

 Open access • Journal Article • DOI:10.1007/S10272-015-0535-1

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Published on: 01 Jun 2015 - [Intereconomics](#) (Springer Berlin Heidelberg)

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Article — Published Version

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Intereconomics

Suggested Citation: Mazzucato, Mariana et al. (2015) : Which industrial policy does Europe need?, Intereconomics, ISSN 1613-964X, Springer, Heidelberg, Vol. 50, Iss. 3, pp. 120-155, <https://doi.org/10.1007/s10272-015-0535-1>

This Version is available at:

<http://hdl.handle.net/10419/111365>

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Which Industrial Policy Does Europe Need?

One lesson of the Great Recession has been that countries with higher shares of industry in their GDP seemed to be less affected by the crisis. Consequently, the call for an industrial renaissance has become stronger. Industrial policy has now become a top priority in countries where it was not explicitly considered in the past. A strong EU-wide industrial policy is expected to foster growth and job creation. However, cultivating industrial development is a complex challenge. This Forum addresses the steps that need to be taken to create a new European industrial policy. What are the structural challenges that need to be addressed? What are the instruments of the EU's industrial policy? And should the EU be engaged in picking winners, or is the market better at making such judgements?

Mariana Mazzucato*

Innovation Systems: From Fixing Market Failures to Creating Markets

The important thing for Government is not to do things which individuals are doing already, and to do them a little better or a little worse; but to do those things which at present are not done at all. – John M. Keynes¹

The road to the free market was opened and kept open by an enormous increase in continuous, centrally organized and controlled interventionism. – Karl Polanyi²

Instead of asking: what benefits [has] this project yielded, it would almost be more pertinent to ask: how many conflicts has it brought in its wake? How many crises has it occasioned and passed through? And these conflicts and crises should appear both on the benefit and the cost side, or sometimes on one—sometimes on the other, depending on the outcome (which cannot be known with precision for a long time, if ever). – Alfred O. Hirschman³

Today countries around the world are seeking “smart”, innovation-led growth – and hoping that this growth is also more “inclusive” and “sustainable” than in the past.⁴ Such a feat requires rethinking the role of government and public policy in the economy – funding not only the “rate” of innovation, but also envisioning its direction. It requires a new justification of government intervention that goes beyond the usual one of “fixing market failures”. It requires the shaping and creating of markets. Rendering such growth more inclusive requires attention to the ensuing distribution of risks and rewards.

Complexity theory is relevant here because innovation is (1) a collective process, defined by a *system* of heterogeneous public and private actors, interacting in different ways; (2) it is a fundamentally uncertain process (in the Knightian sense), with most attempts ending in failure; and (3) it is a path-dependent, cumulative and highly clustered (wave-like) process, characterised by fat-tailed distributions. Unfortunately, models of innovation continue to pretend the opposite, i.e. that (1) it is driven mainly by the individual genius of entrepreneurs, at best facilitated by the public sector; (2) only characterised by risk (see the lottery models of endogenous growth theory); and (3) can be modelled as a random walk (with little persistence) that

* This article is an edited (shortened and translated into English) version of M. Mazzucato: *Costruire lo Stato innovatore: un nuovo quadro per la previsione e la valutazione di politiche economiche che creano (non solo aggiustano) il mercato*, in: *Lo Stato innovatore: una discussione*, in: *Economia & Lavoro*, Vol. 48, No. 3, 2014, pp. 7-24.

1 J.M. Keynes: *The end of laissez-faire*, London 1926, Prometheus Books.

2 K. Polanyi: *The great transformation: the political and economic origins of our time*, New York 1944, Farrar & Rinehart.

3 Cited in J. Adelman: *Worldly philosopher: the odyssey of Albert O. Hirschman*, Princeton 2013, Princeton University Press, p. 313.

4 European Commission: *Europe 2020: A European strategy for smart, sustainable and inclusive growth*, 2010.

statistically appears as a Gaussian process. Understanding the collective, uncertain and persistent nature of innovation helps us to understand the kind of policy questions that we should be asking if we want to achieve smart, innovation-led growth.

Limitations to market failure theory

Market failure theory justifies public intervention in the economy only if it is geared towards fixing situations in which markets fail to efficiently allocate resources.⁵ The market failure approach suggests that governments intervene to “fix” markets by investing in areas with “public goods” characteristics (such as basic research or drugs with little market potential) and by devising market mechanisms to internalise external costs (such as pollution) or external benefits (such as herd immunity). Five key sources of market failures – that is, factors or behaviours that result in costs or benefits that are not reflected in the price system – include imperfect competition, information failures, negative externalities, public goods and coordination failures.⁶

Within the mainstream framework, market failure is a *necessary but not sufficient* condition for governmental intervention.⁷ The sufficiency results from an assessment that the gains from intervention outweigh the associated costs of governmental failures⁸ – such as capture by private interests (nepotism, cronyism, corruption, rent-seeking),⁹ misallocation of resources (for example, “picking losers”),¹⁰ or undue competition with private initiatives (crowding out)¹¹. Thus, there is a trade-off between two inefficient outcomes; one is generated by free markets (market failure) and the other by governmental intervention (government failure). The solutions advocated by neo-Keynesians focus on correcting failures such as imper-

fect information.¹² Solutions advocated by public choice scholars focus on leaving resource allocation to markets (which may be able to correct their failures on their own).¹³ While market failure theory provides interesting insights, it is at best useful for describing a *steady state* scenario in which public policy aims to put patches on existing trajectories provided by markets. It is less useful when policy is needed to dynamically create and shape new markets, as in the cases of the Internet, nanotech, biotech and cleantech. There are four key limitations to the market failure theory.

Directionality: envisioning and “picking” strategically

Policies that aim to correct markets assume that once the sources of the failure have been addressed, market forces will efficiently direct the economy to a path of growth and development. Yet markets are “blind”, and the direction of change which they provide often represents sub-

12 J. Stiglitz, A. Weiss: Credit rationing in markets with imperfect information, in: *American Economic Review*, Vol. 3, No. 71, 1981, pp. 393-410.

13 J. Buchanan: Public choice: the origins and development of a research program, in: *Champions of Freedom*, Vol. 31, 2003.

5 K. Arrow: An extension of the basic theorems of classical welfare economics. Paper presented at the Second Berkeley Symposium on Mathematical Statistics and Probability, Berkeley 1951.

6 M. Mazzucato, C. Penna: Beyond market failures: the market creating and shaping role of state investment banks, University of Sussex, SPRU working paper SWPS 2014-21, 2014.

7 C. Wolf: Markets or governments: choosing between imperfect alternatives, Cambridge MA 1988, MIT Press.

8 G. Tullock, A. Seldon, G.L. Brady: Government failure: a primer in public choice, Washington DC 2002, Cato Institute.

9 A.O. Krueger: The political economy of the rent-seeking society, in: *The American Economic Review*, Vol. 64, No. 3, 1974, pp. 291-303.

10 O. Falck, C. Gollier, L. Woessmann: Arguments for and against Policies to Promote National Champions, in: O. Falck, C. Gollier, L. Woessmann (eds.): *Industrial Policy for National Champions*, Cambridge MA 2011, MIT Press, pp. 3-9.

11 B.M. Friedman: Crowding out or crowding in? The economic consequences of financing government deficits, in: *Brookings Papers on Economic Activity*, Vol. 9, No. 3, 1978, pp. 593-654.

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optimal outcomes from a societal point of view.¹⁴ This is why, in addressing societal challenges, states have had to lead the process and provide the direction towards new “techno-economic paradigms”, which do not come about spontaneously out of market forces.¹⁵ In the mass production revolution and the IT revolution, governments made direct “mission-oriented” investments in the technologies that enabled these revolutions to emerge and formulated bold policies that allowed them to be fully deployed throughout the economy.¹⁶ As I show in my recent book, every technology that makes the iPhone “smart” (i.e. Internet, GPS, touch-screen display and Siri) was publicly funded directly.¹⁷ Even the deployment of most general purpose technologies, from electricity to IT, was an outcome of public policy.¹⁸

Furthermore, in the IT revolution, and even in the emerging clean-tech revolution, government not only funded the actual technologies (such as mainframes, the Internet, wind and solar power, and fuel cells), but also created a network of decentralised public and private actors (a “developmental network state”),¹⁹ provided early-stage funding to companies that risk-averse private finance would not, and devised special tax credits that favoured some activities over others.²⁰ These facts seem to point to a different analytical problem facing policy makers: not trying to determine whether the right role for government is to intervene or to stand back, but rather understanding *how* particular directions and routes can be chosen and determining how to mobilise and manage activities that can lead to the achievement of dynamic social and technological challenges.

Evaluation: static vs. dynamic metrics

Market failure theory has developed concrete indicators and methods to evaluate government investments, usually through a cost-benefit analysis that estimates

whether the benefits of public intervention compensate for the costs associated both with the market failure and the implementation of the policy (including “governmental failures”). However, there is a mismatch between the intrinsically dynamic character of economic development and the static tools used to evaluate policy. The diagnostic tools and evaluation approach based on market failure theory involve identifying the sources of market failure and targeting policy interventions towards their correction. This entails *ex ante* considerations about administrative and fiscal requirements and the political-economic consequences of intervention.

Yet this is a limited toolbox, because it represents a static evaluation of an intrinsically dynamic process. By not allowing for the possibility that government can transform and create new landscapes that did not exist before, the ability to measure such impact has been affected.²¹ This then leads to accusations of government “crowding out” businesses. However, the goal of public investments should be not only to “kick-start” the economy but to choose directions that “do those things which at present are not done at all”.²² We need *indicators* for such transformative action, in order to avoid investments that are too narrow or directed within the confines of the boundaries set by business practices of the prevailing techno-economic paradigm.²³

Organisation: learning, experimentation and self-discovery

Market failure theory calls for the state to intervene as little as possible in the economy. This view has resulted in a trend of “outsourcing” that often rids government of the knowledge capabilities (for example, with regard to IT) that are necessary for managing change. Studies have examined the influence of outsourcing on the ability of public institutions to attract top-level talent with the relevant knowledge and skills to manage transformative mission-oriented policies.²⁴ Indeed, there seems to be a self-fulfilling prophecy whereby the less “big thinking” that occurs in government, the less talent and expertise the public sector is able to attract, the less well it performs, the less “big thinking” it is allowed to do. In order to promote transformation of the economy by shaping and creating technologies, sectors and markets, the state

14 R.R. Nelson, S.G. Winter: *An Evolutionary Theory of Economic Change*, Cambridge MA 1982, Belknap Press; G. Dosi: Technological paradigms and technological trajectories: a suggested interpretation of the determinants and directions of technical change, in: *Research Policy*, Vol. 11, No. 3, 1982, pp. 147-162.

15 C. Perez: *Technological revolutions and financial capital: the dynamics of bubbles and golden ages*, Cheltenham UK 2002, Edgar Elgar.

16 D.C. Mowery: Military R&D and innovation, in: B.H. Hall, N. Rosenberg (eds.): *Handbook of the Economics of Innovation*, Vol. 2, 2010, pp. 1219-1256; F. Block, M. Keller: *State of innovation: the U.S. government’s role in technology development*, Boulder 2011, Paradigm.

17 M. Mazzucato: *The Entrepreneurial State: Debunking the Public vs. Private Myth in Risk and Innovation*, London 2013, Anthem.

18 C. Perez, op. cit.

19 F. Block, M. Keller, op. cit.

20 M. Mazzucato: *The Entrepreneurial State ...*, op. cit.; M. Mazzucato: Financing innovation: Creative destruction vs. destructive creation, in: *Industrial and Corporate Change*, Vol. 22, No. 4, pp. 851-867.

21 M. Mazzucato: *The Entrepreneurial State ...*, op. cit.

22 J.M. Keynes, op. cit.

23 J. Abraham: Pharmaceuticalization of society in context: theoretical, empirical and health dimensions, in: *Sociology*, Vol. 44, No. 4, 2010, pp. 603-622.

24 A. Kakabadse, N. Kakabadse: Trends in Outsourcing: Contrasting USA and Europe, in: *European Management Journal*, Vol. 20, No. 2, 2002, pp. 189-198.

must organise itself so that it has the “intelligence” (policy capacity) to think big and formulate bold policies. This does not mean it will always succeed; indeed the underlying uncertainty in the innovation process means that the state will often fail.²⁵ If the emphasis is on the process of policy making that can allow the public sector to envision and manage transformational change,²⁶ then understanding the appropriate structures of public organisations and their “absorptive capacity” is essential.²⁷

Risks and rewards: towards symbiotic public-private partnerships

Market failure theory says little about cases in which the state is the lead investor and risk taker in capitalist economies through mission-oriented investments and policies.²⁸ Having a vision of which direction to steer an economy requires direct and indirect investment in particular areas, not just creating the conditions for change. This requires crucial choices to be made, the fruits of which will create some winners but also many losers. Figure 1 shows how much public money has been spent on early-stage seed financing through the US Small Business Innovation Research programme. Indeed, precisely because venture capital has become increasingly short-termist, with emphasis on an exit in three years (while innovation generally takes 15-20 years!), such funding has become increasingly important. Guaranteed loans for innovative high-risk projects have become similarly important. For example, the Obama administration in the US recently provided direct loans worth approximately \$500 million each to two green-tech companies, Solyndra and Tesla Motors. While the latter is often glorified as a success story, the former failed miserably and became the latest example, used widely by both economists and the more popular treatment in the media, of government being unable to “pick winners”. Indeed, taxpayers had to pick up the bill and vocally complained.²⁹ This highlights the need to build a theoretical framework that can help the public sector understand its “portfolio” choices³⁰ as well as how to socialise not only the risks of those investments but also the rewards. Is it right that the taxpayer shouldered the Solyndra loss, yet made nothing from the Tesla profits?

25 R.R. Nelson, S.G. Winter, op. cit.; A.O. Hirschman: *Development Projects Observed*, 1967, Brookings Institution Press.

26 D. Rodrik: *Green Industrial Policy*, Princeton University Working Paper, 2013.

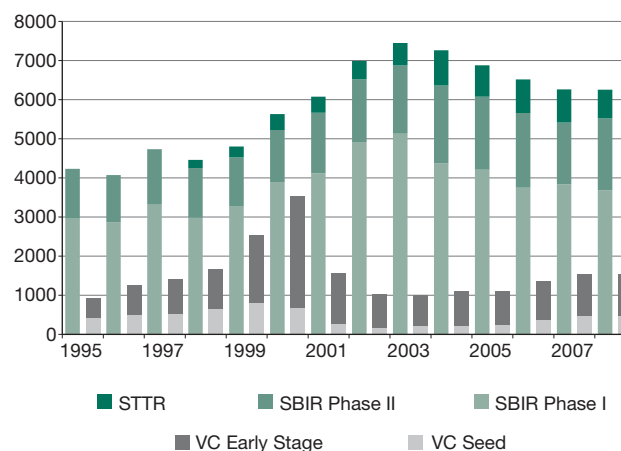
27 W.M. Cohen, D.A. Levinthal: *Absorptive capacity: a new perspective on learning and innovation*, in: *Administrative Science Quarterly*, Vol. 35, No. 1, 1990.

28 D. Foray, D. Mowery, R.R. Nelson: *Public R&D and social challenges: What lessons from mission R&D programs?*, in: *Research Policy*, Vol. 41, No. 10, 2012, pp. 1697-1902.

29 R. Wood: *Fallen Solyndra Won Bankruptcy Battle but Faces Tax War*, *Forbes*, 11 June 2012.

30 D. Rodrik, op. cit.

Figure 1
Number of early-stage and seed funding awards in the US



Note: Funding via the governmental Small Business Innovation Research and Small Business Technology Transfer programmes as well as from private venture capital.

Source: Adapted from M.R. Keller, F. Block: *Explaining the transformation in the US innovation system: the impact of a small government program*, in: *Socio-Economic Review*, Vol. 11, No. 4, 2013, pp. 629-656.

The question comes down to whether, in a market failure framework, the government deserves to retain a direct share of the profits generated from the growth that it fosters. Or put another way, are taxes currently bringing back enough return to government budgets to fund high-risk investments that will probably fail? It is well known that companies that benefit greatly from government investments have been successful in avoiding paying taxes: Google, whose algorithm was funded by the NSF, has been criticised for such avoidance, as have Apple, Amazon and a host of “new economy” companies. Even if they were not dodging taxes, *tax rates*, such as those on capital gains, have been falling due to the mainstream acceptance of the narrative that a narrow set of agents are the real innovators and risk takers.³¹

31 See W. Lazonick, M. Mazzucato: *The Risk-Reward Nexus in the Innovation-Inequality Relationship: Who Takes the Risks? Who Gets the Rewards?*, in: *Industrial and Corporate Change*, Vol. 22, No. 4, 2013, pp. 1093-1128. It was the National Venture Capital Association that in the late 1970s lobbied for a reduction in the capital gains tax from 39.6 per cent to 20 per cent in five years. Warren Buffett has admitted that such tax changes did not affect investment, only inequality.

Socialising both risks and rewards

Innovation is a highly uncertain process; it takes a very long time to develop new technologies, and the effort often ends up in a dry hole. For every Tesla (companies that receive public funding and become market darlings), there are many Solyndras (companies that receive public funding and then go bankrupt). For every Internet (technologies funded by government with great success), there are many Concordes (projects funded by government that fail commercially). Indeed, Solyndra's recent bankruptcy has been used to talk about government failure, not recognising that if government is to act like a venture capitalist (VC), which it historically has, it will undergo many failures to reach some successes – just like all VCs must.

