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‘Repayable Advances’ for Support of Research Projects

Eszter Hargita*, Phedon Nicolaides, and Peter Staviczky

I. Introduction

One of the goals of the European Union is to spend 3 per cent of its GDP on R&D. However, according to the latest statistics released by Eurostat in March 2019, the average R&D expenditure in the EU is just slightly above 2 per cent, falling 33 per cent short of its target.¹ Expenditure by Member State varies significantly, from a low of 0.5 per cent of GDP in Latvia and Romania to a high of 3.4 per cent in Sweden and 3.2 per cent in Austria.

Yet, depending on the reporting year, R&D is the second or third most subsidised policy objective, the other two being environmental protection & clean energy and regional development. The State Aid Scoreboard of DG Competition of the European Commission indicates that Member States provided EUR 9.1 billion to stimulate research in 2016 and EUR 8.8 billion in 2017.²

The Commission's state aid rules on R&D allow relatively high rates of subsidisation of R&D projects. For example, subsidies for industrial research may cover up to 50 per cent of costs, with top-ups for SMEs and collaborative research that can raise aid intensity up to 80 per cent of costs.³ State aid is also allowed for R&D-related activities such as the construction of research infrastructure and innovation clusters.

The Commission has also adopted regulations to ease the administrative burden of Member States for complying with the *ex ante* system of state aid control set out in Article 108 (3) of the Treaty on the Functioning of the Internal Market. Between 2008 and 2014, Member States could avail themselves of the option of implementing measures for the support of R&D without prior notification to the Commission. Such measures had to conform

Key Points

- About 95 per cent of all state aid to industry and services is in the form of grants or tax exemptions linked to investment.
- ‘Repayable advances’ are rather rarely used.
- This article explains the structure of repayable advances and under which conditions they should be used.
- The article also reviews what appears to be the only decision of the European Commission authorising a methodology for calculating the amount of state aid that may be contained in a repayable advance.
- The article concludes that the complexity of the methodology may in fact explain why repayable advances are so rare.

with the requirements of the then General Block Exemption Regulation 800/2008. Since 2014, Member States may use Regulation 651/2014.

According to the staff working paper accompanying the annual competition report that was published on 15 July 2019, 95 per cent of all state aid measures supporting R&D are now implemented on the basis of the GBER.⁴ Indeed, since 2014, not more than seven measures have been notified by Member States and approved by the Commission on the basis of the current Framework for State Aid to R&D&Innovation.⁵ Therefore, when the Commission authorises anything that has to do with state aid to R&D it is newsworthy.

Since 2014, the following measures have been approved by the Commission:

- SA.37137: Development of a new aero engine TS 3000 [FR].
- SA.37178: Superfast electricity grid [FR].
- SA.39457: SABRE rocket [UK].

⁴ The staff working paper makes for interesting reading. It can be accessed at: http://ec.europa.eu/competition/publications/annual_report/2018/part2_en.pdf

⁵ See Commission Framework for State Aid to R&D&Innovation, OJ C 198, 27/6/2014. It can be accessed at: <http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=OJ:C:2014:198:TOC>

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¹ See Eurostat, R&D Expenditure, March 2019. It can be accessed at: https://ec.europa.eu/eurostat/search?p_auth=qpl9Ayq6&p_p_id=estatsearchportlet_WAR_estatsearchportlet&p_p_lifecycle=1&p_p_state=maximized&p_p_mode=view&_estatsearchportlet_WAR_estatsearchportlet_action=search&text=R%26D+Expenditure

² See DG Competition, State Aid Scoreboard, 2018. It can be accessed at: http://ec.europa.eu/competition/state_aid/scoreboard/index_en.html

³ See Article 25 of Regulation 651/2014, the General Block Exemption Regulation.

- d) SA.41540: Science and technology parks [LT] [no state aid as all advantages were passed on to SMEs].
- e) Joint measure SA.45183 [FR] & SA.45185 [DE]: Airbus X6 helicopter.
- f) Joint measure SA.46578 [DE], SA.46590 [UK], SA.46595 [IT], SA.46705 [FR]: Microelectronics [approved on the basis of Article 107(3)(b) as an important project of common European interest].
- g) SA.53791: Repayable advance for R&D in aero engines [DE].

The recently approved measure SA.53791, notified by Germany, is surely unique.⁶ It is the first notified methodology on the calculation of the gross grant equivalent [GGE] of state aid contained in 'repayable advances'.⁷ France also used repayable advance as the aid instrument in measure SA.37137. However, the methodology was not revealed in the Commission decision and, after all, it was specific for that measure, rather than explicitly designed to be used in several support measures. According to the Commission's State Aid Scoreboard, close to 95 per cent of all aid in industry and services is in the form of grants or tax exemptions linked to investments. Therefore, aid granted in the form of repayable advance is indeed unusual.

The purpose of this short article is, first, to explain the meaning, structure and appropriate use of repayable advances. Second, it reviews the German methodology approved by the Commission, which may be used by other Member States to support research projects.

The article concludes that although the decision provides guidance to other Member States to understand how the GGE of repayable advances can be calculated, it is also rather sector-specific. It rather reveals that, ultimately, whether a repayable advance contains state aid very much depends on the practices in and prospects of that sector in question. Hence, caution has to be exercised as the methodology described in the decision should not be simply copied in other notifications concerning other sectors.

II. What is repayable advance and when should it be used?

According to Article 2(21) of the current GBER, Regulation 651/2014, a repayable advance 'means a loan for

a project which is paid in one or more instalments and the conditions for the reimbursement of which depend on the outcome of the project'. Point 15(dd) of the RDI Framework contains exactly the same definition.

