EU State Aid Control

EU State Aid Control

Law and Economics

Second Edition

Edited by

Philipp Werner
Vincent Verouden

BOOK EXTRACT: CHAPTER 10
Research, Development and Innovation Aid, IPCEI
Jan Bonhage & Otto Toivanen

Reprinted from EU State Aid Control: Law and Economics, Second Edition (Philipp Werner and Vincent Verouden, eds.), 2025, with permission of Kluwer Law International

Wolters Kluwer

Published by:
Kluwer Law International B.V.
PO Box 316
2400 AH Alphen aan den Rijn
The Netherlands
E-mail: lrs-sales@wolterskluwer.com
Website: www.wolterskluwer.com/en/solutions/kluwerlawinternational

Sold and distributed by:
Wolters Kluwer Legal & Regulatory U.S.
920 Links Avenue
Landisville, PA 17538
United States of America
E-mail: customer.service@wolterskluwer.com

ISBN 978-94-035-2497-9

e-Book: ISBN 978-94-035-2507-5
web-PDF: ISBN 978-94-035-2517-4

Printed in the Netherlands.

Editors

Philipp Werner is a Rechtsanwalt and Partner in Jones Day's Brussels Office. He focuses on German and EU competition law, State aid law, and the Foreign Subsidies Regulation (FSR). He has extensive experience advising clients in EU, German, and multi-jurisdictional merger control matters. He also advises on antitrust procedures, litigation and compliance, including internal investigations and audits, compliance programmes, and compliance training. A major part of his practice relates to EU and German cartels and abuse of dominance investigations and counselling. Philipp is a recognised leader for high-profile State aid cases, advising and representing government and public bodies, aid beneficiaries, and third parties in particular in EU Commission investigations and before the European and national courts. Philipp is also advising clients on the FSR, including on compliance and notifications in M&A and public procurement cases. He leads the Firm's FSR Task Force. Philipp has been recognized by all major publications, including *Who's Who Legal*, as a global elite 'Thought Leader' in competition and State aid law. He is a frequent speaker on competition and State aid law and has published numerous articles and contributions in these areas. Philipp is an advisory board member of the Berliner Gesprächskreis für Beihilfenrecht e.V. (Berlin State Aid Roundtable), a member of the Studienvereinigung Kartellrecht e.V., and the antitrust section of the American Bar Association.

Vincent Verouden is a competition economist with over 20 years' experience in antitrust, merger control and State aid control. He works as a Senior Expert at the European Commission (DG Competition) in the unit responsible for the *ex post* evaluation of competition policy and enforcement, impact measurement, and the monitoring of the state of competition in the EU. Until December 2021, he was a member of the European Commission's Recovery & Resilience Task Force, set up in the wake of the COVID-19 crisis to coordinate the implementation of the EU's Recovery & Resilience Fund (RRF). Prior to joining the Task Force, he worked as a Director of an economic consultancy firm active in the field of competition economics (2014-2019) and held various positions in DG Competition's Chief Economist Team, including that of Deputy Chief Economist (2012-2014). He is a member of the Editorial Board of the European State Aid Law Quarterly and the author of numerous articles and publications on competition economics.

Contributors

Jan Bonhage is a partner at Hengeler Mueller based in Berlin, specialising in EU, constitutional and public law, as well as public procurement and state aid. He regularly publishes on Antitrust and State aid matters.

Antonios Bouchagiar is a member of the Legal Service of the European Commission, working in the team dealing with institutional aspects of EU law and data protection, while before that he worked in the team in charge of EU State aid law. He teaches competition law at the Vrije Universiteit Brussel (Brussels School of Governance), as well as at the Brussels School of Competition.

Xavier Boutin is a managing director at the Berkeley Research Group. Prior to this, he was an expert at another leading consultancy before founding his own consulting practice. He was also a member of the Chief Economist Team of the European Commission and contributed in this role to the State Aid Modernization.

Albert Bravo-Biosca is the founding director of the Innovation Growth Lab (IGL) at Nesta and BSE, focusing on developing experimental and evidence-based approaches to enhance innovation and productivity.

Caroline Buts is a professor and vice-dean at the Faculty of Social Sciences and Solvay Business School of the Vrije Universiteit Brussel where she teaches European Integration and Competition Policy. She is a founding member and current chair of the Brussels Centre for Competition Policy. Since 2014, Caroline has been a managing editor of the European State Aid Law Quarterly.

Marc Chovino has been working at the European Commission since 2009, in the Directorate General for Competition, currently serving as deputy head of the unit for State aid in the transport sector.

Adina Claici is a managing director at Berkeley Research Group, based in Brussels. In addition to her consulting work, she is currently a visiting professor at the College of Europe as well as at the Barcelona School of Economics.

Giuseppe Conte is currently working in the Business team at the European Commission's Legal Service, having previously been in the Legal Service's State aid and Competition teams.

Cees Dekker is an advocaat with over 35 years of experience, advising on EU and Dutch Competition law, focusing on State aid and foreign subsidies, and acts as a consultant to Simmons & Simmons. He is also a lecturer on State aid at the University of Amsterdam.

Jacques Derenne is a partner at Sheppard Mullin (avocat, Brussels & Paris) and head of EU Competition & Regulatory, with over 35 years of experience in EU competition law, EU law, litigation & regulatory. He is also a professor of State aid law at the University of Liège and the Brussels School of Competition.

Sean Ennis is CCP Director and Professor of Competition Policy at the University of East Anglia and TILEC Extramural Fellow at Tilburg University.

Laurent Eymard is a managing director at Berkeley Research Group, based in Brussels and Paris. He has more than 15 years of experience advising clients in a wide range of State aid and competition cases across many sectors.

Alessandra Fratini is a partner with FratiniVergano-European Lawyers in Brussels, where she is responsible for the Competition and EU Law practice. She is admitted to Italy and is a member of the Brussels Bar.

Hans W. Friederiszick is a director at E.CA Economics and a research fellow at ESMT Berlin. He was a member of the first Chief Economist Team, DG Competition (2003 to 2006).

Christine Gerlach is a fully qualified German Lawyer and works as a Senior Advisor for European Legal and Public Affairs at the Brussels Liaison Office of the German Public Service Broadcaster ARD.

Elżbieta Głowicka is a director at E.CA Economics providing economic expertise in the evaluation of State aid rules, State aid control, mergers, antitrust and cartel litigation across European jurisdictions.

Leigh Hancher is a professor of European law at the University of Tilburg, part-time Professor of Energy Law at the Florence School of Regulation, and Of Counsel at Baker Botts LLP in Brussels.

Hein Hobbelen is a Competition and Trade Partner at Bird & Bird in Brussels admitted to the Brussels and Amsterdam bars. He currently is a Member of the Advisory Council of the Centre for a Digital Society at the Florence European University Institute and a Guest lecturer at Leuven University in the Post-Graduate Studies ICT, IP and Media Law programme.

Michael Honoré, LLM, is a founder and managing partner at Honoré, Fallesen & Andersen based in Copenhagen. He has more than 25 years of experience in competition law, state aid law and general EU law. He is also a member of the Editorial Board of the European State Aid Law Quarterly, academic director at Lexxion and co-founder and vice chairman of the Danish State Aid Law Association.

Pablo Ibáñez Colomo is a professor of Law at the London School of Economics and Political Science. He is also a visiting professor at the College of Europe (Bruges), Joint General Editor of the Journal of European Competition Law & Practice (Oxford University Press) and co-editor of the Chillin' Competition Blog.

Mohammed Khalil is a partner at Oxera Consulting based in London, advising clients on State aid matters across a number of sectors.

Max Klasse is a partner at Blomstein based in Berlin, specialising in State aid law, German and EU competition law, and the Foreign Subsidies Regulation.

Athena Kontosakou is a counsel in the Brussels Office of Quinn Emanuel. Athena is also a Guest lecturer at Queen Mary University (London and Paris).

Alfonso Lamadrid de Pablo is a partner at Garrigues and the head of the firm's Brussels office. Alfonso is also a visiting professor at the College of Europe (Bruges) and at the Brussels School of Competition (Brussels) and co-editor of the Chillin' Competition Blog.

François-Charles Laprévote is a partner at Cleary Gottlieb based in Brussels, specialising in antitrust and State aid law.

Dimitrios Magos is a case manager in the Chief Economist's team at the European Commission, DG Competition, focusing on State aid control as a State aid coordinator.

Frank Maier-Rigaud is managing director at ABC Economics, where he leads a team of 15 specialised economists. He remains a professor in the Department of Economics and Quantitative Methods at the IÉSEG School of Management in Paris/Lille, the Université Catholique de Lille and a member of LEM-CNRS.

Stephen Mavroghenis is a partner at Goodwin in Brussels, focusing on competition law, State aid, and EU regulatory law.

Massimo Merola is the managing partner responsible for the Brussels Office of BonelliErede law firm and is the scientific director of the firm's European Law group. In conjunction with his active legal practice, Massimo Merola has been a professor for thirty years at the College of Europe, Bruges and a lecturer (Conférencier) at Université Paris II, Panthéon-Assas, since 2018.

Till Müller-Ibold is a professor of Law at Passau University in EU Competition law, as well as senior counsel at Cleary Gottlieb Steen and Hamilton in Brussels.

Damien Neven is a professor of Economics at the Graduate Institute of International and Development Studies in Geneva. Previously, he acted as Chief Competition Economist at the Directorate-General for Competition of the European Commission (2006 – 2011).

