Public Disclosure Authorized
Public Disclosure Authorized
Public Disclosure Authorized
Public Disclosure Authorized

# A Case Study on Korea's R&D Tax Incentives: Principles, Practices, and Lessons for Developing Countries



THE WORLD BANK
IBRD • IDA | WORLD BANK GROUP
East Asia & Pacific

Ministry of Economy and Finance

© 2024 International Bank for Reconstruction and Development / The World Bank

**1818 H Street NW**
**Washington DC 20433**
**Telephone: 202-473-1000**
**Internet: www.worldbank.org**

This work is a product of the staff of The World Bank with external contributions. The findings, interpretations, and conclusions expressed in this work do not necessarily reflect the views of The World Bank, its Board of Executive Directors, or the governments they represent.

The World Bank does not guarantee the accuracy, completeness, or currency of the data included in this work and does not assume responsibility for any errors, omissions, or discrepancies in the information, or liability with respect to the use of or failure to use the information, methods, processes, or conclusions set forth. The boundaries, colors, denominations, and other information shown on any map in this work do not imply any judgment on the part of The World Bank concerning the legal status of any territory or the endorsement or acceptance of such boundaries.

Nothing herein shall constitute or be construed or considered to be a limitation upon or waiver of the privileges and immunities of The World Bank, all of which are specifically reserved.

**Rights and Permissions**

The material in this work is subject to copyright. Because The World Bank encourages dissemination of its knowledge, this work may be reproduced, in whole or in part, for noncommercial purposes as long as full attribution to this work is given.

Any queries on rights and licenses, including subsidiary rights, should be addressed to World Bank Publications, The World Bank Group, 1818 H Street NW, Washington, DC 20433, USA; fax: 202-522- 2625; e-mail: pubrights@worldbank.org.

World Bank

Finance, Competitiveness and Innovation
Global Practice

# A Case Study on Korea's R&D Tax Incentives: Principles, Practices, and Lessons for Developing Countries

MAY 2024

# Acknowledgments

This document was prepared by a team led by Jaime Frias (Senior Economist, TTL), which comprised Yanchao Li (Private Sector Specialist), Kyeyoung Shin (Consultant), and Lucio Castro (Consultant) from the Finance, Competitiveness, and Innovation Global Practice of the World Bank (WB). Arnelyn Abdon (Consultant), Muhammad Fajar Nugraha (Consultant), and Viet Anh Nguyen (Senior Public Sector Specialist) provided valuable insights and contributed to the comparative analysis between Korea and Indonesia, the Philippines, and Viet Nam.

The authors are grateful for useful comments from peers Xavier Ciera (Senior Economist), Anwar Aridi (Senior Private Sector Specialist), Ralph Van Doorn (Senior Economist), Jonathan Pemberton (Consultant), Joo Sueb Lee (Senior Economist), Justin Hill (Senior Private Sector Specialist), Victor Steenbergen (Senior Economist), Jiyoung Choi (Senior Economist), and Dr. Jae-Jin Kim, President of the Korea Institute of Public Finance (KIPF), for reviewing specific sections of Korean policy. The authors are also grateful to Zoe Escobar (Assistant) for editorial support.

The team thanks the guidance and oversight of Cecile Niang (Practice Manager, FCI), Zafer Mustafaoglu (Practice Manager, FCI), and Denis Medvedev (Director, IFC). The team benefited from useful discussions of the case through policy discussions with the Department of Finance of the Philippines, the National Economic and Development Authority (NEDA) of the Philippines, the Department of Science and Technology of the Philippines, and the Ministry of Science and Technology of Viet Nam. The following policy practitioners provided invaluable comments: Mr. Hestu Yoga Saksama, Director General of Taxes, and Director of Tax Regulations; Mrs. Juvy Danofrata, Assistant Secretary of Finance, and Head of the Fiscal Incentive Review Board (FIRB) Secretariat; and Mr. Nguyen Duc Hoang, Deputy Director General of State Agency for Technology Innovation (SATI), Ministry of Science and Technology (MOST) of Viet Nam.

The team is grateful to Daein Kang, (Consultant), Grace Morella (Consultant), Kristiana Torres (Assistant), and Adela Antic (Consultant) for facilitating the policy discussions with experts and government representative from Indonesia, the Philippines, and Viet Nam.

This case study was supported by the national government of the Republic of Korea through the Korea-World Bank Partnership Facility (KWPF).

# Contents


Acknowledgments ..... 4

Abbreviations and Acronyms ..... 6

Executive Summary ..... 8

01. Introduction ..... 10

02. Structuring the Analysis of RDTI Policy Practice ..... 20

03. Design Features of RDTIs ..... 27

04. Management Features of RDTIs ..... 45

05. Conclusion ..... 56

Appendices ..... 58

A. Profile of the R&D Tax Schemes in the Philippines, Indonesia, and Viet Nam ..... 59

B. Evidence of the Effectiveness of R&D Tax Incentives in Comparator Developing Countries ..... 77

References ..... 81

Notes ..... 86

# Abbreviations and Acronyms

| | |
|---|---|
| **BEPS** | Base Erosion and Profit Shifting |
| **BIR** | Bureau of Internal Revenue |
| **BOI** | Board of Investments |
| **CIT** | Corporate Income Tax |
| **CORFO** | Production Promotion Corporation [Chilean agency for promoting competitiveness] |
| **CPA** | Certified Public Accountant |
| **CREATE** | Corporate Recovery and Tax Incentives for Enterprise |
| **DIAN** | Dirección de Impuestos y Aduanas Nacionales de Colombia [National Tax and Customs Directorate of Colombia] |
| **DGT** | Directorate General of Taxes (of Indonesia) |
| **eFPS** | Electronic Filing and Payment System |
| **ETR** | Effective Tax Rate |
| **EU** | European Union |
| **EY** | Ernst and Young |
| **ESCAP** | Economic and Social Commission for Asia and the Pacific |
| **FDI** | Foreign Direct Investment |
| **FIRB** | Fiscal Incentives Review Board (of the Philippines) |
| **FIRMS** | Fiscal Incentives Registration and Monitoring System (of the Philippines) |
| **GDP** | Gross Domestic Product |
| **GMT** | Global Minimum Tax |
| **HEI** | Higher Education Institution |
| **IMF** | International Monetary Fund |
| **IOT** | Internet of Things |
| **IPA** | Investment Promotion Agency |
| **iPER** | Innovation Policy Effectiveness Review |
| **IPR** | Intellectual Property Right |
| **IT** | Information Technology |
| **ITH** | Income Tax Holiday |
| **KIPF** | Korea Institute of Public Finance |
| **KOITA** | Korea Industrial Technology Association |
| **₩** | Korean Won |
| **M&E** | Monitoring and Evaluation |

| | |
|---|---|
| **MinCiencias** | Ministerio de Ciencia, Tecnología e Innovación [Ministry of Science, Technology and Innovation] (of Colombia) |
| **MOEF** | Ministry of Economy and Finance (of the Republic of Korea) |
| **MNE** | Multinational Enterprise |
| **MSE** | Micro and Small Enterprise |
| **NABO** | National Assembly Budget Office (of the Republic of Korea) |
| **NIRC** | National Internal Revenue Code (of the Philippines) |
| **NOLCO** | Net Operating Loss Carry-Over |
| **NTS** | National Tax Service |
| **OECD** | Organisation for Economic Co-operation and Development |
| **PEZA** | Philippines Economic Zone Authority |
| **PhD** | Doctor of Philosophy |
| **PRO** | Public Research Organization |
| **PWHT** | Payroll Withholding Tax |
| **PWC** | PricewaterhouseCoopers |
| **R&D** | Research and Development |
| **RDTI** | Research and Development Tax Incentive |
| **SIPP** | Strategic Investment Priority Plan |
| **SME** | Small And Medium Enterprise |
| **SSC** | Social Security Contribution |
| **STEM** | Science, Technology, Engineering, And Mathematics |
| **STO** | Scope, Targeting, And Organization (Framework Of Analysis) |
| **TIDIS** | Títulos de Devolución de Impuestos [tax refund titles] |
| **VAT** | Value-Added Tax |

# Executive Summary

In both developing and developed economies, tax incentives are among the most popular policy instruments governments use to induce private investment in research and development (R&D). As a form of indirect incentives, tax incentives promote private spending in R&D by reducing the cost of capital to invest in it (Cirera et al. 2020).

More generally, R&D tax incentives (RDTIs) can influence a host of development drivers: the quantity and quality of innovation, the mobility of innovation activity and of researchers across regions and countries, the dynamism of firms, the quality of firms and researchers, and the high-level direction of research efforts (for example, from basic research to applied research) (Akcigit and Stantcheva 2020).

In contrast to direct support measures such as cash grants, RDTIs—at least in principle—entail lower compliance and administrative costs for both the beneficiary firms and the implementing agencies. One downside, however, is that as a general matter, RDTIs do not allow for the explicit targeting of the R&D projects that have the highest social returns, as grants can do. In addition, RDTIs can bring budgetary uncertainty when compared with direct support (Cirera et al. 2020).

The available empirical evidence from impact evaluation studies—most of which have been conducted in Organisation for Economic Co-operation and Development (OECD) countries—suggests that RDTIs are effective in inducing additional private R&D investment and, to a lesser extent, R&D outputs, such as patents and commercially viable products (OECD 2019). The limited evidence that is available from developing countries reinforces these findings, pointing to similarly positive effects of such incentives on private firms' R&D inputs and outputs (Cirera et al. 2020).

Against this backdrop, the focus of this policy note is on identifying specific design features and operational practices that can assist in the deployment of RDTIs in developing countries. The aim is to identify principles that can guide the task of adapting emerging good practices for designing R&D tax incentives to the conditions that typically prevail in developing countries. Those conditions include, for example, low rates of tax revenue collection, overstretched tax administrations, high levels of informality, unpredictability, and uncertainty; high relevancy of adaptative innovation; and high levels of perceived and actual risk exposure to tax evasion and fraud.

This note is expected to provide an operational bridge that will facilitate the transfer of OECD good practices for designing RDTI schemes into the prevailing contexts and conditions of three emerging Asian economies—henceforth, the "client countries": Indonesia, the Philippines, and Viet Nam. This knowledge transfer becomes especially important as those countries use tax incentives for R&D activities by multinational enterprises that will be affected by the global minimum tax (GMT) designated by international agreement. This mission is part of the larger World Bank project "Innovation Policy Learning from Korea: Lessons for Their Design and Execution in Developing Countries."

To accomplish those goals, this note combines a review of the available developing-country evidence on the impacts of RDTI on private R&D inputs and outputs with the main findings of interviews that World Bank teams conducted during the first half of 2020 with international experts and with policy makers in charge of RDTI regimes in selected country-level case studies. The note also provides an overview of the Republic of Korea's experience with RDTI schemes to distill applicable and timely lessons for adapting international good practices to the realities of the three client countries.

# 01



# Introduction

# Motivation

This case is part of the series of deliverables under the World Bank's "Innovation Policy Learning from Korea: Lessons for Their Design and Execution in Developing Countries" which aims to promote better innovation policy design and execution in East Asian countries through knowledge transfer and capacity building, drawing upon the experience of the Republic of Korea.

As a country that has seen dramatic growth in private research and development (R&D), the Republic of Korea is uniquely positioned to offer valuable lessons to developing countries that aspire to climbing the "capability escalator" (Cirera et al. 2020). In the 1960s, Korea's GDP per capita was comparable to levels found in the poorer countries of Africa and Asia. Over the following decades, Korea experienced remarkable economic growth and global integration to become one of the world's strongest industrialized economies.

Throughout Korea's catch-up journey, one of the government's key emphases has been innovation. From the initial "imitative innovation" phase until today, Korea—now a frontrunner in many high-tech areas—has effectively promoted business growth and industrial upgrading through various policy instruments. One such instrument is tax incentives to encourage firms' R&D activities. Korea introduced R&D tax incentives (RDTIs) in the 1970s to promote indigenous R&D but has since refined its incentive schemes. Korean scholars widely agree that, over the past several decades, RDTI schemes have played an important role in transforming the country into an innovation-led economy with a high R&D intensity rate.

In addition, Korea has been active in sharing its policy experience with developing economies through bilateral and multilateral programs such as knowledge-sharing partnerships. This proactive work has been highly beneficial to aspiring developing countries, many of whom are keen to draw on Korea's development experience in various ways. Among those countries are the three identified in this project: Indonesia, the Philippines and Viet Nam. Although they each face different development challenges, those three countries, overall, appear ready to absorb and implement innovation lessons from Korea. All three have recently graduated from lower-middle-income status to join the ranks of middle-income countries. Going forward, continual transformation and upgrading through innovation will be needed to unlock further growth and overcome the well-known mid-income trap. To that end, Korea's experience of transforming its economy through innovation-driven growth could offer them practical, actionable lessons, especially in connection with best practices for RDTI improvement and expansion.

# What Are R&D Tax Incentives, and Do They Relate to Innovation?

RDTIs are an indirect way of supporting firms' R&D activities by reducing their tax liabilities (Cirera et al. 2020). According to the OECD Frascati Manual (OECD 2015), for an activity to be classified as R&D activity, it should meet basic criteria:

- **Novel:** new or improved business component, such as a product, process, or formula;
- **Creative:** based on new concepts or ideas that that contribute to the stock of existing knowledge, which typically is technological in nature and linked to the hard sciences (excludes social science research and art and humanities);
- **Uncertain**: due to the technological nature, carries a risk that the project will not succeed;
- **Systematic**: initiatives conducted in a planned way, with budgets and records kept of both the process followed and the outcome;
- **Transferable**: with results that can be codified and shared with other researchers, who may be able to reproduce them (that is, results cannot be tacit).

Developing countries implementing RDTIs have included broader definitions of what constitutes R&D that balance productivity enhancing over science, technology, and engineering to include "new product or processes." Examples of such activities include new product development, automation, software development, design and engineering, product improvement and quality enhancement, tooling design, equipment modification, and scaling up of tested pilot batches.

Among the different categories of tax incentives, most RDTIs fall into the following two: (1) those that are based on expenditures in R&D (expenditure-based) and (2) those based on the results of R&D or related innovation activities or sectors (income-based). The latter category includes either licensing or asset disposal linked to R&D. Expenditure-based RDTIs have traditionally been the dominant type of tax support for R&D, but income-based RDTIs are increasingly common, particularly among OECD member countries. Another way to distinguish RDTIs is to look at which firms' R&D expenditures are eligible for a tax incentive scheme. Volume-based RDTI schemes determine the amount of tax relief by the total volume of the firm's R&D expenditures each year. Alternatively, incremental RDTI schemes allow firms to deduct only the excess amount of the firm's R&D expenditures in a given year above a certain base amount, typically determined by the previous year's expenditures or an average of the past few years. Hybrid RDTI schemes combine elements of the preceding two types.

Governments have typically provided RDTIs to private sector firms to correct market failures (Cirera et al. 2020; OECD 2016). First, incomplete appropriability leads to underinvestment in R&D (relative to a socially optimal level) because knowledge resulting from a firm's R&D can spill over to other firms. Second, difficulties in finding external finance because of the high-risk nature of R&D also lead to underinvestment in R&D, especially in the case of small and medium enterprises

(SMEs) and startups that lack easy access to capital. Third, inadequate collaboration between private sector firms and research organizations often prevents more efficient use of resources and results in missed opportunities. Thus, policy makers globally use tax support to overcome such failures and foster innovation.

## Why the Focus on RDTIs?

Tax incentives are one of the most frequently used policy instruments for inducing private investment in R&D in both developing and developed economies. RDTIs reduce the cost of capital to invest in R&D, thus creating incentives for increasing private firms' spending on R&D (Cirera et al. 2020). Research has shown that R&D activities are robustly correlated with innovation and that RDTIs influence innovation through several channels, including the quantity and quality of innovation, the mobility of innovation and researchers across regions and countries, and the quality of firms and researchers (Akcigit and Stantcheva 2020).

The evidence from developed and developing countries supports the general proposition that the quantity of R&D increases when its tax price falls. The elasticity of R&D investment to its cost has been estimated to be at unity or greater (Bloom, Van Reenen, and Williams 2019; Cirera et al. 2020). In addition, the presence of RDTI has been linked to the increased probability that firms become R&D performers (Criscuolo 2009). However, input additionality has been estimated to be lower for new entrants to the RDTI scheme, relative to the incumbents. This finding is consistent with evidence revealing that R&D support measures can create the unintended consequence of protecting incumbents and slowing down the rate of new entrants to the economy (Bravo-Biosca, Criscuolo, and Menon 2013).

The evidence of the effects of RDTIs on output additionality remains much scarcer than for input additionality, especially in developing country settings. Overall, the results from studies suggest positive effects of firms on sales, increased probability of developing new products, and more patent applications (Cirera et al 2020). A Norwegian study found positive effects of RDTIs on product and process innovation, but those effects were new to the firm and not new to the market, suggesting that the degree of novelty from RDTIs is lower than that from direct support.

RDTIs have several strengths compared with other innovation policy instruments. First and most crucially, RDTIs are known to be less distortionary than more a direct instrument, such as R&D grants, which require agencies to select and award participants. RDTI schemes are generally entitlement based, letting firms choose the R&D activities in which they wish to invest. Second, RDTIs are simpler and administratively less costly to implement. From the governments' perspective, administering RDTIs is typically less costly because they involve less discretion than direct support instruments, and their benefits can be delivered through the corporate tax system. Those benefits can hold true for small firms, which typically lack the resources for preparing applications for R&D grants and subsidies. Third, RDTIs can easily be linked to the attraction of foreign R&D efforts and R&D talent. RDTI schemes can be used to incentivize multinational enterprises (MNEs) to locate their innovation activities in a foreign, developing country, bringing the potential of knowledge spillovers. Fourth, RDTIs that provide incentives to firms to attract high-skilled foreign talent—for example, income tax deductions for engineers—can help bring knowledge

and new skills into a country.

Some proponents of a more cautious policy-building approach argue that, given the limited capacity of the private sector in designing R&D projects and of implementing agencies in deploying those schemes effectively, developing countries should first pay attention to policy instruments other than RDTIs. Those individuals also typically argue for the relative importance of advancing non-R&D-based innovation in emerging economies. Although those are valid points, in many emerging economies, practitioners are no longer still debating whether they should embark on using RDTIs to promote innovation. Several developing countries are, at this point, already deeply vested in using RDTIs, and the degree of using those schemes is only likely to increase in the future. Innovation policy reviews by the World Bank in recent years, for example, indicate that tax incentives for R&D can represent up to 90 percent of the budget for promoting business innovation in any given year. In addition, recent reviews in OECD member countries reveal that the use of tax incentives for R&D and non-R&D innovation has increased since the 2000s as the number of countries using R&D tax incentives has grown and as the scale of tax credits has increased (Izsák, Markianidou, and Radošević 2013; OECD 2009).

## The Case for Learning from Korea's RDTI Experience

This case study aims to share lessons about the design and implementation features of RDTI schemes with practitioners in developing countries, where private investment in R&D remains relatively low. The study focuses on Korea's experience with RDTI schemes for several reasons. First, Korea has stood out as a country where substantial R&D activities take place, with an R&D intensity of 4.8 percent of GDP in 2020, and a remarkable share of private R&D investment. RDTIs are believed to have played an important role in Korea in promoting private investment in R&D (Jung, Oh, and Park 2012; Noh and Lee 2014).

Second, the review of the evidence from impact evaluations suggests that RDTI schemes have brought positive results, such as inducing R&D activities among beneficiaries, particularly during the 2000s and 2010s. Firms that participated in RDTIs during the early 2000s were 5 to 10 percent more likely to have implemented innovations in their product or service lines or in their processes (STEPI 2006). Furthermore, RDTIs led to a significant increase in total R&D expenditure among participant firms during the 2010s (KIPF 2018).

Third, Korea's policy trajectory offers a good frame of reference for developing countries seeking to advance their RDTI systems. The Korean government introduced RDTIs in the 1970s to promote indigenous R&D. Since then, RDTI schemes have evolved, gradually transitioning toward seeking support for SMEs (KIPF 2018). Learning from the implementation challenges posed by those schemes—and the adjustments that had to be made to them—could give developing country practitioners insight into the challenges that they, in turn, face.

To assess the effectiveness of Korea's RDTI schemes, it is important tot examine the country's experience with RDTIs through the lens of international good practice and evidence.

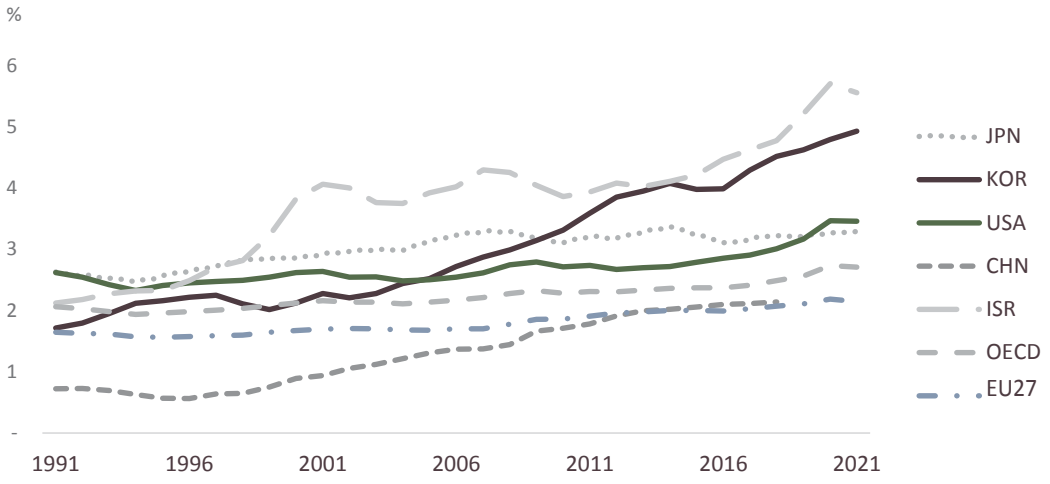
However, the data available in developing countries are too limited to offer a holistic view of the principles on which an RDTI system should be built. To develop a framework for analyzing implementation principles and practice, the next several chapters therefore review several international examples. Korea's RDTIs are subsequently presented to help readers understand better how Korea is positioned in the global context and experience.

