Evaluating the effects of the R&D tax credit in Iceland

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Foreword

Iceland's governmental efforts to boost business R&D and innovation have increased significantly over the past two decades. Total government support to business research and development (R&D) has increased faster in Iceland than in most OECD countries, mainly driven by the provision of R&D tax incentives. The roots for this can be found in the Act on Support for Innovative Enterprises (152/2009), which reflected the government's intention to increase Iceland's economic resilience through a greater orientation towards knowledge-based activities as it sought to recover from the global financial crisis. This act introduced an R&D tax incentive scheme in 2010.

The government of Iceland indicated its commitment to evaluate the R&D tax incentive in its outline of actions as part of the Science and Technology Policy 2020-2022. Conducted at the request of the Ministry of Finance and Economic Affairs and the Ministry of Higher Education, Industry and Innovation, this OECD study aims at contributing to Iceland's broader evaluation efforts by analysing both the economic impact and the implementation and administration of Iceland's R&D tax credit scheme, in line with best practices for evaluating public policies. It provides an assessment of the effectiveness of the tax credit in inducing additional R&D investment at the firm level. This study also comprises a qualitative assessment of the design, implementation and administration of the R&D tax credit in Iceland comparing it to the extent possible to other OECD countries. It assesses aspects related to awareness and communication, application and access, eligibility criteria, institutional co-ordination and monitoring and evaluation mechanisms.

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An early version of the report was discussed at a workshop jointly organised with the delegates of the OECD Economic and Development Review Committee, the OECD Committee on Industry, Innovation and Entrepreneurship and the OECD Committee for Scientific and Technological Policy. Thanks are extended to the participants for valuable comments and insights.

Executive summary

Iceland's efforts to boost business research and development (R&D) and innovation increased significantly over the past decade. Iceland stands out as one of the OECD countries with the highest increase in total government support for business R&D between 2006 and 2020, mainly driven by the introduction of a R&D tax incentive scheme in 2010. Iceland's R&D tax incentive is a refundable volume-based scheme that allows companies to deduct part of the R&D related costs from the corporate income tax. The scheme has become more generous over time, increasing its budgetary impact especially in more recent years. An assessment of the impact and effectiveness of the scheme is therefore timely.

This report presents the findings of the evaluation of the tax incentive conducted by the OECD at the request of the Ministry of Finance and Economic Affairs and the Ministry of Higher Education, Industry and Innovation. The evaluation assesses the economic impact and the implementation of the scheme. It relies on an empirical analysis based on firm-level data provided by Iceland and interviews conducted by the OECD with stakeholders within and outside government.

KEY FINDINGS

The evaluation finds that the R&D tax credit is effective in reducing the costs of R&D and incentivising businesses already engaged in R&D to invest more. R&D performers that started to use the R&D tax credit during the 2013-2020 period (for which data were available and exploitable), experienced a significant rise in R&D spending, - especially micro firms which are found to react more strongly to the reduction in marginal R&D costs induced by the R&D tax credit. The R&D tax credit in Iceland also appears to have had a positive impact on annual firm sales, employment and average wages.

The evaluation also considers the effect of the 2016 policy reform of the R&D tax credit in Iceland which raised the ceiling on total eligible costs and affected on average mostly small and medium-sized firms that, before the reform, were spending on R&D an amount between the old and the new limit. The assessment of the 2016 policy reform points to a significant increase in R&D spending among these firms.

While relevant data were not available yet to assess the effect of more recent policy reforms such as the 2020 reform which introduced differential credit rates for SMEs (35%) vs large firms (25%) and further increased the ceiling on total eligible costs, discussions with stakeholders and descriptive evidence on the level of R&D spending by firm size suggest that the increase in the R&D cap through the 2020 policy reform - unlike the 2016 reform - primarily affected a few large companies.

Overall, businesses appear to have a good understanding of the rules governing the expenditures that are eligible for R&D tax relief. However, there is scope to further clarify and provide regulatory guidance on the eligibility criteria for R&D project applications and tax relief claims in relation to R&D project ownership, R&D subcontracting, intellectual property (IP) costs, and aggregation rules.

The strong growth of the applications and claims is putting heavy demands on Rannís, the Iceland Centre for Research, which pre-assesses and approves applications, and Skatturinn, Iceland Revenue and Customs, which evaluates the tax credit claims and the amount of expenditure eligible for relief. Workload has increased with a negative impact on processing time. For instance, Rannís has been increasingly experiencing delays in its responses beyond the regular two-month processing time limit.

Regular monitoring of the scheme needs improvements. Monitoring efforts are mostly focusing on some aspects of the administration of the scheme and do not systematically monitor take-up, characteristics of beneficiaries and results against a set of objectives. There are no published annual R&D tax relief statistics. Iceland does not provide indicators of the distribution of R&D tax benefits and heterogeneity of impacts across different types of firms.

Data flows between Rannís and Skatturinn are limited, which can be a challenge for the efficient administration of the scheme. Statistics Iceland, the national statistical institute, is responsible for the Icelandic business R&D survey, which collects key data and information particularly important for monitoring and evaluating R&D policies, including firms' R&D expenditure, sources of R&D funds, the orientation of R&D (basic research, applied research, experimental development), and level of R&D employment. Statistics Iceland also has access to external microdata sources, including the data collected by Rannís and Skatturinn, for statistical purposes. While the 2010 law introducing the R&D tax incentive scheme provided for its evaluation three years after implementation, these data were never linked and used for evaluating the scheme before this OECD study.

KEY RECOMMENDATIONS

The evaluation of the impact of the scheme points to the need for some targeting of the R&D tax support. While Iceland started to move in this direction with the 2020 reform, introducing differential R&D tax credit rates for SMEs vs. large firms, the configuration of ceiling levels and aggregation rules still allows for a disproportionate increase of tax credit volumes claimed by large firms. Iceland should maintain this differentiation in R&D tax credit rates and further evaluate the impacts of the reform introduced in 2019 and 2020. Some OECD countries also apply other favourable terms like exclusive refund provisions for SMEs and/or start-ups and young firms as additional targeting instruments.

Iceland should develop additional regulatory guidance to clarify the eligibility criteria for R&D tax relief and software R&D eligibility to ensure accuracy and alignment of project and expenditure approvals. Rules should be designed with the goal of increasing the predictability of the outcome of claims by potential applicants and then be communicated effectively to applicants. An equal effort should be put into facilitating the processing of applications and claims. Some of the evaluation steps could be automated and digitalized, including auditing.

The regular monitoring of the scheme along with improvements in data quality should be a priority. Iceland should develop and implement a set of indicators to track systematically the scheme's take up, beneficiaries' characteristics and R&D and economic performance, including the use of direct R&D support. The dataset developed for this evaluation can provide a good basis for building a more comprehensive R&D policy database.

Evaluation should also be carried out more regularly. Any new legislative change of the R&D tax credit should include an evaluation requirement. To avoid the pitfall of the 2010 legislation, such provision should be accompanied by the allocation of resources, roles and responsibilities for conducting the evaluation. Legislation could also specify data and information needs.

1. Assessment and recommendations

Iceland introduced a tax incentive to boost investment in research and development (R&D) in 2010. The incentive is volume-based, allowing firms engaging in R&D projects to deduct part of the R&D-related costs from the corporate income tax. It is refundable, allowing firms to use earned credits independently from their profit and tax liability. The scheme has become more generous over time, increasing its budgetary impact. The credit rate was initially set at 20% for all types of firms, within the limit of ISK 250 million of total (intramural and extramural) R&D costs incurred by the business. In 2016, the limit of total R&D costs was increased to ISK 450 million which was followed by a second increase to ISK 900 million in 2019. In 2020, a higher, differentiated tax credit was implemented to support investment during the COVID-19 crisis, amounting to 35% for small and medium-sized enterprises (SMEs) and to 25% for large firms. Simultaneously, the limit of total eligible R&D costs was increased to ISK 1.1 billion. In 2022 the aggregate ceiling was reduced to ISK 1 billion and is foreseen to be raised again back to ISK 1.1 billion in 2023 and 2024.

At the request of the Ministry of Finance and Economic Affairs and the Ministry of Higher Education, Industry and Innovation, the OECD assessed the economic impacts and the implementation of the scheme. The assessment relies on an empirical analysis based on data provided by Iceland (presented in Section 3) and stakeholder interviews conducted within and outside government (presented in Section 4). The two parts of the analysis provide the basis for the policy recommendations presented in this section of this report. The policy recommendations take into consideration and enrich the proposals made by the Ministry of Finance and Economic Affairs in 2019 (see Annex A) following its assessment of the R&D tax credit and broader fiscal environment for R&D and innovation in Iceland (MoF, 2019[1]).

The tax credit has a positive sizeable impact on business R&D performance but the scheme's reforms impacted firms differently

The R&D tax credit is effective in reducing the costs of R&D for continuous R&D performers, incentivizing business already engaged in R&D activities to invest more. Companies that performed R&D and started to use the R&D tax credit during the 2013-2020 period (for which data were exploitable), experienced a significant rise in R&D spending. The analysis conducted estimates that a 1% reduction in the cost of R&D to firms due to the take-up of the tax credit results in a more than 2% percent increase in R&D expenditure. More specifically, ISK 1 of R&D tax subsidy translates into around ISK 3 of additional R&D investment. The identified effect for Iceland is relatively high in international comparison. The high result for Iceland is mostly driven by micro firms, who react more to the reduction in marginal R&D costs induced by the R&D tax credit. However, this effect is mostly induced by the low investment in R&D by firms *before* take-up of tax support, rather than the size of the business *per se*.

The R&D tax credit in Iceland also appears to have had a positive impact on yearly firm sales, employment and average wages. The results from the OECD analysis suggest that 1 ISK of R&D tax support generates 0.45 additional ISK of annual sales and 0.002 additional ISK of yearly wage per employee in R&D performing firms. Moreover, spending 10 million ISK (USD 75 600) in tax subsidy is associated with the hiring of one additional employee. However, these results warrant careful consideration due to the challenges in estimating the effects on firms' outcomes. One of the primary concerns is the potential for endogeneity, whereby the magnitude of the effect may be influenced by the fact that larger firms, in terms of employment and sales, are more likely to invest more in R&D and therefore take advantage of the R&D tax credit. Additionally, the effects on certain outcome variables (e.g., innovation, economic performance) may only appear with significant time lag with respect to the uptake of the R&D tax credit.

The changes introduced to the scheme in 2016 provide an opportunity to assess the impact of some of these reforms and the way the scheme is targeted. The increase in total eligible costs from ISK 250 million (ISK 100 million in intra-mural R&D expenditures) to ISK 450 million (ISK 300 in intra-mural R&D expenditures) affected on average mostly small and medium-sized firms that, before the reform, were spending on R&D an amount between the old and the new limit. Comparing the evolution of R&D expenditure between firms affected and those not affected by the reform suggests that ISK 1 of R&D tax subsidy translates into ISK 2 of additional R&D investment.

By contrast, the increase in the ceiling through the 2020 reform seems to have affected a few large firms but seems to have had little impact on micro and small firms as almost all their intramural R&D spending falls below the R&D cap. Discussions with stakeholders confirmed this empirical finding: only few large firms benefitted from the most recent increases in the upper ceiling on eligible R&D expenditures. SMEs in turn benefitted from a comparatively stronger increase in R&D tax credit rates in the 2020 reform which raised the tax credit rate from 20% to 35% for SMEs and to 25% for large firms.

The increased volume of R&D tax support after the 2016 reform and the additional surge since the 2020 reform indicate that a debate on targeting the R&D tax support is timely. Many OECD countries target support to (innovative) small and medium-sized enterprises (SMEs) and/or start-ups and young firms. In most cases, targeting is implemented through enhanced tax credit/allowance rates. While Iceland started to move in this direction with the 2020 reform, the configuration of ceiling levels and aggregation rules still allowed for a large increase of tax credit volumes claimed by medium and large firms (see Figure 4.2). Some OECD countries apply other favourable terms like exclusive refund provisions for SMEs and/or start-ups and young firms (examples are presented in Table 4.4) as additional targeting instruments.

- **Recommendation 1:** In line with Iceland's initial policy objective to raise business R&D investment, in particular among start-ups, continue to apply the differentiated and enhanced R&D tax credit rates for SMEs vis-à-vis large companies that were introduced in the 2020 reform. Maintaining the differentiation is supported by the finding of the evaluation that the R&D tax credit yields higher effects for small and micro enterprises.

- **Recommendation 2:** Quantify the impact of the reforms introduced in 2019 and 2020, which could not be fully assessed in the OECD study because relevant business R&D survey and tax relief microdata were not yet available for analysis (see also Recommendations 4 and 5 below highlighting the need to strengthen data quality and coverage). Future assessments should also consider the effect of direct funding and, to the extent possible, the joint effect of direct and tax support, which was not possible in the OECD study due to data limitations. Sound evidence from these assessments should be a prerequisite to decide on future adjustments and reforms of the R&D tax credit in Iceland (e.g. adjusting the ceilings or further targeting of tax credit rates). These findings should also inform a stocktaking of the direction and priorities of Iceland's R&D policy.

Criteria for expenditures that are eligible for the tax credit should be further clarified to strengthen the effectiveness of the scheme

Businesses have a good understanding of the rules governing the expenditures that are eligible for R&D tax relief. However, there is scope to further clarify and provide regulatory guidance on the eligibility criteria for R&D project applications and tax relief claims in relation to R&D project ownership, R&D subcontracting, intellectual property (IP) costs, and aggregation rules.

The entitlement of the R&D tax relief considering R&D project ownership (Art.2 of Act No. 152/2009) represents a potential source of uncertainty as no regulatory guidance is available specifying ownership (Rannís, 2022a[2]). Tax relief is apparently tied to the IP that results from a presented R&D project. However, in some cases, control and responsibility for IP can be ambiguous. One example represents the eligibility of R&D project applications and claims made by subsidiaries that are liable to pay tax in Iceland but whose IP is controlled by a parent company abroad.

Act No. 152/2009 does not specify whether R&D services purchased from domestic related parties and from foreign parties are eligible for tax relief (Rannís, 2022a[2]). R&D subcontracting abroad is usually eligible for tax relief in most OECD countries with some limitations on the scope of outsourced projects and the country of origin (for example, within the EU single market). Few OECD countries explicitly warrant the eligibility of sub-contracting to domestic related parties, such as the United Kingdom for SMEs.

As some stakeholders expressed confusion regarding the eligibility of IP-related costs for R&D tax relief, a more transparent communication could strengthen applicants' ability to distinguish between IP costs that are integral to the R&D project

and elements that relate to the commercialization of knowledge assets. Following the Frascati Manual (OECD, 2015[3]), only the first category can be assumed as part of the R&D project and qualifies for consideration in the tax relief.

The definition of the ceiling on R&D expenditure eligibility warrants clarification of the applicable business aggregation rules. Uncertainty exists among stakeholders as to whether the ceiling should be applied separately to the R&D tax incentive claims of each tax-paying subsidiary or to the aggregated claims of the group. The evidence gathered indicates that Skatturinn, Iceland's tax authority, treats claims of tax-filing entities separately if they have different tax IDs, which becomes a possible mechanism for firms to optimize tax relief. In 2022, the ministries clarified that the ceiling should apply to the aggregated claims of the group in line with EU tax regulations. One aspect to clarify is the extent to which this ruling applies to claims by subsidiaries belonging to the same group but having a different tax IDs.

- **Recommendation 3:** Develop additional regulatory guidance to clarify the eligibility criteria for R&D tax relief. Rules should be designed with the goal of increasing the predictability of the outcome of claims by potential applicants. Based on the clarification of the eligibility criteria, communicate additional regulatory guidance transparently to applicants. The clarification of eligibility should address:

  – the beneficiary of R&D tax incentives in relation to control and responsibility over the projects whose expenditures are considered eligible for support;

  – R&D services purchased from domestic related parties and from foreign parties;

  – IP-related costs of R&D projects;

  – aggregation rules regarding the applicable ceilings on the amount of qualifying R&D expenditure in the case of subsidiaries that are part of the same group but have different tax IDs.

Indicators and metrics need to be developed further to monitor the direction of the scheme and impacts of recent and future reforms

Monitoring efforts are mostly focusing on some aspects of the administration of the scheme and do not systematically monitor take-up, characteristics of beneficiaries and results against a set of objectives. The administrations managing the scheme monitor deviations in the R&D amounts reported in R&D project applications vis-à-vis tax relief forms. There are no published annual R&D tax relief statistics apart from an annual list of main R&D tax relief recipients. Iceland does not provide indicators of the distribution of R&D tax benefits and heterogeneity of impacts across different types of firms. Stakeholders attributed this problem in part to uncertainty regarding the expected outcomes of the scheme and to the lack of a culture for policy analysis and evaluation. The need to further evaluate the impact of the scheme provides an opportunity to address these challenges. Strengthening monitoring only requires modest efforts and can start with the systematic monitoring of take up and beneficiaries' key features.

- **Recommendation 4:** Develop and implement a set of indicators to track systematically the scheme's take up, beneficiaries' characteristics and R&D and economic performance, including the use of alternative business R&D support measures. The indicators could be monitored by the Ministries of Finance and Economics Affairs and Higher Education, Industry and Innovation, relying on regular reporting from Rannís, Iceland's public research centre responsible for assessing applications for the tax relief and Skatturinn, the tax authority administering the tax relief. The indicators could inform the annual publication of statistics on R&D tax relief.

Data quality, flows and linkages across databases should be strengthened

Rannís, Iceland's public research funding agency, collects data on R&D projects and tax relief applicants as part of the R&D tax relief pre-approval process, while Skatturinn, the tax authority, collects data related to the tax relief claim. Data flows between these two organisations are limited, which can be a challenge for optimal, joined-up scheme

administration. Statistics Iceland, the national statistical institute, responsible for the Icelandic business R&D survey, has access to external microdata sources, including the data collected by Rannís and Skatturinn, for strict statistical purposes. Statistics Iceland also has the technical capability to link data and provide access to data through a secure environment also accessible remotely, a valuable asset that has not yet been exploited to its full potential.

This OECD study was the first exercise of its kind using Iceland's linked business R&D survey, tax relief microdata, and grant funding data to assess the impact of the R&D tax relief. Statistics Iceland is a small institution that faces challenges in maintaining the data. However, the example provided by the OECD study highlights an opportunity for domestic researchers that should not be missed. The OECD worked with Statistics Iceland to build a data dictionary for the dataset created for this study. The dataset and data dictionary can become the basis for an R&D policy database that could be further expanded as indicators and metrics recommended above are developed and expanded.

The OECD study on Iceland's R&D tax credit has also allowed to identify some statistical anomalies that had important policy implications. Reported values of direct government funding of business R&D compiled from business R&D surveys incorporated tax refunds for R&D performed in the previous period. By convention, under international standards, these should be reported as internal funding as the relief is not earmarked for use on R&D on the current period. This discovery led to a significant review and revision of the existing statistics on direct government funding of business R&D (BERD) for Iceland as well as called for reassessing several of the preliminary messages in this report, since absent that information tax support was being double counted. At the time of reporting, Statistics Iceland has already revised the data on direct funding of BERD for 2015-2021 in line with OECD Frascati Manual guidance (OECD, 2015 [3]), removing the R&D tax relief related component, but the revision of the pre-2015 data series is still ongoing. The completion of the ongoing revision and future investments in data quality are important for drawing clear conclusions about the evolution of the R&D support policy mix over time and assessing its impact.

- **Recommendation 5:** Invest in the micro data infrastructure to further develop the database created for the study to progressively build an R&D policy database that can serve for monitoring and evaluating the R&D tax relief and direct R&D support in the future. The availability and quality of underlying data on direct funding should be monitored and improved by reviewing questionnaire design, guidance and estimation practices. Data on direct funding of BERD should be systematically gathered in national business R&D surveys in line with the Frascati Manual guidance. Administrative data on R&D grant funding should comprise information on all recipients and volume received per recipient whenever multiple firms are involved in a project (and not only on the main applicant as it is currently the case). The database could also be expanded by including additional data on personnel and employment output variables (not limited to R&D staff) including the number of employees and wages by gender, age, education/skills. Data exchanges between Rannís, Skatturinn and Statistics Iceland should be formally reviewed and enhanced within the limits required by confidentiality assurances.

With the growing uptake of the scheme, processing of applications and auditing practices should be improved

The increased uptake of Iceland's R&D tax relief scheme was accompanied by a growing number of R&D project applications of companies that have become more and more diverse and have grown in turnover, substantially increasing the workload of the two administrative agencies Rannís and Skatturinn. This reinforces the need for accurate and efficient processing of R&D project applications at Rannís and R&D tax relief claims at Skatturinn.

Ahead of the reform of the tax relief scheme in 2020, Rannís had introduced an improved system to evaluate applications. A checklist-based approach allows to better manage the manual assessment workflow, facilitates the exchange between colleagues, and the handover of applications within Rannís. The system has proven effective in supporting the agency with the growing number of R&D project applications. Some automated routine checks have been introduced. However, various administrative processes are still conducted as manual reviews.

There is potential to increase the effectiveness of analysis on the accuracy of R&D project applications submitted to Rannís and R&D tax expenditure claims reviewed by Skatturinn, as well as their mutual consistency. There exists

room for improved efficiency in auditing efforts that currently focus on potential deviations between the R&D project applications and the tax expenditure claims, and which are not currently supported by automatised tools. Another area where improvements could be introduced is the in-depth assessment of the reported R&D expenses used to claim relief. To date, this poses a significant challenge for Skatturinn as assessing the plausibility of indicated resource requirements to accomplish the R&D project tasks requires highly specific domain technical and financial knowledge. On the side of Rannís pre-approval efforts, more specific guidance on software R&D eligibility could facilitate procedures for the large number of ICT companies applying for tax relief.

Implementing IT-based solutions and automation, where possible, can increase the efficiency of assessment processes and the identification of problematic applications and claims. The introduction of randomised audits could be applied more systematically to help enforce the application of eligibility criteria. Several OECD countries with R&D tax incentive schemes provide relevant examples in terms of approaches and tools to review cases. Potentially relevant practices for Iceland's agencies comprise automated semantic analyses that complement manual evaluations, or automated risk assessment serving to identify claims that are typically error-prone, as in the United Kingdom.

- **Recommendation 6:** Explore possibilities to digitise and automate the evaluation process in order to realise possible efficiency gains in both agencies while maintaining quality (e.g. automated risk assessments and semantic analysis of applications).

- **Recommendation 7:** Develop more specific guidance on software R&D eligibility to ensure the accuracy and alignment of project and expenditure approvals by Rannís and Skatturinn, especially in view of numerous applications from the ICT sector.

- **Recommendation 8:** At Skatturinn, implement systematic randomised audits to strengthen the enforcement of the eligibility criteria for R&D tax relief claims. Additionally, consider the implementation of practices facilitating the in-depth investigation of R&D expenditure claims, such as adopting structured risk classifications through with input from Rannís or conducting in-depth assessments for applications above certain relief/refund thresholds.

Strong growth of applications and claims drive the administrative agencies to their capacity limits, creating needs for increased co-operation and resources

Both administrative agencies are facing capacity issues following fast growth in the use of the support scheme in recent years. The estimated monthly workload for Rannís staff member has significantly increased. At Rannís, two staff members (full-time equivalents) are responsible for the processing of project applications while the assessment and questions by applicants requires on average 4 to 5 exchanges with each applicant which may including intense interactions such as individual site visits. The increasing complexity of applications drives additional demand for interaction between Rannís staff and applicants' R&D and accounting experts to identify eligible R&D components. Skatturinn faces similar challenges related to the increased number and volume of R&D expenditures and their growing complexity and specificity.

Such capacity issues impact the agencies' assessment procedures. Rannís has been able to handle the fast increase in applications but has been increasingly experiencing delays in its responses beyond the regular two-month processing time limit. Due to the time and resource constraints, Skatturinn largely refrains from conducting ex-ante assessments as well as ex-post auditing of a large share of tax relief. R&D recipients. The expertise required for specific cases currently leads Skatturinn staff to consult Rannís colleagues.

In this context, it is even more important to make the best use of all available resources. There is a professional committee composed of representatives of the two Ministries responsible for the R&D tax relief and the Confederation of Icelandic Employers which does not currently play an active role in advising Rannís on emerging issues, procedures and definitions of R&D projects.

- **Recommendation 9:** Going forward, ensure that agents with industry specific expertise can focus on the most knowledge-intensive applications and claims, for instance regarding the identification of eligible R&D components. The agents should further take advantage of knowledge sharing and peer-learning activities with related agencies from other OECD countries facing similar challenges. At the same time, aim to standardise the assessment procedures for less complex cases so that they can be performed by agents without industry specific knowledge.

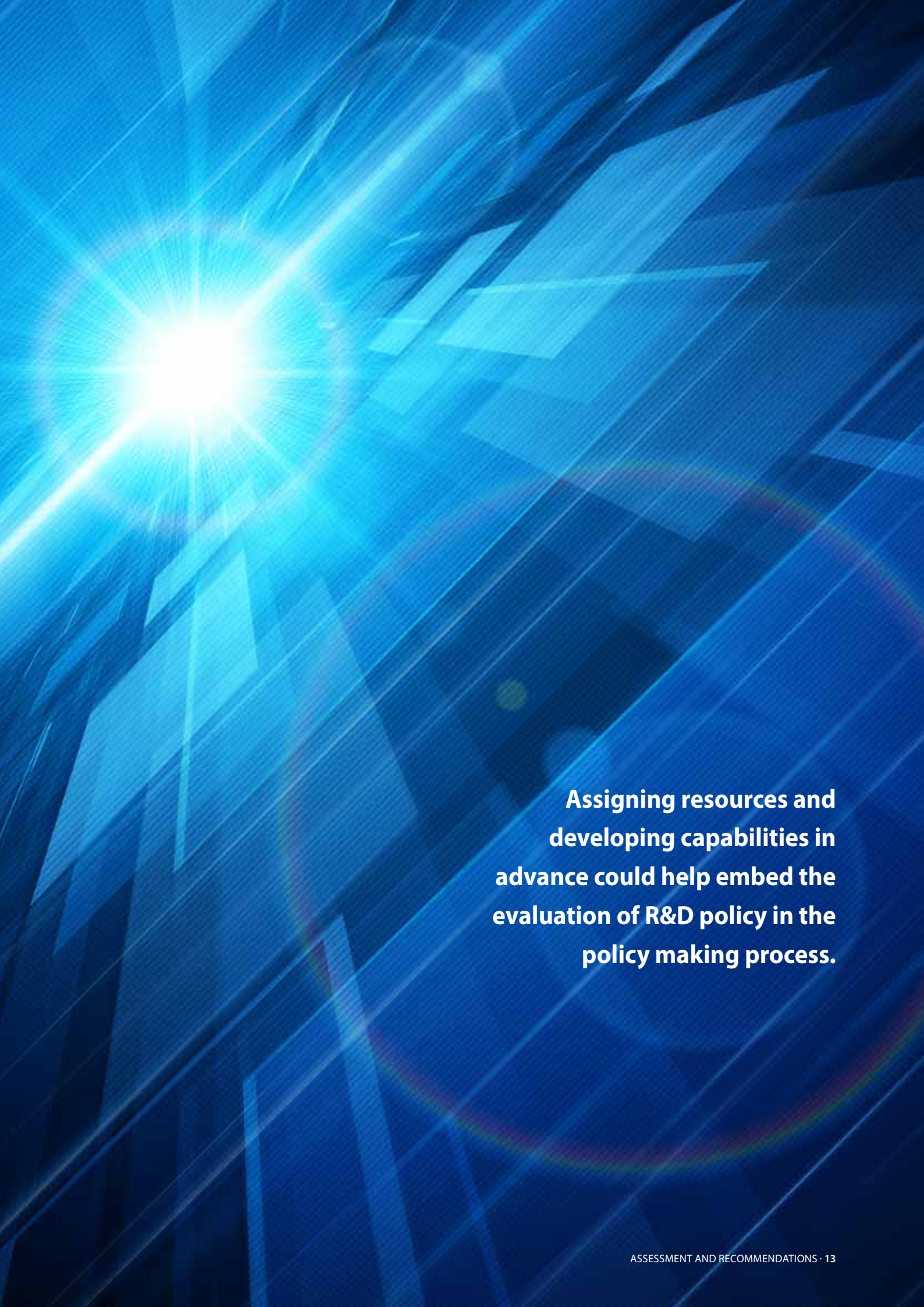
- **Recommendation 10:** For agents at Skatturinn, provide advanced training, to strengthen their knowledge and confidence in working on complex R&D claims while reducing the agency's dependency on knowledge at Rannís.

- **Recommendation 11:** The role of scientific advisory in the administration of the R&D tax credit in Iceland could be further strengthened by establishing more formal and regular exchanges between the professional committee, Rannís and Skatturinn. The committee may point out options for public consultation and assist in developing and testing proposals for operational guidance that Rannís and Skatturinn may wish to consider introducing, or for identifying situations where such guidance would be needed.

Evaluating the R&D tax relief and, more broadly, R&D policy should become a regular practice

The 2010 law introducing the R&D tax incentive scheme provided for its evaluation three years after implementation. While such a provision is considered a good practice, this was however not followed through. Impacts were not systematically assessed and evaluated. In 2021, Rannís conducted a survey among beneficiaries of the tax relief to assess impact of the R&D projects that benefitted from the tax credit. The survey was circulated among 200 companies, collecting self-reported data on beneficiaries' operating income, number of jobs created and purchased R&D work. The survey informed three case studies on companies that benefitted from the tax credit. While this qualitative assessment is useful, it is not sufficient and should be complemented by the quantification of impacts, looking also at outcomes such as firms' productivity and using counterfactual methods. Assigning resources and developing capabilities in advance for such exercise could help embed the practice in the policy making process.

