Europe's neighbourhood regions is also included), and economies of scale and scope could be exploited as well or even better than they are in the other major competing regions (principally North America as well as East and Southeastern Asia). This will require efforts aimed at the increased pooling of resources, boosting the efficiency of administrative structures to implement policies, and pushing back against the lobbying power of entrenched incumbent interests to allow the shift of resources towards new, innovative areas. These efforts should also be directed towards working to establish a consensus and implementing a persistent strategy in support of the three areas of industrial transformation that Europe has to pursue: implementing the green transition and catching up on the digital (and now AI) transformation, regaining a leadership position in innovation related to cutting-edge technologies, and supporting the necessary build-up of European defence capacities.

Below, we provide a summary of recommendations that the EU's IP should follow as guiding principles in the currently evolving geo-political context:

› Use the EU's multi-level governance structure effectively in addition to flexibly exploiting the heterogeneity of the economic and institutional space of the European continent.

[10] Analyses of Chinese development processes have pointed out that experimentation with policies tried out in different regions has also played an important role in developing policy strategies at crucial stages in the country's development (see Weber 2021).

- Focus on boosting productivity growth and innovation performance (in a manner that follows the recommendations found in the Draghi Report) while persistently implementing programmes that have been (or will be) launched and – at times – increasing their resources.
- Innovation policy will continue to be characterised by the tension between the need to support 'centres of excellence' (which goes in the direction of agglomeration) as well as the importance to exploit the innovation (and technology diffusion) potentials across the entire spectrum of firm segments and of regions that are currently operating below the technology frontier. Hence, it is important that innovation policy takes both of these – at times – conflicting targets into account, as diffusion processes are as important to overall productivity improvement as is innovation at the technology frontier.
- Following from this, we emphasise to design and implement an 'appropriate industrial and innovation policy' (AIIP) that aims at mobilising the competencies and potentialities of the different segments of firm, regional and labour force distributions.
- Take up the recommendations found in the Draghi Report to utilise the considerably under-tapped savings volume in Europe to support innovation policy as well as technological and industrial transformation. This involves making urgently needed progress in capital market integration as well as providing support to underdeveloped segments (e.g. venture capital) and instruments of finance.
- View elements of migration policy as an integral part of a successful European industrial and innovation policy, particularly in the area of the mobility of highly skilled/highly qualified migrants. This should include schemes of circular migration combined with cooperative training/educational and labour market policy initiatives in source countries (and especially in EU neighbouring countries).
- Include EU neighbouring countries – to different degrees – in the IP schemes of the EU. Doing so should be an important component of a strategy of intensified trade, investment and security relationships with the non-European neighbourhood.
- Given that the development of military capabilities in Europe resulting from the current conflictual geo-political context will definitely play an important role in the coming phases of European industrial and innovation policy, target spill-over effects in innovation and production relations between the civilian and military sectors when designing policies in this field.

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APPENDIX

Appendix A.1 - Mapping of budget items in the MFF 2014-2020 to the industrial policy themes

The discussion of the EU's budgetary expenditure on IP-related issues during the 2014-2020 period is based on a selection of items within the Multiannual Financial Framework (MFF) 2014 2020 that are subsumed in the realm of IP. Table A.1 lists all budget items that were selected to qualify as being related to IP.

Table A.1 / Industrial policy item within the MFF 2014-2020

Section in MFF	Description	Assigned IP category
1.1.10	European Fund for Strategic Investments (EFSI)	Infrastructure
1.1.11	Implementation and exploitation of European satellite navigation systems (EGNOS and Galileo)	Sectoral policy
1.1.13	European earth observation programme (Copernicus)	Sectoral policy
1.1.31	Framework Programme for Research and Innovation (Horizon 2020)	RDI
1.1.4	Programme for the Competitiveness of Enterprises and Small and Medium-sized Enterprises (COSME)	SME
1.1.6	EU Programme for Employment and Social Innovation (EaSI)	Employment, education, training
1.1.81	Energy	Infrastructure
1.1.82	Transport	Infrastructure
1.1.83	Information and communications technology (ICT)	Sectoral policy
1.1.9	Energy projects to aid economic recovery (EERP)	Infrastructure
1.2.5	Youth Employment Initiative (specific top-up allocation)	Employment, education, training
1.2.6	Contribution to the Connecting Europe Facility (CEF)	Infrastructure
2.0.4	Programme for the Environment and Climate Action (LIFE)	Ecological
1.2.11	Less developed regions (regional convergence)	Regional – for breakdown, see Table A.2
1.2.12	Transition regions	Regional – for breakdown, see Table A.2
1.2.13	More developed regions (competitiveness)	Regional – for breakdown, see Table A.2
1.2.14	Outermost and sparsely populated regions	Regional – for breakdown, see Table A.2
1.2.15	Cohesion fund (incl. contribution to the CEF)	Regional – for breakdown, see Table A.2

Source: European Commission (http://ec.europa.eu/budget/graphs/revenue_expenditure.html)

Appendix A.2 - Mapping of thematic objectives in the ESIF to the industrial policy themes

For the budget items representing expenditure of the European Structural and Investment Funds (ESIF), additional information on the 'thematic objectives' of the funds was used. However, for these targets, only the figures from the projected expenditure (as allocated in the MFF 2014-2020) were available. This information was used to assign the regional policy expenditures to individual targets/objectives. The implicit assumption here was that the actual disbursements (both from the EU budget and national co-financing) have the same distribution across objectives as the projected amounts in the MFF 2014-2020. Since the classification of the MFF 2014-2020 does not allow a distinction to be drawn between expenditure under the European Social Funds (ESF) and the European Regional Development Fund (ERDF), these are treated together, although distinguished by objectives. The data on regional fund allocations can be found at: https://ec.europa.eu/regional_policy/EN/funding/available-budget/

Spending under the Cohesion Fund that was not found in the budget allocations is assigned to infrastructure, as it must be assumed that this spending is made in connection with the Connecting Europe Facility (CEF), which is also included in this budget item.

Table A.2 / Categorisation of the thematic objectives in the ESIF into industrial policy themes

Code	Target objective of structural funds	Assigned IP category
1	Research & innovation	RDI
2	Information & communication technologies	Sectoral policy
3	Competitiveness of SMEs	SME
4	Low-carbon economy	Ecological
5	Climate change adaptation & risk prevention	Ecological
6	Environment protection & resource efficiency	Ecological
7	Network infrastructures in transport and energy	Infrastructure
8	Sustainable & quality employment	Employment, education, training
9	Social inclusion	Social
10	Educational & vocational training	Employment, education, training
11	Efficient public administration	Institutions
12	Outermost & sparsely populated regions	Social
TA	Technical assistance	Institutions
DM	Discontinued measures	Not assigned

Source: European Commission (https://ec.europa.eu/regional_policy/EN/funding/available-budget/)

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