## RDTI Policy Features in Korea and Implications for Developing Countries

This chapter ends with an overview of the Korean experience in designing and adopting RDTIs to promote private investment in R&D and innovation. It provides the context for developing RDTI schemes and profiles the three major RDTIs in operations in the country.

According to the OECD R&D Tax Incentives database, Korea's R&D intensity—defined as expenditure on R&D as a percentage of gross domestic product (GDP)— of 4.8 percent of GDP was the second highest among OECD member countries in 2020, second only to Israel. Korea's R&D intensitymade it one of the best performers in the world. The country also led globally in R&D expenditure growth. As shown in figure 1.1, Korea's upward trend in R&D expenditure relative to GDP stands out even among advanced economies.

**FIGURE 1.1** R&D Intensity Among OECD Countries, 1991–2021

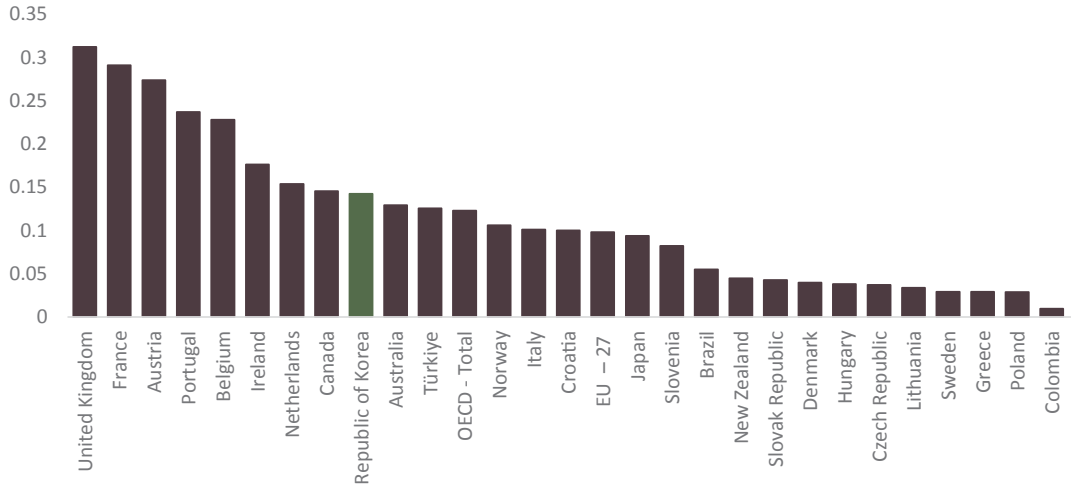



Source: World Bank, based on data from OECD (2020a).

Note: JPN= Japan; KOR= Republic of Korea; USA= United States of America; CHN= People's Republic of China; ISR= Israel; OECD= Members of Organisation for Economic Co-operation and Development; EU27= all 27 Member States the European Union (excluding Northern Ireland)

Since the 1960s, and through the enactment of the Regulation of Tax Relief Act, Korea's RDTI schemes have evolved significantly, with existing schemes covering all stages of firm innovation—from investment in R&D to commercialization of its results (Korea National Law and Information System 2017). By 2020, Korea ranked ninth among OECD countries in the value of government support to RDTIs as a percentage of GDP (figure 1.2).

**FIGURE 1.2** Indirect Government Support Through R&D Tax Incentives as % of GDP, 2020




Source: World Bank, based on data from OECD (2020a).

Note: EU = European Union; GDP = gross domestic product; OECD = Organisation for Economic Co-operation and Development; R&D = research and development.

Korea's RDTIs are entitlement based, with many schemes taking a "negative list" (for sectors and activities) approach. That is, instead of positively enumerating the specific sectors, regions, activities, or technologies that are eligible for RDTIs, the law lets any firms that meet certain prescribed criteria potentially benefit from the incentives except those that have been excluded in the negative list. Such an approach is believed to reduce the risks of allocative distortions.

## Three Important RDTIs in Korea

In Korea, most RDTIs rely on tax credits. Two of the largest RDTI schemes, as measured by the size of their tax expenditures in 2017 (NABO 2018), rely on tax credits to promote R&D activities. The use of tax credits over tax deductions is in line with the practice of OECD member countries. Three of the most prominent RDTI schemes of Korea are detailed below.

### Tax Credits for Research and Human Resources Development Expenses

Until 2018, this RDTI scheme provided tax credits of up to 25 percent of all eligible expenditures to firms that incur expenses for research and human resources development in a taxable year. The

scheme was the largest of all RDTI schemes in Korea: in 2017, the tax expenditure associated with it was ₩ 2.5 trillion (approximately US$1.8 billion), a larger amount than the tax expenditures of all the other RDTI schemes in Korea combined (NABO 2018).

Most domestic firms with eligible expenses can apply for the tax credit, but the tax credit rate differs depending on the size of the firm and the choice of calculation method, as shown in table 1.1. Firms can choose either the volume-based or the incremental-based calculation method, but certain conditions apply to the choice of the incremental-based method; the firm must have incurred expenses for research and human resources development in each of the past four years, and the expenses for the current fiscal year should be bigger than those of the average of the past four years.

**TABLE 1.1** Calculation of Tax Credits for Research and Human Resources Development Expenses

| Method | SMEs | Middle-Market Enterprises | Large Enterprises |
|---|---|---|---|
| Volume-based | 25% of R&D expenditures | 8–15% of R&D expenditures | 0–2% of R&D expenditures |
| Incremental-based | 50% of (R&D expenditures - last year's R&D expenditures) | 40% of (R&D expenditures - last year's R&D expenditures) | 25% of (R&D expenditures - last year's R&D expenditures) |

Source: World Bank staff, based on KOITA (2020) and on information valid as of December 2020.

Eligible research and human resources development activities, such as training, are prescribed in the law. In a nutshell, in the case of in-house R&D, a firm is expected to have its own research center or a department specializing in research. Expenses for outsourced R&D are also generally eligible, but eligible outsourcing partners are specified in the law. Enterprises and SMEs can carry forward unused benefits for 10 years. SMEs are also partially exempt from alternative minimum tax. Firms with eligible expenses can apply to the local tax office by submitting supporting documents and completing forms available online.

**Tax Credits for Investment in Facilities for Research and Human Resources Development**

This tax credit scheme rewards firms that invest in facilities for research and human resources development by providing a tax credit of up to 7 percent of the investment amount. In 2017, a tax expenditure of ₩ 153 billion (approximately US$140 million) was incurred for this RDTI scheme (NABO 2018).

As with other major RDTIs in Korea, this scheme also favors smaller enterprises by offering higher tax credit rates: In 2018, a rate of 7 percent applied to SMEs, 3 percent to middle-market enterprises, and 1 percent to large enterprises. Broad categories of eligible facilities include research facilities, job training centers, and facilities used to commercialize new technologies. More detailed lists of eligible investments are provided in the law. Firms can carry forward unused benefits for five years.

Firms with eligible investments can apply to the local tax office through a form available online. By January 2021, the "Tax Credits for Investment in Facilities for Research and Human Resources Development" was integrated into the "Comprehensive Investment Tax Credit," combining the "Facility related Investment Tax Credit" and "Small and Medium-sized Enterprise Investment Tax Credit" into one scheme. Those tax credits were combined to extend tax benefits for almost all tangible assets (excluding land, buildings, and automobiles) to allow enterprises to have more choices for investment decisions. The tax credit rate on "tangible" investments for research and human resource development was 1 percent for large enterprises, 3 percent for medium-size enterprises, and 7 percent for SMEs.

**Income Tax Reductions for Foreign Engineers and Special Taxation for Foreign Workers**

Certain foreign engineers prescribed in the law shall be granted a tax reduction equivalent to 50 percent of the income tax on the earned income from a domestic employer for five years. The RDTI scheme promotes the acquisition of advanced foreign know-how by domestic firms. The total tax expenditure from this RDTI scheme in 2017 was ₩ 136 billion (approximately US$98 million) (NABO 2018). More specifically on eligibility, a foreign engineer as prescribed in the law refers to a non-Korean national who falls under one of the following categories:

- A person who provides technology in Korea under an engineering technology license agreement prescribed under the Ordinance of the Ministry of Economy and Finance (MOEF).

- A researcher working in the R&D facility of a foreign capital-invested company that meets the requirements prescribed under the Ordinance of the MOEF.

In 2022, the law was amended to encourage additional inflow of talented foreign scientists into Korea. The amendment expanded the scope of benefits for employment agencies by allowing workers who do not work at research and development facilities of foreign-invested companies to benefit from its clause. For example, the new clauses extended benefits to employment of persons who hold a bachelor's degree or higher in the fields of natural science, engineering, and medicine and who have at least five years of R&D and technology development experience at universities and research institutes abroad (for PhD holders, the requirement is two years of such experience before obtaining a doctoral degree) as prescribed by the Ordinance of the MOEF.

**Adjustments Made to R&D Tax Incentive Schemes in Korea and Implications for Developing Countries**

Since the mid-1980s, Korean policy makers have relied on tax incentives to induce firms to invest in R&D, promote technological catch-up, and shift production to higher-end goods. The magnitude of tax expenditures grew significantly, and the Korean government had to increase its monitoring and evaluation (M&E) of RDTI schemes.

Starting in 1982, adjustments were introduced to shift the focus from foreign to domestic R&D investors. Monitoring and impact evaluations enabled policy makers to track performance of the scheme throughout implementation and to adjust more frequently, fostering programmatic

learning and adaptation of policy design. Additional measures contributed to implementation, especially through the M&E of tax incentives programs, requiring that large beneficiaries carry out ex ante feasibility studies and ex post effectiveness reviews for all participants. For schemes targeting smaller firms, program self-assessments were encouraged, along with evaluations to assess impact additionality—the extent to which the program induces additional impact that would not, in the program's absence, otherwise have occurred—that were commissioned from third-party research institutes.

With a high level of concentration of benefits among a small group of large firms (de facto), Korean policy makers started to adjust the schemes for greater inclusion in the 2000s (Ha 2012). Deliberate measures were therefore introduced not only to eliminate restrictions and relax conditions of eligibility to encourage more firms to apply (extensive margin) but also to increase the intensity of R&D spending (intensive margin). The expanded participation of domestic firms coincided with reforms that reduced the costs of compliance and assisted prospective participants to apply, especially SMEs and startups. Those measures are believed by policy makers to have made the country's RDTIs more inclusive and broad-based.

RDTI schemes in Korea are believed to have contributed to the growth of the technological and research capabilities of domestic firms (Noh and Lee 2014). The measures targeting intensity of support have contributed to the increase of R&D as a percentage of GDP. At the time of writing, Korea was among the OECD countries that provide the largest level of government support to business R&D. It is worth noting that—along with tax incentives—other policy measures implemented in parallel to RDTIs, such as funding to public research organizations and matching grants for R&D, have also contributed to the technological catch-up of firms and the growth of their R&D capabilities.

To make the case easier to read, the authors have organized the chapters in sequence. Chapter 2 introduces the analytical framework used to document the case study. The design features are the subject of chapter 3, including targeting; and administrative features of RDTIs are examined in chapter 4. In each chapter, the structure starts with a synthesis of the international experience but is customized to the developing country context. Next is a brief profile of RDTI features in the three client countries and their degree of convergence with (or divergence from) international practice. Each chapter ends with a description of the Korean experience of policy practice for designing and implementing RDTIs and a comparative analysis between the Korean, international, and client country policy practice. Each section ends with a discussion of policy implications for developing countries.

Chapter 5, the final chapter, provides a brief conclusion, comparing the RDTI schemes in Korea to international practice under the proposed framework and teases out some implications for developing countries.

# 02



# Structuring the Analysis of RDTI Policy Practice

The goal of this chapter is to introduce an analytical framework to assess policy practice in the design and implementation of RDTIs, with a focus on their use in developing countries. In the following chapters, the emphasis on identifying good policy practices—which developing countries could replicate—reflects on two constraints. First, the evidence of effective results from using RDTIs in developing countries remains limited and, comparatively, much scanter when compared with that for OECD countries. Second, practitioners in developing countries typically have less access to knowledge resources and less experience to make informed choices on how to effectively design and implement RDTI schemes.

Identifying good policy practice does not imply introducing a one-size-fits-all approach to designing and reforming RDTI schemes. Policy makers ought to adapt good practices to the specific conditions found in each country, considering the capacity of implementing agencies, the strength of the competencies of the intended beneficiaries, and the local conditions of research skills, finance, regulatory framework, and infrastructure, among others (Cirera and Maloney 2017). Distilling principles of good policy practice could serve to guide policy makers engaged in either designing or adjusting RDTI schemes to address specific challenges in advancing RDTI policies. For example, some practitioners may find that their most urgent need is to increase the cost-effectiveness of RDTI policies. Sometimes, the most pressing issue might be to expand the proportional participation of small or young firms in the RDTI program—as a matter of equity. For others, the aspiration of the scheme might induce "behavioral additionality"—the degree to which the scheme induces additional R&D-related behaviors that would not, in the scheme's absence, otherwise have occurred—by promoting collaboration among firms or between firms and research centers. Whatever the case, the choice of the scheme's features should be consistent with its policy objectives.

Furthermore, the design of the scheme should also consider what levers are likely to drive incremental investment in R&D and positive externalities. RDTI schemes can generate economic benefits in the form of additionality and knowledge spillovers—knowledge created by one firm that becomes available to other firms in ways that benefit them and create economic or social value. Important questions continue to challenge practitioners—for example, should the design of the scheme prioritize changing the composition of firms and reducing the barriers for new entrants (that is, increase the extensive margin), or should it prioritize incentivizing firms that have already invested in R&D to increase the level and frequency of their R&D investments (intensive margin). The lack of previous research and the resulting information gaps, however, hamper evidence-based policy making, particularly in developing countries. This chapter proposes a framework to assess the practice of RDTI and describes the overall approach to documenting international policy experience, with a focus on Korea.

# Challenges Associated with RDTIs, Especially in Developing Countries

Challenges are associated with RDTIs as a type of innovation policy instrument per se, and challenges specifically related to deploying RDTIs exist in developing countries.

**Three challenges associated with RDTIs per se**

- Capture by large incumbents: In many countries, the main beneficiaries of RDTIs tend to be large R&D spenders, despite efforts to reward SMEs with higher credit or deduction rates. Once the tax benefits given to large firms have persisted for many years, removing, or adjusting them often becomes challenging, in part because of regulatory capture. Worth noting is that the recent global minimum tax (GMT) agreement introduces rules to prevent MNEs from receiving direct compensation for tax incentives lost because of the imposition of top-up taxes.

- Difficulty in ascertaining eligibility: In many cases, firms apply for R&D tax benefits by submitting self-prepared applications with supporting documents. From the government's perspective, assessing compliance can be costly and time-consuming because of the special skills required for eligibility verification and management of fraud risks, especially in countries without strong administrative systems. From a firm's perspective, uncertainty around eligibility poses a financial risk if a firm must commit itself to an expensive R&D project before knowing with certainty whether its R&D expenditures will be eligible for tax benefits. The situation can be particularly difficult when prospective beneficiaries face overlapping compliance regimes—for example, with eligibility being tested simultaneously by the investment promotion agency (IPA) and the tax administration.

- Difficulty in choosing the right design features: The core issues policy makers face include (1) how to increase input additionality—the extent to which the RDTI scheme induces additional R&D that would not, in the scheme's absence, otherwise have occurred; (2) how to increase knowledge spillovers—knowledge created by one firm that becomes available to other firms in ways that benefit them and create economic or social value; and (3) whether to prioritize policy strategies that would either increase the participation of additional firms (that is, rely on expanding the extensive margin) or promote investment in R&D per firm (that is, rely on expanding the intensive margin of R&D). In considering those questions, policy makers face pressure over the efficient use of fiscal resources because, from the government's point of view, tax revenues forgone due to RDTI schemes are equivalent to tax "expenditures."

**Three challenges specific to deploying RDTIs in developing countries**

- Lack of financial resources, especially in the current context of fiscal stress: In developing countries, RDTI schemes often are administered in an environment of pressured competition over limited resources, which means that even if they are sufficiently earmarked for revenue forgone in the short term, their longer-term sustainability is highly uncertain. Developing

countries may face greater political stress to justify forgone tax revenues, given that their governments often face pressing social needs, such as poverty alleviation. In the wake of the COVID-19 global pandemic and several international crises, diminished tax revenue and increased social spending have left many governments—especially developing country governments—with severely constricted fiscal space.

- Lack of evidence to guide informed policy making: Despite the urgent need for relevant knowledge in developing countries, most empirical evidence from impact evaluation studies comes from developed countries, such as OECD member countries. Policy practitioners in developing countries therefore have limited guidance to replicate international best practices within their own peculiar national setting and face heightened uncertainty surrounding expected outcomes. Compounding that scenario, such policy practitioners often lack a good functional grasp of the strengths and potential risks of specific design features of RDTIs.

- Lack of enabling framework conditions to underpin RDTIs additionality: RDTIs in developing countries often are not as effective as they looked on paper because of the absence of other factors that contribute positively to R&D and innovation, notably the availability of R&D personnel, skills, and a well-functioning intellectual property rights (IPR) protection regime (UN ESCAP 2017). The availability of R&D personnel and a well-functioning IPR regime are two primary concerns that MNE decision makers consider when they are contemplating the possibility of undertaking R&D in a developing country. More generally, the relative importance of tax incentives in investment decisions among international firms has consistently ranked lower than other important considerations, such as economic and political stability; the presence of local factor markets, such as local content and skills; and the strength of the local legal framework (IMF, OECD, UN, and World Bank 2015).

## Documenting Policy Experience to Bridge Knowledge Gaps

This case study aims to contribute to the body of practitioner publications by focusing on the following:

- **Operational issues of RDTIs that developing country practitioners face.** This document is not meant to synthesize the evidence of impact and results from the implementation of RDTIs, which has been reviewed extensively. Overall, what is known about RDTI effectiveness is relatively well established and documented (Cirera et al. 2020; Köhler, Laredo, and Rammer 2012). Instead, the present case study focuses on a largely qualitative assessment of the available evidence, with the aim of distilling applicable principles for designing and adopting RDTI schemes in developing countries.

- **The need to bridge gaps in policy expertise.** A previous review of innovation policies was conducted by the World Bank in three "client countries"—Indonesia, the Philippines, and Viet Nam—between 2018 and 2020. That focus helped the team narrow the scope of data collection for the case study. The baseline of practice in those three countries

also allowed the authors to anchor the analysis of the Korean case and the international experience. Although the initial profiling of the RDTI practice was not meant to substitute for a diagnostics exercise to determine specific problems of practice in those countries, it nevertheless allowed the authors to compare the different design features and identify gaps in practice with international experience. The team relied on synthesizing existing reviews, reports, and specialized publications (for example, policy evaluations when available) and direct discussions with practitioners in each of those countries.

- **The Korean RDTI policy and practice.** The documentation of the Korean experience included profiling existing features of RDTI schemes and engaging with Korean practitioners and policy researchers to understand the successes and failures in implementation and the adjustments and changes made. The goal also was to assess the degree of adherence of Korean practice to that of developed countries to identify areas of strength in (or departure from) the policy design and implementation. Ultimately, those comparisons allowed the authors to identify areas of focus for documenting the Korean experience.

- **Adaption to developing country conditions.** The case team looked at the international literature to create a compendium of principles of RDTI policy practice but with a focus on adapting them to developing countries. Given that the available data were primarily centered on OECD and EU member countries, however, the team conducted additional reviews of the evidence from prior studies on the impact of RDTIs for six developing countries: Argentina, Chile, China, Colombia, Malaysia, and Mexico. Those countries were selected on the basis of the presence of impact evaluations and detailed implementation assessments, complemented by semi-structured interviews with policy makers responsible for managing RDTI schemes in those economies. The team supplemented that review with interviews with international tax experts and practitioners. The interviews were designed to understand the composition of RDTI schemes and distill the lessons learned on how practitioners have addressed operational challenges in designing and implementing RDTIs in their countries.

The next step to comparing and analyzing countries' RDTI schemes is to establish a framework to analyze and define the various features of RDTI schemes; that is the subject of the next section.

# The Features for Effective Design and Implementation of RDTIs

A framework can be useful for breaking down the composition of an RDTI scheme into its separate parts, allowing identification of an array of alternative (and complementary) design and implementation features that could be explored and evaluated. A framework can also help practitioners to structure a discussion about the ideal combination of those features on the basis of practice in a variety of settings.

The proposed framework to analyze RDTIs considers two dimensions: design features of RDTIs and management features features of RDTIs. As mentioned previously, one source of motivation for this case study was the set of previous evaluations of the quality of design, implementation, and governance of the innovation policy mix. The proposed framework aims to complement that analysis and serve as a reference for systematically capturing various aspects of RDTIs that span the policy life cycle and can be applied to different country contexts, both developed and developing. Each of those dimensions is discussed in the next two chapters. Worth noting, the authors sought to understand the different design and implementation features of RDTIs, which are generally accepted principles of policy practice for RDTIs, and how they can be adapted to the realities of developing countries. Several publications in the OECD introduced similar frameworks (European Commission 2014) and have attempted to synthesize good policy for RDTI implementation. The expanded presentation of those features is shown in table 2.1.

**Table 2.1** Features for Effective Design and Implementation of RDTIs

| Dimension | Features |
|---|---|
| Design Features | Aligning design with expected results of tax incentives |
| | Expenditure eligibility |
| | Volume versus incremental design |
| | Income versus cost-based incentives |
| | Generosity |
| | Targeting |
| | FDI, multinational enterprises engaged in R&D, and the global minimum tax |
| | Increased participation of young and small firms |
| | Negative tax (cash refunds) and carry-over provisions |
| | Collaborative R&D |
| Management Features | Evaluation and monitoring |
| | Application and promotion |
| | Prequalification of eligible expenses |
| | Compliance verification and reimbursement |
| | Predictability of benefits |

Source: World Bank, based on Correa (2013), and European Commission (2014).

Note: FDI = foreign direct investment; R&D = research and development.

The Design Features dimension describes which tax incentive types can be used (for example, allowances, credits, reduced or preferable rates, accelerated depreciation of R&D assets, and so on), the eligibility criteria (for example, eligible expenses and novelty), volume or marginal spending assignment mechanisms, generosity, and the mix of tax incentives and grant- or cash-based instruments. This dimension also distinguishes whether an RDTI scheme should be based on a firm's profits or costs to induce private R&D inputs and outputs more effectively. The design dimension also addresses the question of whether RDTI schemes should provide preferential provisions to certain groups of firms based on their size, age, ownership, legal form, sector, or geographical region.