- **Recommendation 12:** Inscribe in any new legislative change of the R&D tax credit the requirement for an evaluation of the scheme after, for example, 5 years of implementation (depending on the extent of the changes to the scheme). Ensure by law that a provision is made for resources to conduct the scheme's evaluation and assign roles and responsibilities for it. Legislation could also specify the data needed and any survey that would need to be conducted to inform the evaluation so that the data can be appropriately collected and be available for the evaluation.



Assigning resources and developing capabilities in advance could help embed the evaluation of R&D policy in the policy making process.

Governments adopt various support instruments to promote R&D with the goal of bringing investment closer to the socially optimal level.

2. Government support for business R&D in Iceland and in the broader OECD context

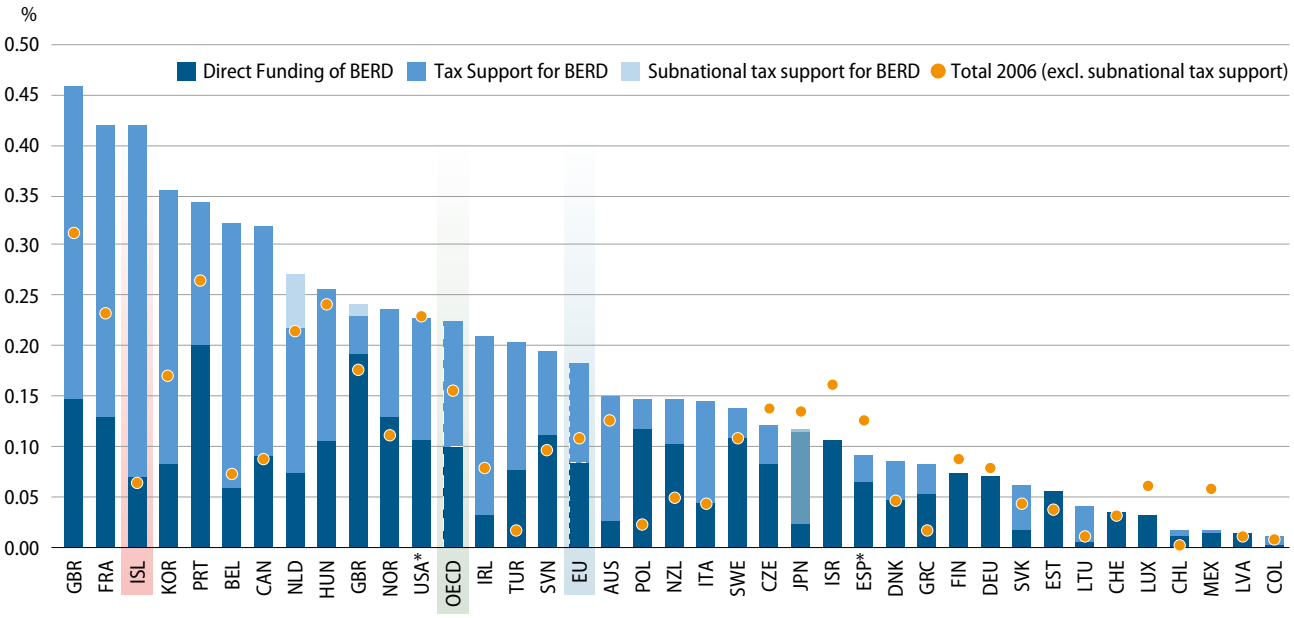
Investment in R&D is a key determinant of productivity and competitiveness. With 70% of total investment in R&D performed by private business, businesses play a key role in determining the level of R&D investment in a country (Appelt et al., 2016[4]; OECD, 2021[5]). However, several factors such as positive externalities which make social and economic returns from R&D higher than private returns, and financial constraints often lead to suboptimal levels of R&D investment. For this reason, governments worldwide adopt various support instruments to promote R&D with the goal of bringing investment closer to the socially optimal level. One major class of R&D support measures aims at alleviating the costs for business associated with R&D activity. In practice, these take the form of direct support measures, such as grants, and indirect support measures, such as R&D tax incentives. Iceland's action towards strengthening R&D is consistent with an effort across OECD countries to boost innovation. This section provides first an overview of policy trends across OECD countries in supporting R&D. It then describes Iceland's R&D tax credit and the other measures put in place to support firm-driven innovation.

TRENDS IN GOVERNMENT SUPPORT FOR R&D

Over the past decade, OECD countries have made a significant effort to boost business-driven innovation. On average, government support has grown by 45% since 2006, reaching 0.22% of GDP in 2020. In this context, Iceland stands out as one of the countries with the highest increase in total government support for business, passing from 0.07% of GDP in 2006 to 0.42% in 2020 (Figure 2.1).

FIGURE 2.1. **Iceland has significantly increased government support to business R&D**

Direct funding and tax support for business R&D, OECD countries, 2020 or latest (% GDP)



* Data on subnational tax support not available

Note: This chart displays the revised data on direct government funding of BERD for 2020 provided by Statistics Iceland in May 2023, and the updated data on government tax relief for R&D expenditures provided by the Ministry of Finance and the Ministry of Higher Education, Industry and Innovation, Iceland in July 2023. The updated R&D tax relief figures for Iceland presented in this chart refer to accrual-based estimates. Previously, cash-based estimates were reported by Iceland. Statistics Iceland revised - in line with the international measurement guidance (OECD, 2015[3]) - the data series on direct funding for 2015-2021, removing the R&D tax relief related component, which was previously incorporated in the direct funding figures, leading to some double-counting.

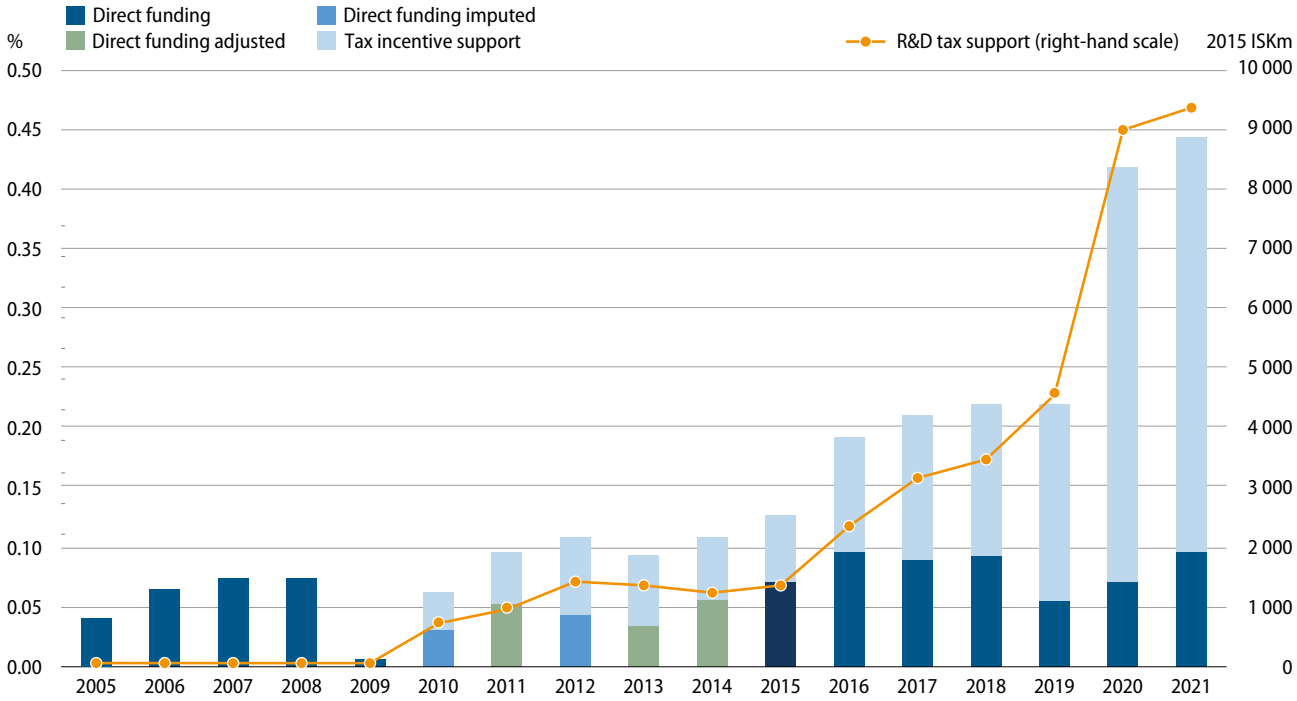
Source: OECD R&D Tax Incentives Database, http://oe.cd/rdtax, April 2023; Statistics Iceland, May 2023; Ministry of Finance and Economic Affairs and the Ministry of Higher Education, Industry and Innovation, Iceland, July 2023.

In terms of instruments used by governments to support R&D, tax incentives have become the primary support measure in OECD countries (Appelt et al., 2020[3]; OECD, 2021[6]), accounting for 55% of total government support in the OECD area in 2020 (OECD, 2023[7]).

Despite several data breaks and significant underlying uncertainty about the statistical data on R&D support[1], this trend is observable in the case of Iceland, where tax incentives have become the primary instrument of government support since their first introduction in 2010, accounting for 83% of the total government support in 2020. Figure 2.2 provides estimates covering distinct periods in terms of support availability as well as data sources and estimation methods to attempt to provide the most longitudinally consistent picture that can be provided as of today:

- A phase from 2005 to 2009 in which no tax support was provided and all documented government support for business R&D was provided through direct funding. This value dropped in 2009 because of the financial crisis and the severe budget tightening that ensued.

FIGURE 2.2. **R&D tax incentives have grown more than direct government funding in recent years in Iceland**
Direct funding and tax support for business R&D, Iceland, 2005-2021(% GDP, ISK million – 2015 prices (right-hand scale))



Note: This chart displays OECD estimates of direct funding of BERD and tax support for R&D drawing on recently substantially revised official sources and still undergoing revision in an attempt to provide a longitudinally consistent picture for the purpose of this report to assess changes in government support for R&D. For 2010-2015 adjustments have been made to mitigate against the potential double counting of tax support in reported direct funding of BERD, currently being revised. Revised data on direct government funding of BERD for 2015-2021 have been provided by Statistics Iceland in May 2023, and updated data on government tax relief for R&D expenditures (GTARD) for 2010-2021 have been provided by the Ministry of Finance and the Ministry of Higher Education, Industry and Innovation, Iceland in July 2023. The updated R&D tax relief figures for Iceland presented in this chart refer to newly provided accrual-based estimates. Figures on direct funding for Iceland for 2011, 2013 and 2014 were adjusted by the OECD by removing the cost of R&D tax relief (accrual-based estimate) in each year, and the 2010 and 2012 figures of direct government support for BERD were imputed as average of the previous and subsequent year values. The OECD R&D Tax Incentives Database series for Iceland will be revised in due course once the revision of data by Statistics Iceland is complete.

Source: OECD analysis based on OECD R&D Tax Incentives Database, http://oe.cd/rdtax, April 2022 Statistics Iceland, May 2023; Ministry of Finance and the Ministry of Higher Education, Industry and Innovation, Iceland, July 2023.

1. Double counting of tax support under direct government funding is an issue of concern. The analysis conducted in this OECD study allowed identifying that Iceland's official statistics of direct funding of BERD in Iceland had mistakenly included elements of R&D tax support, departing from OECD Frascati Manual guidance (OECD, 2015[3]). Upon OECD request, Statistics Iceland revised the data on direct funding for 2015-2021, removing the amount of R&D tax relief in those years that have been reported as direct funding. As Statistics Iceland's revision of the pre-2015 data on direct funding is still ongoing at the time of reporting, this chart presents preliminary OECD estimates of direct funding of business R&D (BERD) for 2010-2014 – the period during which existing figures of direct funding statedly include R&D tax relief. This adjustment may however over-correct and understate direct support since the overlap of tax relief with direct funding may only apply to the tax relief refunded and not the foregone tax revenue.

- For the period 2010-2015, tax support becomes available and soon reaches a comparable value to direct funding, which has been approximated by the OECD for this study given the lack of revised official data. Imputations are also implemented for years in which no business R&D survey was conducted. Over this period, while direct support does not recover to pre-crisis levels, tax support helps fill the gap and soon surpasses the level of direct support provided prior to the crisis.

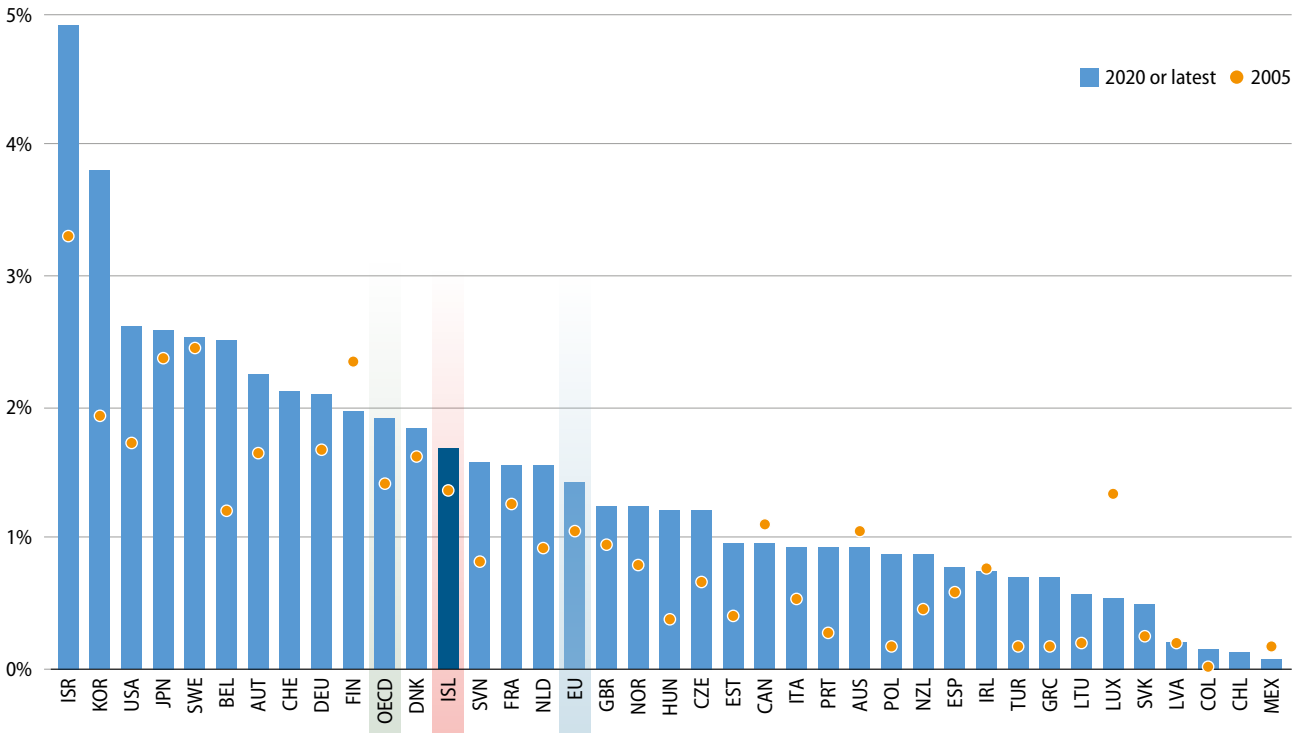
- From 2015 onwards, tax support becomes the dominant type of government support for business R&D, particularly after the 2020 reform. The 2020 reform led to a near doubling of the cost to government of providing R&D tax support. Direct funding of business R&D, by contrast, increased by 25% from 2019 to 2020 but only after it dropped by a similar amount the previous year. Direct support for business R&D remains today at pre-crisis equivalent levels.

The marked increase in the generosity of R&D tax relief though the 2020 policy reform, coupled with the market-based character of R&D tax incentives, plays an important role in explaining their rise as the dominant public measure to support business innovation.

Globally, the rise in government R&D support has been accompanied by an increase in total business R&D expenditure in the past fifteen years in OECD countries, with countries like Korea and Israel showing the largest overall increases in business R&D intensity (total business R&D expenditures as percentage of GDP). Iceland records a rise in business R&D (BERD) intensity of 16 % between 2005 and 2020, which represents a slightly smaller increase than the average change across the OECD in the same time frame (Figure 2.3). As governments increase their efforts to support business R&D, particularly through tax incentives, there is a growing need to examine the effectiveness of R&D tax relief provisions on a country-level basis.

FIGURE 2.3. **BERD (% GDP) in Iceland has increased in the past 15 years but it remains lower than the average OECD country**

Business expenditure in R&D (BERD), 2020 versus 2005 (% GDP)



Note: For Switzerland and Chile, data for 2005 is not available, for Australia and Switzerland the latest available data is from 2019.

Source: OECD Main Science and Technology Indicators, Volume 2022 Issue 1, https://doi.org/10.1787/4db08ff0-en. December 2022.

POLICY MEASURES SUPPORTING BUSINESS R&D INVESTMENT IN ICELAND

The Icelandic R&D tax credit was first introduced in 2010 upon the approval of the Act on Support for Innovative Enterprises (152/2009) (Rannís, 2022a[2]). It is structured as a volume-based scheme, allowing companies that engage in R&D projects to deduct part of the related costs from their payable income tax.

In its original formulation, the Act established a tax credit rate of 20% common to all types of firms, coupled with the definition of a lower and upper limit to the total R&D costs imputable for the calculation of the tax deduction. The credit is refundable: if a company with an approved R&D project has insufficient taxable profits against which it could deduct the R&D costs, the deduction is converted into a refundable amount and paid out to the company in the following fiscal year. To qualify for the scheme, companies are required to *i*) spend a minimum amount per project in R&D established by the Act (ISK 1 million per year per project), and *ii*) obtain a certification of validity by Rannís, the Icelandic Centre for Research, which assesses the R&D content of projects and makes sure that the business plan is well defined and that the staff have the training, education and experience in the area of the proposed project.[2]

Eligible costs for the purposes of the tax deduction include costs directly connected to the R&D project, employee costs associated to the R&D project, costs related to tools, equipment, building and land to the extent and for the period they are used for the R&D project, other operating costs, including material costs, costs of inventory and other operating costs directly connected to the R&D project.

The scheme was modified several times until 2022 to reflect several increases in the upper ceilings that apply to the amount of eligible in-house (intramural) R&D and subcontracted or collaborative (extramural) R&D expenditure that can be imputed for the calculation of the tax deduction (see Table 2.1. for more details). In 2016, the cap of for intramural annual R&D spending was initially increased from ISK 100 million to ISK 300 million. In 2019, the ceilings were increased again, resulting in a cap of ISK 600 million for intra-mural and ISK 300 million for extramural annual R&D spending.

TABLE 2.1. **Changes in R&D tax credit: increase in upper ceilings on total R&D costs**

Eligible R&D expenditure	Period of application	Headline rates	Minimum annual level of R&D expenditure	Maximum annual level of R&D
Current and capital	2011-2015	20%	ISK 1mn per project	Intramural: ISK 100mn Extramural: ISK 150mn
Current and capital	2016-2018	20%	ISK 1mn per project	Intramural: ISK 300mn Extramural: ISK 150mn
Current and capital	2019	20%	ISK 1mn per project	Intramural: ISK 600mn Extramural: ISK 300mn
Current and capital	2020	35% SME, 25% Large Firms	ISK 1mn per project	Total (Intramural + Extramural): ISK 1100mn Extramural: ISK 200mn
Current and capital	2021	35% SME, 25% Large Firms	ISK 1mn per project	Total (Intramural + Extramural): ISK 1100mn Extramural: ISK 200mn
Current and capital	2022	35% SME, 25% Large Firms	ISK 1mn per project	Total (Intramural + Extramural): ISK 1000mn Extramural: ISK 200mn

Notes: Minimum (floor) etc. refer to annual business eligible R&D expenditure and may involve more than a single project. Maximum annual level of R&D is measured per year, in total across projects. The average exchange rate in 2015 was USD/ISK 131.8 and EUR/ISK 146.3 (https://data.oecd.org/conversion/exchange-rates.htm)

Source: OECD R&D Tax Incentives Database (OECD, 2021[8]), http://oe.cd/rdtax. April 2022.

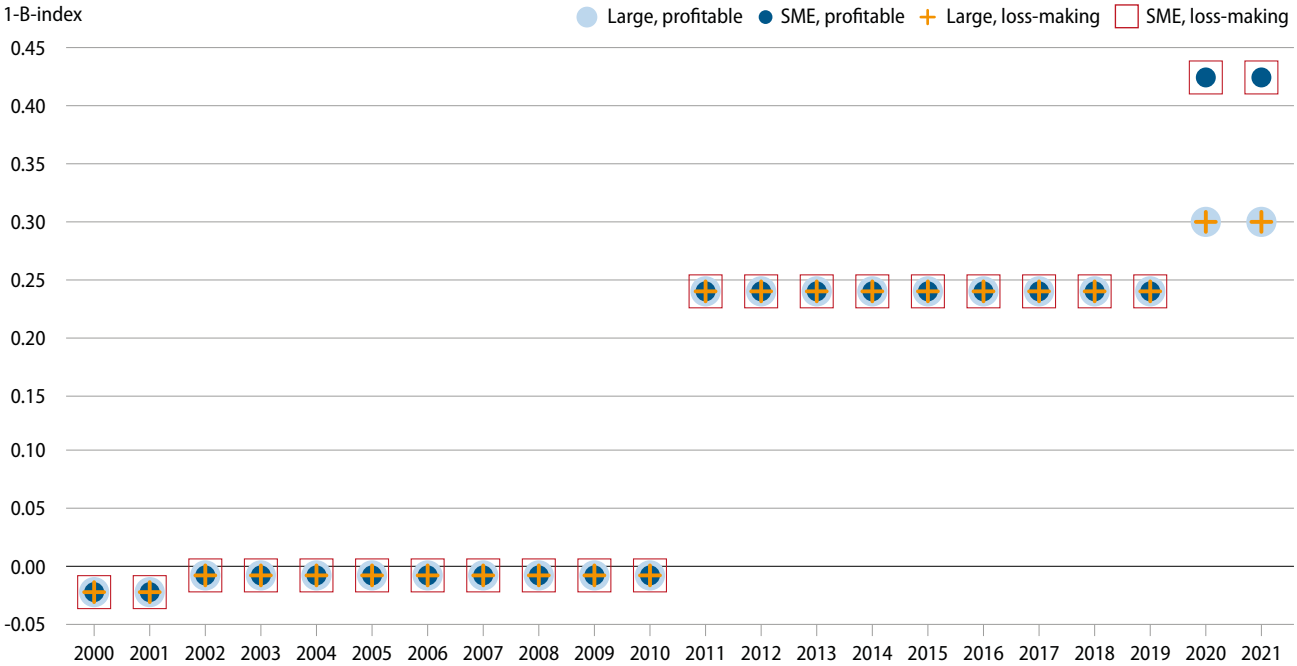
2. To receive the tax incentive for the current year, firms must submit the applications for first-time approval of the project before October 1st and for continuation projects, previously approved, before April 1st.

The modification of the Act in 2020 was part of a broader government action to attenuate the impact of the COVID-19 crisis. The changes to the scheme included *i)* an increase in the previously uniform tax credit rates of 20% to 35% in the case of SMEs and 25% in the case of large firms, and *ii)* a further increase in the ceiling on the total R&D costs for the calculation of the credit from ISK 900 million in 2019 to ISK 1100 million in 2020, which implied an increase in maximum amount of eligible inhouse R&D which more than compensated for the reduction of the ceiling on subcontracted and collaborative R&D. In 2022, the Icelandic government retroactively approved an extension of the temporary provisions introduced at the onset of the COVID-19 crisis from 2020 to 2022, while reducing the ceiling on total qualifying R&D from ISK 1100 million to ISK 1000 million in 2022. However, the ceiling on total qualifying R&D costs is envisaged to increase to ISK 1100 million in 2023 and 2024 again.

Since the introduction of the R&D tax credit in 2010 up until its reform in 2020, the headline rates of the R&D tax credit and the implied notional R&D tax subsidy rate (Figure 2.4) – a measure for the generosity of the R&D tax credit in Iceland – have remained unchanged. These implied R&D tax subsidy rates[3], calculated based on headline rates, provide an upper bound value of the generosity of R&D tax support in Iceland, not reflecting the effect of ceilings that may limit the amount of qualifying R&D expenditure. Implied marginal tax subsidy rates specify the notional levels of tax support (before tax) per additional unit of R&D to which firms with defined characteristics are in principle entitled. In the case of SMEs and large companies in Iceland, marginal R&D tax subsidy rates amounted to 0.24 up until 2019 in both the profit and loss case given the refundable nature of the R&D tax credit. In 2020, this rate increased to 0.42 for SMEs and to 0.30 for large companies. This change made the R&D tax incentive scheme in Iceland one of the most generous support tax relief schemes in the OECD area in 2022 (Figure 2.5.).

FIGURE 2.4. **Implied tax subsidy rates on R&D expenditures: Iceland, 2000-2022**

1-B-Index, by firm size and profit scenario



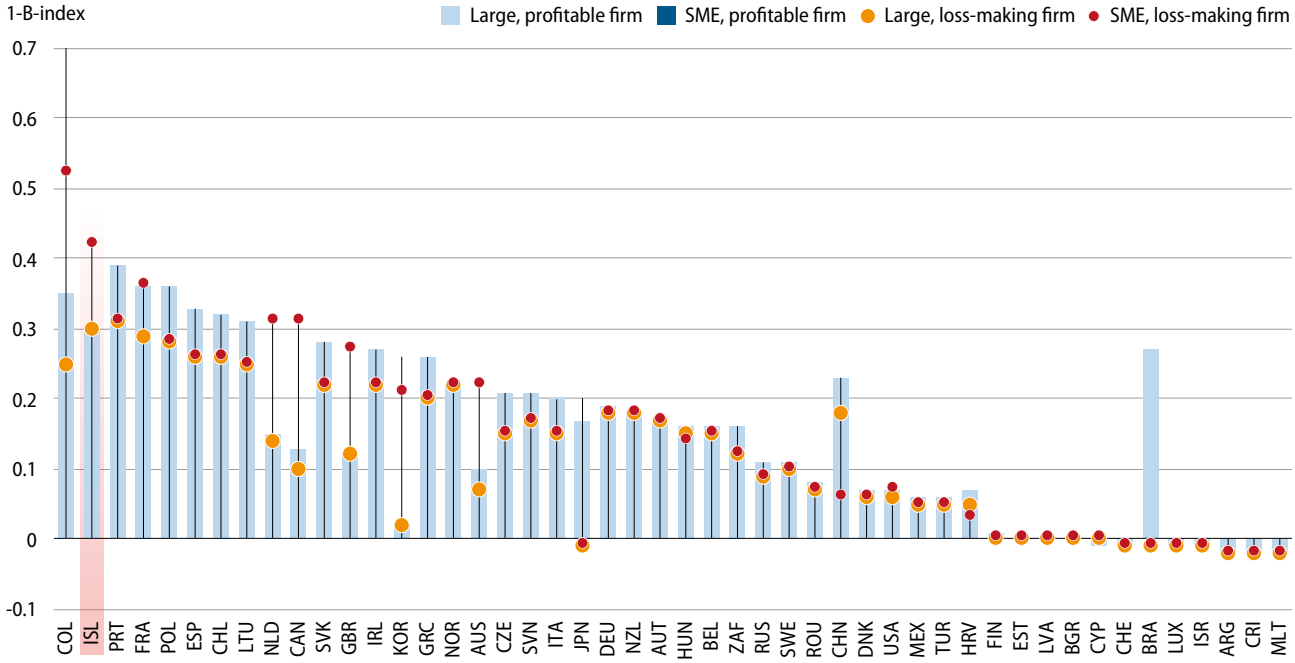
Note: Implied marginal tax subsidy rates, presented for different firm size and profitability scenarios, are calculated based on headline tax credit/allowance rates (see methodology and country-specific notes), providing an upper bound value of the generosity of R&D tax support, not reflecting the effect of thresholds and ceilings that may limit the amount of qualifying R&D expenditure or value of tax relief.

Source: OECD, R&D Tax Incentives Database, http://oe.cd/rdtax, April 2023.

3. Implied marginal tax subsidy rates are calculated as 1 minus the B-Index. The B-index specifies the pre-tax income needed for a "representative" company to break even on a marginal, monetary unit of R&D outlay ((OECD, 2023[7]); (OECD, 2013[52]); (Warda, 2001[61])), taking into account provisions in the tax system that allow for an enhanced treatment of R&D expenditures. This includes preferential tax relief provisions in the form of more favourable tax credit or allowance rates that apply to SMEs in some countries. For a description of the B-Index methodology, see Box 4.1. Understanding the B-Index in Appelt et al. (2019[53]), p.14 and the Definition, interpretation and calculation of the B index (OECD, 2013[52]).

FIGURE 2.5. **Implied tax subsidy rates on R&D expenditures: Iceland, 2022**

1-B-Index, by firm size and profit scenario



Note: Implied marginal tax subsidy rates, presented for different firm size and profitability scenarios, are calculated based on headline tax credit/allowance rates (see methodology and country-specific notes), providing an upper bound value of the generosity of R&D tax support, not reflecting the effect of thresholds and ceilings that may limit the amount of qualifying R&D expenditure or value of tax relief.