By granting a repayable advance instead of an outright grant, the public authority that provides the funding receives part of the revenue that the subsidised undertaking expects to generate. For the granting authority, a repayable advance mitigates the expense of supporting R&D. For the beneficiary undertaking, the repayable advance is a safer form of financing. If the project fails it does not have to pay back the money.

Of course, aid beneficiaries would rather receive a grant. But under EU law, no company has a right to state aid.⁸ Therefore, an aid recipient cannot demand a grant instead of a repayable advance. But in comparison to an outright loan from a bank, a repayable advance, even at market rates of interest is still preferable because it does not have to be paid back in case of failure. Therefore, both the Member State and the recipient company benefit more from a repayable advance than the alternative of a grant or a straight loan, respectively. Given that in case of success, the advance has to be paid back by the beneficiary; this form of aid is also likely to have a lower distortive effect than a grant and, as will be seen below, the Commission appears to be more favourably predisposed towards it.

Although no empirical research appears to have been carried out on the extent of distortions caused by repayable advances, we surmise that they are less distortionary than outright grants because in case of success, the beneficiary retains fewer resources which can be used to finance new projects.

This immediately raises the question why repayable advances are not the standard instrument to support research. The answer, in general, is that the research may be too far from the market so that it may not generate any revenue in the foreseeable future, or that the potential revenue is difficult to quantify, or that the risk of project failure is too high.

Incidentally, publicly available statistics do not indicate how much state aid in the form of repayable advances is granted by Member States. The Commission's State Aid Scoreboard shows that in 2017, Member States granted EUR 1.4 billion in soft loans. But soft loans may also be used to support any other policy objective. At any rate, that amount is miniscule in comparison to the total amount of aid which in 2017 reached EUR 110.7 billion.

⁶ The full text of the Commission decision can be accessed at: http://ec.europa.eu/competition/state_aid/cases1/201927/279600_2079931_131_2.pdf

⁷ It must also be one of the very few measures that have been approved precisely within two months of its notification. The documentation was received by the Commission on 29 March 2019 and was approved on 29 May 2019!

⁸ See opinion of AG in case C-526/14, *Kotnik* (ECLI:EU:C:2016:102), paragraph 79: "under EU State aid rules, no undertaking can claim a right to receive State aid; or, to put it differently, no Member State can be considered obliged, as a matter of EU law, to grant State aid to a company."

In general, a Member State should support a project with a grant when the project is unlikely to be commercially viable without the aid. By contrast, when the project is in principle commercially viable and the risk is comparable to what the market can bear, if any public funding is provided it should be in the form of a loan or capital injection at market rates. A repayable advance falls in between a grant and a loan and it is an appropriate instrument when the commercial success of the project is uncertain and the risk of failure is higher in relation to other projects undertaken by the company or by other companies in the same sector.

One can visualise the choices of granting authorities with the use of the Table 1 below. The trade-off between risk and return varies from one situation to another.

For the sake of completeness, it must be added that in at least two respects repayable advances may be considered as inferior to outright grants. First, as will be shown in sections 4 and 5, they are definitely more complex and difficult to structure correctly and to estimate the GGE of state aid that may be embedded in them. This is not necessarily a disadvantage. In the process of calculating the precise GGE of aid in a repayable advance, at the same time, there is an assessment of the need of the beneficiary to receive state aid. In principle, a granting authority should calculate the necessary amount of aid regardless of providing a grant or a repayable advance.

Second, repayable advances require more administrative effort up front, but they also require monitoring possibly far beyond the standard five-year period required by state aid rules in general. Granting authorities normally have to ensure compliance with the conditions of state aid for a period up to five years. The pay-off period of a research project—when the repayable advance is repaid—may extend into a decade and more. This is an additional administrative burden.

Table 1: The risk-return trade-off

		Commercial return in case of success		
		Low	Average	High
Risk of failure	High	Grant		
	Average		Repayable advance	Equity
	Low		Loan	

III. EU state aid rules on repayable advances

A. Notification threshold

The GBER [Regulation 651/2014] contains specific provisions on the use of repayable advances. Article 4(1) of

the GBER lays down individual notification thresholds. However, sub-paragraph (1)(i)(v) of that Article raises by 50 per cent the thresholds for research projects [which are EUR 40 million for fundamental research, EUR 20 million for industrial research and EUR 15 million for experimental development] when the aid ‘is granted in the form of repayable advances which, in the absence of an accepted methodology to calculate their gross grant equivalent, are expressed as a percentage of the eligible costs and the measure provides that in case of a successful outcome of the project, as defined on the basis of a reasonable and prudent hypothesis, the advances will be repaid with an interest rate at least equal to the discount rate applicable at the time of grant’.

One may interpret Article 4(1)(v) of the GBER as an incentive for the use of repayable advances. On the other hand, the fact that a repayable advance is, under certain conditions, repaid by the aid recipient implies that the amount of state aid is less than the nominal amount of the advance. In addition, the quantification of the amount that the aid recipient has to pay back suggests that the GGE of the aid is minimised. This is another reason why the GBER allows for higher notification thresholds.

B. Transparency

The GBER also requires that aid is transparent.⁹ Article 5(j) of the GBER considers aid in the form of repayable advances to be transparent and therefore allowed by the GBER when ‘the total nominal amount of the repayable advance does not exceed the thresholds applicable under this Regulation or if, before implementation of the measure, the methodology to calculate the gross grant equivalent of the repayable advance has been accepted following its notification to the Commission’.