The Administrative and Managerial dimension distinguishes operational features related to predictability of tax incentives and the availability of organizational and supporting services for RDTI programs (for example, application and approval times, public consultation and evaluation provisions, targeted promotion, and synergies with other incentives to induce R&D investment, such as grants).

# 03



## Design Features of RDTIs

# Aligning Design with Expected Results of Tax Incentives

Developing countries can grant tax incentives in several ways. The basis for granting tax relief is critical because it will likely determine the cost-effectiveness of the scheme. Distinguishing the type of taxes to which incentives can be applied is important. Although RDTIs can bear upon payroll taxes (such as in the form of social contributions), capital gains, proceeds from sales of stock options, value-added taxes (VAT), land, and property, the majority of the reviewed RDTIs apply to corporate income taxes (CITs) (Köhler, Rammer, and Laredo 2012).

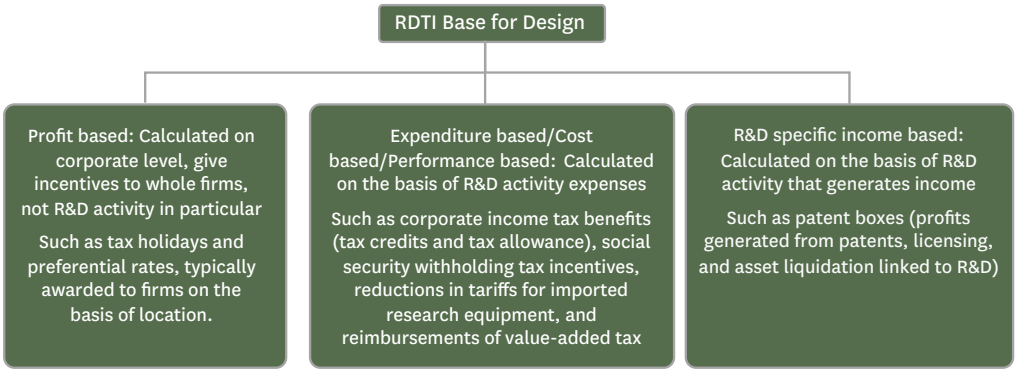
Tax incentives can be either profit-based or cost based (Andersen et al. 2017; IMF, OECD, UN, and World Bank 2015). Choosing the right design will better align the incentives with the expected results. Profit-based incentives, such as preferential tax rates and tax holidays, are typically awarded to firms based on location, as with special economic zones, or the type of company (that is, a presumed innovative company or a science and technology enterprise). Profit-based incentives reduce the tax rate applicable to the firm's taxable income. The designated authority grants this status based on an upfront assessment of the investor. The status of the company is conferred through either a label or a certification, which is typically subject to renewal within a designated period (yearly or every few years). On a tax holiday, the investor may have no obligation to file a tax return, complicating any future process of expense verification.

By 2017, income tax holidays (ITHs) and preferential tax rates were widely used in developing countries, despite the shortcomings of such incentives (Andersen et al. 2017). These incentives have limitations. For example, they usually favor firms with high profits that may not need government assistance. When these incentives are linked to location-specific factors (such as the presence of natural resources), the evidence suggests that it leads to redundancy. In addition, tax holidays can expose countries to tax avoidance through profit shifting because companies can artificially reallocate their profits to entities enjoying tax holidays through internal transfer pricing. Profit-based incentives have been associated with short-term "mobile" investments rather than long-term investments with high upfront costs.

By contrast, cost-based incentives—including tax credits—and allowances condition the eligibility for the tax benefits based on proof of the applicant's specific expenditures in R&D activities. Cost-based incentives are much more closely linked to the desired policy goal because tax relief is proportional to the level of expenditure in R&D activities, irrespective of a company's profit level. Within the category of cost-based incentives, tax allowances and tax credits grant investors the right to deduct investment costs from their taxable income (effectively reducing the

cost of capital for R&D investments). The advantage of tax credits is that they are not subject to change with variation in the corporate tax rate, whereas enhanced allowances must follow those variations to adjust for the change. Tax credits are widely used in developed countries, which is consistent with the OECD position on their advantages. Based on the definitions from Cirera et al. (2020) and Andersen et al. (2017), the authors propose to classify the RDTI as shown in figure 3.1.

**FIGURE 3.1** R&D Base for Design




Sources: Andersen et al. 2017; Cirera et al. 2020.
Note: R&D = research and development; RDTI = research and development tax incentive.

In the developing countries reviewed for this case study, profit-based tax incentives for R&D are typically offered based on a company's status as a "technological company" (that is, a science and technology company) or a "pioneer company." Those designations must be verified (and recertified) over a limited period. By contrast, Korea actively prefers tax credits to tax holidays and allowances, in line with international practice.

The authors of this case study found that ITHs, despite their shortcomings, remain widely used in all three client countries. The major RDTI schemes in Viet Nam feature tax holidays. Furthermore, the past year's increase in the allocation of financial resources for science, technology, and innovation programs was driven primarily by an expansion of tax exemptions in the form of tax holidays. Reliance on tax holidays was also a fixture in the Philippines' RDTIs. According to EY (2020), of the incentives available in the country before the CREATE law took full effect, the income tax holiday scheme delivered the most benefits to investors. Finally, the innovation PER report observed that Indonesia relied on tax holidays, but tax holiday incentives and RDTIs are separate schemes that channel incentives through different components. The Indonesian government relies on a specific tax holiday eligibility criteria, providing up to 100 percent of corporate income tax (CIT) exemption for 5 to 20 years from the start of commercial production for an expanded set of pioneer sectors, such as manufacturing (PwC 2021). Tax system analysis reports indicate that tax holiday schemes often are preferred by R&D investors, suggesting a high degree of dependence and hinting at a plausible explanation as to why tax holidays remain widely in use and represent a significant portion of forgone tax revenue related to RDTIs.

Tax credits are not widely used in developing countries; their use should be expanded when the right conditions are in place. Broad-based tax relief is generally expensive in terms of forgone tax revenue relative to the targeted tax relief. Thus, policy makers may prefer a targeted approach. Examples of targeted schemes include accelerated depreciation and investment tax credits for purchases of equipment or hired skills used in R&D projects. Making those tax credits available independent of the profits that a company generates could expand the participation of younger and smaller firms.

Worth noting, the advent of the GMT agreement will likely diminish the appeal of ITHs and preferential tax rates for large multinational enterprises (MNEs). Because tax incentives targeted at attracting MNEs that conduct R&D-based innovation in host countries have been prevalent in the region, of this case discusses the GMT in further detail.

## Expenditure Eligibility

The design of RDTIs determines the categories of specific R&D expenditures and activities. The Frascati Manual provides a standard for R&D data collection in advanced economies and provides a practical approach to classify R&D activity for the definition of eligible expenses (OECD 2015). It defines R&D activities as those that are systematic, investigative, or experimental; are in a field of science or technology; involve one or more of the categories of R&D—basic research, applied research, or experimental development; seek to achieve scientific or technological advancement; and involve the resolution of scientific or technological uncertainty.

Qualified expenses usually include wages, raw materials, recurrent expenses, and contract research. Wages are the salaries of people involved directly in either conducting or supervising R&D activities. For example, the staff from a firm's quality control or R&D department would be covered under this definition. Generally, R&D tax claims specify the qualified staff and the time they spend on these activities. In addition, RDTI eligibility rules would qualify net wages exclusively; indirect contributions to pensions and savings typically do not qualify. The R&D supplies and recurrent expenses are raw materials used for experimentation, prototype, or testing. Depreciable property and general expenses, such as utility services, tend to be excluded from this category.

Contract research implies that a third party, such as an independent contractor, does the R&D for the firm claiming the tax benefit. An example would be an independent laboratory that conducts testing as part of the R&D process. Certification services and testing for commercial production are also included in this category. To represent an eligible expense, the beneficiary not only assumes the financial risk of the project but also ownership of the results from the investment (as intellectual property [IP] owner).

Generally, those definitions in developed and developing countries converge, which points to the importance of a careful determination of eligible expenditures according to international practice (for example, the Frascati Manual) and the importance of strengthening the auditing capabilities for tax administration. For instance, expenditures related to wages paid to researchers are known to be associated with stronger knowledge spillovers because former employees are an important

channel through which knowledge diffuses unintentionally to other firms. In addition, tax incentives for R&D wages tend to have lower administration and compliance costs than for capital expenditures (Cirera et al. 2020).

By contrast, capital-intensive R&D activities may be difficult to replicate if financial barriers are at play. The OECD seems to have a general preference for including labor costs and current expenditures because capital investments in R&D may rely on assets that are subsequently disposed of (OECD 2016). However, some scholars have argued that the design of the scheme may create distortions by favoring one expense over another and that the firm is in a better position to make its own factor allocation decisions. The Colombian and Chilean schemes that were reviewed offer special provisions to afford complementarities between RDTIs and scholarships in science, technology, engineering, and mathematics (STEM) disciplines. In the case of Chile, the RDTIs offered incremental benefits of a 1.5 times (150 percent) "super deduction" for the presence of advanced R&D wages—for example, the wages of PhD-level researchers from STEM fields in the submitted projects.

Viet Nam RDTIs give special attention to CIT reductions but also allow incentives on VAT, import duty, land use tax, and stamp duty. Even though the PER report found that the presence of researchers was a condition for obtaining high-tech status on the schemes, the assessment was done ex ante and was not based on past expenditures on wages paid to researchers. Worth mentioning, Viet Nam has introduced tax incentive programs to attract high-tech companies operating in science parks. However, those tax incentives do not focus on spurring R&D activity per se but on attracting investment in advanced manufacturing with the potential to generate knowledge and innovation spillovers. In 2020, Viet Nam introduced the Law on Investment (Law No. 61/2020/QH14), which expanded the scope of CIT reduction to include technology transfer projects, technology incubators, science and technology business incubators, innovative start-ups, innovation and creation centers, and R&D centers (Deloitte 2020). Article 15.1.d of this law also introduced provisions for accelerated depreciation and for increased deductible expenses.

Several policy practitioners define novelty as one of the key desired characteristics of R&D investment to reward through the incentive scheme. The more the emphasis is on innovation and advancement beyond the current state of technology or knowledge, the more the reward embedded in the design of the scheme. A few countries include novelty requirements as conditions for eligibility (box 3.1).

In the Philippines, RDTI schemes offer tax incentives for activities identified as Tier III in the Strategic Investment Priority Plan (SIPP), containing the government's list of priority R&D projects resulting in indicative outcomes such as value added, higher productivity, formation of intellectual property, patents, industrial designs, copyrights, and utility models. The application for registration of Tier III activities must have the endorsement of a competent agency and first qualify for registration under Tier I. The SIPP 2022 included activities such as robotics, artificial intelligence (AI), additive manufacturing, data analytics, digital transformative technologies, and nanotechnology (under the label of Industry 4.0 technologies). Worth noting, the criteria did not include references to R&D activity classification criteria used as international practice described in the Frascati Manual (OECD 2015).

## Box 3.1 Novelty Requirement

In Australia, a panel reviewing the RDTI scheme in 2019 considered tightening the definition of expense eligibility of R&D to increase the role of knowledge spillovers. However, despite the potential benefit, the decision was to hold off on the amendment to avoid changing the definition of innovation because the program was not yet fully mature. An OECD review argues that, in general, the focus of the eligibility conditions in RDTIs should be new-to-the-world kinds of novelty but that in developing countries, the incentive scheme could be used to stimulate the adoption of existing technologies. The push for novel inventions and radical innovation is known to deter participation of prospective innovators. Participants in these schemes believe that governmental authorities can apply an excessively narrow interpretation of what constitutes R&D when evaluating applications for R&D tax incentives. The applications can be regarded as overly stringent, with a verification process that demands proof that the project in question is "scientific" and "inventive." A broader definition of innovation, one that sees upgrading and absorption of existing technology, may be more appropriate in this context.

The Philippines R&D expense deduction scheme offers an additional enhanced deduction from gross income of 100 percent of total R&D expenses, granted for R&D directly related to the registered project or activity eligible for fiscal incentives to either expenses incurred for the salaries of Filipino employees or to payments to local R&D organizations. The income tax holiday scheme may be claimed only on income derived from the activities registered with investment promotion agencies, such as the Philippines Economic Zones Authority (PEZA) or the Board of Investments (BOI). The exemption from donor's tax, as the scheme's name implies, intends to promote an increase in charitable contributions by private entities to educational institutions but has nothing to do with R&D wage support.

The Indonesian RDTI schemes reviewed allow taxpayers to include R&D wages in reductions to gross taxable income. The ITH scheme focuses on CIT reductions and exemptions, and the tax allowance scheme provides various tax concessions, such as accelerated depreciation and/or amortization deduction, extension of tax losses carryforward, and net income deduction. The super deduction scheme reduces gross revenue by up to 300 percent of the total expenses incurred for certain R&D activities, without an explicit emphasis on wage support.

In Korea, RDTI schemes focused on supporting the wages of R&D personnel, especially those of SMEs. In addition, of the 10 major RDTIs, 4 are exclusively focused on wage support.

The analysis of eligible expenditures of RDTIs schemes in the Philippines and Viet Nam shows that those countries do not prioritize support for wages over other expenditures as eligible expenses. The authors believe that R&D wages should be explicitly considered in developing countries as a subject of focus for defining expenditure eligibility in RDTI schemes.

## Volume versus Incremental Design

RDTIs can apply either to all eligible R&D expenditures (volume based), to the number of R&D expenditures that exceed a given base level (incremental), or to a mixture of the two (hybrid). In theory, incremental schemes are effective in avoiding the replacement of R&D investment that would have been incurred anyway because they reward exclusively incremental spending on R&D. However, the compliance costs of incremental schemes are generally higher than those of volume-based schemes, given that incremental schemes require review of historical financial data and project documentation to establish and verify a base of previous R&D expenditures. On the other hand, despite their simplicity, volume-based RDTIs can be less efficient in that they are more likely to subsidize R&D expenditures that would have occurred anyway (Cirera et al. 2020). A hybrid system can help offset each type's shortcomings by combining elements of both types of schemes. Such a hybrid system can increase cost-effectiveness for policy makers (OECD 2016).

Indonesia, the Philippines, and Viet Nam use volume-based incentives. The authors' review of the evidence suggests that volume-based schemes are generally preferred—particularly in developing countries, where administrative simplicity may be a critical requirement. Some regional practitioners deliberately use RDTIs in combination with investment facilitation policy, typically on the assumption that the host country will become a world-class innovator and will benefit from FDI inflows linked to foreign technology—its desirable "knowledge spillover" effects. However, the reliance on RDTIs to attract R&D-intensive FDI can have limited effects and promote "race to the bottom" competition for the lowest tax jurisdiction.

Korea is one of the few OECD countries that have a hybrid system (OECD 2016). Firms can choose the option that benefits them the most of the two methods of calculating the amount of tax relief. For example, an SME applying for tax credits for research and human resources development expenses can choose between 25 percent of total R&D expenses or 50 percent of the incremental expenses from the previous year. By allowing corporate taxpayers to choose the method that best suits their firm, Korea has aimed to boost the take-up rate of its RDTIs, particularly among small and younger firms.

The empirical evidence from OECD member countries, such as France and the United States, supports the proposition that incremental schemes generate higher input additionality per unit of forgone tax revenue than volume-based schemes (Köhler, Laredo, and Rammer 2012). However, developing country practitioners should consider the benefits of continuing the use of volume-based incentives, given their simplicity. These schemes present lower administrative costs and demand less capacity of implementing agencies, which tend to be stretched in developing countries. In addition, at low levels of R&D, the cost-effectiveness of both type of schemes has been shown to be in the same range.

Furthermore, despite elevated welfare losses, volume-based schemes have been demonstrated to generate higher additionality for SMEs than for large firms. For example, Lokshin and Mohnen found in the 2012 study of Dutch RDTIs that the elasticity of expenditure to forgone tax revenue was 3.24 for SMEs versus 0.78 for large firms.

Most countries that were reviewed as part of the international experience for this case study continue to use volume-based schemes to keep the scheme design as simple as possible. However, some of the practitioners in those countries are aware of the challenges of building higher additionality relying on volume-based schemes. They should evaluate when sufficient institutional and administrative competency will allow for the effective deployment of incremental RDTI schemes.

## Box 3.2 Open-Ended Entailments to Facilitate R&D Investment: The Case of CORFO in Chile

At the time of the interviews in 2020, Production Promotion Corporation, the Chilean agency for promoting competitiveness (CORFO), was planning to introduce open-ended entitlements incentives for a specific segment of firms, one that would not require annual spending authorization.

This modality would help firms reduce their compliance costs for application and their administrative costs. This selective group of firms would have attained portfolio-level certification and have graduated from the initial R&D project-based system. Prospective participants of this modality would include enterprises with a substantial record of delivering R&D projects that hold large R&D portfolios (that is, multiple projects).

To qualify, firms would have to demonstrate several commitments: dedicated staff for R&D projects, an annual R&D budget as part of their business plan, the appointment of governance and technical boards with the ability to identify and prepare R&D initiatives, a system for monitoring and managing the projects, and at least six projects in their current portfolio.

## Income versus Cost-Based Incentives

RDTIs can be categorized based on whether tax benefits are provided in relation to cost or income (Cirera et al. 2020). Cost-based RDTIs refer to tax incentives given based on expenditures in R&D, whereas income-based RDTIs are those applied to income that is generated from R&D activities and intellectual property. Tax incentives on income apply to later stages in the innovation cycle, once the intangible assets—such as patents, copyrights, trademarks, or goodwill—have been developed and can be licensed for another firm to use as an input in the creation of a new product, process, or service. However, empirical analyses of the effectiveness of income-based RDTIs are still mixed (Bloom, Van Reenen, and Williams 2019), and cost-based RDTIs continue to be regarded as the most common type of tax support for R&D.

Korea's hybrid RDTI system features both income-based and cost-based incentives. Cost-based RDTIs were found to be more prevalent in Korea. However, Korean policy makers also make use of an income-based special taxation scheme for the transfer, acquisition, and so on of technology that rewards SMEs and middle-market enterprises that successfully commercialize their R&D

outcomes. It represents broad coverage of Korea's RDTIs by type of incentive, which could contribute to increasing their appeal and to widening the participation of additional segments of potential beneficiaries.

The lack of evidence on the effectiveness of income-based incentives suggests that their consideration should be treated carefully. The international evidence still suggests that cost-based incentives tend to be effective by inducing more R&D expenditure. Practitioners in developing countries should first consider the use of cost-based tax incentive schemes that are based on expenditures on R&D undertaken by beneficiary firms, but they may also want to consider adopting a hybrid system in the future to promote the participation of additional segments of potential beneficiaries.

## Direct Support and Project-Based Application

Participation of young and smaller firms in the schemes through R&D projects occurs when compliance costs are low, particularly for SMEs, and when the monitoring framework is of good quality. Tax incentives are generally delivered through open-ended entitlements that do not require annual pre-spending authorization. RDTI schemes typically allow beneficiaries unlimited amounts of qualifying activity, thereby relieving participants from preapproval requirements. Such schemes may require that, in addition to financial records, beneficiaries keep project documentation for ex post verification purposes. Project documentation should be simple to produce, qualify, and demonstrate—for example, a record of project narratives and supporting documentation, such as project names; rationale for qualification; meeting minutes; internal reports; test results; and records of technical discussions should be kept. Ex post verification may also require additional documentation, such as job descriptions, department overviews, R&D department mission statements, and descriptions of R&D process overviews. A proper study provides a good case for documentation.

However, ex post approval based on entitlement assumes that firms have the capacity to structure R&D projects independently and that they understand at the outset, with clarity, which activities will qualify for claims of tax incentives (received ex post). Even in developed countries, that level of understanding is not always the case.

Expanding access to tax experts can significantly lower the barriers to accessing RDTIs, especially for SMEs and young firms that lack resources for such professional consulting services. In Korea, the National Tax Service (NTS) provides complimentary consultation and mentoring services to taxpayers via phone, mail, fax, the internet, and in person at local tax offices. For example, a firm or its representative can make inquiries via mail concerning a specific question or situation that the firm is facing regarding the application to the RDTI scheme by explaining the situation with supporting evidence and documentation. An authoritative interpretation or ruling from the NTS carries legal binding force. Besides the services provided directly by its advisers, NTS provides additional references to professional services by specialized accountants.

In developing countries, this level of understanding may be the exception. Evidence from the international schemes reviewed suggests that inducing firms to prepare R&D "projects" —as opposed to allowing firms to qualify R&D expenditures ex post—can be appropriate when a firm's

technological capacity is undeveloped and when it is relatively new to conducting R&D investments. Practitioners, however, may not need to choose between the two modalities, as shown by Chile's CORFO (box 3.2).

## Generosity

The generosity of the scheme represents the implied tax subsidy rate: the expected tax relief per unit of R&D investment. Generosity is important to define, given that it determines the level of incentives available to prospective R&D performers and dictates the overall costs in forgone tax revenues. Reviews from OECD member countries have revealed that the use of tax incentives for R&D and non-R&D innovation has increased since the 2000s as the number of countries using R&D tax incentives has grown, and the generosity of tax credits has also increased (Izsák, Markianidou, and Radošević 2013; OECD 2009).

The evidence from OECD on the use of RDTIs in developed countries suggests that increased generosity leads to high R&D investments (Appelt et al. 2016; Köhler, Laredo, and Rammer 2012). However, determining the appropriate tax subsidy rate is nuanced. If the overall generosity is too low, the value proposition will be insufficient to lure potential R&D performers to participate. If it is too high, it will introduce distortions to investment decisions for R&D, which can lead to resource waste, fiscal strain, and low additionality of impact.

Overall, studies (IMF, OECD, UN, and World Bank 2015) suggest that the impact of fiscal generosity is likely to be nonlinear and context specific. First, the proposition of tax relief should be assessed against the general level of corporate tax rates. At the margin, if the corporate tax rate is low, then the level of generosity should be high to offer a meaningful incentive to prospective R&D performers. This calculus, however, is likely to change in the case of multinational companies with the advent of the GMT agreement, which will impose a de facto minimum tax rate for this segment. Second, and as shown by an existing assessment of a volume-based scheme, increased generosity can lead to an increase in input additionality but only during the first years of participation, showing limited effects in the long run. Further, the presence of complementary design features of the scheme, such as electronic applications, carry-over provisions, and voluntary compliance facilities, seems to be more important in motivating the uptake and participation and in generating impact additionality.