Phedon Nicolaides is a professor of European Economic Law at the University of Maastricht and the University of Nicosia, with a focus on economic integration and competition policy.

David Pérez de Lamo is an associate at Cleary Gottlieb Steen & Hamilton LLP. He is also Editor of EU Law Live's Competition Corner and has worked as a law clerk at the Court of Arbitration for Sport (CAS/TAS).

Florian Reiter-Werzin is a principal associate in Freshfields' Antitrust Competition and Trade team, specialising in EU and Austrian competition law with a focus on State aid law across various sectors.

Nicole Robins is a partner at Oxera Consulting LLP in Brussels, leading the State Aid and Subsidy Control practice and advising clients on economic and financial issues in State aid cases across various sectors.

Ida Rødseth is the Chief Economist at the EFTA Surveillance Authority (ESA) in Brussels, focusing on antitrust and State aid enforcement.

Virginia Romero Algarra is a senior associate at Garrigues, following prior experiences as an associate at Cleary Gottlieb (2013-2018) and at Toyota (2018-2020).

Alexander Rose is a Partner in DWF's Commercial and Competition Law team, who has been at the forefront of the development of the UK's new Subsidy Control regime.

Lluís Saurí Romero is Deputy Chief Economist at the European Commission's Directorate-General for Competition.

Hannah Schauf is a fully qualified German lawyer and obtained her PhD in Law from the Johannes Gutenberg University of Mainz. She works as an in-house lawyer in the legal department of the German public service broadcaster Westdeutscher Rundfunk – WDR, Cologne.

Adam Scott is Director of Studies of the UK Competition Appeal Tribunal, of which he was a founding Member.

Ulrich Soltész is a partner at Gleiss Lutz in Brussels. He has practised in the fields of European competition and state aid law since 1997. Ulrich is the chairperson of the board of the Berlin Round Table on EU State aid law. He is a co-editor of Neue Zeitschrift für Kartellrecht and Europäische Zeitschrift für Wirtschaftsrecht.

Fabrizio Spargoli works as an economist at the EFTA Surveillance Authority (ESA) in the Competition and State Aid department. Prior to that, he was a member of the Chief Economist Team of DG Competition, focusing on the area of State aid control.

Oliver Stehmann has worked in DG Competition in the antitrust, merger and state aid fields, and as a former deputy chief economist. For 10 years, he taught at the Brussels branch of Boston University as an external lecturer.

Kai Struckmann has been practising EU law at the institutional level as well as private practice in Brussels for more than 20 years. He currently is a partner with Deloitte Legal where he is the leader of the firm's EU Law & State Aid Center for Excellence. He advises and litigates on a broad range of questions of EU law, with a focus on antitrust and competition, and has specific expertise concerning the application of the EU competition rules in the energy sector as well as the interface between EU law and investor-state arbitration.

Isabel Taylor is a partner at Slaughter and May, specialising in competition law and State aid law, advising government and private sector clients across various industries on merger control, regulatory requirements, and public procurement.

Otto Toivanen obtained his PhD from the University of Warwick and is now a professor at Aalto University and the Academic Director of the Helsinki Graduate School of Economics.

Michael Troege teaches Finance at ESCP Business School in Paris, focusing on game theory and commercial banking, particularly the competitive dynamics in credit markets.

Zsolt Udvari is a manager at Analysis Group, specialising in competition economics. He was formerly a postdoctoral researcher and lecturer at ECARES, Université Libre de Bruxelles.

Koert van Buiren is a managing director at Amsterdam Bureau for Economics/Economisch Bureau Amsterdam. Koert specialises in the economics of state aid and public procurement and has over 25 years of experience in economic research and consultancy in these fields.

Daniele Vidoni is a policy coordinator at the European Commission's Directorate-General for Education and Culture. From 2018 to 2024, he worked in DG Competition, within the State Aid Case Support and Policy Unit, where he was responsible for the evaluation of large State aid schemes.

Andreas von Bonin is a partner in Freshfields' antitrust, competition and trade group in Brussels, focusing on European competition law, EU State aid, and regulatory procedures.

Baptist Vleeshouwers is a counsel in Bird & Bird's EU, Competition, Trade & RPA practice in Brussels. Alongside his active legal practice, Baptist is a regular speaker at international conferences and educational programmes, including the ERA Academy of European Law and the European University Institute's Centre for Digital Society.

Udo Woll heads the unit for Public Commercial Law, State Aid Law, and Public Transport Contract Law at Deutsche Bahn AG, overseeing a team that advises on both German and EU activities.

Summary of Contents

CHAPTER 10

Research, Development and Innovation Aid, IPCEI

Jan Bonhage & Otto Toivanen[*]

1 INTRODUCTION

It is well established that productivity growth rests on systematic work towards innovation, much of which is conducted as research and development. Promoting research and development and innovation ('RDI') is an important objective of the European Union ('EU'), as stressed in Article 179 of the TFEU. As market failures arise in the context of RDI for a range of reasons, state intervention can improve the functioning of markets and thereby contribute to this vital part of EU policy.

What often goes unmentioned in discussions about RDI aid, however, is that such policy tools should be seen as part of a much broader canvas, though recently, this aspect has gained attention. Takalo and Toivanen (2015),[1] for example, talk about the importance of what they call indirect innovation policies; Bloom, Van Reenen and Williams (2019)[2] similarly emphasise the role of many other policy tools besides RDI aid in improving productivity growth. In contrast to direct investments by States in specific research and development ('R&D') projects, education, general tax policies, labour market regulation, or even patent or bankruptcy law are rather remote from specific R&D projects or from the notion of R&D in general but can indirectly have a comparable, or even bigger, overall impact on RDI in a society.

---

* The views expressed in this chapter are purely those of the authors and do not necessarily represent those of Aalto University, Helsinki Graduate School of Economics and Hengeler Mueller.

1. Takalo, T. & Toivanen, O. (2015). Economics of Innovation Policy. Nordic Economic Policy Review (2015), 2, 65-90.
2. Bloom, N., Van Reenen, J. & Williams, H. (2019). A Toolkit of Policies to Promote Innovation. Journal of Economic Perspectives (2019), 33, 3, 163-184 https://doi.org/10.1257/jep.33.3.163.

The legal implementation of such policies is as diverse as their regulatory environments. The strict EU state aid control pursuant to Articles 107 et seq. of the TFEU generally applies only to direct forms of state intervention. Rather, remote national policies, such as education or EU support, typically do not fulfil all criteria of the notion of state aid, as laid out in Part I of this edited volume.

As far as RDI policies constitute state aid, they must be compatible with the internal market, pursuant to Article 107(2), (3) of the TFEU. Thereby, state aid control translates the economic considerations into legal terms, ideally promoting the maximum social surplus,[3] i.e., a practice where the ratio between the social returns and private returns is highest.[4] In fact, also the European Commission ('EC') has for some time been subscribed to a more economic approach to its state aid control, facilitating 'aid which is well-designed, targeted at identified market failures and objectives of common interest, and least distortive ("good aid")',[5] as part of its State Aid Modernisation (SAM).

The objective of this chapter is to provide an overview of the law and economics of RDI aid. We proceed by discussing the economic and legal background of RDI aid in sections 2 and 3. The sections following these are devoted to separate policy tools put in place by the EC to provide for more effective and targeted state aid: The General Block Exemption Regulation (section 4), the RDI Framework (section 5) and aid for important projects of common European interest (IPCEI, section 6).

2 ECONOMIC BACKGROUND OF RDI AID IN GENERAL

2.1 The Economic Concept of RDI Aid

The economic rationale for RDI aid rests on the concept of market failure. What economists mean by this concept is that the market, left on its own, does not necessarily allocate resources optimally. If this is the case, and only then there is scope for government action. One may wonder whether this approach provides motivation for government intervention in all markets, as casual observation suggests that a market achieves a suboptimal allocation of resources more often than not. Be the accuracy of casual observation high or low, one needs to consider not only whether there is room for improvement but also whether the government has the ability to improve the situation.

3. *EC*, Communication on a Framework for State aid for research and development and innovation (2022/C 414/01) ('RDI Framework'), para. 39.
4. Takalo, T. & Toivanen, O. (2015). Economics of Innovation Policy. Nordic Economic Policy Review (2015), 2, 65-90.
5. *EC*, Communication to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the regions on EU State Aid Modernisation (COM/2012/0209 final) ('SAM Communication'), para. 12.

Research and development investment is, however, a textbook example of an arena where the consensus of economists is that government intervention is warranted. To cite just one example, Jones and Williams (1998)[6] estimate that the US massively underinvests in R&D compared to what would be the socially optimal level. Other researchers have reached similar conclusions.

A few (sources of) market failure stand out in the discussions on RDI aid. First among them are positive knowledge spillovers. By these, economists mean that a private investor would and could not reap all the rewards that stem from these investments. This means that there is a wedge between social and private returns to the investment, with the former being larger than the latter. In such circumstances, society would want to see larger investments than what would be directly profitable for an individual private investor.

The literature often stresses the role of knowledge created through the investment benefiting other parties, e.g., the rivals of the investing firm. There is ample evidence that firms benefit from the knowledge others have created: prima facie evidence of this is that firms cite previous patents in their patent applications, therefore building on previous knowledge.[7] Indeed, every invention builds on prior knowledge – just think of the length of time it takes to educate an engineer in the art and craft of a specific area. All that time is spent learning existing knowledge in order for the newly crafted engineer to be able to build on it.

