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Industrial Policy: Always Dismissed, Always Deployed

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Summary

Industrial policies are interventions by public authorities with the purpose of influencing the *sectoral* (or *locational*) structure of an economy. Authorities could have a multitude of objectives in mind. With the rising geopolitical tensions between the US and China, IP experienced a revival. Supply chain bottlenecks in the wake of the COVID-19 pandemic reinforced this trend, as did the attack of Russia on the Ukraine. Mitigating the risks of dependence, gaining strategic autonomy, became a political priority (near-shoring, friend-shoring). However, while regularly dismissed, IP has always been deployed. Often in a defensive mode, to protect firms challenged by international competition. But also in a forward-looking manner, to support innovation, building on basic research and R&D, directing technological change. Externalities, creating a wedge between private and social values and leading to under provision of goods or over usage of resources, have been the standard justification for IP interventions. In addition, trade- and competition-related arguments are used to defend policy interventions of an allocative type (infant industries and steep learning curves, Airbus vs. Boeing). Redistributive versions of IP support regions left behind or industries in decline. National security (geopolitics) became again a major driver of IP (US CHIPS and Science Act). IP is implemented in a variety of national forms.

Zusammenfassung

Industriepolitische Maßnahmen sind Eingriffe der öffentlichen Hand mit dem Ziel, die sektorale (oder standortbezogene) Struktur einer Wirtschaft zu beeinflussen. Die Behörden können dabei eine Vielzahl von Zielen verfolgen. Mit den zunehmenden geopolitischen Spannungen zwischen den USA und China erlebte die IP einen Aufschwung. Engpässe in den Lieferketten im Zuge der COVID-19-Pandemie verstärkten diesen Trend ebenso wie der Angriff Russlands auf die Ukraine. Die Abschwächung der Abhän-

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gigkeitsrisiken und die Erlangung strategischer Autonomie wurden zu einer politischen Priorität (‚nearshoring', ‚friendshoring'). Auch wenn ihr Einsatz typischerweise abgelehnt wird, wurde immer wieder auf IP zurückgegriffen. Oft in defensiver Weise, um Unternehmen zu schützen, die durch den internationalen Wettbewerb herausgefordert wurden. Aber auch vorausschauend, um Innovationen zu fördern, aufbauend auf Grundlagenforschung und F&E, um den technologischen Wandel zu lenken. Externe Effekte, die einen Keil zwischen private und gesellschaftliche Werte treiben und zu einer Unterversorgung mit Gütern oder einer Überbeanspruchung von Ressourcen führen, waren die Standardbegründung für industriepolitische Eingriffe. Darüber hinaus wurden handels- und wettbewerbsbezogene Argumente verwendet, um politische Interventionen allokativer Art zu verteidigen (junge Industrien und steile Lernkurven, Airbus vs. Boeing). Umverteilungsversionen von IP unterstützen zurückgebliebene Regionen oder Industrien im Niedergang. Die nationale Sicherheit (Geopolitik) wurde in jüngster Zeit erneut zu einer wichtigen Triebkraft für geistiges Eigentum (US CHIPS und Science Act). IP wird in einer Vielzahl von nationalen Formen umgesetzt.

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1. Introduction: Reemergence of a Policy Approach

Calls for "industrial policy" are a hardy perennial. They are *always* voiced when economic sectors (and regions) fall on hard times, regularly because of international competition, declared to be unfair. That is the *protective* version, directed at foreign competitors who enjoy – or are alleged to enjoy – competition-distorting governmental support (think of the fate of the German solar panel industry in the 2000s). Moreover, there has also always been a *forward-looking*, innovative variant, especially in the form of subsidies to basic research in areas where prospects are too uncertain for profit-oriented firms to embark on. This type of intervention has been justified by a potential wedge between private and social returns, a market failure. And then, there has been much of murky in-between, i. e., private-public sector partnerships or cooperation, difficult to defend by "first principles". Much of the activity of European development banks (i. e., the European Investment Bank, the German KfW, as well as the French BPI…) has been and is based on that argument. In fact, KfW, established with Marshall Aid means, was about supporting and directing the reconstruction of West Germany after World War II.

This is what concerns politics – or the political process. Academic economists almost unanimously defended a different perspective "often act(ing) as bystanders (and often naysayers)" (Juhász 2024). Preferring "undistorted" market results, the representative economist typically showed very little appetite for public sector intervention. In fact, this approach is an important element of the

founding documents of the European Union. The founders were completely aware of the fact that European integration would spell restructuring, i. e., firms going out of business, their employees being obliged to change occupations. Without such reallocation, the economies of scale arising from a common or single market could not be reaped. Inevitably, such adjustment would provoke resistance in member states that were negatively affected. Still, because of its impact on the single market, state aid, which can come in a variety of forms, has been prohibited, at least in principle. Therefore, as with international trade and the heavily Freiburg-School-influenced competition policy, the founders – based on the Spaak Report of 1956 – declared these policy domains to be the remit of the European Commission. Otherwise, the argument went, the law of the strongest (the member states with the deepest purse) would rule (see, in particular, Baldwin and Wyplosz 2022, pp. 262 – 279).

Ever since, this discussion reemerged occasionally, however, especially powerfully in the wake of major crises like the Global Financial Crisis and, even more forcefully, in response to the Covid-19 pandemic and the Russian attack on the Ukraine. In 2020 a "temporary framework of exemptions" was established – and, at times, heavily criticized. For instance, the very substantial German support packages, to cushion the effects of the Covid-19 pandemic, were criticized by then Italian prime minister Mario Draghi, among others.[1] It is also here when debates about how to respond to the U.S. Inflation Reduction Act and the CHIPS and Science Act began at the EU level.[2]

"Politicians", as they are often indiscriminately addressed by economists, have also often been exposed to the demands from 'losers', economic agents heavily negatively impacted as well as regionally concentrated. This has regularly been the case when (allegedly) subsidized competitors (steel, coal, shipbuilding etc.) undermined regional competitive positions, as was, for instance, the case in Germany in the Ruhr valley, in France in Alsace-Lorraine, or in Southern Sweden. In no case, however, the unfettered forces of demand and supply, have been simply allowed to run their course, not even in the U.S. au contraire, as we will see. To make cross-border exchange palatable to workers who were bound to lose their jobs, since the early 1960s "trade adjustment assistance" has been on offer. Admittedly, as the "China Syndrome" (Autor, Dorn and Hanson 2021) bears witness to, this happened on a much lower scale than in Europe.

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[1] Given Italy's fiscal strains, the Draghi government was unable to provide similar support. The EU's Next Generation EU program, almost half of the funds in form of grants, with France and Germany as its main proponents, attempted to at least partially correct different capacities to respond to the Covid-19 pandemic.

[2] Closely related, discussions about a 'new' trade policy, a domain Europeanized since the 1950s, were initiated. The EU Commission's wanted to create "an open, sustainable and assertive trade policy", see EU Commission 2021: https://trade.ec.europa.eu/access-to-markets/en/news/open-sustainable-and-assertive-trade-policy.