Source: OECD, R&D Tax Incentives Database, http://oe.cd/rdtax, April 2023.

Iceland also provides other forms of financial support for business R&D investments in the form of grants for business R&D. Between 2010 and 2016, Iceland offered three types of grants: i) pioneer grants to support early-stage projects by entrepreneurs and start-ups; ii) project grants to finance promising R&D projects; and iii) market grants to strengthen the development of marketing infrastructure related to product developments stemming from previous R&D work. Since 2016, the Icelandic government further provides support along the R&D value chain in the form of four different grant types: i) practical research projects, a grant directed to researchers that potentially collaborate with firms; ii) sprout, following the previous pioneer grants with new conditions; iii) growth/sprint for excellent development projects by companies; and iv) a further developed version of the market grants.

TABLE 2.2. **Overview of grants used in Iceland to support business R&D activity**

Grant	Period of utilisation	Maximum duration	Maximum amount	Description
Pioneer grant (Frumherjastyrkur)	2010-2016	2 years	10 mn. ISK per year	Pioneer grants were tailored to the needs of start-ups and entrepreneurs with early-stage projects. The pioneer was at the forefront and intended or had set up a company for her/his idea.
Project grant (Verkefnisstyrkur)	2010-2016	3 years	45 mn. ISK over three years,15 mn. ISK per year	Project grants were awarded for outstanding research and development projects.
Market grant (Markaðsstyrkur)	From 2010 (modified in 2016)	1 year	10 mn. ISK per year	Market grants were intended for companies that were emerging, for marketing infrastructure development. In general, the application had to be related to previous product development in connection with the company's research and development work for the same product(s). Since 2016, a minimum of 50% of the recipient's contribution against the grant amount is required. The application deadline is twice a year. This type of grant is de minimis support.

Grant	Period of utilisation	Maximum duration	Maximum amount	Description
Practical research project (Hagnýt rannsóknaverkefni)	From 2016	3 years	45 m. ISK over three years	Practical research projects aim to acquire new knowledge and skills that will be used to develop new products, work processes or services or to bring about significant improvements in older products, work processes or services. The project must have clear and realistic goals for utilization. A researcher such as a university or research institute is in charge of the project, but collaboration with companies is encouraged. The application deadline is once a year.
Sprout (Sproti)	From 2016	2 years	10 m. ISK per year for two years	Sprout is tailored to the needs of young start-ups and entrepreneurs with projects in their infancy. Emphasis is placed on the novelty of the project. No counter-contribution is requested from the applicants. The application deadline is twice a year. This type of grant is *de minimis* support.
Growth	From 2016	2 years	50 m. ISK over two years	Growth is provided for development projects at companies. A counter-contribution is requested against the grant under EEA rules. The application deadline is twice a year.
Sprint	From 2016	2 years	10 m. ISK per year	In the application for Growth, applicants can apply for Sprint, which gives the possibility of an additional contribution from the fund in each project year, but then it is necessary to demonstrate new share capital to the company of 70 m. ISK which is used for the project. The board of the fund takes a position on whether this is an excellent project and whether additional capital could lead to faster growth of the company. The application deadline is twice a year.

Note: The average exchange rate in 2015 was USD/ISK 131.8 and EUR/ISK 146.3 (https://data.oecd.org/conversion/exchange-rates.htm)

Source: Rannís (2022)

Each firm can apply for both forms of financial R&D support and combine R&D tax relief and direct support; however, in line with EU state aid rules that stipulate upper ceilings on the total amount of public support by firm type and orientation of R&D, the total government subsidy amount per company cannot exceed the limits detailed in Table 2.3.[4]

TABLE 2.3. **Firms can receive both R&D tax credit and direct support within certain limits**

Total amount of subsidies (direct support and tax credit) receivable by firms by firm size and type of R&D Expenditure

Firm type	Basic and Applied Research Costs	Experimental Development Costs
Small (An enterprise which less than 50 employees and an annual turnover of less than EUR 10 million and/or balance sheet of less than EUR 10 million)	Up to 70% of eligible costs Up to 80% of eligible costs for cooperative project	Up to 45% of eligible costs Up to 60% of eligible costs for cooperative project
Medium (An enterprise with between 50 and 250 employees and an annual turnover of less than EUR 50 million and/or a balance sheet of less than EUR 43 million)	Up to 60% of eligible costs Up to 75% of eligible costs for cooperative project	Up to 35% of eligible costs Up to 50% of eligible costs for cooperative project
Large (An enterprise with more than 250 employees)	Up to 50% of eligible costs Up to 65% of eligible costs for cooperative project	Up to 25% of eligible costs Up to 40% of eligible costs for cooperative project

Note: The Regulation is based on the criteria for State Aid for research, development and innovation projects set out in EU Regulation No 651/2014

Source: Regulation nr. 758/2011 Reglugerð nr. 758/2011 (rsk.is)

4. Iceland also offers a tax incentive for personal taxpayers that invest in start-ups, see https://www.skatturinn.is/einstaklingar/tekjur-og-fradrattur/hlutabrefafradrattur/

The R&D tax credit has a positive and sizeable impact on firms' R&D performance.

3. Assessment of the impact of the R&D tax credit

FOCUS AND APPROACH OF THE EMPIRICAL ASSESSMENT

The empirical assessment quantifies the effectiveness of the R&D tax credit scheme in inducing *additional* R&D investment at the firm level.[1] The focus is therefore on the impact of the R&D tax credit scheme on R&D *inputs and selected economic outcomes (i.e. sales, employment, productivity, export)*. The choice is mainly dictated by the availability and access to data (tax relief and structural business statistics data). Patent data and innovation survey data (not available in the current study) would allow for an assessment of the impact of the R&D policy on R&D *innovation outputs*.

The analysis follows the OECD MicroBeRD project (2020[3]) approach, which provides a common framework to estimate the responsiveness of business R&D expenditure to R&D tax incentive support schemes in a set of 20 OECD countries over the 2000-2017 period. The OECD MicroBeRD project (2020[3]) analysis uses national microdata for each country and follows a harmonised methodology to guarantee the comparability of results across countries[2]. The main output is provided under the form of R&D input additionality ratios which measure the additional amount of R&D investment induced by one monetary unit of public funding.

The OECD MicroBeRD project (2020[3]) analysis documents a positive effect of R&D tax support on R&D performance on average across countries, with one marginal unit increase of support being associated with 1.4 extra units of R&D[3]. Both, higher expenditures by existing R&D performers (intensive margin) and new spending by firms that did not previously undertake R&D (extensive margin) are found to drive the increase in total R&D investment. However, the impact of R&D tax incentives varies across different types of firms: large firms and firms with higher initial level of R&D spending show a lower responsiveness in their R&D investment to reductions in the cost of R&D induced by R&D tax incentives.

Differences regarding the effectiveness of R&D tax incentives exist between countries. The country-specific analysis in OECD MicroBeRD project (2020[3]) reveals large heterogeneity in the results, indicating that tax support causes *crowding out* of private R&D investment for some countries and *crowding in* for others. Both compositional effects and differences in the uptake and distribution of R&D tax incentive support and direct funding likely explain some of the variability observed in the effectiveness of public support across countries. Furthermore, policy changes may affect different types of firms (e.g. SMEs vs large firms) and R&D expenditure (e.g. subcontracted R&D vs. in-house R&D), and thus yield different results about the effectiveness of R&D tax incentives in stimulating R&D, both within and across countries. The findings of the within-country firm-level analyses indicate that changes in R&D tax incentive policies that target smaller firms or involve ceilings or thresholds tend to have stronger effects on business R&D investment, as small R&D performers appear to be more responsive than larger firms to the availability of R&D tax subsidies. The OECD MicroBeRD project (2020[3]) aims to deliver further evidence on the role of design features in shaping the effectiveness of R&D tax incentives in its second phase (2020-23).

Several national studies that draw on firm-level microdata confirm a positive effect of R&D tax incentives on business R&D.[4] For Norway, Cappelen et al. (2010[9]) document an increase in R&D investment of two additional Krones for each unit of tax subsidies, mostly driven by firms performing very little R&D before the introduction of the tax credit. In the United Kingdom, the Research and Development Expenditure Credit scheme is found to have an even higher input additionality between 2.4 and 2.7 (Scott and Glinert, 2020[10]). Dechezleprêtre et al. (2022[11]) further discover a

1. Throughout the text, the term R&D performance and R&D investment are used interchangeably.
2. The increasing use of firm-level microdata combined with methods such as quasi-experimental designs over the last two decades have enabled new insights into the relationship between tax incentives and business R&D performance. Previously, the relationship has already been studied with macro approaches (e.g. Bloom et al. (2002[51]) who found evidence of a positive effect of R&D tax credit on firm R&D investment by analysing a panel of nine OECD countries from 1979 to 1997, robust across countries and macroeconomic conditions.
3. This aggregate effect is found to be as high as for direct R&D support in form of grants (Appelt et al., 2020[3])
4. An overview of recent country-level studies is presented in Table 4.7. in Section 4.

particularly strong positive effect of tax subsidies in the United Kingdom for R&D activity by SMEs that is also driving innovation output in form of quality-adjusted patents, and innovation spillovers to technologically related firms. Basto et al. (2021[12]) also find a particularly strong effect of R&D tax credit for SMEs in the Portuguese support scheme. In contrast, for beneficiaries of the 2008 reform of the French R&D tax credit, Bozio et al. (2015[13]), Mulkay and Mairesse (2011[14]), and Mulkay, and Mairesse (2018[15]) (with a longer-term structural estimate) only identify a moderate increase of R&D activity, for which the relative increase in business R&D is not in proportion to the implied R&D cost reduction. With a broad literature survey that summarizes numerous country studies, Hall (2021[16]) supports the general evidence that R&D tax incentives are associated with an increase in business R&D. User-cost elasticities of minus one or lower in most studied countries imply that a 1% user cost reduction through R&D tax incentives increases business R&D by 1% or more, making R&D tax support competitive to direct R&D funding.

Overall, the literature yields evidence for a positive effect of R&D tax incentives in inducing additional business R&D investment (R&D input additionality). The remainder of the chapter is organised as follows. It first presents the dataset that has been built to conduct the assessment, including the challenges faced in building the dataset. Then it discusses the estimation strategy adopted for the assessment, and finally presents the results of the assessment.

DATA DESCRIPTION

The empirical analysis is conducted using a rich firm-level dataset constructed by linking four different sources: *i)* the R&D Survey; *ii)* Structural Business Statistics (SBS) provided by Statistics Iceland, *iii)* administrative R&D tax relief micro data from Skatturinn, the Icelandic tax authority; and *iv)* administrative data on R&D grant funding provided by Rannís, with information on the specific type of grant received by business (see Table 2.2 above for a detailed description of the grants included in the dataset).

Data from the business R&D Survey cover R&D performers in Iceland's business enterprise sector, in line with the international standards laid out in the OECD Frascati Manual. The business R&D survey collects detailed information on firms' R&D intramural and extramural expenditure, including sources of funds (internal, government, business, abroad), intramural R&D expenditure by type of cost (capital and current costs), the orientation of R&D (basic research, applied research, experimental development), and level of R&D employment (by gender and by role, e.g. researchers and technical staff). The information on R&D intramural expenditure and its cost components (capital and current) is available yearly from 2013 to 2020, while the remaining variables are only available for the years 2015, 2017 and 2019.[5] The Structural Business Statistics dataset, linked to the R&D survey by firm identification number and year, contains yearly information on a series of business characteristics, such as sector of activity (NACE rev.2), turnover, value added, labour costs, number of employees (headcount), and value of exports from 2010 to 2020.

Administrative data from the tax authority provide yearly information on the amount of tax relief received by firms. They are matched to the business R&D and SBS survey microdata by national experts in Iceland using unique business identifiers. This integrated micro dataset allows to identify R&D performers that do and those that do not take up the R&D tax credit scheme over the 2013-2020 period. Lastly, R&D grant funding data from Rannís provides information about the amount of R&D grant funding (by type of grant) received by firms per project from 2010 to 2020.[6]

The data preparation process follows as closely as possible the OECD MicroBeRD (2020[3]) approach to ensure harmonisation and comparability of the results with the other countries already analysed by the OECD.[7] After dropping

5. The survey is conducted every other year; however, the values of intramural expenditure and its component values are provided yearly. Information related to the sources of funds of intramural R&D expenditure in 2015 are not consistent with those in the following years in the dataset provided, partly due to changes in the survey questions from 2015 to 2017.

6. The Rannís dataset on R&D grant funding is organised by type of grant received by firms, spanning over multiple years. The multi-period information is then transformed by the OECD into yearly observations by exploiting the detailed information about the specific grant provided in Table 2.2 (maximum amount per year and maximum duration of grant support) and linked to the rest of the data.

7. The main discrepancy in the data preparation procedure between this work and MicroBeRD (Appelt et al., 2020[3]) consists in leaving micro-firms in the final dataset. This is done to ensure that enough observations are present in the dataset used for the econometric analysis. Moreover, MicroBeRD typically relies only on direct funding data (government-financed BERD) from the BERD survey and has not yet made use of separate administrative data on R&D grant funding.

observations without valid information on R&D activity and tax credit use, and only selecting R&D performing firms, the final dataset tracks 538 enterprises between the years 2013 and 2020. Among the tracked R&D performers, micro firms (0-9 employees) account for 54% of the sample, small firms (10-49 employees) represent 26% of observations, followed by medium-sized firms (50-250 employees) (15%) and large firms (more than 250 employees) (5%). The service sector is the most represented among R&D performers, with the Information and Communication Technology sector (industries 62-63 in NACE Rev 2 nomenclature) making up 33% of the sample.

Adding to the challenges identified with aggregate statistical data described in the previous section, the micro-data analysis work encountered two main challenges related to the construction of the dataset based on the business R&D Survey dataset and the Rannís administrative data on direct support for R&D. Firstly, the R&D Survey dataset was not accompanied by a data dictionary. At the same time, measurement units were not consistent throughout time and across variables. Additional difficulties were encountered when mapping the 2015 business R&D Survey questions to the variables provided in the dataset in order to interpret them. Secondly, survey data on R&D direct government funding of BERD are only available for two years (2017-2019)[8] and the administrative data from Rannís on R&D grant funding is only available for the main grant applicant, which has made the identification of the full set of grant recipients impossible in case of collaborative R&D projects[9].

To overcome these challenges, the OECD team created a data dictionary with the help of Statistics Iceland. This new dictionary maps the variables in the original business R&D survey micro dataset to the business R&D survey questions (2017-2019) and to the definitions in the OECD MicroBeRD (2020[3]) project where possible. The measurement units across time and variables have been harmonized, wherever possible. Unfortunately, the combination of survey and administrative data on R&D grant funding does not allow an analysis of the impact of R&D grant funding on business R&D performance.[10] For this reason, the OECD has exploited the available information on R&D grant funding in conjunction with business R&D survey data on direct support (government-financed business R&D, available for 2017-19) only as a control variable in the estimation of the impact of the R&D tax credit to account for the receipt of R&D grants and other forms of direct funding.

ESTIMATION STRATEGY

Estimating the impact of the R&D tax credit scheme on innovation inputs implies answering the following empirical question: *by how much does the R&D investment of firms in the presence of the R&D tax credit differ from the counterfactual level of R&D investment that would have been observed in its absence?* The answer to this question is not straightforward as the counterfactual scenario is not directly observed. The key estimation issue is that R&D performance and R&D support are likely to be correlated for reasons that are not necessarily due to the fact that R&D support boosts R&D performance. For example, the design of the tax credit scheme, which sets the amount of R&D tax relief in proportion to the level of R&D expenditures, implies that firms that spend more in R&D automatically receive more support (*reverse causality*). This creates a positive correlation between R&D support and R&D performance, which would bias the estimation of the impact of the policy.

8. As noted in Section 2, this OECD study has allowed to identify some statistical anomalies in direct funding of BERD, which, departing from the international measurement standard (OECD, 2015[55]), was found to incorporate tax refunds for R&D performed in the previous period. The impact of this double-counting of tax support on the empirical estimation is possibly limited and should not affect the analysis and findings of the OECD study, given the joint use of the BERD survey-based data on direct funding and administrative data on R&D grant funding, and the use of direct funding data in only two years (2017 and 2019), Moreover, the estimation accounted solely for the receipt rather than the actual value of direct support.

9. The limited availability of direct funding data poses a limitation to the study as it complicates controlling for direct funding while estimating the impact of the R&D tax credit.

10. As for R&D tax incentives, a difference-in-difference (DiD) estimation based on policy uptake (using coarsened exact matching) can be applied to estimate the impact of direct funding. In the case of R&D grant funding, a quasi-experimental estimation approach may also be feasible (Santoleri et al., 2022[58]). See also (Dumont, 2022[24]) for an outline of the estimation approaches adopted in a recent evaluation of public support to business R&D in Belgium. Up to date, few micro level studies have assessed the interaction effect of business support policies (e.g. (Huergo and Moreno, 2017[56]); (Pless, 2022[57])). Using funding rules and policy changes in a quasi-experimental evaluation, Pless (2022[57]), for instance, shows that direct grants and tax credits are complements for small firms but substitutes for larger firms.

In an attempt to overcome this challenge, this work follows closely the estimation approach adopted by the OECD MicroBeRD (2020[3]) project, adapting where necessary the methodology to the specificity of Iceland's scheme and the available data described above. The OECD MicroBeRD project (2020[3]) uses two different methods to estimate the impact of the R&D tax credit on firms' R&D performance. The first method compares R&D expenditure of firms that receive the tax credit to firms with similar characteristics (e.g. firm size, industry, level of R&D performance, receipt of R&D grant funding) that do not receive tax credit throughout time. The second method exploits policy changes in the design of R&D tax incentives and compares the R&D expenditures of firms that are affected by the policy change with otherwise similar firms that are not affected by the specific reform. This study exploits the 2016 change in the design of the R&D tax credit in Iceland, i.e. the increase in the upper ceiling on intramural (inhouse) R&D expenditures. In practice, both approaches are implemented using a *difference-in-differences with matching* estimation technique. The main difference consists in the definition of treatment and control groups: while the first approach selects these groups according to the *uptake* of the policy by businesses, the second approach defines treatment and control groups based on whether or not firms are affected by the policy *change* under consideration.

Both approaches aim to deliver causal estimates of the R&D tax credit by exploiting a source of exogenous variation in the cost of R&D activity affecting similar firms differently for reasons not linked to their R&D performance. However, results should be interpreted carefully, in light of the possible biases that might affect the two methodologies. In particular, the first approach compares R&D performance of firms according to their decision to use the tax incentive. As this decision is likely to be endogenous, e.g. correlated with other time-varying factors affecting also firms' R&D performance (such as firms' productivity), these results may potentially overestimate the effect of the tax credit. In contrast, by comparing firms that are differently affected by the change in policy for exogenous reasons, the second approach delivers more robust, "quasi-experimental" estimates of the causal impact of the R&D tax credit, under the key assumption that the R&D expenditure of the treated and control firms would evolve along a similar trajectory in the absence of the policy change. Despite the higher reliability of the approach based on policy changes for delivering causal estimates, the approach based on policy uptake is still a helpful resource for results that are comparable across countries. This approach is more harmonised across countries and does not to depend on the introduction of policy changes in the design of R&D tax incentive schemes.

Both approaches lead to the computation of two indicators which are crucial for drawing conclusions about the effectiveness of the R&D tax credit in raising business R&D investment, namely the user cost elasticity and the incrementality ratio. The *user-cost elasticity* measures the percent change in R&D due to a 1% change in the user cost of R&D induced by the tax credit. The *incrementality ratio* is a measure of input additionality. It indicates the extent to which the R&D tax credit is effective in generating additional R&D expenditure beyond the counterfactual level that would be observed in its absence, in relation to the monetary value of R&D support received. It effectively measures the amount of additional R&D generated by one additional monetary unit of public funding.

Another potential source of overestimation of the effect of the tax credit on input additionality could be due to the relabelling of non-R&D expenditure as R&D. Relabelling would imply that some non-R&D related expenditures decline as R&D expenditure increases. Recent studies suggest that relabelling does not appear to be a serious problem in advanced economies (Appelt et al., 2020[3]). The empirical analysis is based on intramural R&D expenditure as reported by firms in business R&D surveys, which is in principle less affected by the problem of relabelling,[11].

Accordingly, with all the caveats discussed above, the OECD MicroBeRD (2020[3]) methodology helps estimating the causal impact of the R&D tax credit in Iceland. It also allows the use of a harmonised methodology which provides guidance in the definition of the variables and that allows the comparison of the results with other OECD countries present in the OECD MicroBeRD (2020[3]) project.

11. Due to the lack of data on business expenditures qualifying for R&D tax relief, it was not possible to investigate possible differences in the amount of research expenses reported by firms in the business R&D survey vis-à-vis corporate tax returns. The interviews conducted with stakeholders in Iceland highlighted that tax authority Skatturinn investigates deviations in the R&D amounts reported in R&D project applications vis-à-vis tax relief forms but has so far not compiled any broader evidence on the proportion of incorrect and/or fraudulent claims.

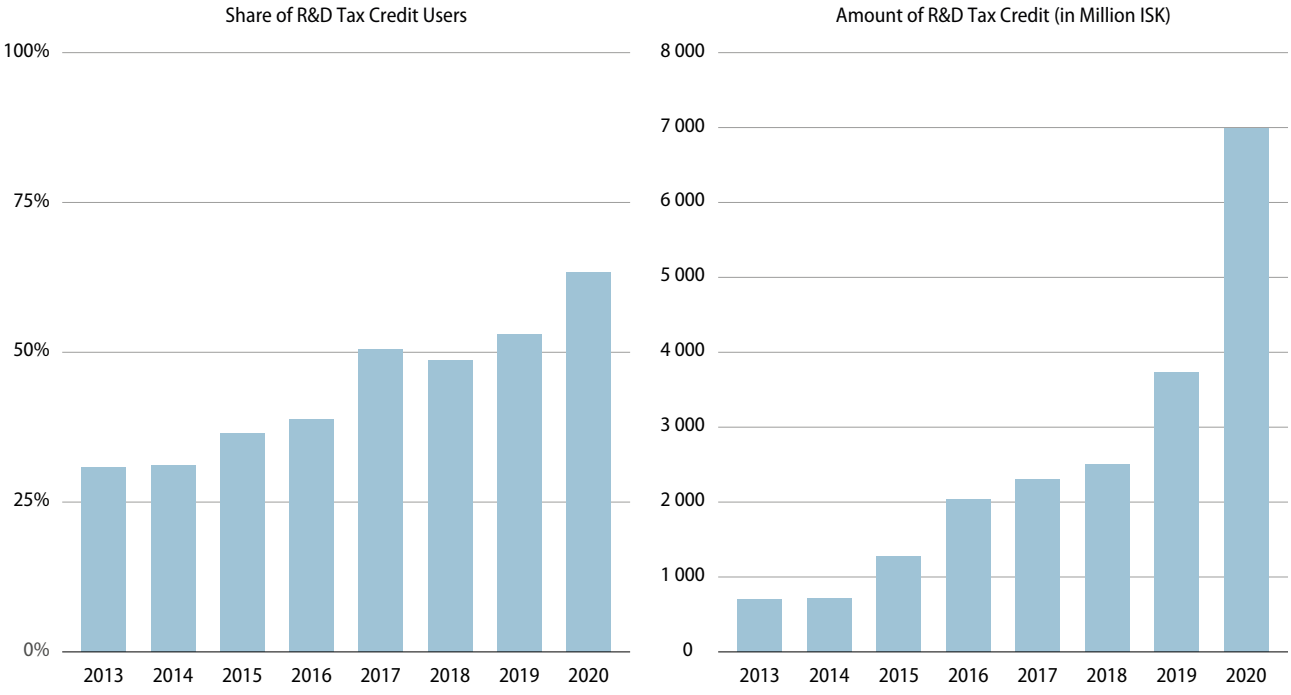
MAIN FINDINGS FROM THE EMPIRICAL ASSESSMENT

The share of firms using the R&D tax credit increased over time, with micro-firms and firms in the service sector accounting for the bulk of recipients

Not all eligible R&D performers use the R&D tax credit. In the Icelandic sample, only about 40% of observations (made of R&D performing firms only) receive R&D tax relief on average. This is in line with the OECD MicroBeRD (2020[3]) analysis, which documents that across 10 countries only about half of all R&D performing firms receive R&D tax support. This can be due to different reasons, such as unawareness of the instrument, difficulties in bearing the related administrative and compliance costs, and use of other sources of support, such as grants. The interviews conducted with stakeholders in Iceland indicated for instance a sequential use of grants and the tax relief (see Section 4). Young enterprises would initially rely on project or start-up grants and begin to apply for the R&D tax credits when they begin to gain scale. The share of firms using the R&D tax credit significantly increased after 2013, more than doubling by 2020 (Figure 3.1, left-side panel). The amount of resources dedicated to the R&D tax credit has also increased significantly since 2013 (Figure 3.1, right-side panel). The increase was particularly significant in 2020, with the rise of the tax credit rate for SMEs and large firms and the increase in the upper ceiling of eligible R&D costs.

FIGURE 3.1. **The share of R&D performing firms in the business R&D survey that use the R&D tax credit has increased since 2013**

Share of R&D tax relief recipients and absorbed resources in million 2015 ISK



Note: OECD analysis based on national business R&D survey data, December 2022. The average exchange rate in 2015 was USD/ISK 131.8 and EUR/ISK 146.3 (https://data.oecd.org/conversion/exchange-rates.htm).

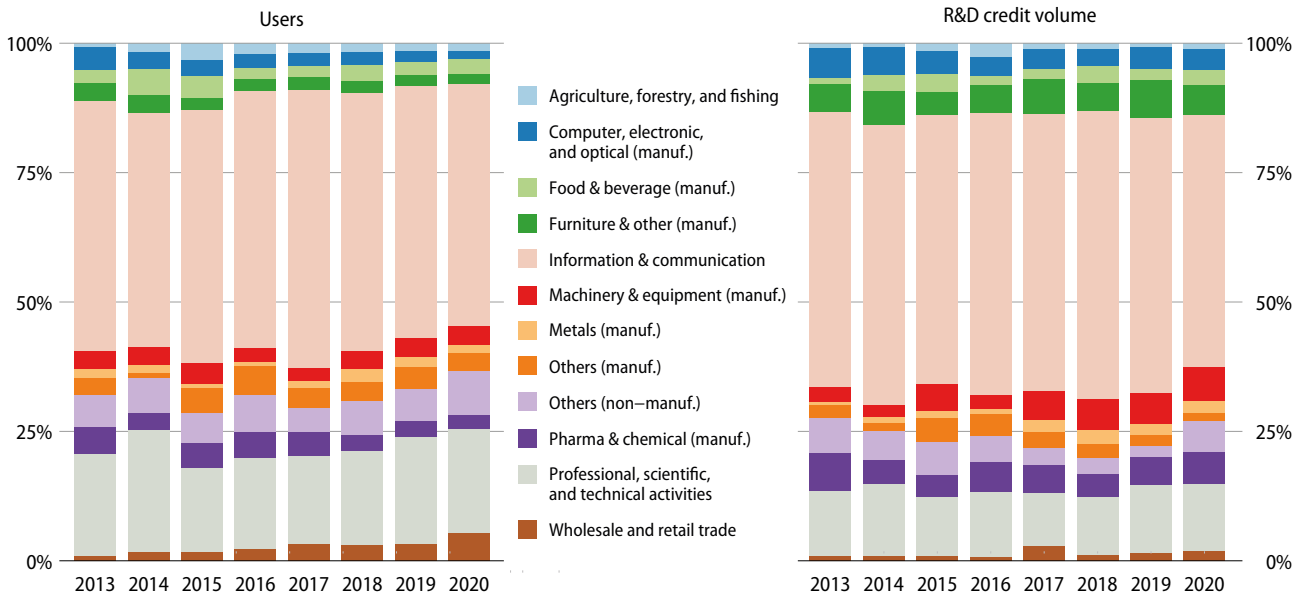
Source: OECD calculations based on Statistics Iceland Business R&D Survey.

In line with official statistics in the OECD tax incentive database[12], most of corporate R&D performers in Iceland that receive the R&D tax credit belong to the service sector, more precisely the information and communication and the professional, scientific, and technical activities sub-sectors (Figure 3.2). Micro-firms represent over 50% of R&D tax relief recipients in most years (Figure 3.3, left-side panel). In contrast, as R&D is highly concentrated in small and medium-sized firms, most R&D tax benefits are absorbed by these firms (Figure 3.3, right-side panel and Figure 3.4.).

