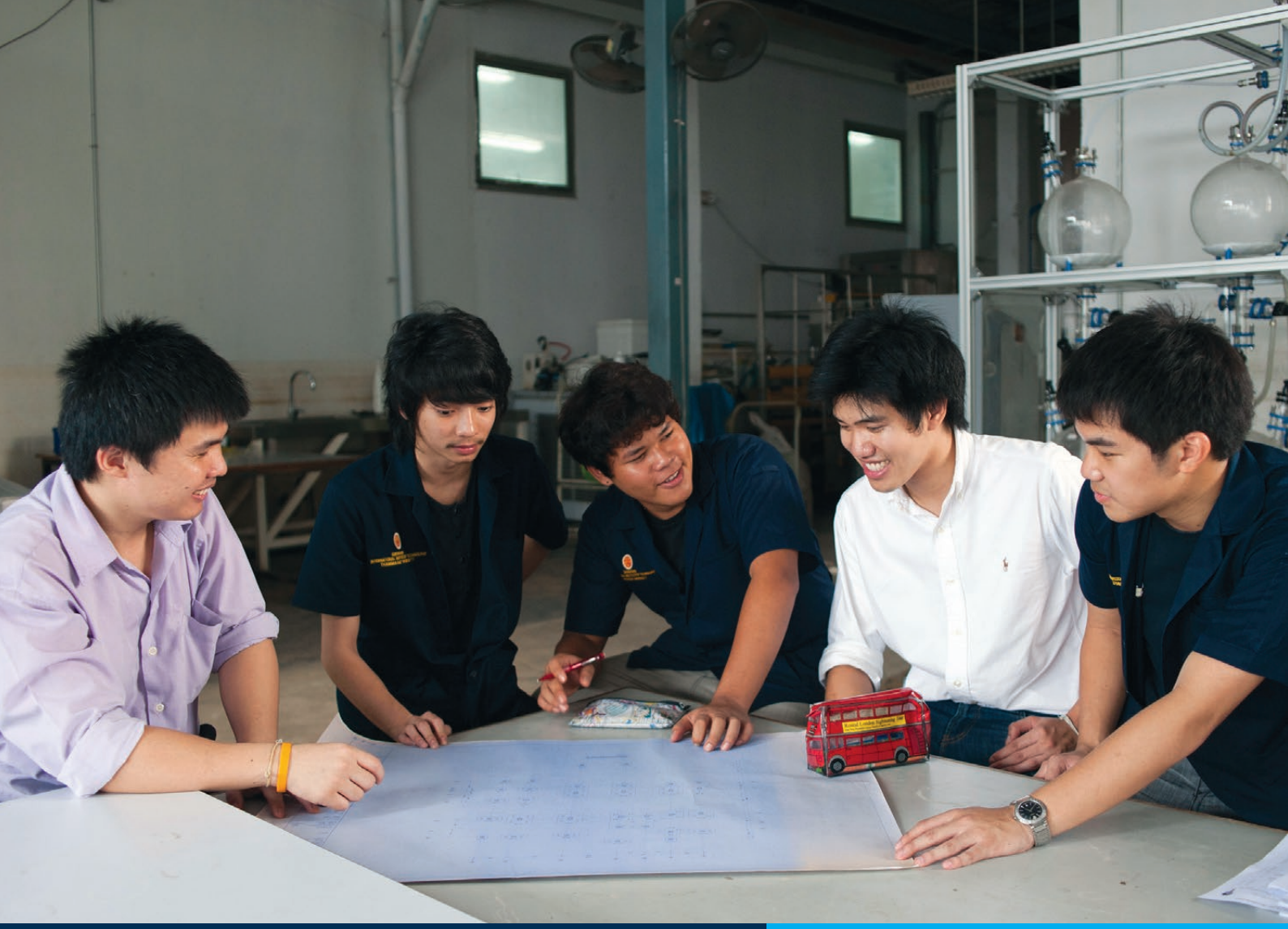

COUNTRY PRIVATE SECTOR DIAGNOSTIC

CREATING MARKETS IN THAILAND

Rebooting Productivity for Resilient Growth

February 2022

WORLD BANK GROUP
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ABBREVIATIONS