However, what has not been sufficiently thought through is the way in which to measure success or failure from a government's standpoint, and also how to ensure that, like private VC funds, the state can reap some return from its successes, in order to cover its losses as well as the next round of investments (i.e. a revolving fund). This is especially important given the path-dependent and cumulative nature of innovation. Returns arise slowly, remaining negative in the beginning before slowly building up – potentially to a big pot (e.g. at the end of the biotech, dotcom and nanotech revolutions). One can think of returns as a cumulative distribution curve, with a slow rise at first, then a steep increase, followed by levelling off. Unless we understand the collective process of innovation, we risk allowing a narrow group of actors to reap not just the returns proportional to their marginal contributions, but close to the entire *integral* under the curve.

So who gets what? Economists argue that the state already earns a return for its investments, indirectly via the taxation system. There are four arguments against this reasoning. First, tax evasion (legal and illegal) is common and realistically will not disappear. Second, taxes, such as capital gains, have been falling over the last few decades, precisely through a false narrative about who the wealth creators are. Third, global movements of capital mean that the particular country or region (e.g. the European Union) funding the innovation might not reap the benefits in terms of local job creation. Fourth, while it is of course right to think that investments in the “basics”, such as education, health and research, should not be thought about as earning a return, it is these directed investments at companies and particular technologies that pose a very different problem. If the state is being asked to make such investments (which it undoubtedly has been making, and increasingly so, as financial markets have become even more speculative and short-termist),

it is necessary for it to cover its inevitable losses when they arise.

Where technological breakthroughs have occurred as a result of targeted state interventions for specific companies, there is potential for the state to reap some of the financial rewards over time by retaining ownership of a small proportion of the intellectual property created. This is not to say the state should ever have exclusive license or hold a large enough proportion of the value of an innovation to deter a wider spread of its application (and this has never been the case). The role of government is not to run commercial enterprises, but to spark innovation elsewhere. However, a government should explore whether it is possible to own some of the value it has created, which over time could generate significantly higher value and then be reinvested into growth-generating investments. By adopting a “portfolio” approach to public investments in innovation, success from a few projects can then help cover the losses from many projects.

There are various ways to consider a direct return to the state for its investments in innovation. One is to make sure that loans and guarantees which are handed out by the state to businesses do not come without strings attached. Loans and grants could have conditions, such as “income-contingent loans”, similar to student loans. If a company receives a loan or grant from the state, it should be required to pay back a portion of it if and when it makes profits above a certain threshold.³² This is not a complicated concept, of course, but it does run counter to some deep-seated assumptions. Currently, with budget deficits under so much pressure, it is no longer possible to ignore the issue.

Apart from income-contingent loans, there is the possibility of the state retaining equity in the companies that it supports. Indeed, this does occur in some countries, such as Israel (through the Yozma public venture capital fund) and Finland (where SITRA, one of Finland's public funding agencies, retained equity in its early-stage investments in Nokia). To be sure, equity stakes are also retained by state investment banks, such as the Brazilian Development Bank (through its BNDESPAR subsidiary), the China Development Bank and the German KfW, which are lead investors in the emerging green economy.³³ However, state equity in private companies is often feared in countries like the US and the UK (and other countries that have copied the Anglo-Saxon model) for fear that the next step is “communism”. Despite this fear, the most successful capitalist economies have had active states mak-

³² M. Mazzucato: *The Entrepreneurial State ...*, op. cit.

³³ M. Mazzucato, C. Penna, op. cit.

ing risky investments that resulted in true technological revolutions.³⁴ We have been too quick to criticise public investments when things go wrong (for example, Concorde or Solyndra) and too slow to reward them when things go right (such as the Internet or Tesla).

A new framework requires new questions

The solutions derived from market failure theory (downsizing the state apparatus, promoting market-based mechanisms to counter market failures, insulating public agencies from the private sector, etc.) might hold for steady-state situations, but not for those in which public policy is required for transformation, such as the technological and socio-economic missions of the past. Such missions required an emphasis not on fixing market failures or minimising government failures but on maximising the transformative impact of policy that can shape and create markets.

A recognition of the need for government policy to “transform”, to be catalytic, and to create and shape markets, rather than merely fix them, helps to reframe the key questions of economic policy from static ones that worry about crowding out and picking winners to more dynamic ones that are constructive in forming the types of public-private interactions that can create new innovation and industrial landscapes. In this perspective, it is key for government to not just pick different technologies or sectors but ask what it wants from those sectors. In the same way that putting a man on the moon required the interaction of many sectors, the “green” revolution being pursued today also requires changes in all sectors. Green is not only about wind, solar and biofuels but also about new engines, new maintenance systems and new ways of thinking about product obsolescence.³⁵ This is not about prescribing specific technologies but providing directions of change around which bottom-up solutions can then experiment. As Stirling recently put it:

The more demanding the innovation challenges like poverty, ill health or environmental damage, the greater becomes the importance of effective policy. This is not a question of “picking winners”—an uncertainty-shrouded dilemma which is anyhow equally shared between public, private and third sectors. Instead, it is about engaging widely across society, in order to build

the most fruitful conditions for deciding what “winning” even means.³⁶

Government would benefit from adopting a portfolio approach to public investments in innovations, nurturing the explorative, plural, and trial and error aspects of change. This requires thinking not only about technological change in a new way but also organisational change in order to build the public agencies of the future with creative, adaptive and explorative capacity.

In sum, to approach the innovation challenge of the future, we must shift the discussion away from the worry about “picking winners” and “crowding out” and towards the four key areas mentioned above as limitations to market failure theory.

Directions: How can public policy be understood in terms of setting the direction and route of change, that is, shaping and creating markets rather than just fixing them? What can be learned from the ways in which directions were set in the past, and how can we stimulate more democratic debate about such directionality?

Evaluation: How can an alternative conceptualisation of the role of the public sector in the economy (alternative to market failure theory) be translated into new indicators and assessment tools for evaluating public policies, beyond the micro-economic cost/benefit analysis? How does this alter the crowding out narrative?

Organisational change: How should public organisations be structured so they can accommodate the risk-taking and explorative capacity and the capabilities needed to envision and manage contemporary challenges?

Risks and rewards: How can this alternative conceptualisation be put into practice so that it frames investment tools so that they not only socialise risk but also have potential to socialise the rewards that enable smart growth to also be inclusive growth?

34 C. Perez, op. cit.

35 M. Mazzucato, C. Perez: Innovation as Growth Policy, in: J. Fagerberg, S. Laestadius, B. Martin (eds.): The Triple Challenge: Europe in a New Age, Oxford 2014, forthcoming, Oxford University Press.

36 A. Stirling: Making choices in the face of uncertainty, Themed Annual Report of the Government Chief Scientific Adviser, Chapter 4, June 2014, mimeo.

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The Rationale for Industrial and Innovation Policy

The evolution of industries in the last two centuries in all countries has been closely supported by a wide range of public policies addressing the patterns of capital accumulation, trade rules, the organisation of markets, innovative efforts and the process of knowledge creation and diffusion. Specific institutions have been created supporting such developments and have played a key role in economic growth. The protection of infant industries, the definition of trade and intellectual property regimes, the distribution of rents, and the coherence with macroeconomic policies are key elements of such policies. The current challenges of industrial and innovation policies are discussed in the light of recent experiences in emerging countries.

The evolution of industries

A fundamental element in countries that successfully caught up with the leaders during the 19th and 20th centuries was active government support of the catch-up process, involving various forms of protection and direct and indirect subsidy. The guiding policy argument has been the need for some protection of domestic industry from advanced firms in the leading nations in those industries judged at the time to be critical in the development process. Hamilton's argument for infant industry protection in the new United States was virtually identical to that put forth half a century later by List regarding Germany's needs.¹ Gershenkron's famous 1962 essay documented the policies and new institutions used in Continental Europe to enable catch-up with Britain.² The same story also fits well with the case of Japan, and of Korea and Taiwan somewhat later. In many countries, these policies engendered not a successful catch-up but rather the protection of an inefficient home industry. However, they also were the hallmark during the 20th century of all the countries

that have now achieved their goals of catching up.³ We need to learn more about the circumstances under which infant industry protection leads to a strong indigenous industry and the conditions under which it is self-defeating.

These policies obviously angered companies in the leading countries (and their governments), particularly if the supported industry not only supplied its home market but began to encroach onto world markets. The case made for free trade after World War II was mostly concerned with eliminating import protection and subsidies among the rich countries, and at that time there was sympathy for the argument that some infant industry protection was often useful in developing countries. More recent international treaties, however, have increasingly been used to prevent the use of import protection and subsidies in countries seeking to catch up from far behind. Our belief is that Hamilton and List were and continue to be right that successful catch-up in industries where international trade is considerable requires some kind of infant industry protection or other modes of support.

Table 1 summarises an exploratory taxonomy of policy interventions, measures and related institutions. Policies and other activities of "institutional engineering" affect (i) the technological capabilities of individual and corporate organisations, and the rate at which they actually learn; (ii) the economic signals that they face (including of course profitability signals and perceived opportunity costs); (iii) the ways they interact with each other and with non-market institutions (e.g. public agencies, development banks, training and research entities).

All major developed countries engage in relatively high degrees of intervention – whether consciously conceived as industrial policies or not – that affect all the above variables. This applies even more so to the period when today's developed countries were catching up with the international leaders. What primarily differentiate the various countries are the instruments, the institutional arrangements and the philosophy of intervention.

* This paper draws upon M. Cimoli, G. Dosi, J.E. Stiglitz (eds.): *Industrial policy and development. The Political Economy of Capabilities Accumulation*, Oxford 2009, Oxford University Press, and on successive joint work by the authors. The research leading to this work has enjoyed the long-term backing of the Initiative for Policy Dialogue, Columbia University.

1 A. Hamilton: Report on the Subject of Manufactures, 1791, in: H.C. Syrett (ed.): *The Papers of Alexander Hamilton*, Vol. X, New York 1966, Columbia University Press; F. List: *The National System of Political Economy*, London 1841, Longmans, Green and Co.

2 A. Gershenkron: *Economic Backwardness in Historical Perspective*, Cambridge 1962, Harvard University Press.

3 For a broad historical overview of the role of policies in some now-developed countries, see E.S. Reinert: *How Rich nations got Rich. Essays in the History of Economic Policy*, Working paper No. 1, Centre for Development and the Environment, University of Oslo, 2004.

Table 1
Processes and institutions for policies on technological learning and industrial change

Domains of policy intervention	Policy measures	Related institutions
(i) Opportunities of scientific and technological innovation	Science policies, graduate education, “frontier” technological projects	Research universities, public research centres, medical institutes, space and military agencies, etc.
(ii) Socially distributed learning and technological capabilities	Broader education and training policies	From primary education to polytechnics to US-style “land-grant colleges”, etc.
(iii) Targeted industrial support measures affecting e.g. types of firms – <i>in primis</i> the structure, ownership and modes of governance of business firms (e.g. domestic vs. foreign, family vs. publicly owned companies)	From the formation of state-owned firms to their privatisation, from “national champions” policies to policies affecting multinational corporations’ (MNCs) investments, all the way to the legislation affecting corporate governance	State-owned holdings, public merchant banks, public “venture capitalists”, public utilities
(iv) The capabilities of economic agents (especially business firms) in terms of the technological knowledge they embody, the effectiveness and speed with which they search for new technological and organisational advances, etc.	Cf. especially points (ii), (iii) and R&D policies; policies affecting the adoption of new equipment, etc.	
(v) The economic signals and incentives profit-motivated agents face (including actual and expected prices and profit rates, appropriability conditions for innovations, entry barriers, etc.)	Price regulations; tariffs and quotas in international trade; intellectual property rights (IPR) regimes, etc.	Related regulatory agencies, agencies governing research and production subsidies, trade-controlling entities, agencies granting and controlling IPRs
(vi) Selection mechanisms (overlapping with the above)	Policies and legislation affecting anti-trust and competition, entry and bankruptcy, allocation of finance, markets for corporate ownership, etc.	Anti-trust authorities, institutions governing bankruptcy procedures, etc.
(vii) Patterns of distribution of information and of interaction amongst different types of agents, e.g. customers, suppliers, banks, shareholders, managers, workers	Governance of labour markets, product markets, bank-industry relationships, etc., all the way to collectively shared arrangements for intra-firm information-sharing mobility and control, forms of cooperation and competition amongst rival firms, etc. (cf. for example the historical differences between Japanese and Anglo-Saxon firms)	

Source: Authors’ elaboration.

The case of Japan is a paradigmatic example of catching-up policies.⁴ Interestingly, Japan appears to have acted comprehensively on all of the variables categorised in our taxonomy above. Strong discretionary intervention into the structure of signals (also involving formal and informal protection against imports and foreign investments) recreated the “vacuum environment” that is generally enjoyed only by technological leaders. However, this was matched by a pattern of fierce oligopolistic rivalry among Japanese companies and a strong export orientation, which fostered technological dynamism and prevented any exploitation of protection simply in terms of collusive monopolistic pricing.

It is tempting to evaluate this Japanese experience – notwithstanding recent, mostly macroeconomic difficulties – against others that have been on average less successful,

such as the European ones, which heavily relied upon one single instrument, namely financial transfers (especially R&D subsidies and transfers on capital account), leaving to the endogenous working of the international market both the determination of the patterns of signals and the response capabilities of individual firms. Certainly, there are country-specific features of the Japanese example which are hardly transferable. However, that case, in its striking outcome, points at a general possibility of reshaping the patterns of “comparative advantages” as they emerge from the endogenous evolution of the international markets.

The historical experience shows a great variety of country- and sector-specific combinations of the types of policies illustrated above. Some subtle commonalities nonetheless emerge.

The first common characteristic is the centrality of public agencies, such as universities, and public policies to the

⁴ G. Dosi: Technical Change and Industrial Transformation, London, Macmillan and New York 1984, St. Martin Press.

generation and establishment of new technological paradigms. This has been the case since the 19th century.

Second, and relatedly, incentives are often not enough. A crucial role of industrial and innovation policies is to expand the capabilities of actors, especially in the case of new technological paradigms, but also in all cases of catching up in which no reasonable incentive structure might be sufficient to motivate private actors to surmount big technological lags.

Third, market discipline is helpful in so far as it weeds out the poor performers and rewards the high performers within particular populations of firms. However, nothing guarantees that powerful selective shocks will not wipe out the entire populations, thus also eliminating any future learning possibility.

Fourth, policies – especially those aimed at catching up – generally face the need to balance measures aimed at capability building (and at protecting the “infant learner”) with mechanisms to curb inertia and rent-seeking. For example, the latter are one of the major elements missing from the old Latin American experience of import substitution, while the former are lacking under many of the more recent “liberalisation” policies.

Fifth, a successful catching-up effort in terms of per capita income and wages has always been accompanied by catching up in the new and most dynamic technological paradigms, irrespective of the initial patterns of comparative advantages, specialisation and market-generated signals. Our conjecture is that, *ceteris paribus*, the structural need in a particular country for policies that also affect the patterns of economic signals (including relative prices and relative profitability) as they emerge from the international market will be greater, the larger the distance of the country from the technological frontier. This is what Amsden provocatively called policies of deliberately “getting the prices wrong”.⁵ Conversely, endogenous market mechanisms tend to behave in a “virtuous” manner for those countries that happen to be on the frontier, especially in the newest and most promising technologies. This is broadly confirmed by historical experience: unconditional free trade often happened to be advocated and fully exploited only by the technologically and politically leading countries.

Such lessons from the past are useful in so far as they also apply to the future. Today, policy making ought to be acutely aware of the fact that future capabilities build upon, refine and modify incumbent ones: hence the policy

5 A. Amsden: *Asia Next Giant*, 1989, Cornell University Press.

goal of building *good path dependencies*.⁶ We now present several feasible policies that go in this direction.

The necessity of nurturing infant industries

Safeguarding the possibility of learning is indeed the first basic pillar of the infant industry logic.

On the incentive side, market signals left to themselves are often not enough and indeed frequently *discourage* the accumulation of technological capabilities in so far as they ought to occur in activities currently displaying significant comparative *disadvantages* and thus also unfavourable current profitability. Incidentally, note that financial markets are inadequate instruments for translating a future and uncertain potential for learning into current investment decisions.⁷ Thus, there are sound learning-related reasons for why historical evidence shows that, just prior to industrial catching up, average industrial import tariffs are relatively low; they rise rapidly in the catching-up phase, and they fall after a mature industrialisation. Indeed, it is during the catching-up phase that the necessity of distorting (international) market signals is more acute, precisely because of the young and still relatively fragile learning infant industries. This has partly to do with the fact that many forms of protection entail the possibility of learning but not, in the language of Khan and Blankenburg, the “compulsion” to innovate, as distinct from the sheer incentive to just exploit a monopoly rent, no matter how inefficient and lazy the potential “learner” is (more on this below).⁸ Partly, it has to do with the *conditions of capabilities accumulation and the characteristics of the actors involved*.

After all, even under the best intentions and incentives, industrialisation might have rather little to do with the sheer award of property rights and with the establishment of firms as legal entities.⁹ Of course, the legal context does matter and is likely to be a conducive condition. However, this is far from sufficient. In fact, it is quite misleading to think that all over the world there are plenty of sources of technological knowledge just waiting to be exploited,

6 See also R. Hausmann, D. Rodrick: *Doomed to Choose: Industrial Policy as Predicament*, CID Working Paper, Harvard University, 2006.

7 See J.E. Stiglitz: *Whither Socialism?*, Cambridge, MA 1994, The MIT Press; J.E. Stiglitz, B.C. Greenwald: *Creating a Learning Society: A New Approach to Growth, Development, and Social Progress*, New York 2014, Columbia University Press.

8 M.H. Khan, S. Blankenburg: *The Political Economy of Industrial Policy in Asia and Latin America*, in: M. Cimoli, G. Dosi, J.E. Stiglitz, op. cit.