Moreover, "politicians" typically have been more ambitious – possibly again responding to demands of their constituencies. In the German case, there has been a recurrent debate about *Standort Deutschland*, recurring whenever the "German model" seemed endangered – Germany was branded "sick man of Europe", about three times during the last half-century. For the U.S., discussions about supporting "Made in America" (Dertouzos, Lester and Solow 1989) or attempts at limiting or reversing de-industrialization are as pertinent as well as longstanding (Bluestone and Harrison 1982). Similar discourses have taken place in basically all nations exposed to structural adjustment challenges. France is another case in point. There, in fact, an important charge of *France Stratégie* – formerly known as *Commissariat Général du Plan* – is to think about enhancing the relative attractiveness of France as a place to create economic value and, concurrently, to generate gainful employment. France has seen a long-term decline of the share of its manufacturing industry in gross value added. This became an economic, but in particular also a political problem (Artus and Virard 2011).

Therefore, much of recent "industrial policy", in France and elsewhere, was about attempting to re-industrialize, i. e., raising the share of manufacturing in added value. The same, obviously, held true in the case of the China-shocked U.S., in fact, even more so (Autor et al. 2021), White House (White 2021a), (White 2021b). President Biden's *Build Back Better* program was also conceived as a response to the loss of good jobs for the American 'middle class.'

During the last decade, two additional and closely interacting dimensions came into play: (1) the vulnerability of worldwide global value chains, as manifestly exposed during the Covid-19 pandemic. And (2), instead of *doux commerce*, the "weaponization" of inter-dependencies (Farrell and Newman 2019). In particular with tensions between the U.S. and China on the rise for almost a decade now, the latter dimension – geopolitics – became ever more impactful, ultimately decisive. Agents, engaging in cross-border exchange, are expecting mutual benefits. At the same time, such trade inevitably implies dependence. In some cases, such dependence cannot be reduced by diversification. Therefore, while geopolitics clearly already has an impact on trade flows, in particular in goods, there are binding, quasi-physical limits, consider, for instance, rare earths. (see Seong et al. 2024). Where diversification is feasible, it comes at a cost, often steep ones (see Gehrig and Steinbacka 2023).[3] Efforts at "near-shoring" or "friend-shoring" imply less competition, higher prices, and reduced consumer welfare – at least in a static perspective. National security has a price,

[3] In the early 2000s, the German Monopoly Commission warned about the increasing dependence of relying on Russian gas. Therefore, the Monopoly Commission suggested diversification. This would have implied higher costs for the main industrial users, i. e., lower profits, lower share prices, and, possibly, less employment. Firms concerned, liable to their shareholders, were strongly opposed. "Politicians" responded as to be expected.

which could be worthwhile, of course. To be sure, security concerns were never completely muted, including in non-military domains. A prime example is the EU's common agricultural policy where underwriting 'food security' was always brought to bear to defend subsidies. Still, the opportunity costs of strategic autonomy might be valuable when they come with more security, protecting against possible future extortion (Felbermayr and Braml 2024).

For two decades, since the mid-1990s, after the end of the Cold War, the rule-based WTO framework shaped global trade flows to a substantial degree and, concurrently, patterns of national industrial structures. However, at least since the U.S. vetoed the appointment of judges to the WTO's dispute settlement mechanism in 2018, this multilateral approach to managing cross-border trade has been in decline – and protectionism on the rise. As mentioned, the Covid-19 pandemic and rising geopolitical pressures accentuated this trend. Also, trade liberalization had gone beyond eliminating tariffs for a long time. However, as especially the debate in the mid-2010s about the Trans-Atlantic Trade and Investment Partnership (TTIP) documented, the reduction of non-tariff barriers was substantially more demanding. Deeper integration imperiled historically evolved societal compromises. This included important differences in preferences between polities in particular about the proper scope of public sector activities (e. g., education, health care), provoking passionate popular backlashes (Maggi and Ossa 2021). Also, while trade was seen as beneficial on net, more cross-border exchange inexorably meant increased adjustment needs, implying substantial distribution effects within nations. Hence, as international economics predicted, the reduction of trade barriers unavoidably created losers.

Finally, the crises of the early 2020s have made palpably clear that deeper integration was tantamount to a higher degree of dependence, coming with potentially fragile and risky supply chains. Therefore, strengthening the resilience of national economies, gaining more autonomy, has become a priority of policymakers. Inevitably, this meant more public sector intervention. It has also sparked a fierce controversy: In one camp are the advocates of 'pure', unfettered competition, opposing any kind of industrial policy; the other camp, in view of strategies pursued by the U.S. and China, amongst others, calling for a more policy-led direction of investment into systemically important sectors of the economy.

The present paper offers some reflections on the case for and scope of such industrial policies, drawing on theoretical insights and historical experience. While history is littered with failures, there are also many notable success stories of industrial policies. Thus, it appears imperative to avoid abstract ideological battles. Instead, the focus should be on understanding what worked and what

did not work, and why. In view of current concerns about the "competitiveness"[4] and dynamism of European economies, and considering the aggressive industrial policies pursued by major competitors such as China (Made in China 2025) and the United States (Inflation Reduction Act, CHIPS and Science Act etc.), policymakers in Europe are tasked with navigating a demanding environment. The new Administration of President Trump is determined to 'roll-back' or repeal most of the initiatives of his predecessor. However, putting emphasis on reducing bilateral trade deficits, via a higher level of tariffs as well as their 'reciprocal' design does by no means reduce challenges for the EU. Instead, 'reciprocal' means targeting tariffs to the specifics of a surplus nation, including different VAT rates. Therefore, with trade surpluses varying significantly across EU member states this is prone to create substantial tensions within the EU. Moreover, the rising uncertainty blurs the picture considerably. Against this background, conceiving policies that are conducive to sustained and inclusive growth (e. g., Acemoglu and Robinson 2016) become imperative. At the same time the pitfalls that have plagued industrial policies in the past should be avoided, as far as possible.

In Section II, we start with some observations on the analytical concept and the scope of industrial policy. Section III is about practical implementation of IP, with reference to national as well as sectoral cases, including the particular case of Electrical Vehicles. Section IV concludes by drawing some lessons for Europe.

2. Industrial Policy – Concept and Scope

We understand industrial policy as any intervention by public authorities purposefully impacting on the *sectoral* structure of the economy. In pursuing such policies, authorities could have a multitude of objectives in mind. These goals could include addressing externalities and market imperfections or supporting basic research as well as RandD to raise productivity and the potential output path. In that case they would have an *allocative* orientation. They could also be about *redistributive* policies, including the place-based variety, i. e., the support of 'regions left behind' ('cohesion policy', in EU-jargon) or protecting industries in decline. Or they might concern national security or geopolitical objectives, establish strategic autonomy ('near-shoring', 'friend-shoring') – reducing dependence on critical imports which could be weaponized ('choke points'). As a result, industrial policy is inevitably interrelated with other policy domains, in

[4] Of course, policies should be focused on creating an environment conducive to productivity, hence allowing for societal welfare to be raised in an equitable, inclusive way. Thus, while we completely agree with Paul Krugman's critique of the concept of the "competitiveness of nations" (or, in this case, even regions) (Krugman 1994), it has become long ago futile to insist on proper usage of the term.

particular, trade and competition policy, both EU Commission competencies. These interactions are not necessarily harmonious, they come with conflicting goals (e. g., possibly diverging views on national champions between competition policy vs. industrial policy). They imply trade-offs to be dealt with.

2.1 The Analytical Core of Industrial Policy: Market Failures

According to standard economics, using the visible hand of the public sector in the allocation of resources is justified wherever market failures lead to an under-provision of societally valued goods, as in the case of public goods, where consumption is non-rival or the exclusion of some people impractical (Musgrave 1959). Externalities, positive or negative, also produce a gap between social and private returns. In the case of positive externalities, such a gap justifies compensating subsidies. A negative externality, i. e., when costs are not internalized in market prices, calls for correcting taxes.