The following is an interesting example of how the adjustment of features other than generosity can lead to increased uptake in the scheme. The managers of the Chilean RDTI scheme witnessed a fivefold increase (for the period starting in 2012) in applications during the first year of the introduction of the newly designed program, without modifying the tax subsidy rate. Adjustments removed ceilings of R&D project proposals, which is estimated to have made the incentive more appealing to SMEs (Ministry of Economy, Development and Tourism 2016). Furthermore, the amendments to the program allowed for intramural R&D investments (removing the requirement of collaboration with research centers) and simplified the process of proposal applications, offering technical assistance for voluntary certification.

# Targeting

As an indirect measure, targeting through the RDTI's design is inherently difficult. The review of the literature reveals mixed results. Several reviews show no robust indication of clear benefits to targeting specific firms by ownership, legal form, sector, technology, or geographical region through special provisions in the RDTI scheme. Several studies, by contrast, suggest that smaller and younger firms respond relatively stronger to incentives than their bigger and older counterparts. Volume-based schemes showed that SMEs experience particularly strong results in impact additionality. Smaller firms tend to suffer proportionally more than larger ones from credit constraints. Evidence from studies in the OECD back this proposition as it shows RDTIs having higher impact additionality for financially constrained firms.

The evaluations reviewed from Argentina and China indicate that RDTI seems to be increasingly effective in inducing R&D investment in large and mature firms, whereas the case of Colombia shows that the RDTI scheme was more effective in achieving investment results among SMEs.

Viet Nam's heavy focus of its R&D tax incentives linked to foreign investment attraction was a peculiar feature in 2019. Viet Nam provided an array of inbound investment incentives granted based on regulated sectors, prioritized locations, and project size. The World Bank's Innovation Policy Effectiveness Review (World Bank 2021) revealed that, in Viet Nam, tax incentive programs in 2017 represented a disproportionate amount of the total budget for business innovation policy, accounting for 93.9 percent of its total spending. For one scheme, the forgone tax revenue was associated with a small number of very large firms, implying that the benefits remain highly concentrated in a few participants.

Viet Nam's RDTI schemes, which focus on promoting high-tech sectors, take a "positive list" approach to granting incentives. The international literature suggests that targeting specific sectors, regions, industries, or technologies may not lead to the intended results and may even create an uneven playing field at the national level. The incentives for the high-tech sector, for instance, are used by the largest firms in the sector. The incentives for science research and technology development applied only to firms that have been certified as running scientific and technological operations, including incurring R&D-related expenses and employing R&D workers, while registered with a competent science and technology authority (such as the Ministry of Science and Technology). Those eligibility restrictions can limit the beneficiary pool. In addition, although targeting larger firms may reduce proportionally the costs of administering the scheme, limiting eligibility to large firms may distort competition against the smaller players.

In the Philippines, firms registered with an investment promotion agency (IPA) are eligible for an income tax holiday of up to seven years for firms classified under Tier III industries outside Metro Manila and up to four years for Tier I industries in Metro Manila. Under the CREATE law, the tier classification is indicated in the Strategic Investment Priority Plan (SIPP), which is either reviewed or amended every three years. The definition of eligibility of R&D expenses for the beneficiary under the enhanced deduction regime depends on whether it includes expenses of local salaries of Filipino employees, consumables, and payments to local research and development organizations. In addition, the established practice for expense deductions

requires sufficient evidence, including official receipts, showing the deducted expense and other records showing that such expense is directly related to the trade, business, or profession of the taxpayer. The BOI—in coordination with the FIRB, BIR, and other stakeholders—is working on the specific guidelines for claiming the enhanced deduction incentive.

Indonesia actively targets specific themes and innovation-related activities through RDTI schemes. The tax allowance incentive and RDTI are two different types of tax incentives, featuring different taxpayer criteria and eligibility (taxpayers using RDTI are not automatically eligible for the tax allowance incentive, and vice versa). The tax allowance is directed toward pioneer industries. Corporate taxpayers that make new capital investments under pioneer industry status are eligible for corporate income tax holidays. The definition of pioneer industry is focused on the manufacturing sector. The RDTI scheme is expenditure based and targets 105 thematic activities in 11 focus areas, without any limitation to a specific region. Qualifying firms are eligible for two years of carryover benefit, but the tax loss compensation can be extended up to five years, as stipulated in Government Regulation 78/2019.

Amid efforts in relocating its capital from Jakarta to Nusantara in Kalimantan, Indonesia issued Government Regulation No.12/2023, which regulates fiscal incentives, including RDTI activities that are carried out at the new capital city. For R&D activity in Nusantara, the government gives a larger additional allowance (up to 350 percent) compared with the PMK 153/2020 super deduction tax (up to 300 percent). However, challenges arise in its implementation because the firms must set their operational base, relocating their equipment and facilities to the new capital before effectively conducting any R&D activity in Nusantara.

The review of the international evidence suggests that targeting by region or legal form yields no benefits. Targeting regions may be flawed because gaps in framework conditions can make policy support unlikely to influence R&D-based innovation and because it may create significant distortions, such as an uneven playing field, which might trigger firms to move their R&D activities to targeted regions. The review of the evidence also suggests that targeting to legal forms can lead to resource misallocation and create an uneven playing field that hampers the dynamics of economic performance.

## FDI, Multinational Enterprises Engaged in R&D, and the Global Minimum Tax

Access to foreign knowledge and technology can be important for hosting countries, particularly if they are engaged in export manufacturing and have the potential for technological catchup. However, a review by the European Union strongly recommends against targeting benefits to large MNEs because they have access to cross-border tax planning and significant access to finance, which can increase their unfair advantage over domestic firms, creating distortions (OECD 2023; O'Sullivan and Gómez 2022).

Empirical analyses confirm that RDTIs play a role in attracting R&D activities to a country, especially in the final stages of location decisions. For the most part, notwithstanding, final

location decisions are driven by economic fundamentals, not by incentives. For example, investors typically favor the availability of scientific knowledge services, the presence of specialized suppliers, the availability of skills, the strength of intellectual property rights, and the access and size of the domestic market, among several other attributes. The general corporate tax rate and the relative presence of similar incentives in alternative hosting locations may also play a role.

However, the effectiveness of RDTI schemes will also depend on the international tax rules that are in place. Tax incentives rolled out in different jurisdictions are subject to competition, raising the risk of a "race to the bottom" among countries that are competing to attract R&D from MNEs linked to FDI. This fact suggests that international coordination is key.

The GMT and tax incentives will put international coordination at the forefront of using RDTIs in the policy toolkit for all countries, including the client countries featured in this case study. The GMT is part of an international agreement reached by 139 countries in 2021 that is designed to prevent the race to the bottom by ensuring that MNEs pay an effective tax rate (ETR) of 15 percent. The GMT will affect countries even if they are not signatories to the agreement. The GMT will primarily affect MNEs. Tax incentives targeted at purely domestic companies will likely be compliant with the GMT.

The GMT presents governments with an opportunity to transition from profit-based incentives (such as tax holidays) to expenditure-based incentives that induce beneficiaries to perform desired activities, such as investing in R&D. In particular, the substance carveout motivates governments to adjust tax incentives to include features that encourage more expenditures on targeted assets and employment, such as R&D activities, and less on open-ended incentives. On one hand, tax holidays, zero corporate tax, and tax-free zones remain largely incompatible with the GMT. On the other hand, tax credits, accelerated depreciation, and loss carryforward provisions remain largely compliant with the GMT.

Some countries, including Indonesia and Viet Nam, have already taken steps to prepare for the rollout and implementation of the GMT. In December 2022, the government of Indonesia issued regulation PP 55/2022, which governs international tax provisions and indicates the intention to implement Base Erosion and Profit Shifting (BEPS) Pillar One and Pillar Two in 2023. The Vietnamese government has also made similar moves through Res 115/NQ-CP, dated 7/28/2023, for implementing BEPS Pillar Two in 2024.

## Increased Participation of Young and Small Firms

In many countries, one criticism of RDTIs is that they tend to benefit larger firms more than smaller ones. That criticism is closely linked to the issue of input additionality because critics argue that large firms would have typically invested in R&D even in the absence of the tax benefits. To increase efficiency, many countries have contemplated introducing policy features that would make their RDTI benefits accrue more proportionally to SMEs. Widespread evidence indicates that

the participation rate of SMEs in RDTIs is lower than that of larger firms. This problem, which has been extensively documented, has several causes, including the inability of SMEs to generate profit in the early years of operation and the high monitoring costs of participation. In addition, the appeal of incentives could be lower for SMEs because they typically are already subject to reduced tax rates. Furthermore, SMEs tend to be less informed and less aware of those schemes. Finally, the application and compliance costs of RDTI schemes are often significantly larger for SMEs because they may have limited internal ways to meet the accounting and reporting requirements that participation in RDTIs demands.

With concerns about low take-up rates among younger and smaller firms so prevalent in developing countries, practitioners have begun to make efforts to entice their participation. In Colombia, during the implementation of the RDTI scheme that was reviewed, the data suggest that the tax benefits favored—and were highly concentrated in—mostly large firms, including state-owned enterprises. Yet these larger beneficiaries typically had the capacity to finance and implement substantive R&D projects and to hire international consultants who can assist them in managing the expensive application procedures.

To promote participation of smaller firms, the Colombian RDTI scheme introduced a preferential quota that, in any given year, sets aside approximately 15 percent of the entire forgone tax revenue for SMEs. Although that proportion is earmarked for SMEs, if it is not used, it can ultimately be reallocated to large firms. However, not differentiating eligibility by firm size does not mean that practitioners should not be proactive in promoting increased participation of smaller (and younger) firms.

The introduction of minimum expenditure provisions in RDTI schemes to reduce the administrative costs for implementing agencies is believed to present the unintended consequence of deterring the participation of young firms and SMEs.

Moreover, interviews conducted with Chilean practitioners suggest that despite the generous tax benefits given to firms investing in R&D, many firms decide not to apply. The review of the Chilean RDTI scheme revealed not only that firm investment in R&D was low but also that firms certified only a fraction of what they had invested in R&D and therefore were only able to claim a limited proportion of the tax incentives being offered. Furthermore, participants disbursed only a fraction of what had been certified. In 2014, only 18 percent of private investment in R&D stemmed from projects that were granted tax benefits.

In Indonesia, the Philippines, and Viet Nam, the reviewed RDTIs generally took a positive list approach, focusing on firms in high-tech sectors and special economic zones. In addition, "pioneer status" incentives seem to have been widely used to attract investment in advanced manufacturing.

For the most part, RDTIs in Korea are broad based, with eligibility criteria covering a wide range of expenditures and activities. However, RDTIs for specific targets are used selectively, and two RDTI schemes are exclusive to SMEs and middle-market enterprises: (1) special taxation for transfer, acquisition, and licensing of technology, and (2) tax exemption for research provided to investigators in research institutes affiliated with SMEs or venture businesses.

Table 3.2 provides information about the former. Details of eligible firms and technologies are prescribed in the law.

**Table 3.2** Special Taxation for Transfer, Acquisition, and Licensing of Technology in Korea

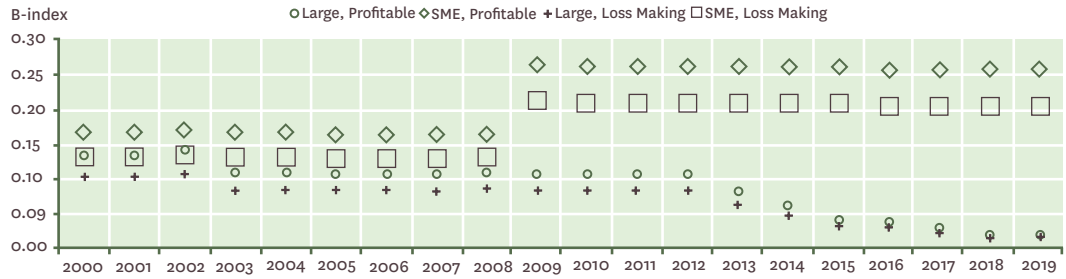
| | Technology Transfer | Technology Acquisition | Technology Licensing |
|---|---|---|---|
| **Flow of Technology** | SME or middle-market enterprises→ Domestic firm | Domestic firm → Domestic firm | SME → Domestic firm |
| **Form of Tax Incentive** | Tax reduction based on income from technology transfer | Tax credit based on expenditures on technology acquisition | Tax reduction based on income from technology licensing |
| **Tax Incentive Rate** | 50% of income from technology transfer | When the technology is acquired by an SME: 10% of the amount of the acquisition<br>When acquired by a non-SME: 5% | 25% of income from technology licensing |

Source: World Bank, based on information valid as of December 2020.

In the case of tax exemption for research, up to an amount not exceeding ₩ 200,000 (approximately US$140) per month is exempt from income tax of researchers in research institutes or departments affiliated with SMEs or venture businesses.

Over the past two decades, Korea has continued to enhance special taxation benefits for SMEs while reducing tax benefits for large firms. A result of such continued efforts for SMEs has been a divergence in tax subsidy rates between large firms and SMEs, as shown in figure 3.2. According to the OECD R&D Tax Incentives database, Korea's implied tax subsidy rate for SMEs was one of the highest among OECD countries, whereas that for large firms was one of the lowest.

**Figure 3.2 Implied Tax Subsidy Rated on R&D Expenditures in Korea, 2000–19**




Source: OECD 2019a.

Note: B-index is defined as the present value of the before-tax income necessary to cover the initial cost of R&D investment and to pay corporate income tax so that it is profitable to perform research activities (OECD 2009).

Countries in the OECD offer more generous terms in RDTIs for SMEs, especially if they are profitable, as shown in the B-index (OECD 2016). Appelt et al. (2016) argue that smaller firms are more responsive than larger firms to R&D tax incentives. This assertion is consistent with the view that SMEs tend to

suffer from market failures and that they are more likely to be credit constrained and lack the means to offer collateral. In addition, the evidence also suggests that knowledge spillovers from large firms tend to exceed those from smaller firms (European Commission 2014).

The risk for distortive incentives from RDTIs that motivate firms to either stay or pretend to be small seem relatively low. In lieu of differentiated tax rates, carryforward provisions—together with direct support measures such as technical assistance and cash refunds—can be offered to younger and smaller firms to help them fully benefit from investment in projects involving research and development.

### Box 3.3 Transferability of Carry-Over Provisions

Transferability provisions enable firms to take advantage of corporate income tax credits and provide firms with more flexibility in their investment decisions. This option is especially important for young firms when cash refunds are not available. In Colombia, the management of the RDTI introduced an incremental credit provision (equivalent to 50 percent of the value of the existing deduction benefit) that allows for transferability of benefits through the securitization of tax credits that exceed 1,000 Unidad de Valor Tributario (UVT) (Col$36 million in 2019). When R&D expenditures exceed Col$36 million, firms are able to apply for and obtain a tax refund title (Títulos de Devolución de Impuesto [TIDI]). The DIAN (National Tax and Customs Directorate of Colombia) endorsed this credit, which earns a "monetary value." The credit is administered through the commercial banking sector. The resulting tax credit can either be used to offset future tax liabilities for a period of several years or be traded among financial institutions or other firms.

The endorsement or certification from the DIAN seemed critical. By using TIDIs as collateral, beneficiaries can access funding from financial institutions. This new benefit will apply only to micro and small enterprises (MSEs).

By the time of the interviews, the program managers were working on defining the carry-over provisions for the tax certificate. In principle, the credit could be used for a maximum period of three years and for a minimum amount of Col$3.

## Negative Tax (Cash Refunds) and Carry-Over Provisions

Innovative firms tend not to make profits in the first years of operation. A "negative tax" option provides firms with cash refunds in case they do not make a profit. In the absence of a "negative tax," young firms cannot benefit from the tax incentive simply because they have no taxable income. The review of the evidence suggests, however, that young and innovative firms, with restricted profit-generating capacity, should be provided with more favorable conditions to lower the barriers of entry into the scheme. Age, rather than size, is a determinant of dynamism in firms (Criscuolo, Gal, and Menon 2014; Haltiwanger, Jarmin, and Miranda 2012). Obtaining finance is especially difficult for young firms because they lack collateral and a track record

that can provide financiers with the requisite level of confidence. Those entry barriers result in overall lower competition and possibly less pressure on incumbents to innovate. Interviewees for this case study confirmed how challenging it has been to encourage the participation of young enterprises with the capacity to bring innovation to the scheme. In Colombia, for example, practitioners estimated that it will take a firm in its early business stages approximately six to seven years to generate income that can be the subject of the tax benefit.

In Viet Nam, the authors found limited mechanisms to promote the participation of small or young firms in RDTI schemes. The expanded investment in 2020 (Law No. 61/2020/QH14) introduced an extended list of beneficiaries eligible for CIT reduction to include young start-ups and intermediaries, such as technology incubators and science and technology business incubators, but the scope of activities applied to technology transfer projects, innovation and creation centers, and R&D centers. Losses may be carried forward to offset taxable income for up to five consecutive years after the year in which the losses are incurred. Although a provision of carry-over of unused benefits is considered good practice, the maximum period of five years is rather short. In addition, the carry-over provision does not distinguish between large, small, or young firms, unlike in countries with well-established RDTI schemes.

In the Philippines, SMEs and young firms are encouraged to apply for available fiscal incentives, not merely RDTI schemes. However, promoting the participation of either SMEs or young firms in RDTI schemes is not an explicit goal. Most notably, the net operating loss carry-over (NOLCO) provision has been limited to only three years, although under certain circumstances, Package 2 of the comprehensive tax reform program (CTRP) allows for an extension of the benefit to five years. Even with a five-year NOLCO provision, the maximum period of five years is relatively short when compared with extension periods in countries with more advanced RDTI systems. Cash refunds and transferability provisions are not available for R&D activities in the Philippines.

In Indonesia, the tax allowance scheme grants two years of tax loss carryforward, and this can be extended up to five years.  Only firms conducting qualifying R&D activities on product development or manufacturing efficiency are defined as eligible. The absence of cash refunds and transferability provisions, together with the lack of incentives promoting R&D collaboration, are features—which were found in all profiled client countries, including Indonesia—suggesting that the country departs from international practice in targeting.

In Korea, preferential provision of carryforward of unused tax benefits for SMEs and young firms is available for up to 10 years. Because young firms typically take considerable time to generate profits, which are necessary to enjoy tax benefits in full, provisions allowing them to carry over tax losses for a predefined period can facilitate their participation in R&D activities. The standard period of carryforward of tax losses is 5 years for most RDTIs, but the law  allows SMEs and middle-market enterprises to carry forward their tax losses for up to 10 years, thereby making the RDTIs more appealing to them. Korea was in the process of extending this period even further by the time of writing of this case study.

Carry-over and cash refund provisions should be incorporated to facilitate the participation of young and innovative firms in RDTI schemes. Countries, like Colombia, have found novel ways to make these refund provisions responsive to young and small firms (box 3.3). The provisions are particularly important for companies that cannot benefit from corporate income tax

incentives because they are not yet generating profits and are cash constrained in their first years of operation. However, introducing these provisions is not always easy, and it will remain susceptible to fiscal rationing. In 2018, CORFO put forward an internal proposal to introduce a cash refund for SMEs equivalent to 35 percent of eligible expenditures for an R&D project, but the proposal was not approved until the time of writing of this note.

## Collaborative R&D

The reviewed studies and the interviews with RDTI managers as part of this case study indicate that collaboration between private firms and research and academic institutions can lead to additional R&D investment. However, the review also points out that the participation of young and smaller firms in the schemes through R&D projects occurs only when compliance costs are low. More connected firms are more innovative (see Nooteboom and Stam 2008). As public research institutes publish at least part of their results, one can argue that the results of cooperation between firms and public research institutes have knowledge spillovers. However, evidence of the effectiveness of tax incentives for R&D collaboration remains scarce (Appelt et al. 2019). For example, a Norwegian collaborative scheme showed substantive results but, on average, lower than similar noncollaborative schemes. In addition, one possible concern is that collaborative partnerships for R&D between firms and research organizations lower potential knowledge spillovers, given that those collaborative partnerships may displace funding for basic research for applied research. Incentives for knowledge sharing can be significantly compromised once private interests are vested in the project.

In the three countries reviewed, the authors found opportunity to improve the potential of R&D links between academia, government, and industry. RDTIs for R&D collaboration are either nonexistent or limited. At the time of the review, Indonesia had introduced engineering, innovation, and technology diffusion collaboration through Government Regulation 35/2007. This regulation allows an entity to form partnerships (through licensing and research services) with universities, research and development institutions, and other business entities to obtain fiscal incentives and technical assistance. In addition, the super deduction incentive allowed an entity to obtain an additional 25 percent tax deduction if it conducted research collaboration with government-owned R&D institutions or higher education institutions. However, since the introduction of those regulations in 2007 and 2020, the level of R&D participation carried out by private sectors and higher education in Indonesia has not experienced a significant improvement. Viet Nam did not use incentives to promote R&D collaboration between public research organizations (PROs); higher education institutions (HEIs), including universities; and firms, which seems to be a potential lost opportunity, considering that findings by the World Bank (2021) and Nguyen (2017) revealed low levels of university–industry collaboration in Viet Nam.