9 See M. Hobday, F. Perini: *Latecomer Entrepreneurship: A Policy Perspective*, in: M. Cimoli, G. Dosi, J.E. Stiglitz, op. cit.

with the lag due mainly to institutional and incentive-related forces. In fact, irrespective of the opportunities for the entrepreneurial exploitation of technological knowledge that are *notionally* offered by the “international knowledge frontier”, the fundamental gap exists precisely because of a lack of capabilities in exploring and exploiting them. This is a crucial bottleneck for development. “Horizontal” policies of education and training, together with technical support to firms by public institutions, can go a long way in the capability-enhancing direction. But even that is not likely to be enough. Fostering the emergence and occasionally explicitly building technologically and organisationally competent firms are indeed fundamental infant-nurturing tasks.

Needless to say, the absence/existence of mature technological capabilities and “dynamic capabilities” for changing them in any one country is not a binary variable.¹⁰ However, the distribution is highly uneven. Several dozen countries hardly show any of these capabilities, while others display a few technologically progressive organisations in a bigger sea of less dynamic firms. In fact, even in the most developed countries, only a fraction of the population of firms can be considered technologically dynamic organisations. (Note that this applies to both high-tech and low-tech sectors as conventionally defined). In a sense, industrialisation has to do with the properties of changing distributions between “progressive” and “backward” firms. How do policies affect this process? Dahlman reports on China and India, but his findings apply well beyond these two country cases.¹¹ Policies involved the following aspects:

- state ownership
- selective credit allocation
- favourable tax treatment to selective industries
- restrictions on foreign investment
- local context requirements
- special IPR regimes
- government procurement
- promotion of large domestic firms.

In a nutshell, this is the full list of the capital sins which the market faithful are supposed to avoid!

Here again is a widespread misunderstanding to be dispelled, which goes under the heading of “picking the winner” or “national champion” fallacies. Why should

governments foster national oligopolists or monopolists in the first place? And how could governments be more “competent” than the market in selecting which firms are technologically better?

There certainly are unintentional or even counterintentional outcomes of discretionary industrial policies. Of course, pro-market advocates typically quote the failures of the computer support programmes among OECD countries and the Concorde project in Europe as archetypes of such “government failures” to be put down on the table against “market failures”. Economists more sympathetic to the positive role of the public visible hand, including us, would find it easy to offer the cases of Airbus and ST Microelectronics in Europe or Petrobras and Embraer in Brazil, among many others, as good counterexamples.¹² However, our point goes well beyond this. The “picking the winner” idea basically builds on the unwarranted myth that there are many “competitors out there” in the market, and the government has the arrogance of knowing better than the market in selecting which competitor to support. This is often far from reality in developed countries and is even more unrealistic in catching-up ones. In fact, the major vehicles of learning and catching up in all episodes of successful industrialisation, with the possible exception of little Singapore, have been *domestic* firms – sometimes alone and sometimes in joint ventures with foreign MNCs – and only rarely MNCs themselves. This holds true from German and American industrialisation all the way to China currently – possibly the case nearest to a two-pronged strategy of fostering the development of domestic firms and trying to squeeze out of foreign MNCs as much technological knowledge as possible.

“Infant-nurturing” measures have been a major ingredient of development policies throughout the history of industrialisation. Historically, the infant learners had to be shielded or helped in the domestic and international markets essentially in their interactions with the more efficient and more innovative firms from “frontier” countries. This happens to a large extent also today. However, China’s industrial policies have given it an absolute cost advantage in an expanding set of goods, including those which were/are central to industrial production in many low and middle income countries.¹³ In that respect, the magnitude and the speed of Chinese industrialisation risk exerting a sort of crowding out effect vis-à-vis the industrialising po-

10 See D. Teece, G. Pisano, A. Shuen: Dynamic Capabilities and Strategic Management, in: Strategic Management Journal, Vol. 18, No. 7, 1997, pp. 509-533.

11 C.J. Dahlman: Growth and Development in China and India: The Role of Industrial Innovation Policy in Rapid Catch-Up, in: M. Cimoli, G. Dosi, J.E. Stiglitz, op. cit.

12 See M. Pianta: An industrial policy for Europe, in: Seoul Journal of Economics, Vol. 27, No. 3, 2014.

13 China quickly reduces its absolute disadvantages across the board, in both more traditional productions and in activities based on the newest technological paradigms, at rates higher than its catching-up in wages (notwithstanding the fast growth of the latter).

tential of many other countries. So, for example, Brazil – a country on the upper tail of the distribution of industrialisers in terms of technological capabilities – turns out to be a very “high wage” country compared to China, but so are other less developed Latin America countries. Even African countries are losing cost-based international (and domestic) competitiveness vis-à-vis China.

In the interactions between infant learners and more mature firms, there is no reason to give up the infant-nurturing philosophy. On the contrary, they provide all the more reason to pursue the “capital policy sins” mentioned above. Moreover, they ought to serve as an impetus for the more explicit use of domestic or regional markets as venues for the cultivation of an emerging national industry even when the latter tends to be squeezed on the international arena between “advanced productions” and Chinese exports.

Infant industries under the new international trade regime

A central novelty in the current organisation of international economic relations is the regulatory regime stemming from the World Trade Organization (WTO) and the agreements on Trade-Related Aspects of Intellectual Property Rights (TRIPS). This historically unprecedented regime implies a significant reduction in the degrees of freedom developing countries can enjoy in their trade policies, in contrast to the catching-up countries in the preceding waves of industrialisation, which could exploit a large menu of quotas, tariffs and other forms of barriers. The TRIPS agreements have led to stronger constraints on what is admissible in terms of subsidies and other discretionary forms of support to firms and industries. This state of affairs has made it more difficult for new players – new firms, new sectors, new emerging economies – to enter existing industries. What can be done?

Actually, quite a few things can be done within the incumbent agreements, full as they are of loopholes and provisions for exceptions, generally put there by the negotiators from developed countries with an eye on their special interests – ranging from dubiously defined “anti-dumping measures” to national safety and security considerations. Developed countries have been quick to exploit these provisions, while developing countries have rarely done so, overwhelmed by the combined powers of money, political clout, legal sophistication and the potential for blackmail by stronger states. At least equally common thus far has been the unawareness of these opportunities for pragmatic management, certainly worsened – we caricature on purpose – by Chicago-trained economic minis-

ters who truly believe that all of their country’s problems stem from the fact that trade liberalisation has not gone far enough, and by directors-general of the ministries of trade who were taught that the Heckscher-Ohlin-Samuelson theorem on gains from trade is the last word on the subject. In this respect, we believe that if catching-up countries could display the same amount of pragmatism (someone would say cynicism) currently practised by e.g. US representatives at the WTO, many degrees of freedom could be regained even under current rules. There are other actions which would also help, such as avoiding “bilateral” agreements at all costs.

In brief, “bilateral” agreements are WTO-plus – and in terms of intellectual property rights, “TRIPS-plus” – agreements whose ultimate aim is to close the loopholes, exceptions and safeguard clauses of the original WTO and TRIPS agreements, freezing them in favour of companies and industries from the developed world. A bilateral agreement might offer “preferred country clauses” to a developing country, typically concerning textile exports and the like. However, such an agreement has minimal benefit to the developing country, since Chinese exports are still more competitive globally even if all tariffs on the developing country’s exports are removed. On the other side, the provisions of the bilateral agreement often involve the unconditional acceptance of the IPR regime imposed by the developed partner and curbs on imports from third countries of commodities produced under the various waivers still permitted under the WTO. While there are significant and still largely unexploited degrees of freedom unintentionally provided by the current international trade institutions and rules, the straightjacket is likely to remain tight. As Dahlman remarks, if China and India

had liberalised from the beginning it is unlikely that they would be the strong economic powers that they have become. To a large extent, some of the strengths of both countries are that they developed strong capabilities before they liberalized.¹⁴

The point also applies, of course, to countries which are just beginning their processes of capability accumulation. But then the conclusion is that some trade renegotiation is going to be necessary. It is reasonable, for example, to switch to a regime in which the object of multilateral agreement is *average* industrial tariffs, as opposed to tariffs that are line-by-line or that apply to specific products and sectors.

¹⁴ C.J. Dahlman, op. cit., p. 320.

Such a system is simpler than the current structure of tariff commitments and would also reconcile multilateral discipline with policy flexibility, since countries would be subject to an overall average ceiling while maintaining degrees of freedom for discretionary sectoral strategies. In practice, it would have the effect of balancing tariff increases and reductions, since a country would need to lower its practiced tariffs on some products in order to be able to raise them on others. This would encourage governments to view tariffs as temporary instruments and focus their efforts on ensuring that they effectively serve the purpose they are designed for, namely to provide breathing space for infant industries before they mature and catch up with their counterparts in more advanced countries. Moreover, the average ceiling itself ought to depend on a country's level of technological and economic development, rising as the catching-up process is put in motion and falling as industrialisation becomes mature.

Management of the distribution of rents favourable to learning and industrialisation

The other side of infant-nurturing policies regards the rent distribution profile that they entail. We have already emphasised that allowing, say, the use of a temporary trade barrier as an opportunity to learn and mature does not imply per se the incentive to do so, and may instead be used to simply exploit the rents stemming from the protection. As outlined by Khan and Blankenburg, successful industrialisation policies have all come with rent management strategies that provide *compulsions* for learning and for the accumulation of both technological capabilities and production capacity.¹⁵ There are three sides to such strategies.

First, on the “carrot” side, policies must be able to transfer resources to the “progressive actors”: fiscal policies, subsidies, preferential credits and grants are among the possible means. In fact, fiscal policies are particularly important in the transfer of resources from those activities which benefit from (cyclical or, even more so, trend) improvements in the terms of trade of natural resources – in the form of export levies, royalties indexed on the final price of the commodities, and fines and taxes discouraging environmental damage. Moreover, the construction of industrialisation-friendly financial institutions is of paramount importance. The absence of “industry-friendly” intermediation of finance is a major bottleneck for both learning and investment – as witnessed by most Latin American countries in recent decades.

¹⁵ M.H. Khan, S. Blankenburg, op. cit.

Second, on the “stick” side, governments must have the credibility to commit to developmental rents for periods that are sufficiently long, but not too long (which depends on the sectors; the nature of the technologies; the distance from the international frontier; and the initial capabilities of managers, technicians, workers, etc.). Here, the critical requirement is the credible commitment to stop all rent-yielding measures after some time and to impose sanctions on firms and industries failing to achieve technological investment or export targets.

Third, the nurturing of domestic oligopolists has to be matched by measures fostering competition. There is a general lesson from the experiences of Korea and Japan, where quasi-monopolistic or oligopolistic domestic firms were forced, quite early on, to compete fiercely in international markets. And above some threshold of industrial development, anti-trust policies are an important deterrent against the lazy exploitation of “infant protection”. Indeed, the management of rent distribution in its relation with industrial learning is one of the most difficult and most crucial tasks of any industrialisation strategy, as it concerns the overall distribution of income, wealth and political power across economic and social groups.

Tight IPR regimes never help industrialisation – and sometimes harm it

All catching-up countries – including the United States and Germany long ago – have done so through a lot of imitation, reverse engineering and straightforward copying. But these activities are precisely what strong property right protection is meant to prevent. How effective IPRs are in achieving this objective depends a lot on the technologies and the sectors, but certainly when they are effective, they are likely to represent an obstacle to domestic technological learning. Conversely, even if IPR protection serves as an incentive to innovate in frontier countries – a claim which is indeed quite controversial and not supported by particularly robust evidence¹⁶ – there is no evidence that it has any positive effect in spurring innovative activities in catching-up countries. Certainly, successful industrialisers at some point start innovating and also patenting, but typically – a century ago as well as today – they fill their patent claim in frontier countries where their strongest competitors are likely to be based. At the same time, the domestic IPR regime has been characteristically

¹⁶ For a discussion see G. Dosi, L. Marengo, C. Pasquali: How much should society fuel the greed of innovators? On the Relations Between Appropriability, Opportunities and Rates of Innovation, in: Research Policy, Vol. 35, No. 8, 2006, pp. 1110-1121.

weak. The situation, however, has recently changed with the TRIPS agreements, which have basically extended the tightest IPR rules of developed countries to all of the signing countries, including developing ones, and has been made even worse by the already mentioned bilateral agreements. Further, TRIPS has eliminated the possibility of differentiating the regime of protection across products and technologies.

What can catching-up countries do? First, they must be aware and never buy the story that “IPRs are good for development because they are good for innovation”. On the contrary, in many technological areas, they are largely irrelevant for both innovation and technological catching-up. In other areas, particularly pharmaceuticals, they are definitely harmful for imitation and capability-building in catching-up countries. An additional consequence of such awareness is the need for greater efforts to build institutional capabilities and for a clear technology acquisition strategy to orient negotiations and dispute settlements.

Second, and relatedly, the TRIPS agreements contain a series of loopholes, safeguard clauses and exceptional provisions – for example concerning compulsory licensing – which catching-up countries must still learn how to exploit.

Third, the most advanced of the catching-up countries ought to strive to offer the less developed ones appealing regional agreements which could be viable alternatives to the bilateral agreements with the US and EU that generally contain even stricter IPR provisions than TRIPS.

Last but not least, there is a need for a new wave of multilateral negotiations which aim at:

- reducing the breadth and width of IPR coverage
- expanding the domain of *unpatentability*, from scientific knowledge to algorithms to data
- conditioning the degrees of IPR protection on the relative level of economic and technological development of each country.

After all, the current international IPR regime is largely a response to the special appropriability interest of a small sub-set of developed countries’ firms – basically Big Pharma and biotech, Microsoft and Hollywood. A reform in the manner indicated here would benefit not just catching-up countries but also first world consumers, without doing any harm to the overall rate of innovation.

The necessary consistency between macro-economic and industrial policies

As extensively discussed in Cimoli, Dosi and Stiglitz, there are macroeconomic policies which can kill most learning efforts along with the related learning capabilities.¹⁷ The sudden and indiscriminate dismantling of trade barriers can easily do this, especially when combined with the reckless (non-) management of exchange rates, characterised by vicious cycles of appreciation followed by sudden devaluations. Such cycles have only been amplified by the stubborn refusal to utilise controls over capital movements, especially short-term movements.

Blind trust in the “magic of the marketplace” and the associated lack of fiscal policies and demand management increases output volatility. In turn, this volatility, together with the endemic financial fragility of many developing countries’ firms, induces waves of corporate mortality and the resultant disappearance of the capabilities of technological accumulation. Even among surviving firms, behaviours tend to become more short-term and the economy tends to respond more to financial signals than to long-term learning opportunities.¹⁸ A comparison of the vicious feedback loops between macro policy shocks prescribed by orthodox recipes and micro dynamics (e.g. in Latin America) versus the virtuous feedback loops between more interventionist and “Keynesian” macro policies and the continuing industrial expansion even under severe financial crises (e.g. in Korea) demonstrate the importance of getting industrial and innovation policy right.

¹⁷ M. Cimoli, G. Dosi, J.E. Stiglitz, op. cit.

¹⁸ See also J.A. Ocampo, L. Taylor: Trade liberalization in developing economies: modest benefits but problems with productivity growth, macro prices, and income distribution, in: *The Economic Journal*, Vol. 108, No. 450, 1998, pp. 1523-1546; and J.E. Stiglitz, J.A. Ocampo, S. Spiegel, R. French-davis, D. Nayyar: *Stability with Growth. Macroeconomics, liberalization and development*, New York 2006, Oxford University Press.

Michael A. Landesmann

Industrial Policy: Its Role in the European Economy

This article discusses the arguments underlying the use of industrial policy in advanced and less advanced economies. It reviews both arguments in favour and against the use of industrial policy in different economic and politico-economic contexts, and it explores the advantages and disadvantages of the different types of industrial policies.

There is a lively debate on these issues in the current context of the European economy, where major problems have been recognised over the past decades, particularly since the onset of the financial and economic crisis in 2008. Amongst these problems, we single out two in particular. First, the rather slow overall growth trajectory of the European economy, and particularly its productivity growth performance, in relation to the US economy since the early 1990s. Linked to that is the concern that Europe has not been at the forefront of the main innovative technological trajectories, e.g. in information technology and bio-engineering, and shows little sign that this is going to change. Second, there is a fear that the EU has stopped delivering on its promise of convergence, i.e. that lower-income economies and regions would follow a sustained catching-up process towards the higher incomes and productivity levels of the more advanced European economies. There is a recognition of the fact that the European economy shows severe imbalances, which are revealed as sustained external account deficits in a range of lower- and medium-income economies and which can be traced to severe long-term weaknesses in exporting capacity in these economies. This in turn reflects strong agglomeration features of industrial activity in Europe.¹

Both these considerations lie behind the renewed interest in industrial policy and the need to avoid some of the pitfalls that characterised earlier versions of such policies.

Review of the debate on industrial policy

Industrial policy had fallen into disrepute since the 1980s mainly on the basis of two arguments. First, why should governments have more information about the direction in which structural change should be encouraged than the actors in the private sector? Second, if policy measures were used to differentially benefit particular industries or

types of enterprises, such policy measures would be subject to lobbying efforts and rent-seeking behaviour (in the worst case, shared by both policy makers and the groups which benefit from the measures), and hence – even if the proper allocation of such funds were known – they would be wrongly allocated and not benefit the aims of industrial policy.

Industrial policies were thus largely pushed aside in the policy debate, even though in practice the traditional tools of industrial policy remained in widespread use (such as subsidies or tax exemptions of various types, concessional credit, privileged access to public tenders, and infrastructural support, including training and R&D facilities benefiting particular groups of firms/industries or regions).