12. OECD, R&D Tax Incentives Database, http://oe.cd/rdtax, April 2023.

FIGURE 3.2. **Most R&D tax credit users and volume are in the Information and Communication sector**

R&D tax credit users by industry, share in percent

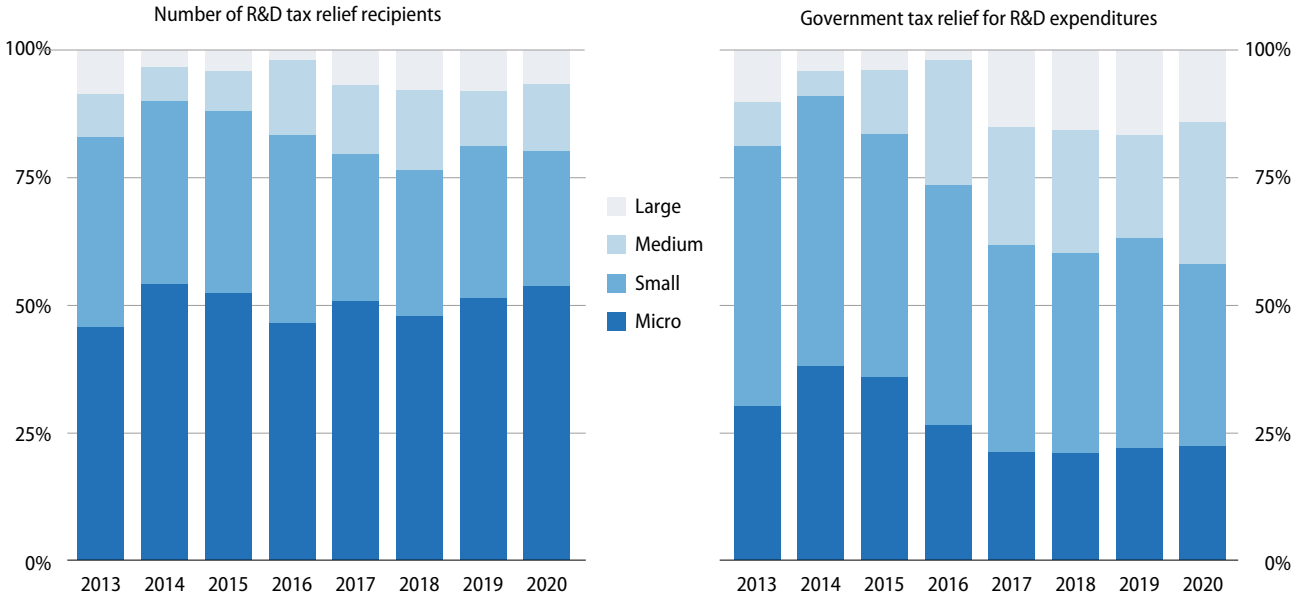


Note: The sector classification is based on NACE codes. "Furniture and other (manuf.)" may potentially include manufacture of jewellery, bijouterie and related articles, manufacture of musical instruments, manufacture of sports goods, manufacture of games and toys, and manufacture of medical and dental instruments and supplies. "Others (manuf.)" may potentially include the manufacture of electrical equipment, manufacture of rubber and plastic products, manufacture of other non-metallic mineral products, repair and installation of machinery and equipment, manufacture of textiles, manufacture of leather and related products, manufacture of coke and refined petroleum products, manufacture of motor vehicles, trailers and semi-trailers, and manufacture of other transport equipment. "Others (non-manuf.)" includes electricity, gas, steam and air conditioning supply, water supply, sewerage, waste management and remediation activities, transportation and storage, financial and insurance activities, real estate activities, administrative and support service activities, public administration and defence; compulsory social security, education, human health and social work activities, arts, entertainment and recreation, other service activities, activities of households as employers; undifferentiated goods- and services-producing activities of households for own use, and activities of extraterritorial organisations and bodies.

Source: OECD analysis based on national business R&D survey data, March 2023.

FIGURE 3.3. **Micro-firms account for the bulk of tax credit recipients, but small and medium firms absorb most of the R&D tax credit resources**

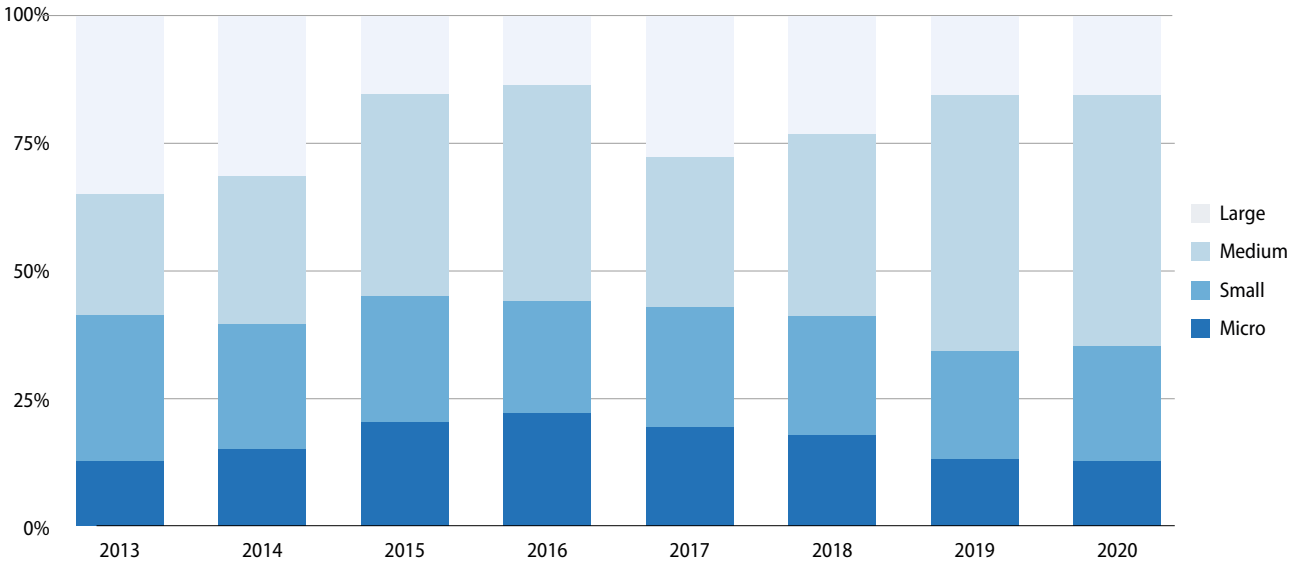
R&D tax credit users and amount by firm size, share in percent



Source: OECD analysis based on national business R&D survey data, December 2022.

FIGURE 3.4. **Small and medium sized firms account for the bulk of business R&D in the R&D survey data**

Intramural R&D expenditure by firm size, share in percent



Source: OECD analysis based on national business R&D survey data, December 2022.

R&D performers that receive the R&D tax credit are slightly different from those that do not (Table 3.1). In line with what was found in previous studies (Appelt et al., 2020[3]), recipients spend on average and in median more in (intramural) R&D, employ more workers - in general but also more R&D specialists – and are slightly more productive. The median recipient also shows higher sales compared to the median non-recipient.

TABLE 3.1. **In the estimation sample, tax credit users invest more in R&D, employ more workers and are slightly more productive**

Characteristics of R&D firms by tax credit status (2013-2020)

	Intramural R&D expenditure (Million ISK) 2013-2020		Employment (headcount) 2013-2020		R&D Employment (headcount) 2013-2015-2019		Productivity (Million ISK) 2013-2020		Sales (Million ISK) 2013-2020	
	Non-recipient	Recipient	Non-recipient	Recipient	Non-recipient	Recipient	Non-recipient	Recipient	Non-recipient	Recipient
Mean	93.33	136.58	45	51	10	18	23.93	29.08	2,617.24	1,847.58
(million 2005 USD)	0.97	1.43					0.25	0.30	27.31	19.28
Median	12.15	64.31	6	10	4	9	13.67	14.17	104.51	131.73
(million 2005 USD)	0.13	0.67					0.14	0.15	1.09	1.37
Number of Observations	1,073	874	1,073	874	398	349	999	830	999	830

Note: The average exchange rate in 2015 was USD/ISK 131.8 and EUR/ISK 146.3 (https://data.oecd.org/conversion/exchange-rates.htm).

Source: OECD calculations based on Statistics Iceland Business R&D Survey.

R&D investment of R&D performers significantly increases as they take-up the tax credit

The estimates based on policy uptake suggest that the R&D tax credit has a positive and sizeable impact on firms' R&D performance. The results are presented in Table 3.2. and show that the average treatment effect on the treated (ATT) is positive and statistically significant, suggesting that firms increase their R&D expenditures as they take up the tax credit. This is true in the baseline estimation (column 1), but also in the specification which controls for the receipt (dummy variable) of grant funding (column 2) and the log value of firms' sales (column 3). The ATT becomes slightly smaller in size and statistically not significant when controlling for firm size proxied by (log) employment (column 4). However, in all specifications, the ATT is not precisely estimated due to the low number of observations in the dataset. The user-cost elasticity implied by the estimated ATT in the baseline specification (column 1) suggests that a 1% reduction in the user cost of R&D due to the take-up of the tax credit results in more than 2% percent increase in R&D expenditure. The implied incrementality ratio is higher than 1, indicating the presence of *crowding-in* effects: one monetary unit of public funding generates almost 3 additional units of business R&D investment.

The results for Iceland are broadly in line with what has been found for other countries in the OECD MicroBeRD (2020[3]) project using a similar estimation method (Figure 3.5). Iceland, together with Belgium, Portugal, the Netherlands and Sweden, is among the countries with an incrementality ratio higher than 2. The confidence interval for the estimation is however very large, showing low precision in the estimation of the ATT. The cross-country variation in the estimated incrementality ratios can *inter alia* be attributed to differences in the composition of the treatment groups.[13] The estimates capture by construction the average effects of the policy for the *treated* firms. In contrast with the OECD MicroBeRD project (2020[3]), which excludes firms with less than 10 employees (micro-firms) from the estimation sample, the treatment group in Iceland is mostly represented by this type of firms (Figure 3.6.).[14] Evidence from the OECD MicroBeRD project (2020[3]) indicates that smaller firms show greater responsiveness to tax incentives, mostly due to their low initial levels of R&D investment.

TABLE 3.2. **Estimates indicate that the tax credit has a large positive impact on firms R&D performance**

Diff-in-diff estimation results based on policy uptake

	(1)	(2)	(3)	(4)
Average Treatment effect on the Treated (ATT)	0.487**	0.486**	0.497*	0.318
Standard error	(0.24)	(0.24)	(0.28)	(0.22)
Business is R&D grant recipient	No	Yes	No	No
Log(sales)	No	No	Yes	No
Log(employment)	No	No	No	Yes
Business Fixed Effects	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes
R-squared	0.049	0.049	0.057	0.081
Number of observations	1,277	1,277	1,148	1,262
User Cost Elasticity	-2.11	-2.10	-2.17	-1.26
Incrementality Ratio (IR)	2.84	2.83	1.69	2.91
90% confidence interval (IR)	[0.43, 6.41]	[0.43, 6.39]	[-0.19, 4.40]	[0.15, 7.31]

Note: *** 1%, ** 5%, * 10%. Standard errors in parenthesis are clustered at the firm level. Matched samples are constructed using coarsened exact matching by size class, macro-industry and quantile of initial level of R&D expenditure in the year before treatment.

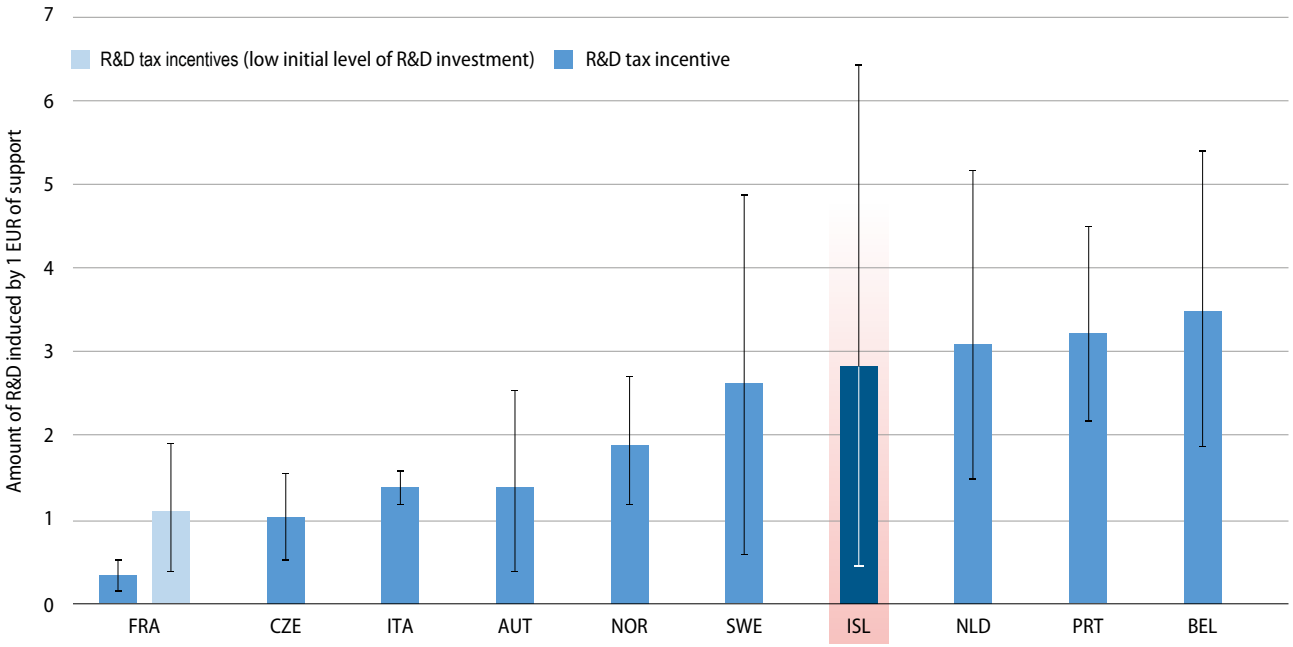
Source: OECD analysis based on national business R&D survey data, December 2022.

13. It cannot be excluded, however, that part of the variation could also be explained by differences in the effectiveness of the scheme, but there are no elements in this analysis to quantify this channel.

14. The choice of considering micro-firms in the estimation sample diverge from the OECD MicroBeRD (2020[3]) approach. As micro-firms are in fact prevalent in the Icelandic data, this choice reflects the necessity of having treatment and control groups with adequate sample size for the estimation.

FIGURE 3.5. **The estimated additionality of the R&D credit in Iceland is high but not significantly different from other countries because of a high margin of error**

Estimated incrementality ratios for Iceland and other OECD countries, with 90% confidence intervals



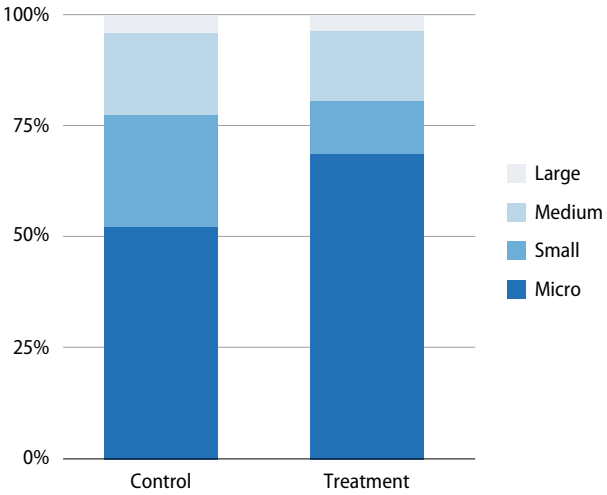
Note: The error bands are constructed using the 90% confidence intervals. Large bars size can be due to the lower number of observations in the treatment group: the treatment group is made of 190 observations and the matched control group by 1,087 observations.

Source: OECD calculations based on Statistics Iceland and OECD MicroBeRD (2020[3]).

This result is confirmed in this empirical study. The presence of heterogeneous effects of the impact of the R&D tax credit by firm size is evaluated by including interaction terms of the variables *Recipient* and *Business size*. The results of the estimation are presented in Table 3.3. They show that the tax credit has indeed a stronger impact on R&D performance of micro-firms both in the baseline specification (column 1) and in the estimation specifications which include additional controls (column 2 and 3), while it has no significant effect on large and medium firms (the effects on large and medium firms are estimated as Average Treatment Effect on the Treated). As for other countries in the OECD MicroBeRD project (2020[3]), the stronger responsiveness of micro-firms to R&D tax incentives is related to the relatively low amount of initial R&D performance compared to other firms. Indeed, when a control variable for firms' pre-treatment level of R&D expenditures is added to the equation, the effect of business size vanishes, indicating that R&D tax incentives boost R&D more strongly for smaller firms because these firms tend to perform less R&D, rather than because of their size per se (column 4 and 5).

FIGURE 3.6. **Micro firms are the most represented in the treatment and control groups in the policy uptake estimation**

Business size distribution (before uptake) for treatment and control groups



Note: Matched samples are constructed using coarsened exact matching by size class, macro-industry and quantile of initial level of R&D expenditure in the year before treatment. In the year prior to the treatment, the average size, in terms of number of employees for the treated (control) firm is equal to 41.22 (42.7), the median for the treated (control) is 4.33 (8.3) and standard deviation is 102.27 (93.64).

Source: OECD analysis based on national business R&D survey data, December 2022.

TABLE 3.3. **The tax credit has a stronger impact on firms with a low initial level of R&D investment such as micro-firms**
Diff-in-diff based estimation results based on policy uptake – differential effects by firm size (before uptake)

	(1)	(2)	(3)	(4)	(5)
Average Treatment effect on the Treated (ATT)	-0.057	-0.057	-0.121	-0.055	-0.047
standard error	(0.34)	(0.34)	(0.33)	(0.34)	(0.34)
ATT*Micro	0.675**	0.674**	0.798**	0.516	0.356
standard error	(0.34)	(0.34)	(0.37)	(0.33)	(0.37)
ATT*Small	0.716	0.714	0.86	0.709	0.716
standard error	(0.70)	(0.70)	(0.80)	(0.70)	(0.70)
ATT* Firms with Initial Low R&D (Initial Low R&D takes value 1 (0) if R&D expenditure lower (higher) than the 25th percentile of the intramural R&D expenditure in the year preceding the take up of the tax credit)				2.424***	
standard error				(0.28)	
ATT* Firms with Initial Low R&D (Initial Low R&D takes value 1(0) if R&D expenditure lower (higher) than the 50th percentile of the intramural R&D expenditure in the year preceding the take up of the tax credit)					0.586*
standard error					(0.35)
Business is R&D grant recipient	No	Yes	No	No	No
Log(sales)	No	No	Yes	No	No
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes
R-sq	0.051	0.052	0.061	0.06	0.05
Number of observations	1,277	1,277	1,148	1,277	1,277

Note: *** 1%, ** 5%, * 10%. Standard errors in parenthesis are clustered at the firm level. Matched samples are constructed using coarsened exact matching by size class, macro-industry and quantile of initial level of R&D expenditure in the year before treatment. In column (4) the variable Initial low R&D is a dummy variable taking value of 1(0) if the firm has intramural R&D expenditure lower (higher) than the 25th percentile of the intramural R&D expenditure in the year preceding the take up of the tax credit. In column (5) the variable Initial low R&D is a dummy variable taking value of 1(0) if the firm has intramural R&D expenditure lower (higher) than 50th percentile of the intramural R&D expenditure in the year preceding the take up of the tax credit. Micro-firms have 1-10 employees, small firms: 10-50 employees, medium firms: 50-250 employees, large firms: more than 250 employees.

Source OECD analysis based on national business R&D survey data, December 2022

The responsiveness of R&D expenditure to the user cost of R&D affected by the tax incentive can also vary by type of R&D cost, i.e. for current (labour and other current cost) vis-à-vis capital expenditure. The results of the analysis by type of R&D cost are shown in Table 3.4. They suggest that tax incentives mostly induce businesses to increase *current* rather than *capital* R&D expenditures. Given the composition of the treatment group in the estimation sample, this is in line with previous studies which find larger elasticities of current R&D expenditure for smaller firms and higher elasticities of capital R&D expenditure for larger firms (Rao, 2016[18]; Agrawal, Rosell and Simcoe, 2020[19]).

TABLE 3.4. **The tax credit mostly induces firms to increase current intramural R&D expenditure**
Diff-in-diff based estimation results based on policy uptake – effects by type of R&D costs

	log(R&D Current costs)				log(1+R&D Capital Costs)			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Average Treatment effect on the Treated (ATT)	0.572**	0.572**	0.408*	0.584**	-0.629	-0.63	-1.253	-0.797
standard error	(0.24)	(0.24)	(0.21)	(0.28)	(1.33)	(1.33)	(1.37)	(1.41)
Business is R&D grant recipient	No	Yes	No	No	No	Yes	No	No
Log (employment)	No	No	Yes	No	No	No	Yes	No
Log (sales)	No	No	No	Yes	No	No	No	Yes

	log(R&D Current costs)				log(1+R&D Capital Costs)			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.053	0.053	0.085	0.06	0.051	0.051	0.07	0.053
Number of observations	1,276	1,276	1,261	1,147	1,277	1,277	1,262	1,148
Elasticity	-2.60	-2.60	-1.70	-2.67	1.57	1.57	2.41	1.85
Incrementality Ratio	3.37	3.37	2.20	3.47	-1.04	-1.04	-1.59	-1.22

Note: *** 1%, ** 5%, * 10%. Standard errors in parenthesis are clustered at the firm level. The Log(1+capital costs) is used to avoid dropping observations with 0 R&D capital costs from the estimation sample (55% of the observations) . Matched samples are constructed using coarsened exact matching by size class, macro-industry and quantile of initial level of R&D expenditure in the year before treatment.

Source: OECD analysis based on national business R&D survey data, December 2022.

Output additionality

Assessing the impact of R&D activities on innovation output and economic performance, i.e. output additionality, is particularly challenging. Only a limited number of studies have attempted to do so and delivered mixed results, ultimately indicating that greater input additionality does not guarantee greater output additionality or greater spillover effects (Bodas Freitasa et al., 2017[20]; Czarnitzki, Hanel and Rosa, 2011[21]; Cappelen et al., 2010[9]; Takalo, Tanayama and Toivanen, 2013[22]; OECD, 2021[6]; Appelt et al., 2022[23]).This type of analysis is challenging for several reasons. First, it is difficult to choose the most relevant outcome indicators, i.e. the variables that best capture, in addition to input additionality, the ultimate goals that policy makers want to achieve when introducing the tax incentive. Second, it requires the use of multiple sources of firm-level data, such as innovation surveys, patent data or production surveys, which are not always available. Third, it is technically challenging to causally estimate output additionality effects, as best performing firms are also generally more likely to receive (more) public support, especially through tax incentives via reduction in corporate income taxation (Dumont, 2022[24]). Additionally, the lag between R&D investments and the effects on outcome can be very long, and the benefits of the incentives might spill over to firms that did not directly receive any support, complicating estimation based on a comparison of recipient and non-recipient firms. In its second phase (2020-23), the OECD MicroBeRD project (2020[3]) aims to provide additional evidence on innovation and economic effects of R&D tax incentives and direct funding, i.e. extend the existing analysis of R&D input additionality to a pilot analysis of R&D output additionality.

Considering the aforementioned caveats, this work attempts to give preliminary insights of the impact of the R&D tax credit on selected economic outcome measures, such as firm sales, employment, wages, productivity and export performance (extensive and intensive margin). This is done by following the same methodology used in the input additionality analysis, and therefore by estimating a difference-in-differences (with coarsened exact matching) model in which treatment and control groups are constructed according to business' decision to use the tax incentive.

The results of the output additionality analysis indicate that the tax credit is associated with higher firms' sales, employment and wages per employee, while no statistically significant effect is found for productivity and export performance (Table 3.5). Specifically, incrementality ratios indicate that 1 ISK of tax subsidy generates 0.45 additional ISK of sales, and 0.002 additional ISK of (yearly) wage per employee in R&D performing firms. Moreover, spending 10 million ISK (USD 75 600) in tax subsidy is associated to the creation of one additional job opportunity. However, results should be interpreted with caution due to all the caveats highlighted above, and the confidence intervals of the estimates are very large, showing low precision in the estimation of the ATT.

TABLE 3.5. **The R&D tax credit has a positive impact on firm sales, employment and average wages**
Diff-in-diff based estimates based on policy uptake – effects on business performance outcomes other than R&D

	log (Sales)	log (Employment)	Log (Wages / Employment)	Log (Productivity)	Export (extensive margin)	log (Export) (intensive margin)
Average Treatment effect on the Treated (ATT)	0.397**	0.240**	0.427**	0.186	0.015	-0.672
standard error	(0.19)	(0.09)	(0.20)	(0.15)	(0.057)	(0.527)
Business is R&D grant recipient	Yes	Yes	Yes	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.132	0.128	0.074	0.073	0.024	0.114
Number of observations	1,148	1,277	765	1,148	1,277	323
Incrementality Ratio (IR)	0.45	1.25E-07	0.002	0.04	5.6E-10	-0.0005
90% Confidence interval (IR)	[0.08; 0.95]	[4.20E-08; 2.22E-07]	[4.6E-04; 4.6E-03]	[-0.1; 0.1]	[-2.7E-09; 4.2E-09]	[-0.0008; .0.0002]

Note: *** 1%, ** 5%, * 10%. Standard errors in parenthesis are clustered at the firm level. Results are obtained estimating Equation (4.A.1) in Annex B using the following outcome variables: log(Sales), log(Employment), log(Wages/Employment), log(Productivity), a dummy equal to 1 if the firm exports and 0 otherwise; and log(export) which only considers exporting firms. Matched samples are constructed using coarsened exact matching by size class, macro-industry and quantile of initial level of R&D expenditure in the year before treatment.

Source: OECD analysis based on national business R&D survey data, December 2022.

The 2016 threshold-raising reform resulted in a rise of R&D investment for the affected R&D performers

The results from the difference-in-differences estimation based on the 2016 threshold-raising reform qualitatively confirm the findings from the analysis based on policy uptake (see Table 3.6). The estimated average treatment effect on the treated (ATT) is positive and statistically significant in the baseline (column 1), implying that the rise in the R&D expenditure threshold induces some R&D performers to invest more in R&D. This result also holds in the controls-augmented estimation specifications (column 2 and 3), in which the fact of being a grant recipient and the total sales of the firms are taken into account. As before (see Table 3.2), controlling for firm size, proxied by (the log of) employment, makes the estimation statistically non-significant.

The user-cost elasticity implied by the estimated ATT in the baseline specification (column 1, Table 3.6) suggests that a 1% reduction in the user cost of R&D due to the take-up of the tax credit results in almost 2% increase in R&D expenditure. The implied incrementality ratio is also higher than 1, indicating that one monetary unit of public funding generates more than 2 additional units of business R&D investment.

The estimated incrementality ratios are slightly smaller relative to the ones obtained in the analysis based on policy uptake. The results based on policy uptake are likely to be overestimated due to the endogeneity in the business decision of taking up the support. Moreover, the estimates now capture the average effect of the policy change for the treated firms which, in contrast to the policy uptake estimation, is primarily composed of larger-sized business, i.e. small and medium firms (Figure 3.7). As documented in Section 4 (Figure 4.2), the R&D tax credit in Iceland, which featured a ceiling of 100 million ISK in its original formulation, affected mostly the marginal R&D costs of firms spending an amount lower than 100 million ISK in R&D, which are primarily micro-firms. In contrast, the increase in the ceiling from ISK 100 to 300 million induced by the 2016 policy reform mostly affected companies with R&D investments between ISK 100 and 300 million, i.e. mainly small and medium-sized firms.

TABLE 3.6. **Firms benefitting from the 2016 threshold-raising reform saw their R&D performance increase relative to not affected R&D performing firms**

Diff-in-diff estimation based on the 2016 threshold-raising reform

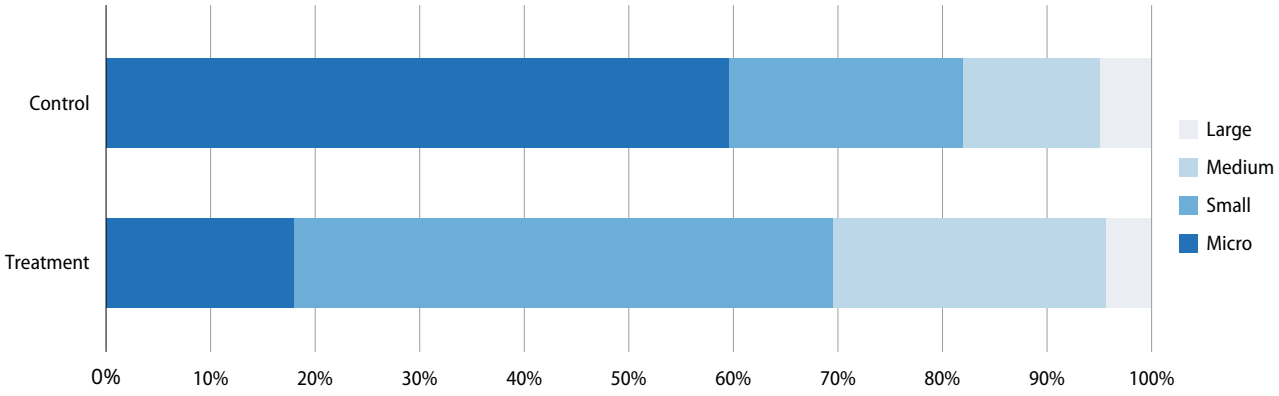
	(1)	(2)	(3)	(4)
Average Treatment effect on the Treated (ATT)	0.353*	0.351*	0.382*	0.35
standard error	(0.20)	(0.20)	(0.22)	(0.22)
Business is R&D grant recipient	No	Yes	No	No
Log(sales)	No	No	Yes	No
Log(employment)	No	No	No	Yes
Firm Fixed Effects	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes
R-squared	0.079	0.08	0.074	0.119
Number of observations	958	958	890	940
User Cost Elasticity	-1.97	-1.96	-2.13	-1.95
Incrementality Ratio (IR)	2.16	2.17	2.31	2.16
90% Confidence interval (IR)	[0.16, 3.40]	[0.13, 3.40]	[0.20, 3.55]	[-0.08, 3.47]

Note: *** 1%, ** 5%, * 10%. Standard errors in parenthesis are clustered at the firm level. Matched samples are constructed using coarsened exact matching by size class and macro-industry in the year before the policy change.