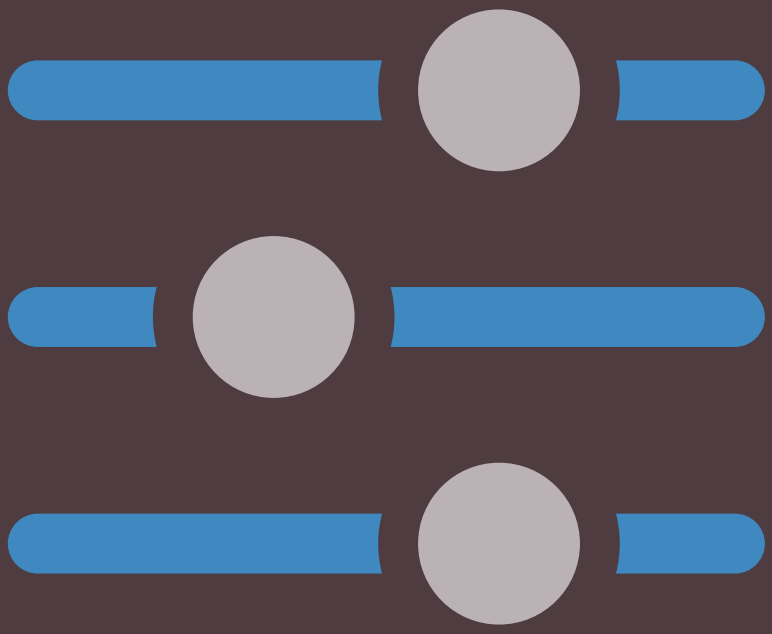
In the Philippines, the Philippine Development Plan (PDP) 2023–2028 highlights the challenge of weak links among stakeholders for advancing innovation. However, existing RDTIs do not promote R&D collaboration, even though strengthening collaboration among government, academia, and industry has been one of the government's innovation policy priorities. Worth noting, the scheme offers additional incentives for the salaries of Filipino researchers and payments to local research organizations, which could lead to long-term behavioral additionality. In addition, the scheme

allows industries willing to locate their operations in university science and technology parks and to participate in academic and research activities at universities to import duty-free items in connection with the joint activities. However, the effectiveness of such incentives appears to be limited. The World Bank (2018) found that the level of university–industry R&D collaboration could be significantly improved and that policies used to support such collaboration were limited.

Korea has tax credit provisions that promote collaboration between firms, HEIs, PROs, and nonprofit organizations. For instance, tax credits are given for expenses incurred in outsourcing R&D services of new "growth engines" and source technologies to any of the institutions specified in the law and expenses incurred in conducting joint R&D with any such institutions. Another scheme, which is based on an act that facilitates collaboration between firms, universities, and research institutes, allows firms and other domestic entities that receive eligible contributions for conducting R&D to exclude the equivalent amount from their gross income in calculating their taxable income for that tax year. In addition, eligible foundations that promote industry–academia cooperation can include their reserve funds in deductible expenses.

More generally, collaboration with R&D institutions may induce more private R&D spending, but adequate institutional conditions and operational mechanisms will need to be in place. Connected firms are prone to be more innovative, and research and academic institutions are likely to generate the strongest externalities. To mitigate the risk of fraud in subcontracted expenditures, authorities may have to certify extramural R&D service providers. In addition, compliance requirements for joint projects with R&D institutions must be simplified to improve take-up rates for SMEs.

# 04



# Management Features of RDTIs

# Monitoring and Evaluation

The findings from several policy reviews indicate that mandatory and systematic collection of high-quality data for conducting rigorous impact evaluations has not been the norm in developing countries. The importance of monitoring and evaluation (M&E) cannot be emphasized enough, especially to assess programs that carry large public expenditures (in the form of forgone revenue), such as RDTI schemes. Without an effective M&E system, policy makers cannot thoroughly understand what works and what does not, which limits their ability to make timely adjustments to existing schemes. International best practices suggest that having a strong legal governance requirement for M&E is crucial to secure high-quality data.

In most of the countries examined, the evidence points to insufficiently robust administrative and monitoring capabilities in implementing agencies and tax authorities. Moreover, the authors' findings from the reviews draw attention to the pervasiveness of coordination problems between the executing agencies and tax authorities in the administration of tax benefits (for instance, in Argentina, Colombia, and Malaysia, among others). Proper monitoring and evaluation can also minimize the risk of abuse and fraud of the scheme (box 4.1).

Most of the interviewees for this case study stated that impact evaluation is one area that especially needs improvement. For example, they suggested that monitoring and evaluation of the Colombian scheme remained a challenge. At the time of the interview, MinCiencias (the Ministry of Science, Technology and Innovation) in Colombia was not able to produce rigorous data or build and maintain a database of beneficiaries and projects. As a result, practitioners may have missed the opportunity to make timely adjustments.

Similarly, in Chile, the lack of reliable data on the R&D projects presented by the beneficiary firms stood out as another impediment to conducting evaluations of their effectiveness. CORFO had a data unit that would monitor and evaluate the effectiveness of tax incentives, including the R&D tax incentive scheme, but at the time of this writing, it had not yet been set up.

The authors in the 2019 Innovation Policy Effectiveness Review (iPER) under the Viet Nam: Science, Technology and Innovation report (World Bank 2021) found no specific M&E system in Viet Nam or the Philippines to track progress in the implementation of RDTIs and to foster learning from implementation. The World Bank's innovation PER has shown that, in Viet Nam, M&E frameworks and systems for innovation policy focused on administrative compliance, although that attribute is not specific to RDTIs. What is more, a report by Oxfam and UN Women (Tuan and Thuan 2016) found that, in Viet Nam, the evidence on the effectiveness of tax incentives overall is scarce. The

incentives regime in the Philippines under the CREATE Act provides for the conducting of impact evaluation on tax incentives to capture the generation of jobs, redistribution of development, higher tax collection, and economic spillover effects, among others. The act mandates investment promotion agencies to submit firm-level and activity-level data to the Fiscal Incentives Review Board. The Indonesian government has put in place administrative and managerial features of evaluation and monitoring of tax incentives, including the R&D incentive, through its annual Tax Expenditure Report. The report tracks tax expenditure based on the type of tax, economic sector, beneficiary subject, and policy objectives.

## Box 4.1 Preventing Fraud and Tax

Mechanisms to prevent fraud are important for RDTI schemes deployed in developing countries. At the beginning of the Chilean scheme, CORFO and the tax authority did not have adequate capabilities to conduct audits for many beneficiaries. The strategy was to require detailed budget disclosures at the time a proposal is submitted. Random audits were conducted on 15 to 20 percent of the selected projects. All approved projects were subject to financial reporting and technical verification of activities. Firms had to submit financial and technical electronic reports by January for any given year.

Because the information is in electronic format, it can be immediately cross-checked with the budget estimates from the original proposal. On the basis of the outcome of this check, CORFO then releases a brief statement of acknowledgment (informe de gastos aceptados). The information is then sent to the tax authority (Servicio de Impuestos Internos) for integrity checks against the tax filing of April of that year.

CORFO is currently working to develop a risk-based assessment to promote smart audits that is expected to reduce the agency's supervision costs. Through this approach, an algorithm will take into consideration key parameters that can be considered risk factors, such as the existence of a previous case (that is, prior errors in claims), the size of the project, and certain expenses. A subsequent field audit in the future will be more selective and targeted.

**The Korean RDTI system relies on three mechanisms of M&E that are designed to cover the entire life cycle of RDTI schemes.**

In Korea, First, ex ante feasibility studies are required in Korea for new RDTI schemes that are expected to incur a tax expenditure of ₩ 30 billion (approximately US$22 million) or more. The special taxation law articulates in detail the requirements of the feasibility studies, including the items that should be evaluated and submission deadlines. The ex ante evaluations cover the necessity, timeliness, expected outcomes, and anticipated challenges of the proposed RDTI scheme. With that information, practitioners would be able to objectively decide whether the proposed RDTI should be introduced. Research institutions specialized in policy evaluation conduct these studies. Such research institutions are designated by the law, and only those recognized by law can perform the feasibility studies.

Second, self-evaluations by relevant ministries are conducted during the implementation of RDTI schemes. The law mandates that line ministries evaluate the effects of their RDTI schemes and submit tax expenditure evaluation reports. These reports cover the effects of tax relief—and the responsible ministry's suggestions regarding whether the RDTI should be retained or not—and are submitted to the Ministry of Economy and Finance (MOEF). In addition, the law vests line ministries with the right to submit tax expenditure proposals to suggest new RDTI schemes with their assessments of the policy effects expected from such tax reduction or exemption, estimated annual revenue effects, and related statistical data. The self-evaluations—which include the tax expenditure evaluation reports and the tax expenditure proposals—are carried out to ensure the responsible management of RDTI schemes by line ministries. The reports and proposals submitted by line ministries to the MOEF are checked for their completeness and integrity by an independent research institute designated by the law.

Third, the primary goal primary goal of the ex post in-depth evaluation is to determine whether an RDTI scheme has achieved its goal and its intended economic impact through a comprehensive analysis. The ex post in-depth evaluation is composed of two categories of evaluation: the mandatory in-depth evaluation and the optional in-depth evaluation. The former is conducted on large-scale RDTI schemes with a tax expenditure of ₩ 30 billion (approximately US$25 million) or more that are reaching the end of their sunset period in that year. The latter is performed on certain RDTI schemes meeting certain conditions that necessitate a comprehensive analysis of effectiveness. As with other M&E instruments, the ex post in-depth evaluation is required by law, which also designates qualified research institutions to perform it. The evaluation is comprehensive in scope and depth, covering the level of goal achievements, economic impact, and effects on income redistribution, among other topics.

Impact evaluations are a must, and they must be planned from the beginning. Programs need adjustments over time, but those adjustments must be based on evidence. Without rigorous evaluations, practitioners will be blind trying to navigate the improvements to be made to the scheme. If those improvements can be embedded in the legal system, then practitioners are more likely to end up obtaining high-quality data. Because RDTIs equate to tax "expenditures" from the perspective of government, they must be planned, implemented, and managed efficiently. A systematic M&E system empowered by legal mandates would enable a deeper understanding of what works and what does not, thereby promoting evidence-based policy making.

## Application and Promotion

Evidence from OECD reviews in 2019 suggests that the main factors explaining the gap between the high level of subsidy rates and comparatively ex post low level of subsidy is the low uptake of RDTIs. This finding reinforces the proposition that, despite generosity matters, the presence (or absence) of complementary design features such as one-stop shops, which reduce the costs of entering, and voluntary compliance facilities, which mitigate the risks of ineligibility, matter meaningfully.

Online applications can improve take-up rates among prospective participants and the efficiency of administrative process. One-stop shops and online applications may contribute to reducing

administrative and compliance costs.

The review undertaken for this case study found that the application process in Colombia was costly because firms must rely on intermediaries who assist applicants in completing the required paperwork and interacting with MinCiencias. However, staff at implementing agencies had begun to take remedial measures and have recently introduced streamlining measures for application procedures. Over the past years, MinCiencias simplified the application process to make it less arduous for firms. The measures include easing requirements and allowing for expenditure-based claims as opposed to project-based claims. For example, claims for tax incentives could be filed against the expenses of hiring staff with advanced university degrees (such as PhDs in STEM fields) without the requirement of embedding these expenses in R&D projects.

In the review of RDTI for Viet Nam as part of this case study, the authors also found no measures that actively help firms make use of the RDTI benefits. Although basic access to information about RDTIs is available online, proactive outreach efforts by implementing agencies targeting communication and promotion to potential beneficiaries through public consultation sessions were missing. To obtain certification from the Ministry of Science and Technology, major RDTI schemes require a large set of documentation from applicants and from approved beneficiaries. The lack of a one-stop platform for applications seems to have increased compliance costs even further.

As in the case of Viet Nam, in the Philippines, deliberate promotion activities to help firms benefit from RDTI schemes were found to be limited. Although the Department of Finance's National Tax Research Center provides information through its website and reports, the information is limited to basic disclosures. Investment promotion agencies (IPAs) conduct regular investment promotion efforts targeted to prospective investors, which inform investors about available tax incentives, including those available for R&D activities. CREATE has simplified the menu of incentives available, adding consistency across all the IPAs. The Fiscal Incentives Review Board (FIRB) provides information to applicants about the menu of incentives on its website and allows firms to register, apply for incentives, and monitor the status of their application through the Fiscal Incentives Registration and Monitoring System (FIRMS). Proponents envision that FIRMS will facilitate the absorption of required information for analysis and monitoring and evaluation.

The Korean case study highlights the importance of actively offering information sessions for target beneficiaries. Every year, the Korean tax authorities organize information sessions for private sector firms, chambers of commerce and industry, business associations, the Korea Federation of SMEs, and others to brief stakeholders about major changes made to RDTIs and to promote participation in the schemes. The MOEF also hosts information sessions with more specific target audiences, such as certified public accountants (CPAs), tax accountants, and other tax professionals. Once industry tax experts acquire information on recent developments concerning RDTIs, they use that information to consult and provide services to firms applying for RDTIs, thereby disseminating relevant RDTI information.

Korea has also developed one-stop-shop information portals to provide comprehensive information on RDTIs. The National Tax Service–operated Hometax and the platform operated by the KOITA are two examples. Hometax, through which firms file their taxes and claim tax benefits, proactively

provides relevant information. For instance, it provides tips for tax savings and other tax filing assistance services to help business taxpayers make effective use of tax incentives. The KOITA's Registration and Management System for Research also provides information. Institutes and Specialized Departments  is an online platform that makes information on RDTIs accessible. Through the system, firms register their research institutes and departments, which is a necessary step to claim certain tax incentives. The platform not only allows registration and management but also provides information related to a wide array of tax incentives that firms can take advantage of.

The Korean government also tries to make public announcements and information packages easily accessible and organized. Led by the MOEF, ministries proactively share RDTI-related information through public announcements on their websites and various other government platforms, such as Government24, BizInfo for SMEs, and SMTECH,  among others. Furthermore, every year, the MOEF publishes a Summary of Tax Law Amendments, which summarizes legal amendments in an easy-to-understand way. Other information sources for corporate taxpayers include the websites of the National Assembly Bill Information, National Law Information Center, and the Ministry of Government Legislation Lawmaking Support Center.

In developing countries, it is common to find firms that are unaware of R&D tax incentives available to them or that do not take advantage of such incentives, even though they are eligible. This fact is especially true in the case of young and smaller firms, which often lack information on RDTIs. Practitioners in the schemes for the developing countries reviewed have recently introduced activities intended to promote more equitable and broad-based participation, actively driving awareness-raising efforts through channels such as social media and business association networks.

## Prequalification of Eligible Expenses

Young firms might be discouraged from applying for a tax incentive when they face uncertainty about compliance costs. Electronic application and a one-stop agency where firms can resolve relevant questions can substantially reduce the administrative burden on governments and the compliance costs for firms. Increasing access to R&D tax incentives for younger and smaller firms requires reducing compliance costs.

In many countries, firms applying for RDTIs cannot be certain about the amount of tax relief they can enjoy until they have conducted R&D and have applied for such tax benefits. Furthermore, if the tax authority concludes that an R&D expenditure is ineligible for the applied tax benefit, the firm can face the risk of increased tax liabilities or a penalty. Offering voluntary compliance measures can partly offset the uncertainty of investing in R&D, and, if combined with technical assistance, it can enable smaller and younger firms to benefit. For instance, CORFO in Chile offers technical assistance to prospective applicants before they submit their project application for tax incentives. That approach has helped build formulation capabilities for innovation projects in firms. By contrast, in some of the international RDTI schemes reviewed, eligible participants claim R&D tax benefits on a self-assessment basis and thus face uncertainty until they receive their application results from the relevant authority. Reports from beneficiaries indicate that application requires the assistance of specialized accountants who can help firms navigate the

complex maze of forms and requirements.

The review of schemes of RDTIs in the Philippines and Viet Nam did not find information on voluntary compliance mechanisms that are open to all companies investing in R&D activities. That result suggests that these countries lack such assistance, which could have helped in reducing the costs of compliance. The notable exceptions are for investors who have registered with investment promotion agencies (IPAs) and who can enjoy IPAs' services. However, IPAs typically respond to general queries on incentives for taxpayers and are not specific to R&D schemes. In the Philippines, for example, taxpayers who have questions regarding eligibility requirements for claiming incentives can request assistance from IPAs overseeing the taxpayers' operations. Those IPAs have dedicated investors' support departments that can answer queries from their registered business entities.

The Indonesian Directorate General of Taxes has a tax extension team in tax office units that provides tax guidance, including assistance on information linked to participating in the RDTI schemes. Taxpayers can write to the Directorate General of Taxes to request an affirmation response regarding specific components of the R&D expenditures that can be fiscally accommodated for the utilization of R&D tax incentives.

The Korean RDTI model offers voluntary compliance mechanisms to reduce uncertainty for younger and smaller firms. To make the process more predictable, the National Tax Service (NTS) of Korea provides voluntary compliance services, whether a firm's R&D activities are either planned or already executed. Once a firm submits a request to the NTS either through Hometax or regular mail with supporting documents, the NTS confirms whether the planned or executed R&D activities are eligible for a certain RDTI scheme. The NTS ruling is authoritative and cannot later be overturned by the tax authorities, thereby reducing compliance risks for the taxpaying firm. A decision from the NTS comes with detailed explanations and references to additional consulting services if needed. Firms that submitted preapplication inquiries and were preapproved by the NTS are exempt from some of the post-application compliance requirements, furthering the simplification.

Voluntary compliance provisions, combined with technical assistance, represent a way to overcome some of the difficulties and enable smaller and young firms to reduce the uncertainty of benefits and participate in the RDTI scheme. Provision of technical assistance to young and smaller firms, as part of their preparation for project design, was identified as a valued feature in the Chilean case. The CORFO in Chile provides technical assistance to prospective applicants before they submit their project application for tax incentives. At the time of writing this report, the management team of the program at CORFO was working on establishing a voluntary certification facility, which will rely on a self-assessment tool that will help prospective firms understand which activities would be eligible for tax benefits. This measure is expected to nurture the project formulation capabilities of Chilean firms.

## Compliance Verification and Reimbursement

Verifying eligible expenditures and assessing compliance are complex and costly tasks requiring specialized skills (Cirera et al. 2020). A failure to address difficulties in verifying eligibility could lead to the potential for fraud—for example, through relabeling and overestimating what constitutes expenditures in R&D. In addition, for young and liquidity-constrained firms, timely access to external finance is crucial for growth. Especially for those firms, the decision time and the reimbursement of the benefit should be as short as possible. Countries such as Argentina and Colombia have introduced carry-over and cash refund provisions with the aim of assisting and encouraging young firms that have not generated profits to participate in RDTI schemes. If the refund decision is routinely made long after the investment has been made, young firms may not respond to the policy at all. Agility in tax benefits allocation and reimbursement is needed to induce private investment in R&D, particularly from financially constrained firms.

The authors' review suggests that Viet Nam's RDTI has elevated compliance costs for its participants. The mechanics of the scheme are burdensome, which may discourage firms from applying, thereby decreasing wide participation. Most of the issues found in Viet Nam pertaining to compliance were also found in the Philippines, where compliance costs were perceived to be high, with a high level of administrative burdens imposed on firms. In terms of the R&D expense deduction scheme, no deduction for R&D expenditures is permitted unless the taxpayer provides sufficient evidence, such as official receipts or other adequate records, showing the amount of the expense being deducted and the direct connection of the expense being deducted to the development, management, operation, and/or conduct of the trade, business, or profession of the taxpayer. The claimed deduction does not require that the taxpayer remit the withholding tax due to Bureau of Internal Revenue (BIR). However, the taxpayer should be ready to present document support if a post-filing audit (or investigation) occurs. In the Philippines, the process for the R&D expense deduction scheme is less complicated because corporate taxpayers file self-assessed returns using the Electronic Filing and Payment System (eFPS) of the BIR. Certain corporate taxpayers not covered by eFPS are required to use electronic BIR Forms (eBIRForms) in filing their tax returns.

Korean policy makers have developed several measures to increase the take-up rate and enhance the accessibility of RDTIs, with the intent of maximizing the spillover effects of RDTIs. As mentioned earlier, Hometax is the national online platform through which firms can file their taxes and claim tax benefits. Because many corporate taxpayers prefer to submit their claims and supporting documents through the platform rather than through mail-in or in-person applications, human intervention is minimized throughout the process. For certain RDTIs, including the tax credits for research and human resources development expenses, firms are required to register their affiliated research centers or departments that specialize in R&D on the Registration and Management System for Research Institutes and Specialized Departments operated by the Korea Industrial Technology Association (KOITA). The law prescribes the requirements that firms must meet for their research centers or departments to be acknowledged. The system is linked with the systems of the NTS, making it convenient to verify eligibility.

As indicated before, a common issue developing countries face when designing and implementing RDTIs is the low take-up rate. For RDTIs to generate the effects that policy makers intended at the planning stage, firms must make use of the tax incentives. Taxpayers often struggle to understand tax incentives, in part because of an overly complicated tax system.

Clear and simple design of schemes and a streamlined document verification process through integrated systems are known to lower compliance costs. To reduce regulatory and administrative costs, especially for young and innovative firms, coordination between executing agencies and tax authorities is critical. Ideally, a single agency (such as the tax administration) should be responsible for conducting all audit activities, but some countries use multiple agencies to either approve or audit the realization of RDTI projects. For instance, according to Articles 7 and 10 of PMK 153/2020, Indonesia requires the involvement of at least two agencies in administering the super deduction RDTI: the Directorate General of Taxes (DGT) and a science and technology agency.

## Predictability of Benefits

Whether or not RDTIs work may depend on the predictability of benefits over time and the stability of the operating conditions. An OECD study (OECD 2019b) suggests that practitioners need to fix the design and the rates for at least five years. Predictability of the policy is crucial for firms to integrate the tax benefit in their R&D investment plans, which can span many years. If a policy instrument is changed frequently and on an irregular basis, tax incentives will not likely be fully considered when firms make their investment decisions. Stability is crucial for inducing private investment in R&D through RDTI schemes, given the intrinsic long-term features of R&D projects. As suggested by the OECD, ensuring predictability for at least five years is crucial for firms to incorporate tax incentives into their R&D investment decisions.

The authors' review suggests that overly frequent modifications to the generosity of the scheme and to the structure and functioning of tax incentive schemes may have created unpredictability in the expected returns on investment for participants, which has likely deterred investments in R&D (for example, in Colombia). The studies that the authors analyzed also point to delays in the approval of tax benefits and reimbursements, when applicable, as common problems in most of the countries reviewed, which compound the issue of unpredictability and deter investments in R&D, especially from young firms and SMEs. According to the interviews held with practitioners from Chile, the long-term projection of an RDTI scheme is a distinctive feature, one that brings a powerful benefit that time-bound direct support cannot deliver. Therefore, RDTIs have been perceived as largely complementary to direct support measures, such as grants. CORFO practitioners went a step further to state that the RDTI scheme has the power to induce behavioral change (behavioral additionality) in firm staff by making a regular habit of investing in R&D, motivating firms to carry out repeated and overlapping projects over time.