ADBI	Asian Development Bank Institute
AEC	ASEAN Economic Community
AI	artificial intelligence
ASEAN	Association of Southeast Asian Nations
BCA	Business Collateral Act
BCG	Bio-Circular-Green
BOI	(Thailand) Board of Investment
BOT	The Bank of Thailand
BSA	Business Security Act
BTI	Bertelsmann Stiftung's Transformation Index
B2B	business-to-business
B2C	business-to-customer
CAGR	compound annual growth rate
CE	circular economy
CIBA	Credit Information Business Act
COM	Council of Ministers
CPI	Consumer Price Index
CPSD	Country Private Sector Diagnostic
CPTPP	Comprehensive and Progressive Agreement for Trans-Pacific Partnership
CIT	corporate income tax
CVC	corporate venture capital
DAI	Digital Adoption Index
DDT	Digital & Disruptive Technology
DEPA	(Thailand) Digital Economy Promotion Agency
DITP	Department of International Trade Promotion
DLT	deep learning technology
DMC	domestic material consumption
DOP	Department of Older Persons
EABC	European Association for Business and Commerce
EAP	East Asia and Pacific
EBIT	Earnings Before Interest and Taxes
EEA	electronic and electrical appliance
EEC	Eastern Economic Corridor
EEC Office	Eastern Economic Corridor (Office)
EESD	Environmental Education for Sustainable Development Partnership
EEC-OSS	EEC One Stop Service
EIU	Economist Intelligence Unit
E-KYC	Electronic Know Your Customer
EPI	Environmental Performance Index

EPR	extended producer responsibility
ERIA	The Economic Research Institute for ASEAN and East Asia
ESB	Eastern Seaboard (project)
ESOP	employee stock option plan
ETDA	Electronic Transactions Development Agency
EV	electric vehicle
FBA	Foreign Business Act
FBC	Foreign Business Commission
FBL	foreign business licensing
FDI	foreign direct investment
FIs	financial institutions
FTA	Free Trade Agreement
FTI	Federation of Thai Industries
GCR	Global Competitiveness Report
GDP	gross domestic product
GHG	greenhouse gas
GIC	Global Investment Competitiveness
GNI	Gross National Income
GPP	green public procurement
GPTs	general-purpose technologies
GVC	global value chain
HQ	headquarters
IB	Immigration Bureau
ICRG	International Country Risk Guide
ICT	information and communication technology
IDI	ICT Development Index
ILO	International Labor Organization
IoT	Internet of Things
IPO	initial public offering
IPR	intellectual property right
ISIC	International Standard Industrial Classification of All Economic Activities
ITU	International Telecommunication Union
LICs	low-income countries
MAI	Market for Alternative Investments
M&A	mergers and acquisitions
MDES	Ministry of Digital Economy and Society
MFN	most-favored nation
MHESI	Ministry of Higher Education, Science, Research, and Innovation
ML	machine learning
MNRE	Ministry of Natural Resources and Environment
MOC	Ministry of Commerce

MOE	Ministry of Education
MOF	Ministry of Finance
MOI	Ministry of Interior
MOL	Ministry of Labor
MRAs	Mutual Recognition Agreements
MSDHS	Ministry of Social Development and Human Security
MSMEs	micro-, small- and medium-Size enterprises
NA	National Assembly
NBTC	National Broadcasting and Telecommunications Commission
NDCs	nationally determined contributions
NESDB	National Economic and Social Development Plan
NFE	Office of Non-Formal and Informal Education
NGO	non-governmental organization
NIA	National Innovation Agency
NSO	National Statistical Office
NSTDA	National Science and Technology Development Agency
NXPO	Office of National Higher Education Science Research and Innovation Policy Council
ODR	online dispute resolution
OECD	The Organization for Economic Co-operation and Development
OHEC	Office of the Higher Education Commission
OSMEP	Office of Small and Medium Enterprises Promotion
OVEC	Office of the Vocational Education Commission
PCI	Product Complexity Index
PDPA	Personal Data Protection Act
PE	private equity
PIER+	Puey Ungphakorn Institute for Economic Research
PISA	Program for International Student Assessment
PPP	public-private partnership or purchasing power parity
PwC	PricewaterhouseCoopers
P2P	peer-to-peer
RCEP	Regional Comprehensive Economic Partnership
R&D	research and development
RIA	Regulatory Impact Assessment
SaaS	Software as a Service
SCB	Siam Commercial Bank
SCD	Systematic Country Diagnostic
SEA	Southeast Asia
SEC	The Securities and Exchange Commission
SEPO	(Thailand) State Enterprise Policy Office
SET	Stock Exchange of Thailand