A specific form of spillover accrues through agglomeration benefits.[8] This term usually refers to the benefits that knowledge-intensive firms get from locating close to each other. Such co-location means more intense knowledge spillovers between firms but also a thicker job market which benefits both employers and employees. Often, such agglomeration also leads to local public goods being better tailored for the type of employees the firms need, e.g., in the form of higher quality public schools, etc.

Another surprisingly neglected source of a wedge between social and private returns is consumer surplus. Think back to any gadget or service you have recently bought that builds on modern technology. Were you just indifferent between buying and not buying the product? Most likely not, and if that was the case, you received a consumer surplus from the purchase. Obviously, this surplus is generated by the inventions embedded in the product you bought, and equally obviously, you captured them, not the inventing firm. Looking back, it is clear that research and development lie behind many of the most important product introductions: think of personal computers, mobile phones, biological pharmaceuticals and online services, to name but a few.

6. Jones, C. & Williams, J. (1998). Measuring the Social Return to R&D. Quarterly Journal of Economics (1998), 113, 4, 1119-1135 https://doi.org/10.1162/003355398555856.
7. A classic reference is Jaffe, A., Trajtenberg, M. & Henderson, R. (1993). Geographic Localization of Knowledge Spillovers as Evidenced by Patent Citations. Quarterly Journal of Economics (1993), 108, 3, 577-598 https://doi.org/10.2307/2118401.
8. Moretti, E. (2004). Human Capital Externalities in Cities, Handbook of Regional and Urban Economics (2004), 4, 2243-2291, North Holland-Elsevier.

Both of the above points – knowledge spillovers to other firms and consumer surplus – highlight an important issue:[9] which knowledge spillovers should one care about? Whose consumer surplus should one take into account? These are questions for the policymaker. A global policymaker would equally value knowledge spillovers from a European firm to another European firm and to a non-European firm. Is this true, or should this be the case for a European policymaker who is using European tax money to fund the RDI aid? Similarly, should a policymaker in a given Member State take into account knowledge spillovers that flow into other Member States when using local tax money? Same arguments apply to the question of whether and whose consumer surplus to take into account in deciding on RDI aid.

These are questions of first-order policy importance. They suggest that the arguments for RDI aid are stronger at the EU than at a Member State level, raising the question of the division of labour between the Commission and the individual Member States.

The second most often cited alleged market failure are various financial market imperfections. Investments are always based on calculations of expected discounted profits. The accuracy of such calculations is debatable as the future is uncertain. It stands to reason that such calculations are even more uncertain when the investment is aimed at RDI, for two reasons: first, there is not only uncertainty on market conditions but also on whether or not the research succeeds or not. Second, the time until the cash flow turns positive lies, in general, further in the future for RDI than for a regular investment, making prediction more difficult. To the extent that uncertainty increases the cost of funding, RDI investments have to pay higher interest rates than regular investments of the same size. Notice, though, that such a gap in cost of funding is not a market failure but stems from fundamental differences in the types of projects that are considered. So what is supposed to be a market failure is in fact a typical case of incomplete information of which there are two types: either the 'type' where the entrepreneur or the project is not fully known to the funder, or else the funder cannot observe all the 'actions' of the investor. The former is labelled adverse selection, and the latter moral hazard.

The problem created by adverse selection is that potential funders have to worry about the possibility that the skills of the firm are not what they seem to be, e.g., that the firm's ability to carry out the R&D is worse than it seems. The problem for the funder is that a given level of funding cost might be acceptable to the not-so-skilled firm but unacceptable to the more skilled. At the same time, the funding cost could be at a level that makes funding profitable only if other (also) high-skilled firms are interested. In such circumstances, everybody might be left without funding.

Moral hazard creates a different challenge. Here the question is whether the funder can rely on the firm making the right decisions from the funder's point of view in circumstances where the funder does not have the same information as the firm. If not, moral hazard ensues. The firm that benefitted from the investment might, for example, be willing to continue the project longer than what would be feasible from the

9. *Ibid*.

funder's point of view, even when it is becoming likely that the project should be abandoned.

Financial market participants are well aware of these phenomena,[10] and a host of institutional arrangements have been invented to ameliorate the problems that adverse selection and moral hazard can create. These actions notwithstanding, it is likely that problems of incomplete information are larger regarding RDI investments in comparison to other investments.[11]

Notice that the different market failures that could motivate RDI aid are not mutually exclusive, nor do they need to coexist to motivate the use of public funds for private purposes: it is conceivable that an R&D project generates high social returns to private returns ratio even in the absence of any financial market imperfections. Similarly, it could be that an R&D project would not be carried out at all, or to insufficient scale in the presence of financial market imperfections. In such a case, public funding could improve welfare even when the social returns to private returns – ratio is not very high.

2.2 Reasons and Limits for RDI Aid

We have outlined the economic rationales for RDI aid above. It is prudent now to give a few words of caution. From an economic perspective, identifying a market failure is the first step towards implementing a government policy to foster private RDI investment. That should, however, not be enough, as the follow-up question of whether or not the government can improve the situation in a meaningful way needs to be asked next. The concept of government failure encapsulates this idea.[12]

Applying the principle that public money should be channelled to RDI projects with the highest social returns to private returns – ratio necessitates that the government can estimate both. What would this take? It means that the engineers working for the government should be able to estimate both the social returns, including knowledge spillovers and consumer surplus and private returns, i.e., profits, on a long-term horizon. Recent research suggests that several schemes manage this[13] but that the room for improvement may be small.[14] Research also shows that the efficacy of the

10. Lerner, J. & Merges, P. (1998). The Control of Technology Alliances: An Empirical Analysis of the Biotechnology Industry. Journal of Industrial Economics (1998), 46, 2, 125-156 https://doi.org/10.1111/1467-6451.00066. Kaplan, S. & Strömberg, P. (2003). Financial Contracting Theory Meets the Real World: An Empirical Analysis of Venture Capital Contracts. Review of Economic Studies (2003), 70, 2, 281-315 https://doi.org/10.1111/1467-937x.00245.
11. Santoleri, P., et al. (2020). The Causal Effects of R&D Grants: Evidence from a Regression Discontinuity. SSRN Electronic Journal (2020), https://dx.doi.org/10.2139/ssrn.3637867.
12. Holmström & Myerson (1983) provide an important analysis of how incomplete information affects the social planner's problem of which policy to choose. Holmström, B. & Myerson, R. (1983). Efficient and Durable Decision Rules with Incomplete Information. Econometrica (1983), 51, 6, 1799-1819 https://doi.org/10.2307/1912117.
13. *Ibid*.
14. Acemoglu, D., et al. (2018). Innovation, Reallocation, and Growth. American Economic Review (2018), 108, 11, 3450-3491 https://doi.org/10.1257/aer.20130470. Takalo, T., Tanayama, T. & Toivanen, O. (2022). The Welfare Effects of R&D Support Policies. Bank of Finland Research Discussion Paper 02 (2022).

R&D subsidies is limited by the fact that only a rather small fraction of eligible firms actually apply for subsidies.

The challenges in granting RDI aid can be illustrated by looking at two simple forms of it: RDI subsidies and RDI tax credits. Regarding the design of an R&D tax credit, the government should first understand that the selection of firms that make use of an R&D tax credit is very different from the selection of firms that make use of an R&D subsidy. There are three reasons for this: First, regarding the tax credit, there is less of a selection regarding which firms apply to make use of them. Second, there is no selection from the side of the government as long as the applicants satisfy the formal criteria. Third, the government should understand that the firms use the R&D tax credit by applying their own criteria, i.e., where the private return is the highest, rather than the government's criteria of social return.

Besides the above arguments, the government should also take into account the possible competition-distorting effects of R&D subsidies. One often talks about the maintenance of a 'level-playing field'. Here, a clear distinction needs to be made regarding *ex ante* and *ex post* points of view. With clear and transparent rules, all firms and all technologies are on an equal footing, but the situation may be different afterwards. A thorny question from a political, and sometimes even from an economic theory point of view is whether a government (national or supranational) should favour some technologies over others. Evidence of the ability of governments to 'bet' on the right technologies is rather dismal, yet, at the same time, systemic changes, like mobile phone standards, may require coordination. The European policy tools are somewhat contradictory in this regard, as the basic principle is one of technology neutrality, yet some tools, such as IPCEI, seem designed to allow for choosing (to favour) a particular technology.

Still, an important aspect of all state aid is that even when it, in principle, satisfies the criteria set out by economics, the implementation may or may not deliver the sought-after behavioural changes or changes in outcomes. It is therefore instrumental that all such aid schemes are rigorously evaluated on a systematic basis. The modern economics literature provides a rich toolbox for such empirical evaluations. What is often neglected though is the emphasis that those tools, even when prudently used, often only partially answer the policy-relevant questions.

As an example, the recent study by Santoleri et al. (2022)[15] produces convincing evidence that the EU Small and Medium Enterprise Instrument increases patenting, the probability of obtaining private equity funding, and growth, whether measured by assets or by the number of employees. The study is implemented using the so-called Regression Discontinuity Design, which seeks to compare outcomes for applicants just below and above the acceptance threshold. This comparison is made possible by the fact that the funding scheme employs experts who grade the applicants; the applicants are then ranked according to this grade. Only the highest-ranked applicants receive aid (i.e., all those for whom the budget enables the agency to grant aid).

15. *Ibid*.