The government's long-term commitment to RDTIs is another measure that increases predictability for firms. In Korea, the current RDTI schemes began to take shape in the late 1990s with the enactment of the Restriction of Special Taxation Act and have, up to the present, remained largely consistent in terms of benefits given and eligibility criteria. Given the age and past trends of the RDTI schemes, firms are relatively unconcerned about the possibility of dramatic shifts in

benefits and eligibility criteria and can therefore plan R&D activities with relative certainty. This statement is especially true for SMEs and middle-market enterprises, for which tax benefits have rarely diminished.

A long-term commitment to RDTIs also brings predictability benefits to the government. Budgetary uncertainty is a drawback of RDTIs compared with more direct R&D support measures such as grants and subsidies because the tax expenditures from RDTIs can be large and are hard to predict in advance. In this sense, Korea's long-term commitment to RDTIs contributes to increasing budgetary predictability, thanks to a better understanding of firm behaviors based on accumulated data. The tax authorities and research institutes in Korea have estimated tax expenditures from RDTIs by calculating revenue losses and generating strong predictive models. The country's long-term perspective on RDTIs is also in line with recommended practices, which encourage a minimum commitment of five years (Cirera et al. 2020).

In short, predictability is a critical factor when it comes to RDTIs—for government and beneficiaries. From the government's perspective, managing public resources efficiently by accurately predicting expenditures devoted to RDTIs is important. From the perspective of firms, predictability enables them to plan and execute R&D activities with certainty about the tax benefits that they will be able to receive.

# 05



## Conclusion

Private investments in business R&D continue to be low in general—and significantly lower in developing countries than in frontier countries. Tax incentives are among the most popular instruments that governments in both developing and developed economies employ to induce private investment in R&D. In developing countries, settling on the right design features of RDTIs continues to be an important challenge.

This case study identifies some principles for adapting good international practices for designing RDTIs to the specific features and conditions prevailing in developing countries. With that aim in mind, it explores the existing evidence on the functioning and impacts of RDTI schemes in Korea and in Asian and Latin American countries comparable to Indonesia, the Philippines, and Viet Nam. Practitioners from those countries can take a closer look at RDTI schemes to frame a discussion about the composition of design and implementation features considering the international experience. That information is complemented by detailed information on the operational conditions and functioning of RDTIs in selected countries, stemming from semi-structured interviews conducted with internationally recognized experts and with policy makers responsible for administering those schemes. The policy note also reviews the characteristics and specific features of RDTI schemes in developing countries compared with those prevailing in their OECD peers.

The authors find that OECD good practices ought to be adapted to the supply and demand conditions in the developing countries to provide useful guidelines for designing the organizational and operational aspects of RDTI schemes in those countries. On the basis of the available evidence reviewed and the interviews with RDTI managers and international experts, this study identifies principles for adapting international good practices to the context of developing countries' context in two critical dimensions for designing and managing RDTI schemes.

Nevertheless, one should bear in mind that the available evidence is limited to just a few countries, mainly from Latin America and Asia. Therefore, an important need exists to conduct more in-depth qualitative assessments and impact evaluations of RDTIs in other developing countries. This form of broader analysis could provide the kind of robust evidence needed to assist client countries more solidly when they are designing such incentive schemes.

# Appendices

# Appendix A. Profile of the R&D Tax Schemes in the Philippines, Indonesia, and Viet Nam

## R&D Tax Incentives in the Philippines

The tax incentive system covering R&D in the Philippines is codified in the National Internal Revenue Code (NIRC) of 1997, which was recently amended in 2021 with the passage of the Corporate Recovery and Tax Incentives for Enterprise (CREATE) Law.

Incentives under CREATE can be applied to activities or projects registered with an investment promotion agency (IPA). The approval of the grant of incentives with investment capital of PHP1 billion or less rests with IPAs and of investment capital exceeding PHP 1 billion, with the Fiscal Incentives Review Board (FIRB). On R&D, the law provides for (1) additional deductibility for R&D expenses; (2) longer incentives that include income tax holidays, reduced corporate income tax rates (paid in lieu of all national and local taxes), or additional deductions; and (3) power to the president to grant incentives over an extended period not exceeding 40 years.

An additional deduction from gross income of 100 percent of total R&D expenses is granted for R&D directly related to the registered project or activity eligible for fiscal incentives and limited to expenses incurred for the salaries of Filipino employees and payments to local R&D organizations. CREATE defines R&D in the following way:

Experimental or other related projects or activities:

1. Whose outcome cannot be known or determined in advance on the basis of current knowledge, information, or experience but can only be determined by applying a systematic progression of work:
   a. based on principles of established science; and
   b. proceeds from hypothesis to experiment, observation, and evaluation, and leads to logical conclusions.
2. That are conducted for the purpose of generating new knowledge, including new knowledge in the form of new or improved materials, products, devices, processes, or services.

The specific operational criteria to identify R&D activities are not provided in the law, but its Implementing Rules and Regulations (IRR) point to the Strategic Investment Priority Plan (SIPP), which should contain the terms and conditions on the granting of enhanced deductions. The current version of the SIPP (2022), however, does not provide details about the eligibility of

activities and expenditures for R&D. The established practice for expense deductions requires sufficient evidence, including official receipts, showing the deducted expense and other records showing that such expense is directly related to the trade, business, or profession of the taxpayer. The Bureau of Investments (BOI) is working on the specific guidelines for claiming enhanced deductions, including additional deductions for R&D activities. The guidelines will include the specific documentary and legal requirements that enterprises should show to prove entitlement to the additional deductions, based on the criteria as codified in the law. Once the BOI releases such guidelines, they will be relayed by the BIR in the form of a revenue issuance. At present, the CREATE Act provides a criterion for the deductibility of additional expenses for purposes of availing the enhanced deductions. In particular, the additional deduction for expenditures in R&D activity applies only to research and development directly related to the registered project or activity of the entity and shall be limited to local expenditure incurred for the salaries of Filipino employees and consumables and payments to local research and development organizations.

CREATE offers additional tax incentives for projects or activities identified as Tier III in the SIPP, which contains the government's list of priority projects or activities, scope, and coverage of location and industry tiers, among others. Under the law, Tier III activities shall include (1) R&D resulting in demonstrably significant value-added, higher productivity, improved efficiency breakthroughs in science and health, and high-paying jobs; (2) generation of new knowledge and intellectual property registered and/or licensed in the Philippines; (3) commercialization of patents, industrial designs, copyrights, and utility models owned or co-owned by a registered business enterprise; (4) highly technical manufacturing; or (5) investments that are critical to the structural transformation of the economy and require substantial catch-up efforts. The application for registration of Tier III activities must count with an endorsement of a competent agency and first qualify for registration under Tier I. Worth noting, the criteria did not include references to R&D activity classification criteria used as international practice (OECD 2015).

## The 2022 SIPP classifies R&D activities as Tier III:

Research and development (R&D) and activities adopting advanced digital production technologies of the fourth industrial revolution, such as but not limited to, robotics; artificial intelligence (AI); additive manufacturing; data analytics; digital transformative technologies (e.g. cloud computing services, hyperscalers, data centers, and digital infrastructure); nanotechnology (includes nanoelectronics); biotechnology; production and/or adoption of new hybrid seeds; and other Industry 4.0 technologies.

This language entitles the above activities up to 17 years for export-oriented activities and 12 years for domestic-oriented ones (table A.1). Both export- and domestic-oriented activities in Tier III are entitled to the same number of years of income tax holidays (ITH) but longer by one year for activities or projects outside the National Capital Region (NCR). The law allows for an additional two years of ITH subject to a declaration from the president based on an armed conflict or a major disaster and the issuance of a presidential directive for the implementation of recovery programs of the affected area or areas. Worth clarifying, activities registered before the effectivity of CREATE, or under the incentive system provided under CREATE, that relocate

outside the NCR are entitled to an additional year of ITH after the relocation of operations.

**TABLE A.1** Number of Years of Fiscal Incentives by Location and Tier Classification

| | Tier I | | Tier II | | Tier III | |
|---|---|---|---|---|---|---|
| | ITH | ED/SCIT | ITH | ED/SCIT | ITH | ED/SCIT |
| NCR | 4 | 10 | 5 | 10 | 6 | 10 |
| Metropolitan areas or areas contiguous and adjacent to NCR | 5 | 10 | 6 | 10 | 7 | 10 |
| All other areas | 6 | 10 | 7 | 10 | 7 | 10 |
| NCR | 4 | 5 | 5 | 5 | 6 | 5 |
| Metropolitan areas or areas contiguous and adjacent to NCR | 5 | 5 | 6 | 5 | 7 | 5 |
| All other areas | 6 | 5 | 7 | 5 | 7 | 5 |

Source: CREATE Law.
Note:ED = enhanced deductions; ITH = income tax holiday; NCR = National Capital Region. SCIT = special corporate income tax.

The provisions in the CREATE Act that allow domestic enterprises to avail themselves of the special corporate income tax (SCIT), were vetoed by former President Duterte during his administration. The veto message suggested that SCIT for domestic enterprises was redundant, unnecessary, and weakened fiscal position. Hence, domestic-oriented activities were not to avail themselves of SCIT but only of five years of enhanced deductions (EDs) after the lapse of the ITH period.

After ITH, the eligible activity is entitled to either ED (box A.1) or a reduced SCIT rate of 5 percent of gross income, for a period twice as long for export-oriented activities as for domestic-oriented ones. Although the 2022 SIPP lists R&D in Tier III, specific criteria for eligibility are not stated. In the absence of actionable conditions for eligibility, all applications are currently assessed as Tier I.

## Box A.1 Enhanced Deductions

1. Depreciation allowance of the assets acquired for the entity's production of goods and services
    a. additional 10% for buildings
    b. additional 20% for machineries and equipment;
2. 50% additional deduction on the labor expense incurred in the taxable year;
3. 100% additional deduction on research and development expense incurred in the taxable year;
4. 100% additional deduction on training expense incurred in the taxable year;
5. 50% additional deduction on domestic input expense incurred in the taxable year;
6. 50% additional deduction on power expense incurred in the taxable year;
7. Deduction for reinvestment allowance to manufacturing industry—When a registered manufacturing business enterprise reinvests its undistributed profit or surplus in any of the projects or activities listed in the SIPP, the amount reinvested to a maximum of 50% shall be allowed as a deduction from its taxable income within a period of 5 years from the time of such reinvestment; and
8. Enhanced net operating loss carry-over (NOLCO)—The net operating loss of the registered project or activity during the first 3 years from the start of commercial operation, which had not been previously offset as deduction from gross income, maybe carried over as a deduction from gross income within the next 5 consecutive taxable years immediately following the year of such loss.

Source: Fiscal Incentives Review Board.

CREATE endows the president power to grant ITH for up to eight years, followed by SCIT of 5 percent, when the grant of ITH and SCIT in total does not exceed 40 years, for projects with (1) a "comprehensive sustainable development plan with clear inclusive business approaches, and high level of sophistication and innovation" and (2) at least PHP 50 billion investment capital, or the company is expected to employ 10,000 within three years. In addition, this extraordinary incentive package could include the "utilization of government resources such as land use, water appropriation, power provision, and budgetary support provision." This provision is aimed at attracting a "highly desirable project or a specific industrial activity based on defined development strategies for creating high-value jobs, building new industries to diversify economic activities, and attracting significant foreign and domestic capital or investment." The implementing regulations on the power of the president to grant incentives under Section 301 of the CREATE Act are included in the CREATE IRR in Rule 10 Section 3. The president will exercise this provision based on a recommendation from the FIRB, considering the project has a development plan with inclusive business and innovation, base capital of PHP 50 billion or its equivalent in US dollars, or a minimum direct local employment generation of at least 10,000 within three years from registration. As of the writing of this case study, the FIRB has not yet received a tax incentive application that invokes the president's power pursuant to Section 301 of CREATE.

# Context

CREATE was envisioned to rationalize the fiscal incentives regime in the Philippines by redesigning the incentives scheme to be time bound, performance based, targeted, and transparent. In 2017, the forgone income in tax incentives was estimated at PHP 441 billion (or about 2.8 percent of GDP). The government was able to estimate precisely only the amount of incentives being granted since 2015, after the enactment of the Tax Incentives Management and Transparency Act.

The current administration has recently amended the IRR of CREATE in response to issues raised by investors concerning the value-added tax imposed on indirect exporters—that is, those supplying goods and services to exporters and the difficulty and slow processing of VAT refund claims. CREATE provided for the development and implementation of an electronic sales system that would facilitate faster processing of VAT refunds to minimize, or make negligible, its impact on cashflows. The BIR has released several issuances to streamline and simplify requirements and procedures for filing and processing VAT refunds, such as the Revenue Memorandum Circular No. 71-2023 and Revenue Memorandum Order No. 23-2023. Those issuances reduced the document requirements from 30 to a minimum of 9 and a maximum of 17 documents and eliminated submission requirements for scanned copies of sales invoices or official receipts.

As of 2022, the FIRB reports that 5,632 firms are registered with the different investment promotion agencies. However, data for only 1,517 firms—89 of which are registered under the new regime, and the others in transition—are complete and used in the FIRB's most recent analysis in September 2022. Those data were collected from the reportorial submissions of registered business enterprises (RBEs) and IPAs, as prescribed under the CREATE Act. However, readers should exert caution in the interpretation of the preliminary report because the datasets require further cleaning, validation, and cross-checking vis-a-vis the information contained in databases from other government agencies, such as the BIR and BOC.

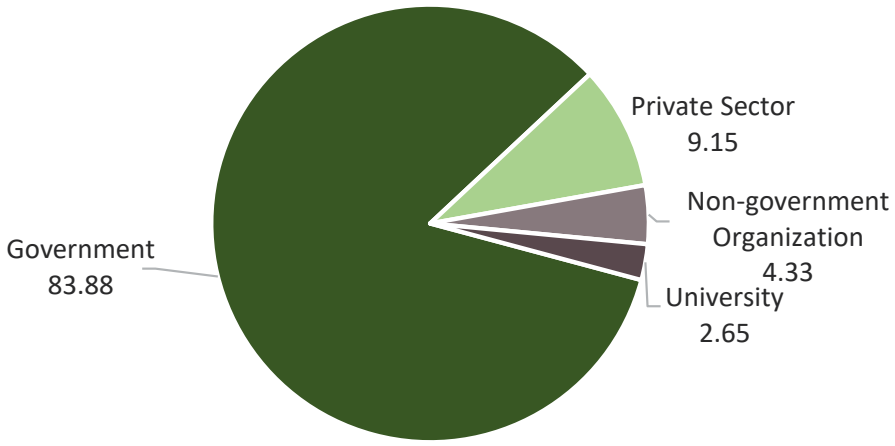
# Distinctive Features

Tax incentives for R&D under CREATE include a combination of cost-based and profit-based incentives, such as tax holidays. Several of those incentives can be applied to activities or projects registered with different agencies, depending on the size of the project registered. Those agencies include investment promotion agencies (IPAs) for investment capital of PHP 1 billion and less and, with the Fiscal Incentives Review Board, for investments more than that amount. The specific criteria to identify R&D activities are not in the law but in its investment plan, which provides a list of promoted areas of investments eligible for government incentives. This approach seems to add flexibility and provide for adjustments, considering that the SIPPs are developed regularly. The schemes offer differentiated incentives to salaries of Filipino researchers and payments to local research organizations. The schemes also offer differentiated incentives presenting a premium for export-oriented over domestic-oriented ones and activities outside the national region.

# R&D Tax Schemes in Indonesia

The Indonesian government issued Government Regulation No. 45/2019 and the Ministry of Finance Regulation No.153/2020 that introduced the super deduction tax. This initiative comes in response to several preceding policy measures falling short in stimulating substantial R&D activity. Since the existence of R&D tax incentives in 1990, the structure of R&D spending in Indonesia has been dominated by the government (figure A.1).

**FIGURE A.1** R&D Expenditure by Actor—Indonesia




Source: Ministry of Education, Science, and Technology of Indonesia.

The Ministry of Finance Regulation 153/2020, as part of the National Science and Technology System policy package, offers a substantial tax deduction up to 300 percent for companies investing in research and development. Those pursuits include activities to produce inventions/innovations, mastering new technologies, and/or for technology transfer to develop/improve the competitiveness of national industries. In addition, Indonesia also is focusing on promoting pioneering manufacturing industry that introduces new technology. Although not promoting R&D activity in particular, the pioneering industry can potentially create innovation and technological spillovers. Tax incentives related to R&D in Indonesia are summarized in table A.2.

**TABLE A.2** R&D and Innovation Related Tax Policy in Indonesia

| No. | Regulation | Description | Type of Incentive |
|---|---|---|---|
| 1 | Minister of Finance Regulation KMK 769/KMK.04/1990 on Tax Treatment of Research and Development Cost Conducted by Enterprise | Tax treatment of R&D divided into three expense categories:<br>a.depreciated/amortized expenses,<br>b.day-to-day business expenses<br>c.consulting fees. | Tax Allowance |
| 2 | Law No. 10/1994 on Income Tax Law | Article 6 (f):<br>Starting from the 1994 Income Tax Law, R&D costs carried out in Indonesia can be deducted for income tax calculation. | Tax Deduction |
| 3 | Government Regulation No. 1/2007 and Government Regulation 52/2011 on Income Tax Facility for Investment in Certain Sector or Area | Article 2:<br>Additional loss carry-over provision for R &D-related cost. | Tax Allowance:<br>GR 1/2007 and GR 52/2011 do not focus on R&D activity in particular as because they were intended to focus on investment. However, the regulation incorporates additional carry-over provision loss if an institution conducts domestic R&D costs in the context of product development or production efficiency of at least 5% of the investment within a period of 5 years. |
| 4 | Government Regulation 35/2007 on Enterprise Income Allocation for Enhancement of Engineering Capacity, Innovation, and Technology Diffusion | Article 5:<br>Introduced engineering, innovation, and technology diffusion collaboration with academia, research institutions, and other private entities through licensing and R&D service.<br><br>Article 6:<br>The right to receive tax, customs, and/or technical assistance for R&D activity as long as it is regulated in the provisions of laws and regulations in the field of taxation and customs. | |

| | | | |
|---|---|---|---|
| 5 | Law 36/2008 on Income Tax Law and Law 7/2021 on Harmonization of Tax Regulations | Article 6:<br>R&D-related costs can reduce taxable income tax. | Tax Allowance:<br>Although not specifically targeting R&D activity, Article 31A of Income Tax Law No. 36/2008 also emphasizes incentives for companies investing in high-priority sectors. The available tax allowances according to Article 31A include the following:<br>a. A reduction in net income of 30% of investments,<br>b. Accelerated depreciation and/or amortization,<br>c. An extended tax loss carryforward no longer than 10 years, and<br>d. A reduced 10% withholding tax rate for dividends (only for Article 26—on dividend income received from Indonesia by foreign taxpayers). |
| 6 | Government Regulation 93/2010 and Minister of Finance Regulation 76/2011 on National Disaster Management Donation, Research and Development Donation, Educational Facilities Donation, Sport Development Donation, and Social Infrastructure Development Cost | Article 1:<br>The right of an entity to deduct research and development donation from gross income. | Tax Deduction:<br>Technical provisions related to Article 6 of Tax Income Law No. 36/2008 to regulate the amount of donations. Before Income Tax Law No. 36/2008, donations could not reduce taxable income tax. Since the 2008 Income Tax Law, several types of donations can be charged to calculate income tax, including donations for R&D activity.<br><br>The amount of the donation value and/or social infrastructure development costs that can be deducted from the gross income is limited to no more than 5% of net income from previous fiscal year (Article 3 of GR No. 93/2010). |

| | | | |
|---|---|---|---|
| 7 | Minister of Finance Regulation PMK 35/2018 and Minister of Finance Regulation 130/2020 on Corporate Income Tax Deduction | Corporate income tax deduction is provided to various pioneer industries that—<br>1.have broad links<br>2.provide added value and high externality<br>3.introduce new technology<br>4.provide strategic value for the national economy | Tax Holiday:<br>Does not promote R&D activity because it is meant to incentivize foreign direct investment.<br>Nevertheless, "pioneering" industries that introduce new technology and provide added value might generate knowledge and innovation spillovers. |
| 8 | Government Regulation 45/2019 and Minister of Finance Regulation PMK 153/2020 on Gross Income Reduction for Certain Research and Development Activities in Indonesia | Super deduction tax up to 300% that is divided into two schemes:<br>1.100% reduction on gross revenue for costs incurred in conducting R&D activities.<br>2.Maximum of 200% additional reductions to gross revenue for accumulated costs incurred to conduct R&D activities that have to meet certain conditions:<br>a.50% for R&D that generates intellectual property (IP) rights in the form of a patent or plant variety protection (PVT) rights registered in the local patent or PVT office,<br>b.25% for R&D that generates IP rights in the form of a patent or PVT rights registered in both local and overseas patent or PVT offices,<br>c.100% for R&D that reaches the commercialization stage, and/or<br>d.25% for R&D that generates IP rights in the form of a patent or PVT rights and/or reaches the commercialization stage and is carried out by collaborating with a government R&D institution and/or higher education institution in Indonesia. | Tax Allowance |

| | | | |
|---|---|---|---|
| 9 | Government Regulation No. 12/2020 on Special Economic Zone (SEZ) Facility | Tax, customs, and excise facility for certain activities, including research and development (Article 3).<br><br>The delivery of Taxable Goods for research and development in Special Economic Zones is not subject to VAT and Sales Tax on Luxury Goods (Article 14). | Tax Allowance:<br>Does not promote R&D activity because it is meant to focus on special economic zones.<br><br>Nevertheless, special economic zones with a robust technology ecosystem might generate knowledge and innovation spillovers. |
| 10 | Government Regulation No. 12/2023 on Providing Business Licensing, Ease of Business, and Investment Facilities for Business Actors in the Capital City of Nusantara | Article 27:<br>Income tax facility reduces gross income for certain research and development activities.<br><br>Article 44(2):<br>Gross income reduction facility is given a maximum of 350% of total R&D activity costs. | Tax Allowance:<br>Does not promote R&D activity because it is meant to focus on attracting investment to build the new capital of Nusantara. (In effect until 2035) |

## Context

The tax incentive to foster R&D in Indonesia has evolved since the early 1990s, when the government issued KMK 769/KMK.04/1990 on the tax treatment of R&D costs. Under that legal framework, R&D costs were identified as costs for product development, in terms of type and quality, and for improving company efficiency, including technology for process development. In the fourth amendment of the Income Tax Law in 2008 (Law 36/2008), the government of Indonesia also stipulates that the cost of R&D that companies carried out in Indonesia can be deducted from gross income. However, Law 36/2008 on income tax does not provide coverage of what activities and costs can be categorized as R&D activities.