Source: OECD analysis based on national business R&D survey data, December 2022.

FIGURE 3.7. **Small and medium firms are more affected by the policy change than large and micro firms**

Firm size distribution (before change) for Treated and Control groups



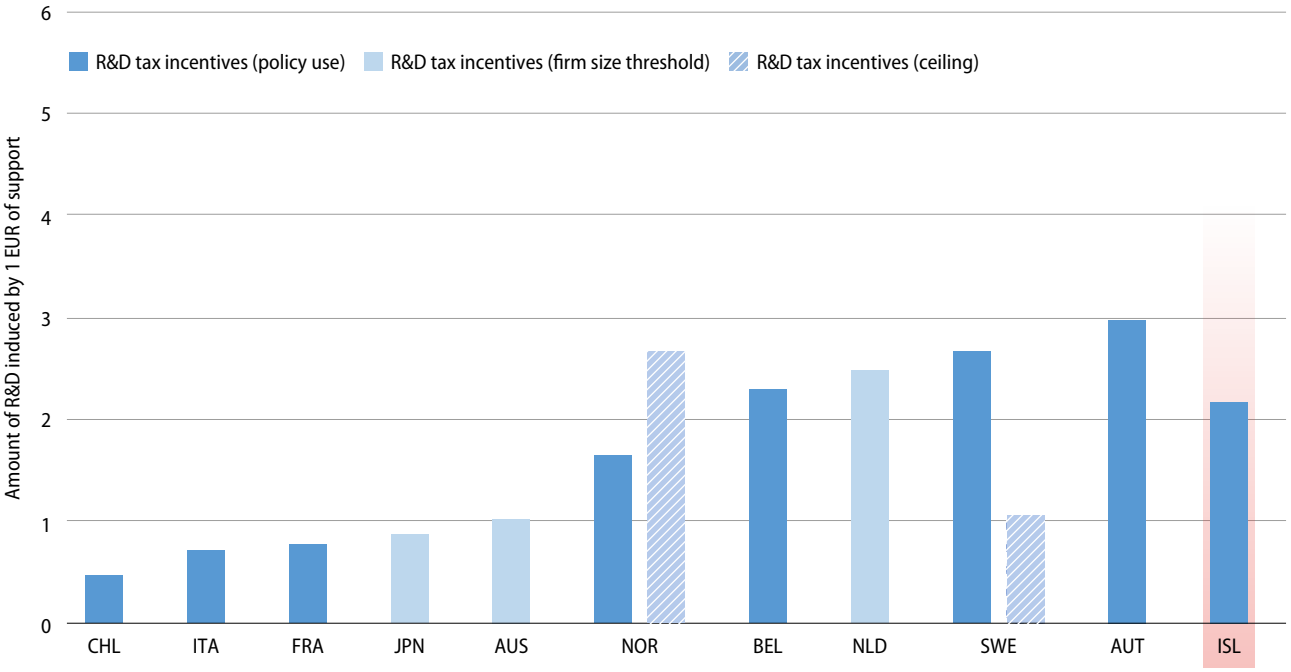
Note: Matched samples are constructed using coarsened exact matching by size class, macro-industry and quantile of initial level of R&D expenditure in the year before treatment. In the year prior to the treatment, the average size, in terms of number of employees for the treated (control) firm is equal to 56.57 (39.02), the median for the treated (control) is 26.92 (5.04) and standard deviation is 82.44 (105.86). More precisely, the treatment group is composed of firms spending more than 80% of the old ceiling and less than 110% of the new ceiling before the policy change. This is because firms spending an amount close to the old and new thresholds before the policy change are also likely to be affected by the increase in the ceiling in 2016. Firms with very low and very high levels of R&D (intramural) expenditure in 2016 are taken off the sample.

Source: OECD analysis based on national business R&D survey data, December 2022.

The estimated input incrementality ratios based on the 2016 policy reform are broadly in line with most of the OECD countries analysed in the MicroBeRD project (2020[3])[15]. As previously explained, the variability in the effectiveness of R&D tax incentives can be partly attributed to compositional effects, variations in the uptake and distribution of support, as well as different effects of policy changes on different firm types.

15. The OECD MicroBeRD project (2020[3]) exploits various sources of policy change for different countries, which are summarised in Annex C, Table C.1. They include the introduction and/or change of a ceiling on eligible R&D expenditure (Austria, Norway and Sweden), changes that applies to firms of different sizes (Australia and Japan), or to several specific features of the tax credit design, such as the introduction of a partial exemption of withholding tax paid on researchers wages, extension of eligible type of R&D expenditure, conversion to (and expiration of) volume based tax credit (for Belgium, Chile, France and Italy, as well as for Norway and Sweden as an alternative estimation).

FIGURE 3.8. **The results for Iceland are in line with other similar OECD countries**
Estimated incrementality ratios for Iceland and other OECD countries with 90% confidence intervals



Note: The error bands are constructed using the 90% error confidence interval.

Source: Statistics Iceland, OECD calculations and OECD MicroBeRD (2020[3]).

The estimation of the effects of the tax credit using the policy change on the different component of the R&D spending confirms that the R&D tax credit has a positive effect on current R&D expenditure; however, in this case the coefficients are statistically non-significant, except for the specification in column (4) where the estimation takes into account firms' sales (Table 3.7). The estimated impact on capital R&D expenditure is in this case positive, possibly reflecting the different composition of the treatment group – now made of bigger-sized firms – compared to the policy uptake estimation, but it is also statistically non-significant.

Table 3.7. There are positive but non-significant effects on current and capital R&D expenditure
Diff-in-diff estimation based on the 2016 threshold-raising reform – effects by type of R&D costs

	log (R&D Current costs)				log (1+Capital Costs)			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Average Treatment effects on the Treated (ATT)	0.298	0.297	0.303	0.351*	1.857	1.789	1.684	1.295
standard error	(0.20)	(0.20)	(0.21)	(0.21)	(1.37)	(1.36)	(1.41)	(1.38)
Business is R&D grant recipient	No	Yes	No	No	No	Yes	No	No
Log(employment)	No	No	Yes	No	No	No	Yes	No
Log(sales)	No	No	No	Yes	No	No	No	Yes
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.121	0.121	0.151	0.115	0.073	0.08	0.078	0.085
Number of observations	958	958	940	890	958	958	940	890

Note: *** 1%, ** 5%, * 10%. Standard errors in parenthesis are clustered at the firm level. The Log(1+capital costs) is used to avoid dropping observations with 0 R&D capital costs from the estimation sample (55% of the observations). Matched samples are constructed using coarsened exact matching by size class and macro-industry in the year before the policy change.

Source: OECD analysis based on national business R&D survey data, December 2022.

There is no statistically significant effect of the 2016 tax credit reform on firms' outcome variables, such as employment, sales, productivity and export (Table 3.8). The absence of a significant effect of the tax credit on outcome variables estimated when using the 2016 reform confirms the caveats highlighted when discussing the policy uptake results (see above). Reverse causality may play an important role, as bigger firms may be more likely to take up the tax credit, explaining the positive and significant impact shown in Table 3.5. Time lag and adjustment costs may also play a role, as it often takes time and additional investments for firms to enhance their economic performance. The composition of the treatment group may also be key when interpreting the results: the *take-up* of the R&D tax credit has a higher impact in terms of additional R&D investment (input additionality) on micro and small business – mainly represented in the treatment group in the *policy uptake* estimation – given their initial low level of R&D investment compared to larger firms. By boosting their R&D expenditure in response to the tax credit, micro and small firms also grow more in terms of sales, number of employees and pay higher wages (or the micro and small firms that take up the tax credit are simply more performant on average).

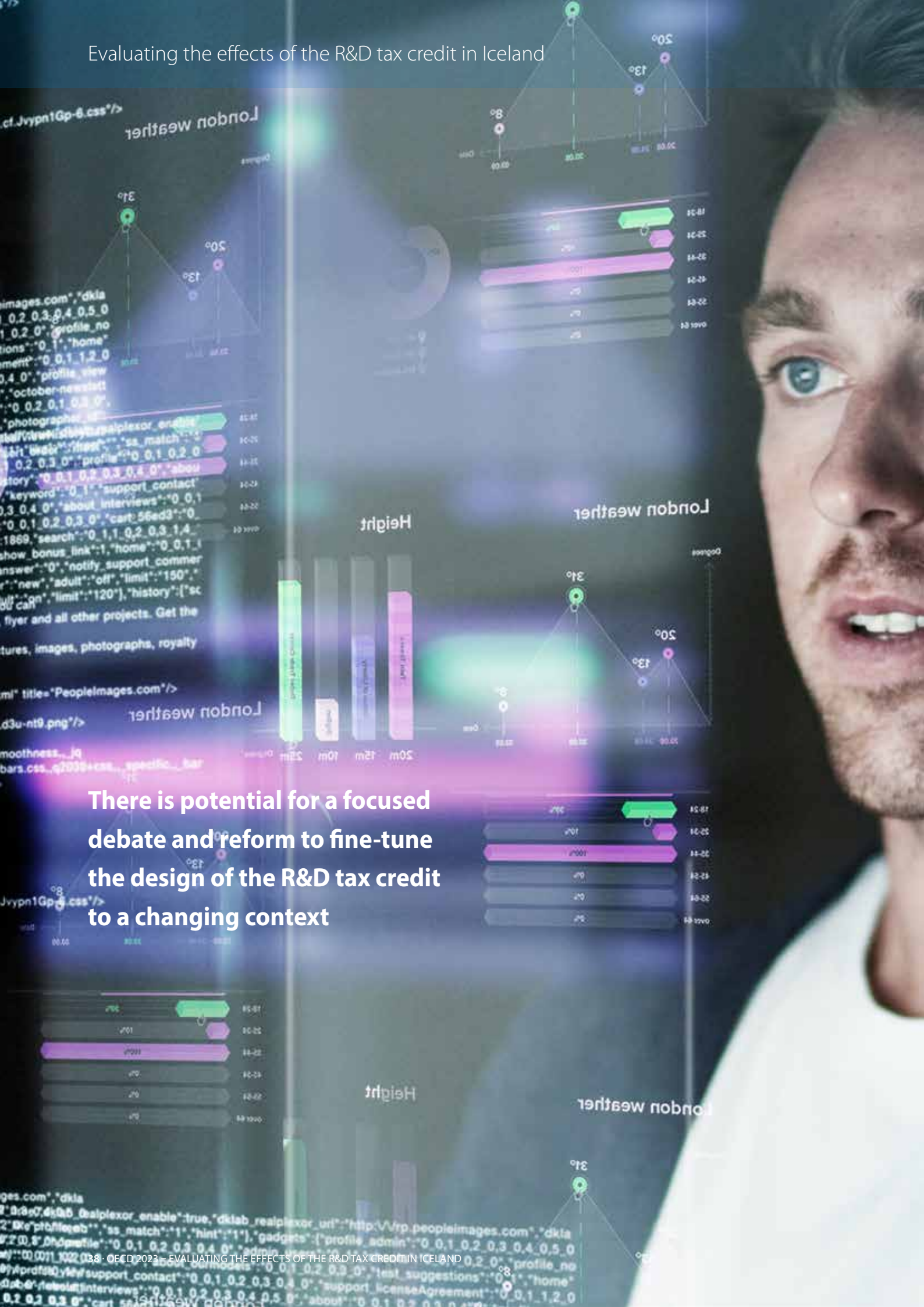
TABLE 3.8. **There are no-significant effects on outcome variables when estimating impacts through the 2016 threshold-raising reform**

Diff-in-diff estimation based on the 2016 threshold-raising reform – other outcomes

	log (Sales)	log (Employment)	log (Productivity)	log (Wage / Employment)	Export (extensive margin)	log (Export) (intensive margin)
Average Treatment effects on the Treated (ATT)	0.116	0.074	0.076	-0.029	0.047	0.424
standard error	(0.15)	(0.08)	(0.11)	(0.10)	(0.063)	(0.505)
Business is R&D grant recipient	Yes	Yes	Yes	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.071	0.093	0.036	0.036	0.006	0.067
Number of observations	890	958	890	459	958	436

Note: *** 1%, ** 5%, * 10%. Standard errors in parenthesis are clustered at the firm level. Matched samples are constructed using coarsened exact matching by size class and macro-industry in the year before the policy change.

Source: OECD analysis based on national business R&D survey data, December 2022.



There is potential for a focused debate and reform to fine-tune the design of the R&D tax credit to a changing context

4. Assessment of the implementation of the R&D tax credit in Iceland

This section reviews the implementation of the R&D tax credit in Iceland, providing a qualitative assessment of its design, implementation and administration. The review complements the empirical impact analysis of the R&D tax credit presented in the previous section. The assessment examines the broad range of available evidence, including key stakeholders' views, to identify the most salient points for the Icelandic authorities to take into consideration as part of their evaluation and potential reform of the R&D tax incentive.

The assessment relies on a series of interviews with key stakeholders in Iceland's government, agencies and representatives from the business sector and also draws on the experiences of other OECD countries whose experience on specific issues can be considered relevant for Iceland. The evidence and views gathered highlight the following points for government's attention:

- Overall appreciation of the scheme's trajectory since its inception and its contribution to Iceland's economic development;
- Aspects of R&D tax relief eligibility requiring formal clarification;
- Aspects of the R&D tax incentive design shaping its generosity and targeting towards different types of firms and R&D activity potentially requiring re-alignment to meet competing policy objectives including financial sustainability;
- Potential steps for improving the efficiency of the tax incentive administration; and
- Scope for improving monitoring and impact analysis capabilities and practices to serve the policy objectives foreseen for the R&D tax incentive and public support for innovation in general.

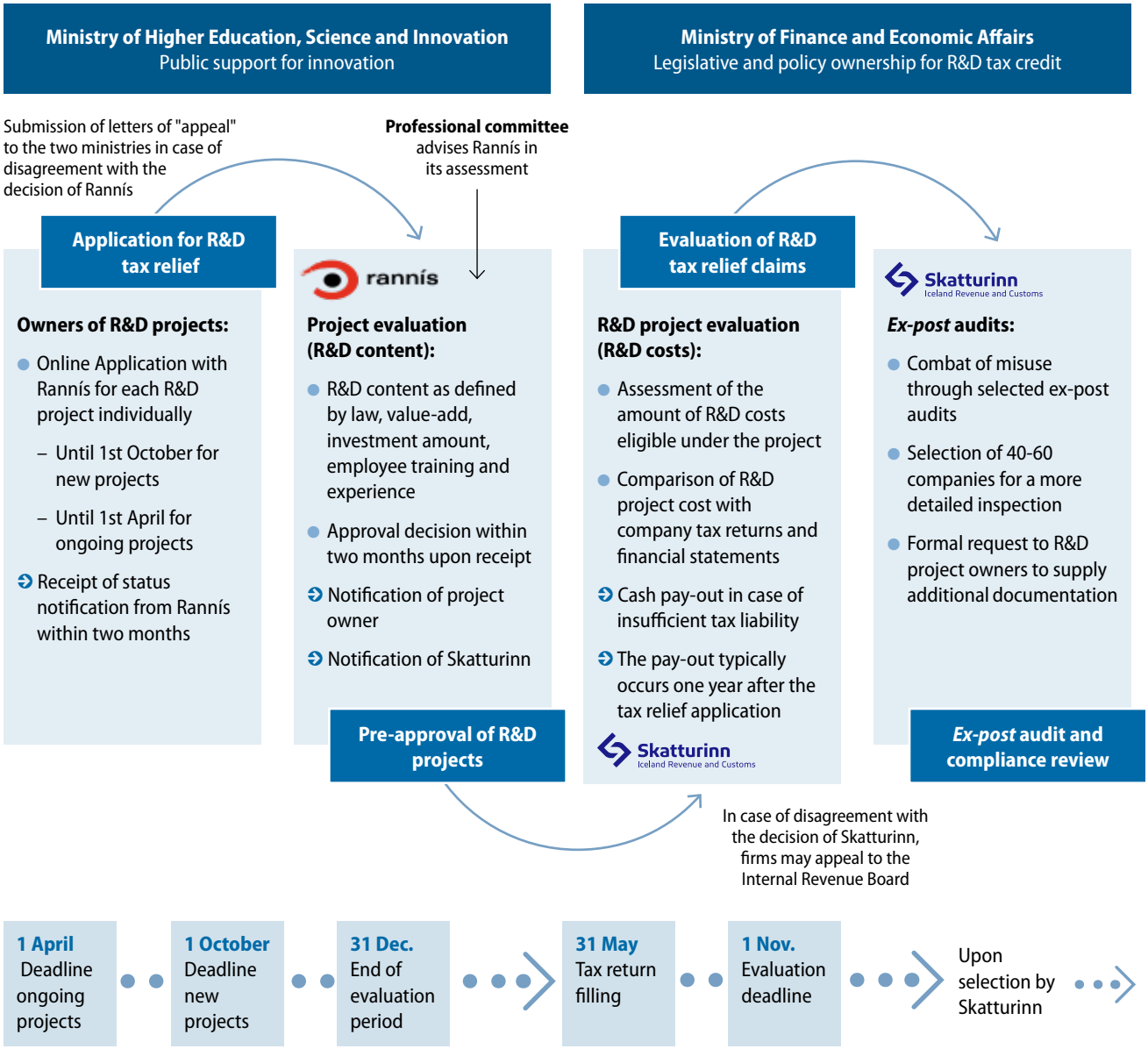
OVERVIEW OF THE R&D TAX INCENTIVE IMPLEMENTATION IN ICELAND

Figure 4.1. provides a summary overview of the process, timeline, institutions and agencies involved in the implementation of the R&D tax credit in Iceland. In order to qualify for the scheme, companies are required to obtain a certification of validity by Rannís, the Icelandic Centre for Research.[1] Therefore, the R&D tax incentive in Iceland can be characterised among those with a technical pre-approval mechanism. Several OECD countries use this approach to ensure that the projects are quality-assured on an ex-ante basis by a trustworthy organisation, sometimes the main research funding agency, so as to reduce the risks that companies consider and embark on projects that fail to meet the criteria required for an eligible R&D project. Furthermore, while entailing additional administrative costs, this approach also contributes to reducing uncertainty on the part of the business claiming support. Upon receiving a positive assessment by the accreditation-provider, beneficiaries can embark on their planned investment project without fear of an ex-post assessment that may conclude that the project did not qualify as an eligible R&D project with all the financial and legal consequences that this might entail.

The R&D tax credit in Iceland is refundable, allowing firms to use earned credits independently from their profit and tax liability. This element is also common to several OECD countries, requiring the tax authority Skatturinn, which is in charge of assessing the claims and conducting ex-post audits, to implement a refund system over and above the amounts that may be deducted from payable tax (foregone tax revenue).

1. They are also required to spend a minimum amount per project in R&D established by the Act (ISK 1 million per year per project).

FIGURE 4.1. **Implementation of the R&D tax credit in Iceland – process timeline and institutions involved**



Source: OECD elaboration.

The mapping of roles and key responsibilities in the overall governance of the R&D tax credit in Iceland reveals that the overall governance of the R&D tax credit in Iceland is shared among several ministries and agencies, with several intertwined roles Roles and responsibilities include:

- **Ministry of Finance and Economic Affairs:**
  - In accordance with Article 4 item 2 of the Presidential Decree (2022 No. 6 31 January 2022), matters regarding the R&D tax incentive scheme are located under the Ministry of Finance and Economic Affairs since the Ministry formulates Iceland's policy in tax matters and other government revenue generating activities. The Ministry is responsible for the maintenance and update of Act No. 152/2009, because it has a relation to tax deduction of companies (Rannís, 2022a[2]). The longer-term fiscal planning, including the R&D tax incentive policy, is prepared and decided in cooperation with the Ministry of Higher Education, Industry and Innovation.
  - Oversees the assessment of the fiscal environment for research and innovation in (MoF, 2019[1]).

- **Ministry of Higher Education, Industry and Innovation:**
  - Has delegated budgetary responsibility for the R&D tax incentive.
  - Handles matters relating to public support for innovation in line with Article 5, item 5, item b of the presidential decree (2022 No. 6 31 January 2022).

- **Icelandic Centre for Research (Rannís) (Government agency, under the Ministry of Higher Education, Industry and Innovation):**
  - Processes R&D tax credit applications (pre-assessment), which includes support to business during the application process and provision of information; evaluation of eligibility of R&D expenditure and granting approval for applications (pass/ fail).
  - Administers competitive funds and strategic research programmes.
  - Coordinates and promotes Icelandic participation in collaborative international projects in science and technology.
  - Monitors resources and performance in R&D and promotes public awareness of research and innovation in Iceland.

- **Iceland Revenue and Customs (Skatturinn) (Government agency, under the Ministry of Finance and Economic Affairs):**
  - Evaluation of R&D tax credit claims as part of processing of corporate income tax returns.
  - Final decision on the amount of expenditure eligible for relief.
  - Distributes relief and refunds.
  - Carries out ex-post audits and compliance checks of R&D tax relief claims.
  - Produces and updates list of largest R&D tax relief beneficiaries.

- **Expert panel/special professional committee:**
  - For the purpose of assessing R&D projects, Rannís may seek the advice of the professional committee nominated by the Ministry of Finance, the Ministry of Higher Education and the Confederation of Icelandic Employers, in accordance with Art. 8 of Act No. 152/2009 (Rannís, 2022a[2]). However, the committee has not been appointed. The purpose of the committee is to provide general advice regarding projects but does not deal with individual project applications or applicants. Decisions on the processing of project applications are entirely left to Rannís.

From an evaluation and monitoring perspective it is worth noting the formal responsibility of the Icelandic National Audit Office (INAO), with overall accountability oversight for public spending/tax expenditures and appropriations. Statistics Iceland, the country's National Statistical Organisation, has access to administrative records as part of its fulfilment of statistical responsibilities. As provider of official R&D statistics, it conducts R&D surveys of business which can be used alongside administrative data, as indicated under Section 3 "Data description" of this report.

FOCUS AND METHODOLOGICAL APPROACH OF THE IMPLEMENTATION ASSESSMENT

In light of the summary description of the processes and roles, the assessment has focused on the following dimensions:

- **Allocation of responsibilities and institutional co-ordination:** who is responsible for designing, delivery and monitoring the scheme and the extent to which the current set-up can optimise the scheme's implementation.

- **Awareness/communication:** the extent to which the objectives of the scheme have been appropriately communicated and advertised and firms are aware of the advantages afforded by the scheme.

- **Eligibility criteria and benefits:** what eligibility criteria are in place and how do they influence incentives to apply by different types of companies and for which types of projects.

- **Application and access:** what steps do firms have to go through to apply and obtain the tax credit, including filing the application, response and delivery of the rebate, and what uncertainty do they face.

- **Monitoring and evaluation:** to what extent the monitoring and evaluation framework is fit for purpose, ensures appropriate data collection and maintenance, is aligned with the scheme's objectives as well as requirements for evidence on impact, efficiency and value for money; to what extent it minimises burdens on government organisations and business beneficiaries; how does it inform policy design.

Comparing the Icelandic experience to that in other countries and securing the perspectives and insights from a broad range of domestic stakeholders was considered necessary for informing the assessment of these questions. Interviews were conducted with a wide range of government and non-government stakeholders. Annex D provides an overview of the interviewed stakeholders and the process followed.

MAIN FINDINGS FROM THE QUALITATIVE ASSESSMENT

The interviews with key stakeholders provided several valuable insights into the design, implementation and monitoring of the R&D tax credit in Iceland and were enriched with additional evidence from other OECD countries.[2]

The R&D tax credit has supported Iceland's transition to a knowledge-based economy, but there is room for fine-tuning the incentive

There is consensus among stakeholders that the introduction of the R&D tax credit in 2010 was a coherent move to improve economic resilience following the financial crisis and support Iceland's transition to a knowledge-based economy. At the time of the creation of the R&D tax credit in Iceland, insights from the examination of other tax incentives, especially the R&D tax credit in Norway and Ireland, helped shape the design and administration of this scheme. Stakeholders were able to cite many cases that point to business emergence and growth, particularly among start-ups, that also lend support to the decision to make the incentive refundable from the start. Overall, the prevalent view among stakeholders is that the R&D tax incentive has not displaced other forms of R&D support, including the amount of R&D support going to basic research and the science sector more broadly, but that this should not be assumed indefinitely since both direct and tax-based support measures represent competing calls for public financial resources.

Due to the growing size and share of the R&D tax credit in relation to Iceland's corporate tax revenue, in particular following the latest policy reform in 2020, stakeholders expressed some degree of concern over the long-term financial sustainability of the incentive from the government's budgetary perspective. The R&D tax credit amounted to 1,9% of corporate income tax (CIT) revenue in 2011 and just over 2% of CIT revenue from 2012-2016. In more recent years, the tax credits share in CIT revenue increased substantially from 3,6% in 2017 to 8,3% in 2020. In 2021 it peaked at 16,3% of CIT revenue. Stakeholders did point out that a holistic perspective to the question of financial sustainability should be adopted, taking into account the indirect tax revenue-raising impacts from the R&D tax incentive, including through payroll taxes.

It is noteworthy that none of the stakeholders raised proposals for adopting a preferential tax regime for innovation-related income (e.g. an IP box that improves the financial upside of successful innovation efforts). The consensus view appears to indicate a preference for a tax incentive system that makes the hiring of researchers and the establishment of R&D collaborations with higher education and research institutes more affordable for businesses, in particular start-ups. This stance is consistent with the OECD overall assessment (Appelt et al., 2016[4]) of the evidence on the rationale for different tax incentives for business innovation, given the priority to encourage substantive, under-supplied economic activity generating broader economic and societal benefits,[3] while minimizing the scope for tax base erosion and profit shifting.[4]

2. This evidence is based on country responses to the annual OECD R&D tax incentives data collection, covering 38 OECD countries and eleven partner economies, and OECD desk research. For additional information on the OECD work on R&D tax incentives, see https://oe.cd/rdtax

3. Hall (2021[16]) provides a comprehensive survey of the literature on tax policy for innovation, including expenditure-based and income-based tax incentives.

4. In the framework of the base erosion and profit shifting (BEPS) action plan, OECD members agreed to enforce rules requiring substantial R&D activities and presence. The nexus approach only allows a taxpayer to benefit from an IP regime to the extent that it can show that it itself incurred expenditures, such as R&D, which gave rise to the IP income. For additional details, see OECD (2015[55]).

There is an opportunity for re-defining a long-term coherent approach for R&D and innovation support in Iceland through a revived policy consensus, based on the outcomes of the government's planned evaluation. As the following key findings and messages indicate, there is some potential for a focused debate and reform to fine-tune the design of the R&D tax credit to a changing context and to improve the efficiency of its governance and administration system.

There is scope to further clarify the eligibility criteria of the scheme

Companies have developed an overall good understanding of the rules (e.g. R&D definition, eligible costs) that govern R&D tax relief eligibility in Iceland. This appears to be the result of peer-learning, often facilitated by business associations, and regular exchanges with the Icelandic Centre for Research (Rannís), which is responsible for the pre-approval of R&D projects for tax relief purposes and by implication for the communication of effective requirements. However, the discussions also highlighted that there are four specific areas where some additional clarification and regulatory guidance are deemed necessary:

- **R&D project ownership** – what is the nature of the beneficiary of R&D tax incentives in relation to control and responsibility over the projects that is eligible to claim R&D tax relief?
- **R&D subcontracting** – to what extent can costs on R&D conducted by others on behalf of the business be claimed and how to prevent that two parties claim relief for the same activity? Should the location of the subcontracted R&D matter?
- **IP costs** – why are the costs for filing and protecting patents not eligible for R&D tax relief?
- **Aggregation rules** – do maximum limit thresholds apply to legal units or to entire domestic groups?

Additional clarification and regulatory guidance on these points would help firms attain greater certainty about eligible R&D costs and the possible level of R&D tax subsidy. The predictability of R&D tax relief is essential for firms to be willing to make long-term investments in risky R&D projects and for Rannís and Skatturinn to appropriately assess and process R&D tax relief project applications and R&D tax relief claims. In particular, the source of uncertainty in relation to eligible costs could be addressed at root at the level of the legislation and implementing regulation.

Definition of R&D project ownership

According to Art.2 of Act No. 152/2009, the tax deduction applies to "companies that have their own research or development projects that have been certified by the Icelandic Research Centre" (Rannís, 2022a[2]). There is currently no explicit guidance in the existing legislation on how to interpret and apply the term "own R&D project" for tax relief purposes.

R&D project ownership has been identified in practice by the implementing agencies with ownership over resulting IP, so that the direct owners of IP resulting from the R&D project would be entitled to tax relief. This raises some questions as to the situation of subsidiaries liable to pay tax in Iceland whose IP is controlled by the parent company abroad. The legislation should provide greater clarity about the nature of the beneficiary of R&D tax incentives in relation to control and responsibility over the projects whose expenditures are considered eligible for support, in particular in the context of contribution agreements and other cost-sharing mechanisms.

R&D subcontracting rules

The eligibility of R&D services purchased from related parties and R&D purchased from abroad, including possible limitations, represents another key area where additional regulatory guidance seems necessary. While Act No. 152/2009 specifies that purchases of R&D services from unrelated enterprises qualify for R&D tax relief[5], it does not explicitly specify the exclusion of R&D services outsourced to related parties (Rannís, 2022a[2]). Furthermore, there are no specific provisions for the treatment of R&D purchases from third parties abroad (related or unrelated).[6]

5. A definition of connected parties is in turn provided in Regulation nr. 758/2011, Art. 7.

6. The same applies to the treatment of R&D collaborations where guidance on the treatment of R&D collaborations with third parties abroad (related or unrelated) is currently missing.