There is a caveat to the interpretation and usefulness of the results of this well-crafted analysis: its results apply to the firms at the acceptance threshold. The study is therefore unable to answer what the effects would be for applicants further away from the threshold, either below it (applicants that would have received funding if the budget had been larger) or above it (the very good applicants who might have received all the necessary funding from private sources had the instrument not been available). Furthermore, the analysis does not answer the social cost-benefit question – recall the principle advocated earlier that money should be channelled to the projects with the highest social returns to private returns – ratio. The setup of the study does not allow one to assess whether this was or was not achieved, nor what the social and private returns are. These observations are not a criticism of the study, rather are made to illustrate the point that the informational needs of policymakers are vast.

It is important to put these words of caution into context: it is of utmost importance that such tools are used and used more in the future than has been the case heretofore. At the same time researchers have to be transparent about their ability to provide policymakers information that they need to design as good support schemes as possible.

Given the structure of European decision-making, one needs to find a way to balance decision-making at the national and supranational levels. One approach is to try to design a decision-making system, granting different types of RDI aid in a way that maximises Union-level social surplus. Another approach is to try to address the constraints that arise from the fact that different Member States may have diverging objectives and that transfers between Member States are difficult to organise. It is also true that the level of information available to decision-makers may be different at the local and the supranational level; this should also be taken into account in designing the optimal policy-mix. In any case, some form of alignment between national and supranational decision-making has to be found. Several of the structures we observe can be interpreted to serve exactly this purpose.

As a final issue, one needs to consider what types of policies are in place in other countries. Concurrently, the US Inflation Reduction Act has created a vocal discussion about whether the international level-playing field gets distorted and, if so, what the best European approach would be. IPCEI is a European tool that explicitly allows to take such policy measures in other countries into account in deciding about aid. More generally, policymakers need to keep their heads cool. There is ample evidence that competition in granting aid may be a no-win situation where everybody loses. If one wanted to be provocative, one could ask: isn't it in the interest of Europeans to let China heavily subsidise solar panel production as they thereby gain access to very cheap solar panels? The answer of course depends on what happens in the long run: does Europe run the risk of losing (or not gaining) an inventive edge in some yet-to-be-invented technology, or to become captured by Chinese producers who then eventually raise prices substantially? Answering such questions is not straightforward, yet one should challenge both researchers and policymakers to argue their case either way.

3 LEGAL BACKGROUND OF RDI AID

3.1 Forms of RDI Aid

Aid promoting RDI activities can be granted in different forms, including:

- Loans (funds with repayment plus interest)
  In particular, interest rates may be reduced ('soft loans')[16] or the loan subordinated. They may be granted through intermediaries on behalf of public authorities[17] and on the beneficiaries' side.[18]
- Repayable advances (funds with repayment)
  Contrary to loans, repayable advances are typically only repayable if the project is successful. Since risks are thus shared between the beneficiary and state, they are generally suitable where the outcome of a project is uncertain, e.g., experimental development.[19]
- Direct grants (funds without repayment)
  Direct grants shift the risk even further to the state. They may be necessary where risks are particularly high[20] or the project's outcome is, even if successful, not expected to lead to marketable products in the near future.[21]
- Tax measures, such as allowances and credits, especially IP/innovation boxes (special advantages for the taxation of revenues deriving from IP rights).[22]
  Tax measures provide wider incentives to conduct RDI.

Indirect forms of aid may be found, among others, in cooperation between publicly funded entities, such as dedicated research organisations and private companies. Also, public procurement of RDI services may entail aid elements,[23] but a formal tender procedure generally ensures compliance with market conditions.[24]

16. *EC*, Decision of 23 March 2015, C(2015) 1901 final (Centro de ensayos de alta tecnología ferroviaria de Antequera (CEATF)), para. 29. The measure was later found to be incompatible with the internal market, *EC*, Decision of 25 July 2016, C(2016) 4573 final, paras 98 et seq., 139.
17. *EC*, Decision of 1 July 2015, C(2015) 4458 final (Evaluation plan – Aid scheme for funding of research and development projects), para. 6.
18. *EC*, Decision of 20 June 2011, C(2011) 4506 final (ERP-Innovationsprogramm), para. 35.
19. *EC*, Decision of 29 May 2019, C(2019) 4097 final (Methodology for the determination of the aid amount for repayable advances financing R&D expenses in civil aviation projects), para. 31.
20. *EC*, Decision of 17 February 2020, C(2020) 812 final (Federal R&D aid scheme for the aeronautics sector), paras 77 et seq.
21. *See*, for example, *EC*, Decision of 1 July 2015, C(2015) 4458 final (Evaluation plan – Aid scheme for funding of research and development projects), para. 12.
22. *EC*, letter to a Member State (Spain) of 13 February 2008, C(2008) 467 final, clearing a taxation rule according to which revenue from certain intangibles may reduce the tax base of an undertaking.
23. RDI Framework, paras 31 et seq.
24. RDI Framework, paras 33 et seq; cf. *EC*, Notice on the notion of State Aid (2016/C 262/01) ('NoA'), paras 89 et seq.

3.2 Existence of Aid

The general notion of state aid under EU law, as discussed in Part I of this volume, applies to RDI state aid.

Research organisations and infrastructures are not considered to be undertakings, and hence, public funding is not state aid if the supported activities are indeed non-economic, e.g., providing public education within the educational system,[25] R&D for more knowledge and understanding, as well as openly disseminating research results.[26] Where organisations and infrastructures merely act as intermediaries passing on public funds, only the final recipients are beneficiaries.[27]

In contrast, renting out equipment or laboratories or contract research for undertakings are economic in nature.[28] Where research organisations and infrastructures are used for both non-economic and economic purposes, there is no state aid if the economic use is purely ancillary.

In principle, also benefits to private companies may not constitute state aid as long as the specific RDI activity is non-economic and has no connection whatsoever to a company's economic activity.[29] However, such circumstances would be very difficult to prove.

3.3 Compatibility of RDI Aid

RDI aid can primarily be justified on the basis of Article 107(3)(b) and 107(3)(c) TFEU. These exceptions are supplemented by the General Block Exemption Regulation (GBER)[30] and EC communications.

4 GENERAL BLOCK EXEMPTION REGULATION (GBER)[31]

RDI aid complying with the GBER has been declared compatible with the internal market, neither requiring notification nor an individual EC decision.[32]

25. RDI Framework, para. 19 and 20; NoA, para. 28. CJEU, Case C-263/86 *Humble and Edel* [1988] ECR I-5365, paras 9-10, 15-18; CJEU, Case C-109/92 *Wirth* [1993] ECR I-06447, para. 15; EFTA Court, Case E-5/07 *Private Barnehagers Landsforbund* [2008] EFTA Ct. Rep. 62, paras 80-83; ; CJEU, Case C-76/05 *Schwarz und Gotjes* [2007] ECR I-6849, para. 39.
26. RDI Framework, para. 20.
27. RDI Framework., paras 22 and 23.; *EC*, Decision of 29 September 2016, C(2016) 6340 final (Aid to public legal persons – Science and Technology Parks), paras 41 et seq.
28. RDI Framework, para. 22.
29. *See* the general standards set out in EC Decision 16 July 2014, Case T-309/12 *Zweckverband Tierkörperbeseitigung Rheinland-Pfalz* :676, para. 53; CJEU, Case C-49/07 *MOTOE* [2008] ECR I-04863, para. 25.
30. *EC*, Regulation (EU) 651/2014 of 17 June 2014 (last amended by Regulation (EU) 2023/1315 of 23 June 2023), ('GBER').
31. For a comprehensive overview of the GBER, *see* Rose, A. & Van Buiren, K. (2024), The General Block Exemption Regulation ('GBER'), in Chapter 8 of this book.
32. The same is true for RDI aid satisfying the criteria of the Regulation on the application of Arts 107 and 108 of the Treaty on the Functioning of the European Union to de minimis aid ((EU) 2023/2831) based on Art. 108(4) TFEU.

Since the adoption of the first GBER in 2008, certain R&D aid has been block exempted. Recent amendments with the revised GBER are limited. The changes to the RDI Chapter reflect realignments of EU policy and serve to clarify as well as to modernise the provisions. In particular, the revisions shall also ensure consistency with the revised RDI Framework.[33]

A simplified cost approach to calculate indirect project costs as a flat rate of 20% of the total eligible direct costs has been introduced in Article 25(3)(e) GBER to make RDI aid more attractive to companies without extensive capacities for applications, such as SMEs.

4.1 Economic Rationale

From an economic point of view, the rationale for the GBER is to try to strike a balance between national and Union-level objectives and concerns. As noted above, GBER relieves Member States from the duty to notify the Commission of aid if it satisfies certain criteria and stays below given quantity thresholds.

This may be viewed as a reasonable streamlining of the decision-making process, which allows Member States to lower their transaction costs in implementing aid policies. It further allows Member States to make use of the information they possess which for the types of aid that fall under the GBER may be superior to the information available to the Commission. Lastly it allows Member States to pursue policy goals that have local relevance even if they may diverge from those of the Commission. The question, then, is whether the GBER reaches such goals. To the best of our knowledge, the jury is still out on this question. Having said that, the current rules strike us as reasonable.

4.2 Scope of Application for RDI

The GBER covers RDI aid quite comprehensively, including for R&D projects, research infrastructures, testing and experimentation infrastructures, innovation clusters, organisational as well as process innovation (Article 29) and innovation aid for SMEs (Articles 25-28). In addition, Article 25a to 25d GBER exempt certain aid to projects that have already been evaluated on the basis of Horizon 2020 or Horizon Europe programme rules.