More recently, there has been a revival of the role industrial policies can play, partly driven by concerns about the impact of the international financial and economic crisis, partly in response to the structural adjustment processes resulting from the impact of fast international economic integration (globalisation), and partly from the insights gained from the development literature on successes and failures of various forms of government interventions and business-government relationships observed in the developing world.

In this context, Rodrik states that the issue is no longer the *whether* of industrial policy but rather the *how*, i.e. whether one can “design institutions that take into account the informational and political problems which have preoccupied industrial policy skeptics”.² Hence, there is general agreement that in any assessment of industrial policy, explicit attention has to be paid to government failures, the capture of government policy by special interest groups, and the efficiency and quality with which government agencies operate.

Definitions of industrial policy

Let us start with definitions of industrial policy, narrowing the very wide range provided in the literature to those definitions which we find suitable for this particular paper.³

¹ For more details on this, see M. Landesmann: The North-South Divide in Europe: Can the European Convergence Model be Resuscitated?, in: J. Fagerberg (ed.): The Challenge for Europe in a New Age, Oxford, forthcoming, Oxford University Press; and M. Landesmann: Structural Dynamics of Europe's Periphery – Which are the Main Issues, in: Journal of Economic Policy Reform, forthcoming.

² D. Rodrik: Normalizing Industrial Policy, Commission on Growth and Development, Working Paper No. 3, Cambridge and Washington 2008, p. 2.

³ See e.g. K. Warwick: Beyond Industrial Policy. Emerging issues and new trends, OECD Science, Technology and Industry Policy Papers, No. 2, OECD Publishing, 2012.

Aghion defines industrial policy as “adequately targeted” if it “targets a particular market failure (such as knowledge externalities or financial market imperfections)”.⁴ Pack and Saggi consider industrial policy as

basically any type of selective intervention or government policy that attempts to alter the structure of production toward sectors that are expected to offer better prospects for economic growth than would occur in the absence of such intervention.⁵

A similar definition by Crafts considers the objective to change the distribution of resources across economic sectors as the defining element of industrial policy.⁶ Warwick widens the Pack and Saggi definition somewhat in the following way:

Industrial policy is any type of intervention or government policy that attempts to improve the business environment or to alter the structure of economic activity toward sectors, technologies or tasks that are expected to offer better prospects for economic growth or societal welfare than would occur in the absence of such intervention, i.e. in the market equilibrium.⁷

The above definitions emphasise the impact of industrial policies on the economic structure. The Treaty on the Functioning of the European Union (TFEU) also links industrial policy to competitiveness. According to Article 173 TFEU, the objective of the EU’s industrial policy is to provide the appropriate conditions for making EU industry internationally competitive. This objective recognises that businesses themselves are ultimately responsible for their success or failure in the global market, but industrial policy can support – but potentially also impede – firms or whole industries in gaining international competitiveness. These broad definitions do not confine industrial policies to manufacturing. In fact, many recent contributions in the literature on industrial policy stress that effective measures should encompass the entire value chain and the whole spectrum of the economy.

Another well-known argument is the public goods argument in favour of providing infrastructure (transport, communications, standards, etc.) which would be insufficient-

ly provided by private suppliers and could be welfare diminishing, as it could lead to the exclusion of users. There is also the coordination failure argument, which refers to situations when a development effort would require the mobilisation of a significant set of complementary inputs (some of them of a governance type) which the spontaneous decision-making in the market could generally not provide, especially in the presence of significant “indivisibilities” of such inputs. In such circumstances, the state (at national, regional or cross-national levels) has to provide a “push” in the direction of such coordinated efforts.⁸

Linked with this is the influence that industrial policy can exert on the path-dependent process of innovation and the diffusion of technology.⁹ This has become particularly prominent in the debate about climate change and how to counteract it with the development of “green technology”. The role played by the US Advanced Research Projects Agency, e.g. in the development of the internet, is famous in this respect. Pisano and Shih emphasise the importance of the long-term commitment that public involvement in the development of such technological trajectories has to show – acting as a coordinating and supporting agent to encourage networking activities amongst firms, research institutions and universities.¹⁰ Also, the support provided through public procurement policy is important here, as it is in areas in which the military sector is directly and indirectly involved.¹¹

In this context, Rodrik emphasises that innovation and technology absorption takes place within a framework which shapes the direction of technological developments (in advanced and developing countries) and extends the analysis to consider the role which industrial policy can play in influencing a country’s or region’s pattern of industrial specialisation.¹²

4 P. Aghion: Growth Policy and the State: Implications for the Design of a European Growth Package, LSE Growth Commission, 10 June 2012, footnote 2.

5 H. Pack, K. Saggi: Is There a Case for Industrial Policy? A Critical Survey, in: World Bank Research Observer, Vol. 21, No. 2, 2006, pp. 267-297.

6 N. Crafts: Overview and Policy Implications, in: Learning from some of Britain’s successful sectors: An historical analysis of the role of government, BIS Economics Papers No. 6, March 2010, pp. 1-17.

7 K. Warwick, op. cit., p. 12.

8 See the “big push” theories of economic development started by P. Rosenstein-Rodan: Problems of Industrialization of Eastern and Southeastern Europe, in: Economic Journal, Vol. 53, No. 210-211, June-September 1943, pp. 202-211; and more recently elaborated by K. Murphy, A. Shleifer, R. Vishny: Industrialization and the Big Push, in: Journal of Political Economy, Vol. 97, No. 5, October 1989, pp. 1003-1026.

9 See P. Aghion, D. Acemoglu, L. Bursztyn, D. Hémous: The environment and directed technical change, Working Paper 2010.93, Fondazione Eni Enrico Mattei; and P. Aghion, A. Dechezlepretre, D. Hémous, R. Martin, J. Van Reenen: Testing for Path Dependence in Clean versus Dirty Innovation: Evidence from the Automotive Industry, unpublished manuscript, 2010.

10 P.S. Pisano, W.C. Shih: Restoring American Competitiveness, in: Harvard Business Review, Vol. 87, 2009, pp. 114-125.

11 See e.g. R. Pollin, D. Baker: Public Investment, Industrial Policy and US Economic Revival, Joint CEPR-PERI Working Paper 211, London and Washington 2009.

12 D. Rodrik, op. cit.

The role of influencing and strategically planning a country's (or region's) position in an international setting has gained further importance in an age in which value chains are growing more fragmented and there are increasing options for countries and regions to plug themselves into international and regional production networks. Publicly provided "specific inputs" (see below) are therefore not only relevant at the industry level, but their role is also to support the local production of particular "fragments" in international production activity.

Industrial policy and other policies

What about relationships between industrial policy and other policies? We shall discuss three such policies: competition policy, provision of public goods, and trade and foreign direct investment (FDI) policy.

Competition policy

Aghion et al. argue that since industrial policy targets sectors rather than particular firms, it can be quite compatible – in fact complementary – to competition policy.¹³ Industrial policy could/should encourage the entry of new firms, especially in high innovation industries, but also in older industries where "churning" (i.e. the exit of existing firms and entry of new firms) is required. Industrial policy could be explicitly directed towards reducing structural entry barriers and the advantages of incumbent firms.

An additional argument for the potential complementarity between industrial policy and competition policy is that the latter provides a framework for "proper governance" of industrial policies. A strong and independent competition authority with clear and transparent rules governing its decision-making can be an important complementary agency for strong, forward-looking industrial policy measures. In this context, it is interesting to point out that the institutional design of the EU puts it into a particularly favourable position in this respect, as competition policy has been delegated to the EU level, and hence it is somewhat removed from capture by the national lobbying efforts of incumbent firms. There is of course a conflict zone between a very high degree of competition (contestability) in markets and the willingness for firms to commit large *ex ante* investments into developing new products or new types of technologies, branching out into new areas of international specialisation, etc. This conflict zone will have to be explicitly addressed in the interaction between competition authorities and agencies responsible for industrial policy, but it is this interaction which has a

¹³ P. Aghion, J. Boulanger, E. Cohen: Rethinking Industrial Policy, Bruegel Policy Brief, Issue 2011/04, Brussels 2011.

chance to push the pattern of industrial policy in a direction that facilitates a forward-looking form of industrial policy. The rules of conflict resolution could specify the activities to be supported, for example, those with long lead times in product or technology development, those that embark on new areas of product or technology development, those that support new entrants as against cementing the market positions of incumbents, those that support new patterns of specialisation with potentially high returns in terms of future learning and technology spillovers, etc.

Provision of public goods

Hausmann and Rodrik see the provision of "public inputs" as a core element of industrial policy.¹⁴ They also emphasise that public inputs tend to be highly specific to the activity in question. They point out that industrial policy is there to support new activities and change the pattern of specialisation, to provide "specific inputs" conducive to supporting these new activities, or to push the economy towards an evolving new pattern of specialisation rather than allowing the economy to become entrenched in an existing pattern. Older activities have an incumbent's advantage over new activities because of sunk costs and established lobbying powers, and hence a forward-looking industrial policy maker is perfectly entitled to positively discriminate in favour of these new activities. Difficult political economy problems have to be faced to overcome the advantages of incumbents – apart from sheer lobbying advantages, they may also point to a better "track record" compared to the new activities, which do not have the sunk cost advantage and are also not as far along on the learning curve. Hence, the analytically correct assessment of performance measures should be forward-looking, i.e. comparing present values of future flows of social returns likely to emerge from alternative decisions about public support. In practice, such measures will not be easy (countering the arguments of incumbents in favour of "proven track records" and lower risk), but they nonetheless have to be attempted to break the asymmetric advantages of incumbent firms and activities.

Trade and FDI policy

There is no doubt that trade policy played an important role in economies' catching-up episodes,¹⁵ be it through

¹⁴ R. Hausmann, D. Rodrik: Doomed to Choose: Industrial Policy as Predicament, mimeo September 2006.

¹⁵ See e.g. A. Amsden: Asia's Next Giant: South Korea and Late Industrialisation; Oxford University Press, Oxford 1989; H.-J. Chang: Kicking away the ladder: development strategy in historical perspective, Anthem Press, London 2002.

direct import restrictions (tariffs, quotas, various types of non-tariff barriers), through preferential treatment of domestic producers in the domestic market (e.g. public procurement policies) or through export supports of various types (export credits, various supports to access foreign markets, FDI supports such as export-processing zones, etc.). While certain realms of trade (and FDI) policy have been restricted through various types of trade policy agreements (of a bilateral or multilateral type), other areas remain of great importance.

Developments over recent decades have been two-sided. On the one hand, there has been a strong increase in various forms of international integration: there has been an increase in the range of activities which have become tradable, particularly various types of services activities; a new dimension of international integration has evolved through the splitting up of the value chain, which has led to the specialisation and integration of tasks in production processes across borders; and there has been a substantial increase in the international mobility of high-skilled professionals. On the other hand, there has also been more pressure to move towards a more liberalised trade policy regime. These two tendencies of course have conditioned each other: increased liberalisation has led to more integration, and the increased openness of economies has meant an increase in vulnerability with regard to detrimental outbreaks of trade policy conflicts and thus a need to move towards policy coordination and policy arbitrage.

The upshot is that commonly used trade policy instruments have changed from the direct use of import-restricting policies (often based on the “infant industry” argument) to other instruments (e.g. non-tariff barriers, financing instruments, public supports in market access, and indirect instruments strengthening export activities such as R&D and training supports, export processing zones, etc.). Analysis and policy positions have also changed in the direction of a dynamic perception of a country’s position in the international division of labour, i.e. of the place which a country’s producers occupy in international production structures, be it at the level of industries or tasks/fragments in international production chains. The jockeying of a country’s place in a seemingly hierarchically organised structure of international production and trade relationships has become a prime target of trade and industrial policies. Such hierarchies have been operationalised in empirical research through rankings in terms of capital, skill or R&D intensities, leading to a focus in various policy fields to support a country’s move up the ladder of such hierarchies. The role of foreign technology spillovers and of foreign producers as carriers of such spillovers and as supports for access to foreign markets

has been recognised, and attention has also been paid to incentivising the channels through which such spillovers to domestic producers would occur. In all these respects, the three areas of trade policy, FDI policy and industrial policy have been seen as highly interrelated and complementary in achieving the goal of “climbing up the ladder”.

Framework conditions and horizontal vs. vertical interventions

An old issue in industrial policy is the question of the relative weights which should be given to so-called horizontal vs. vertical policies. The “specific inputs” approach by Hausmann et al. automatically means that the specific requirements of particular activities or of clusters of activities have to be recognised in formulating policies, either horizontal or vertical.¹⁶

Rodrik rightly states that

horizontal interventions need to be thought of as a limiting case, and not as a clear-cut alternative, to sectoral policies. In practice most interventions, even those that are meant to be horizontal, necessarily favor some activities over others. ... Thus, policy makers do not have the luxury of neglecting the asymmetric effects of their “horizontal” interventions. They need to ensure that the activities being ultimately favored are those that disproportionately suffer from the market imperfections in question.¹⁷

Hence, the first issue with regard to the discussion of horizontal vs. vertical policies is that the boundary cannot be easily drawn. Critics of vertical policies would say that such policies explicitly discriminate in favour of particular firms or sectors. However, the above quotation emphasises that horizontal policies also impact differently on different types of sectors or enterprises, and a well-informed policy maker should be aware of this. Hence, the distinction between explicit or implicit discrimination is pretty blurred.

Secondly and more importantly, there remains a crucial argument in favour of explicit vertical intervention that has to do with coordination failures in a market economy. This refers to a situation in which the development of a particular sector, activity, new product line or technology, or a move into a new market segment would take place only

¹⁶ R. Hausmann, D. Rodrik, C.F. Sabel: Reconfiguring Industrial Policy: A Framework with an Application to South Africa, Harvard University, August 2007

¹⁷ See D. Rodrik, op. cit., p. 6.

if other firms/actors participate. As no actor can be sure that the others will also move, they do not move either. Everybody, however, is aware that a joint move would generate spillover effects, allow a critical mass of joint R&D spending, lead to the training of a joint pool of qualified labour, make it worthwhile to build new infrastructure, and allow the joint development and penetration of new markets. The coordinating role of government in such circumstances is well recognised in the literature and has been put into practice on many occasions.

The criticism remains, however, that vertical policy always implies that government selects a particular branch of activity, technology or particular market niche for support. The accusation of “picking winners” is based on the criticism that governments do not have any privileged source of information regarding such picking. The answer which Hausman and Rodrik, Hausman et al., and Rodrik give to this is that industrial policy should not pick *ex ante* but in close interaction with all the possible actors involved (they call this strategy “embeddedness”).¹⁸ Hence, no superior information by government agencies is presupposed; rather, government should attempt to pool many potential sources of information, embark on a search process and focus on areas where potentially high (social) returns could emerge from a range of coordination supports. A transparent process of searching and laying down clearly stated criteria for decision-making at different nodes of this process should also provide a safeguard against capture by interest groups.

With regard to the use of vertical industrial policy instruments, policy makers face different challenges in advanced and less advanced economies.

Less advanced economies

In less advanced economies, the main aim is to choose a particular path of catching-up, and the choice of vertical policies is in some sense easier, as development patterns across stages of industrial developments have been well studied.¹⁹ This makes the choice of a sequence of activities which allows a gradual “climbing up the ladder” process to take place more straightforward than in the case of advanced economies. The criteria for such a choice include an assessment of what is feasible in relation to factor endowments that are available and could be provided within a particular time horizon. Further, the strongest learning opportunities need to be determined, as do linkage effects to other activities in which further

learning and development potentials could be exploited. The growth potential criterion explains the strong attraction to acquire stakes in high income markets where global purchasing power is concentrated. Finally, it is important to assess which types of firms (in terms of numbers, scales and factor recruitment capacity) would most likely succeed in overcoming thresholds of market entry and embarking on a sustained growth record in the chosen areas of activity.

Advanced economies

In advanced economies, i.e. those close to the technological frontier, the future development with regard to new industrial activities, new products and new technologies is untested territory. Advanced economies are on less solid ground in assessing which criteria are decisive for success. One can only draw on analogies, on the policies that worked well in previous technological ventures and in the setting up of infrastructure for new activities before that, on lessons with respect to appropriate market structures to optimise the balance between reaping scale economies and competitive pressure, etc. It is also difficult to foresee the nature of international competition that could be encountered: there could be overcrowding in the same areas of new technologies, new branches and new products, as countries at similar levels of technological and industrial development are all driven by similar evaluations of the next most important frontier with regard to industrial and technological development. It is important also in this context to be aware of a country’s/region’s particular comparative advantages within the space of next generation technologies, products and activities. Such comparative advantages are based on the built-up stock of skills, infrastructure and public inclinations to support one or another type of technology or activity and thus the willingness to provide public resources to support the development of these.

Apart from the support of new activities, there is also a role for vertical policies to influence the nature of an adjustment process with regard to old industries that have come under acute pressure either from international competition (through a changing international division of labour) or simply because these are – at a certain stage of national or global development – industries with rather low growth prospects and/or they require a major overhaul in terms of product spectrum and techniques used. The shift of resources out of old industries, technological trajectories and product segments that should be vacated could encounter lock-in features which serve as exit barriers, which require coordination efforts, just as entry barriers for new activities do. Hence, here is another role for industrial policy.

¹⁸ R. Hausmann, D. Rodrik, *op. cit.*; R. Hausmann, D. Rodrik, C.F. Sabel, *op. cit.*; D. Rodrik, *op. cit.*

¹⁹ See the early works of S. Kuznets, H. Chenery and R. Syrquin.

Recommendations regarding policy processes and procedures

(i) Industrial policy formulation and execution have to take place at all levels (regional and sub-regional, national and supra-national).

