Effective tax rates for R&D: Modelling notes

Explanatory Annex to Corporate Tax Statistics 2023

R&D tax incentives that provide preferential tax treatment to firms' expenditures on R&D exhibit very heterogeneous design features across jurisdictions, which come on top of existing differences in standard corporate income tax systems. Indicators based on forward-looking effective tax rates capture in a synthetic manner the effect of taxation on firms' R&D investment decisions.

Indicators of the effective average tax rate (EATR) and the cost of capital for R&D are useful to analyse decisions at the extensive margin (e.g., whether or where to invest in R&D) and at the intensive margin (e.g. how much to invest in R&D), respectively. This note contains a summary of the key parameters and modelling assumptions that enter the indicators of the cost of capital and EATR for an R&D investment in Corporate Tax Statistics. The methodology that underpins these indicators is available in an accompanying **OECD Taxation Working Paper** (González Cabral, Appelt, & Hanappi, 2021). These indicators stem from the ongoing collaboration of the Centre for Tax Policy and Administration (CTPA) and the Directorate of Science, Technology and Innovation (STI).

In line with recent OECD work on effective tax rates (ETRs) including the impact of different tax incentives, the formulae to calculate ETRs has been updated to follow the permanent investment model (Klemm, 2008[2]).[1] This model assumes a standardised investment project where investors acquire a capital asset and use it for production until the capital asset is fully depleted (i.e., there is no reselling of capital assets). The change in methodology seeks to attain greater flexibility in the modelling of tax incentives and is in line with recent OECD publications on income-based R&D tax incentives (González Cabral et al., 2023[2]). The modelling of expenditure-based tax incentives is unaffected and still follows the methodology in González Cabral et al. (2021[1]) Annex A provides the updated formulae for the EATRs, cost of capital and B-Index.

Estimates in the database include indicators of the EATR and cost of capital for R&D investments, including expenditure-based R&D tax incentives. To assess the preferential tax treatment for R&D investments in relation to other investments, it is instrumental to calculate the EATR or the cost of capital

[1] See for example Celani, Dressler and Hanappi (2022[19]) for OECD studies that use this model to compute baseline ETRs and tax incentives for foreign direct investment or González Cabral et al. (2023[3]) for the impact of income-based R&D tax incentives. The permanent investment model simply relaxes the assumption of the one-period perturbation of the capital stock, which is assumed in Devereux and Griffith. The permanent investment model assumes that the asset is not disposed of after one year but rather kept during its lifetime. The investor keeps the asset and uses it in production until it is fully depleted. Under certain conditions, both models retrieve the same ETRs (see Klemm, (2008[2])). Certain tax incentives particularly those that affect the income stream of the project require the permanent investment model formulation in order to properly capture their effect on firms' ETRs.

for a comparable investment to which R&D tax incentives do not apply. By taking the difference between the estimate in the R&D and non-R&D case, it is possible to gauge the preferential tax treatment offered to R&D in a given jurisdiction, in isolation from baseline tax provisions available to *all* types of investments. Income-based tax incentives that provide preferential tax treatment to the income from R&D or R&D-related activities are not captured in these estimates. OECD work is ongoing to expand the measurement work to capture income-based tax incentives.

Closely linked to these indicators is the B-Index, the tax component of the cost of capital abstracting from financing decisions, which is a well-established indicator in the R&D literature (Warda, 2001; OECD, 2022). The three indicators: the EATR for R&D, the cost of capital for R&D and the B-Index, which are all contained in OECD Corporate Tax Statistics and the OECD R&D tax incentives database, provide a toolbox for policymakers to evaluate the impact of taxation on firms' R&D investment decisions at the extensive and intensive margin. The modelling of R&D tax incentives is consistent across the three indicators; certain differences in the estimation remain and are discussed in this note.

1. Modelling assumptions

Estimates of the EATR for R&D and the cost of capital for R&D focus on the incentives faced by large firms among which R&D is heavily concentrated (Dernis, et al., 2019; OECD, 2022) and assume that firms are able to use in full their tax benefits. Provisions introduced by governments to target particular firm types and to promote R&D among firms that may not be able to fully use their tax benefits are not captured in these indicators, but can be analysed using the B-Index indicator available since the year 2000 (OECD, 2022).