The effectiveness of any economic policy rests on a correct diagnosis of the underlying market failure the policy is intended to correct. In the case of industrial policy, the most common type of inefficiency to be addressed involves some type of externality. Benign externalities, if not internalized result in an under provision of the respective good. Internalization amounts to supporting a specific industry, i. e. industrial policy. However, the concept of "externalities" can be interpreted rather elastically, extending from otherwise only latent cost savings, as in knowledge spillovers or agglomeration effects, to "good-jobs externalities when creating middle-class jobs produces greater social cohesion" and other social benefits (Juhasz et al. 2024). If used in this broad sense, the concept risks losing its usefulness as a device for separating welfare-enhancing policy interventions from other policy areas such as redistributive policies – which could be legitimate nonetheless, but should be justified for different reasons. This also holds true for ultimately futile attempts to prevent inevitable adjustments in industry structure and size. For instance, given the high social costs of failing banks and financial instability, public sector authorities supported banks and other financial institutions and markets (e. g., the commercial paper market, mortgage markets, money market funds etc.) with massive rescue plans in the wake of the Great Financial Crisis. In the U.S., the bail-out of two of the major U.S. auto-producers was justified with reference to potential systemic effects (Goolsbee and Krueger 2015).

A particularly relevant case of externalities justifying industrial policy is the *funding of basic research* the private sector is not willing to undertake on its own because of the limited appropriability of profits. This also concerns the whole spectrum of sciences where basic or fundamental research is conducted without a commercial purpose in mind. Indeed, as Freeman and Soete 2004 observe:

"Many of today's most useful technologies owe their very existence to programs of fundamental research…" (p. 194). Defense-related research is an interesting case. It is at the origin of a number of well-known success stories that have yielded unexpected benefits far beyond their immediate purpose. In the U.S., DARPA has proven to be particularly effective in this respect. Also, Israel's impressively successful high-tech sector has substantially profited from extensive government funding, both for civilian and military purposes.

A specific type of externality, *coordination failures* often occur when the interaction between upstream and downstream industries is purely market mediated. As a case in point, the market for E-Vehicles depends on the availability of a battery-charging infrastructure while the supply of charging stations in turn depends on the number of E-Vehicles in circulation. In such a situation, a suboptimal prisoners' dilemma type of equilibrium can easily arise with too low a level of both upstream and downstream activity. Although there may exist market incentives to resolve the coordination failure, the costs of bringing about such coordination may be too high. The government then can usefully step in to overcome the impasse.

2.2 Industrial Policy and International Trade

Very often, public sector interventions have been justified to address issues stemming from the exposure of domestic industries to 'free' trade. Industrial policy then amounts to the erection of tariff or non-tariff barriers to protect such industries.

Under conditions of perfect competition, trade restrictions, in whatever guise, distort the allocation of resources, reducing consumer and producer surplus. In short, they diminish welfare. From this perspective, "there is really no good economic argument for the use of tariffs or quotas" (Feenstra and Taylor, p. 277). But then, few real-world firms are price takers. Imperfect competition, economies of scale and network externalities are pervasive. In such a context, protecting domestic firms might be justifiable, correcting a disadvantage they otherwise might be exposed to.

Dumping is a case in point. When foreign competitors charge lower prices in foreign markets than at home, this can have consequences for the domestic industrial structure. Therefore, WTO rules allow for "countervailing duties". The idea is to offset the power to price-discriminate across markets and, by supporting domestic producers, to establish a 'fair-trading' environment. At the same time, however, home consumers must obviously pay a higher price. Such anti-dumping tariffs have been applied, for instance, in the case of solar panels from China, by the U.S. in 2012 and the EU in 2013. Whereas anti-dumping duties on solar panels continue to be applied in the U.S., in the case of the EU,

these tariffs expired in 2018 and were not renewed. This has to do with the EU's institutional context. While trade policy is an exclusive competency of the EU Commission, differences in national interests do play a role. Germany was opposed to the countervailing duties already in 2013 and its allies view then dominated in 2018. What regards the effectiveness of these barriers, the two U.S. companies which initiated the anti-dumping causes both went bankrupt. A standard argument against such protection of domestic firms is to let the foreign government subsidize its industry, thereby worsen its terms-of-trade, and at the same time let home consumers enjoy cheaper products. This was also an argument made against the 100 % tariffs on Chinese EVs, implemented by the Biden-Administration. Over time, however, the counterargument was that such a dominance could be exploited as well as used strategically, as a potential "choke point". This is where trade policy meets geopolitics.

In many places, the argument that domestic firms need protection to get a foothold in World markets has been used – and it failed. But there are historical instances suggesting that the protection of fledgling firms (or *infant industries*) could work: the U.S. and Germany in the 19th century, the South-East Asian Tigers in the 1960s and 1970s, and, of course, China after 1978. The classical infant industry argument rests on the presence of dynamic increasing returns. When costs in an industry decrease with experience, a newcomer may not be able to compete with an incumbent, even if it has a latent comparative advantage (see e. g., Krugman et al. 2023, p. 163). Having accumulated so much knowledge, and having descended swiftly on the learning curve, the incumbent firm is able to produce at average cost substantially below a newcomer. This initial acts as an insurmountable barrier to entry. Therefore, the market for this product will remain uncontested unless the domestic public sector covers the initial cost difference to get its firms going – a model followed by China in many industries, and earlier by Taiwan and Japan.

2.3 The Geopolitics of Industrial Policy

The debate about defending European sovereignty – creating "strategic autonomy" – gained momentum with the intensifying conflict between the U.S. and China (Leonard, Pisani-Ferry, Ribakova, Shapiro and Wolff 2019), that is *before* the massive supply chain disruptions resulting from Covid-19 in the spring of 2020 and the trade restrictions and sanctions, subsequent to the Russian invasion of the Ukraine in February 2022. With China and the U.S. becoming increasingly "geopolitical" during the first Trump administration, giving national security and power considerations a decisive weight, Europe seemed to be compelled to ponder an integration of economic and geopolitical considerations as well. Attempting such an integration is a particularly tall order in the European case. There are substantial differences in policy preferences across EU member

states. To caricature a bit, some in the North are much less inclined to opt for intervention than other member states in the South. This might have less to do with economic philosophies than with bottom line interests, like differences in exposure to the Chinese market. There is also significant competition between member states whenever a response has regional or locational consequences. Though, as we will see below, the U.S are not all that different in this respect.

Nevertheless, the EU has shifted important policy domains to the supra-national level, in particular trade policy and, at least as critical, state aid. Interestingly, the EU's state-aid rules were relaxed in the wake of both of the recent crises, but also in response to U.S. and Chinese 'statecraft'. The EU Commission published a new "Temporary crisis and transition framework" in March 2023. As a Briefing Paper for the European Parliament observes, these "(d)iscussions pit German and French support for more state intervention to create EU industrial champions, against smaller member states' support for unfettered competition and free trade" (Cesluk-Grajewski 2023). Obviously, beyond philosophies, these conflicting views also reflect very substantial differences in fiscal means or "space", differences which clearly tilt the playing field. Of course, the original state aid prohibition and its Europeanization were exactly meant to ensure undistorted competition within the EU.