Government Regulation No.93/2010 and Ministry of Finance Regulation PMK No.76/2011 regulate R&D donation that can be deducted from gross income. This government regulation explicitly defines the field of arts and culture as a form of research activity. Through Government Regulation No. 52/2011 on Income Tax Facility for Investment in Certain Sector/Region, the government provides additional loss carry-over facilities if companies incur domestic R&D costs in the framework of product development or efficiency of at least 5 percent of the investment within five years. Indonesia also provides import duty exemption for goods and services import related to R&D activity as stipulated in the PMK No. 107/2015 on Income Tax Article 22 Collection.

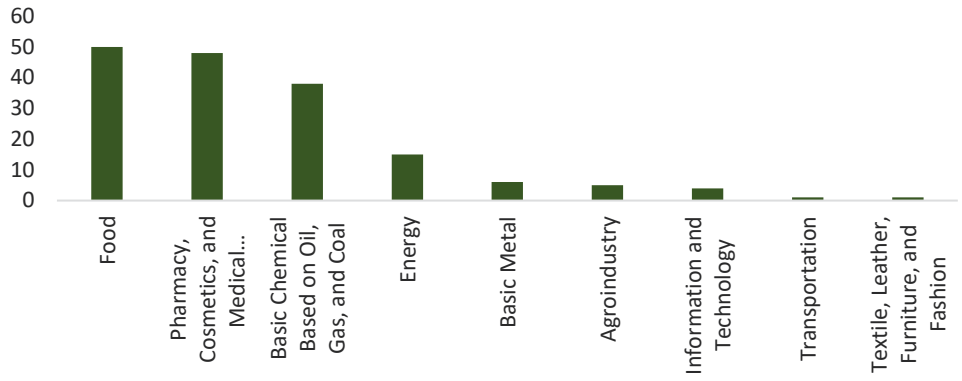
R&D super deductions have been used by various business entities in Indonesia. However, both in terms of the number of beneficiary entities and the monetary value, the scale remains relatively modest.

According to Indonesia's Tax Expenditure Report 2021, 168 R&D proposals have been submitted by 23 business entities, all of which have been granted the research super deduction (Badan Kebijakan Fiskal 2022). The Indonesian Ministry of Finance estimates that the disbursed incentives amount to Indonesian rupiah (Rp) 1.2 trillion (around US$80.8 million), with Rp 5.7 billion (around US$384,000) specifically earmarked for fixed assets. The R&D incentives constitute only 0.40 percent of Indonesia's entire 2021 tax expenditure of Rp 299.12 trillion.

Among the projects benefiting from this super deduction scheme, three research projects were already completed as of September 2022. All the completed projects focused on pharmaceuticals in relation to COVID-19 mitigation efforts. The majority of the submitted R&D proposals are concentrated within sectors such as food, pharmaceuticals (including cosmetics and medical equipment), and basic fuel elements (oil, gas, and coal). Various kinds of companies submitted R&D incentive proposals in 2021, including public and private companies and state-owned enterprises. Among those companies, private companies (including closed corporations) have been the most prolific in submitting research proposals to the ministry, which organizes government affairs in the field of science and technology via an online single submission (OSS) system.

The Ministry of Finance argued that one possible reason for the concentration of R&D super deduction incentives in the pharmaceutical sector was related to the firm's financial capacity to carry out R&D activity during the pandemic. PMK 153/2020 was issued at the height of the COVID-19 pandemic, constraining business activity in certain sectors.

**FIGURE A.2** R&D Tax Incentive Recipient by Research Focus as of September 2022




Source: Fiscal Policy Agency—Ministry of Finance Indonesia, University of Indonesia based on Dimyati, 2021.
Note: Energy includes renewable energy, biomass energy, battery, electrical equipment, and enhanced oil recovery. Basic chemical based on oil, gas, and coal include petrochemical, fertilizer, pesticides, synthetic resins and plastic materials, natural and synthetic rubber, and coal gasification.

Indonesia's super deduction tax tends to be carried out through expanding the intensive margin of R&D, incentivizing firms that have already invested in R&D to increase the level and frequency of their R&D investments. R&D super deduction in Indonesia also has a high level of concentration among groups of large firms. For example, among those submitting proposals for research incentives were several entities such as PT Finusolprima Farma Internasional, PT Bintang Toedjoe, PT Saka Farma Laboratories, PT Sanghiang Perkasa, and PT Global Onkolab Farma, which belong in the same group as subsidiaries of PT Kalbe Farma Tbk. The R&D super deduction policy is also used by the multinational company East West Seed Indonesia. An illustration of the types of companies that have submitted R&D incentive proposals to Indonesia's Directorate General of Taxes at the time of writing this case study are provided in table A.3.

**TABLE A.3** Company Research Focus

| Name | Research Focus |
|---|---|
| PT Chandra Asri Petro-chemical Tbk | Pharmaceuticals |
| PT Kalbe Farma Tbk | Pharmaceuticals |
| PT Finusol Prima Farma Internasional | Agroindustry |
| East West Seed Indonesia | Pharmaceuticals |
| PT Bintang Toedjoe | Textiles, Footwear, and Miscellaneous |
| PT Supernova Fleksible Packaging | Pharmaceuticals |
| PT Saka Farma Laboratories | Pharmaceuticals |
| PT Soho Industri Pharmasi | Pharmaceuticals |
| PT Sanghiang Perkasa | Pharmaceuticals |
| PT Onkolab Farma | Food |
| PT Lautan Natural Krimerindo | Energy |
| PT Pertamina (Persero) | Basic Metal |
| PT Indonesia Asahan Aluminium (Persero) | Aluminum |

Source: Fiscal Policy Agency—Ministry of Finance Indonesia, University of Indonesia, based on Dimyati (2021).

Most companies that applied for R&D incentives are concentrated in Java Island due to adequate infrastructure for research activities and because R&D activities are primarily conducted at the headquarters (HQ), which are predominantly situated in Java Island. Distribution of investment and infrastructure development throughout regions in Indonesia became a primary inquiry to stimulate R&D activities outside Java Island.

Amid efforts in relocating its capital from Jakarta to Nusantara in Kalimantan, Indonesia issued Government Regulation No.12/2023, which regulates a bundle of fiscal incentives, including for R&D activities that are carried out at the new capital city until 2035. For any R&D activity in Nusantara, the government gives a larger additional allowance (up to 350 percent) compared with the PMK 153/2020 super deduction tax (up to 300 percent). However, challenges arise in its implementation because the firms should set their operational base, relocating their equipment and facilities to the new capital before effectively conducting any R&D activity in Nusantara.

## Distinctive Features

Indonesia's approach to RDTIs is multifaceted, incorporating various features, including cost-based and profit-based incentives, a volume-based scheme, sector-specific preferences, and conditions for collaborative R&D efforts. First, cost-based incentives are provided, for which taxpayers must meet certain criteria to qualify for tax benefits. The super deduction incentive is one example, requiring taxpayers to provide evidence of specific expenditures in R&D activities. Furthermore, the profit-based incentive strategy (tax holiday), in accordance with Ministry of Finance Regulation PMK 35/2018, facilitates a reduction of corporate income tax (CIT) for industries classified as pioneers.

Second, Indonesia employs a volume-based scheme, applied uniformly to all eligible R&D expenditures. The rationale behind this strategy is its administrative simplicity and ease of application.

Third, Indonesia's R&D tax incentives are generally carried out to encourage manufacturing activities and pioneer industries without providing preferences for SMEs. For example, the super deduction in Indonesia is granted with a positive list limited to 11 priority sectors, ranging from food and pharmaceuticals to defense and security. Those priority sectors limit the scope of R&D activities that can be incentivized in Indonesia only to manufacturing interests. In addition, Indonesia does not provide specific incentives for researchers who engage in R&D activity. Evidence of that fact is visible in the lack of medium- to small-scale companies among those applying for super deduction proposals. Some R&D super deduction incentive proposals are even submitted by several pharmaceutical companies that are part of one group.

The fourth feature of Indonesia's R&D tax incentive strategy revolves around fostering a collaborative triple-helix R&D culture among the government, academic institutions, and private entities. As per Article 5 of Government Regulation 35/2007, entities are allowed to form engineering, innovation, and technology diffusion partnerships with universities, research and development institutions, and other businesses. Article 2 of the super deduction policy stipulates additional tax deductions if an entity collaborates with a government-owned R&D institution or a higher education institution in Indonesia. Worth noting, collaboration should not translate to cronyism. Jia and Ma (2017) mentioned that government intervention could undermine the role of tax incentives in motivating corporate R&D. They further suggest that tax incentives have a stronger impact on private firms without political connections, implying that reducing political intervention would enhance the effectiveness of tax incentives in fostering R&D for firms in developing countries.

In addition, Indonesia has administrative and managerial features of evaluation and monitoring of tax incentives, including the R&D incentive, through its annual tax expenditure report. The report tracks tax expenditure on the basis of the type of tax, economic sector, beneficiary subject, and policy objectives. Despite those fiscal incentive strategies, Indonesia needs to implement a comprehensive nonfiscal policy mix to further spur R&D activity. The absence of a strong intellectual property (IP) framework may be deterring investment R&D. A study by Aswicahyono and Rafitrandi (2020) revealed that 20.32 percent

of surveyed companies preferred governmental protection assistance over fiscal incentives (preferred by only 6.57 percent of companies), emphasizing the importance of improving the whole R&D ecosystem in Indonesia.

## R&D Tax Schemes in Viet Nam

In Viet Nam, qualified high-tech entities can benefit from a preferential corporate income tax rate of 10 percent for a period of 15 years. This preferential rate can be extended up to 30 years with approval from the prime minister. In addition, those entities may enjoy a four-year corporate income tax exemption, followed by a 50 percent reduction in the tax base for the subsequent nine years.

In addition to income tax reduction and exemption, Viet Nam allows companies to create a specific fund using up to 10 percent of their annual taxable income as a finance source for investing in scientific research and technological development activities, as stipulated in Circular No. 15/2011/TT-BTC (KPMG 2023). A summary of those incentives is provided in table A.4.

**TABLE A.4** R&D Tax Incentive Schemes in Viet Nam

| Type of Incentives | Definition |
|---|---|
| Corporate Income Tax | Regulations related to high-tech activities in Viet Nam encompass various decrees, laws, and decisions that provide incentives to promote investment in scientific research, technological development, and innovation centers. These regulations include the following:<br>1. Decree 218/2013/ND-CP: Stipulates a reduced corporate tax rate of 10 percent for 15 years (extendable to 30 years with the prime minister's approval) for investment projects in scientific research, technological development, and the high-tech sector. It applies from the first year of the investment project generating revenue. In addition, companies are eligible for four years of corporate income tax (CIT) exemption and nine years of 50 percent CIT deduction starting from the first year of profitability.<br>2. Law No. 61/2020/QH14: Focuses on CIT reduction for projects related to establishing or expanding innovation centers and R&D centers. The incentive provides a maximum of 6 years of tax exemption and an additional 13 years of 50 percent CIT reduction. To qualify, the project must have total investment capital of at least VND3,000 billion and disburse at least VND1 trillion within three years from the issuance date of the investment registration certificate.<br>3.Decision 29/2021/QD-TTg: Offers incentives for new investment projects in innovation centers and R&D centers. Three different schemes are available based on selected criteria:<br>a. A preferential tax rate of 9 percent is applied for 30 years on earned income. |

| | |
|---|---|
| | b. A preferential tax rate of 7 percent is applied for 33 years on earned income.<br>c. A preferential tax rate of 5 percent is applied for 37 years on earned income. |
| VAT | Law No. 13/2008/QH12:<br>1. Reduced VAT Rate:<br>A 5 percent VAT rate may be applied to scientific and technological services.<br>2. VAT exemption:<br>Machinery, equipment, and materials that are not yet able to be manufactured in Viet Nam and are imported for scientific research and technology development are considered nontaxable objects. |
| Import Duty | Circular No.38/2015/TT-BTC:<br>An import duty exemption is applicable on imported goods for scientific research and certain goods that cannot be domestically manufactured. |
| Land Incentives | 1. Decree 46/2014/ND-CP:<br>The exemption and reduction rate of land lease fee depends on the location of the investment project. Entire exemption can be delivered if the R&D project is fulfilling the following conditions:<br>a.land used for building laboratories<br>b.technology incubators and business incubators<br>c.experimental establishments and experimental production establishments<br>2. Decision 29/2021/QD-TTg: Gives incentives for land and water surface rent exemption that is delivered into three different schemes:<br>a.18 years exemption and 55 percent rent reduction for the remaining period<br>b.20 years exemption and 65 percent rent reduction for the remaining period<br>c.22 years exemption and 75 percent rent reduction for the remaining period<br>3. Hi-Tech Park Incentive:<br>a.Decree No. 04/2018/ND-CP on incentive mechanisms and policies for the Da Nang Hi-Tech Park<br>b.Decree No.74/2017/ND-CP on provision for specific policies on Hoa Lac Hi-Tech Park |
| Stamp Duty | A stamp duty exemption applies when registering for a land use right and house ownership for an R&D project. |

Sources: Deloitte 2020; EY 2020; Grant Thornton; Thư Viện Pháp Luật.

# Context

The Vietnamese government has recognized the importance of research and development (R&D) activities in creating a high-value-added economy since the late 1980s, coinciding with the emergence of economic reforms known as Đổi Mới. To encourage foreign investment in R&D, Law No. 04-HDNN8 on foreign investment was introduced in 1987, providing tax incentives for foreign entities that contribute prescribed capital in patents, technical know-how, technological processes, and technical services. Those entities could be exempt from profits tax for a maximum period of two years. The expansion allows more companies, particularly technology start-ups, to access those incentives.

In recent years, Viet Nam has seen growing interest from leading multinational high-tech companies to establish and expand their R&D centers and manufacturing facilities in the country. Notably, Samsung launched its regional R&D center in Hanoi in December 2022 (Quy 2022). In addition, Qualcomm announced its first Southeast Asia R&D center, focusing on 4G/5G wireless technologies and the internet of things (IoT), also located in Hanoi (Minh 2020). LG opened its second R&D center in Da Nang and has plans to expand its electric vehicle (EV) R&D operation (Viet Nam News Agency 2023). These developments highlight the growing presence of multinational high-tech companies in Viet Nam, with significant investments and the establishment of R&D centers that foster R&D activity in the country through Viet Nam's high-tech park model. Among many R&D tax incentive schemes in Viet Nam, the authors estimate that the corporate income tax scheme offering a preferential rate of 10 percent for 15 years to high-tech firms accounted for the highest value of forgone tax revenue in 2018 (World Bank 2021).

Participation in the high-tech park incentive scheme has also been significant. For example, the Saigon Hi-Tech Park, which was established in 2002, has attracted more than US$12 billion in domestic and foreign investment, with approximately 60 percent of projects focusing on research and development and high-tech manufacturing (Viet Nam News Agency 2021). The park is home to multiple multinational corporations, such as Intel, Nidec, Samsung, Nipro, and NTT (Nippon Telegraph and Telephone). Da Nang Hi-Tech Park, established in 2010, has attracted 515 projects, including 128 foreign-invested projects, with registered capital of nearly US$2 billion, and 387 domestic projects, with registered capital of US$1.3 billion (Van and Duc 2023). In 2022 alone, the park attracted four foreign direct investment (FDI)-related investments worth US$65.34 million, along with 21 domestic investments worth US$168.53 million.

# Distinctive Features

The focus of R&D tax incentive schemes in Viet Nam is primarily on promoting high-tech sector manufacturing rather than directly fostering R&D activities. The tax incentives include corporate income tax reduction, VAT exemption, import duties exemption, and land fees exemption. It is applicable on the basis of the company's operating area, such as hi-tech parks, or the nature of its activities, such as scientific research and technology development or projects using new or high technology. Those incentives are available to both large and small enterprises without any distinction based on company size. Net operating losses, if any, can be carried forward for a maximum period of five years from the year following the year in which the losses arise, whereas carryforward of losses is not allowed.

To qualify for the incentives, companies must obtain a registration certificate of scientific research activities from a state management agency, fulfilling specific requirements such as being a high-tech enterprise, having R&D expenses, and maintaining a certain proportion of R&D employees (Deloitte 2020; EY 2020). In 2020, Viet Nam introduced the Law on Investment (Law No. 61/2020/QH14), which expanded the scope of corporate income tax (CIT) reduction compared with the previous investment law in 2014. The new law extended the list of beneficiaries eligible for CIT reduction to include priority technology transfer projects, technology incubators, science and technology business incubators, innovative start-ups, innovation and creation centers, and R&D centers (Deloitte 2020).

Those broad-range schemes show that Viet Nam's approach to delivering R&D tax incentives incorporates various features, including profit-based incentives, volume-based schemes, and sector-specific preferences, amplified by its high-tech park model. Although Viet Nam's high-tech park scheme primarily focuses on attracting high-tech investment and manufacturing rather than directly stimulating R&D activity, it can potentially generate knowledge and innovation spillover effect. Hoa Lac Hi-Tech Park—Viet Nam's first high-tech park, which was established in 1998—has successfully attracted more than 100 investment projects with total registered capital of US$3.8 billion (Phong 2022). The park has attracted major enterprises and corporations from around the world, including two projects by Nidec Group for research, development, production, and sales of high-performance thermal modules and a project by Hanwha AeroSpace for manufacturing parts and components for aircraft engines and industrial gas turbine engines (Nhân Dân 2022).

Table A.5 provides a simple comparison of RDTI schemes across the Republic of Korea, Indonesia, Viet Nam, and the Philippines.

**TABLE A.5** RDTI Features Comparison

| Features | Korea, Rep. | Indonesia | Viet Nam | Philippines |
|---|---|---|---|---|
| Existing Tax Incentives | Tax credit | 1.Reduced tax rates/preferable tax rates<br>2.Accelerated depreciation on R&D assets<br>3.Tax allowance, particularly the super deduction incentive<br>4.Tax holiday | 1.Tax credits<br>2.Loans<br>3.Reduced tax rates/preferable tax rates<br>4.Accelerated depreciation on R&D assets<br>5.Infrastructure/ land preferential price<br>6.Tax exemptions<br>7.Financial support<br>8.Tax holiday | 1.Reduced tax rates/preferable tax rates<br>2.Tax deduction<br>3.Tax exemptions<br>4.Tax holiday |

| | | | | |
|---|---|---|---|---|
| Volume vs. Incremental Design | Volume and incremental based | Volume based | Volume based | Volume based |
| Income- vs. Cost-Based Incentives | Cost and income based | Cost based | Cost based | Cost based |
| Targeting | | 11 priority sectors | FDI focus, particularly on high-tech sectors | SIPP |
| Increased Participation of Young and Small Firms | Some RDTI schemes that are exclusive for SMEs and middle-market enterprises | Does not give any specific preference to SMEs | No preference for SMEs; however, incentives provided for start-ups within high-tech sector | No preference for SMEs, but extraordinary incentives for firms with more than PHP50 billion investment |
| Negative Tax (Cash Refunds) and Carry-Over Provisions | 10 years preferential carryforward provision for SMEs and young firms | Does not provide cash refunds<br><br>5 years carry-over provision with additional years, depend on condition met | Does not provide cash refunds<br><br>5 years maximum carry-over provision | Does not provide cash refunds<br><br>5 years maximum carry-over provision |
| Collaborative R&D | Tax credit provisions for institutions that collaborate with others (firms, universities, public organizations, PROs, and nonprofit organizations). | Additional 25% tax deduction for firms that collaborate with the government or research institutions | None | None |

Sources: EY 2022; Indonesia Ministry of Finance; Thư Viện Pháp Luật.
Note: PRO = public research organization.

# Appendix B. Evidence of the Effectiveness of R&D Tax Incentives in Comparator Developing Countries

### B.1. Selection of Comparator Countries

To select peer countries to compare the features of RDTIs in the client countries, the following four criteria were employed: (1) economic characteristics, proxied by GDP and GDP per capita adjusted by purchasing power parity (PPP)-adjusted US dollars; (2) overall efficiency of the tax system, proxied by the country's position in the "ease of paying taxes" ranking of the 2019 Doing Business guide (World Bank 2019); (3) an R&D fiscal incentive framework for the purpose of selecting countries with RDTIs that share common features with the client countries' RDTIs; and (4) the availability of information, particularly impact evaluation studies or qualitative assessments of RDTIs carried out either independently or by the government. The selection of comparator countries was informed not only by desk research but by information obtained from in-depth, semi-structured interviews with policy makers and international tax experts.

The six comparator countries selected are Argentina, Chile, Colombia, Malaysia, Mexico, and China. Considerable heterogeneity exists even among the client countries, and in selecting peer countries, the authors made a substantial effort to reflect such diversity. When it comes to the economic characteristics of the comparator countries vis-à-vis the client countries, the comparator countries display a higher level of development, proxied by PPP-adjusted GDP per capita. Yet the comparator countries—except for Malaysia—exhibit similar levels of R&D investment as a percentage of GDP. In addition, the economies of the comparator countries—proxied by PPP-adjusted GDP—are comparable in size to those of the client countries. Finally, the low levels of efficiency in the tax systems of the comparator countries are like the levels in the client countries.

Similarities exist between the RDTI schemes of the comparator countries and those of the client countries. Table B.1 shows some of the common features—in particular, accelerated depreciation on R&D assets (Argentina and Chile), reduced tax rates and preferable tax rates (Argentina), tax deduction (Chile and Malaysia), tax exemptions (Argentina and Malaysia), and tax holiday and allowance (Malaysia).

**TABLE B.1** RDTI Schemes in Comparator Countries

| Country | Existing Tax Incentive |
|---|---|
| Argentina | • Accelerated depreciation on R&D assets<br>• Refunded tax benefits<br>• Reduced social security contributions<br>• Reduced/preferable tax rates<br>• Tax credits<br>• Tax exemptions<br>• VAT reimbursement |
| Chile | • Accelerated depreciation on R&D assets<br>• Refunded tax benefits<br>• Tax credits<br>• Tax deduction<br>• Tax credits<br>• VAT reimbursement |
| China | • Tax credits<br>• Refunded tax benefits<br>• Tax allowance<br>• Tax deduction |
| Colombia | • Tax credits<br>• VAT reimbursement |
| Mexico | • Tax credits |
| Malaysia | • Refunded tax benefits<br>• Tax allowance<br>• Tax deduction<br>• Tax exemptions<br>• Tax holiday |

Source: World Bank, based on EY (2020).