One may interpret Article 5(j) as an incentive to Member States to notify appropriate methodologies so that the nominal amount of the repayable advance can go beyond the maximum aid intensities defined by the GBER.

If they do not notify their methodologies, Member States can exceed the maximum aid intensities by only 10 per cent and only under certain conditions. This is because Article 7(5) of the GBER on aid intensity provides that ‘where aid is granted in the form of repayable advances which, in the absence of an accepted methodology to calculate their gross grant equivalent, are expressed

⁹ In this sense, transparent means that the GGE of the aid can be easily calculated. The reason for this requirement is that the GBER relieves Member States from the obligation of notification to and prior approval of their aid by the European Commission. Therefore, the Commission wants to reduce the possibility of miscalculating the GGE of aid. Any amount that exceeds the permissible aid intensity in the GBER is automatically illegal and quite likely incompatible with the internal market.

as a percentage of the eligible costs and the measure provides that in case of a successful outcome of the project, as defined on the basis of a reasonable and prudent hypothesis, the advances will be repaid with an interest rate at least equal to the discount rate applicable at the moment the aid is granted, the maximum aid intensities laid down in Chapter III may be increased by 10 percentage points'. [Chapter III of the GBER includes the specific provisions concerning state aid for RDI (i.e. section 4, Articles 25–30)].

In other words, Article 7(5) lays down a very simplified methodology. Certainly, the discount rate grossly underestimates the true risk of research. The discount rate is the base rate plus 1 per cent. As of 1 September 2019, the base rate for the Eurozone is –0.2 per cent, which makes the discount rate only 0.8 per cent.

Moreover, Article 7(6) provides that 'where regional aid is granted in the form of repayable advances, the maximum aid intensities established in a regional aid map in force at the moment the aid is granted may not be increased.' It follows that repayable advances for R&D are treated more favourably than repayable advances for regional development.

C. Less distortive

Notwithstanding Article 7(6), the GBER does not explicitly indicate that repayable advances are less distortionary or a 'better' state aid instrument. However, the RDI Framework considers repayable advances to be a more appropriate form of policy intervention because they are a 'potentially less distortive form of aid' [point 60 of the RDI Framework].

Points 78–81 of the RDI Framework lay down specific rules for the use of repayable advances:

'(78) If a Member State awards a repayable advance which qualifies as State aid within the meaning of Article 107(1) of the Treaty, the rules laid down in this section apply.'

This implies that it is possible, at least in theory, to design a repayable advance that is free of state aid. That would be the case when the return obtained by the granting authority compensates it for the risk it assumes. A simple example is presented in the next section.

Point 79 contains a safeguard. If Member States do not calculate the GGE of the aid embedded in a repayable advance, then the nominal amount of the advance is considered to be equal to the amount of state aid and it must remain below the maximum allowable rate of aid intensity (see next para). However, if Member States notify to the Commission a methodology for calculating the GGE, then the nominal amount of the repayable advance can

exceed the maximum aid intensity as long as the derived GGE remains below the relevant aid intensity. The next section shows an example of such a possibility.

Point 80 stipulates that 'in all other cases, the repayable advance is expressed as a percentage of the eligible costs and may exceed the applicable maximum aid intensities by 10 percentage points, provided that the following conditions are fulfilled:

- a. in case of a successful outcome, ... the advance is to be repaid with an interest rate not less than the [applicable] discount rate ...;
- b. in case of a success exceeding the outcome defined as successful, the Member State concerned should request payments beyond repayment of the advance amount including interest according to the applicable discount rate;
- c. in case the project fails, the advance does not have to be fully repaid. In case of partial success, the repayment should be proportional to the degree of success achieved.'
- d. Since the RDI Framework does not provide more details on the calculation of the GGE and the conditions of repayment, the Commission assesses the structure and terms of repayable advances on a case-by-case basis. So far, the decisional practice of the Commission has not provided guidance on repayable advances because very few measures have been notified by Member States since 2014.

IV. How to calculate the GGE of state aid in repayable advances

Before showing how to derive the amount of state aid in a repayable advance, it is instructive to consider the reasoning of an investor when the outcome of the investment is uncertain.¹⁰ A rational investor who is risk-neutral [i.e. neither risk averse nor risk seeking] makes an investment when the pay-off is large enough to compensate for the possibility of failure.

Let A be the amount of investment, p the probability of success and B the amount returned by the investment. The investor is willing to make the investment only when value of expected outcome $\geq A$.

That is,

$$B \times p \geq A$$

¹⁰ In this article we make no distinction between uncertainty and risk and we treat them as synonymous. Normally, an outcome is uncertain when no probability can be ascribed to it. By contrast, risk refers to an outcome with measurable probability. However, state aid rules do not attribute distinct meanings to uncertainty and risk and so do we in this article.

If, for example, the probability of success is 10 per cent, the pay-off, B, must be at least 10 times larger than A. [Because $dB/dp < 0$, as the probability decreases, the pay-off must increase and vice versa.]

The reasoning of the lender who considers whether to grant a loan is exactly the same. The lender has to charge a rate of interest that compensates for the risk of default. A minor complication in this case is that the lender forgoes the risk-free return on the amount that it lends and therefore the interest rate that it charges should compensate not only for the risk of default but also for the opportunity cost of the money, which is the risk-free return or rate.

Let r be the risk-free rate of interest, which implies that the opportunity cost of the loan or the risk-free amount that can be obtained is $(A \times r)$.