This is a complex area and international comparisons are hard to establish. Countries typically wish to encourage domestic activities and therefore constrain the scope for R&D that is outsourced abroad. EU State aid rules limit the potential use of geographic eligibility constraints to the detriment of other members of the European Economic Area (EEA).[7] The R&D tax credit in Iceland is thus subject to EU rules on state aid and implemented in compliance with the General Block Exemption Regulation (GBER) which defines certain categories of state aid that are compatible with the implementation of the EEA agreement.[8]

R&D subcontracting costs qualify for R&D tax relief in many OECD economies (Table 4.1). A few countries have explicitly reported on the treatment of R&D purchases from related parties in the OECD R&D tax incentives survey[9]. Whereas such expenditures are not eligible for R&D tax relief in Finland, Ireland and Norway, for instance, they qualify in the case of France and the United Kingdom (SME contractors only). Table 4.1. (Panel B) also provides information on the eligibility of R&D services purchased abroad. In 19 countries, such costs qualify for R&D tax relief. Within the European Union, several countries consider subcontracted R&D performed in other member states as eligible R&D expenditure.

Table 4.1. Eligibility of R&D services in the OECD area and beyond, 2022

Eligibility of subcontracted R&D
Australia, Austria, Brazil (tax allowance), Canada, Chile, China (tax allowance), Colombia, Croatia, Cyprus, Czech Republic, Denmark (tax credit - deficit), Finland, France (CIR), Germany, Greece, Hungary (tax allowance, tax allowance innovation contribution), Iceland, Ireland (tax allowance), Italy, Japan, Korea (R&D tax credit), Lithuania (tax allowance), Mexico, New Zealand, Norway, Poland, Portugal, Romania, Russian Federation (tax allowance), Slovak Republic, Slovenia, South Africa, Spain (R&D tax credit), United Kingdom (tax allowance, tax credit), United States
Panel A. Eligibility of R&D services subcontracted to related parties
Eligible
Chile, China (at arm's lengths), France, South Africa, United Kingdom (SME contractors)
Not eligible or applicable
Australia, Austria, Canada, Czech Republic, Finland, Ireland, Italy, Norway, Slovak Republic, Slovenia
No details
Brazil, Colombia, Croatia, Cyprus, Denmark, Greece, Hungary, Iceland, Japan, Korea, Lithuania, Mexico, New Zealand, Poland, Portugal, Romania, Russian Federation, Spain, United States
Panel B. Eligibility of R&D services purchased abroad
Australia, Austria, Chile, Colombia, Denmark (tax credit - deficit), France (CIR), Germany, Hungary (tax allowance, tax allowance innovation contribution), Iceland, Ireland (tax credit), Japan, Korea (R&D tax credit), Lithuania (tax allowance), Norway, Portugal, Romania, Slovak Republic (tax allowance - volume), Spain (R&D tax credit), United Kingdom (tax allowance, tax credit)

Note: For additional details, see OECD INNOTAX portal.

Source: OECD R&D Tax Incentives Database, http://oe.cd/rdtax, April 2023.

The limitations on the eligibility of costs of outsourced R&D came up as an issue during the stakeholders' interviews, in particular in the context of buying R&D services abroad. Iceland aligns with several OECD countries (e.g. Austria, France, Ireland, Türkiye)[10] in imposing a dedicated ceiling on the amount of subcontracted R&D that qualifies for R&D tax relief. Some interviewees argued that the cap on outsourced R&D is comparatively low. This can, they argued, be

7. The European Economic Area (EEA) unites the EU Member States and the three EEA EFTA States (Iceland, Liechtenstein, and Norway) into an Internal Market governed by the same basic rules, include state aid provisions.

8. See Reglugerð nr. 758/2011 (rsk.is)

9. The OECD R&D tax incentives survey asks countries to report on applicable subcontracting rules but does not explicitly request information on the treatment of R&D subcontracted to related parties (e.g. at arm's lengths). As a result, such details are currently only available for a subset of countries which reported this information at own initiative.

10. For additional details, see OECD (2023[7]).

problematic for firms in the life sciences that rely on R&D services that need to be conducted abroad (e.g. for clinical trials), considering that domestic sourcing is more challenging in a small open economy like Iceland. Others pointed to the need to assess and clarify in more detail the rationale for having in place additional restrictions on the treatment of R&D services purchased from independent third parties abroad.

Finally, it is important to note that none of the interviewees expressed concerns about the possibility of "double-dipping" (i.e. having two parties claim support for the same activity) in the context of R&D subcontracting.[11] This might suggest that the existing rules in Iceland are effective in avoiding any duplicate claims of R&D tax support for the same underlying R&D activity by the R&D performer and funder paying for the R&D services. However, given that the notion of "project ownership" was considered unclear by several interviewees and there was no evidence provided on how this issue is addressed in practice, it cannot be assumed that there are no practical challenges that may contribute to double dipping in ways not foreseen by the Icelandic legislators.

Eligibility of IP-related costs

Stakeholders also noted that the practical identification of R&D project and IP ownership often creates confusion among R&D tax relief applicants as the costs for filing and protecting patents are not eligible. The Frascati Manual indicates that "patent application and licensing activity, market research, manufacturing start-up, and tooling up and redesign for the manufacturing process are not in their own right R&D activities and cannot be assumed to be part of an R&D project" (OECD 2015[3]).

Additional information on the effective eligibility of IP-related costs would be necessary according to several interviewees. A distinction should be made between the costs incurred for the acquisition of software, licenses and IP rights used as integral part of an R&D project, on the one hand, and patent filing and related IP right protection costs which are elements relating to the commercialization of knowledge assets, and while commercially relevant for many R&D performing firms, they do not contribute to the fulfilment of the criteria underpinning the definition of R&D. As the latest OECD R&D tax incentive survey results for 2022 show (Table 4.2), the former (Panel A) are eligible for tax relief in 10 out of 34 OECD countries that offer R&D tax incentives in 2022, including Iceland. By contrast, the latter (Panel B) turn out to qualify for tax relief only in five OECD countries. This is the case in Norway, where firms can claim the costs for patenting incurred in the context of a company's own R&D activity.

Table 4.2. Eligibility of IP costs in the OECD area and beyond, 2022

Panel A. Eligibility of acquisition costs of software, licenses and IP rights used for R&D
Belgium (tax allowance, tax credit), Brazil (Acc. dep.), Cyprus, Czech Republic, Denmark (tax credit - deficit, tax allowance), France (CIR), Greece, Hungary (tax allowance, tax allowance innovation contribution, tax credit), Iceland, Ireland (R&D tax credit), Italy (R&D tax allowance), Japan (tax credit special R&D), Korea (R&D investment tax credit), Lithuania (Acc. dep.), Portugal, Russian Federation (tax credit), Slovak Republic, Spain (tax credit, acc. dep.), Türkiye (R&D tax allowance), United Kingdom
Panel B. Eligibility of patent filing and protection costs
France (CIR), Italy (tax allowance), Norway (SkatteFUNN), Poland (R&D tax allowance), Portugal (only for SMEs), Slovenia (tax allowance)

Note: For additional details, see OECD INNOTAX portal.

Source: OECD R&D Tax Incentives Database, http://oe.cd/rdtax, April 2023.

Definition and communication of aggregation rules

Iceland applies an upper ceiling on the total amount of qualifying R&D expenditure, i.e. sum of in-house, subcontracted and collaborative R&D (ISK 1000 million in 2022), and dedicated cap on the amount of subcontracted and collaborative R&D (ISK 200 million in 2022). While the costs of different R&D projects are aggregated to the level of the business taxpayer, firms are required to submit separate applications to Rannís for each R&D project when seeking pre-approval.

11. A different form of "double dipping" applies when a single company receives both tax support and direct incentives for the same R&D activity.

There is uncertainty among stakeholders as to whether ceilings should be applied at the individual taxpayer (firm) or consolidated domestic group level. Additionally, there are no clear and enforceable rules on how to treat R&D tax incentive claims of enterprises that are part of a larger group.

The need for additional clarification regarding the treatment of associated parties is connected to the division of labour among institutions for implementing the tax incentive. Rannís approves individual R&D projects not knowing whether or not the total amount of R&D recorded in the project applications exceeds the cap on qualifying R&D expenditures. The ceiling only comes into play in the assessment as firms submit their tax forms to Skatturinn. Furthermore, information on whether firms are part of a group does not seem to be readily available to Rannís staff who in turn rely on the correct reporting of economic ownership by firms upon their request. In 2022, the ministries clarified that the ceiling should apply to the aggregated claims of the group in line with EU tax regulations. One aspect to clarify is the extent to which this ruling applies to claims by subsidiaries belonging to the same group but having a different tax ID.

From the evidence gathered, for the purposes of applying the maximum ceiling thresholds, Skatturinn treats the claims of enterprises that are part of the same group separately only if the tax filing subsidiaries have different IDs for tax purposes, which appears to be the case in a number of instances. While some interviewees pointed out that different subsidiaries may submit multiple applications in good faith, others explicitly acknowledged the existence of options for tax optimisation whereby firms that are part of a group would be inclined to split R&D project spending to minimise the impact ceilings on tax relief. Table 4.3 provides a cross-country summary overview of the aggregation rules applicable in determining the R&D tax benefits if enterprises that are part of a group. While several OECD countries (e.g. Finland, Norway) treat associated parties separately, a similarly large number (e.g. Canada, Denmark, Ireland, Sweden) carry out a joint assessment of associated entities.

Table 4.3. Aggregation rules applicable in determining R&D tax benefits in the OECD area and beyond, 2022

Treatment of R&D tax incentive claims of enterprises that are part of a group

Joint assessment of associated parties
Australia (R&D tax incentive), Canada (tax credit), Colombia (tax credit), Croatia (tax allowance), Czech Republic (same legal entities), Germany, Denmark, Ireland (R&D tax credit), Japan, New Zealand, Poland (tax allowance), Russian Federation, Spain (tax credit), Sweden (SSC exemption), United States (tax credit)
Separate assessment of associated parties
Austria, Belgium (acc. dep.), Brazil (tax allowance), Chile, Cyprus, Czech Republic (separate legal entities), Finland, France, Greece, Hungary, Iceland (tax credit), Italy (tax credit, tax allowance), Korea, Lithuania, Mexico, Netherlands, Norway (SkatteFUNN), Portugal (Sifide), Romania, Slovak Republic, South Africa, Spain (SSC, acc. dep.), Türkiye (tax allowance)
No details available
Belgium (PWHT, tax credit, investment deduction), Brazil (acc. dep.), China, France (CiCo), United Kingdom, Ireland (Accelerated depreciation for R&D capital), Slovenia, Türkiye SSC, acc. dep.)

Note: This table presents country responses to the 2022 OECD R&D tax incentives survey except for Iceland where relevant information was provided as part of the fact-finding interviews. For additional details, see OECD INNOTAX portal.

Source: OECD R&D Tax Incentives Database, http://oe.cd/rdtax, April 2023.

The cost-effectiveness of the scheme will need to be considered carefully

Stakeholders emphasised concerns related to the size, targeting and sustainability of R&D tax support. The R&D tax credit was introduced in 2010 with a broad consensus among the Icelandic political, scientific and business communities, as an instrument to improve economic resilience following the financial crisis and to support Iceland's transition to a knowledge-based economy. A decade later, the R&D tax credit was significantly reinforced in response to the COVID-19 crisis.

Recently, further increases in the generosity and magnitude of the R&D tax credit in Iceland - while broadly supported by the different communities - have raised questions about the appropriate size and targeting of this instrument in

Iceland and possible mechanisms to ensure its medium-to-long term sustainability. These stakeholder reflections are consistent with the Ministry of Finance's previous assessment and proposals (see Annex A) to examine pathways for reducing the continued growth in budget expenditures and implement legislative changes with a view to keeping the expenditures for the R&D tax credit within the intended budget.

Magnitude and directionality of R&D tax support

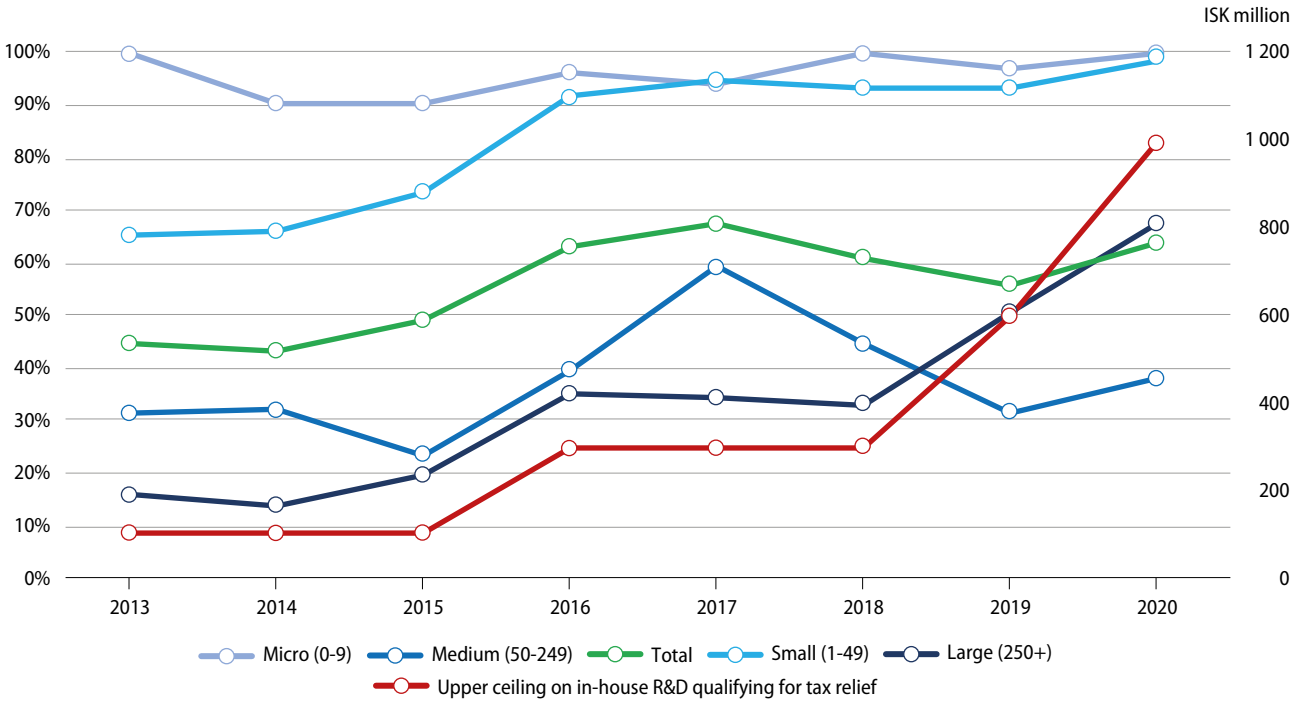
There was widespread support from interviewees for the continuation of the enhanced R&D tax credit rates (35% for SMEs and 25% for large firms, previously 20%) introduced in 2020 and the maintenance of the current ceilings on total (inhouse and subcontracted/collaborative R&D) qualifying R&D (ISK 1000 million) and subcontracted/collaborative R&D (ISK 200 million).[12] This, as indicated in Section 2 "Policy measures supporting business R&D investment in Iceland", contributes to placing Iceland among the OECD countries with the most favourable tax support regime for R&D.

Ceilings

An exploratory analysis of national business R&D survey data (Figure 4.2) sheds light on the relative magnitude of the ceiling on inhouse-R&D and level of intramural R&D expenditure performed by firms in different size classes. While there are conceptual differences in qualifying R&D and R&D reported in business R&D surveys (OECD, 2023[7]), this exploratory comparison shows how much firms of different size have been affected by recent changes in the ceiling on qualifying inhouse R&D, assuming that firms in 2020 fully exploit the ceiling on the total qualifying R&D through their inhouse-R&D investments.

FIGURE 4.2. **Intramural R&D expenditure subject to R&D tax expenditure limitation in Iceland, by business size groups**

Intramural R&D expenditure below upper ceiling on in-house R&D qualifying for tax relief as percentage of intramural R&D



Notes: The indicator present on the left-hand scale depicts the estimated average share of business R&D below the upper ceiling on qualifying in-house (intramural) R&D, as a proportion of total intramural R&D across firms in the relevant size group. Business size groups are defined by employment bands on display in legend. The ceiling's evolution over time is displayed as red line on the right-hand scale.

Source: OECD analysis based on national business R&D survey data, July 2023.

12. None of the interviewees referred to the potential case for automatically introducing inflation-based adjustments for these thresholds but these could be considered as an option for ensuring these remain constant in real terms.

Figure 4.2. shows how the average share of intramural R&D that falls below the upper ceiling on qualifying R&D expenditure and may thus benefit from R&D tax relief has evolved over time, looking at firms of different size. This average share has changed little with recent increases in the upper ceiling on qualifying R&D in the case of micro (0-9 employees) and small (10-49 employees) companies. Most of their intramural R&D spending falls below the upper ceiling on qualifying intramural R&D, this share being close to 100% from 2016 onwards. In the case of medium-sized (50-249 employees) and large firms (more than 250 employees), by contrast, this share increased overall as the ceiling on inhouse R&D was raised over the 2015-2020 period.[13] Any decision about possible changes in the current ceilings on total qualifying R&D and subcontracted R&D would need to account for its differential impact on firms of different size as well as applicable aggregation rules.

Targeting

Key stakeholders emphasised that the R&D tax credit is unique and different from other support measures in Iceland (e.g. research and technology fund) in that it focusses on start-ups. The R&D tax credit is typically used by more mature start-ups already operating on the market, while early-stage start-ups, before applying to the R&D tax credit, rely on grant funding, initially local, then national and finally, as start-ups grow, some of them argued, go on to apply for EU grants. This outcome can be attributed to four specific factors:

- The requirement of a minimum level of R&D spending to qualify for tax relief;
- Applications costs, which are not negligible especially for small companies;
- Low R&D tax credit rates before the 2020 policy reform;
- State aid rules limit the total amount support per project (i.e. grants reduce R&D tax relief).

Finally, interviewees argued for the potential differentiation of provisions applying to SMEs and start-ups of different types. Currently, the same rates and terms apply to SMEs in Iceland, including early and late-stage start-ups. As Table 4.4. shows, a number of OECD countries provide preferential tax relief provisions for SMEs in form of enhanced tax credit/allowance rates or other favourable terms such as SME exclusive refund provision (e.g. Australia, Austria, Canada, France). A few OECD countries (e.g. Portugal, Netherlands) apply such preferential provisions exclusively to start-ups or young firms.

Table 4.4. Preferential R&D tax relief provisions for SMEs in the OECD area, 2022

	Enhanced tax credit/allowance rates	Other more favorable terms
SMEs	Australia, Canada (CCPCs), Colombia, France (general and collaboration specific tax credits), Iceland, Japan (volume-based tax credit), Korea, United Kingdom	Australia, Austria, Belgium, Croatia, Canada (CCPCs), France (general tax credit), Spain (innovative SMEs)
Start-ups	Portugal (start-ups), United States (certain start-ups), Netherlands (start-ups)	Poland (R&D tax allowance - start-ups)
Young firms		Belgium (young innovative firms), France (JEI/JEU)

Note: For additional details, see OECD INNOTAX portal.

Source: OECD R&D Tax Incentives Database, http://oe.cd/rdtax, April 2023.

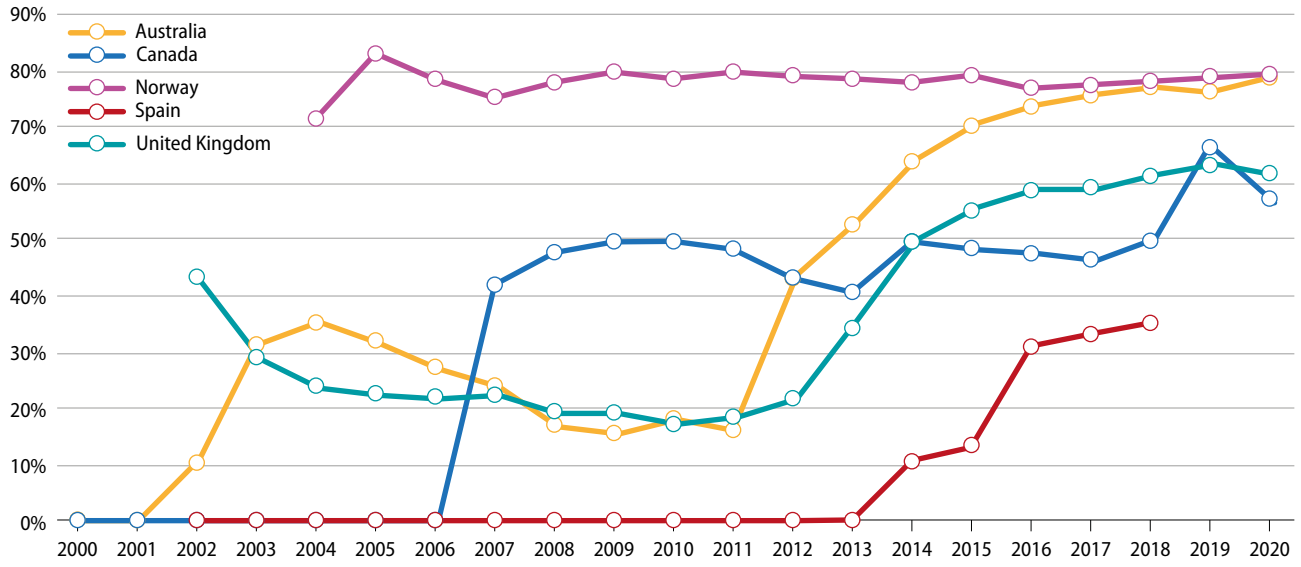
Financial sustainability of R&D tax relief

The R&D tax credit has grown on several metrics, with total relief reportedly accounting for 16% of corporate income tax revenue in Iceland in 2021. Demand is a key factor of success but can also present a threat to financial sustainability. The R&D tax incentive appears to be attractive to firms in Iceland, generating considerable uptake and pressure on the financial and administrative sides. A pre-approval system can operate as modulator of demand, ensuring that effective conditions apply..

13. A recent study on the tax exemption in Sweden similarly shows that changes in the rules regarding the deduction ceiling in 2020 have mainly affected companies with 50 or more employees (Statistics Sweden, 2023[59]).

FIGURE 4.3. **Payable R&D tax support, 2000-2020**

As a percentage of the total value of R&D tax support



Note: Figures for the United Kingdom refer to the payable credits available under the tax allowance provision for SMEs. Relevant data for the payable RDEC tax credit, introduced for large companies in the United Kingdom in 2013, are not available.

Source: OECD R&D Tax Incentive Database, http://oe.cd/rdtax, April 2023.

Refundability, as previously discussed, is one key feature of the R&D tax incentive in Iceland, which adds to its attractiveness to firms.[14] Stakeholders pointed to the comparatively large and growing magnitude of budget expenditures (i.e. payable credits) vis-à-vis tax deductions (i.e. forgone tax revenue). Out of the total amount of R&D tax support of ISK 3.6 billion in 2018, payable credits (reported as expenditures in the budget) accounted for ISK 3 billion (MoF, 2019), i.e. 83% of total R&D tax support. As Figure 4.3. shows, this percentage is comparable to those reported by Australia and Norway, where the refundable component is close to 80% but larger than the ratios reported by Canada (55% in 2020), Spain (35% in 2018) or the United Kingdom (60% in 2020). In the context of the relatively high share of payable tax credits in Iceland, interviewees also noted that the timeline would matter as it would take start-ups two to three years to attain a sustainable business model and achieve revenues. Progress can be witnessed in more recent years with more start-ups in Iceland reaching sustainable operations.

Considering potential alternative or complementary tax vehicles in light of potential limits presented by the size of the corporation tax, it is worth considering what tools are used in other countries. Table 3.3 shows that 21 out of 34 OECD countries that provide tax support for R&D in 2022 provide refundable (Panel A) or equivalent incentives (Panel B). In the case of tax offsets based on corporate income tax (CIT), most OECD countries, including Iceland, provide for a cash payment in the case of insufficient tax liability. However, there are also a few cases (Italy, the United States) where earned tax credits can be offset against other taxes in the case of insufficient CIT liability. Some stakeholders pointed out that firms need to bridge around 15 months between application and payment. This delay, which is relatively short by international standards, is considered too long for some small companies in Iceland.

Incentives with a refund-equivalent provision (Panel B) comprise tax offsets redeemable against payroll taxes or social security contributions. Such incentives are disconnected from the corporate tax liability of the firm and are thus in principle also payable in both the profit and loss-making scenario subject to any limitations that may apply. Tax offsets redeemable against payroll taxes or social security contributions typically facilitate quarterly payments which may be important for small companies which are more prone to be more cash constrained.

14. R&D tax incentives can be refundable in a number of OECD countries (e.g. Australia, Canada, France, Norway, Italy, Spain). For additional details, see OECD INNOTAX portal.

Table 4.5. Payroll and alternative R&D tax relief offsets in the OECD area, 2022

Panel A. Payable R&D tax incentives (cash-payments)
Australia (SMEs), Austria, Belgium (R&D tax credit after five years; payroll withholding tax exemption), Canada (CCPCs), Colombia (R&D tax credit for SMEs), Denmark (tax credit for deficit related R&D), France (R&D tax credit – immediate for SMEs, else after three years), Germany, Iceland, Ireland, Poland (start-ups), New Zealand (general R&D tax incentive and tax credit for deficit related R&D), Norway, Spain (reduced, payable tax credit optional), the United Kingdom
Alternative tax offsets (beyond CIT tax offset)
Italy (Redeemable against income tax liability, regional taxes, and social security contributions), United States (certain start-ups may elect to apply a portion of their research credit (up to USD 250 000) against their payroll tax liability)
Panel B. Refund through wage system
Belgium (payroll withholding tax exemption), France (JEI/JEU), Hungary (exemption and credit), Netherlands (Payroll withholding tax credit), Spain (SSC exemption), Sweden (SSC exemption), Türkiye (SSC exemption)

Note: For more details, see OECD INNOTAX portal.

Source: OECD R&D Tax Incentives Database, http://oe.cd/rdtax, April 2023.

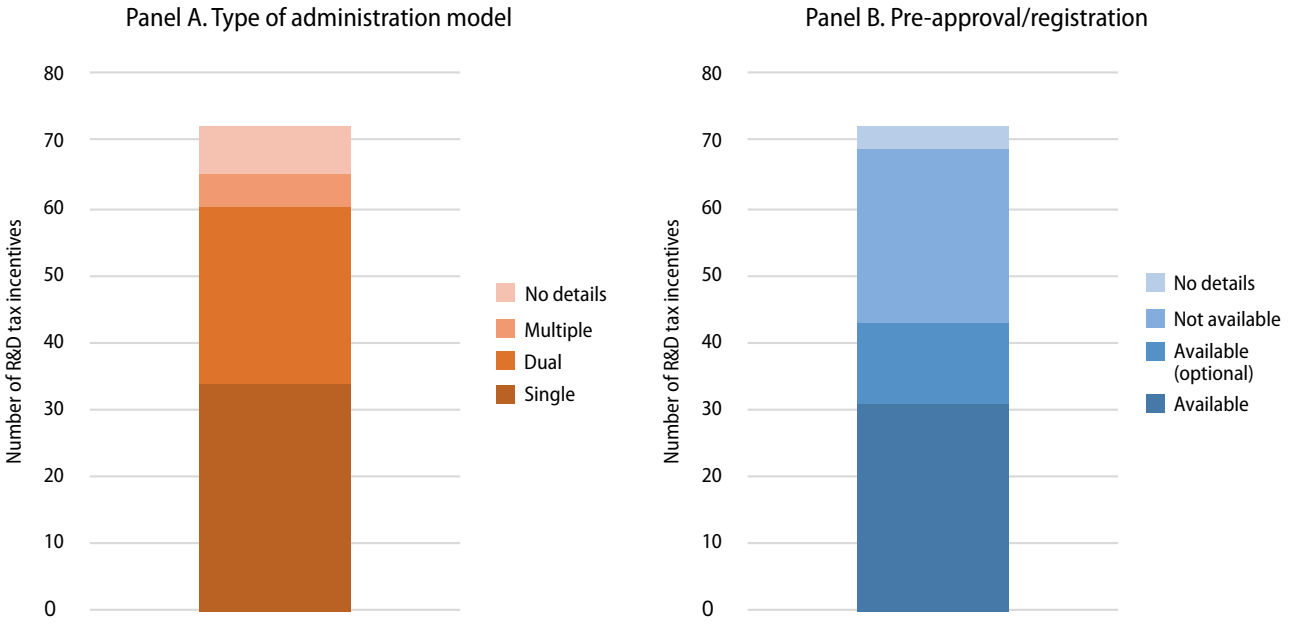
Several stakeholders argued that comparatively high wages and payroll taxes in Iceland result in high R&D costs for labour-intensive innovative companies. Alternative tax offsets via payroll taxes, while not yet considered by Iceland, as the discussion illustrated, may represent one possible mechanism to reduce the high proportion of payable credits in Iceland. The idea of payroll tax offset option attracted some interest among some stakeholders. However, several argued that the current CIT-based system is simple and well understood and that predictability and clear guidance to how to obtain R&D tax relief should be a priority for the design and implementation of tax support.