RDI aid schemes with an annual budget exceeding EUR 150 million are only temporarily exempted for six months and require the assessment of an evaluation plan by the EC for permanent exemption, Article 1(2)(a) GBER.[34]

33. *EC*, Explanatory note accompanying the proposal for the targeted GBER revision, p. 4 (available at: https://ec.europa.eu/competition-policy/public-consultations/2021-gber_en#reference-documents-and-other-related-consultations [accessed on 23 October 2024]).
34. *See* in detail Rose, A. & Van Buiren, K. (2024), The General Block Exemption Regulation ('GBER'), in Chapter 8 of this book.

4.3 Legal Exemption Requirements

RDI aid is alleviated from some of the general conditions of Chapter I GBER. start-up aid for SMEs can now, under certain circumstances, be considered transparent (Article 5(2)(g) GBER). For certain aid (e.g., projects awarded a Seal of Excellence quality label), no incentive effect needs to be proven (Article 6(5)(j) GBER).

The applicable exemption thresholds for RDI aid set out in Article 4(1)(i)-(m) GBER range from EUR 2.5 million to EUR 55 million (aid supporting fundamental research, Article 4(1)(i) GBER).

4.3.1 Aid Intensities for R&D

Given that market failures are expected to be graver and market distortions less pronounced for projects far from market introduction, aid for fundamental research may amount to up to 100% of the eligible costs, for industrial research and feasibility studies up to 50% and for experimental development up to 25%. These intensities may be increased, including for SMEs or if the results of the project are widely disseminated.

4.3.2 Projects Evaluated under the Horizon Programmes

Certain projects that have received a Seal of Excellence or that have been selected under the Horizon programmes are also exempted, as these projects have already been positively assessed under EU standards.[35] Seals of Excellence are awarded to projects that merit funding but did not receive it due to budgetary constraints.[36]

Further, R&D projects and feasibility studies co-financed by at least three Member States or two Member States and at least one associated country (Article 25c GBER) or Teaming actions[37] co-financed by at least two Member States (Article 25d GBER) may be exempted if the beneficiaries have been selected independently and on the basis of transnational calls in accordance with the Horizon programmes.

4.3.3 Investment Aid for Infrastructures

Access to the funded infrastructures must be granted at market prices, ensuring that only the operators are beneficiaries and no indirect aid is granted to users.[38] While

35. *See EC,* Explanatory note accompanying the proposal for the amendment of the 2014 GBER, p. 3 (available at: https://competition-policy.ec.europa.eu/public-consultations/2019-gber_en [accessed on 23 October 2024]).
36. *See* https://ec.europa.eu/info/research-and-innovation/funding/funding-opportunities/seal-excellence/receiving-seal-excellence_en [accessed on 23 October 2024].
37. Teaming actions are measures to build or update 'centres of excellence', i.e., long-term partnerships and cooperations between leading scientific institutions in Europe and main beneficiary institutions in low R&I countries, https://rea.ec.europa.eu/funding-and-grants/horizon-europe-widening-participation-and-spreading-excellence/teaming-excellence_en [accessed on 23 October 2024].
38. Bernhard von Wendland (2022), in: Münchener Kommentar Europäisches und Deutsches Wettbewerbsrecht (4th edn, 2022), Art. 26 AGVO, para. 41. Targeted aid to users may be exempted under, for example, Art. 26 or 28 GBER.

access has to be granted on a transparent and non-discriminatory basis, undertakings that have contributed at least 10% of the investment costs may be treated more favourably.

Maximum aid intensity is higher if two Member States provide the funding and, in case of testing and experimentation infrastructures, for SMEs. Since research infrastructures often carry out both economic and non-economic activities, it must be ensured, e.g., through a clawback mechanism, that the aid intensity is not exceeded when the share of economic activities subsequently increases.

4.3.4 Innovation Aid

Innovation clusters can be supported through investment aid for their construction and update as well as operating aid (Article 27 GBER). Similar conditions as for infrastructures under Article 26 and 26a GBER apply. The maximum aid intensity generally amounts to 50% but may be increased by 15 or 5 percentage points if a cluster is located in certain areas.

4.4 Economic Evaluation

The overriding economic rationale for such aid is the divergence of social and private benefits. The key question to the policymakers is whether the government can improve the situation compared to laissez-faire. As hinted at above, many indirect innovation policies may change the laissez-faire outcome substantially for the better. Improvements in regulation of financial markets, streamlining of bankruptcy laws, lowering of entry barriers, improvements in education policy and IPR laws may all be more important than direct aid for RDI.

Concerning direct financial aid, the first question to be asked is who the most likely recipients or beneficiaries of the planned aid are. There is strong evidence that some forms of aid, such as R&D subsidies, reach a rather selected set of firms.[39] It is also conceptually clear that some forms of aid can be better targeted to projects with a high social-to-private returns ratio (R&D subsidies) than others (R&D tax credits). A key question is whether it is better for the aid tool to reach a larger number of firms (R&D tax credits) even though its social benefits per recipient are lower than in the alternative (R&D subsidies).

39. *Ibid*., Arque-Castells, P. & Mohnen, P. (2015). Sunk Costs, Extensive R&D Subsidies and Permanent Inducement Effects. Journal of Industrial Economics (2015), 63, 3, 458-494 https://doi.org/10.1111/joie.12078.

5 FRAMEWORK FOR STATE AID FOR RESEARCH, DEVELOPMENT AND INNOVATION

The Framework for State Aid for Research and Development and Innovation (RDI Framework) complements the provisions of the GBER and specifies the applicable criteria of Article 107(3)(c) TFEU in the RDI context.

The first RDI Framework was enacted in 2006, followed by a 2014 revision. The recent State Aid Fitness Check identified a need to revise and update, among others, certain definitions and to simplify the rules and procedures,[40] resulting in the revised RDI Framework of 19 October 2022. The RDI Framework forms part of a push to pursue a wider economic strategy, establishing the EU as a 'global player' that excels in key sectors[41] and reflects EU advancements such as the European Green Deal and Digital Strategies.[42]

5.1 Economic Rationale

The Framework sets out the economic rationales for RDI aid to be exempted from the main principle of the prohibition of state aid. It rests on two criteria: first, a positive one in that the aid in question must change the behaviour of the recipient compared to the counterfactual situation where no aid is given. Second, a negative one in that aid must not adversely affect trading conditions in a way that would be contrary to common interest. These criteria are in line with the economic rationales outlined above, as is the principle that the Framework is applied in a technology-neutral way. Quite naturally, the Framework stipulates that funding managed by the Union does not constitute state aid.

The Framework stresses three ways in which state aid can negatively affect 'the trading conditions': by distorting the entry and exit process; by distorting the dynamic investment incentives; and by creating market power.

The entry and exit process is often seen as a central element of the reallocation process through which markets channel resources to their best uses. Aid would distort this process if it leads to a situation where more efficient potential competitors decide not to enter a market because of aid given to an existing firm or if aid leads to an existing inefficient firm staying in the market when it should have exited. Either way, reallocation of resources is stifled.

40. *See EC*, Explanatory note on the Revision of the state aid rules for RDI, (available at https://ec.europa.eu/competition-policy/document/download/5cf6ccf6-e46e-44ca-8ca3-d4ee5370f642_en [accessed on 23 October 2024]).
41. *EC*, Communication on a New Industrial Strategy for Europe (COM(2020) 102 final), pp. 13 et seq.; *EC*, Communication to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the regions on the 2023 Digital Compass: the European way for the Digital Decade (COM(2021) 118 final), pp. 6 et seq.
42. RDI Framework, paras 5 et seq.; *see also EC*, Communication to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the regions on a new ERA for Research and Innovation (COM(2020) 628 final), pp. 2 et seq.

The worry regarding dynamic investment incentives is that aid to a given firm leads to crowding out of investment by other firms, thereby slowing down productivity growth. At the same time, one needs to remember that one way in which markets may overinvest in RDI is through unnecessary duplication. Thus, any assessed negative effects on rival investment incentives should be balanced against an evaluation of whether duplication is reduced. While crowding out can be harmful to resource allocation, reduced duplication is a positive outcome.

Market power obviously is a distortion from a static point of view; however, RDI aid is all about dynamics. The starting point of economic theory is that any investment, RDI included, is made in the expectation of them generating sufficient returns in the future. Fixed and/or upfront investments thus necessitate positive price-cost margins at some point. One might think that the difficult evaluation task then is to answer the question: does a particular RDI aid lead to an increase in market power in comparison to what would have been the case without the aid? This question, however, needs to be modified with regard to the so-called extensive margin, i.e., whether an R&D project is carried out or not. In such a case, by definition, market power will increase. Although this is not the sought-after effect, it is a prerequisite for the sought-after effect, namely productivity improvements. The situation may be different when aid functions at the intensive margin, i.e., because of aid, the firm invests more in a project than it would have invested without aid, although it would have invested even without aid. The existing literature has yielded a somewhat mixed picture in terms of whether RDI aid is effective at the extensive and/or at the intensive margin. The answer will most likely vary depending on the type of aid and recipient.

Besides the above, the Framework also raises concerns over other possible negative effects of RDI aid. For example, aid could affect the location of firms. Casual observation suggests strongly that governments, those of Member States included, believe that RDI schemes do have such an effect. The empirical evidence is more mixed, and it is likely that regarding location choices elements of indirect innovation policies, such as the supply of educated employees, transparency and ease of bureaucratic and legal processes, are at least equally important.