Certain design features that limit tax benefits for R&D such as the presence of ceilings and thresholds are assumed not to be binding due to a lack of data reflecting the share of R&D expenditure or performers bound by these limitations. These estimates should be interpreted as an upper bound of the generosity of R&D tax incentives, i.e. the maximum amount of relief firms can obtain from an R&D investment, see González Cabral et al. (2021) for a discussion of the three indicators.

2. An R&D investment

In generating R&D assets, firms typically incur a mix of current costs and capital investments. The enhanced tax treatment for each component differs across jurisdictions (Appelt, Galindo-Rueda, & González Cabral, 2019; González Cabral, Appelt, & Hanappi, 2021). The modelling considers a fixed mix of 90% current expenditure (60% labour; 30% other current expenditure) and 10% capital (5% tangible assets; 5% non-residential structures) to produce the R&D asset, reflecting average R&D input shares in OECD countries (OECD, 2022).

The indicator captures variation in baseline depreciation rules and on the preferential tax treatment of current and capital inputs used for R&D purposes across countries. The composition of the R&D investment underpins the calculation of the B-Index, cost of capital and EATR for R&D indicators. A fixed project composition ensures that variations across jurisdictions can be attributed to taxation. The sensitivity of estimates to variation in the composition of the R&D investment can be consulted in the accompanying paper (González Cabral, Appelt, & Hanappi, 2021).

3. Tax parameters

Data on the design of R&D tax incentives are collected as part of the annual OECD R&D tax incentive survey. The survey is conducted by STI in collaboration with members of the OECD R&D tax incentive network, formed by experts from the Working Party of National Experts on Science, Technology and Innovation and from the Working Party No.2 on Tax Policy and Statistics (WP2). The calculations of

EATRs and the cost of capital for R&D build upon the same design features and the same modelling of R&D tax incentives as the B-Index contributed by STI. Differences arise with respect to the macroeconomic scenario chosen (see B-Index modelling notes for an extended explanation and macroeconomic parameters below) (OECD, 2022). TableB.1 at the end of this document provides a list of the expenditure-based R&D tax incentive provisions modelled.

CIT rates come from the OECD Tax Database (OECD, 2023[9]). Baseline tax depreciation rules and rates for tangible assets and non-residential structures and other elements of the tax system such as allowances for corporate equity are obtained from the OECD Corporate Effective Tax Rates survey. This survey, conducted by the CTPA, engages experts of WP2. The tax parameters and modelling of these provisions align with that used to compute corporate effective tax rates published as part of the Corporate Tax Statistics for the categories cited above (Hanappi, 2018[11]; OECD, 2023[10]). For tangible assets an unweighted average is used. When countries report that accelerated depreciation is available for capital inputs used for R&D purposes, the baseline depreciation treatment captured as part of Corporate Tax Statistics is replaced with the respective accelerated depreciation scheme.

4. Economic parameters

A key parameter in the model for the estimation of the effect of taxation on an inframarginal investment is the pre-tax rate of return of the project, which in this case, corresponds to the private return on the R&D asset. The pre-tax return of the R&D investment is calibrated to the average rate of p=30% for the purpose of this analysis. As Hall, Mairesse and Mohnen (2009) point out, this parameter is not a 'scientific constant' but an outcome of several factors and returns to R&D may vary across sectors, countries and likely over time. See González Cabral et al. (2021) for an analysis of the sensitivity of estimates to this parameter.

Economic depreciation rates are hard to measure for intangibles. In line with previous literature, this study considers the economic depreciation rate for R&D assets to be 15% (Hall, 2007; Evers, Miller, & Spengel, 2013; Lester & Warda, 2014). However, it is recognised that R&D depreciation rates might differ extensively across sectors and over time (Li & Hall, 2020).

The modelling considers a real interest rate of 3% and an inflation rate of 1% in line with the low-tax scenario considered in Corporate Tax Statistics (OECD, 2023[9]). The B-Index assumes a different macroeconomic scenario with a nominal and real interest rate of 10%. Table 1 contains the values of the key modelling parameters used.

Table 1. Key model parameters

Parameter		Value
Pre-tax rate of return	p	30%
Economic depreciation rate	δ	15%
Real interest rate	r	3%
Inflation	π	1%

Source: OECD Secretariat.

5. Other modelling assumptions

- The estimation abstracts from the inclusion of personal income taxes and other related taxes such as real estate taxation.