SFIs	specialized financial institutions
SMBs	small- and medium-size businesses
SMEs	small- and medium-size enterprises
SOE	state-owned enterprise
S&T	science and technology
STEM	Science, Technology, Engineering, and Mathematics (program)
STRI	Services Trade Restrictiveness Index
TCC	Thai Chamber of Commerce
TCCT	Trade Competition Commission Thailand
TDRI	Thailand Development Research Institute
TFP	total factor productivity
THB	Thai baht
TPPs	third-party providers
TPP	Trans-Pacific Partnership
TVET	Technical and Vocational Education and Training
UMIC	upper-middle-income country
UNEP	United Nations Environment Program
UNESCAP	United Nations Economic and Social Commission for Asia and the Pacific
USD	United States dollar
VC	venture capital
WBG	World Bank Group
WDI	World Development Indicator
WEF	World Economic Forum
WTO	World Trade Organization

EXECUTIVE SUMMARY

Thailand's initial strong economic growth after the 2008 global financial crisis, and its subsequent plateauing as a middle-income tier economy, is well-documented, and a rich body of previous analyses have provided recommendations for how Thailand can jump-start its attempt to become a high-income economy. The World Bank Group's Thailand Country Private Sector Diagnostic (CPSD) endeavors to build on this work by focusing on the private sector's contribution to that vision of high growth, which assumes an even higher priority now, given the impact COVID-19 has had on the economy.

This CPSD argues that addressing existing investment constraints and implementing an innovation- and knowledge-led growth model, are two actionable projects Thailand urgently needs in order to adjust the trajectory of its current path of economic growth toward high-income status. This model also could create a powerful pathway to generating high-quality jobs by moving workers into high-productivity sectors, and to increasing the participation of women in the labor force by adopting new technologies. The CPSD sets out specific private investment opportunities that could create innovative markets and generate sustainable growth, but also identifies the constraints that might impede the realization of those opportunities. In providing recommendations for addressing these constraints, the CPSD underscores the importance of specific interventions that should become prominent in the reform agenda.

The factors that contributed to Thailand's high economic growth in recent decades are unlikely to yield similar dividends in the current period and, unless Thailand urgently shifts gears, its aspiration to become a high-income country by 2037 may be unrealistically ambitious. The growth prospects of the export-led model that not long ago powered so much of Thailand's economic growth have diminished significantly, owing to a contraction in productivity. Average growth in total factor productivity (TFP) stagnated from a high of 3.6 percent per annum during the early 2000s to just 1.3 percent during 2009–2017. Private investment declined from more than 40 percent in 1997 to 16.8 percent of GDP in 2019, while FDI flows and participation in global value chains have also shown signs of stagnation. Structural transformation is unlikely to continue moving resources from agriculture to industry, at the pace it once did. Manufacturing shows modest forward linkages but remains dependent on foreign inputs and faces increasing competition from regional neighbors. Travel and tourism, the country's mainstay in services, present relatively fewer linkages and diversification prospects when compared to other service subsectors. The increasing frequency of natural disasters is also a threat to sustained economic growth. Furthermore, high economic growth has come at the cost of the environment and social inclusion. Greenhouse gas emissions (GHG) have risen markedly during this recent period of rapid growth, as has inequality between the country's regions and firms.

Additionally, the COVID-19 pandemic has dealt a blow to the economy, aggravating the structural challenges. In 2020, the economy is estimated to have contracted by 6.1 percent. This is sharply steeper than the decline that occurred during the 2008 Global Financial Crisis (0.3 percent in 2008) and second only to the 7.2 percent contraction in 1998, the sharpest full-year economic contraction in the past 25 years. The coronavirus outbreak has caused significant loss of economic output and employment across a range of sectors, reversing hard-won gains in poverty reduction. It has negatively impacted firm operations, resulting in corporate debt-service difficulties, with small- and medium-sized enterprises (SMEs) suffering disproportionately. Recent data for the East Asia

and Pacific (EAP) region suggest that even the COVID-19 recovery could be uneven. The devastating effects of the pandemic shutdowns are likely to widen inequality, considering the nature of the present inequalities in access to social support and digital technologies.[2]

To shift gears, the country must use the pandemic as an opportunity to build back better. But even more crucially, Thailand's engine of growth needs to be fueled by innovation and knowledge, and in a way that demonstrates resilience and agility. In pursuing such growth, Thailand can leverage the opportunities that arise from four major trends that are outlined below. However, to achieve its aspirations, the government will need to move swiftly with bold reforms.