It is clear from the earlier discussion that industrial policy intervention which is directed towards reducing or overcoming entry barriers, counteracting coordination failures, and providing public goods will have to take place at different levels depending on the scope and space where such phenomena take place. This is easy to see in the case of public goods provision, where access to different public goods (transport, communications, training infrastructure) support different scales and geographic scopes. However, it similarly applies to policy designed to overcome entry barriers or coordination failures.

There are advantages and disadvantages of policy processes conducted at higher or lower levels. At the regional or sub-regional levels, the advantages include the easier involvement of all relevant actors (“embeddedness”) in the information-gathering process and the potential to cater more precisely to the specific input needs of a particular region or sub-region or a geographically defined cluster of activities. The disadvantages might lie in the easier capture of the process of decision-making by powerful local groups and the smaller range of alternatives which could be weighed against each other and which would provide a yardstick to make sure that the best option is chosen. Furthermore, the capture might also lead to greater intransparency of the process. A counterweight could be provided by the involvement of authorities at a higher level (national or supra-national) to deliver information on comparative projects, to provide standards, to undertake additional evaluations, to supply technical know-how which would not be available at the regional or sub-regional level, and to increase the level of transparency by publishing cross-regional evaluations, etc.

At the higher (national or supra-national) levels, the problem of “embeddedness” of the policy process is more severe; authorities would have to select which actors to involve in the “search process”, which will limit access to all relevant information.²⁰ On the other hand, standards of evaluation and of execution can be higher, as there is more scope for comparison, for the hiring of better expertise and for the cumulative build-up of a knowledge base. The respective advantages and disadvantages of the policy process at higher and lower levels imply that interac-

²⁰ See R. Hausmann, D. Rodrik, C. Sabel, *op. cit.*

tion between the processes at different levels would lead to better outcomes.

(ii) What are the risks of government failures? What are the challenges for low/medium/high income countries?

It is clear, like in all areas of government intervention, that there is the risk of government failure. One reason for such failure is that the relationship between government and private sector agents is affected by asymmetric information, and this can lead to problematic principal-agent problems. How can government agencies ensure that correct and sufficient information is provided so that good decisions can be made? Furthermore, how can effective monitoring of the use of resources and the impact of policies be undertaken, and – following from this – how can a proper evaluation be conducted? There is no general recipe available to deal with these issues. The recommendation by Rodrik et al. is to use a carrot-and-stick approach to elicit information from private agents in an interactive process of searching for an appropriate industrial policy framework tailored to the specific situation.²¹ Clear evaluation guidelines for the continuation or discontinuation of support schemes should be worked out, always maintaining access for newcomers to such schemes so that a competitive bidding process is in place at each stage of an industrial policy strategy.

Apart from the issue of asymmetric information, there is the problem of rent-seeking bureaucrats as well as rent sharing between public authorities and private agents. This can be a particularly problematic issue in the case of the use of industrial policy instruments, as such arrangements can influence long-term market structures and market positions. The capture of public policy-making institutions can thus thwart economic structures in the direction of entrenching the position of incumbents and solidify entry barriers. A recent econometric study by the Vienna Institute for International Economic Studies looked at the impact of various types of state aid schemes in the European Union. One very robust result obtained showed that the impact of state aid depends strongly on governance indicators, deciding in many cases between a positive and a negative impact.²² Hence, it is clear that the emphasis in the development literature on improving the quality of governance is very much an issue of whether industrial policy can have beneficial impacts.

²¹ *Ibid.*

²² See Vienna Institute for International Economic Studies (wiiw): A ‘manufacturing imperative’ in the EU – Europe’s position in global manufacturing and the role of industrial policy; background study to the European Competitiveness Report 2013, DG Enterprise, Vienna and Brussels 2013.

Mario Pianta*

What Is to Be Produced? The Case for Industrial Policy

The financial crisis of 2008 has had lasting consequences on the world economy. Seven years after its start, global industrial production is about six per cent higher than in 2008 – a very modest recovery. Growth is due to emerging market economies – China in particular – which, however, did not return to the very high growth rates of the pre-crisis years. Among advanced countries, the United States has recovered first, showing modest progress compared to 2008 levels; Japan is catching up, while Europe has lost ground. Within Europe, sharply divergent dynamics are found. Comparing major countries in 2013 and 2008, only Germany, Austria and the Netherlands returned to pre-crisis growth levels and suffered limited slumps. Poland alone has shown substantial growth. In 2013 the UK and France were 11 per cent below their 2008 levels, and similar losses can be found in most countries in Central and Northern Europe. Ireland has returned to its pre-crisis growth levels only after dramatic losses in the midst of the crisis. Southern Europe has lost a major part of its industrial capacity: one-seventh in Portugal, and about a quarter in Italy, Spain and Greece.¹ The crisis has led to a major destruction of economic activities, dramatic job losses and a changed hierarchy of industrial production.

Advanced countries face a structural loss of production capacity in industries that were previously the engines of growth, while no other fast-growing economic activity appears to be able to play a similar role in the future – finance is overblown and highly unstable, consumer services suffer from the slump in demand and the public sector is being downsized everywhere.

This combination of economic stagnation and industrial decline has wide-ranging consequences. As industry loses its role as a major source of employment – especially for medium-skilled workers – unemployment becomes more intractable, wages fall, and inequality and poverty rise. External imbalances are likely to become more seri-

ous; when a recovery arrives, the loss of domestic production capacity is likely to result in mounting trade deficits – with the exception of surplus countries such as Germany, Japan and China. Such imbalances will have to be compensated by greater capital inflows, a further rise in private and public debt, and the risk of financial instability.

International production systems are showing a more hierarchical structure. Leading firms increase their oligopolistic market power and control a wider network of outsourcing and offshoring activities distributed in an increasing number of advanced and emerging market economies. At the same time, in their home countries, especially in Europe, large firms have downsized production capacity, closed plants, and slashed employment; additionally, R&D and investment have often been reduced. Industrial employment has been hit hardest – even in countries with growing output, productivity increases mean that there is no net job creation.²

Private investment continues to be negatively affected by firms' expectations of low demand, as world export growth has not returned to pre-crisis levels and remains important for surplus countries only. Austerity policies have prevented an expansion of public investment and services, resulting in a prolonging of the stagnation, especially in Europe. The result is the emergence of a polarised industrial structure – “leaders” are becoming stronger, while “weak” countries, regions, industries and firms are becoming even weaker.

Five reasons for a new industrial policy

All this is not happening by chance. It is the result of the policy decisions of the last thirty years. In advanced countries, mainstream economics and neoliberal policies have imposed the conventional wisdom that “free” markets are efficient and capable to drive the long-term development of national economies. Policy actions have liberalised markets, privatised almost all state-owned

* The arguments of this paper were presented at workshops at the EuroMemorandum 2015, EAEPE, wiiw and the Sapienza University of Rome. See M. Mazzucato, C. Antonelli, R. Bellofiore, F. Garibaldi, A. Ginzburg, M. Landini, M. Pianta, M. Lucchese: Lo stato innovatore: una discussione, in: *Economia e Lavoro*, Vol. 48, No. 3, 2014. A detailed presentation of the proposals can be found in M. Pianta: An industrial policy for Europe, in: *Seoul Journal of Economics*, Vol. 27, No. 3, 2014, pp. 277-305.

1 Data are from Eurostat, World Bank and UNIDO; see M. Pianta: An industrial policy for Europe, in: *Seoul Journal of Economics*, Vol. 27, No. 3, 2014, pp. 277-305; and the article by Valeria Cirillo and Dario Guarascio in this issue of *Intereconomics*.

2 The evolution of European industries in the recession is examined by N. Foster-McGregor, M. Holzner, M. Landesmann, J. Pöschl, R. Stehrer, R. Stöllinger: European Competitiveness Report. A ‘Manufacturing imperative’ in the EU – Europe’s position in global manufacturing and the role of industrial policy, Vienna 2013, wiiw; A. Simonazzi, A. Ginzburg, G. Nocella: Economic relations between Germany and southern Europe, in: *Cambridge Journal of Economics*, Vol. 37, No. 3, 2013, pp. 653-675; K. Aiginger: Industrial Policy for a Sustainable Growth Path, WIFO Working Papers, No. 469, 2014.

firms, opened up trade in goods and services, favoured international investments and capital flows, enhanced private intellectual property rights, and reduced all forms of regulation and labour protection. The article by Cimoli, Dosi and Stiglitz (in this Forum) explains the logic of such neoliberal policy and the continuing need for industrial and innovation policies.³ In fact, industrial policy drove Europe's highly successful expansion from the 1950s to the 1970s. Then industrial policy fell out of fashion. Policies lost their selectivity and were limited to automatic "horizontal" mechanisms, such as across-the-board tax incentives for R&D or for the acquisition of new machinery. The result has been a general loss of policy influence on the direction of industrial change.

The rationale for industrial policy is that it can steer the evolution of the economy towards activities that are desirable in economic terms (improving efficiency), in social terms (addressing needs and reducing inequality), in environmental terms (assuring sustainability) and in political terms (protecting key national interests). The economic rationale includes the search for improvements in static and dynamic efficiency, especially in cases of market failure; in the coordination of decisions; and in the framework conditions of economic activities. Gains in dynamic efficiency are the most important argument for industrial policy. Public policy can expand available resources, favouring the growth of firms and industries that are characterised by strong learning processes, technological change, productivity increases, scale economies, internationalisation and rapid demand growth. The resulting benefits include faster growth of production, incomes, employment and competitiveness.

In the aftermath of the crisis of 2008 and of the failure of "free markets" to deliver results, a widespread rethinking on the importance of industrial policy is underway. In emerging market economies, extensive public policies have been at the root of industrialisation. Chang and Rodrik have provided compelling arguments on the need for industrial policy.⁴ Its relevance for emerging economies is discussed by Cimoli, Dosi and Stiglitz and by Stiglitz and Lin Yifu.⁵ The European context is examined

by Pianta, Foster-McGregor et al., and Aiginger.⁶ Mazzucato emphasises the need for a broad role of "transformative" public action in innovation and industrial change.⁷ Even mainstream perspectives have paid attention to the need for industrial policies.⁸

Building on such a debate, there are five major reasons for developing a new industrial policy, especially in Europe. The first one is rooted in macroeconomics. Exiting the current stagnation requires a substantial increase in demand, which could come from an EU-wide investment plan driven by public policies.

The second reason is associated with the changes in the economic structure resulting from the crisis. Major losses are taking place in troubled industries. New large economic activities that could offer additional output and new jobs are required, whereas the inflated financial sector needs to be downsized. A new industrial policy could drive the rise of new environmentally sustainable, knowledge-intensive, high-skill and high-wage economic activities. Specific activities that could be targeted include: a) environmental protection, sustainable transportation, energy efficiency and renewable energy sources; b) the production and dissemination of knowledge, applications of ICTs and web-based activities; and c) health, welfare and caring activities.

Third, a new industrial policy is needed in order to reverse the massive privatisations of past decades. The crisis is also the result of the short-term horizons of firms – due in large measure to the dominant role played by finance. There is a need for substantial action by the public sector in setting priorities, investing and creating employment. Public action could support the organisation of new markets, the development of competences and entrepreneurship, access to capital, etc.; it could directly produce public goods, such as knowledge, environmental quality, well-being, social integration and territorial cohesion.

The fourth reason for a new industrial policy is related to the regional dimension. A growing divide is emerging in Europe – between the "German-centred core" and the "Southern periphery", as pointed out in the article by Cirillo and Guarascio in this issue. This leads to deepen

3 See also H.-J. Chang: *The political economy of industrial policy*, Basingstoke 1994, Macmillan; M. Cimoli, G. Dosi, J. Stiglitz (eds.): *Industrial policy and development*, Oxford University Press, Oxford 2009; J. Stiglitz, J. Lin Yifu (eds.): *The industrial policy revolution I. The role of government beyond ideology*, Basingstoke 2013, Palgrave Macmillan.

4 H.-J. Chang, *op. cit.*; D. Rodrik: *Normalizing industrial policy*, The International Bank for Reconstruction and Development/The World Bank, Commission on Growth and Development, Working Paper, No. 3, 2008.

5 M. Cimoli, G. Dosi, J. Stiglitz, *op. cit.*; J. Stiglitz, J. Lin Yifu (eds.), *op. cit.*

6 M. Pianta: *Industrial and innovation policies in Europe*; in: A. Watt, A. Botsch (eds.): *After the crisis: towards a sustainable growth model*, ETUI, 92-95, Brussels 2010; M. Pianta: *An industrial policy for Europe ...*, *op. cit.*; N. Foster-McGregor et al., *op. cit.*; K. Aiginger, *op. cit.*

7 M. Mazzucato: *The entrepreneurial state*, London 2013, Anthem Press.

8 P. Aghion, J. Boulanger, E. Cohen: *Rethinking industrial policy*, Bruegel Policy Brief, Issue 2011/04, 2011.

ing imbalances that could be effectively reduced by a new industrial policy.

Fifth, a new industrial policy could become a major tool for addressing the urgent need for an ecological transformation. Making advanced economies sustainable – reducing the use of non-renewable resources, developing renewable energy sources and energy efficiency, protecting ecological systems and landscapes, lowering CO₂ and other greenhouse gas emissions, reducing waste and recycling – goes well beyond the emergence of specific environmentally friendly new activities. It is a transformation that concerns the whole economy and all of society. A combination is needed of direct public action, with the provision of environmental services, and appropriate regulations for private activities, including environmental taxation, incentives, public procurement and organisation of new markets. A new industrial policy could provide the framework for integrating the different policy tools needed for making economies sustainable.

Industrial policy can be an important and flexible tool for addressing all these priorities. Could Europe be the agent of such policy novelty?

Europe's missing industrial policy

European Union policies on the evolution of economic activities are now framed in the Europe 2020 strategy, approved in June 2010 by the European Council. Three priorities are identified: “smart growth” – an economy based on knowledge and innovation; “sustainable growth” – a resource-efficient, greener and more competitive economy; and “inclusive growth” – a high-employment economy with social and territorial cohesion. By 2020 the EU is expected to reach five headline targets, and eight flagship initiatives are associated to priority themes for reviving Europe's growth.⁹ The specific targets identified by Europe 2020 follow the footsteps of the Lisbon Agenda. The target of devoting three per cent of EU GDP to R&D expenditure is maintained. In 2008, R&D spending in the EU27 amounted to 2.1 per cent, with a highly uneven distribution across countries and no sign of convergence. Since then, the recession has led to falling expenditures and even greater disparities. Innovation capacity should be supported by the formation of human capital – the share of early school leavers should be under ten per cent in 2020 (it was 14.4 per cent in 2009 in the EU27), and at least 40 per cent of the younger generation should have a tertiary degree (32.2 per cent in 2009 in the EU27).

9 European Commission: Europe 2020. A strategy for smart, sustainable and inclusive growth, COM (2010) 2020 final, Brussels 2010.

Again, the recession has rolled back advances in peripheral countries.

The strategy includes a set of indicators from the 20/20/20 climate/energy targets established in 2009 by the European Council. The first one is a 20 per cent reduction in greenhouse gas emissions by 2020 from the levels of 1990 (30 per cent “if the conditions are right”). In 2009 the level of emissions declined by 17 per cent, largely due to the fall in output. The second target is a rise in the share of EU energy consumption produced from renewable resources to 20 per cent (in 2008 it was 10.3 per cent). The third target is a 20 per cent rise in energy efficiency. The two flagship initiatives devoted by Europe 2020 to innovation and industrial policy are the “Innovation Union”¹⁰ and “An integrated industrial policy for the globalization era”¹¹. As in the Lisbon Agenda, industrial policy is based on a horizontal approach, where the main policy tools are the provision of infrastructure, the reduction of transaction costs across the EU, a more appropriate regulatory framework favouring competition, and access to finance. This strategy confirms the EU's rejection of targeted industrial policies and state action for developing particular activities, a stance that first emerged in the 1980s.

Since the start of the crisis, the focus on austerity policies has sidelined any serious discussion on industrial policy. Still, the severity of industrial decline led the European Commission in January 2014 to introduce a new policy initiative called the Industrial Compact, which established the target of returning industrial activities to 20 per cent of GDP by 2020, against the present 16 per cent.¹² German and, to a lesser extent, Italian industry and governments lobbied for such action, which remains entirely within the Europe 2020 approach described above.

More importantly, in late 2014 the Commission President Jean-Claude Juncker launched the Investment Plan for Europe, promising new investment projects valued at €315 billion. While €8 billion of new EU funds were promised, by April 2015 the European Commission had found only €2 billion – from previous budget lines. The EU guarantee on the projects was expected to bring in an additional €8 billion, and the European Investment Bank (EIB) was expected to contribute €5 billion. This total of €21 billion was expected to mobilise private funds to contribute an amount 15 times greater, relying on a huge leverage effect in financial markets based on expectations of high re-

10 European Commission: Innovation Union, COM (2010) 546, Brussels 2010.

11 European Commission: An integrated industrial policy for the globalization era, COM (2010) 614, Brussels 2010.

12 European Commission: For a European Industrial Renaissance, COM (2014) 14/2, Brussels 2014.

turns on investment. However, national funds committed to the projects have been limited – €8 billion each from Germany, France and Italy – and have been constrained to domestic investment. Interestingly, member states have so far proposed 1,300 projects costing a total of €2 trillion. This shows the great need for public investment in EU countries and the huge mismatch between current policies and available resources.

Finally, an additional policy development in Europe emerged in 2013 with the negotiations for the Transatlantic Trade and Investment Partnership (TTIP) with the United States. TTIP would move Europe further down the road of trade liberalisation – the very process that has led to a more polarised industrial structure. More importantly, it would offer very strong protection for private foreign investment and scale back the scope for public policy and regulation in major fields, including environmental rules, genetically modified organisms (GMOs), utilities and other public services.¹³ TTIP has come under increasing criticism, and its future is uncertain. If it were approved, the scope for a European industrial policy would definitely be restricted, and the space for public action in the economy would be reduced to a minimum.