- The investment is considered to be a domestic investment, i.e., cross-border investments are not considered at this point although the effect of these provisions could be investigated as part of future work
- For the purpose of this analysis, the investment is assumed to be financed by retained earnings for simplicity and allowance for corporate equity are accounted for where available (OECD, 2023[17]). Note that the B-Index abstracts from the impact of financing decisions.

Annex A. Updated formulae to calculate ETRs

This annex updates the formulae in González Cabral et al. (2021[1]) to calculate the effective average tax rate (EATR), cost of capital and B-Index for R&D investments using the permanent investment model formulation. The calculation of the total value of tax benefits including expenditure-based R&D tax incentives, A^*, remains as outlined in that paper. Table A.1 includes a variable list and Table A.2 summarises the main equations.

Table A.1. Variable list

Variable	Description	Range	Category
p	Pre-tax rate of return	$0<p\leq 1$	(asset)
δ	Economic depreciation rate	$0<\delta\leq 1$	(asset)
π	Inflation rate	$0\leq\pi$	(macroeconomic)
r	Real interest rate	$r\gtrless 0$	(macroeconomic)
i[2]	Nominal interest rate	$0\leq i$	(macroeconomic)
τ	Corporate tax rate	$0\leq\tau$	(tax)
φ	Capital allowance rate (SL, DB)	$0\leq\varphi\leq 1$	(tax)
β	Capital allowance factor (DBSL)	$1\leq\beta$	(tax)
T	Project lifetime for tax purposes (DBSL)	$0<T$	(tax)
T^*	Optimal switching period (DBSL)	$0<T^*\leq T$	(tax)
A	Net Present Value of Capital Allowances	$0\leq A\leq\tau$	(tax)
A^*	Net Present Value of Total Tax Benefits (including tax incentives)	$0\leq A^*\leq\tau$	(tax)
v	Indicator for Inventory Valuation Method	$v=\{0; 0.5; 1\}$	(tax)
$\hat{\imath}$	Notional Interest Deduction (ACE)	$0\leq\hat{\imath}$	(tax)
$\hat{\tau}$	Tax rate applicable to notional interest	$0\leq\tau$	(tax)
N^{ACE}	ACE: Number of years over which the provision is spread (Belgium)	$N^{ACE}\geq 1$	(tax)
φ_{exp}	Share of initial investment expensed	$0\leq\varphi_{exp}\leq 1$	(tax)
τ_d	Tax rate on distributions (Estonia, Latvia)	$0\leq\tau_d\leq 1$	(tax)

[2] The real and nominal interest rates are related through the Fisher equation $(1+r)(1+\pi)=1+i$.

Source: OECD, based on OECD (2023[17]).

Table A.2. Update to the formulae used to calculate indicators of effective tax rates, cost of capital and B-Index for R&D

Effective Average Tax Rate	$$EATR = \frac{R^* - R}{Y^*}$$	(A.1)
Net income (Y^*)	$$Y^* = \sum_{s=0}^{\infty} \frac{p(1+\pi)^s(1-\delta)^{s-1}}{(1+i)^s} = \frac{p}{r+\delta}$$	(A.2)
Economic profit in the absence of taxation (R^*)	$$R^* = -1 + \sum_{s=0}^{\infty} \frac{(p+\delta)(1+\pi)^s(1-\delta)^{s-1}}{(1+i)^s} = \frac{p-r}{r+\delta}$$	(A.3)
Economic profit under taxation (retained earnings), R	$$R = R^{RE} + F^{DE} + F^{RE}_{ACE}$$	(A.4)
Retained earnings (no financing terms)	$$R^{RE} = \sum_{s=1}^{\infty} \frac{(p+\delta)(1+\pi)^s(1-\delta)^{s-1}(1-\tau_{t+s})}{(1+i)^s} + A^* - 1 = \frac{(p+\delta)(1-\tau)}{(r+\delta)} + A^* - 1 \ \ if \ \forall t \ \tau_t = \tau$$	(A.5)
Financing term (debt)	$$F^{DE} = \begin{Bmatrix} (1-\tau\varphi_{exp})(i - i(1-\tau))\frac{1}{(r+\delta)(1+\pi)} & Debt \\ 0 & Retained\ Earnings \end{Bmatrix} \forall t \ \tau_t = \tau$$	(A.6)
Financing term (Allowance for corporate equity)	$$F^{RE}_{ACE} = \begin{Bmatrix} \hat{\imath}(\tau - \hat{\tau})\frac{1}{(r+\delta)(1+\pi)} & ACE - Equity\ Stock \\ \hat{\imath}(\tau - \hat{\tau})\frac{1}{(1+i)} & ACE - New\ Equity \end{Bmatrix} \forall t \ \tau_t = \tau$$	(A.7)
	$$\tilde{p} = \frac{(1-A^*)(r+\delta)}{(1-\tau)} - \frac{F(r+\delta)}{(1-\tau)} - \delta \ \forall t \ \tau_t = \tau$$	(A.8)
B-Index (exclusive of financing effects)	$$B - Index = \frac{1-A^*}{1-\tau} \forall t \ \tau_t = \tau$$	(A.9)