To meet these short- and medium-term challenges, Thailand needs to foster a new innovation-led growth model to jumpstart its quest to reach high-income status and create better jobs in the future. Thailand can leverage its manufacturing capabilities to produce complex products, develop linkages, and at the same time upgrade its service model toward global innovator services.[3] To follow this path, Thailand will have to build a system that can enable firms to adopt technology, rely on an expanded skill base and continuous innovation, and create more opportunities for resilient growth and the inclusive participation of all firms. The pandemic recovery agenda should be leveraged to address the long-term structural weaknesses and constraints holding back innovation and productivity and set the country back on track to meet its aspirations of becoming a high-income country by 2037. This innovation-led growth model will also provide the opportunity to shift jobs toward highly productive activities, countering one of the most important structural challenges of the Thai labor market—an ageing population—and balancing the negative effects of recent cuts in work hours, business closures, and the movement toward agricultural activities brought about the COVID-19 pandemic. An innovation-led economic growth model can help redress the environmental damage that was done during the high-growth years, meet new international climate targets, and achieve the country's decarbonization agenda.

The government's commitment to developing a vision that relies on a knowledge-based economy is commendable, but advancing critical reforms is essential to attaining this vision. To advance an innovation-led growth model, the government has developed a strong vision, formulated strategies, and proposed action plans at all levels of the country and across sectors. These include the Thailand 20-Year National Strategy with its implementation through the 12th National Economic and Social Development Plan (NESDP) and Thailand 4.0, all of which feature opportunities and constraints that are fully aligned with this CPSD report.

Furthermore, the Eastern Economic Corridor (EEC) represents a flagship program expected to demonstrate a set of iconic government initiatives for the knowledge economy and lead implementation in this transformative change by example. However, the perception of a slowdown in reforms that characterized previous wins can hinder the momentum of implementation. The slow pace in the implementation of regulations adds to the perception that vested interests have been allowed to stall the pace of reforms, disproportionately harming the young disruptors. Some of these concerns are also reflected in the implementation of the EEC. The current economic outlook highlights the importance of these challenges because the COVID-19 recovery could be uneven and could exacerbate the sustainability of growth, particularly in the light of the fiscal constraints that the government may face in the immediate term.

Four megatrends—now further accentuated by the COVID-19 pandemic—are likely to influence Thailand's growth and competitiveness prospects.

i. *Technology, and the rise of automation and services, are reshaping industries and work, with long-term implications for the labor force and supply-chain operations that will likely be accelerated by the COVID-19 shock*. Evolving customer tastes for goods and services, including their delivery, will also accelerate the speed of innovation for solutions. More recently, technology has helped firms to adjust to the shock, promoting resilience and adaptability in response to the pandemic.

ii. *Ongoing global trade tensions and new regional agreements are shifting the trade environment and the configuration of global value chains*. This carries implications for intraregional trade and the markets that Thailand could compete in. The pandemic has also shown possible repercussions for GVC configurations as firms seek to diversify risk and establish near-shore operations.

iii. *Climate change, including the drive toward a low-carbon global economy,* represents another disruptive trend as firms respond not only to changing consumer expectations about sustainable products and services, but also to government policy designed to support environmentally sustainable growth. On the one hand, there are calls for policymakers to use the pandemic as an opportunity to build back greener; on the other, there is a risk that the more urgent priorities of the economic recovery may stall this call.

iv. *Thailand's ageing demographic structure carries implications for the country's economic growth*. Thailand's share of population aged 65 and older is the third largest in the EAP region, after Korea and Japan, and the largest among the non-high-income economies of the region. First, the ageing demographic is diminishing the relative proportion of the country's capable workforce, resulting in occupational and skills shortages that will likely reduce productivity. Second, it is changing the nature of the demand for products in the country, which will likely require new delivery models. Third, aging opens new challenges and opportunities brought by a specific segment of the population for which care services can be targeted—for example, a lack of proficiency in the use of digital financial services among the elderly creates an opportunity to improve the user experience and customization.