The Framework guidelines list criteria that are taken into account in assessing the negative effects of RDI aid. The list includes e.g., market growth, amount of aid, closeness to market, the features of the selection process, exit barriers, incentives to compete for the market, and product differentiation. The list is formidable and challenging to assess. What can be stated for sure is that the academic literature on the negative effects of aid is dwarfed by the amount of research on the positive effects of aid.

5.2 Scope of Application

The RDI Framework applies to aid schemes and individual aid alike across all sectors covering a wide range of aid measures, i.e., aid for R&D projects, feasibility studies, research and technology infrastructures as well as innovation activities and clusters.

Aid may not be granted to undertakings in difficulty, as is generally the case under specific state aid regimes.[43] Several Member States argue that the current definition of undertakings in difficulty, as interpreted and applied by the EC, excludes economically sound undertakings because certain forms of financing, such as subordinated loans, are not considered own capital.[44]

5.3 Compatibility Assessment

5.3.1 Incentive Effect

5.3.1.1 Legal Conditions

RDI aid may generally only be granted where market participants would not otherwise invest in RDI activities.[45] Member States shall provide a counterfactual, which may be the absence of an alternative project or a clearly defined and sufficiently predictable project considered by the aid beneficiary in the alternative.[46] Thereby, high costs, low profitability or a long payback period and high risk indicate an incentive effect.[47] Member States shall base their evaluation of the project's profitability on specific performance indicators such as the net present value of a project or the internal rate of return,[48] illustrating that the EC is committed to sound economic assessments.[49]

As a general rule, the RDI activity must not have commenced before the recipient has applied to national authorities.[50]

5.3.1.2 Economic Parameters

To show *ex ante* that an investment would not be made without RDI aid is a challenging task. From a social point of view, what should be emphasised in such an assessment is not only that it would not be privately profitable without aid but also that the social

43. RDI Framework, para. 11. *See* in detail as regards aid to undertakings in difficulty Soltész, U. & Maier-Rigaud, F. (2024), Rescue and Restructuring Aid, in Chapter 13 of this book.
44. *See* the comments of the German government of 3 June 2021 on the consultation document published by the EC on the RDI Framework, pp. 1 et seq. and also the joint statement of the 'Friends of Industry' of 22 November 2019, p. 3, (both available at https://competition-policy.ec.europa.eu/public-consultations/2021-rdi_en [accessed on 23 October 2024]).
45. RDI Framework, paras 46, 60.
46. RDI Framework, para. 46. *EC*, Decision of 29 October 2014, C(2014) 7818 final (Avance récupérable pour le programme de recherche et développement TS 3000), paras 87 et seq.; *EC*, Decision of 14 August 2015, C(2015) 5694 final (SABRE – Aid to Reaction Engines Limited), paras 41 et seq.
47. *EC*, Decision of 17 February 2020, C(2020) 812 final (Federal R&D aid scheme for the aeronautics sector), para. 67; *EC*, Decision of 19 October 2014, C(2014) 7818 final (Avance récupérable pour le programme de recherche et développement TS 3000), paras 56 et seq.
48. RDI Framework, para. 50.
49. *See* in general *EC*, Communication on a pro-active Competition Policy for a Competitive Europe(COM(2004) 293 final), para. 3.2.
50. As an exception, recipients may carry out feasibility studies before applying, RDI Framework, footnote 52.

return to RDI warrants the use of public money. That is, the project should hold the promise of sufficient spillovers to also make the public investment, not only the private investment, worthwhile. Furthermore, from an economic point of view, the so-called intensive margin must also be considered. This means that increasing the investment in a project due to aid that would be executed at a lower investment level without aid is potentially just as valuable as a project that would not be executed at all. The comparison really depends on the social returns of the two projects.

5.3.2 No Undue Effect on Trading Conditions to an Extent Contrary to the Common Interest

5.3.2.1 Legal Conditions

Member States must demonstrate a concrete market failure whereby the market cannot efficiently deliver the scope of the aided RDI.[51] In addition, the instrument that leads to the least distortion of competition and specifically addresses the market failure at hand must be chosen; as a general rule, Member States must ensure the least shift of risks from private to public entities (i.e., loans instead of grants).[52]

The EC assesses proportionality following three governing principles. First, aid is considered to be more likely to have negative effects the closer the aided activities are to the market.[53] Second, the EC deems aid to be less detrimental if it is granted to smaller undertakings. Third, the EC takes into account how imminent the market failure is.[54]

A provision that was already included in the 2014 RDI Framework but has gone largely unnoticed is the so-called 'matching clause'.[55] Pursuant to the matching clause, higher aid intensities are allowed if competitors located outside the Union have received or are going to receive aid for similar projects from third countries. As the EC aims at establishing European champions and shielding the internal market from the distortive effects of third-country subsidies,[56] the matching clause will likely play a role in the future.

51. RDI Framework, paras 60 et seq.
52. RDI Framework, para. 75. *EC*, Decision of 17 February 2020 C(2020) 812 final (Federal R&D aid scheme for the aeronautics sector), paras 73 et seq.
53. *EC*, Decision of 14 August 2015, C(2015) 5694 final (SABRE – Aid to Reaction Engines Limited), paras 61 et seq.
54. RDI Framework, para. 78.
55. RDI Framework, para. 98; an identical provision can be found in *EC*, Communication on criteria for the analysis of the compatibility with the internal market of State aid to promote the execution of important projects of common European interest (2014/C 188/02), in its revised version (2021/C 528/02) ('IPCEI Communication'), para. 38. *See also* Ibáñez Colomo, P. & Neven, D. (2024), State Aid Control Beyond the EU: Legal Convergence and Unilateral Expansion, in Chapter 6 of this book.
56. *See* Regulation (EU) 2022/2560 of 14 December 2022 on foreign subsidies distorting the internal market.

5.3.2.2 *Weighing of Positive and Negative Effects*

As the last step, the EC examines whether the negative effects of an RDI aid measure are minimised or avoided and weighs up the positive and negative effects of an aid measure.[57] Irrespective of their specific economic effects, certain aid measures that run against the principle of a free internal market, such as aid limited to beneficiaries established in a specific Member State or merely leading to a change of location of RDI activities within the EU, are per se incompatible with the RDI Framework.[58] Where aid, in contrast, aligns with the objectives of key Union objectives such as the European Green Deal or the European Digital Strategy, positive effects are presumed.[59]

Since the EC must respect primary and secondary Union law also in its state aid decisions,[60] RDI aid measures must not contravene applicable provisions and principles of EU law.[61] In *Austria v. Commission*, the CJEU found that the EC must declare aid incompatible if it infringes EU environmental law.[62] However, the CJEU ruled that as a matter of fact, principles of EU environmental law such as the 'precautionary principle' and the 'polluter pays principle' do not conflict with an aid's objective to further the development of a powerful nuclear industry,[63] arguing that security of energy supply is itself a principle of Union law and Member States are free to choose their energy sources and structure of energy supply (Article 194 TFEU).[64] This is in line with the EC Communication on a Green Deal emphasising 'technological neutrality' as well as the Taxonomy Complementary Climate Delegated Act.[65]

5.3.2.3 *Transparency*

Member States must make aid awards of EUR 100,000 or more public on a state aid website to ensure transparency.[66] The threshold has been lowered from EUR 500,000 with the RDI Framework 2022 to align with the revised GBER and other recent European policy instruments.[67]

57. RDI Framework, paras 105 et seq., 132 et seq.
58. RDI Framework, paras 117, 128.
59. RDI Framework, paras 136 et seq.; in particular on aid supporting projects that contribute to reducing the carbon footprint of a sector, para. 127. *EC*, Decision of 17 February 2020, C(2020) 812 final (Federal R&D aid scheme for the aeronautics sector), para. 62.
60. CJEU, Case C-594/18 P *Austria v. Commission* [2020] ECLI:EU:C:2020:742, para. 44; CJEU, Case C-225/91 *Matra v. Commission*[1993] ECR I-3260, para. 41.
61. RDI Framework, para. 53 et seq.
62. CJEU, Case C-594/18 P *Austria v. Commission* [2020] ECLI:EU:C:2020:742, para. 100.
63. CJEU, Case C-594/18 P *Austria v. Commission* [2020] ECLI:EU:C:2020:742, paras 48-49, 33; but *see AG Hogan*, Opinion on C-594/18 P, para. 41.
64. CJEU, Case C-594/18 P *Austria v. Commission* [2020] ECLI:EU:C:2020:742, para. 48.
65. *EC*, Delegated Regulation (EU) 2022/1241 of 9 March 2022, paras 6 et seq., 18.
66. RDI Framework, para. 100.
67. GBER, Art. 9(1)(c); *EC*, Communication on a Temporary Framework for State Aid Measures to support the economy in the current COVID-19 Outbreak (C(2020) 1863 as amended, last amended by C(2021) 8442), para. 103.

6 IMPORTANT PROJECTS OF COMMON EUROPEAN INTEREST (IPCEIs)

6.1 Introductory Overview

RDI aid granted under Article 107(3)(b) TFEU is not assessed based on the RDI Framework but according to the dedicated Communication on the analysis of state aid to promote the execution of important projects of common European interest (IPCEI Communication).[68] Article 107(3) TFEU is subject to a narrow interpretation and the EC enjoys wide discretion when applying the provision.[69]

As part of the state aid Fitness Check launched in 2019, the IPCEI Communication has been revised, in particular, to align with current policy objectives such as the European Green Deal and the European Digital Strategy.[70] Despite criticism, the EC did not explicitly aim at streamlining or accelerating aid approvals. In contrast, to promote the pan-European idea and tackle economic imbalances, the minimum number of participating Member States has been increased from two to four,[71] and Member States must transparently inform interested parties prior to notification.[72] Procedures will thus likely remain cumbersome.