Note: The formulae presented here underlies the indicators currently present in Corporate Tax Statistics: the EATR, cost of capital and B-Index. It considers the case of an investment financed by retained earnings including the presence of allowances for corporate equity where available.
Source: OECD, based on OECD (2023[17]).

Annex B. Modelled expenditure-based R&D tax incentives

Table B.1 Expenditure-based R&D tax incentives modelled and notes, large firms, 2019-2022

Country	Modelled R&D tax provisions
Argentina	- No expenditure-based R&D tax incentives in 2019-2022
Australia	- R&D tax credit (volume) Modelling note: The modelling considers a firm with turnover above AUD 50 million Not modelled: - 175% International Premium incremental tax concession for additional investment in foreign-owner R&D (available as of 1 July 2007)
Austria	- R&D tax credit premium (volume)
Belgium	- R&D tax credit for capital expenditures (volume) - Partial exemption of payroll withholding tax (PWHTC) - Accelerated depreciation for R&D in 2019
Brazil	- R&D tax allowance - Accelerated depreciation for tangible assets used for R&D Not modelled: - The R&D tax allowance rate may vary from 60% to 100% depending on R&D staff growth and patent/cultivar registration. 70% for an increase of up to 5% in R&D staff; 80% for an increase of more than 5% in R&D staff; extra 20% deduction for qualifying costs incurred in developing a patent or cultivar (allowed when patent/cultivar is registered).
Bulgaria	No expenditure-based R&D tax incentives in 2019-2022
Canada	- Scientific Research and Experimental Development (SR&ED) tax credit (volume) Not modelled: - Provincial R&D tax incentives
Chile	- Tax credit for intramural and extramural R&D (volume)
China	- R&D tax allowance (volume) - Accelerated depreciation for tangible assets used for R&D
Colombia	- R&D tax credit (volume)
Costa Rica	- No expenditure-based R&D tax incentives in 2019-2022
Croatia	R&D tax allowance (volume)

Country	Modelled R&D tax provisions
	Modelling note: The R&D tax allowance is available at a rate of 100% for basic research, 50% for industrial research, 25% for experimental development and 50% for feasibility studies. An enhanced rate of 37% is modelled, applying a common 6:30:64 distribution of business R&D expenditure (BERD) by orientation of R&D performance (basic research, applied research and experimental development) based on an average estimate for OECD countries for 2008-15 (www.oecd.org/sti/rds).
Czechia	- R&D tax allowance (hybrid) Not modelled: Extension of qualifying expenses to include external services related to R&D provided by public R&D institutions (from January 2014)
Cyprus[3]	- 2022: Enhanced tax deduction for R&D expenses
Denmark	- R&D tax allowance - Accelerated depreciation for tangible assets used for R&D. Not modelled: - R&D tax credit (deficit-related, volume)
Estonia	No expenditure-based R&D tax incentives in 2019-2022
Finland	No expenditure-based R&D tax incentives in 2019-2020 - 2021-2022: R&D tax allowance for R&D-related research cooperation expenditures
France	- Crédit d'Impôt Recherche (CIR), R&D tax credit (hybrid): Modelling note: A tax credit rate of 30% apples to eligible R&D expenditures up to EUR 100 million (5% above this threshold).This threshold is assumed to be non-binding. In the modelling, the tax credit is only assumed to apply to 43% of operational costs matching the cap on staff costs. - Accelerated depreciation for tangible assets used for R&D. Not modelled: - The double deduction applicable to the wages of researchers with a PhD or equivalent degree and unlimited employment contract (young doctors) for the purposes of the R&D tax credit. - The exemption of social security contributions for young innovative enterprises (JEIs) or young university

[3] Footnote by Türkiye: The information in this document with reference to « Cyprus » relates to the southern part of the Island. There is no single authority representing both Turkish and Greek Cypriot people on the Island. Türkiye recognizes the Turkish Republic of Northern Cyprus (TRNC). Until a lasting and equitable solution is found within the context of United Nations, Türkiye shall preserve its position concerning the "Cyprus issue".