If the lender knows the probability of default of the borrower, then it needs to calculate a rate of interest, r^* , that can compensate for the risk of default or the cost of default. The expected cost of default is the certain loss of the risk-free return, $(A \times r)$, plus the probable loss of the principal of the loan $(A \times p)$. Therefore, as in the case of the investor above, the amount obtained by the lender must exceed its costs. That is,

$$(A \times r^*) \geq (A \times r) + (A \times p)$$

which is reduced to $r^* \geq r + p$.

Therefore, a risk margin has to be added which is equal to the probability of default.

Now assume that instead of a loan, the investor provides a repayable advance to finance a research project. Naturally, if the investor would be willing to forgive repayment of the loan in case of failure of the project, the pay-off in case of success must be sufficiently high. For simplicity also assume that the whole project, i.e. the research and commercialisation of the resultant product, takes place in one period. The research is completed at the end of period and all the revenue is generated at the end of that period [e.g. the research results (patents, know-how, etc.) are sold]. Lastly, assume that in case the research project fails, no product is commercialised and, therefore, the investor receives nothing [neither is the advance repaid, nor any revenue paid]. How would the investor structure this repayable advance? As always, the pay-off must at minimum be equal or exceed the cost of the investor.

The cost of the investor is the opportunity cost plus the amount it commits to the research project. Given that there is only one period, the cost in present value is

$$\text{Cost} = (A \times r) + (A \times p) = A \times (r + p).$$

where,

Amount of repayable advance = A.

Risk-free rate of interest = r .

Probability of failure = p .

The potential benefits in the present value (i.e. brought to the beginning of the period) are the repayment of the loan with interest, $A \times (1 + r)$, and a share of the profits.

$$A + [(R \times s) \times (1 - p)] / (1 + r).$$

where,

Revenue from project = R.

Investor's share of revenue = s .

Probability of success = $1 - p$.

One may ask how R, s, and p or $1 - p$ are derived. In principle, they must be supplied by the prospective aid recipient. A company that undertakes an R&D project needs to estimate beforehand the likelihood of successful outcome of its project [technical success] and the likelihood of successful marketing of the resultant product [commercial success]. Of course, an aid granting authority or any other investor should verify the reliability and robustness of such estimates [see, further, section 5 below on the incentives of the aid recipient].

The investor provides the repayable advance only when

$$A + [(R \times s) \times (1 - p)] / (1 + r) \geq A \times (r + p).$$

We can now solve for A. The maximum amount, A^* , that a lender would be willing to commit for any given R, s and p is equal to the expected return from the project. That is,

$$A^* = ((R \times s) \times (1 - p)) / [(1 + r) \times (r + p - 1)].$$

This equation shows that the higher the revenue, the share, and the probability of success, the larger the amount that can be invested. Conversely, the higher the risk-free return and the probability of failure, the lower the amount that can be invested.

The amount of state aid contained in a repayable advance is the difference between the actual amount invested, A, and the maximum amount that could have been invested, A^* . It follows that the GGE of state aid contained in a repayable advance, A, is

$$\text{GGE} = A - A^* = A - ((R \times s) \times (1 - p)) / [(1 + r) \times (r + p - 1)].$$

For state aid to exist, it must be that $A > A^*$. If $A = A^*$, no state aid is involved. If $A < A^*$, the granting authority itself obtains a benefit and, therefore, no state aid is granted. In this case, the granting authority behaves as a market economy operator. It follows that this kind of calculation can also be used to prove compliance with the Market Economy Investor Principle [MEIP]. This is the case whenever $A^* \geq A$.

V. The incentives of aid recipients

Any aid granting authority faces at minimum three challenges: (a) not to grant aid after the project has started, (b) not to grant more aid than what is necessary and (c) not to grant aid to cover ineligible costs.¹¹

For R&D projects funded by grants, aid recipients may have an incentive to inflate the costs of research. For example, they may exaggerate the number of researchers who work on a particular project. A company with research staff on permanent contracts has to constantly engage them in research; otherwise, they draw salaries while remaining idle. If a project receives state aid, then the salaries of extra personnel are partly offset by public money. Of course, this is not a viable long-term strategy because the company bears part of their salaries. But if the alternative is no project and no subsidy, then a partly aided project is preferable.¹²

For this reason, funding authorities must, in addition, check whether all eligible costs are in fact strictly required for the project. Indeed, the project may not be viable without public funding [therefore, the aid is necessary and has an incentive effect], the costs may be eligible under the GBER or the RDI Framework, the aid intensity may not exceed the permissible threshold in the GBER or the RDI Framework, but not all inputs [which are in principle eligible] can be strictly required for the completion of the project.

Even if a substantial risk exists in the case of granted-funded projects, it does not necessarily follow that a similar risk exists in the case of repayable advances. The question arises whether, given the special calculations which must be performed in order to determine the GGE of state aid in repayable advances, the aid recipients also

have an incentive to over-estimate or under-estimate the true costs of R&D projects and the expected revenue from the resultant products. The incentives can run either direction.

With respect to costs, the higher the amount, the more likely that the repayable advance contains state aid, for any given amount of revenue and share of that revenue that goes to the granting authority. So, if the aid recipient exaggerates the costs, it will be subject to state aid rules.

With respect to revenue, the higher the amount, the less likely that the repayable advance contains state aid, for any given amount of cost and share of the revenue that goes to the granting authority. So, if the aid recipient exaggerates the revenue, it may escape from state aid rules.