2.4 Industrial Policy and National Security

Economic and national security concerns are rarely taken into account by profit-motivated firms and are thus a legitimate motive for policy interventions affecting industrial structure and trade. However, with the end of the Cold War and the integration of China as well as the successor states of the Soviet Union and its satellites into world trade during the 1990s and 2000s, national security considerations faded ever more into the background. Not so much in the case of the U.S. where export controls for critical products and technologies as well as the protection of critical infrastructures were never completely given up. In fact, based on section 721 of the Defense Production Act of 1950, the Committee on Foreign Investment in the United States (CFIUS) has always been coordinating these protective activities across various government agencies. These rules have been continuously updated – adapting to changing political environments and objectives. The Department of Commerce's Bureau of Industry and Security, for instance, being supposed "to establish appropriate controls, including interim controls, on the export, reexport, or transfer (in country) of emerging and foundational technologies", is comprehensive indeed. Technological categories to be protected include, inter alia: "biotechnology, artificial intelligence, microprocessor technology, advanced computing technology, data analytics technology, quantum information and sensing, robotics, brain-computer interfaces, hyper-

sonics, advanced materials, advanced surveillance technologies …" (Federal Register 2018).

Protective measures regularly come with extra-territorial effects. Not only because some parts might be components of cross-border value chains. But more directly, since the U.S. enforces, via the threat of "secondary sanctions", non-U.S. firms to oblige, unless they want to give up the U.S. market. This is what Cornelia Woll calls "the long arm of the American legal system" (Woll 2023). Clayton et al.'s (2025) in their geoeconomic approach also highlight the ability of a hegemon to "coerce foreign governments to pressure their own firms on the hegemon's behalf". Take for instance Dutch company ASML, Europe's most advanced chipmaker. Still in the Biden-Administration, the U.S. government expressed in no uncertain terms its expectations for the Dutch government. The Netherlands were supposed to introduce binding export restrictions on ASML's chip exports to China. Given that ASML is sourcing much of its parts across Europe, this has significant consequences for all parts suppliers (in 2023, more than 5,000 in total). The U.S. also makes use of its "exorbitant privilege" with the U.S.-Dollar as the ultimate safe asset as well as the US-Dollar based payments system SWIFT (e. g., Krugman 2024). Of course, amongst potential targets, this has led to plans to create an alternative payments system as well as diversifying away from dollar assets.

Europe has been far less assertive. "Asset protectionism" was not only perceived to go against the spirit of WTO agreements. It also was incompatible with prevailing economic philosophies – though varying across member states. When, for example, the German Minister for Economic Affairs, Sigmar Gabriel, pondered to prevent the acquisition of Kuka, a German robotics firm at the technological frontier, by Midea, a Chinese investor, in 2016, he was heavily criticized. Even his idea to search for an alternative investor did not find favor. Criticism came in particular from German industry associations. Gabriel quickly backpedaled. Only a few years later, the Federation of German Industries took a much more nuanced view of its member firms' relation with China (BDI 2019).

In the meantime, it had become palpably evident that the Chinese government was serious about achieving its geopolitical goals, as defined in its ten-year plan *Made in China 2025*, published a decade ago. With the intensifying trade conflict between the U.S. and China, and, at least since 2018, with the intention of reducing dependence, the Chinese government put an additional emphasis on "self-reliance" as well as the "circular economy" (de Soyres and Moore 2024). More recently, concerns about security or resilience have been put in stark relief by both the Covid pandemic and the Ukraine war as supply-chain disruptions revealed hitherto little-noticed dependencies from particular foreign suppliers in critical industries, thereby pushing national security considerations back into

the forefront of policy deliberations. The very protracted process of disengagement from Russia after the attack on the Ukraine is an obvious result of this shift.

2.5 Industrial Policy and Competition

A key factor that separates industrial policy successes from industrial policy failures is how the policies affect competition, provided competition is feasible at all. If industrial policy promotes competition, say by encouraging market entry by young new firms, it is more likely to boost growth (Harrison 2025). An influential study by Aghion et al. (2015) has corroborated this hypothesis empirically for a large sample of Chinese enterprises in the period 1998 – 2007. Industrial policies are pro-competitive when they allow for markets to be contested, when they are applied to a sector broadly rather than supporting only a few selected producers, and more generally, when they force firms to succeed under competitive conditions.

The experience of industrial policies during the first 25 years of the post-war period comes close to a laboratory experiment. Policies favoring import substitution, as they were widely practiced in Latin America during the 1950s and 1960, were notoriously unsuccessful because they shielded the protected industries from international competition and prevented the import of cutting-edge technologies from abroad. As a result, growth and innovation in these countries faltered.

In contrast, the export-promoting industrial policies pursued by the Southeast Asian "tiger economies" in the same period succeeded in sparking growth and innovation as governments conditioned their support on sustained success in global competitive markets and encouraged private-sector FDI, associated with technology transfer.

In the same vein, governments aiming at advancing technological progress towards specific societal needs, be it in cleantech or in the health-sector, should avoid trying to pick winners, but rather harness the forces of competition for public-policy purposes. Aghion et al. (2024) cite the mRNA vaccines as a shining example of "competition-friendly industrial policy" when America's Biomedical Advanced Research and Development Authority (BARDA) funded six different projects based on different technologies to achieve rapid results – with stunning success, as soon became apparent. Critically, BARDA at no point favored large incumbents or claimed superior knowledge on which technologies might be most promising, but let scientists make the decisions. Most obviously, BioNTech, which was actually at the forefront in bringing an mRNA-based vaccine to the market, evolved in a different eco-system around the University of Mainz. Curevac, a Tübingen University start-up was not far behind.

Finally, market structure is crucial. When there is only a small number of firms – because of very substantial economies of scale or very high network externalities – first-mover advantages can become decisive. Take the case of Airbus, which received governmental support in many ways – as did its competitor Boeing, the other large passenger airplane producer. Without this supra-national European industrial policy, Airbus would not be in business. However, Airbus turned out to be not just a technological and commercial success, but importantly also prevented the market for wide-bodied aircraft to become dominated by a monopoly – a huge benefit to airlines and consumers in Europe and worldwide.

2.6 The Political Economy of Industrial Policy

Industrial policy attempts to change the structure of an economy, to make it more productive, putting it on a higher trend-output path. Further objectives include addressing regional inequality, mitigating the risks of climate change or providing good jobs. By necessity, IP creates winners and losers. Since it has redistributive consequences, it is inevitably political, giving rise to conflicts about who gets what. It is here where conflicting claims need to be reconciled. This is the dimension of "interests".

In addition, there is the dimension of "ideas". Industrial policy often gives rise to heated controversy between its advocates and its critics. Some of that heat can be attributed to a clash between conflicting, firmly held political or ideological beliefs about the proper role of government in the economy. Economists, seeing the role of the government confined to that of a rule-setter and of a guardian of the essential institutions of a market economy, will generally take a skeptical view of discretionary policy interventions. In contrast, economists who point to the many ways markets can fail and who are prepared to view the government as a benign force doing its best to correct market failures will be more open-minded about industrial policy.

Advocates and critics of industrial policy tend to talk past each other not only because of such philosophical differences, but also because they approach the policy issues from entirely different analytical angles. The standard approach to economic policy analysis starts with the traditional Tinbergen-style framework of targets and instruments, identifying deviations from target, e. g. due to market failures, and deriving the appropriate remedy from a positive analysis of the causal link between instruments and targets. This is essentially what was meant by 'analytical' foundation above and what is highlighted by Harrison (2025) as a key ingredient of any successful industrial policy. A problem with this position is that most of the literature is observational and descriptive, pointing at correlations. Questions like what would have happened to China if it had not been

allowed into the WTO or, more than a decade later, what would have happened in the absence of the *Made in China 2025* program, are quite infeasible to answer. In principle, one would have to account for all the reverberations of an industrial policy measure across an economy. The focus is typically on specific sectors or regions. Still, policymakers, not enjoying the luxury of agnosticism, do embark on industrial policy activities.