Footnote by all the European Union Member States of the OECD and the European Union: The Republic of Cyprus is recognized by all members of the United Nations with the exception of Türkiye. The information in this document relates to the area under the effective control of the Government of the Republic of Cyprus.

Country	Modelled R&D tax provisions
	enterprises (JEUs). - Expenses incurred in work contracted to public-sector research bodies count double for research tax credit purposes. - Crédit d'Impôt collaborations de recherche
Germany	- 2019: No expenditure-based R&D tax incentives. - 2020-2022: Tax credit for R&D labour expenditures ("Forschungszulage")
Greece	R&D tax allowance (volume)
Hungary	- R&D tax allowance (volume) - Exemption of social security contributions. Modelling note: The social security contribution rates researchers and PhD students are weighted to account for the share of R&D expenditure attributable to each group in each year. Not modelled: – Collaboration agreements with higher education institutions, the Hungarian Academy of Sciences or research institutions established by them (300% R&D tax allowance rate). – Development tax incentive for acquisitions of intangible assets, machinery and equipment and buildings used for R&D purposes. - R&D tax credit on SSCs of R&D staff in enterprises recognized as a research facility (50%, mutually exclusive with SSC exemption), exemption and R&D tax credit in Small Business Tax (KIVA).
Iceland	R&D tax credit (volume)
Israel	No expenditure-based R&D tax incentive is currently modelled.
Ireland	- R&D tax credit (volume) - Accelerated depreciation for tangible assets and non-residential structures used for R&D (incompatible in its use with the R&D tax credit from 2020 onwards).
Italy	- 2019: R&D tax credit (incremental), including the enhanced deduction on labour costs for researchers and technicians employed in R&D activity (costs related to highly qualified employees under 35 years of age with a PhD, at their first job and employed with a fixed-term contract are computed at 150 percent of the actual expenditure. Modelling note: The base amount is defined to be the average R&D investment cost in the 2012 - 2014 period. In the model, the base amount if taken to be a three-year average as an approximation. - 2020-2022: R&D tax credit (volume), including the enhanced deduction of 150% on labour costs for employees aged less than 35 at their first job, employed with a fixed-term contract and holding a PhD or a master's degree in technical or scientific fields. Since 2021, R&D tax benefits are payable in three yearly instalments in both the profit and loss case.

Country	Modelled R&D tax provisions
	Not modelled: - 2020-22: Enhanced R&D tax credit rates for firms in the Southern region of Italy - 2021-2022: Tax allowance for R&D expenses related to eligible intangible assets -
Japan	R&D tax credit (volume) Modelling note: Until March 31, 2021, the volume-rate of relief can range from 12-17% for SMEs and from 6-14% for large firms. The rate of 14% and 17% was used for modelling large firms and SMEs respectively. Until March 31, 2023, the volume-rate of relief can range from 12-17% for SMEs and from 2-14% for large firms. The rate of 14% and 17% was used for modelling large firms and SMEs respectively. Not modelled: - The high R&D intensity tax credit (incremental) - The Open Innovation activity-based R&D tax credit (volume) for cooperative or subcontracted R&D with national R&D institutes and universities (30%), SMEs (20%, applicable since 2019), R&D venture corporations (25%) or other non-public corporations (20%).
Korea	- R&D tax credit for research and human resource development (hybrid) Modelling note: For large firms, the volume-based component is modelled in 2019-2022. -Tax credit for investment in research and test facilities, training facilities and facilities for commercializing new technology Not modelled: - The position of high-potential enterprises that count with an enhanced volume-based credit rate compared to large firms. - The Growth Industry and Basic Technology tax credit (enhanced volume-based rate of 20-30% for large firms and high-potential enterprises. - 2022: the National Strategy Technology tax credit scheme (enhanced volume-based rate of 30% - 40% for large firms and HPE and 40% - 50% for SMEs - for R&D aimed at National Strategy Technologies.
Latvia	No expenditure-based R&D tax incentives in 2019-2022.
Lithuania	- R&D tax allowance (volume) - Accelerated depreciation for tangible assets used for R&D.
Luxembourg	No expenditure-based R&D tax incentives in 2019-2022.
Malta	Not modelled: - Enhanced tax deduction for R&D - R&D tax credit, 2014-20 - Aid for Research and Development projects (R&D tax credit), 2017-19.