With respect to the share of the revenue for the granting authority, the larger the share, the less likely that the repayable advance to contain state aid. But then after the completion of the project the aid recipient will have to return to the granting authority a larger part of the revenue that it will generate. So, the aid recipient is unlikely to offer to the funding authority a larger share in order to escape from state aid rules.

It follows that if the aid recipient wants to escape from the claws and scrutiny of state aid rules, the 'safest' tactic is to over-estimate the revenue that can eventually be generated by the project. If reality turns out to be different, it suffers no ex-post penalty. While costs can actually be measured and verified on the basis of audits and invoices by the funding authority, future revenue remains an educated guess.

In theory, by over-estimating the potential revenue, the aid recipient may succeed to receive a larger amount of public money than what would normally be allowed if all of the repayable advance is counted as state aid. For example, if the cost of a project is 82 and the maximum permissible aid intensity is 50 per cent, the amount of an outright grant or a repayable advance without a pre-approved methodology for calculating the GGE of the aid cannot exceed 41. Also assume that the potential revenue that can be generated by the project is 400 and that the project has an overall probability of success of 10 per cent. This means that the expected revenue is 40 and, therefore, no rational investor would commit more than 40. But the sum of 41 of state aid and 40 of private money is not enough to cover the costs of 82. This is a marginal project and the company is more likely to abandon it rather than proceed with it.

By contrast, on the basis of an approved methodology, the nominal amount of the repayable advance may exceed the GGE of 41. This can happen if the company succeeds to exaggerate the potential revenue from the project and

11 See the findings in European Court of Auditors, "More efforts needed to raise awareness of and enforce compliance with State aid rules in cohesion policy", Special Report 24, 2016.

12 Aid recipients do not always have an incentive to exaggerate the cost of a project. In the case of regional investment aid, a company may have an incentive to minimise the cost of the investment in an alternative, non-assisted location in order to maximise the permissible amount of aid which is calculated as the difference between the cost of the investment in the assisted area and the cost of the investment in the non-assisted area.

its chances of success. Instead of 400, it claims on the basis of fairly reasonable projections that the revenue will be 410, with probability of success of 10 per cent and offers to the funding authority to share that revenue 50/50. If the funding authority invests 20.5 in the project, it believes it has a 10 per cent chance to earn 205 [50 per cent of the supposed return of 410] or 20.5. This is a rational bet. It, therefore, grants a repayable advance of 61.5, which contains only 41 of state aid [20.5 is MEIP compliant and should be explicitly stated]. The company puts in 20.5 and has a 10 per cent chance of earning 200 or 20. If the project succeeds, it will share the 400 with the funding authority. But if the project fails, the impact on the company is much smaller. It loses 20.5 instead of 40. The big upside for the company is that it can keep employing its researchers at a lower actual and potential cost.

This example demonstrates two important risks for public authorities when they provide repayable advances. First, a company may have an incentive to over-estimate the potential revenue. Second, the incentive is present even if the beneficiary company accepts more public money, greater public participation in the project and the possibility for paying back money to the funding authority than otherwise.

As will be seen in the review of the German methodology in the next section, the correct estimation of the probability of success of the project and its potential revenue is critical to calculating the correct GGE of state aid that may be contained in a repayable advance. Reliance on independent expertise is unavoidable.

VI. Support of R&D in the development of civil aircraft sector [SA.5379 I]

The German measure was intended to finance R&D in the experimental development of new aircraft with more than 20 seats. The fact that the notified methodology is to be used for projects in a specific sector does not detract from its generality and usefulness as the same approach can be applied to any sector or project. Only the particular values of the variables used in the proposed formula may have to be adjusted to reflect the actual conditions in other sectors.

The Commission considered that the granting authority would be acting as an investor. ‘(5) Generally, if the project succeeds, the investor (i.e. the grantor of the repayable advance) will receive a return on investment, including additional royalties if the project exceeds the sale forecasts. The investor also normally receives interest

on the outstanding amount (i.e. amount of repayable advance not yet repaid).’

The return that a private investor would demand for the various risks it would encounter established a benchmark for determining the GGE of the aid. Any shortfall from that benchmark would be equivalent to the amount of aid embedded in the repayable advance.

Any R&D project bears at least two risks: a technical risk [i.e. nothing useful may be discovered or invented] and a commercial risk [i.e. the product is a marketing flop or that competitors come up with a better product]. In this case, there was also a regulatory risk [i.e. failure to obtain a licence for new aircraft]. Boeing’s recent travails with the 737 Max show that the regulatory risk can be significant.

As explained in the Commission decision, ‘(7) the methodology . . . relies on establishing the market conform return (the return that a market economy investor would require for the repayable advance) and on calculating the GGE of the aid of a repayable advance as the difference between the market conform return and the actual return of the repayable advance. In the proposed methodology, the market return reflects the R&D risk and the licensing risk, the specific market risk, the administrative costs, and the risk-free rate of return.’

The explanation in paragraph 7 of the decision suggests that a funding authority has to calculate, first, the expected future revenue from the project, and then discount it to its present value using an appropriate discount rate that reflected all the various risks and, finally, compare the derived amount to the actual amount of the repayable advance. The difference is the GGE of the aid.

For example, if the future share of the revenue from the project, R , is 120 and the risk-adjusted discount rate, r , is 20 per cent, then a private investor would not want to invest more than a 100 [= 120/1.2]. The GGE in a repayable advance, A , is any excess amount over a 100 or, more abstractly,

$$\text{GGE} = A - R/(1 + r).$$

However, the notified formula was more complicated. The Commission decision explained that ‘(8) for the application of the methodology, the starting point is the consideration that the project has only two possible outcomes depending on R&D success (base case) or failure (failure case):

- If the R&D project fails (i.e. essential work packages cannot be finalised successfully or the project does not lead to an aircraft that can be commercialised and no aircraft is certified), the entire amount of the repayable

advance will count as a grant where the GGE equals to the outstanding amount (failure case scenario).