In any case, given that industrial policy is inevitably political, an additional level of analysis necessarily comes into play. Political constraints under which industrial policies are put into practice must be acknowledged. As Juhász/Lane (2024) demonstrate, conflicting interests, legitimate in a pluralistic society, often prevent 'first best' industrial policies from being enacted. They illustrate the point with what is perhaps the single most important global industrial policy challenge: the greening of the economy. There is no doubt about the externality at work, no doubt about the climate being a global public good, no doubt about the first-best Pigouvian tax required to address the problem.[5] And yet, progress is painfully slow. Why? Most obviously, the global public good problem remains unresolved in the absence of a benevolent dictator or social planner who could enforce the collective global action required to bring down global CO_2 emissions fast enough.

To the extent that climate policy is enacted, the first-best instrument of carbon pricing is deployed, if at all, only very moderately. Instead, typically a portfolio of instruments is applied, designed to direct economic activity towards lower greenhouse gas emissions (Blanchard et al. 2024). Carbon taxes meet political resistance because, even with full lump-sum reimbursement of the proceeds, they are perceived as an immediate cost whereas benefits are uncertain and may accrue in a distant future. Green industrial policies, in contrast, usually mean that the government can allocate resources directly to specific ends like EV subsidies or battery research. As Juhász/Lane (2024, p. 35) put it: "Where a carbon price is a 'stick', green industrial policies provide 'carrots'." Although the 'stick' is the first-best instrument, in a first-best world, the constraint of political feasibility prevents its adoption. In addition, a carbon tax is levied based on criteria which, of course, must be defined by a public authority, hence are not beyond politics, but which can be monitored whereas carrots are obviously more exposed to political lobbying.

Once such political-economic constraints are taken into account, industrial policy may look a lot less appealing than it would under the presumption that a benign, well-informed government adopts the first-best policy. Still, policymakers have to deal with the prevailing politico-institutional environment. There is a parallel here to fiscal policy where the first-best course of action would always

[5] In the real, at best second-best world, there are doubts about the feasibility of the Pigouvian solution (see Blanchard et al. 2024).

keep public debt on a sustainable path. The political process, however, typically exhibits a deficit bias, leading to issues with long-term sustainability.

Constitutional provisions to rectify this problem such as the German debt brake or the (long forgotten) Gramm-Rudman-Hollings rule in the U.S. of the 1980s) have proven highly problematic. In the case of industrial policy, it is even harder to think of robust rules that could effectively constrain the outcome of the political process. Under these circumstances, it is even more important to identify the underlying market failure to be corrected carefully and to explain well which policy instrument addresses the problem most directly and most efficiently.

3. Applied Industrial Policy – National and Sectoral Cases

For a long time, beginning in the 1980s, a substantial majority of economists was in general rather skeptical of industrial policy. That government could pick winners consistently seemed infeasible. At the same time, IP was supposed to create a wasteful *chasse gardée* for rent-seekers (see for the debate in the U.S. in the 1980s (Norton 1986)) The largely negative assessment, however, was often based on an unachievable benchmark, or a benchmark which rested on unrealistic preconditions. This suggested a less demanding line of attack, acknowledging the real available alternatives, a comparative institution approach à la Harold Demsetz. Researchers working in the more practical, policy-oriented domains were generally much less discouraging. In particular, Michael Porter and his collaborators documented the pertinence of public sector intervention in creating Marshallian clusters, firm external economies, applying at a regional level as well as the level of an industry (Porter 1990), (Ketels and Protsiv 2021) see also (Krugman, Obstfeld and Melitz 2022).

Moreover, this might help to understand the divergence between actual industrial policy and the proclaimed underlying blueprints. The deviation from the conceptual playbook is most glaring in the case of the U.S. The U.S. has never followed the advice given by IP-skeptical standard economics. France, at the same time, has always been accused of dirigisme (Colbert, Planification etc.) And, of course, even 'ordo-liberal' West-Germany did not stay away from using the heavy hand of the state when sectors, which often meant regions, faced structural adjustment needs.

3.1 Industrial Policy in the U.S.

The U.S. is often understood, in particular by European pundits, as an economic environment untrammeled by the heavy hand of government intervention. Of course, IP has always been a decisive part of the context in which cor-

porate decisions were taken. In a highly instructive book, Jonathan Gruber and Simon Johnson document the pervasive influence of public sector involvement on the innovation process in many domains of the U.S. economy, often via the military research channel (Gruber and Johnson 2019). By 1940, the US did not possess "the technology that would win the war" against Nazi Germany. To Vannevar Bush, the chief inspirator and coordinator of the U.S. response "it started to become clear … that the United States needed to … urgently develop technology that could be applied to war. One obvious response would be for the government to draft scientists and put them to work in its own laboratories, along the lines of the German or Soviet model. The early success of German technology in World War II certainly recommended that model" (pp. 15 – 16). Given that "the goal now was national defense, not making profits", what Bush was pondering was "the right way to break loose from the traditional profit-oriented framework of private business while retaining private initiative and the ability to move fast" (p. 16).

In 1958, in response to another (far less dramatic event), the Sputnik shock, the U.S. Department of Defense launched the Advanced Research Projects Agency (ARPA). Later renamed into DARPA, the agency continues today to support some 100 research projects, in a flexibly organized way, run by program directors with substantial discretionary power (Azoulay, Fuchs, Goldstein and Kearney 2019). A number of breakthrough innovations (internet, laser technology, personal computers, mobile phones etc.) have been traced back to DARPA projects. DARPA has also spawned numerous similar approaches in other domains, and not only in the U.S. (Carleton and Cockayne 2023). Concerning the health and pharmaceutical sectors, the National Institutes of Health with their 25 dedicated centers funds intra- but particularly extra-mural research, typically in the form of grants to research universities. Similarly, the National Science Foundation, founded in 1950 as an independent agency of the U.S. government, funds basic research across the sciences as well as supporting educational programs. To be brief, the notion of a mainly private sector-driven R&D process in the U.S. has always been a myth.

3.2 Industrial Policy in France

Ever since the 1980s, France has experienced a substantial decline of its manufacturing sector as a share of value added and employment. This was often accompanied by *délocalisation*, the shutting down of factories in France and their relocation to more profitable places. Given the strong regionally concentrated impact – combined with its electoral consequences (i. e., the rise of the far right *Front National* and its successor *Rassemblement National* in regions particularly hit and left behind) – this was increasingly seen as a problem to be corrected by public policy. In the case of France, IP was therefore to a substantial degree

about *re*-industrialization. The emphasis, however, is not on protecting 'old' industries. Instead, policies are conceived to buttress sectors at the frontier. A summary report of *France Stratégie* "focuses on seven industrial sectors – health products, aeronautics, automotive, space, rail, electricity – where the state plays a particularly important role" (Aussilloux, Frocrain, Lallement and Tabarly 2020, p. 1). The authors observe that in most advanced economies between the 1980s and up until the 2010s, IP-strategies were barely stated in a consistent way. In the meantime, developing such a guidance is now seen as "a necessity to correct certain structural imbalances, and to mobilize (a) country's vital forces confronted by major new challenges" (p. 3). The focus of the Report is "the worrisome decline of French industry". Sarah Guillou (Guillou 2024), sketching the historical evolution of IP in France, takes a different view. She argues that France should give up on fighting deindustrialization and re-establishing *planification*. Instead, she suggests that French IP should address three "challenges associated with the European Union, the greening of the economy and artificial intelligence".