Country	Modelled R&D tax provisions
	- R&D tax credit for R&D and Innovation, 2017-19
Mexico	R&D tax credit (incremental)
Netherlands	Payroll withholding tax credit (WBSO)
New Zealand	- R&D tax credit (volume) Not modelled: - R&D tax credit (deficit-related)
Norway	- R&D tax credit (volume) ("Skattefunn")
Poland	- R&D tax allowance (volume) Not modelled: - The enhanced allowance rate for companies with Research and Development Centre (RDC) status.
Portugal	- R&D tax credit (hybrid). Modelling note: Operating expenditures qualify up to a level of 55% of R&D wage expenditure (50% of the share of other current costs is assumed to qualify for modelling purposes).
Romania	- R&D tax allowance (volume)
	-
Slovak Republic	- R&D tax allowance (hybrid) Not modelled: - R&D tax allowance for incentive recipients
Slovenia	R&D tax allowance (volume)
South Africa	-R&D tax allowance -Accelerated depreciation for R&D tangible assets
Spain	- R&D tax credit (hybrid). - Accelerated depreciation for tangible assets and non-residential structures used for R&D. Not modelled: - Enhanced volume-based credit rate for staff dedicated exclusively to R&D - Exemption of employer social security contributions for qualified R&D staff (only compatible for the R&D tax credit for innovative SMEs).
Sweden	Exemption of employer social security contributions.
Switzerland[4]	No expenditure-based R&D tax incentives in 2019-2022.
Thailand	-2019-2020: R&D tax allowance -2021-2022: No details available
Türkiye	- R&D tax allowance (incremental) - Exemption of employer social security contributions. - Accelerated depreciation for tangible assets used for R&D.

[4] Switzerland does not provide expenditure-based R&D tax incentives at the central government level, however an optional R&D tax deduction at cantonal (subnational) level was introduced in 2020.

Country	Modelled R&D tax provisions
United Kingdom	- Research and Development Expenditure Credit (RDEC) for large enterprises - Accelerated depreciation provision for tangible assets and non-residential structures used for R&D. Modelling note: In 2021 and 2022, the superdeduction is modelled instead of the Research and Development Allowance as it would offer a more generous tax treatment for the taxpayer.
United States	- Regular Research credit (RRC) - Alternative Simplified credit (ASC) Modelling note: A weighted average of the impact of RRC and ASC on the total value of deductions is calculated, using IRS SOI data on the credits' respective shares in total qualified R&D expenditures as a weight. The weight applicable in2019-2021 refers to the 2013 weights as this is the latest data available at the time of this modelling exercise. The calculation accounts for RRC claims subject to the excess base (20% tax credit rate) and 50% current R&D expenditure limitation (10% tax credit rate) and the share of qualified R&D that is eligible under the ASC (14% tax credit rate). The modelling accounts for the capitalization of R&D resulting from the 2017 US tax reform (2017 Tax Cuts and Jobs Act). From 2022 onwards, R&D expenses are no longer expensed but capitalized and deducted over a five-year period (assuming the R&D took place in the United States). Legislation delaying the implementation of amortization has not been enacted yet.Not modelled: - Credit for basic research conducted in universities and certain non-profit organisations - Credit for energy research

Note: This table lists expenditure-based R&D tax provisions for large firms that were available in 2019-2022. When no year is specified, the incentive and modelling notes refer to both periods. Expenditure-based R&D tax incentives that are targeted to loss-making large firms referred to as deficit-related incentives in the table are not modelled. For a full list of expenditure-based R&D tax incentives available from the year 2000 for different firm types and profitability see the B-Index modelling notes below.
Source: OECD Secretariat adapted from the OECD R&D Tax Incentive Database, http://oe.cd/rdtax, September 2023.

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