- If the R&D project leads to the commercialisation of aircraft(s), the repayable advance will be repaid according to a pre-agreed baseline repayment scenario (base case scenario). Actual repayments will depend on the degree of the project's commercial success. Possibly, once the success threshold is reached, the specific agreement can include additional payments to the investor (bonus success fee).'

The actual formula notified by Germany calculated the present value of the GGE '(9) as the valuation of the probability that the R&D project fails (failure case scenario) plus the discounted value of the interest rate benefits obtained (calculated on the basis of a market conform return minus the contractual rate of return) in relation to the annual conditional loan disbursements and repayments (base case scenario).'

The precise formula was:

$$\text{GGE} = (A \times p) + (1 - p) \times \sum (C \times (F + CR + M - \text{IRR}) / (1 + r)^n).$$

where

A = amount of repayable advance.

p = probability of failure (reflecting both R&D risk and licensing risk).

(1-p) = probability of success.

C = cash flows.

F = funding rate (which is the risk-free rate plus 0.25 per cent to take account of related costs).

CR = corporate risk rate.

M = market risk rate.

IRR = internal rate of return at the base scenario (successful outcome).

r = discount rate.

The precise values of the variables in the formula would have to be determined by independent experts.

According to paragraph 10 of the decision, the applicable risk-free rate is equal to the swap rate corresponding to the currency and the maturity of the repayable advance. The length of the maturity is the time period until the revenue of the project reaches the pre-determined milestone for success.

'(14) On top of the funding costs, the proposed methodology puts forward that a market economy investor would ask the remuneration of the risk linked to the debtor's creditworthiness.'

'(15) The corporate risk margin [R] depends on the debtor's creditworthiness and collaterals. For that pur-

pose, the rating of the benefiting company is used as well as its level of collateralisation or alternatively the one of the mother company if this would result in a lower rating.' '(16) The corporate risk margin is determined according to the Communication from the Commission on the calculation of reference rates and discount rates.'

The market risk rate, M, depends on several other variables such as demand, price levels, supply, and the competitive environment. '(18) The proposed methodology puts forward that a market economy investor would ask remuneration for the risk relating to the sales forecasting errors.'

'(20) The market risk premium is established with reference to market credit default swap (CDS) premiums for projects/companies with comparable rating and thus comparable risk.'

According to the notified methodology, a 'specific default rate or viability gap', PD, would be '(21) determined on the basis of an empirical study of aircraft developments over the last three decades, which have a comparable R&D character.'

That study, which was submitted to the Commission, considered a total of 60 aircraft programmes and identified their default rate simply as the ratio of the number of unsuccessful programmes over the number of successful programmes.

Then the annualised probability of default was

$$\text{APD} = -(1 - \text{PD})^{(1/t)}$$

where

t is the average maturity of non-successful programmes.

'(25) In order to translate the APD in a corresponding commercial annual risk spread reflecting the market risk, the proposed methodology takes the following steps:

(a) Express the probability of default as an expected loss (EL). Based on the empirical analysis, the independent expert judged that the exposure at default (EAD), i.e. the remaining outstanding notional amount at the moment of project failure, is 50 per cent

$$\text{EL} = \text{APD} \times \text{EAD}.$$

(b) In a repayable advance, recovery will not be achieved by enforcement of collateral or other liquid assets, i.e. when the project stops, no more sales are realised and therefore the loss given default, for the remaining sales that will not be realised, is equal to 100 per cent. Since this LGD is higher than the typical LGD on CDS (the average LGD on senior unsecured bonds is 60 per cent), a corresponding adjustment of the probability of default (PD) is required for subsequent derivation of a

corresponding credit rating as follows:

$$\text{APDadj} = \text{EL}/\text{LGD}.$$

(c) Calculate the adjusted multi-annual default probability of the specific project for which the valuation methodology is applied

$$\text{PDp} = 1 - (1 - \text{APDadj})^{\text{tp}}.$$

where

PDp = the multi-annual default probability of the project;

APDadj = the annual default probability based on past empirical evidence, adjusted for an LGD of 60 per cent;

tp = the maturity of the project (i.e. the period required until the nominal amount of the repayable advance is repaid in full, under the base case).

(d) Identify the corresponding credit rating by looking up the PDp in the average cumulative corporate default rates table provided by one reference credit rating agency given the project specific maturity.

(e) The relevant market rate [M] corresponds to calculating the average spread over a basket of single name CDS of the corresponding maturity. That basket contains all EU companies for which a CDS is traded in the same rating category.

(f) For each single name CDS, the last mid-prices at the time of the day the valuation are taken. Then a simple average over the resulting prices is taken to arrive at the CDS basket benchmark value. In case there is no traded CDS for the relevant project maturity, the traded CDS with the next greater maturity can be substituted.

(g) If there are less than ten single CDS names in a given basket, the methodology cannot be applied.'

In order to estimate the GGE, it is first necessary to determine the contractual rate of return of the project which takes into account all the credit costs under the base case, the specific pre-agreed loan disbursements and repayments and the returns in case of payment of the success fees. The internal rate of return (IRR) is calculated as the discount rate that makes the net present value of all cash flows under the base case scenario equal to zero.