How can we change what is produced?

A different policy perspective is needed, one that addresses the joint needs to end the depression, fund the necessary public investment and rebuild sustainable economic activities. Decisions on the future of the industrial structure have to be brought back into the public domain. A new generation of industrial policies has to overcome the limitations and failures of past experiences – such as collusive practices between political and economic power, heavy bureaucracy, and lack of accountability and entrepreneurship. They should be creative and selective, with mechanisms of decision making based on the priorities for using public resources that are more democratic, inclusive of different social interests, and open to civil society and trade union voices.

The general principles of industrial policy are simple enough. It should favour the evolution of knowledge, technologies and economic activities in directions that improve economic performances, social conditions and environmental sustainability. It should favour activities and industries characterised by learning processes – by individuals and in organisations – rapid technological change, scale and scope economies, and strong growth

of demand and productivity. This would include activities centred on the environment and energy, knowledge and information and communication technologies (ICTs), and health and welfare.

Environment and energy. The current industrial model has to be deeply transformed in the direction of environmental sustainability. The technological paradigm of the future could be based on “green” products, processes and social organisations that use much less energy, resources and land; have a much lighter effect on climate and ecosystems; move to renewable energy sources; organise transport systems that transcend the dominance of cars via integrated mobility systems; rely on the repair and maintenance of existing goods and infrastructures; and protect nature and the Earth. Such a perspective raises enormous opportunities for research, innovation, and new economic and social activities. A new set of coherent policies should address these complex, long-term challenges.

Knowledge and ICTs. Current change is dominated by the diffusion throughout the economy of the paradigm based on ICTs. Its potential for wider applications, higher productivity and lower prices, and new goods and social benefits should be supported. However, ICTs and web-based activities are reshaping the boundaries between the economic and social spheres, as the success of open source software, copyleft, Wikipedia and peer-to-peer activities clearly show. Policies should encourage the practice of innovation as a social, cooperative and open process, easing the rules on the access and sharing of knowledge, rather than enforcing and restricting the intellectual property rules designed for a previous technological era.

Health and welfare. Europe is an ageing continent with the best health systems in the world, rooted in their nature as public services separate from the private market. Advances in care systems, instrumentation, biotechnologies, genetics and drug research have to be supported and regulated considering their ethical and social consequences (as in the cases of GMOs, cloning, access to drugs in developing countries, etc.). Social innovation may spread in welfare services with a greater role for citizens, users and non-profit organisations, renewed public provision, and new forms of self-organisation of communities.

All these fields are characterised by labour-intensive production processes and by the requirement of medium to high skills, giving them the potential to provide “good” jobs. But how could individual countries – and Europe as a whole – change their economic activities in such directions?

¹³ See the critical review in EuroMemo Group: EuroMemorandum 2015. What future for the European Union – Stagnation and polarisation or new foundations?, 2015.

Industrial policy has long relied on different mechanisms. On the supply side, public funds have supported selected R&D, innovation and investment efforts. Public investment banks and public enterprises have supported business start-ups in key fields with credits and venture capital and have managed the restructuring of major production activities. Public, community and cooperative enterprises have a role in fields – such as knowledge-based activities and environmental and local services – where public goods and public procurement are prevalent.

On the demand side, far-sighted public procurement, the organisation and regulation of markets with high growth potential, and support and incentives for early users of new technologies have helped “pull” innovation and investment through “mission-oriented” policies.¹⁴ In Europe the diffusion of wind and solar energy is the result of the use of such instruments. In fewer cases, policies have “empowered the users”, letting them define specific applications of existing technologies that may lead to new goods and services with large markets. Finally, policies have aimed at building closer relationships among all actors of national and European systems of innovation – firms, financial institutions, universities and policy makers – helping to coordinate decisions of public and private actors. The funding for such policies has generally come from national public expenditures, but fiscal austerity has now dried up this option.

A proposal for a new EU-wide industrial policy

The need for rebuilding and restructuring economic activities in Europe has recently led to several policy proposals. The German trade union confederation DGB proposed “A Marshall Plan for Europe”, envisaging a public investment plan of the magnitude of two per cent of Europe’s GDP per year over ten years.¹⁵ Along the same lines, the European Trade Union Confederation proposed “A new path for Europe”.¹⁶ European Greens proposed a similar plan for a sustainable Europe.¹⁷ Building on such ideas, we can

¹⁴ See M. Mazzucato, *op. cit.*

¹⁵ DGB: A Marshall Plan for Europe: Proposal by the DGB for an economic stimulus, investment and development programme for Europe, 2012.

¹⁶ European Trade Union Confederation: A new path for Europe: ETUC plan for investment, sustainable growth and quality jobs, 7 November 2013.

¹⁷ The Greens: European Free Alliance in the European Parliament. A Green Investment Plan for Europe, Brussels 2014. Previous work advancing such arguments include M. Pianta: Industrial and innovation policies in Europe ..., *op. cit.*; M. Pianta: An industrial policy for Europe ..., *op. cit.*; M. Pianta, M. Lucchese: Industrial and innovation policies in the European Union; in: F. Garibaldo, M. Baglioni, V. Telljohann, C. Casey (eds.): *Workers, Citizens, Governance: Socio-Cultural Innovation at Work*, Berlin 2012, Peter Lang; EuroMemo Group, *op. cit.*

argue that an ambitious but realistic proposal could be developed on the basis of the following institutions, governance mechanisms and funding arrangements.

The institutional arrangements. Individual EU countries are too small to develop an industrial policy that could be effective in the current context of globalisation. The new industrial policy has to be set within the European Union or at least the eurozone. This is needed in order to coordinate industrial policy with macroeconomic, monetary, fiscal, trade, competition and other EU-wide policies. Changes are required in current EU regulations, in particular the ones that prevent public action from “distorting” the operation of markets. As this policy is likely to meet opposition by some EU countries, a “variable-geometry” EU policy could be envisaged, excluding the countries that do not wish to participate.

Close integration has to be developed among the European, national and local dimensions. Existing institutions could be integrated in such a new industrial policy, including – at the EU level – Structural Funds and the EIB. However, their mode of operation should be adapted to the different requirements of the role proposed here. While adapting existing institutions is the most effective way to proceed in the short term, in the longer term there is a need for a dedicated institution – either a European Public Investment Bank or a European Industrial Agency – coherent with the mandate of reshaping economic activities in Europe.

A system could be envisaged in which EU governments and the European Parliament agree on the guidelines and funding of industrial policy, calling upon the European Commission to implement appropriate policy tools and spending mechanisms. In each country a specific institution – either an existing or a new one, such as a National Public Investment Bank – could assume the role of coordinating the implementation of industrial policies at the national level, interacting with the existing national innovation system, policy actors, the financial sector, etc. The institutions at the national and local levels would take responsibility for spending decisions, identifying the private firms to be supported (either with low interest loans or with a share of ownership), the projects to be developed and the new public activities that are required. These institutions would be subject to the strict monitoring described below.

The funding of industrial policy. Funds for an EU-wide industrial policy should come from EU-wide resources. It is essential that troubled national public budgets would not be burdened with the need to provide additional resources and that national public debt would not be increased.

The order of magnitude of the funding for the industrial policy programme outlined above is about two per cent of EU GDP over a period of ten years (that is, about €260 billion per year), as suggested by the DGB, the ETUC and the Greens. As terms of reference, we can note that the European Central Bank (ECB) started its quantitative easing programme in March 2015, through which it will purchase €60 billion of bonds per month until September 2016. EU Structural Funds in the period 2007-13 reached €347 billion. Annual lending by the EIB is €65 to €70 billion. An investment effort of about two per cent of EU GDP appears therefore to be feasible – considering the size and power of European institutions. It would be adequate to fund all the projects proposed under the Juncker Plan, and it would be big enough to compensate for the lack of investment – still 17 per cent below the pre-crisis level – and effectively end Europe’s stagnation.

Different funding arrangements could be envisaged. The most viable one in the short term is the emission of EIB bonds that could be bought by the ECB with funds from its quantitative easing programme. A similar proposal for funding was made by Greek Finance Minister Yanis Varoufakis at the Cernobbio and INET conferences in April 2015. For eurozone countries, a variety of other arrangements are possible. For example, the emission of Eurobonds could fund industrial policy, a new European Public Investment Bank could borrow funds directly from the ECB or the ECB could directly provide funds for industrial policy to the relevant spending agencies.

The DGB proposal suggests that funds could be raised on financial markets by a new European Public Agency and that funds could come from the EU-wide receipts of a one-time wealth tax and from the newly introduced financial transactions tax.¹⁸ Such tax income could help to cover interest payments for the necessary projects that are not profitable in market terms. An alternative may come from deeper European tax reform, introducing an EU-wide tax on corporations, thus effectively eliminating fiscal competition among EU countries.

Finally, funding arrangements could be different according to the relevance of the “public” dimension:

- The priority of public funds should go to public investment in non-market activities – such as public goods provision, infrastructure, knowledge, education and health.
- Public funds and long-term private investment should be combined in funding new “strategic” market activi-

ties, such as the provision of public capital for new activities in emerging sectors.

- Public support could stimulate financial markets to invest in private firms and non-profit organisations developing market activities that could more easily repay the investment.

In all cases, the rationale for financing industrial policy cannot be reduced to the financial logic of the return on investment.

The governance system. The European institution in charge of industrial policy – possibly a European Public Investment Bank – should be accountable to the European Parliament, which could appoint its board with representatives from business, research organisations, trade unions and environmental civil society organisations. No “revolving door” between industrial policy institutions and private firms and banks should be allowed. The European institution should engage in consultation with EU political, economic and social actors to develop its proposed industrial policy, which should be approved by the European Parliament. Funds could then be assigned to national institutions and specific targets – within the economic activities outlined above – and could be used in order to:

- fund, through loans or minority ownership, enterprises – including new start-up firms – operating in high-risk, high-innovation fields relevant for such policy priorities; the shares could then be sold if the firms are successful and attract private finance;
- fund procurement programmes for innovative products relevant for public services and growing markets;
- fund R&D in universities, and public and private institutions;
- fund innovation and its diffusion in private and public organisations;
- fund and organise networks of innovators, producers and users in new activities, in order to consolidate economic relationships and create markets;
- continue to provide horizontal support to firms with the existing policy instruments.

The lessons from similar successful experiences outside Europe, such as ARPA-E in the US or the Brazilian Development Bank BNDES, are discussed by Mazzucato.¹⁹

¹⁸ DGB, op. cit.

¹⁹ M. Mazzucato, op. cit.

Transparency in decisions would be required, and monitoring and evaluation procedures – similar to those required by EU Structural Funds – should be arranged.

In order to reduce the scope for “pork barrel politics”, the countries and regions where such investments could be carried out have to be defined in advance, with the explicit aim to reduce the polarisation that is weakening the industrial base of Europe. For instance, 75 per cent of funds could go to activities located in periphery countries (Eastern and Southern Europe, plus Ireland), and at least 50 per cent of these should be devoted to the poorer regions

of such countries. Another 25 per cent could go to the poorer regions of the countries of the “centre”.

These criteria may contribute to overcoming the collusion between industrial policy and economic and political power that has characterised past European and national experiences. Opening a debate on industrial policy is an urgent task. The political obstacles are indeed enormous, but a new industrial policy could help to end stagnation, provide new high-wage jobs and social cohesion, and offer progress towards an ecological transformation and a more effective democracy.

Rainer Walz

Green Industrial Policy in Europe

One lesson of the financial crisis has been that countries with higher shares of industry in their GDP seemed to be less affected by the crisis. Consequently, the call for an industrial renaissance has become stronger. This development has also changed the industrial policy discourse: after years of dominance of a more laissez-faire approach,¹ economists have started to look into selective industrial policies again. However, this debate is not just a revival of the old concepts about sector-specific policies or of the lessons to be learned from the rapid catch-up of Asian countries. One significant difference is that industrial policies are also becoming aligned with approaches for tackling global challenges. Most prominent for this new trend is the case of green industrial policy.

The background to green industrial policy

The last few years have seen publications and reports dealing specifically with green industrial policy. Widely circulating policy papers on industrial policy, such as from the OECD, very often include sections on industrial policy fostering a green economy, and publications by

renowned scholars have taken up the issue.² Within the European Union, the policy debate focuses on the Europe 2020 strategy for smart, sustainable and inclusive growth. The Europe 2020 strategy was launched not only to overcome the financial crisis but also to address long-term challenges, among them pressure on resources and environmental concerns.

Among the seven flagship initiatives of the Europe 2020 strategy, there are three with specific importance for green industrial policy. The flagship initiative “Innovation Union” calls for increasing R&D spending and improving innovation efficiency. It defines a more strategic approach to innovation as an important area of action, committing explicitly to developing an Eco-innovation Action Plan (EcoAP). The flagship initiative on a “Resource-efficient Europe” aims to support the shift towards a resource-efficient and low-carbon economy. It also links increasing resource efficiency to securing growth and jobs for Europe by stimulating innovation, improving competitiveness and opening new export markets. The flagship initiative on “Integrated Industrial Policy for the Globalisation Era: Putting Competitiveness and Sustainability at Centre Stage” underlines the importance of a strong manufacturing val-

¹ See for example G. Owen: Industrial Policy in Europe since the Second World War: What has been learnt?, ECIPE Occasional Paper No. 1/2012, Brussels.

² See for example K. Warwick: Beyond Industrial Policy: Emerging Issues and New Trends, OECD Science, Technology and Industry Policy Papers, No. 2, OECD Publishing, 2013; D. Rodrik: Green Industrial Policy, Oxford Review of Economic Policy, Vol. 30, No. 3, 2014, pp. 469-491; and K. Aiginger: Industrial Policy for a Sustainable Growth Path, Policy Paper No. 13, WIFO, Vienna, June 2014.

ue chain for the EU. It draws attention to a radically changing global business environment, one with globalising value chains and in which emerging economies are rapidly catching up. It calls for an integrated approach and for using strategic intelligence such as impact assessments and insights into sectoral innovation performance. Recently, the European Commission reiterated the need to link industrial strategy to fields important for a green economy.³

The term industrial policy can be defined either narrowly or more widely.⁴ In a wider definition, industrial policy strives to improve the environment for business or alter the structure of economic activity towards sectors, technologies and tasks which offer better prospects for economic growth and social welfare. The above-mentioned European documents implicitly use such a wider definition: they express the ambition that a green industrial policy should foster both better prospects for economic growth while at the same time contributing to the achievement of environmental goals.

Among the various publications, the term “green” is very often narrowed down to “climate-friendly”. Indeed, many publications on green industrial policy very often deal only with energy-related aspects. While tackling climate change and reducing energy-related greenhouse gases certainly is an important green topic, the implications of the greening of industrial policy go beyond such a narrow definition. A transition to a green economy affects many different sectors. From a technological perspective, a delineation of green technologies yields green energy supply and energy efficiency, but also green transportation, waste and material efficiency technologies, and water-related technologies.⁵ Green industrial policy, however, also requires strategies through which new technologies are complemented by organisational and institutional changes. Furthermore, terms such as sustainable production and consumption patterns as well as the transitions of sectors are also important goals for achieving a green economy. They signal that green industrial policy not only concerns technologies but also encompasses changing sectors and tasks.

The rationale for green industrial policy

A lot of the debate about industrial policy focuses on the rationale for such a policy. Market failures are widely ac-

cepted with regard to knowledge spillovers, which form a justification for supporting R&D on a horizontal, non-technology-specific basis. In addition, however, green industrial policies favour environmentally friendly solutions which reduce environmental pressure. As long as environmental costs are externalised, this advantage does not show up in the economics of the technology choice. As long as perfect internalisation of external costs – the cornerstone of neoclassical environmental economics – cannot be achieved, there is a need for “second-best” policies. Thus, it is not only the externality of research, but also the environmental externalities which lead to a widely acknowledged double regulatory challenge for green innovation.⁶

Despite the call for deregulation and liberalisation, it is still acknowledged – even by neoclassical economists – that monopolistic bottlenecks should be regulated. Sectors such as electricity, gas, water supply and sewage treatment, and railways, all of which are central to a green industrial policy, are linked to monopolistic bottlenecks in the form of infrastructure systems with physical networks. Furthermore, even potentially competitive market segments, in general, require access to the sectors with monopolistic bottlenecks, e.g. electricity from renewable energy sources produced by new independent power producers. As the monopolistic market power within these sectors can be carried over to the potentially competitive stages either by excessive charges for access to the infrastructure or by hindering or even foreclosing the downstream market to competitors, there is no level playing field between incumbents and newcomers. Therefore, many green technologies face a triple regulatory challenge,⁷ which extends the rationale for green industrial policy towards the arena of economic sector regulation.

The rationale for industrial policy can also be analysed from a systems perspective, which moves beyond the classical market failures framework and draws on evolutionary economic concepts. An argument similar to the infant industry model from development economics can be brought forward with regard to new “green” technologies versus old “dirty” technologies. Without reaching economies of scale and learning in the market, it is argued, new solutions are not able to achieve cost reductions in order to compete with older solutions. In the context of evolutionary economics, this argument is fur-

3 European Commission: For a European Industrial Renaissance, Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of Regions, COM(2014) 014 final.

4 K. Warwick, *op. cit.*

5 R. Walz, W. Eichhammer: Benchmarking green innovation, in: *Journal of Mineral Economics*, Vol. 24, No. 1, 2012, pp. 79-101.

6 K. Rennings: Redefining innovation – eco-innovation research and the contribution from ecological economics, in: *Ecological Economics*, Vol. 32, No. 2, 2000, pp. 319-332.