# B.2. Findings from the Available Evidence in Comparator Countries

Table B.2 presents key findings from the available evidence in five of the comparator countries, organized along the three dimensions of the STO (scope, targeting, and organization) framework. The findings provide valuable insights into key principles of good practice

**TABLE B.2** Synthesis of Findings From Evidence Available in the Comparator Countries

| Country | Studies | Scope and Effectiveness | Targeting | Organization |
|---|---|---|---|---|
| **Argentina** | Giuliodori and Giuliodori (2012) | · Positive effects on R&D expenditures and firm outcomes<br>· Project-based incentives may induce R&D with high social returns but also high compliance costs | · Tax incentives were more effective at inducing R&D expenditures into low-technology sectors and in mature and large firms | · Budgets must reflect the fiscal costs of tax incentives with transparent criteria<br>· Solid evaluation and monitoring capabilities are crucial |
| **Chile** | Intellis (2017); Ministry of Economy (2016) | · Mixed effects of tax incentives on R&D investment<br>· No robust evidence on the generosity of tax incentives | · Low take-up rate for SMEs<br>· No robust heterogeneous effects across types of firms or sectors | · Cumbersome compliance and monitoring procedures<br>· Inadequate coordination with other fiscal incentives |
| **China** | Wang and Kesan (2020); Chen et al. (2018); Cai, Chen, and Wang (2018) | · Positive effects of the RDTI for the corporate income tax (CIT) incentive on R&D private expenditures and outcomes (for example, patents per employee); no conclusive evidence on the impacts of the VAT benefit | · Positive effects of CIT incentive on R&D expenditures and outcomes for SMEs in the software and integrated circuit industries | · Targeted tax credits were effective for inducing R&D investment by SMEs in some sectors in the absence of strong intellectual property right regimes |

| | | | | |
|---|---|---|---|---|
| | | · Positive effects of 2008 CIT reform on R&D inputs and outputs, yet relabeling of expenditures accounts for one-third of those effects | · Larger effects of the 2008 RDTI reform on medium and large firms' R&D intensity and productivity<br>· Larger R&D effects of tax incentives on financially constrained firms | · Focusing monitoring efforts on fewer firms could raise the costs of relabeling and incentivize real R&D at a lower fiscal cost |
| **Colombia** | Mercer-Blackman (2005), Parra-Torrado (2013) | · Positive effects on R&D expenditures and firm outcomes<br>· Mandatory collaboration with R&D institutions may raise compliance costs for SMEs and young firms | · Low take-up rates among SMEs due to lack of profits and burdensome compliance costs<br>· Tax incentives induced more private R&D investment in SMEs | · Interagency collaboration is crucial for reducing compliance and administrative costs<br>· Frequent changes in tax incentives may hinder long-term R&D investments |
| **Mexico** | Calderon Madrid (2009) | · Positive effects of incentives on R&D<br>· Access to research grants increases the effectiveness of tax incentives in inducing private R&D investment | · Low take-up rates among SMEs and young firms | · Available data for conducting impact evaluations need to be improved |

Source: World Bank.

# References

# References


Akcigit, Ufuk, and Stefanie Stantcheva. 2020. "Taxation and Innovation: What Do We Know?" NBER Working Paper No. w27109, National Bureau of Economic Research, Cambridge, MA.

Andersen, Maria R., Benjamin R. Kett, and Erik von Uexkull. 2017. "Corporate Tax Incentives and FDI in Developing Countries." In Global Investment Competitiveness Report 2017/2018: Foreign Investor Perspectives and Policy Implications. Washington, DC: World Bank.

Appelt, Silvia, Matej Bajgar, Chiara Criscuolo, and Fernando Galindo-Rueda. 2016. "R&D Tax Incentives: Evidence on Design, Incidence and Impacts." OECD Science, Technology and Industry Policy Paper No. 32, OECD Publishing, Paris.

Aswicahyono, Haryo, and Dandy Rafitrandi. 2020. "Emerging Technology in Indonesia's Manufacturing Sector." Centre for Strategic and International Studies Working Paper, CSIS Indonesia, Jakarta.

Badan Kebijakan Fiskal. 2022. Tax Expenditure Report 2021. Jakarta: Kementerian Keuangan.

Bloom, Nicholas, John Van Reenen, and Heidi Williams. 2019. "A Toolkit of Policies to Promote Innovation." Journal of Economic Perspectives 33 (3): 163–84.

Bravo-Biosca, Albert, Chiara Criscuolo, and Carlo Menon. 2013. "What Drives the Dynamics of Business Growth?" OECD Science, Technology and Industry Policy Paper No. 1, OECD Publishing, Paris.

Cai, Jing, Yuyu Chen, and Xuan Wang. 2018. "The Impact of Corporate Taxes on Firm Innovation: Evidence from the Corporate Tax Collection Reform in China." NBER Working Paper No. 25146, National Bureau of Economic Research, Cambridge, MA. DOI: 10.3386/w25146.

Calderón Madrid, Angel. 2009. Evaluación del Programa de Estímulos Fiscales al Gasto en Investigación y

Desarrollo de Tecnología de las Empresas Privadas en México (EFIDT). El Colegio de México.

Camil, Mohammad Rinaldi, Nur Huda, and Fildza Malifa Setiabudi. 2019. Potensi Pendanaan Riset Berorientasi Kebijakan di Sektor Swasta [Potential for Funding Policy-Oriented Research in the Private Sector]. Jakarta: Kementerian PPN/Bappenas.

Chen, Zhao, Zhikuo Liu, Juan Carlos Suárez Serrato, and Yi Xu. 2018. "Notching R&D Investment with Corporate Income

Tax Cuts in China." NBER Working Paper No. 24749, National Bureau of Economic Research, Cambridge, MA.

Chittenden, Frances, and Mohsen Derregia. 2010. "The Role of Tax Incentives in Capital Investment and R&D Decisions." Environment and Planning C Government and Policy 28 (2): 241–56.

Cirera, Xavier, Jaime Frias, Justin Hill, and Yanchao Li. 2020. "A Practitioner's Guide to Innovation Policy: Instruments to Build Firm Capabilities and Accelerate Technological Catch-Up in Developing Countries." Working paper, World Bank, Washington, DC.

Cirera, Xavier, and William F. Maloney. 2017. The Innovation Paradox: Developing-Country Capabilities and the Unrealized Promise of Technological Catch-Up. Washington, DC: World Bank.

Correa, Paulo, and Irem Guceri. 2013. "Tax Incentives for Research and Development." Innovation, Technology & Entrepreneurship Global Practice Policy Note, World Bank, Washington, DC.

Criscuolo, Chiara. 2009. "The effect of R&D tax incentives on location of R&D investment." Centre for Economic Performance, London School of Economics, and OECD.

Korea National Law and Information System. 2017. National Tax Law Information System (국세법령정보시스템).
KPMG. 2023. Global R&D Incentives Guide.

Lokshin, B. and Mohnen, P., 2012. How effective are level-based R&D tax credits? Evidence from the Netherlands. Applied Economics, 44(12), pp.1527-1538.

Mercer-Blackman, Valerie. 2005. Estudio Sobre la Evaluación del Impacto de los Incentivos Tributarios Otorgados para la Ciencia, Tecnología e Innovación [Study on the Evaluation of the Impact of Tax Incentives Granted for Science, Technology and Innovation]. Bogotá DC: Fedesarrollo.

Minh, Nhat. 2020. "Qualcomm Establishes R&D Center in Hanoi, First in SE Asia." Hanoi Times, June 23.

Ministerio de Economia, Fomento y Turismo (Ministry of Economy, Development and Tourism). 2016. Efectividad de la Ley de Incentivo Tributario a la I+D basada en B-Index [Effectiveness of the Tax Incentive Law for R+D based on B-Index]. Santiago, Chile: División de Innovación con apoyo de la División de Política Comercial e Industrial [Innovation Division Supported by the Trade and Industrial Policy Division].

Mohnen, Pierre, and Jocelyn Olivari. 2013. "Estudio Realizado para el Ministerio de Economía de Chile, División de Innovación" [Study Conducted for the Ministry of Economy of Chile, Innovation Division]. UNU-MERIT, Maastricht, Netherlands.
National Assembly Budget Office (NABO). 2018. Analysis of Tax Expenditure Proposal for 2019. [2019년도 조세지출예산서 분석].

Nguyen, Hong Van. 2017. "Tax Incentive Policies and Private Sector's Investments for R&D and Innovations in Vietnam." Master's thesis in public policy and financial management, University of Tampere, Finland.

Nhân Dân. 2022. "Many Large Corporations Come to Hoa Lac Hi-Tech Park." Nhân Dân, March 4, 2022. Retrieved from

Noh, Meansun, and Sam Youl Lee. 2014. "Improving Tax Support Systems on R&D." Innovation Studies [한국혁신학회지] 9 (2) (December): 49–76.
Nooteboom, Bart, and Erik Stam. 2008. Micro-Foundations for Innovation Policy. Amsterdam:
Netherlands: Amsterdam University Press.

OECD (Organisation for Economic Co-operation and Development). 2009. "Tax Treatment of R&D." In OECD Science, Technology and Industry Scoreboard 2009. Paris: OECD Publishing.

OECD. 2015. Frascati Manual 2015: Guidelines for Collecting and Reporting Data on Research and Experimental Development. The Measurement of Scientific, Technological and Innovation Activities. Paris: OECD Publishing.

OECD. 2016. "Fiscal Incentives for R&D and Innovation in a Diverse World." Chapter 3 in Business and Finance Outlook 2016. Paris: OECD Publishing.

OECD. 2019a. "Compendium of R&D Tax Incentive Schemes: OECD Countries and Selected Economies." Paris: OECD Publishing.

OECD. 2019b. "R&D Tax Incentives: Korea, 2018." OECD Directorate for Science, Technology and Innovation.

OECD. 2020a. "Measuring Tax Support for R&D and Innovation."

OECD. 2020b. "R&D before the COVID-19 Crisis: Final Estimates of R&D Performance in 2019." OECD Main Science and Technology Indicators. Last updated September 2021.

OECD. 2023. "Minimum Tax Implementation Handbook (Pillar Two)."
OECD CIIE (Committee on Industry, Innovation and Entrepreneurship) and CSTP (Committee for Scientific and Technological Policy). 2016. R&D Tax Incentives: Design and Evidence. Directorate for Science, Technology and Innovation. DSTI/IND/STP(2016)1. Paris: OECD Publishing.

O'Sullivan, David, and Ana Cebreiro Gómez. 2022. "The Global Minimum Tax: From Agreement to Implementation - Policy Considerations, Implementation Options, and Next Steps." Equitable Growth, Finance & Institutions Insight, World Bank, Washington, DC.

Parra Torrado, Monica. 2013. Exenciones Fiscales para la I+D+I Experiencias en América Latina Y Retos Pendientes. Evaluación del Caso Colombiano [Tax Exemptions for R&D&I Experiences in Latin America and Pending Challenges: Evaluation of the Colombian Case]. Bogotá DC: Banco Interamericano de Desarrollo [Inter-American Development Bank].

Phong, Vinh. 2022. "Hoa Lac High-Tech Park to Become a Science and Technology City." The Voice of Vietnam, December 23, 2022.

PwC. 2021. "Corporate—Tax Credits and Incentives."

Quy, Luu. 2022. "Samsung Opens Its Largest Regional R&D Center in Vietnam." VnExpress, December 22, 2022.

Roca, Jerónimo. 2010. "Evaluación de la Efectividad y Eficiencia de los Beneficios Tributarios [Evaluation of the Effectiveness and Efficiency of Tax Benefits]." IDB Discussion Paper #IDB-DP-136. Washington, DC: Inter-American Development Bank.

Science and Technology Policy Institute (STEPI). 2006.

Tuan, Truong Ba, and Le Quang Thuan. 2016. Assessing Vietnam's Tax Incentive Policies. Oxfam and UN Women. Hanoi: Oxfam in Vietnam.

UN ESCAP. 2017. Tax Incentives and Tax Base Protection in Developing Countries.

Van, Thanh, and Tri Duc. 2023. "Danang High-Tech Park, Industrial Parks Attract $2 Bln in FDI." The Investor: Vafie Magazine, February 4, 2023.

Vietnam News Agency. 2021. "Saigon Hi-Tech Park to Celebrate 20th Anniversary." Vietnam Plus, October 20, 2021.

Vietnam News Agency. 2023. "LG Electronics Scales Up R&D in Vietnam." Vietnam Plus, March 9, 2023.

Wang, Runhua, and Jay P. Kesan. 2020. "Do Tax Policies Drive Innovation by SMEs in China?" Journal of Small Business Management 60 (2): 309–46.

Warda, Jacek. 2002. A 2001-2002 Update of R&D Tax Treatment in OECD Countries. Report prepared for the OECD Directorate for Science, Technology and Industry, OECD, Paris.

World Bank. 2019. Doing Business 2019: Training for Reform. Washington, DC: World Bank. https://openknowledge.worldbank.org/handle/10986/30438.

World Bank. 2021. Vietnam: Science, Technology and Innovation Report. Washington, DC: World Bank.

# Notes

# Notes

[1] This review is part of a series of policy case studies documented under the project Innovation Policy Learning from Korea: Lessons from Design and Implementation of Innovation Policy in Developing Countries. The project focuses on documenting the experience of Korean technology and innovation policies to facilitate knowledge collaboration between Korean practitioners and their peers in Indonesia, the Philippines, and Viet Nam. The review has been undertaken to compare RDTI schemes across countries, provide a framework to analyze the design of RDTI schemes in those three countries, and narrow down the scope of data collection for the Korean case study.

[2] Cirera and Maloney (2017) noted that the set of policy instruments that can support the building of innovation capabilities at each stage differs. The process of gradually deploying instruments of increasing complexity is generally advised to reduce to a manageable level the demands on government capacity.

[3] See Science and Technology Policy Institute (STEPI 2006) and Korea Institute of Public Finance (KIPF 2018).

[4] In selecting target client countries, their need for reform and demand for support were considered. They were identified mainly by referring to the findings from the World Bank's previous advisory engagements with developing countries. Most notably, the Innovation Policy Effectiveness Reviews (iPERs) for innovation policy previously conducted in each of the client countries served as valuable resources. Between August and September 2019, members of the project team also visited Viet Nam and the Philippines and held interviews and consultations with the policy makers in the two countries to conduct demand assessments. Also guiding the client country selection process was the consideration of synergies with completed, ongoing, and scheduled World Bank projects, both lending and nonlending, to achieve maximum impact.

[5] R&D comprises three general types of activities: basic research, applied research, and experimental development.

[6] According to Cirera et al. (2020), examples of expenditure-based RDTI include corporate income tax benefits, social security withholding tax incentives, reductions in tariffs for imported research equipment, and reimbursements of value-added tax. Lower corporate tax rates on profits generated from patents, licensing, and asset liquidation linked to R&D, such as a patent box, are examples of income-based RDTIs.

[7]As presented in the "Policy Effective Review, Vol. III" (Washington, DC: World Bank, 2020), the companion volume of the World Bank (2021) report Vietnam: Science, Technology and Innovation.

[8] In 2007, 21 OECD countries offered tax credits for R&D compared with only 12 in 1995 (OECD 2019a).

[9] OECD, "Tax Incentives for R&D and Innovation," https://www.oecd.org/innovation/tax-incentives-rd-innovation/.

[10]OECD, "Tax Incentives for R&D and Innovation," https://www.oecd.org/innovation/tax-incentives-rd-innovation/.

[11] The Restriction of Special Taxation Act, the foundational act that serves as the legal basis for most RDTIs in the country.

[12] Based on Article 10 of the Restriction of Special Taxation Act.

[13] Annex 6 of the Enforcement Decree of the Restriction of Special Taxation Act.

[14] Article 22 of the Restriction of Special Taxation Act; Article 13 of the Act's Implementation Guidelines.

[15]Article 18 of the Restriction of Special Taxation Act; Article 16 of the Enforcement Decree of the Act.

[16] The sparse evidence that is available for developing countries indicates similarly positive effects of those incentives on private firms' R&D inputs and outputs (Cirera and Maloney 2017).

[17]A study undertaken by the European Commission (2014), which reviewed more than 80 RDTI schemes in 31 countries, served as a valuable resource for this framework. That report identified 20 principles of good practice, each of which fall into one of the three STO dimensions.

[18] "Tax credits for research and human resources development expenses" and "tax credits for investment in facilities for research and human resources development" take up a significant portion of all RDTI schemes in Korea in terms of forgone tax revenue. Tax credits provided by the two largest RDTIs take up more than one-half of total forgone tax revenues for RDTIs (NABO 2018).

[19] The Corporate Recovery and Tax Incentives for Enterprises Act is a law in the Philippines that was signed by the president in March 2021. Its main purpose is to rationalize the tax incentive system in the country. The law aims to increase tax efficiency by consolidating the tax incentive administration system and making tax incentives more performance-based, targeted, time-bound, and transparent.

[20] After the tax holiday period, firms receive a 50 percent CIT reduction for two years. In addition,

the Ministry of Finance provides a tax holiday of 50 percent of CIT due for five years from the start of commercial production for the capital investment plan (PwC 2021). After the period for which the CIT reduction is granted, the taxpayer receives a CIT reduction of 25 percent payable for the next two years. This facility is provided to firms in pioneer industries that have a wide range of backward and forward linkages and connections, promise additional value and positive spillovers, are introducing new technologies, have strategic value for the national economy, or a combination of those attributes.

[21] Memorandum Circular No. 2022-0072, issued by the Philippines' Board of Investments (BOI), states that the application for registration of Tier III projects/activities must be accompanied by an endorsement from the Department of Science and Technology (DOST), Department of Trade and Industry-Competitiveness and Innovation Group (DTI-CIG), or any other institutions as may be identified by the board.

[22] Taxpayers can include R&D wages as 100 percent reduction and up to 200 percent additional reduction in gross income (in accordance with Article 4, paragraph 3, letter c of Ministry of Finance Reg No. 153/PMK.010/2020). However, the RDTI schemes exclude the depreciation of land and building asset expenditures (in accordance with Article 4, paragraph 3, letter a of Ministry of Finance Reg No. 153/PMK.010/2020).

[23] In the 2021 Tax Expenditure Budget Report, 18 tax expenditures are related to R&D, of which 4 are provided in the form of wage support ("Income tax reduction for foreign engineers and Special Taxation for Foreign Workers," "Tax exemption for foreign workers," "Income tax reduction for Korean workers returning to Korea," and "Tax credit for business performance bonus of performance-sharing SMEs").

[24] Thus, qualified activity is defined in the statutory language, and the amount of oversight is generally no more than voluntary self-compliance, with low levels of audit by tax authorities (OECD 2016).

[25] A study in the UK revealed that, for more than one-half of the respondents in the survey, a lack of confidence is the main reason they ignore R&D tax incentives in planning their expenditures on R&D (Chittenden and Derregia 2010). The study found that for many prospective participants, uncertainty about the outcomes of their R&D incentive applications was reducing the policy's effectiveness. Most firms, the study found, used internal funds to finance investments in R&D. Thus, internally constrained firms who were not sure about the eligibility of their expenditures found themselves exposed to a significant risk of expense ineligibility, which often compelled them to assume away the incentives when making decisions. By contrast, firms with a stronger financial position that saw R&D as a strategic investment essentially viewed the incentives merely as an extra bonus that offered limited additionality to the program.

[26] In Argentina and Colombia, for instance, governments require companies that are applying to RDTI schemes to present projects detailing how tax investments will be used in R&D and innovation activities.

[27] In 2007, 21 OECD countries offered a tax credit for R&D, compared with 12 in 1995 (OECD 2019a).

[28] Originally, proposals ceilings were designed not to exceed 15 percent of revenue.

[29] Interview with Juan Sebastian Robledo Botero, director, Dirección Nacional de Planificación

(DNP), Colombia.
[30]Interview with Isabel Salinas, R&D tax incentive coordinator, CORFO, Chile.
[31] Interview with Salinas, CORFO.
[32] 기술이전 및 대여 등에 대한 과세특례; based on Article 12 of the Restriction of Special Taxation Act.
[33] 연구원 연구활동비 소득세 비과세; based on Article 12 of the Enforcement Decree of the Income Tax Act.

[34]Although the incentives for technology acquisition are not exclusively available to SMEs or middle-market enterprises, those incentives are presented in the table along with the incentives for technology transfer and for technology licensing because they are all based on the same article of the Restriction of Special Taxation Act.
35 OECD, "Tax Incentives for R&D and Innovation," https://www.oecd.org/innovation/tax-incentives-rd-innovation/.

[36] Article 144 of the Restriction of Special Taxation Act.

[37] The overall perception was that there was a low appetite within the Ministry of Finance for introducing features that may carry additional loss of tax revenue. It should be noted that the proposal was not presented with an accompanying estimative model of the net economic value to be created nor the long-term impact on fiscal revenue, which may have contributed to an informed debate.

[38] Article 135-2 of the Enforcement Decree of the Restriction of Special Taxation Act.

[39] 기업부설연구소/전담부서 신고관리 시스템.

[40] For small and medium technology.

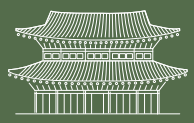
[41]The regular corporate income tax rate is 20 percent on the taxable income of domestic corporations with net taxable income not exceeding PHP 5 million and with total assets (excluding land) not exceeding PHP 100 million; otherwise, 25 percent.

[42] The questionnaire used for the interviews covered three main areas: (a) the main characteristics of the RDTI scheme; (b) the functioning of the RDTI scheme in the three STO dimensions; and (c) the main challenges to the performance of the RDTI scheme and reform initiatives (both ongoing and proposed) aimed at addressing those challenges.



KWPF

Korea-World Bank Partnership Facility



SEOUL CENTER FOR FINANCE AND INNOVATION



THE WORLD BANK

IBRD • IDA | WORLD BANK GROUP

East Asia & Pacific