Then, '(27) the individual annual aid equivalents are calculated on the basis of the difference in interest rate calculated at the rate of return in line with the market remuneration for projects of similar risk [= C + M + F] minus the contractual rate of return (= IRR) in relation to the annual loan disbursements and repayments. This

amount is then discounted at the applicable reference rate, the aid element reflecting the specific R&D risk is then added. Table 2 below summarises the main features of the German methodology.'

A. Commission's conclusion

The Commission approved the methodology because it considered that '(35) these factors are what a market economy operator, operating in the normal conditions of a market economy and for a comparable transaction size, would evaluate for the determination of a fair remuneration of his investment.'

It then added that '(36) in line with recitals 102 to 104 of the Commission Notice on the Notion of State aid:

- The Commission considers that due to the debt nature of the financing instrument, it is correct to calculate the GGE of the aid of the repayable advance as the difference between the market conform rate and the actual return of the repayable advance.
- The Commission considers that the IRR is an appropriate measure of the actual return of the repayable advance considering that it corresponds to the present value of the cash flows foreseen in the financial structure of the contracted instrument. The Commission notes that the applicable discount rate is set in accordance with the Communication from the Commission on the revision of the method for setting the reference and discount rates.'

On the basis of the above analysis, the Commission concluded that 'the GGE of aid comprised in repayable advances and calculated according to the approved methodology will therefore be considered as a transparent form of aid in the meaning of Article 5(2)(j) of the GBER.'

VII. Appraisal and conclusions

Since the Commission decision approving the notified German methodology is the first public document in which the Commission explains how the GGE of a repayable advance can be calculated, it should be welcomed by both Member States that want to use repayable advances and potential beneficiaries. It brings some clarity to this very complex issue and can be a useful precedent for future notifications, albeit with some limitations and caveats. At least Member States now know that the Commission has accepted this formula, so they can apply it to their own measures.

Nonetheless, it would have been even more useful if the Commission presented a concrete example in the annex of the decision, similarly to the annex that was attached

Table 2: The German approach in calculating the GGE of the aid in a repayable advance

	Failure scenario	Base scenario
Aid element according to the formula	RA × p	$(1-p) \times \sum (C \times (F + R + M - IRR) / (1 + r)^n)$
Similar instrument	Grant	Soft loan/equity
Presumptions	The whole repayable advance stays with the beneficiary	The whole repayable advance is paid back until the end of the duration of the project with some interest
Aid element	Whole amount multiplied by the probability of this scenario	$\sum (\text{market rate-actual rate}) \times \text{outstanding amount of loan at PV multiplied by the probability of this scenario}$
What is the market rate?		Profit expected by the market (F + R + M)
What is the preferential rate?		IRR (the rate the beneficiary is supposed to earn on the project, so that is the amount the repayable advance 'brings')
What is C?		The amount from the repayable advance that is actually with the beneficiary. So if the beneficiary received the whole amount of the repayable advance at the beginning of the project in the first year RA = C, at the same time, if the RA is paid back well before the end of the project, C = 0.

GGE = aid element in the failure scenario + aid element in the base scenario.

to decision SA.22668 concerning the investment in film studio Ciudad de la Luz.¹³

As regards the limits of the usefulness of the German methodology, the following issues can be highlighted.

First, the decision describes a methodology from a viewpoint of an investor but it also mentions factors such as creditworthiness which is an indicator more often used by lenders. Therefore, it makes it more difficult to understand the right approach to follow: that of investor or lender. Maybe it is a mixture of the two approaches, but nothing similar has been approved in other state aid decisions.

At the same time, the methodology appears to be closer to the calculations for the application of the market economy investor principle [MEIP]. However, in the present case, an advantage exists when the return is lower than what a private investor would require to finance the project.¹⁴ From this follows an important theoretical question. Can one apply this 'MEIP-like' approach as described in this decision for projects where the return would not be acceptable to a rational private investor (hence the investment would be state aid)? If yes, can this approach be applied, even with some modifications for other non-R&D-related projects, to establish the amount of GGE of state interventions in the form of equity? So far, the Commission has denied such arguments by Member States and has clearly said that if the NPV of the project is negative or its IRR does not reach its WACC, the **whole**

amount of the equity investment is aid. This was clearly explained in a number of Commission decisions. In the already cited Commission decision in case SA.22668 Ciudad de la Luz Film studio, the Commission stressed that '(114) [...] the investment in Ciudad de la Luz made by the Valencia region would not have been made by a private investor on the same terms and conditions. As a result, the **entire** public investment in the project is considered by the Commission to be illegal aid. (115) Consequently, the aid amount up to December 2010 is the total of €265 089 599 of direct public investment in Ciudad de la Luz SA and any incentive granted to film producers under the condition that filming took place at Ciudad de la Luz' [emphasis added].

Similarly, in the case of MALÉV Hungarian Airlines Zrt. (SA.30584), the Commission assessed a number of measures implemented by Hungary and made the following statements: '(120) With regard to the capital increase, the Commission considers that, given Malév's financial state, the apparent need for further support following the capital increase, the lack of any realistic prospective to recoup the "invested" funds, no private investor would have put those funds at Malév's disposal. The injected capital of HUF 25.4 billion plus the debt to equity swap of HUF 4.7 billion for the advanced payments for Malév GH is the aid element. [...] (124) For the reasons set out above in paragraph (120), the Commission considers that the aid element is the injected capital of HUF 5.3 billion starting September 2010. [...] (125) For the reasons set out above in paragraphs (120) above, the Commission considers that total amount of the loan is comparable to a straightforward grant and hence the entire amount of HUF 5.7 billion is the aid element starting September 2010.'