6.2 Economic Rationale

IPCEIs are another example of a policy tool that tries to strike a balance between national and supranational decision-making. As the name suggests, IPCEIs are projects that are important when analysed from the point of view of the whole Union. Leaning on the principles outlined earlier in this chapter, IPCEIs should be projects that generate substantial information spillovers, consumer surplus effects, and/or agglomeration effects that are internalised at the Union level but not so much at the level of individual Member States. In a well-functioning decision-making environment, such a tool seems justified.

The key question therefore is how IPCEIs are chosen: whether the rules are transparent and clear to all potential applicants, and such that the policy tool cannot (easily) be misused. The obvious worry with IPCEIs is that the decision-making process is subject to intensive lobbying by established interests, and the outcomes are therefore

68. *See supra* n. 55.
69. CJEU, Order of 3 December 2014 Case C-431/14 P-R (*Greece v. Commission*), para 37.
70. *EC*, Explanatory note accompanying the public consultation on the review of the IPCEI Communication (available at: https://ec.europa.eu/competition-policy/document/download/1f7a3cc8-504c-4cb5-9bc3-86a2830b9529_en [accessed on 24 October 2024]), pp. 1 et seq.; IPCEI Communication, para. 4.
71. *EC*, Explanatory note accompanying the public consultation on the review of the IPCEI Communication, p. 2; IPCEI Communication, para. 16.
72. *EC*, Commission Staff Working Document 'Fitness Check of the 2012 state aid modernisation package, railways guidelines and short-term export credit insurance' (SWD(2020) 257 final part 1/4), pp. 73, 126.

biased in favour of strong parties, be they Member States or, for example, representatives of individual industries or firms.[73] It is indeed difficult to see how emerging technologies, for example, could benefit from IPCEI. This is not to say that IPCEI could not be a useful addition to the innovation policy toolbox, but rather that next to it other tools are needed that allow new firms and technologies to emerge.

IPCEI has proven to be a handy instrument for political projects such as the European Green Deal, Digital Strategy, New Industrial Strategy and Next Generation EU. IPCEI rules also explicitly mention that it can be used as a tool to counter policy measures of other countries. Optimally, countries should negotiate to avoid a no-win outcome where all countries in question use public resources to compete for projects, to the detriment of taxpayers in all countries. DG Competition has published a thorough code of good practices regarding IPCEIs.[74]

6.3 First Industrial Deployment

The IPCEI Communication applies to IPCEIs in all sectors, including all forms of aid. For RDI projects, the Communication sets out additional criteria.[75]

In contrast to the RDI Framework and GBER, the IPCEI Communication explicitly includes support for a first industrial deployment ('FID'), provided that the FID arises from an RDI activity and contains an RDI element which is 'integral and necessary' for the implementation of the project.[76] One might argue that FID has little connection to RDI activities as scaling up pilot facilities or demonstration plants aims at subsequent commercial exploitation;[77] however, the EC considers RDI activities to be 'very important' in the context of FID differing from 'mere engineering work'.[78]

73. For anecdotal evidence suggesting that these worries are not merely academic, *see* Poitiers, N. & Weil, P. (2022). Opaque and Ill-Defined: The Problems with Europe's IPCEI Subsidy Network, Bruegel Blog post (published 26 January 2022), (https://www.bruegel.org/blog-post/opaque-and-ill-defined-problems-europes-ipcei-subsidy-framework, [accessed on 24 October 2024]).
74. *DG Competition*, Code of good practices for a transparent, inclusive, faster design and assessment of IPCEIs, (published 17 May 2023), (https://competition-policy.ec.europa.eu/system/files/2023-05/IPCEIs_DG_COMP_code_of_good_practices.pdf [accessed on 24 October 2024]).
75. IPCEI Communication, paras 22 et seq.
76. IPCEI Communication, paras 23 et seq.
77. *See* the comments of the German government on the consultation document on the revision of the IPCEI Communication published by the EC (available at: https://ec.europa.eu/competition-policy/document/download/cf95085f-9ae1-4587-8f75-008e4c17705d_en [accessed on 24 October 2024]), p. 5.
78. *EC*, Decision of 13 December 2018, C(2018) 8864 final (Important Project of Common European Interest (IPCEI) – Microelectronics), para. 339.

6.4 Compatibility Assessment

6.4.1 Legal Conditions

6.4.1.1 Common European Interest

In contrast to the RDI Framework, where contributions to key EU policies are a positive factor when balancing a measure's effects,[79] aid under the IPCEI Communication must make an important contribution to the Union's strategies and objectives and have a significant impact on sustainable growth.[80]

RDI projects must be of a major innovative nature and go beyond the current state of the art.[81] In case of IPCEIs, the EC will therefore not only focus on the economic dimension but also thoroughly examine the project's scientific and technical merits.[82] It is therefore not straightforward to establish whether an IPCEI satisfies the mentioned criteria.

6.4.1.2 Conflicting Interests

The IPCEI Communication does not address projects pursuing an interest that conflicts with other common interests.[83] Germany raised this issue during the recent revision, proposing that a project must not conflict with other EU strategies or objectives.[84] Such conflicts may especially arise where an IPCEI affects (also) the 'horizontal clauses' of the TFEU, e.g., resource- and energy-intensive projects may conflict with environmental protection (Article 11 TFEU), certain medical research projects may conflict with animal welfare (Article 13 TFEU).

Due to the absence of a general rule in the IPCEI Communication, the EC will likely not per se reject projects conflicting with common interests, in accordance with the 'do no significant harm' principle[85] requiring IPCEIs to avoid significant harm to certain environmental objectives.

79. RDI Framework, para. 133.
80. IPCEI Communication, para. 14.
81. IPCEI Communication, para. 22; fn. 23.
82. *EC*, Decision of 13 December 2018, C(2018) 8864 final (Important Project of Common European Interest (IPCEI) – Microelectronics), para. 332.
83. CJEU, Case C-594/18 P *Austria v. Commission* [2020] ECLI:EU:C:2020:742 discussed above does not apply to IPCEIs because Art. 107(3)(b) and (c) TFEU are manifestly different, *see* para. 20 of the decision.
84. Comments of the German government on the consultation document on the revision of the IPCEI Communication published by the EC (available at: https://ec.europa.eu/competition-policy/document/download/cf95085f-9ae1-4587-8f75-008e4c17705d_en [accessed on 24 October 2024]), p. 3.
85. IPCEI Communication, para. 20.

6.4.1.3 Importance

While formally a project must show 'qualitative or quantitative'[86] importance, the mere number of participants and/or volume of investments generally suffices as proof.[87] RDI projects that are of a major innovative nature, go beyond the current state of the art and are thus in the common European interest are routinely considered to be qualitatively important.[88]

6.4.2 Funding Gap of up to 100%

Where multiple complementary projects pursuing the same objective are grouped into an 'integrated project',[89] the EC may, taking the nature of a project into consideration, presume a market failure and that individual components of an integrated project contribute to a common European interest if the integrated project itself is of common European interest.[90]

To determine whether aid is necessary, the EC requires – on the basis of concrete evidence and calculations – a counterfactual scenario, as under the RDI Framework. However, in a significant departure from the RDI Framework and also the GBER, the IPCEI Communication does not provide for strict maximum aid intensities but calls for demonstrating concrete funding gaps, which allows for aid to cover 100% of eligible costs.[91] In addition, the scope of eligible costs includes costs for FID.[92]

As a tool for correction, the EC may require Member States to implement a clawback mechanism in case a project turns out to be more profitable than initially expected.[93] Albeit being new to the revised Communication, clawback mechanisms have been implemented into IPCEIs that have been approved in the past.[94] Furthermore, clawbacks have been part of the EC's wider state aid practice in the past.[95] They are also explicitly mentioned in Article 26(7) GBER.

86. IPCEI Communication, para. 26.
87. *EC*, Decision of 13 December 2018, C(2018) 8864 final (Important Project of Common European Interest (IPCEI) – Microelectronics), para. 311; *EC*, Decision of 20 March 2020, C(2020) 1683 final (Fehmarn Belt Fixed Link), paras 282 et seq.
88. *See*, for example, *EC*, Decision of 13 December 2018, C(2018) 8864 final (Important Project of Common European Interest (IPCEI) – Microelectronics), para. 311 where the EC references its findings on the innovative nature of the project to declare it important. This approach is also anchored in the IPCEI Communication itself according to which the criteria to assess whether a project is in the common European interest may be quoted to establish its importance, IPCEI Communication, para. 26 with reference to section 3.2.
89. *See* IPCEI Communication, para. 13.
90. IPCEI Communication, para. 29. *EC*, Decision of 13 December 2018, C(2018) 8864 final ((Important Project of Common European Interest (IPCEI) – Microelectronics), paras 314 et seq.
91. IPCEI Communication, paras 30 et seq.
92. IPCEI Communication, Annex.
93. IPCEI Communication, para. 36.
94. *EC*, Decision of 9 December 2019, C(2019) 8823 final (Important Project of Common European Interest (IPCEI) on Batteries), paras 194 et seq.
95. For example, *EC*, Decision of 4 December 2013, C(2013) 8442 final (Aid for the NovaSAR project), para. 49. The decision was made on the basis of the RDI Framework. *See also EC*, Communication on the application of European Union state aid rules to compensation granted

Clawback mechanisms mitigate the irrevocable nature of direct grants and, at the same time, do not impose on recipients the cost of capital associated with repayable advances.[96] As applied by the EC so far, they incentivise economically sound behaviour by leaving a share of the unexpected profits with the beneficiary. Grants with clawback mechanisms are therefore an adequate form of aid where the commercial application of an RDI project is uncertain and where imposing the conditions of a repayable advance would represent an additional cost factor that would unreasonably burden the recipients.[97]

Like the RDI Framework, the IPCEI Communication includes a matching clause underlining the importance of IPCEIs in terms of industrial policy.[98]

6.5 EC Practice

In the past, the (former) IPCEI Communication(s) has been applied rarely, most notably to large infrastructure projects connecting multiple Member States.[99]

More recently, the focus has shifted to IPCEIs that aim at future-proofing European economies and consequently involve significant RDI elements. Member States have successfully notified two IPCEIs on battery development and production[100] and yet another on the development and production of microelectronics.[101] Further IPCEIs have been initiated to support, *inter alia*, RDI on the production, storage, transport and practical use of hydrogen,[102] the development and production of microelectronics in the Union,[103] cloud infrastructures and services[104] and RDI in the pharmaceuticals sector.[105]

for the provision of services of general economic interest (2012/C 8/02), para. 67; *Bacon,* European Union Law of State Aid (3rd edn. 2017), para. 8.32.