3.3 Greening the Economy

Nicholas Stern famously described the negative externality from green-house gas emissions "as the greatest market failure the world has ever seen." Natural resources more generally are used at prices far below their marginal social costs. Recent estimates of the "social costs of carbon" are orders of magnitude higher than previous consensus estimates (Bilal and Känzig 2024). Markets are wasting resources on a massive scale. Economists' traditional focus on carbon taxes or emission trading, with strong adherents on both sides, seems too narrow (Stavins 2022). Carbon pricing, however, seems to be politically unpalatable, even if compensated. Blanchard et al. 2024 refer to the French *gilets jaunes* movement as a case in point. Hence while they advocate carbon pricing, they recommend to use a more comprehensive toolbox: R&D support; emissions standards and prohibitions, subsidies, compensation as well as accounting for the global public good dimension.

In addition to the substantial mispricing of fossil fuels and the vulnerability to free-riding, Dani Rodrik (2014) lists a third reason why public sector support of green R&D is essential: substantial externalities, not recuperable by a potential private investor. We would add that the uncertainty involved in many projects is much too high and private sector investors might be unable to diversify to the same degree as the public sector can. Building on the critique by Pindyck, Heal and others, Stiglitz, Stern and Taylor (2023) make a number of important additional points – the issue of the proper discount rate, non-linearities and tipping points, tail risks, not accounted for in the damage functions etc. – in arguing why Integrated Assessment Models as the mainstream approach to evaluate the

risks of climate change are fragile. Given the immense risks and irreversibility, they argue that policymakers should take extreme risks seriously and opt for a more assertive approach, therefore.

3.4 The Case of E-Mobility

There are several sectors – solar panels, batteries, etc. (White House 2021a) – which could serve to illustrate the issues detailed above. Given the relevance of the car industry for many national economies, one exemplary case are electric vehicles (EVs). In order to mitigate CO_2-emissions, the EU, for instance, attempts to stop the sale of internal combustion engine (ICE) vehicles by 2035. In the U.S., a number of incentives – lower taxes, rebates, building of infrastructure – were designed to nudge consumers in the same direction. The transition to EVs is heavily incentivized by governments across the industrialized world. The novel feature here is that China, which for the most part of its industrialization of the past five decades has been importing western technology in its drive to catch up, has pursued a long-lasting and persistent industrial policy to gain a technological lead in e-mobility. In addition, due to its notoriously weak domestic consumption demand, China heavily depends on investment and net exports to keep its macroeconomy in balance (Tordoir and Setser 2025). Accordingly, China has built up capacities to produce EVs far beyond the size of its domestic market. For the United States and Western Europe, the question then is how to respond. Neither one of them is willing to let China flood their domestic market with EVs and thereby obtain market dominance in this industry. And yet, they differ in their response.

With a 100 % surcharge, the United States has effectively closed its market to Chinese EVs. This protection of the domestic industry can be explained in political-economy terms by the earlier backlash against the so-called "China Shock" which had hit the U.S. industrial heartland in the wake of China's accession to the WTO (Autor et al. 2024). In terms of welfare and growth, however, this level of protection appears hard to justify: It destroys a large amount of consumer surplus and it slows down the green transition in favor of short-run profits and jobs in the car industry. As an anti-competitive, import-substituting policy, it is likely to reduce the pressure to innovate, thereby harming productivity growth in the longer term (Lawrence 2024).

The effects of America's tariffs against Chinese imports will be felt in Europe as well. As China is locked out of the U.S. market for EVs, the need to export its excess capacity output will be directed towards the European market with even greater force. Europe, in turn, has started to put its own policy response in place. In contrast to the U.S., Europe's response is trying to level the playing field in line with WTO provisions. That is, countervailing duties, ranging between 20 %

and 40 %, are firm specific, thus trying to capture implicit subsidies at a firm-level basis. However, the European Union finds it difficult to define a coherent and credible strategy, as its members differ in their engagement with China and in their exposure to the recent Chinese export offensive. No wonder they are deeply divided over the proper response.

As a case in point, Germany was a prime beneficiary when China industrialized its economy and began to take part in the international division of labor with its accession to the WTO in 2001. At that time China did not directly compete with Germany's key industrial sectors, but was a keen buyer of German machinery, machine tools and cars. This time around, however, Germany's position as a world-leading exporter in core industries such as vehicles and cleantech is under assault. Neither Germany's industry nor its political leadership appear well prepared to rise to this existential challenge. Some argue that at this juncture, it would be in Germany's very own interest to support a joint European response to China's offensive industrial policy – or even to assume a leading role in designing a unified European policy stance (Tordoir and Setser 2025). Others argue that German industry should try to take up the competitive gauntlet and stay at the frontier (for instance Hüther 2023). In practice, Germany voted against the EU's countervailing duties on Chinese EV exports, also concerned about China's likely retorsion which would harm the significant investments German manufacturers have on the line in China.

Catching up with China in the EV industry is not made easier by Europe's historically strong position in the ICE technology which has been incrementally improved and made more fuel efficient over the years, but which now faces a dead end as ICE cars will be banned from being sold in Europe from 2035. In contrast, the industry leaders in the EV market – America's Tesla (incidentally, bailed out in 2011) and China's BYD – have no history in the construction of ICEs but have both started from scratch. Switching from ICEs to EVs is an enormous challenge and requires flexibility in reshuffling jobs that has long been lost in an industry which has grown accustomed to continuous growth over many decades (Garicano 2024).

However, skepticism is not a foregone conclusion. Recent agreements between unions and Germany's Volkswagen indicate that there is some capacity to adjust. Union members, or more specifically, works councils, have a long-term interest in the survival of their companies (Jäger 2022). This is the major reason behind "wage moderation", characteristic of the German labor market (Dustmann et al. 2014). Still, challenges are enormous, and they ripple through the whole value chain.

How can industrial policy help in this difficult transition? The temptation to subsidize individual producers or production locations should be resisted as such subsidies are all but certain to be hijacked politically and be directed to-

wards saving jobs that have no future. More promising avenues could include measures to accelerate the build-up of an extensive, easily accessible charging infrastructure. Providing a reliable supply of affordable energy and adopting DARPA-style practices in promoting pertinent research (batteries) would also fit these criteria.

Moreover, as the rule-based, multilateral order of yesterday is eroding, domestic-content provisions have become standard usage in the industrial policies of the major global players. Europe should follow suit, if only to gain an extra bargaining chip. It goes without saying that any use of tariffs and other protectionist tools must balance the multiple objectives of giving European producers some breathing space, maintaining competitive pressure, keeping the green transition on track, and encouraging foreign industry champions to invest in Europe and bring their advanced know how with them – much as China has practiced it over most of its industrialization drive.

Europe's way forward towards its own EV industry thus will be steep and arduous. But if the move away from the ICE is to remain part and parcel of Europe's green transition, giving up and leaving the field to foreign manufacturers of EVs would come at high cost – much as surrendering the market for wide-bodied aircraft to the Americans would have more than a generation ago.