7 R. Walz: The role of regulation for sustainable infrastructure innovations: the case of wind energy, in: *International Journal of Public Policy*, Vol. 2, No. 1/2, 2007, pp. 57-88.

ther supported by co-evolutionary processes of organisations and institutions. The innovation process along a technological trajectory is embedded in the production of knowledge and the socioeconomic development of institutions.⁸ However, the co-evolution between technology and the surrounding institutions along a technological trajectory can also increase path dependency. A new technology has not only to compete against a traditional one but also against a system consisting of a traditional technology together with institutions which have been co-evolving around this technology. This can result in a lock-in situation which prevents shifts towards new solutions.⁹ Overcoming such path dependencies and lock-in situations are another rationale for green industrial policies.

There are additional specificities which make path dependency a particular problem for green technologies. A lot of the technologies in the energy, water and transportation sectors are characterised by very long lifetimes. Thus, the high asset durability limits the opportunities for reinvestments. Furthermore, the investments in supply technologies tend to be very capital-intensive. Thus, it would be very costly to substitute environmentally intensive technologies before the previous investments reach the end of their useful lives. Both factors support “technical path dependency”. The dependency on a grid also leads to another kind of path dependency: the grid structure is optimised towards existing technologies. If green solutions require a different grid structure, they cannot increase their market share unless they are supported by major investments in a new grid structure. The problem is increased further if the grid operators and investors have specific interests in keeping the traditional structure intact and if the regulation of the infrastructure is not pushing them in that direction.

Policy orientation

Traditionally, a major debate about the orientation of industrial policy has been related to horizontal policies versus selective policies, which support specific sectors and technologies. Given the goals and rationale of green industrial policy, it can be argued that the policies have to be selective to a certain extent, as they are targeted at substituting “dirty” technologies by “clean” ones. The specific rationale and characteristics of green industrial policy also provide arguments in favour of selective policies. First, as outlined above, path dependency is a

very pressing problem, and it calls for specific support, especially of new solutions and systems change. Secondly, first-best solutions, which could alleviate market failures, are very often not feasible for political reasons. For example, a horizontal policy such as a uniform carbon tax, which would alleviate the externality of carbon emissions, would require tax rates close to the external costs, which are estimated to be very high. However, a CO₂ tax in this order of magnitude is currently not feasible for political reasons. Therefore, second-best policies are needed which focus on a smaller segment, such as enabling green technologies to become more cost competitive. Thus, typical selective policy instruments such as financial subsidies and selective technology funding have to be used. Thirdly, the sectors targeted by green industrial policies are very often already subject to economic sector regulation. Indeed, instruments such as price regulation are not only a typical instrument for selective green industrial policies but also a traditional element of regulation of infrastructure sectors.

The use of selective policy instruments is very often criticised with the argument that governments are ill-suited for picking winners. However, it is also argued that it is more important to enable learning by government.¹⁰ This requires the coordination of government policy with business strategies, monitoring and evaluations, as well as the substitution of smart instrument designs for policies which lead to unsatisfactory results. Another challenge of industrial policy is that diversity in technological solutions is fostered to prevent lock-in into a limited number of technologies. However, preventing such lock-ins is not necessarily equivalent to using horizontal instead of selective policies. Indeed, in some instances a selective policy is necessary to prevent such lock-ins.

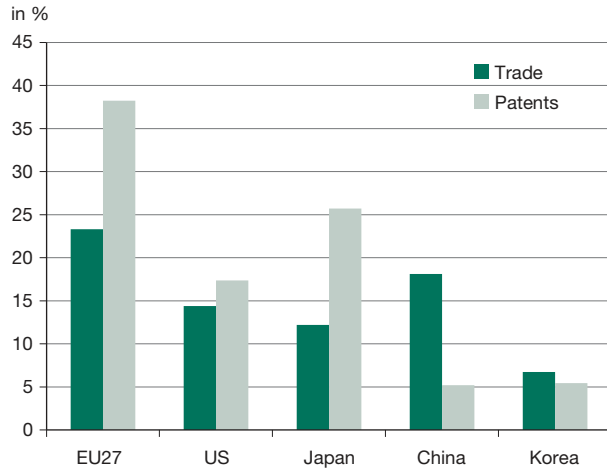
The German case of feed-in tariffs for photovoltaics (PV) is a good example of the need for both selective policies, in order to ensure diversity, and policy learning. Technology-specific feed-in tariffs have been criticised for not being technology-neutral, i.e. for being too selective, and uniform tradable quotas have been suggested as an alternative. However, if a uniform tradable quota for renewable energy had been chosen instead of feed-in tariffs, the policy would have had almost no effect on bringing PV to the market, because PV was very far away from being cost competitive with other renewable energy sources. Thus, opting for a uniform quota system would have been equivalent to letting government implicitly pick a winner, and it would have led to lock-in into few renewable energy technologies. In contrast, technology-specific feed-in tariffs enabled PV to become a viable alternative,

8 G. Dosi: Technological paradigms and technological trajectories. A suggested interpretation of the determinants and directions of technical change, in: *Research Policy*, Vol. 11, No. 3, 1982, pp. 147-162.

9 G.C. Unruh: Understanding carbon lock-in, in: *Energy Policy*, Vol. 28, No. 12, 2000, pp. 817-830.

10 D. Rodrik, op. cit.

Figure 1
Green technology shares of major technology supplier countries, 2011-12



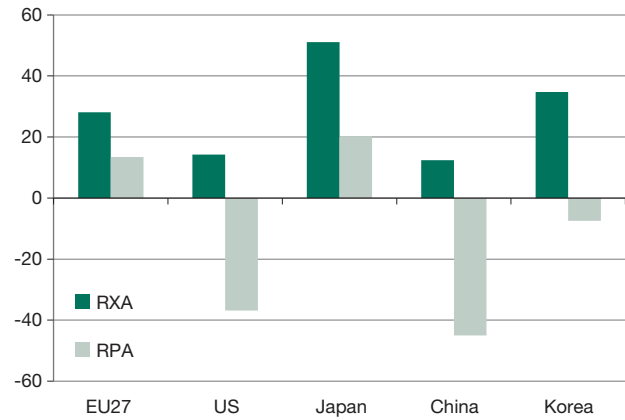
Note: Intra-EU trade is excluded.
Sources: AUN COMTRADE, PATSTAT, calculation by Fraunhofer ISI.

increasing the diversity of realistic renewable energy options. However, cost reductions for PV modules began to outpace the reduction of the feed-in tariffs, resulting in an installation boom, which ultimately led to a large increase in the costs of the policy. Clearly there was a need for policy learning. Government first reacted by reducing feed-in tariffs on a case-by-case basis. It then introduced smarter policy designs which automatically link feed-in tariffs to the target level of technology diffusion. To sum up, there will always be mistakes in applying selective green industrial policies, but the important issue is that policy makers are able to learn and to quickly correct these mistakes. A key prerequisite for doing so is strategic intelligence with regard to markets and cost development.

The strategic orientation of industrial policy distinguishes between the development of comparative advantage and comparative advantage-following policies.¹¹ The first seeks to develop strategic advantage in new areas, while the second aims at consolidating current strengths. Figure 1 shows that Europe is clearly the world's leading region with regard to green patents.¹² Even if one discounts

11 K. Warwick, op. cit.
12 The concept for identifying patents and export classification is described in R. Walz, J. Köhler: Using lead market factors to assess the potential for a sustainability transition, in: Environmental Innovation and Societal Transitions, Vol. 10, March 2014, pp. 20-41.

Figure 2
Green technology specialisation profile of major technology supplier countries, 2011-12



Note: Intra-EU trade is excluded. The values for the specialisation indicators relative patent activity (RPA) and relative export advantage (RXA) are normalised between -100 and +100.
Sources: AUN COMTRADE, PATSTAT, calculation by Fraunhofer ISI.

intra-EU trade, Europe remains the leader in exports of potentially green technologies, albeit with a less clear advantage. Figure 2 shows the specialisation profile for both patents and exports. Like Japan, the EU27 exhibits a positive specialisation for both patents and exports to non-EU countries. The other major competitors show negative specialisations with regard to patents. Thus, the EU27 certainly is among the global leaders and shows comparative advantages in the field of green technologies.

However, the picture looks more heterogeneous if one disaggregates the green technologies into five broad technology domains (see Table 1) and even more so if one moves towards the level of single technology classes, such as wind turbines or PV. The EU27 accounts for about 60 per cent of annual wind turbine patents, representing a relative patent activity (RPA) score of 54, but only for 25 per cent of annual PV patents (an RPA of -27). Thus, nobody should be surprised if the same industrial policy that was applied to the wind turbine industry in Europe leads to different results if applied to the PV industry. Clearly, there is a need for strategic positioning that takes comparative advantages into account when designing green industrial policy. However, this requires the build-up of strategic intelligence with regard to the factors relevant for building a lead market and lead supplier position and for the diffusion of this knowledge to the policy debate in

Table 1
Shares and specialisation of EU27 in green technology patents and exports

Green technology domain	EU27 patent share	EU27 export share*	EU27 RPA	EU27 RXA*
Waste & recycling	40.0%	33.5%	18.0	55.0
Green energy supply	39.9%	29.1%	17.8	47.1
Energy efficiency	37.3%	20.5%	11.0	15.6
Green transport	39.1%	13.3%	15.8	-26.9
Water	32.6%	32.3%	-2.3	54.7

Note: RPA: relative patent activity; RXA: relative export advantage.

* Excluding intra-EU trade.

Sources: UN COMTRADE, PATSTAT, calculations by Fraunhofer ISI.

the specific policy arenas.¹³ The EU certainly has room for improvement in this area.

Instruments and stringency of EU green industrial policy

The portfolio of instruments that the EU uses for green industrial policy is broad. The first important pillar is funding of R&D and innovation. In the past, the EU has funded research and demonstration projects on clean technologies in the various framework programmes, in programmes such as the Competitiveness and Innovation Framework Programme, or under the Environmental and Climate Change sub-programmes of the LIFE+ programmes. Horizon 2020 will be the major programme for R&D funding in 2014-2020.¹⁴ Within Horizon 2020, topics related to green industrial policy are funded within the section on societal challenges. The environment sub-section focuses on water, waste and resources. Energy and transport issues form separate subsections, while bioeconomy is part of the food sub-section. Thus, most of the technolo-

¹³ R. Walz, J. Köhler, op. cit., identifies domestic market factors on the demand side, market factors on the supply side, innovation-friendly regulation in the country, the technological capability of the country, and the structure of actors and competitiveness of related industry clusters in the country as the main factors for achieving a lead market and lead supplier position.

¹⁴ For the debate about Horizon 2020, see the Intereconomics Forum R. Veugelers, M. Cincera, R. Frietsch, T. Schubert, C. Rammer, A. Pelle, J. Leijten, C. Montalvo, A. Renda: The Impact of Horizon 2020 on Innovation in Europe, in: Intereconomics, Vol. 50, No. 1, 2015, pp. 4-30.

gies and sectors which form the core of green industrial policies are covered by Horizon 2020.

A second pillar of EU policies consists of the EU Structural and Investments Funds. An increasing number of “green” projects have been introduced over the past 20 years within the Structural Funds. However, there is no comprehensive evaluation of what has been achieved yet with regard to the greening of industrial policy. With the adoption of the new multiannual financial framework 2014-2020, at least €100 billion of European Structural and Investment Funds are available to finance investment in innovation, in line with industrial policy priorities. The Commission’s Communication on “Industrial Renaissance” points out that the priorities should be set according to “smart specialisation”.¹⁵ With bio-based products, clean vehicles and vessels, sustainable construction and raw materials, and smart grids, four of the six topics prioritised by the Commission in the Industrial Renaissance Communication touch directly upon green industrial policies. Given the specialisation pattern of Europe with regard to green technologies, there should be substantial potential for projects in these topics which fit the “smart specialisation” logic. However, it will have to be seen how much of the 2014-2020 budget will indeed go to “green” projects.

The EU has also put considerable effort into fostering coordination among actors and stakeholders. European Innovation Partnerships (EIP) aim at bringing together all relevant actors in order to step up research and development efforts, to coordinate investments in demonstration and pilot projects, to anticipate and fast-track necessary regulation and standards, and to coordinate the supply and demand sides. In particular, the EIPs on water, smart cities and raw materials have strong links to green industrial policy. Within the energy theme, the Strategic Energy Technology Plan aims at coordinating the different energy-related activities. Another approach to foster coordination is through Technology Platforms, which are industry-led stakeholder forums recognised by the European Commission as key actors in driving innovation, knowledge transfer and European competitiveness. Some of them are connected to sectors important for green industrial policy, especially renewable energy and transport. However, the degree to which the activities of the latter indeed aim at new forms of mobility, as opposed to pushing along traditional lines, has yet to be determined. Furthermore, the themes of energy efficiency and water seem to be under-represented so far.

¹⁵ European Commission, op. cit. To support member states and regions, the EU has started a smart specialisation platform; see <http://s3platform.jrc.ec.europa.eu/home>.

Successful coordination among actors and stakeholders requires that the coordination activities are not captured by vested interests and that they remain open to newcomers. The review of existing EIPs by an independent expert group names additional challenges, such as the divergence of views among the different Directorates of the Commission, the need to bring in more new actors, including more SMEs, and the need for a stronger focus on systemic change.¹⁶

A crucial element of industrial policy is stimulation of the demand side. One of the most frequently mentioned instruments is public procurement, which has also been a prominent factor in traditional mission-oriented projects. However, the diversity of user groups and the magnitude of investments necessary for a green economy make additional demand-side instruments necessary.¹⁷ One of the specificities of green industrial policy is that environmental policy is part of its rationale. Implementing environmental policy, however, not only aims at environmental targets but at the same time translates into a demand pull for green technologies. The EU has set various targets for different environmental topics. The energy targets of the EU 2030 energy strategy, which are well known, call for a 40 per cent cut in greenhouse gas emissions compared to 1990 levels, at least a 27 per cent share of renewables in energy consumption and a 30 per cent improvement in energy efficiency (compared to business-as-usual projections). However, there is currently no target for material use and resource efficiency. Furthermore, the latest European Environmental Agency report on the State of the Environment underlines that in various environmental fields, the EU is not or only partially on track to reach the targets.¹⁸ This lack of stringency also indicates that environmental policy has not been used to its full potential as demand-oriented industrial policy.

However, lack of stringency in some environmental policy areas is not the only problem on the demand side of green industrial policy. The fragmentation of policy arenas, e.g. supply side and environmental policy, with different DGs being responsible for policy implementation, has led to the effect that the priorities within each arena are sometimes developed without taking the other sides sufficient-

ly into consideration. Thus, environmental policy tends to emphasise the need to reduce environmental pressure as quickly as possible. Green policies on the supply side tend to concentrate on topics for which a technological push seems possible or for which specific actor structures imply opportunities. It is one of the major challenges of green industrial policy to improve the coordination in this area.

The need for better coordination of the demand and supply sides is also taken up by the European Eco-Innovation Action Plan, which forms the most elaborate strategy for a European green industrial policy so far. It addresses almost the complete range of instruments and policy domains which are discussed with regard to industrial policy. The following actions are part of the EU EcoAP:

- environmental policy and legislation (Action 1)
- demonstration projects and partnering (Action 2)
- new standards boosting eco-innovation (Action 3)
- financial instruments and support services for SMEs (Action 4)
- international cooperation (Action 5)
- development of emerging skills and jobs and related training (Action 6)
- European Innovation Partnerships (Action 7).

Multi-level governance and the need for impact assessment

The EcoAP explicitly calls for activities by the member states. This reflects the importance of national interests in designing green industrial policies. First, there are different views among member states about the future direction of green strategies. Most obvious is the case of nuclear power, which is seen as an environmental problem to be phased out as quickly as possible in some member states and as a legitimate technology for reducing CO₂ emissions in others. Green industrial policy at the European level is unable to resolve such contradictory views. Consequently, it will focus more on fields in which the differences among the member states are less dramatic, leaving the highly controversial matters to the national level.

Another reason for emphasising member states' activities is that the economic costs and benefits of green industrial policies differ among member states. Green industrial policy is a policy arena in which national governments will push the green strategies which benefit their constituencies in their home countries. It will always be a challenge to align green industrial policy among the different government levels. Given the high level of economic interest,

16 E. Aho, S. Schwaag Serger, W. Mönig, P. Wilson, C. Garmendia, M. Steinberg, P. Swieboda: Outriders for European Competitiveness: European Innovation Partnerships (EIPs) as a Tool for Systemic Change, Report of the Independent Expert Group, Luxembourg 2014, Publications Office of the European Union.

17 D.C. Mowery, R.R. Nelson, B. Martin: Technology policy and global warming: Why new policy models are needed (or why putting new wine in old bottles won't work), in: *Research Policy*, Vol. 39, No. 8, 2010, pp. 1011-1023.