Budgetary predictability of tax support for R&D represents another important aspect of sustainability for the authorities in Iceland and any other country providing this type of incentive. The on-demand nature of the R&D tax incentive makes this particularly challenging. In 2018, expenses were considerably in excess of budget plans (MoF, 2019[1]). The budget plans for the R&D tax credit in Iceland are derived based on cost forecasts by Rannís. Interviewees highlighted that it is difficult for Rannís to correctly predict the number and type of companies that will ultimately apply for the R&D tax credit, including the level of qualifying R&D spend incurred by different types of businesses. According to interviewees, the precision of budget forecast by Rannís has improved over time leading to a smaller divergence in budget plans vis-à-vis budget expenditures.

The tax incentive is run effectively, but there is scope for improving the efficiency of the administration system

The allocation and implementation of the R&D tax credit in Iceland relies on the pre-approval of R&D projects by Rannís, followed by Skatturinn's assessment of the R&D tax relief forms submitted by firms as part of their annual corporate tax returns. As Figure 4.4. shows, in most cases the administration of R&D tax incentives relies on a single agency model (Panel A), i.e. one institution – typically the tax authority or Ministry of Finance - is responsible for the administration of the scheme, including the evaluation of R&D tax relief claims by business. The pre-approval of R&D tax projects in turn is mandatory or available on an optional basis (Panel B) for a majority of R&D tax incentive schemes available in the OECD area and other economies in 2022. Table 4.6. provides a list of countries that rely on a pre-approval system and dual agency model in the administration of R&D tax incentives in 2022. Aside Iceland, a pre-approval system is available in Australia, Austria, Canada (optional), Germany (optional), the Netherlands, Norway, Portugal, and Spain (optional), for instance. Australia, Austria, Germany, Netherlands, Norway and Spain also rely on a dual agency model in the administration of their R&D tax incentive schemes.

FIGURE 4.4. **Administration of R&D tax incentives in the OECD area and beyond, 2022**



Note: Panel A provides information on the number of institutions involved in the administration of R&D tax incentive schemes. Single / dual / multiple means that one / two / three or more institutions are involved in the administration and monitoring of the R&D tax incentive. Panel B provides information on the availability of a pre-approval or registration (certification) process. Optional means that that pre-approval/ registration is not mandatory but available to firms on an optional basis upon request. For additional details, see OECD INNOTAX portal.

Source: OECD R&D Tax Incentives Database, http://oe.cd/rdtax, April 2023.

Table 4.6. Pre-approval and dual administration systems in the OECD area and beyond, 2022

Pre-approval/registration
Australia, Austria, Belgium (tax credit, investment deduction), Canada (optional), Chile, China, Colombia, Czech Republic, Germany (optional), Spain (optional), France (optional), United Kingdom (optional), Greece, Hungary (optional), Iceland, Italy (tax credit for R&D wages), Korea, Lithuania (optional), Latvia, Mexico, Malta, Netherlands, Norway, New Zealand, Portugal, Romania (optional), Slovak Republic, Slovenia, Türkiye (tax allowance), United States (optional), South Africa
Dual administration model
Australia, Austria, Belgium (tax credit, investment deduction), Brazil, Chile, Germany, Spain, France, Greece, Croatia, Iceland, Korea, Latvia, Netherlands, Norway, New Zealand, Romania, Slovenia, Türkiye (tax allowance), South Africa

Note: This table represents country responses to the 2022 OECD R&D tax incentives survey. For additional details, see OECD INNOTAX portal.

Source: OECD R&D Tax Incentives Database, http://oe.cd/rdtax, April 2023.

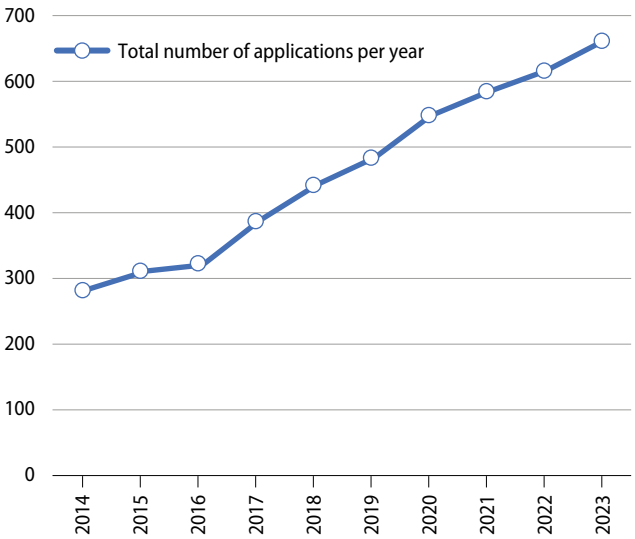
R&D tax incentives with pre-approval systems are by nature more demanding of administrative resources than schemes that rely solely on ex-post assessment mechanisms. As already noted, the main upside of having pre-approval procedures is that they reduce business uncertainty as to the likelihood of receiving tax support for the R&D activities, allowing them to commit resources at an earlier stage. The efficiency of the administration of Iceland's R&D tax credit design thus relies on the role of Rannís and how that is complemented by that of Skatturinn as claims are ultimately assessed.

Stakeholders appear to be generally satisfied with the dual system with pre-approvals and its implementation, especially the quality and efficiency in which Rannís and Skatturinn respectively process and assess R&D project applications and R&D tax relief claims. Stakeholders also highlighted the good collaboration between Rannís and Skatturinn, the overall fairness of judgements, as well as the regular exchanges of Rannís with companies to help ensure awareness of applicable rules leading to more robust R&D project applications.

Rannís' approval rate of R&D project applications is high, – around 89% of the almost 2500 R&D project applications received between 2011 and 2018 were approved (MoF, 2019). A high acceptance rate is in principle consistent with an efficient system that helps minimise the number of badly designed applications and projects that do not meet the conditions set by Rannís. However, this could also be potentially indicative of a relatively low threshold on the criteria for R&D projects that are considered as meeting the definition of R&D. It was beyond the scope of the study to assess this point in particular, but it should be noted that given the large number of ICT companies claiming support, more specific guidance on software R&D eligibility (see next subsection) would be necessary in Iceland as in many other countries.

Finally, the system has been significantly stretched as number of applications kept on increasing (Figure 4.5.) while procedures remained more attuned to those appropriate for managing a relatively small number of R&D tax relief claims in a close-knit economy.

FIGURE 4.5. **R&D project applications: Iceland, 2014-2022**



Note: Data on the number of R&D project publications in 2021 and 2022 were provided by Rannís in September 2023.

Source: Rannís (2022b[25]).

The interviews alluded to possible ways to achieve additional efficiency gains in the administration system that is confronted with a steadily increasing number of project applications, especially following the policy reform in 2020. Such levers relate to the provision and use of guidance and software tools, capacity increases and enhanced governance arrangements. Multiple ministries and agencies are involved and interact in the administration of the R&D tax credit. While administrative changes arguably affect small companies disproportionally more than larger companies, no larger changes in the administration system and its underlying processes have occurred since the inception of the scheme back in 2010.

Tools and practices to further automatize and fine-tune processes

Several stakeholders pointed out that Rannís made some advancement in its internal processes, introducing a more sophisticated, "check-list" based system to process applications just ahead of the COVID-19 crisis. This check-list based approach allows to better manage the manual assessment workflow, facilitates the exchange between colleagues, and the handover of applications within Rannís. As interviewees claimed, this new application system has enabled the processing of a growing number of R&D project applications of companies that have become more and more diverse and have grown in turnover. In the context of this growing uptake of the R&D tax credit, stakeholders pointed to the possible use of more advanced IT tools to alleviate the high pressure on both Rannís and Skatturinn and facilitate the speedy and effective processing and assessment of R&D project applications and R&D tax relief forms by Rannís and Skatturinn respectively.

Overall, the discussion indicated that various administrative processes, ranging from the assessment of R&D project applications by Rannís to the evaluation of R&D tax relief claims by Skatturinn, and possible follow-up inspections (audits), are currently primarily based on manual review and fail to make use of IT-based solutions that could help automatise certain procedures. IT-based solutions may also facilitate the identification of high risk and potentially fraudulent claims via semantic analysis, for instance, or the implementation of randomised audits. In light of the increasing uptake of the R&D tax credit, stakeholders emphasized the importance of increased monitoring efforts, including the application of randomised audits. Table 4.7. provides some examples of approaches and tools used in the evaluation of R&D tax incentives by selected OECD countries, distinguishing between ex-ante and ex-post assessments.[15]

15. European Commission (2017[60]) provides a review of national R&D tax incentive administration systems, including administration and monitoring approaches and tools.

Table 4.7. Approaches and tools in the evaluation of R&D tax incentive claims, selected examples

Country	Approach	Description	Timing
Australia	Manual risk assessment	As part of compliance reviews conducted for each application, AusIndustry manually assigns risk categories ("Getting it right", "Trying to get it right", "Does not comply") to each claim (AusIndustry, 2021[26]). Depending on the assessment, the application takes different review journeys differing in the depth of the review conducted by AusIndustry and the Australian tax authority (ATO). However, there are no targets or quotas for assessments.	Ex-ante
Norway	Manual risk assessment and random sampling	The Research Council of Norway manually evaluates each application ex-ante. To combat misuse, it evaluates each claim for five risk categories (Statistics Norway, 2019[27]). Meeting two out of five categories leads to a high-risk designation. It then conducts 150 controls within the group of high-risk claims and 50 within low-risk claims. Applications are assessed by hand, refusals are checked twice, i.e. by two advisors. Difficult applications are evaluated by means of a "group processing".	Ex-ante
Spain	Semantic analysis	Spain explores the automation of the R&D tax incentive application assessment process by using semantic analysis to complement the manual evaluation tasks.	Ex-ante
Canada	Automated risk assessment	Canada established an automated screening of each SR&ED claim to limit non-compliance and determine the scope of review for each application (Canada Revenue Agency, 2015[28]).	Ex-post (ex-ante optional)
France	Structured selection	Besides conducting general tax audits, France adopts a structured approach for selecting claims for review. Tax credit claims exceeding EUR 1 million trigger a tax audit and claims paid out as refunds to SMEs can result in a tax audit. That way 10-20% of the applications are scrutinized in an ex-post audit.	Ex-post (ex-ante optional)
United Kingdom	Automated risk-assessment	The UK adopted an automated risk-assessment approach for identifying applications associated with a high risk for targeting reviews and controls. HM Revenue & Customs (HMRC) published a list of errors, common to high-risk claims, including ineligible staffing costs, overheads that do not qualify as consumables or project activities out of scope, that are used by the system for profiling tax claims (HMRC, 2023a[29]) (HMRC, 2023b[30])	Ex-post (ex-ante optional)
Ireland	General tax audits	Ireland uses an ex-post evaluation system where reviews of R&D tax credit claims are integrated in general tax audits conducted by the tax authorities.	Ex-post

Note: This table, prepared based on country responses to the OECD R&D tax incentives survey and OECD desk research, provides a non-exhaustive list of approaches adopted in the evaluation of R&D tax incentive claims. The information for Spain is based on Spain's presentation at the 2018 OECD Expert workshop on R&D Tax Incentive Design and Indicators.

Source: OECD elaboration..

While Rannís carries out the pre-approval of R&D project applications (i.e. R&D content[16] and eligible R&D costs), Skatturinn is responsible for reviewing the R&D tax relief form submitted alongside the corporate tax return and assessing the eligibility of R&D expenses ultimately claimed by firms. Those expenses can differ from the amounts recorded in the R&D project application, as interviewees noted. As Skatturinn reviews the tax relief form, comparing the R&D costs claimed in the tax return and other expenses those cost filed in the R&D project application, difficulties appear to arise when it comes to the validation of R&D expenses. Since companies operate in highly specialised domains, this makes Skatturin's assessment of R&D costs challenging, since it has to make decisions regarding the eligibility of highly specific types of costs and the plausibility of resources required to accomplish concrete tasks. Lacking specific R&D domain expertise, Skatturinn was reported to consult with Rannís for clarification on individual cases. It does no longer carry out company visits as it was the case some years ago.

16. The R&D project application form ask for a description of the R&D project and the state of the art in Iceland and abroad in the areas covered by the project to facilitate the novelty assessment.

As the latest OECD R&D tax incentive indicators show (OECD, 2023[7]), companies in the information and communication sector (e.g. gaming, software development) represent the majority of R&D tax relief recipients in Iceland and most R&D tax benefits accrue to firms in this sector. In 2020, firms in the information and communication sector account for 47% of all R&D tax relief beneficiaries and 50% of all R&D tax benefits in that year. These shares do not change significantly in the first year after the 2020 reform, firms in the ICT sector accounting for 50% of all R&D tax relief beneficiaries and 47% of all R&D tax benefits in 2021. Given the importance of ICT sector and software development more specifically in many advanced economies, some OECD countries have started to develop and issue guidance on eligible software expenses with industry-specific examples to facilitate the evaluation of software claims and identification of R&D vis-à-vis routine software development. The United Kingdom (HMRC, 2016[31]) and the United States (IRS, 2023[32]) are two cases in point. HMRC also additionally employs specialists to evaluate complex software claims. While industry-specific guidance and evidence on software may not fully replace the need for company-specific follow-up investigations, they can contribute to a systematic, streamlined and less ad-hoc review of complex R&D tax relief claims.

Finally, the discussion with stakeholders also highlighted that the professional committee (see Section 5 "Overview of the R&D tax incentive implementation in Iceland") which has the mandate to advise Rannís on issues, procedures and definitions of R&D projects, has not been very active in practice. While there appear to be some informal exchanges between Rannís and the professional committee, this advisory group seem to meet only infrequently, the last time three years ago. This represents a significant deviation from the professionalization and systematization of several of the administrative procedures in place and the more formal advisory role of the professional committee foreseen in the legislation (Art. 8 of Act No. 152/2009) (Rannís, 2022a[2]).

Growth of applications and claims drives the administrative agencies to their capacity limits

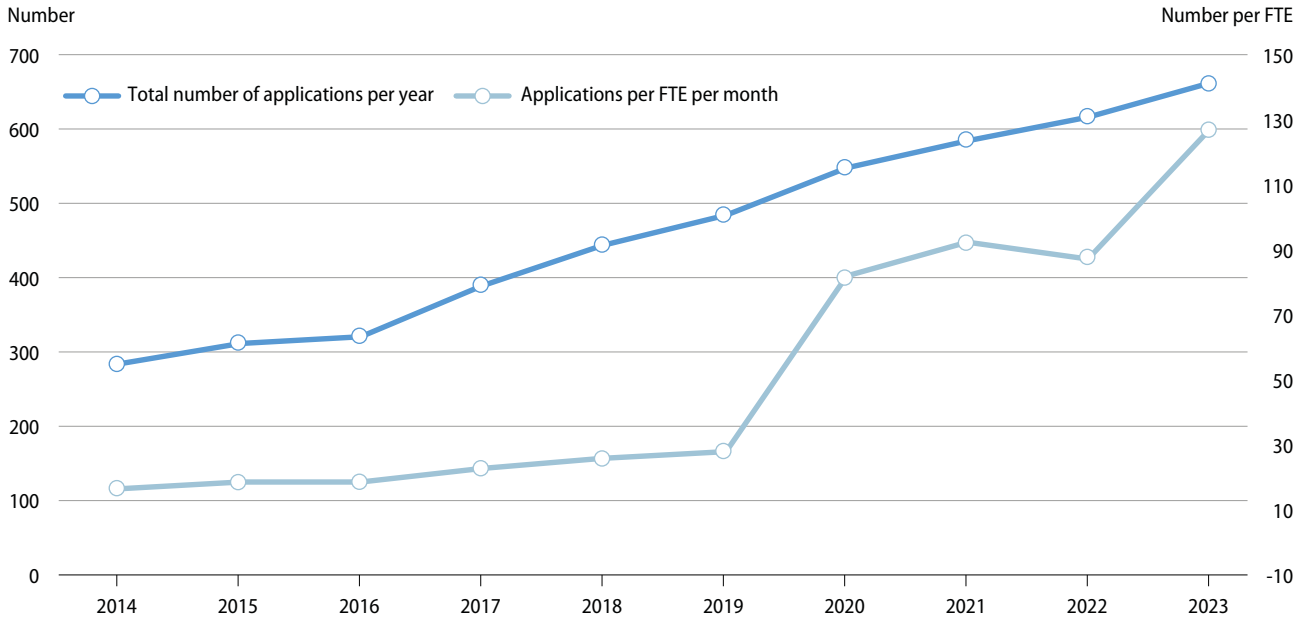
Throughout the different interview sessions, stakeholders acknowledged the issue of capacity in the Icelandic R&D tax relief administration system, especially on the side of Rannís where a comparatively small team of 2-3 staff members are in charge of the R&D tax credit work on a full or part-time basis. With the growing uptake of the R&D tax credit following the 2020 policy reform, the capacity issue has become more severe. Rannís was nevertheless able to handle the strong increase in applications, yet with some delay in its response beyond the usual two months limit for processing R&D project applications. As an increasing number of projects are connected to an overarching larger project, company visits and discussions with company accountants with access to special project bookkeeping are increasingly required for Rannís to be able to accurately assess and identify the R&D component of each project application.

Furthermore, companies tend to pose many questions to Rannís in the course of the application process, such that 4-5 exchanges (i.e. individual visits) are typically required until the assessment of an R&D project application is complete. Figure 4.6. displays the strong increase in R&D project applications over the 2014-2023 period as well as the estimated monthly workload, i.e. number of project applications per Rannís staff member, leveraging data on the number of Rannís staff members responsible for the processing of project applications on a full-time basis. The simple calculation points to a five-fold increase in the monthly workload per full-time staff member from 2014 (17 applications per month) to 2020 (83 applications per months). This exploratory comparison abstracts from any possible changes in the time needed to assess R&D project applications over the said period.

As the discussion highlighted, Skatturinn faces similar capacity challenges. Interviewees explained that Skatturinn mainly relies on inspections after the assessment of tax returns due to the limited time and resource available for ex-ante assessments. Tax returns are submitted in the summer and need to be processed before the 1 November deadline (see Figure 4.1.). It was reported to OECD that Skatturinn used to inspect 50-60 companies per year prior to the COVID-19 crisis, requesting additional documentation and carrying out additional controls afterwards as necessary. However, it was reported that limited resources do no longer permit Skatturinn to audit a large share of R&D tax relief recipients. Several stakeholders pointed to the need of government support in form of additional human resources to address and resolve the capacity issues encountered by Rannís and Skatturinn and help maintain the quality of assessment in the evaluation of R&D project applications and R&D tax relief claims respectively.

FIGURE 4.6. **R&D project applications and estimated monthly workload of Rannís staff**

Total number (left-hand scale) and number of applications per full-time equivalent (FTE, right-hand scale)



Note: OECD calculation based o national data on R&D project applications (Rannís, 2022b[25]) and work force information from Rannís. Data on the number of R&D project publications and work force in 2021 and 2022 were provided by Rannís in October 2023.

Source: OECD elaboration.

Co-ordination and collaboration across institutions

While the individual agencies responsible for administrating the R&D tax relief appear to work effectively, coordination among them could be ostensibly improved. Currently two ministries – the Ministry of Finance and Economic Affairs and the Ministry of Higher Education, Science and Innovation (previously three ministries - the Ministry of Finance and Economic Affairs, the Ministry of Education, Science and Culture and the Ministry of Industry and Innovation) – are in charge of the governance of the R&D tax credit in Iceland (Section 5 "Overview of the R&D tax incentive implementation in Iceland").

Rannís, an agency of the Ministry of Higher Education, Science and Innovation (previously the Ministry of Industry and Innovation), carries out the pre-approval of R&D projects based on a contractual agreement with the Ministry of Finance.[17] If firms wish to appeal Rannís's decision, they need to write a letter to the two (previously three) ministries to object the decision of Rannís as there is no formal appeal process for the R&D tax credit in Iceland. In the case of a disagreement with Skatturinn's decision, firms may in turn appeal to the Internal Revenue Board which deals with all types of taxation related claims and appeals, including those for the R&D tax credit.

While stakeholders perceived the decisions made by the agencies to be fair and there are very few cases of appeals in practice, they argued for a closer alignment of processes between Rannís and Skatturin in the face of the increasing uptake of the R&D tax credit scheme. Data sharing and joined-up assessment of R&D costs emerged as two possible areas where an enhanced collaboration between Rannís and the tax agency could be beneficial.

As noted earlier, Skatturinn encounters challenges in the assessment and inspection of R&D tax relief claims due to limited resources and highly specialised and company-specific nature of R&D projects. This challenge is not necessarily unique to the tax agency in Iceland. As the recent reviews of the dual agency-based systems of the R&D tax relief administration in Norway, Spain and Australia show, tax agencies in other OECD countries face similar difficulties in

17. This service agreement between the Ministry of Finance and Economic Affairs and Rannís was proposed in the context of the Ministry of Finance's 2019 assessment of the R&D tax credit (see Annex A).

the assessment of R&D costs and the same type of coordination issues (e.g. in the context of data sharing, development of joint guidance) also arise in other dual agency-based R&D tax relief systems (see Box 4.1 for additional details).

According to interviewed stakeholders, Rannís and Skatturinn could cooperate more closely in the provision and sharing of data relevant for the assessment of R&D project applications and tax relief claims. The sharing of information on the group status of R&D tax relief applicants is one case in point that emerged during discussion. Such information appears to sit with the tax agency in Iceland but is currently not readily available to Rannís. Information on the group status of firms is relevant in the assessment of SME status (e.g. enhanced tax credit rates apply to SMEs in Iceland from 2020 onwards), the eligibility of subcontracted R&D costs and application of aggregation rules, i.e. separate or joint treatment of R&D tax relief claims by associated parties.

As noted earlier, the professional committee has not been appointed and therefore does not play any role in advising Rannís on issues, procedures and definitions of R&D projects. The role of scientific advisory in the administration of the R&D tax credit in Iceland could be further strengthened by establishing more formal and regular exchanges between the professional committee and two bodies - Rannís and Skatturinn – responsible for the administration of the scheme. Joint and regular exchanges with this committee would promote inter-institutional coordination and facilitate a more pro-active and coordinated resolution of overarching questions and issues (e.g. eligibility of subcontracted R&D costs, aggregation rules) that arise in the assessment of R&D project applications and R&D tax relief claims.

BOX 4.1. RECENT REVIEWS OF DUAL-AGENCY BASED R&D TAX RELIEF ADMINISTRATION SYSTEMS

SkatteFUNN tax credit, Norway

The recent evaluation of the R&D tax credit in Norway by Benedictow et al. (2018), highlights that the Norwegian Tax Administration experiences significant issues in the audit of SkatteFUNN beneficiaries due to the lack of resources in assessing whether the activities in the project are in line with the description sent to the Research Council of Norway (responsible for the pre-approval of R&D projects). The Norwegian Tax Administration lacks the competence to assess whether the actions classify as R&D in accordance with the regulations. Furthermore, as the evaluation reveals, it is difficult to assess whether the discrepancies found during audits are related to deliberate misuse or sloppiness. To improve the efficiency of audits, the Research Council of Norway and the Norwegian Tax Administration entered into an agreement in 2016. The agreement was intended to enhance inter-agency collaboration and make it easier for the involved institutions to identify fraudulent cases and sanction misuse.

R&D&I tax credit, Spain

The State Tax Administration Agency and the Ministry of Science and Innovation also entered into a new agreement recently to help define the terms of their cooperation and support the Spanish tax authority in its assessment of eligible R&D costs (Government of Spain, 2022). As noted in the agreement closed in 2022, "the qualification of a project as R&D and/or I (innovation) requires very specific and qualified technical knowledge, complicating both the application and control of the incentive associated with these types of activities by the Tax Administration." In Spain, the pre-approval of R&D projects is available on an optional basis. It results into the issuance of a binding reasoned report by the Ministry of Science and Technology that certifies the compliance of R&D projects with the scientific and technological requirements laid out in the law. The new agreement enables the Tax authority in Spain to request an expert assessment from the Ministry of Science and Technology not only for those R&D projects that are certified via pre-approval.

R&D Tax Incentive, Australia

The R&D tax incentive in Australia is jointly administered by the Australian Taxation Office (ATO) and Industry Innovation and Science Australia (IISA) and the Department of Industry, Science, Energy and Resources (DISER), with IISA responsible for registering companies' R&D activities and the ATO responsible for the administration and processing of R&D tax offset claims. To identify opportunities to reduce duplication between the two administrators, simplify administrative processes, or otherwise reduce the compliance costs for applicants, the Board of Taxation in Australia carried out review of the dual-agency administration model (Board of Taxation Australia, 2021). The recommendations proposed by the Board in 2022 related inter alia to the maintenance of the dual agency model, to the provision of clear and concise guidance with examples that should be released jointly between the two administrators including an overarching guidance document or manual" and to improvements in data and information sharing between the co-administrators (Board of Taxation Australia, 2022[35]).

Source: Benedictow et al. (2018[17]), Government of Spain (2022[33]), Board of Taxation Australia (2021), (2022[35]).

Moreover, the committee may assist in developing and testing proposals for operational guidance that Rannís and Skatturinn may wish to consider introducing, or for identifying situations where such guidance would be needed. If the role of the professional committee remains the status quo, alternative arrangements may need to be considered by Iceland, including informal consultative arrangements such as public consultations. A number of OECD countries (e.g. Australia,[18] United Kingdom[19]) carry out such consultations to inform policy-making in this area.

There is the need to invest in monitoring, data collection and evaluation to better steer the evolution of the R&D tax credit

The topic of monitoring and impact analysis was prevalent in all interview sessions. Stakeholders unanimously emphasized the importance of tracking the achievement of policy objectives and stepping up existing monitoring and impact assessment related efforts. Key stakeholders cautioned, however, that a revisiting and clarification of policy objectives would be an important pre-requisite for assessing the effect of the R&D tax credit. The lack of a precise policy mandate, beyond the initial one of raising R&D performance of Icelandic firms, coupled with limited resources and the unavailability of a common data infrastructure, currently limit the scope of monitoring and analytical activities for the R&D tax credit in Iceland.

Future assessments of objectives and impacts

As the discussion with key stakeholders highlighted, Iceland introduced the R&D tax credit during the global financial crisis to facilitate Iceland's transition from a natural resource-based to an innovation driven, IP-based economy and promote the collaboration of firms with research institutes. Both government officials as well as business representatives had a common understanding about this primary policy objective in the pursuit of which the R&D tax credit was introduced back in 2010. However, key stakeholders also pointed out that there remains some uncertainty in regard to the ultimate outcomes that Iceland would like to achieve with the R&D tax credit at this stage. According to interviewees, a review and clarification of policy objectives would be essential in light of the increasing uptake and magnitude of the R&D tax credit scheme. Stakeholders made references to a number of additional outcomes that in their view would be of policy interest:

- R&D personnel (e.g. full-time staff, gender[20], nationality);
- Innovation and economic performance (e.g. productivity growth);
- Domestic R&D collaboration between business and higher education / research institutes;
- International R&D collaboration.

Overall, key stakeholders gave a very positive appraisal of the effect of the R&D tax credit in Iceland in achieving the initial policy objective and subsidising innovative companies. According to them, the R&D tax credit was particularly important for companies during the transition, and in particular in crisis times. Many stakeholders were able to give some anecdotal evidence for the positive effects of the programme in the form of job creation, start-up emergence or knowledge spillovers. However, uncertainty prevails in regard to the ultimate outcomes of the programme, in particular the effect of the R&D tax credit on innovation and productivity. Little is also known about the distribution of R&D tax benefits and heterogeneity of impacts across different types of firms (e.g. firms in traditional R&D sectors or firms in rural areas). Throughout the interviews, stakeholders therefore emphasised the importance of building up evidence on the impact of the R&D tax credit and its interaction with other business R&D support policies.

Development of metrics, indicators and systematic data collection

Key stakeholders' appeal to step up measurement, monitoring and impact assessment related efforts is consistent with the Ministry of Finance and Economic Affairs' proposal in 2019 (see Annex A) to strengthen monitoring activities, develop metrics for evaluation and carry out a broader, more holistic assessment of the R&D tax credit in account of other available R&D support policies. According to interviewees, impact assessment-related considerations only came

18. See Consultation Guide: Review of the dual-agency administration model (taxboard.gov.au)

19. See 20230113_R_D_Consultation.pdf (publishing.service.gov.uk)

20. Gender related analyses of the R&D support system In Iceland are also foreseen in the 2019 proposal by the Ministry of Finance (see Annex A).

up recently in policy discussions (e.g. in the context of actions under the Science and Technology Policy 2020-2022[21]) and did not arise during the preparatory exchanges and consultations with experts in Norway, for instance. In light of the growing size of the R&D tax credit, as they explained, the Icelandic parliament has taken up the R&D tax credit and policy analysis as topics for discussion. With the envisaged formation of the new innovation council in Iceland, stakeholders also expect the topic of impact analysis to gain additional weight in policy discussions.

According to interviewees, no metrics or specific policy objectives have been defined up-to-date that would facilitate a comprehensive assessment of the R&D tax credit. In their view, individual organizations currently collect data as part of their administrative processes without any specific monitoring or evaluation objectives in mind, and this phenomenon can apparently be attributed to three factors: (i) the lack of a policy mandate, (ii) the lack of an overarching strategy for building up a research infrastructure for policy analysis, and (iii) the up-to-date limited policy demand for quantitative and qualitative (e.g. extended R&D tax relief statistics) policy analysis.