3.5 Performance Assessment

As Dani Rodrik (Rodrik 2014) writes, "(t)he trouble is that industrial policy has a very chequered history" (p. 474). Critiques typically highlight failures. But, given the deep uncertainty surrounding these projects, such failures should be expected. If, conversely, public sector support was mostly associated with successes, that would signal a problem, i. e., a high probability that public funds were allocated to projects which would have been pursued anyway (Meunier and Ponssard 2024). In fact, there is barely any breakthrough innovation that has not benefited decisively during its development phase from public sector support. Mariana Mazzucato (Mazzucato 2013) has many examples, as do Jonathan Gruber and Simon Johnson (Gruber and Johnson 2019). Therefore, not unlike venture capitalist firms, the public sector should take a portfolio view. Meunier and Ponsard suggest "repayable advances" conditioned on future sales, an approach "commonly used by European governments in aeronautics". They also refer to a report commissioned by French government President Chirac (Beffa 2005), which suggested the creation of an *Agence de l'Innovation Industrielle* supposed to work on similar principles.[6]

[6] Truth in advertising, one of the authors was involved in a personal capacity in the preparation of this report.

4. What Now For Europe? Lessons To Be Drawn

"Competitive advantage in high-technology industries is created, not endowed by nature" (Laura Tyson 1992)

For almost a decade now, the EU has been challenged by the Great Power conflict between the U.S. and China. Tensions have been increasing in the aftermath of the Ukraine war. Sanctions imposed on Russia came with a substantial negative terms-of-trade shock for European energy-intensive industries. In volume (though not in value) terms, German manufacturing, for instance, has been flatlining, however, already since 2018 (Hüther 2023). Spillovers have been ricocheting across economies integrated into the German value chain. Moreover, in terms of structural dependence on trade surpluses, there are several 'Germanies' in the EU (as well as in the EEA, e. g., Switzerland). Meanwhile, the just inaugurated U.S. Administration is about to introduce so-called "reciprocal tariffs", thereby changing the situation for Europe's small, open economies again, and most probably fundamentally so.[7] Substantial alterations also concern NATO or national security. Europe will have to defend itself, i. e., to spend much more of its resources on military goods and personnel. If the position of the U.S. Administration prevails, Europe will have to bear most of the cost of protecting and, at some point, rebuilding the Ukraine.

What can the EU and/or its member states do to respond to these challenges? The EU Commission as well as the EU Council have commissioned each a Report, one by former ECB President and Italian Prime Minister Mario Draghi and another one by Enrico Letta, also a former Italian Prime Minister. Both essentially focus on how to get towards a higher growth path and both, therefore, are concerned about achieving a resilient, sustainable and inclusive growth of productivity – growth in income per capita.

4.1 Industrial Policy and Economic Growth

The Draghi Report (2024a) documents a gap between U.S. and EU productivity growth which has widened since the early 2000s.[8] This is much more than an accidental cyclical deviation. There is, however, also a palpable difference in the growth rates of demand between the US and the EU, ever since the start of the

[7] Obviously, the new U.S Administration strongly holds the belief that tariffs have an impact on the overall trade balance. This is opposed to standard economics which sees (almost exclusively) consequences for the composition of the cross-border flow of goods and services. For a more encompassing assessment see Posen (2024)

[8] Based on the Draghi-Report, the EU Commission has defined in January an approach (*The EU Competitiveness Compass*) that is supposed to address the gaps diagnosed in the Report.

euro area periphery debt crisis and accentuated in the wake of the Covid-19 pandemic (Draghi 2024b, see also Kotz et al. 2018). What stands out as the primary cause of a substantial and persistent growth gap, however, is a conspicuous innovation gap. The Report thus arrives at the policy conclusion that there is an urgent need for an industrial policy directed at the tech sector: "First – and most importantly – Europe must profoundly refocus its collective efforts on closing the innovation gap with the US and China, especially in advanced technologies" (p. 2).

The key barriers diagnosed by Draghi (2024a, chap. 2) as standing in the way of innovation in Europe comprise

- a static, automotive-determined industrial structure and not enough investment in digital technology. With is focus on low innovation, low productivity and mature industries, Europe is stuck in a "middle technology trap";
- too low a number of research institutions achieving top levels of excellence. Notably, the pipeline from innovation to commercialization is weak. This is consistent with the observation that European would-be innovators take their projects to some place other than Europe when they approach the point of being ready for the market. Most of these innovations end up being commercialized in the United States;
- aggregate spending by EU governments on research and innovation, as a share of GDP, is in the same order of magnitude as the amount spent by the U.S., but the effectiveness of that public spending suffers from a multitude of weaknesses that are specific to Europe: excessive fragmentation, inadequate scale and coordination, bureaucrats instead of scientists in charge of programs[9], not to mention the Single Market which still is far from complete, thereby hindering innovative companies from scaling up in the EU.

This laundry list of impediments to innovation in Europe indicates that the scarcity of public funds might be an issue, but their limited effectiveness as spelled out above is obviously pertinent. Still, to allow for a catch-up, Draghi (2024a) is probably right in calling for substantially higher spending. Still, improvements in Europe's institutional and regulatory environment may in fact be more critical for spurring innovation and growth. But then one should also ask why these improvements have proven infeasible to achieve. Why are energy markets so fragmented? Why is military procurement organized on a subscale? Or, more bluntly, the perennial *cui bono* question, who profits from the status quo?

[9] To be sure, academia can also be quite inefficient, status-quo oriented and risk averse, see most recently Azoulay 2025 on NIH grant renewals assessed by peer-review mechanisms. If possible, the easily disparaged 'bureaucrats' could make mor use of DARPA like competitive approaches.

This leads to a geographic or regional aspect, potentially more important in Europe than in the U.S. As Krugman (2024), a doyen of economic geography, has pointed out, digital technology is currently concentrated, at least to a large degree, in Silicon Valley. (Incidentally, until some three decades ago, it used to be Route 128, north of Boston).

IP in its narrow understanding has often been about protecting challenged industries. This always had a regional dimension. Shocks to industries inevitably hit places. At the same time, in the U.S., regional policies were not looked upon favorably, at least outside the academic discourse. Obviously, such policies were pursued, nonetheless. And some of them turned out to be successful. A typical feature of such successful policies was that they typically were close to research hubs. Cambridge's Kendall Square is a prominent case in point. A manufacturing site mired in decline for decades was turned around in the 1990s, becoming one of the most dynamic centers of life sciences, attracting investors from all over the world. Much of the seed money came from National Institute for Health grants, funneled through projects at MIT or the Harvard Medical School. Another inspiring example, perhaps less well known, at least in Europe, is a research cluster in Durham, NC, with outstanding universities close by. What Gruber and Johnson (p. 174) call: "The classic example of a place transformed by research enterprise is North Carolina's Research Triangle Park, founded in the 1950s and now the nation's largest research park."

Of course, one can find similar clusters in all EU member states (Porter 1990) or (Ketels and Protsiv 2021). In France, for instance, several *pôles de compétivité* (e. g., *technopolitaine nationale* (Sophia Antipolis) or *nanotechnologies grenobloises*) are quite successful. Or in Germany, for example BioRegions, focused on life-sciences, Measurement Valley (Göttingen) or Robotics.