¹³ http://ec.europa.eu/competition/state_aid/cases/224304/224304_1396907_301_2.pdf

¹⁴ Although, under the methodology it is possible theoretically that the GGE of the repayable advance is zero so that it does not constitute state aid.

The Commission took the same approach also for the Paks II nuclear power plant project to be financed by the Hungarian State (SA.38454), where the company was not in financial difficulty, but the Commission's assessment showed that the project's return was lower than what a private market investor would accept. Here the Commission concluded as follows: '(261) Based on those results, the Commission concludes that the project would not produce sufficient returns to cover the costs of a private investor who could only obtain financing at market prices. Even though the February 2017 data are the most relevant for running the MEIP test, the results derived from the analysis of the data are valid even when the analysis is made using data available at the time of the initial investment decision in December 2014. (262) Based on the assessment developed in this, the Commission concludes that a private investor would not have invested in the project under the same terms and conditions. Therefore, since Paks II benefits fully from a new asset with an economic value, the Commission finds that the measure entails an economic advantage for Paks II.'

The logic was also followed in the EDF case (SA.13869), where the Commission assessed the MEIP compliance of the non-collection of tax payments of a state-owned company. The Commission concluded that the **full** amount of not paid tax was state aid as the return of the 'investment' in the form of non-collection of tax was too low: '(191) Even if the principle of the prudent private investor in a market economy were applicable, in the light of the documents provided by the French authorities shedding light, according to them, on the profit expectations and risks attached to the alleged investment in the form of a tax exemption, application of the test of the private investor in a market economy leads to the conclusion that a prudent private investor would not have invested an amount equal to the tax due in the EDF capital increase in 1997. [...] (220) It follows that France must take all necessary measures to recover from EDF the aid unlawfully paid in the form of exemption from corporation tax in the amount of FRF 5 882 849 762 relating to the reclassification of part of the provisions to the tune of FRF 14 119 065 335 as capital.'

Perhaps the decision analysed in this article signals a change in Commission policy.

Second, in paragraph 8, the decision mentions that in case of bigger success than what is foreseen at the time of the provision of the repayable advance, the funding authority can receive additional payments [bonus fee]. Although paragraph 26 also refers to this possibility, it is not explained in the text of the decision in detail and it is not clear how this requirement relates to Article 7(5) of the GBER prescribing the amount of repayment

in case of success. For the sake of legal clarity, a more detailed explanation about the share of the profit in case the success threshold is not only reached but surpassed, would have been useful. We are very much aware that this is a sector-specific measure but some hints would have been useful also for ensuring equal treatment of beneficiaries in other sectors.¹⁵

Third, the decision is rather vague on how the premium of 0.25 per cent was established. In case of guarantee schemes, the Commission also requires the calculation of the operational costs of the guarantee-granting entity and expects Member States to prove that the guarantee fee covers these costs as well.¹⁶ One can assume that for granting entities smaller than the German KfW having fewer schemes, because of diseconomies from small size, this premium can be pretty much higher having a non-negligible impact on the GGE of the repayable advance.

Fourth, paragraph 15 refers to the credit history of the beneficiary. In case of undertakings in the civil aviation sector, it is probably not unusual to have a proper credit history. However, R&D is often driven by start-ups, spin-offs, and SMEs without any credit rating or credit history. Therefore, in other cases and sectors, the GGE of the repayable advance can be higher as the creditworthiness of the beneficiaries would be lower. Future methodologies should probably also deal with the situations where the beneficiary does not have any credit rating at all.¹⁷ At this stage we can only presume that the credit rating of the aid beneficiary or a proxy for it has somehow to be derived.

Fifth, paragraph 21 and the paragraphs that follow show the limits of the decision and of that particular methodology for other cases. The methodology requires detailed sectoral knowledge and benchmarks to assess the riskiness of projects. In the civil aviation sector, where the state's presence for historical reasons is strong, this is manageable. By contrast, this may not be the case in other sectors where the state most probably does not have the required knowledge and data. It appears that either the state must rely on independent expertise to assess requests for repayable advances or the aid applicants must submit studies by independent experts. This would seem to militate against horizontal, cross-sector, schemes.

Sixth, without knowing the specific riskiness of a particular project, in comparison to historical benchmarks, it

15 The presence of the bonus success fee allows also us to think that the Commission followed the logic of an investor because a lender would never get more than the interest in case the project is successful.

16 See Commission Notice on the application of Articles 87 and 88 of the EC Treaty to State aid in the form of guarantees, OJ C 155, 20/6/2008, p. 10.

17 For example, the Commission 2008 notice on the reference and discount rates requires 400 bps to be added to the risk premium of undertakings without a credit rating, OJ C 14, 19.1.2008, p. 6.

is impossible to establish how advantageous this methodology is in relation to the simplified rules of Article 7(5) of the GBER. Perhaps the difference is not substantial and applying this very complex methodology does not result in a significantly lower GGE for the state aid that may be embedded in a repayable advance.

Taking all of the above into account, we can conclude that the decision is both interesting and noteworthy, but it definitely contains certain unexplained statements and may not be the ideal model for other Member States

to follow. The methodology outlined in the decision is heavily dependent on sectoral information. This means that public authorities will have to utilise outside expertise. In conclusion, the Commission decision SA.53791 reveals both the advantages [e.g. larger nominal amounts of public funding] and disadvantages [e.g. complexity] of supporting research through repayable advances.

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