96. Repayable advances are loans for which the conditions for the reimbursement depend on the outcome of the project, RDI Framework, para. 16(ee).
97. *EC,* Decision of 4 December 2013, C(2013) 8442 final (Aid for the NovaSAR project), paras 49, 19.
98. IPCEI Communication, para. 38. Specifically in the context of IPCEIs, the clause has been deemed appropriate by Member States, *EC,* Commission Staff Working Document 'Fitness Check of the 2012 State aid modernisation package, railways guidelines and short-term export credit insurance' (SWD(2020) 257 final part 1/4), p. 74.
99. *See*, for example *EC*, Decision of 15 October 2014, C (2014) 7358 final (Aid granted to Øresundsbro Konsortiet), paras 120 et seq.; *EC,* Decision of 13 May 2009, C (2009) 3571 final (Restructuring of London & Continental Railways and Eurostar), paras 160 et seq.
100. *EC*, Decision of 9 December 2019, C(2019) 8823 final (Important Project of Common European Interest (IPCEI) on Batteries).
101. *EC*, Decision of 13 December 2018, C(2018) 8864 final (Important Project of Common European Interest (IPCEI) – Microelectronics).
102. Manifesto for the development of a European "Hydrogen Technologies and Systems" value chain, https://www.bmwi.de/Redaktion/DE/Downloads/M-O/manifesto-for-development-of-european-hydrogen-technologies-systems-value-chain.pdf?__blob = publicationFile&v = 10 [accessed on 24 October 2024].
103. *EC*, IPCEI on microelectronics – A major step for a more resilient EU chips supply chain, https://commissioners.ec.europa.eu/news/ipcei-microelectronics-major-step-more-resilient-eu-chips-supply-chain-2021-12-20_en [accessed on 24 October 2024].
104. *EC*, Towards a next generation cloud for Europe, https://digital-strategy.ec.europa.eu/en/news/towards-next-generation-cloud-europe [accessed on 24 October 2024].
105. *EC,* Commission approves up to €1 billion of state aid by six Member States for the first Important Project of Common European Interest in the health sector https://ec.europa.eu/commission/presscorner/detail/en/ip_24_2852[accessed on 24 October 2024].

7 RDI AID IN OTHER CONTEXTS

Since fostering RDI is an overarching Union objective,[106] RDI aid is addressed in various policy instruments unrelated to RDI. For instance, the guidelines on risk finance investments address the capital needs of certain R&D-heavy undertakings exceeding the GBER thresholds.[107] RDI aid may also be approved under the Guidelines on state aid for climate, environmental protection and energy (CEEAG).[108] The SGEI Communication specifies criteria for whether the activities of universities and research organisations involve state aid.[109] In the context of the COVID-19 pandemic, the EU allowed for aid specifically targeted at COVID-19 and other antiviral-relevant R&D, as well as RDI aid to support the economies' sustainable recovery post-COVID.[110]

RDI aid may certainly also be approved solely on the basis of Article 107(3) TFEU without reference to an EC communication or act of secondary law.[111]

8 CONCLUSION

All national economies are under considerable pressure to innovate in the face of global competition and global challenges. Particularly in response to the crises of the recent past and present, the EU has significantly expanded the possibilities and scope of RDI aid. This is an ongoing process, the design of which naturally leads to some ambiguities. One can take the three pillars of the ambitious Horizon programme – excellent science, global challenges and European industrial competitiveness and innovative Europe[112] – as an overarching slogan and as a general illustration of recent RDI practice: Policymakers demonstrate significant will to shape and broaden this field with the bigger picture in mind, but this leads to difficulties and peculiarities in concretising these reforms – and when it comes to capturing them in a legally and economically accurate way.

106. *See* in general *EC,* Communication to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the regions on a new ERA for Research and Innovation (COM(2020) 628 final).
107. *EC*, Communication on Guidelines on state aid to promote risk finance investments (2021/C 508/1), paras 71 et seq. *See* Taylor, I., Bravo-Biosca, A. & Troege, M. (2024), Risk Finance Aid, in Chapter 12 of this book.
108. *EC*, Communication on Guidelines on state aid for climate, environmental protection and energy 2022 (2022/C 80/01), paras 12, 96. *See* Struckmann, K. & Sauri Romero, L. (2024), Climate, Environmental Protection and Energy Aid, in Chapter 21 of this book.
109. *EC,* Communication on the application of European Union state aid rules to compensation granted for the provision of services of general economic interest (2012/C 8/02), paras 29 et seq. *See* Conte, G. & Khalil, M. (2024), Advantage, in Chapter 2 of this book.
110. *EC,* Communication on a Temporary Framework for State Aid Measures to support the economy in the current COVID-19 Outbreak (C(2020) 1863 as amended, last amended by C(2021) 8442), paras 34 et seq., 97. *See also* Lamadrid, A., Romero, V. & Claici, A. (2024), State Aid in Times of Crisis: Temporary Frameworks and the Boundaries of State Aid Policy, in Chapter 15 of this book.
111. *See EC*, Decision of 28 January 2009, C(2009) 211 final (AWARE-P programme "advanced water management and rehabilitation in Portugal"), paras 20, 31 et seq.
112. Regulation (EU) 2021/695 of 28 April 2021 on establishing Horizon Europe, Art. 4(1).

While the broad economic rationale outlined in this chapter applies to every compatibility regime, there are overlaps and differences at the same time at the level of concrete design. Overall, the three compatibility regimes each cover different levels of economic activity within the EU. The GBER, above all else, aims to enable Member States to pursue specifically local innovation policies. The RDI framework complements this by linking national projects to the overall strategic development of the EU. From this perspective, IPCEIs then form the final level of integration in that they are geared towards clearly defined EU-wide goals and require the cooperation of several states. However, this picture can also be changed: IPCEIs are, as such, not linked to RDI aid verbatim, but by their factual nature, they are probably mostly RDI projects. In the GBER, too, RDI aid is just one type of aid among many. Against this background, the RDI Framework are the rules that formulate the legal and actual independence of RDI aid.

On a legal level, however, this relatively clear order is somewhat frayed. Similar categories are used in the schemes with a different emphasis without this difference being systematically derivable. This becomes especially clear when comparing IPCEI and the RDI Framework. Although being reviewed under different provisions (Article 107(3)(b) and (c) TFEU respectively), their assessment seems congruent at first glance. Both share the prerequisite of a concrete market failure and the development of a counterfactual scenario as proof of the necessity of the aid. However, the scrutiny of these categories is much stricter in the RDI Framework. The transnational character of the IPCEI almost works like a legal presumption of a market failure, while the category of the counterfactual scenario is also much more manageable via the criterion of the funding gap. Furthermore, IPCEI also covers the first industrial deployment and therefore introduces something extraneous to the typical notion of RDI aid. At the same time, this simplification and addition might serve as a counterbalance to the distinct protractedness of organising an IPCEI and getting the application on the way. Lastly, these divergences also result from the fact that the applications of the schemes by the EC are ultimately, as already mentioned, concretisations of Article 107 TFEU, and therefore largely at its discretion.

It remains to be seen whether the growing importance of RDI aid will lead to further harmonisation between the schemes. Recent EC practice suggests that especially the clawback mechanism could play a bigger role in the foreseeable future and could transcend its use in the IPCEI.[113] Furthermore, general political strategies such as the Green Deal become ever more important. They are increasingly relevant when it comes to abstractly determining the question of eligibility for aid. With that in mind, there is a tendency for RDI, in combination with those strategies and other guidelines, to become independent as a quasi-legally defined justification for aid under Article 107 TFEU. Thus, the exceptional character of aid measures laid down in primary law is softened to some extent. This is also reflected in the Commission's practice of waving

113. *See*, for example, the press release concerning a French measure of EUR 1.5 billion to support an R&D project for batteries, https://ec.europa.eu/commission/presscorner/detail/en/ip_23_4029 [accessed on 24 October 2024].

through projects of considerable volume. At the same time, it remains to be seen whether this political impact will override the condition of technological neutrality in the long run. While this development is understandable and perhaps even necessary as a steering approach against the background of the current challenges, it remains important to continuously evaluate these measurements on a legal and economic basis.