The CPSD for Thailand looks at two potential levers that can help Thailand harness the trends identified as engines of growth. The adoption of expanded Digital and Disruptive Technologies and the capabilities of the Circular Economy can help unleash innovation and knowledge across sectors, yielding growth dividends and driving resilience.

The CPSD proposes greater private participation in digital and disruptive technology (DDT) and circular economy (CE) approaches as levers to enable resilient and innovation-led growth. These two levers were chosen for several, interrelated reasons. *First,* the adoption of digital and disruptive technologies, together with circular technologies, can leverage "intangible capital" to increase the efficiency of capital and add labor force-reviving momentum to the stalled growth of TFP. For example, the integration of cyber-physical systems—that is, using data analytics, artificial intelligence, and machine learning—enables workers, machines, and resources to work together more efficiently. Circularity also drives improvements in the use of resource and material inputs that enhance efficiency, such as in the acquisition of technology that allows the reuse of waste in production.

***Second,* these levers can therefore have significant spillover effects across the traditional sectors of the economy.** For example, the use of disruptive technology can boost tourism by improving planning, accommodation, and transport services. Circular models in the automotive sector can lead to upgraded processes through recycled plastics, the redesign of electronic content, and shared mobility as an end-service.[4]

***Third,* both levers can assist in making production processes more sustainable.** For example, the use of big data analytics underlies precision farming, which increases the output of sustainable agribusiness. In addition, mobilitytech increases the utilization rate of vehicles, thereby supporting greener transport solutions. Similarly, circularity enables the decoupling of growth from GHG emissions and virgin resource use, promoting decarbonization – for example, the use of alternative materials such as grass in the production of vehicle parts. CE approaches therefore offer solutions to the ominous threat of climate change that Thailand faces.

***Finally,* these technologies can help Thai firms tap into the opportunities that arise from the megatrends mentioned above.** DDTs are at the core of the rise of automation and services in manufacturing, and the fourth industrial revolution. CE can help Thai firms expand their participation in green GVCs and meet the high public and private environmental standards observed in international markets.

If Thailand fails to support the growth of digital and disruptive technologies and the circular economy, it risks widening its income gap with frontier economies (annex D-1). This is especially imperative because, in the wake of COVID-19, firms are seeking to strengthen their resilience in GVCs by leveraging technologies such as Industry 4.0 and 3D printing to respond to shifting consumer behavior and national requirements for sustainable trade.[5] Successful participation in the global economy will therefore increasingly depend on exceling in the scaled adoption of digital and disruptive technologies and circularity.

Lever 1: **Digital and Disruptive Technologies encompass innovative technologies that have the potential to radically change the way organizations and people operate, creating new markets and new business models and making affordable goods and services accessible to more people.** The use of disruptive technologies for advanced participation in GVCs is a critical strategy if countries are to attract FDI, climb the value chain, diversify their products and services, and support domestic improvements in living standards and wages, leading to better jobs. DDTs also offer opportunities for greater female labor force participation. E-commerce platforms can boost SME trade and GVC participation by reducing export costs, lowering barriers, and accessing operational supporting services. Like circular models, DDTs serve as enablers to sustainable solutions by helping firms improve the energy efficiency of their production processes and asset utilization. These technologies also offer firms solutions to increase their climate resilience (for example, drones and Internet of Things -IoT- sensors).

In terms of investment opportunities: based on an analysis of regional risk capital funding flows to digital startups, there is an opportunity of about USD 1.8 billion, both in currently untapped potential in five B2B digital sectors, and in the expansion of four vital sectors in B2C. It is estimated that if Thailand's digital firms were to attract levels of venture capital (VC) or private equity (PE) investments comparable to Asian frontier markets in five sophisticated, mostly B2B sectors – mobilitytech, big data and analytics, health tech, digital media, and entertainment tech – additional investments of USD 1.2 billion would flow into Thailand annually (table 1). The remaining USD 0.6 billion would result from Thailand strengthening the sectors in

which it is already well-positioned. Investments in these underlying sectors and technologies would help accelerate the digitalization of traditionally analog sectors such as automotive, health and agribusiness. A second step to the current analysis would be to delve deeper into the industries that most use the prioritized digital sectors as drivers of productivity and growth.