4.2 Innovation Policies: A Trade-Off Between Risk and Return?

A warning might be in order at this point: While the Draghi Report suggests a reform of European institutions along the lines of the American model, they are not simple-to-adjust policy instruments like a tax rate or an investment subsidy. On a more fundamental level, they reflect deep-seated differences in attitudes towards new breakthrough technologies. Perhaps oversimplifying, one could say that the American approach towards major innovations is to embrace the opportunities they might offer and to regulate only later, if at all, when possible risks and abuses manifest themselves undeniably. Also, there are significant differences between U.S. states. California is, what concerns privacy and data protection, closer to the EU than Texas. Whereas in the U.S. banks sell client da-

ta[10], Europeans take a comprehensive perspective what concerns data and data markets, integrating issues of competition, privacy and consumer protection (Caffara et al. 2021 and 2022, ProMarket). Such differences in preferences imply that Europe, in contrast, attempts to take the lead in setting up a regulatory framework to contain possible risks early on. The hope is, as Margarethe Vestager, at the time EU Commissioner, declared upon presenting "A Europe fit for the digital age", that by: "spearheading the development of new global norms to make sure AI can be trusted [and] by setting the standards, we can pave the way to ethical technology worldwide and ensure that the EU remains competitive along the way" (European Commission, 2021).

Chances are, however, that by following the 'precautionary principle' instead of Europe taking the lead in a well-regulated digital age, innovators prefer the far less regulated greener fields in the U.S. Which leaves Europe with fewer entrepreneurs, less VC investment, hardly any dominant tech firms and, ultimately, with less growth (McAfee 2024, Thierer 2024). Europe ends up with an innovation gap and low productivity growth (or low total factor productivity). A more nuanced interpretation might instead view the choice of a regulatory architecture as facing a trade-off between risk and return, not unlike the trade-off investors face on financial markets when they make their portfolio decisions. Low growth then might just be the price Europe is willing to pay for its cautious approach towards the incalculable risks inherent in break-through innovations. But then, only recently, French start-up Mistral was able to outcompete a number of the U.S. luminaries, not to speek of DeepSeek.

4.3 The Need For More Europe – When It Is About European Public Goods

Even within the constraints of its risk-averse approach to innovation, Europe has ample scope for efficiency gains. With an EU-wide perimeter of externalities, i. e., European public goods, and substantial economies of scale prevalent in many domains, Europe pays a high price for its fragmentation. As geopolitical tensions create mounting threats to Europe's economic and geostrategic security, the need for closer cooperation and deeper integration of the European Union is too obvious to be denied. Unfortunately, at this critical juncture, strong political forces pull the other way, favoring a retreat from the idea of European unity in a number of member states as they seek to preserve the incomes and the security of citizens under the shelter of their nation states. However, as a response to current challenges, this route is bound to lead into a blind alley.

[10] See PayPal Knows Your Pants Size—and Will Share It With Marketers, WSJ, Oct. 25, 2024. Installing software in Europe or the US also implies rather different levels of private data protection.

Policy areas in which the domain of public goods or the returns to scale extend well beyond the nation state to the European Union at large abound (Fuest and Pisani-Ferry 2019). In all of these areas, there is technically a strong case for moving the decision-making authority up from nation states to the European Union – or in some cases even further. Obviously, such a move must be democratically legitimized. For example, the fragmentation of climate policy along national lines or of defense, including defense industries and procurement of military equipment, is highly inefficient. In the same vein, the stability and efficiency of Europe's financial sector would be enhanced by a deeper integration of its banking and financial sectors.[11] The European Union is working at it for years. Harmonization requirements would, however, reach far beyond financial market regulation where actually one rulebook exists and in the case of banks also one Europeanized single supervisor. Harmonizing insolvency laws and procedures or taxation conflicts with legitimate interests. In network industries, exploiting returns to scale is essential. As Europe moves towards renewable energy, the benefits of a large, integrated electricity grid as a device for balancing regional disequilibria between supply and demand have become ever more evident. But, here again, vested interests in the energy sector would lose rents.

To some degree, the same logic seems to carry over to the area of industrial and innovation policies. There, too, substantial spillovers and coordination problems extend well beyond national borders. However, the points made by the Draghi Report (2024, p. 25) on the contrast between the U.S. and the EU on the allocation mechanism of the public funds for research and innovation are not completely justified. As mentioned above, there is substantial involvement of the state and local level in the allocation of funds. There is also substantial competition between states or municipalities when trying to allure investors. Competition about Amazon's Secon Head Quarter was an exemplary and instructive case. And, again, states and municipalities have different budgetary constraints. Moreover, the U.S. federalism is, of course, very different from the EU one. In the latter case, genuine federalism is still a desideratum, as Draghi once remarked (in a speech at the Harvard Kennedy School in 2013). Member states still play a substantially more role than the EU. In Europe, only one tenth of industrial policy spending takes place at the EU level. In contrast, in the U.S., DARPA, NIH, NSF etc. are federal. But they function as enablers of state or local competition. In other words, the balance in Europe between member states and the center has to be a different one, unless the member states delegate more of their allocative and redistributive role to the center, in other words, a substan-

[11] Though there are caveats. The Capital Market Union – meanwhile dubbed Savings and Investment Union – was suggested in order to orient Europe's financial system towards a stronger capital market orientation. Inter alia, it was argued that this would allow for more securitization of SME loans, highly information-impacted asset claims (see Kotz/Schäfer 2018).

tially larger EU budget with more own resources and the capacity to issue debt. We do not have to explain why this does not seem feasible under current background conditions. Still, as Draghi (2024) observes, Europe trails the U.S. in its support for R&D along many dimensions. Among them, fragmentation and lack of coordination are particularly cumbersome.

The costs of fragmentation are not just a matter of limited scale. In the presence of tightly integrated markets, as in the European Single Market, uncoordinated national industrial policies may be welfare reducing for the simple reason of generating adverse cross-border spillovers, thereby distorting the regional allocation of production and trade patterns. A recent IMF study by Hodge et al. (2024) employs a general equilibrium model to demonstrate and quantify these effects. The results point to significant benefits from coordinating policies – possibly under the roof of a "single decision-making body to facilitate EU-wide coordination on strategic priorities, streamlining the existing range of overlapping programs and coordination instruments", as the authors state (ibid., p. 5). Alas, this benevolent dictator (or social planner, as she is also called) is incompatible with political realities. One just has to think of the foreseeable debates about the new multi-annual financial plan, running from 2028 to 2034, and the debates about the national net contributions.

There are many ways industrial policies can go wrong. But there are also many ways where IP is indispensable and, while not beyond failing, can contribute substantially to societal welfare. The most obvious market failure has to do with addressing the risks of climate change. Here, the EU level should be clearly in charge. Admittedly, it is probably inevitable that struggling industries will be supported for too long at times. Though, support in case of a grave shock or in helping with downsizing seem to be justifiable (see, again, Goolsbee and Card 2015). However, unilateral, uncoordinated action is bound to prove costly, both fiscally and politically.

In view of the most recent purely transactional policies enacted by the administration of President Trump the new – or very old – principle seems to be "might is right". The EU has to face up to a future where power play by the geopolitical heavy weights will be prevalent. In this global environment, it is pointless and self-defeating to follow the logic of the old WTO-governed system (Felbermayr and Braml 2024). Rather, Europe must learn to bring its economic weight to bear, to speak with a single voice and act in a coordinated and coherent way if it is to safeguard its interests. Clearly, industrial policy is one of the arenas in which the global power play takes place, and in which the big players are aggressively pursuing strategies to minimize their own vulnerabilities to supply-chain disruptions and to achieve a dominant position, establish choke points in critical sectors. As in so many other policy domains, Europe cannot afford to carry on with fragmented national action in industrial policy, but must instead, as far as possible, develop a common strategic game plan if it is to match the still

considerable economic weight of the European Single Market with equivalent political clout in the global arena.

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