18 European Environmental Agency: *The European Environment. State and Outlook 2015*.

performing impact assessments of the economic impacts of green policies becomes a strategic prerequisite of European activities in green industrial policy. However, it is not only the EU's comparative advantages that differ from one technology to the other. Whether a member state is among the winners or losers of a green industrial policy also depends on which specific sectors and technologies are included in the policy. Thus, the impact assessments must be based on a sound technological foundation, which goes beyond the standard procedure of impact assessment and the use of top-down economic modelling instruments alone. Instead, a combination of bottom-up tools, qualitative analysis of competitiveness in order to derive export scenarios, and macroeconomic models is necessary, such as that which was implemented in the analysis of the impacts of renewable energy policies in Europe for DG Energy (see Figure 3).¹⁹

Conclusion

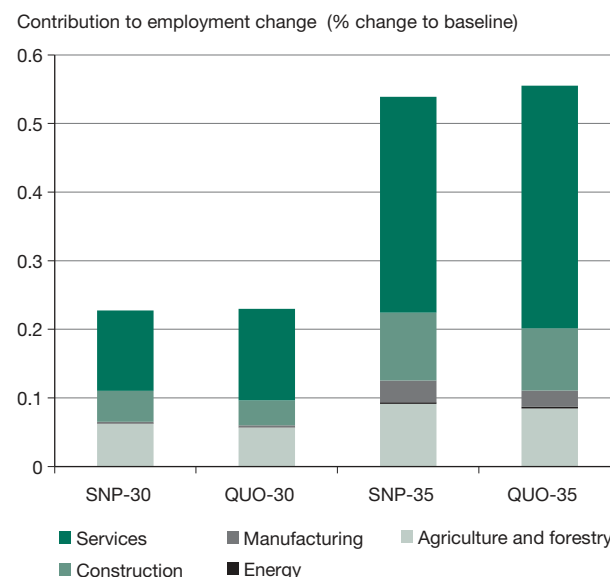
There has been renewed interest in industrial policy lately. Green industrial policy aims at contributing to reaching environmental goals as well as fostering prospects for increased economic growth. The specific rationales for a green industrial policy support a policy orientation which also puts an emphasis on selective industrial policies. However, in order to be implemented successfully, such policies require the coordination of government policy with business strategies and the substitution of smart instrument designs for policies which lead to unsatisfactory results. Another challenge is that green industrial policy must foster diversity in technological solutions to prevent lock-in into too few technologies. Strategic intelligence is needed with regard to markets and cost development, factors relevant for building a lead market and lead supplier position, monitoring and evaluation of policies, and analysis of the impacts of the policies.

An analysis of comparative advantages indicates that green technologies offer considerable potential for a success story. However, the analysis also indicates that strategic positioning should differ with regard to the various technology classes. There is no "one size fits all" strategy, and smart selection and tailoring of policies to technology classes is necessary.

EU policy documents and many of its activities, among them the EcoAP, indicate that the EU is moving towards

¹⁹ V. Duscha, M. Ragwitz, B. Breitschopf, W. Schade, R. Walz, M. Pfaff, E. de Visser, G. Resch, C. Nathani, P. Zagamé, A. Fougeyrollas, B. Boitier: Employment and growth effects of sustainable energies in the European Union, FINAL REPORT, Contract No. ENER/C1/428-2012, Karlsruhe, June 2014.

Figure 3
Sectoral employment effects of increasing renewable energy use, 2021-30



Note: Average EU-level sectoral employment effects of increasing renewable energy demand to 30 or 35 per cent of total energy demand in Europe in 2030 under two energy policy scenarios: the Strengthened National Policies (SNP) scenario, wherein each country uses national support schemes to meet its own target, and the quota (QUO) scenario, in which an EU-wide harmonised support scheme for the electricity sector is assumed.

Source: V. Duscha, M. Ragwitz, B. Breitschopf, W. Schade, R. Walz, M. Pfaff, E. de Visser, G. Resch, C. Nathani, P. Zagamé, A. Fougeyrollas, B. Boitier: Employment and growth effects of sustainable energies in the European Union, FINAL REPORT, Contract No. ENER/C1/428-2012, Karlsruhe, June 2014.

such a comprehensive and coordinated approach. However, there are various challenges which have to be met in order to make green industrial policy a European success story:

- In the context of green industrial policy, environmental policy also acts as a demand-oriented industrial policy. The EU is only partially on track to reach its environmental goals. Increasing the stringency of environmental policy will also increase the demand pull for innovative solutions.
- It is important to coordinate the many different activities at the EU level and avoid sending contradictory signals. Overcoming the fragmentation of policies, in particular between supply- and demand-oriented (environmental) policies, will remain an important aspect of improving the policy process.

- The strategic positioning is likely to differ from technology to technology. Thus, strategic intelligence must be provided on a specific level, too. More strategic intelligence is necessary to avoid policy support being captured by vested interests and in order to concentrate efforts on supporting systemic change.
- European green industrial policy will always be caught between the diverging interests of member states. Thus, the need for coordination of the different government levels will continue. Impact assessments in order to demonstrate that green industrial policy supports the economic interests of member states will be a prerequisite for EU activities. Given the technology-specific level to which green industrial policy has to be tuned, this requires linking technology-specific analyses with

qualitative competitiveness analyses and economic modelling.

The debate about green industrial policies focuses on the European and national levels. However, value chains are becoming increasingly globalised. Smart specialisation and the adaptation of policies to specific circumstances are one strategy to cope with this.

Another option, which needs further exploration, is a transnational approach to industrial policy. This would require strategic positioning along international value chains and coordination of industrial policies among the EU and non-EU countries affected. Green industrial policy may be particularly suited for such an approach, because it focuses not just on economic interests but also on tackling global challenges.

Tim Page

A European Industrial Policy for the New Global Economy

Back in 1978, Communist China had a problem. Shenzhen, in Guangdong province, was less than 32 kilometres from Hong Kong. China, a poor country, was losing tens of thousands of its brightest and best to its non-communist island neighbour. This problem was not new. Communist East Germany had, after all, built a wall in Berlin to prevent the loss of its population to the West. But China's new leader, Deng Xiaoping, took a different approach. Rather than more fencing and border controls, Deng believed that a better idea would be to improve the economy of Guangdong so that young people did not wish to flee in the first place.

Deng, like Mao Zedong before him, was a communist. But unlike Mao, Deng believed that interaction was needed between the market and the state if China was to prosper. So in the spring of 1978, China set about creating an export processing zone in Bao'an county, in Guangdong province, where materials could be brought from abroad to be manufactured by Chinese labourers and then exported without tariffs or other restrictions. Within a few months, what was to become the Shenzhen Special Economic Zone was established.

China's history since then has been well documented. By the late 1980s, the entire 166 kilometre route along the Pearl River Delta, from Guangzhou to Hong Kong, was lined with factories on both sides. Shenzhen's population of 20,000 in 1979 had grown to ten million 20 years later. Deng had wished to bring prosperity to poor Chinese citizens. Explaining his embrace of markets to do so, the communist leader famously said, "It does not matter whether a cat is black or white, so long as it catches mice." Deng also noted that some parts of China would get rich first, but the challenge in the post-Deng era has been to raise the wealth of the whole of this vast country.

The Chinese economy is now the fastest growing in the world. Its rise followed that of Japan and the so-called Four Little Dragons of South Korea, Taiwan, Singapore and Hong Kong. The post-war world which was dominated by the United States and Western Europe is seeing a gradual rebalancing of economic power towards the east. In 2001 the head of Global Economics Research at Goldman Sachs, Jim O'Neill, coined the acronym "BRICs" to describe Brazil, Russia, India and China and their growing importance in the world economy. O'Neill has since spo-

ken of the MINTs – Mexico, Indonesia, Nigeria and Turkey – to describe another group of emerging economies. The message is clear. The world is changing fast. Europe needs to respond.

Margaret Thatcher and the neo-liberal revolution

Before considering that response, however, let us delve once more into late twentieth century history.

In May 1979, a year after the Deng era began in China, the UK also embarked on a new economic journey. Margaret Thatcher, the incoming Prime Minister, rejected the so-called Keynesian consensus, which had been supported by centre-left and centre-right British governments since the end of the Second World War. In its place came neo-liberalism, which minimised the role of the state, rejecting the role of government in shaping an industrial policy. It also sought to weaken trade unions. An ideological soul-mate of Mrs Thatcher, Ronald Reagan, became US President the following year.

During the 1980s, the UK saw a major period of deindustrialisation. Nearly one in four of all manufacturing jobs disappeared within Mrs Thatcher's first term of office. Privatisations and an economic policy geared towards a housing boom followed.

The neo-liberal consensus took hold. The 1997 Labour Government of Tony Blair introduced minimum standards at work, including a national minimum wage. These were important achievements for which the Trades Union Congress (TUC) campaigned hard. But there was no fundamental shift in the dynamics of capitalism. Blair set out to end child and pensioner poverty, but did not seek to address inequality. Manufacturing continued to shrink while the financial services industry of the City of London went from strength to strength. Few questioned this dangerously lopsided economy.

Western European countries did not fully embrace neo-liberalism in the way that the Anglo Saxon economies did, but they nevertheless moved further towards the free market philosophy. At the turn of the millennium, the European Union adopted the Lisbon Strategy, which sought to make the EU “the most competitive and dynamic knowledge-based economy capable of sustainable economic growth with more and better jobs and greater social cohesion” by 2010. This was strongly supported by European trade unions, but as the BRICs assumed a greater role in the world economy and former Eastern European countries joined the EU, focus switched to the need for a high number of European jobs, with much less emphasis

on the quality of those jobs. Deregulation became part of the policy mix, and income inequalities, poverty and exclusion began to rise.

Then, in September 2008, the global financial services company Lehman Brothers filed for bankruptcy. The world entered its most serious downturn since the Great Depression. Economies like that of the UK, which were overexposed to the financial services sector, were hit particularly hard. The downturn caused great pain, in the UK, in Europe and across the world. If it had one silver lining, at least in the UK, it changed the terms of the economic debate. Industrial policy, for so long rejected by policy makers, was back in fashion.

An industrial strategy for Europe

So in 2015, a year before China is due to become the world's largest economy, according to the OECD, where should the EU go next? How do we rebuild the European economy after the downturn, while also responding to the shift in global economic power? Trade unions believe we need a robust industrial strategy as part of a new economic model which values the role of the social partners.

This strategy must recognise the importance of exports – especially to the growing Chinese market, with its rising middle class and increasing taste for consumer goods. There are some who think the rise of China will spell the end of major manufacturing sectors in Europe. They could not be more mistaken. Of course, China has economies of scale. It can easily beat Europe in the production of low-skill, low-value goods, and Europe should not try to compete on those terms. China also wishes to move up the value chain, so the coming years will not be easy for the West. But China cannot produce everything. Interviewed for the TUC report “The Way of the Dragon”, the Minister for Manpower and former trade union leader from Singapore, Lim Swee Say, said, “for any economy not able to compete with China, China will be a big threat. Probably the biggest threat. But for any economy that's able to compete with China, then China will be probably one of the biggest opportunities.”¹ Moreover, not only will China want to buy Western goods, but we know very precisely which goods it will want to buy, because China sets out its strategy in a five-year plan. The 12th Five-Year Plan, published in March 2011, identified seven strategic future industrial sectors. The Chinese government has encouraged foreign business participation in the development of these sectors. This is a huge opportunity for European

¹ The Way of the Dragon, TUC, 2014, p. 14.

companies that should not be lost. A 13th Five-Year Plan will follow next year, along with more possibilities.

China also invites us to rethink the relationship between state and market in a modern democracy. Deng Xiaoping threw out China's hard-wired belief that the state was infallible. Should the West do the same with markets? The dynamism of markets must be recognised and protected, of course, but it was a belief in the infallible market that led the UK to reject its previous industrial strategy, losing much of its manufacturing base in the process. Dr Hu Angang, the respected Chinese economist, sets out a very specific blueprint, including goals for economic growth, structural reform, common prosperity, education, science and technology, sustainable development, social harmony, and democracy and the rule of law.² While the advisability of strict targets is debateable, the former Deputy Prime Minister, Michael Heseltine, called on the UK government to "produce an overarching and long-term National Growth Strategy and its vision for wealth creation, with concrete commitments against which it can be held to account."³ This envisages the government shaping the market, not the other way around.

Europe must increase its spending on research and development as a matter of urgency. South Korea spends five times as much on R&D as most European countries, whilst also having the world's fastest Internet bandwidth. Half of the total number of employees at Tencent Inc, China's largest Internet service portal, work in research and development. As both countries are still catching up with the West, Europe can withstand this difference for now. In the longer term, however, such a disparity is unsustainable. In the UK, the Secretary of State for Business in the last government, Vince Cable, called for a doubling of innovation spending. Over time, such an increase is necessary. It remains to be seen whether the new UK government recognises the urgency.

Employment creation

Industrial strategy must embrace employment creation. For a person of working age, a good job is a cornerstone to a good life. It is the best defence against poverty. Yet in the UK, it is assumed that the market will provide the necessary jobs. This assumption has clearly been shown to be false. As it moves from the age of the "iron rice bowl" to an open market economy, China responds to genuine

fears about employment by targeting "employment-intensive, high-technology, and new technology industries and ... modern service industries, especially those that are information, knowledge and employment intensive".⁴ There will never be an exact match between desirable industries and desirable jobs, but where possible, a modern industrial strategy should be employment-specific, targeting industries which could be export-rich as well as sectors that deliver high quality, well-paying jobs for working people.

The greening of the economy

The greening of the economy has often been described as the "next big thing" after the development of the Internet. Mazzucato argues that Europe, the US and China dominated global new investment in renewable energy between 2004 and 2011, with Germany leading this investment in Europe.⁵ This contrasts with the UK's stop-start approach to green initiatives: the outgoing government's 2010 pledge to be the "greenest government ever" actually saw a cut in spending, leading to the scaling back of green technologies.

It is clear that government must drive the green revolution. The private sector will not rise to this task, and if government does not step in, European countries risk once again being left behind. One interviewee told "The Way of the Dragon" that the scale of investments that China is making in the seven strategic industries of the 12th Five-Year Plan is on a par with the investments that the US made in the 1950s in the computer age – the very foundations of computer science and the internet that were planted in the 1950s in the US. Those comparable sums of human efforts in finance and research are now taking place in China on the technologies of the future and they are not being strategically matched by any western economy.

Europe's vital democratic strength

It is easy to become excited about the achievements of China over the last thirty years. While those achievements have been considerable, let us pause for one moment. China is not a democracy in the sense that the West understands the word. This does not mean its government can do whatever it wishes – life is never that simple – but it nevertheless proceeds in a way that would not fit the values of Europe. China has achieved what it has because

2 H. Angang: China in 2020: A New Type of Superpower, Brookings Institute Press, 2011.

3 M. Heseltine: No Stone Unturned in Pursuit of Growth, BIS, October 2012, p. 203.

4 H. Angang, op. cit., p. 137.

5 M. Mazzucato: The Entrepreneurial State, London 2013, Anthem Press.

of a top-down approach to economic development that would be incompatible with the European tradition. Europe must meet the challenge of China on its own terms, and from the bottom-up.

Part of Europe's democratic heritage is the role and importance of free trade unions. The All-China Federation of Trade Unions (ACFTU) is an important body in China, acting as a conduit for discussions in the workplace and giving a workers' perspective to change. But the ACFTU is not a free trade union and so, again, it cannot be part of a role model for Europe. As readers would expect, the TUC supports an active and vibrant trade union movement and, in our view, that union voice should be heard as companies make important decisions about their future. Europe's strongest economy, Germany, is a social market economy which values the opinions of the workforce as it does those of employers.⁶ Central to this is the concept of "co-determination", which allows a workers' voice through Works Councils and Supervisory Boards. Martin Rosik, Human Resources Manager at Volkswagen in Wolfsburg, states:

From my point of view co-determination does not make it more difficult to take important decisions, but it depends on the way this kind of influence is used by the labour representatives and the company. There is a big common sense that competitiveness and labour welfare are directly linked to each other.⁷

A wealth of evidence shows that high-performance workplaces, which include a strong workers' voice, enjoy higher productivity and profitability. For example, Tusemann et al. studied worker representation, employee participation and employment relations in German subsidiaries in the UK and their associated impact on firm performance.⁸ They found that German subsidiaries are more likely than their US counterparts to use participative systems that afford independent worker structures, which take the form of trade unions in the UK, a role in the decision-making in the introduction and operation of comprehensive direct employee participation schemes. Tusemann et al. argue that this is because a majority of German multinational companies use a German works council model, which alongside sectoral collective bargaining, promotes trust, cooperation and long-term perspective in management-works council relations

in Germany. The study also finds that German subsidiaries with trade union recognition exhibit above-average productivity.

Sadly, the new Conservative government in the UK wants to go in the opposite direction. Rather than embrace trade unions as partners, the Business Secretary, Sajid Javid, has indicated that an early priority of the government will be to make legal strikes more difficult. In order to be legal, 50 per cent of those entitled to vote must take part in the ballot. In public services such as health and education, 40 per cent of those entitled to vote must be in favour of strike action for such action to be possible. Strikes are, of course, a last resort, but the right to strike is a hallmark of a democratic society. The government would do better to focus its efforts on genuinely supporting good industrial relations.

A strong Europe

Finally, a European industrial policy requires a strong Europe. The challenges facing our continent are great, but so are the opportunities for Europe to move out of the crisis and compete on the world stage with the growing power of China and India. Following the UK election, there will be a referendum on Britain's membership in the EU by 2017. Trade unions, along with the majority of businesses, will be campaigning hard for the UK to remain central to the European Union. Anything else would spell disaster for our industries.

Conclusion

In conclusion, there is no law of economics to say that Europe cannot succeed in the 21st century. Our success simply depends on how we respond to new challenges. For example, Singapore operates on the principle that where other countries can be cheaper, Singapore has to be better. If other countries are better, Singapore has to be cheaper.

Europe clearly cannot be cheaper at our stage of economic development. We can only be better. That means higher quality skills, more research and development, and greater investment in infrastructure and in future technologies. It means identifying those niche industries where we have world-class companies and developing what the rest of the world wants to buy. It also means including all of our citizens, with managers and trade unions working together to build strong, successful and fair workplaces.

6 The social market model is discussed at length in German Lessons, TUC, 2011.

7 Democracy in the workplace, TUC, 2014, pp. 27-28.

8 H.-J. Tusemann, F. McDonald, A. Heise, M. Allen, S. Voronkova: Employee Relations in Foreign-Owned Subsidiaries: German Multinational Companies in the UK, Basingstoke 2007, Palgrave Macmillan.