Further improvements, as stakeholders argued, could also be achieved in the efficiency with which data are collected and used within individual organisations as well as the data flow between organizations which seems to remain limited for the moment. While Statistics Iceland has in principle access to external microdata sources based on an agreement with Rannís and Skatturinn, there is currently no joint data infrastructure or data space that could be exploited by different institutions and agencies in Iceland. Data maintenance in turn was stated to be very challenging for a small statistical office such as Statistics Iceland. Interviewees also noted that Statistics Iceland did not engage in any larger scale data linking efforts before the current OECD study on the R&D tax credit in Iceland. In the context of this study, the existing microdata sources - business R&D survey, tax relief microdata, and grant funding data (Section 4 "Data description") - were linked and used for impact assessment purposes for the first time.

Systematic evaluation of the R&D tax credit

In addition to the empirical analysis of the R&D tax credit carried out with support from the OECD, Iceland has recently undertaken an evaluation of the technology fund with the help of experts from the University of Iceland. Stakeholders pointed out that most of the policy assessments carried out by Iceland up-to-date (e.g. the technology fund evaluation) rely on questionnaires and/or company interviews but do not resort to more quantitative approaches that would facilitate a causal impact estimation. As stakeholders argued, capacity issues largely limit the scale and scope of monitoring and evaluation efforts in Iceland.

According to the interviewees, current monitoring efforts focus on deviations in the R&D amounts reported in R&D project applications vis-à-vis tax relief forms but do not deliver any broader evidence on the proportion of incorrect and/or fraudulent claims, for instance. Furthermore, interviewees indicated that Iceland does not issue any extended R&D tax relief statistics on a regular basis so far, apart from the annually updated list of main R&D tax relief recipients[22] and ad-hoc publications of R&D tax relief statistics (MoF, 2019). While Rannís prepares an annual report on the R&D tax credit for the Ministry of Higher Education, Industry and Innovation and the Ministry of Finance and Economic Affairs, these reports are not published. Available resources limit the scope for annual publications and statistical analysis.

Ahead of the OECD study, national efforts to assess the impact of the R&D tax credit in Iceland consisted of an excel-based survey among corporate R&D tax relief recipients carried out by Rannís in 2021.[23] This survey was intended to assess the impact and tax footprint of R&D projects that were subsidised via the tax system over the 2010-2020 period. According to stakeholders, around 200 companies participated in the voluntary survey and delivered information on metrics such as operating income, number of jobs created, and purchased R&D work from domestic sources. Up to date, the survey has delivered three case studies[24] that showcase the success story of three companies– Controlant,

21. Action 2 foresees an examination of the tax and grant system for research and innovation, see https://www.government.is/library/01-Ministries/Prime-Ministrers-Office/Science%20and%20Technology%20Policy%202020%e2%80%932022.pdf

22. See Skattfrádráttur vegna nýsköpunar | Frádráttur vegna nýsköpunar | Skatturinn - skattar og gjöld

23. See R&D tax deductions | Tax deductions | The Icelandic Centre for Research (Rannís.is)

24. See Promotional videos | The Icelandic Centre for Research (Rannís.is)

Saga Natura, MainManager – which benefited from R&D tax relief. However, as interviewees explained, a more comprehensive quality review or analysis of survey responses has not been possible so far due to resource limitations. Despite this backdrop, Rannís statedly has the intention to repeat this survey in the future.

Table 4.8. provides a summary overview of measurement, monitoring and evaluation practices in selected OECD countries with a view to highlighting the type of R&D tax relief statistics and evaluations that are produced by other OECD countries to provide insights in the magnitude, distribution and impacts of R&D tax incentives. The R&D tax relief statistics in France and the United Kingdom, for instance, provide information on the magnitude of R&D tax support over time as well as the distribution of R&D tax benefits by firm size, industry and region. National evaluations of R&D tax incentives in turn typically rely on a combination of qualitative and quantitative approaches in assessing the R&D, innovation and broader economic impact of R&D tax incentives. Insights into the degree of misuse is provided by the recent evaluation of the SkatteFUNN tax credit in Norway (Benedictow et al., 2018[17]), for instance, which highlights that "Tax authorities found that firms use group structures to bypass expenditure ceilings", and that "a relatively large share of the firms seemingly report ordinary operating costs as costs related to R&D. In 13 per cent of the firms, the Norwegian Tax Administrations' investigator considered this to be the case".

Overall, the discussions with key stakeholders suggested that additional tools and increases in the capacity of existing agencies would be crucial in stepping up the existing measurement, monitoring and analytical activities of the relevant actors in Iceland. As interviewees argued, the introduction of an additional monitoring body would not be required to accomplish this task but add one additional layer of complexity in the administration system of the R&D tax credit in Iceland.

Table 4.8. Measurement, monitoring and evaluation practices in selected OECD countries

National R&D tax relief statistics		
Country	**Publication**	**Link**
Australia	Science, research and innovation (SRI) budget tables (Australian Government, 2023[36])	Statistics
Belgium	Inventaire des dépenses fiscales fédérales (Service Public Fédéral Finances, 2022[37]) Statistics	Statistics
Canada	Report on Federal Tax Expenditures (Government of Canada, 2023[38])	Statistics
France	Crédit d'Impôt Recherche : Études et résultats statistiques (Ministère de l'Enseignement supérieur et de la Rec, 2020[39])	Statistics
Ireland	Research and Development Tax Credit statistics prepared by Revenue Ireland (Ireland Revenue, 2022[40])	Statistics
United Kingdom	HMRC Research and Development Tax Credits Statistics (HMRC, 2022[41])	Statistics
United States	SOI Tax Stats - Corporation Research Credit prepared IRS (IRS, 2014[42])	Statistics
National R&D tax incentive evaluations		
Country	**Publication**	**Link**
Austria	Evaluation of the Research Premium, 2017 (Ecker et al., 2017[43])	Study
Australia	Review of the R&D Tax Incentive, 2016 (Ferris, Finkel and Fraser, 2016[44])	Study
Belgium	Tax incentives for business R&D in Belgium – Fourth evaluation, 2022 (Dumont, 2022[24])	Study
France	Crédit d'Impôt Recherche : Études et résultats statistiques Évaluation du Crédit d'impôt recherche - Rapport CNEPI 2021 (Harfi and Lallement, 2021[45])	Study Study
Ireland	Economic evaluation of the R&D tax credit, 2016 (Irish Government Economic & Evaluation Service, 2016[46])	Study
Norway	Evaluation of SkatteFUNN, 2018 (Benedictow et al., 2018[17])	Study
Netherlands	Evaluation of Dutch R&D tax credit scheme (WBSO) 2011-2017, 2019 (De Boer et al., 2019[47])	Study
United Kingdom	Evaluation of the Research and Development Tax Relief for Small and Medium-sized Enterprises, 2019 (Devnani, Ladher and Robin, 2020[48]) Evaluation of the Research and Development Expenditure Credit (RDEC), 2020 (Scott and Glinert, 2020[10])	Study Study

Note: This table provides a non-exhaustive summary list of R&D tax relief statistics and evaluations carried out in selected OECD countries.

Source: OECD elaboration.

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Annex A. Reform proposal of the R&D tax credit scheme, 2019

Upon review of the law and its implementation, as well as in light of the suggestions received from the Ministry of Education and Culture and the Ministry of Business and Innovation, the Ministry of Finance and Economic Affairs presented the following proposals following its assessment of the R&D tax credit and broader fiscal environment for R&D and innovation in Iceland:

- That it will be examined how it is possible to reduce automation in expenditure growth, as well as it will be assessed whether there is a need to sharpen the conditions for the concessions contained in the support system for tax deductions for innovative companies. The law will be changed so that expenditures will be in accordance with the budgets intended for the support system according to the decision of Alþingi – the supreme national parliament of Iceland - and in accordance with the framework budgeting in fiscal matters.

- That it will be evaluated how support for research, development and innovation is best conducted in the context of other types of grant systems run by the government. The current action in the policy of the Science and Technology Council is primarily based on tax incentives. Here, it is proposed that the action be expanded and the tax and subsidy system for research and innovation re-evaluated holistically, using the methods of the theory of revaluation of expenditures, with the aim of mapping how the objectives of support for research and innovation can best be met.

- That metrics will be found to evaluate the success of support for successful initiatives and innovation.

- That the support system will be examined using methods of gender budgeting.

- That a service agreement be concluded between the Ministry of Finance and the Economy and Rannís on the administration of applications for tax deductions for innovative companies, but this would be in accordance with the conclusion of the National Audit Office's report on Rannís from November 2018. With the agreement, the implementation aspect of the law would be strengthened with a detailed review of applications and thus strive to ensure that the implementation of the law is in accordance with the objectives their

- That tax control with the support system for tax deductions for innovative companies be strengthened[1].

1. OECD translation of policy proposals made by the Ministry of Finance and Economic Affairs in 2019 following its assessment of the R&D tax credit and broader fiscal environment for R&D and innovation in Iceland. See MoF (2019[1]).

Annex B. Estimation methodology

DIFFERENCE-IN-DIFFERENCES BASED ON POLICY UPTAKE

An unbiased estimation of the effect of the R&D tax credit would ideally compare the R&D performance of firms that receive the tax credit with the *counterfactual* R&D performance that would be observed if these firms did not receive the support. In practice, the counterfactual scenario is unobservable and needs to be estimated. The estimation is based on firms that *are as similar as possible* to the R&D tax credit users but do not receive the support. The variation in tax credit take-up rates is therefore used to compare the R&D performance across time of firms that receive the R&D tax credit and those that do not. The analysis only focuses on R&D performers and allows to draw conclusions only on the effect of the tax credit on business R&D performance at the intensive margin, i.e. it allows for a quantification of the effectiveness of the R&D tax credit in inducing *additional* R&D investment among firms that already perform R&D.

The estimation method used is *difference-in-differences* with *"coarsened exact matching" (CEM)*. This method entails a double comparison of firms R&D performance: first, a *within-firm* comparison in which firms' performance is compared throughout time, before and after-tax credit users start receiving support and, second, a *between* firms comparison, in which the R&D performance of tax credit users (*treatment group*) is compared to the R&D performance of similar firms that do not receive support (*control group*).

The treatment and control groups are constructed as follows. The treatment group is made of firms that *i)* start receiving the tax credit in a certain year c, and *ii)* are present in the dataset at least one year before (*c*–1) and one year after (*c*+1) receiving the support. The treated group is therefore composed of firms that switch status from non-users to users during the sample period.[1] For each treated firm that starts receiving the tax credit in year c, a control group is constructed selecting firms that *i)* never receive the tax credit and *ii)* belong to the same class of initial quintile of R&D performance, size class (micro, small, medium, large) and macro industry (manufacturing vs other).[2]

Once the two groups are constructed, the following equation is estimated by OLS:

$$logY_{it} = \beta_1 Recipient_{it} + X_{it} + \gamma_i + \gamma_t + \varepsilon_{it} \qquad (4.A.1)$$

Where Y_{it} is the outcome variable (total intra-mural R&D expenditure for firm i at time t); $Recipient_{it}$ takes value 1 for treated firms after they start receiving the tax credit. It takes value 0 for treated firms in earlier years and in all years for control firms. X_{it} is a vector of control variables, namely firm size, (log) sales, a dummy variable indicating if firm *i* is a grant recipient. Firm and time fixed effects are also included and respectively denoted as γ_i and γ_t, and ε_{it} is the error term. The estimate of the coefficient β_1 represents the impact of the R&D tax credit on R&D performance. It can be interpreted as the average treatment effect on the treated (ATT).

The estimate of the coefficient β_1 is used, together with the micro-data based B-Index[3] and the observed tax subsidy rate for the average firm, to construct two important related measures of the effectiveness of the R&D tax credit in raising business R&D investment, namely: *i)* the user-cost elasticity and *ii)* the incrementality ratio. The user-cost elasticity measures the percent change in R&D due to a 1% change in user cost of R&D induced by the tax credit. The incrementality ratio is a measure of input additionality that indicates the extent to which the R&D tax credit is effective in generating additional R&D expenditure beyond the counterfactual level that would be observed in its absence, in relation to the monetary value of R&D support received. It effectively measures the amount of additional

1. Notice that a difference -in-differences estimation in which the time of the introduction of policy is used in the before-after difference estimation could not be implemented as data are only available starting from 2013, while the R&D tax credit was introduced in Iceland in 2011.

2. This work uses the CEM approach to assign firms to the *control* group. It is an intuitive and easily implementable way that allows to identify firms that show an exact match in terms of (pre-treatment) chosen coarsened variables. Unlike other matching estimators, CEM reduces imbalances between treatment and control groups, it restricts data to a common support between the two groups and it has some desirable statistical properties (Appelt et al., 2020[3]).

3. The B-Index estimates used to compute the user cost elasticity are calculated on national microdata and do not correspond to the theoretical ones presented in Section 3 "Policy measures supporting business R&D investment in Iceland".

R&D generated by one additional monetary unit of public funding. Both measures not only help quantifying and interpreting the impact of R&D tax credit in Iceland, but can also be compared with other within-country firm level results derived in the MicroBeRD (2020) project. The two impact measures are computed as follows:

$$e^{TaxUptake} = \frac{\exp(ATT) - 1}{\log\left(\overline{BIndex}^{receipients} - \overline{BIndex}^{non\text{-}receipients}\right)} \quad (4.A.2)$$

$$IR^{TaxUptake} = \frac{\exp(ATT) - 1}{\overline{TSRD}} \quad (4.A.3)$$

Where $\overline{BIndex}^{receipients}$ is the average B-index of the tax credit recipients over the estimation sample, while $\overline{BIndex}^{non\text{-}receipients}$ indicates the average B-index for firms not using the tax credit. $\overline{TSRD}$ is the average tax subsidy rate and it is calculated as: $\overline{TSRD} = \frac{1}{N}\sum_{i=1}^{N}\frac{TS_i}{RD_i}$.[4]

As discussed above, the results obtained with this methodology should be interpreted in light of the possible bias that could originate from the potential endogeneity of the tax credit uptake decision, linked to other factors also affecting the R&D performance of firms. For example, if (non-observably) more productive firms are more likely to receive the R&D tax credit and to have higher R&D expenditure, the estimated coefficient β_1 will be upward biased, and therefore suggest a higher impact of the tax support. For this reason, under certain assumptions, the results obtained based on the approach that exploits policy changes are considered to be more reliable for revealing the causal effect of the policy.

DIFFERENCE-IN-DIFFERENCES BASED ON POLICY CHANGES

The changes in the design of the R&D tax credit in Iceland (see Table 2.1. Changes in R&D tax credit: increase in upper ceilings on total R&D costs) affect some firms more than others. This heterogeneity in the effect of policy reforms across firms represents a different source of variation in the data that can be exploited in estimating the impact of the support on R&D performance. Under the key assumption that the R&D performance of the different groups of firms would have evolved in a similar way in absence of the policy change, comparing the R&D expenditure of affected firms (*treatment group*) and non-affected firms (*control group*) provides an estimate of the effect of the policy.

This study exploits this intuition and evaluates the effect of the change in the upper ceiling on qualifying inhouse (intramural) R&D from 100 to 300 million ISK in 2016. This change in the upper ceiling affects only the cost of R&D and R&D tax subsidy of some, namely those that spend between 100 million and 300 million ISK in inhouse R&D. This is visually shown in Figure B.1, which plots the average implied marginal R&D subsidy rate against the firms' total eligible intramural R&D expenditure, before and after the policy change. In the original formulation of the R&D tax credit, firms with R&D expenditure below the pre-reform ceiling (100 million ISK) faced a higher subsidy rate than firms spending a higher amount. After the modification of the ceiling, firms spending more than 100 million and less than 300 million ISK see their implied subsidy rate per marginal outlay of R&D increasing. If firms' R&D investment decisions depended on their subsidy rate, then the introduction of the scheme would not affect the investment decisions of firms with R&D spending below the pre-reform ceiling (100 million ISK), while it would affect the investment decision of firms spending an amount between the old and new thresholds.

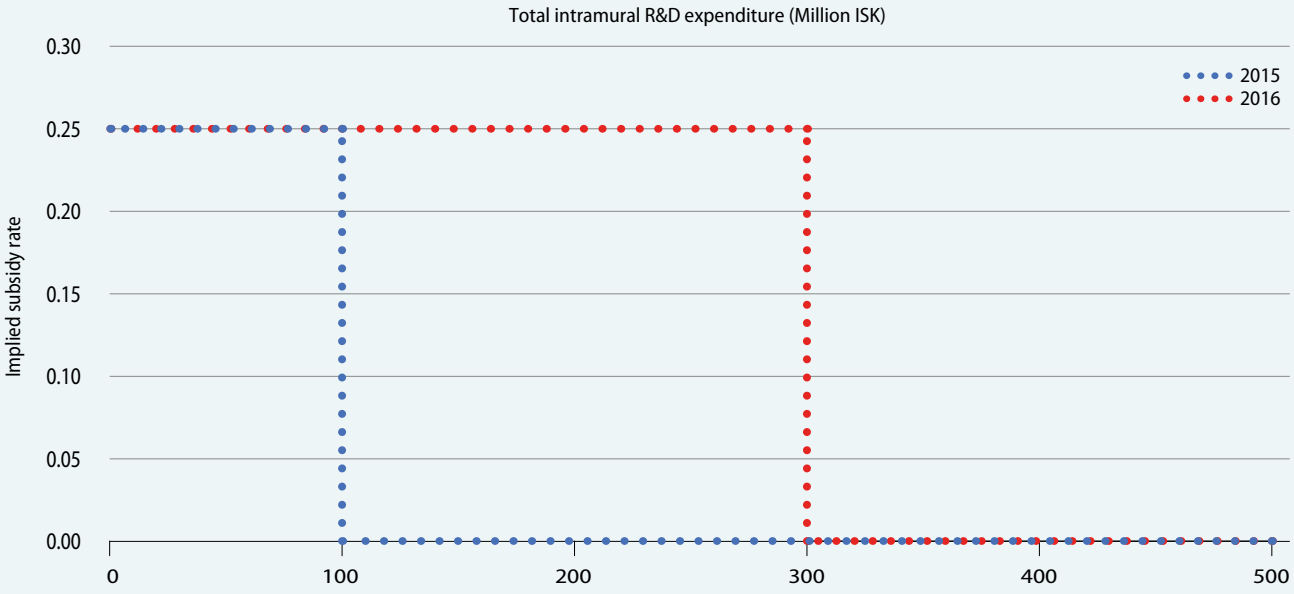
Therefore, in this case the *treatment* group is made of firms that in the absence of the policy change would have spent an amount between 100 and 300 million ISK, and the *control* group by firms that in absence of the policy change would have spent less than 100 and more than 300 million ISK. The comparison between the R&D spending of treatment and control groups over time helps provide an estimate of the impact of the tax credit. The estimation equation is accordingly specified as follows:

$$logY_{it} = \beta_1(Treated_i * Change_t) + X_{it} + \gamma_i + \gamma_t + \varepsilon_{it}, \quad (4.A.4)$$

4. This formula is also used in the computation of incrementality ratios in the output additionality analysis. However, in this case the denominator reflects the average of the ratio between the amount of R&D tax relief by the firm and the outcome variable of interest.

FIGURE B.1. **The 2016 increase in R&D spending thresholds in Iceland raised the tax subsidy rate for firms spending more than 100M ISK and less than 300M ISK**

Implied marginal R&D tax subsidy rate as a function of eligible R&D expenditure before and after the policy change



Note: Notional R&D tax subsidy rate for one additional unit of R&D outlay (1-B-Index) in account of the 2016 change in the upper ceiling on inhouse R&D.

Source: Statistics Iceland, OECD calculations.

Where Y_{it} is the outcome variable (total intra-mural R&D expenditure for firm i at time t); $Treated_i$ takes value 1 if firm i invests an amount between 100 million ISK and 300 million ISK in 2015. It takes value 0 if firm i invests less than 100 million ISK or more than 300 million ISK in 2015, the year preceding the introduction of the changes to the ceiling.[5] Notice that this variable is constant throughout time. $Change_t$ is equal to 1 in the years after the change in policy (from 2016 onwards), and 0 otherwise. X_{it} is a vector of control variables, namely firm size, (log) sales, a dummy variable to consider if is a grant recipient. To control for time-invariant firm characteristics and time-varying factor which could bias the estimation, firm and time fixed effects are included and respectively denoted as γ_i and γ_t. ε_{it} is the error term. The estimate of the coefficient β_1 represents the impact of the R&D tax credit on R&D performance. It can be interpreted as the average treatment effect on the treated (ATT).

As in the case of policy uptake, the estimate of β_1 is used to construct user cost elasticity and incrementality ratio as follows:

$$e^{TaxChange} = \frac{\exp(ATT) - 1}{\log\left(\Delta\overline{BIndex}^{treated} - \Delta\overline{BIndex}^{controls}\right)} \quad (4.A.5)$$

$$IR^{TaxChange} = \frac{1}{1-t} * \frac{e^{TaxChange}}{e^{TaxChange}(1-\overline{BIndex}) - \overline{BIndex}} \quad (4.A.6)$$

Where $\Delta\overline{BIndex}^{treated}$ and $\Delta\overline{BIndex}^{controls}$ represent the difference in the B-index between the last pre-treatment year and the first post-treatment year in the estimation sample for the treatment and the control groups. The variable t denotes the corporate income tax rate and $\overline{BIndex}$ is the average B Index between the last pre-treatment year and the first post-treatment year in the estimation sample.

5. More precisely, the treatment group is composed of firms spending more than 80% of the old ceiling and less than 110% of the new ceiling before the policy change. This is because firms spending an amount close to the old and new thresholds before the policy change are also likely to be affected by the increase in the ceiling in 2016. Firms with very low and very high levels of R&D (intramural) expenditure in 2016 are taken off the sample.

Annex C. Details on reforms of the R&D tax incentives across OECD countries

Table C.1. Reforms to the R&D tax credit schemes in OECD countries

	Year of policy reform	Policy change	Treatment definition	Sample years
Ceiling on qualifying R&D expenditure				
Austria	2005	Ceiling imposed on eligible extramural R&D	Mean extramural R&D in 2002-2004 > EUR 100 000	2004-2010
Norway	2002 (2003)	Volume-based R&D tax credit introduced for SMEs (large firms)	Mean intramural R&D in 1999-2001 < NOK 4 million	1997-2006
Sweden	2014	Introduction of payroll withholding tax credit	Mean R&D tax deduction in 2011-2013 < SEK 2.76 million	2011-2017
Firm size threshold				
Australia	2012	Tax allowance replaced by tax credit with higher rate for SMEs	SME as defined for tax purposes	2008-2016
Japan	2003	Volume-based R&D tax credit extended to large firms	Large firms as defined for tax purposes	2000-2005
Uptake of R&D tax incentives				
Belgium	2005	Payroll withholding tax exemption introduced	Receives tax relief at least once between 2005 and 2007	2001-2007
Chile	2012	Volume-based tax credit extended to intramural R&D	Receives tax relief at least once between 2012 and 2016	2009-2016
France	2008	Hybrid R&D tax credit converted to volume-based R&D tax credit and increase in tax credit rates	Receives tax relief at least once between 2008 and 2012	2004-2012
Italy	2010	Expiration of volume-based R&D tax credit (Law 296/2006), available since 2007	Receives tax relief for qualifying R&D incurred in all years 2007-2009	2007-2013
Norway	2002 (2003)	Volume-based R&D tax credit introduced for SMEs (large firms)	Receives tax relief at least once between 2002 and 2006	1997-2006
Sweden	2014	Introduction of payroll withholding tax credit	Receives tax relief at least once between 2014 and 2017	2011-2017

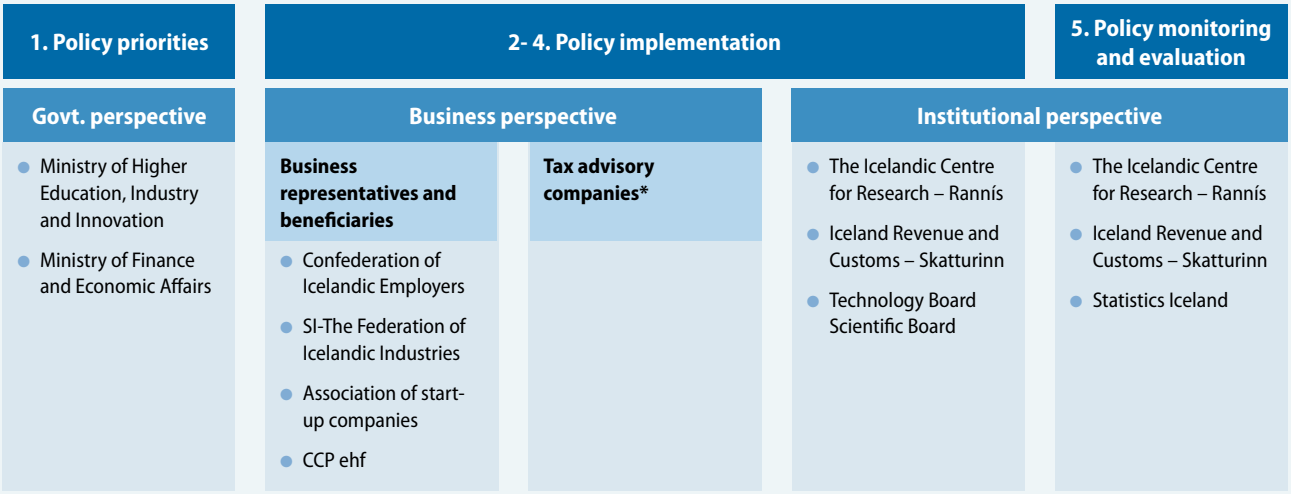
Note: Australia: SMEs are defined for tax purposes as firms which are not controlled by exempt entities and have turnover of less than AUD 20 million. Due to data limitation, only the turnover-based condition is applied here. Austria: Introduction of the ceiling reduced the marginal subsidy for the treated firms (those with R&D expenditure above the ceiling prior to the policy change), so it can be expected to reduce R&D performance among these firms. Japan: SMEs are defined for tax purposes as firms with 100 million yen or less of stated capital or firms controlled by an enterprise meeting the capital condition. Due to data limitation, only each firm's own stated capital is used here to define SMEs. Norway: Estimation takes into account that large firms became eligible for the tax credit only in 2003. Norway applies separate ceilings on intramural, extramural and total R&D expenditure. The ceiling on intramural expenditure is used here to produce baseline estimates, and robustness of the results to instead using the ceiling on the total R&D expenditure is tested.

Source: OECD (2020), "The effects of R&D tax incentives and their role in the innovation policy mix: Findings from the OECD microBeRD project, 2016-19", https://doi.org/10.1787/65234003-en.

Annex D. Interview methodology and approach

With support from government officials, who provided relevant contact information to match the OECD specification of stakeholder profiles, the project team proceeded to organise a series of five interview sessions thematically organised as indicated in Figure D.1. These five sessions covered policy priorities (as conveyed by government officials from the Icelandic Ministry of Higher Education, Science and Innovation and the Ministry of Finance and Economic Affairs); policy implementation (perspectives from agencies/institutions in charge and the businesses making use of the tax incentives) and policy monitoring and evaluation (relevant officials from concerned agencies/institutions).

FIGURE D.1. **Interviews with Icelandic stakeholders convened by the OECD: structure and participation**



Note: *Representatives from Ernst & Young, Deloitte, KPMG and PWC were invited to participate in the session. The session was conducted with the sole business representative that responded to the OECD invitation (KPMG).

Source: OECD elaboration.

These interviews were conducted via video-conference over the first two weeks in December 2022, taking approximately 90 minutes each. Key aspects in the implementation and administration of the R&D tax relief measure in Iceland were explored through semi-structured interviews that followed a common structure with differences of emphasis depending on the respondent's role vis a vis the issue:[1]

- Introductions, confirmation of interview protocol and agreement to record for strict note taking purposes.
- Invitation to stakeholder to provide their own appreciation of the R&D tax incentive scheme from its genesis until the present, including the overall with other mechanisms of business R&D and innovation support.
- Questions to stakeholder to assess views on specific tax credit design features.
- Questions to stakeholder to assess specific implementation features.
- Invitation to provide views about potential reform avenues.
- Opportunity to ask any questions to OECD team or provide final remarks.
- Outline of project's next steps.

1. The session on monitoring and evaluation followed a slightly different model given its different scope.

Investment in research and development (R&D) is a key determinant of productivity and competitiveness. Several factors often lead to suboptimal levels of R&D investment. Accordingly, governments adopt various support instruments to promote R&D and bring investment closer to the socially optimal level. Over the past decade, OECD countries have made a significant effort to boost business-driven innovation. Tax incentives have become the primary instrument used by governments to support R&D in OECD countries.

Iceland stands out as one of the OECD countries with the highest increase in total government support for business R&D between 2006 and 2020, mainly driven by the introduction of a R&D tax incentive scheme in 2010. The scheme has become more generous over time, increasing its budgetary impact especially in more recent years. An assessment of the impact and effectiveness of the scheme is therefore timely.

This study presents the findings of an evaluation of Iceland's R&D tax incentive, assessing the economic impact and the implementation of the scheme. The study shows that the R&D tax credit is effective in reducing the costs of R&D and incentivising businesses already engaged in R&D to invest more. It highlights the need for some targeting of the R&D tax support, greater clarification of eligibility criteria and improved data to regularly monitor and evaluate the impact of the tax incentive.

The work underlying this study was conducted by an interdisciplinary OECD team bringing together the Economics Department (ECO) and the Directorate for Science, Technology and Innovation (STI), with the support of the Ministry of Finance and Economic Affairs and the Ministry of Higher Education, Industry and Innovation.

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