TABLE 1: THAILAND'S ANNUAL FUNDING GAP (OR SURPLUS) RELATIVE TO ASIA'S FRONTIER MARKETS (USD MILLION)[6]

Focus of Thailand's strategy	Thailand's annual funding gap (or surplus) relative to Asia's Frontier Focus of Thailand's Markets US$ million		
Catch-up	-390	Mobility tech	Passenger transportation (air travel, train, automobile) logistics, traffic monitoring and tracking, on demand ride share and haul, passenger transportation repair platforms and online maps.
	-326	Entertainment tech	E sports, e casino, movies, animation studios and gaming, music; video streaming and services, arts, music algorithm software, and entertainment online management and social media.
	-285	Big data and analytics	Firms that use data as a service, data analysis and visualization services and data collection services.
	-208	Digital media	Digital journalism, social media, e media searching and subscription platforms, and publishing logistics management products and services.
	1.8	Health tech	Telehealth, e health platforms, pharma-tech, technical medical device development, medical laboratory management, and diagnostic algorithm development.
Keep growing and scale	-354	e-commerce	Online marketplace, aggregator e commerce, e commerce analytics, e commerce transaction, e-commerce logistics.
	-276	Fin tech	Loans, payments, wealth and investment management as well as software providers automating financial processes or addressing core business needs of financial firms.
Scale and lead	24	Food tech	Restaurant aggregator/ review platform, food e marketplace, food lifestyle media as well as prepackaged food subscription firms.
	167	Travel tech	Travel booking platforms, travel review and discovery platforms, and travel security software.

Lever 2: **The Circular Economy – often shortened to just Circularity – aims to replace the traditional take-make-waste economy with one based on reusing renewable natural capital and keeping materials and products in use for as long as possible.**[7] The business models and approaches that underlie circularity are innovative by nature, one, because they require a fundamental shift in thinking that ranges from the design of goods and services to the disposal of waste, and, two, because they foster parallel innovation in supporting eco-systems such as finance. Circularity models are a solution for green and resilient growth because production systems are a major contributor to GHG emissions and thereby to climate change.

The CPSD for Thailand identified food and agriculture, construction, and electrical and electronic appliances (EEAs) as priority sectors for the introduction of circular business models. Specific value chain activities in these sectors have been quantified for value creation and/or cost savings. The adoption of the six highest-priority circular approaches could yield returns to the private sector through increased revenues and reduced costs amounting to a cumulative total of approximately USD 1.6 billion by 2025. A more detailed study would be needed to assess the GHG emissions reduction that would come from adopting these solutions.

TABLE 2: INVESTMENT OPPORTUNITIES FOR THE CIRCULAR ECONOMY IN SELECTED SECTORS

Sectoral Opportunity	Investments Required	Examples of Application	Potential Sector Benefits
Food & Agriculture: • **Regenerative Farming** • **Conversion of organic waste to product**	• Logistics services to transport organic waste to product manufacturers • Research and development related to new bio-based products • New product manufacturing facilities	• Conversion of raw agriculture products and animal products in a circular way • Processing of agricultural and food waste into intermediate or end-products such as animal feed, construction materials and bioplastics	• Cumulative THB 12.1 billion (USD 385.8 million) net value creation
Construction: • **Reuse of construction materials** • **Flexible and shared spaces**	• Technical knowledge and supporting tools for design for deconstruction • Research and development of deconstruction techniques and durable materials • Material passport services • Material exchange platforms • Space sharing platforms Space utilization monitoring technologies	• Reuse of construction materials in new buildings and infrastructure assets. • Asset redesign to enable deconstruction so that materials can be reused again • Use of underutilized spaces for short-term use by other occupants and users – in most office, retail, and leisure and some residential buildings	• THB 10.3 billion (USD 329.7 million) and THB 2.57 billion (USD 81.9 million) cost savings
Electrical & Electronic Appliances: • **Device remanufacturing** • **Device sharing**	• Product design • Logistics services related to take-back schemes • Training in remanufacturing skills • Products passports • B2B, B2C and C2C sharing and exchange platforms • Logistics services transporting devices from one user to another	• Investment in the production of important electric vehicle components such as electric motors, inverters, on-board chargers, electric sensors • Multiple user access to products through lease agreements, performance-based contracts, or product-as-a-service contracts	• THB 28.2 billion (USD 0.9 billion) cost savings

It is important to note that achieving success in adopting this innovation-led model through the above two levers comes with both risks and challenges in implementation. Both these approaches run the risk of having an adverse effect on inclusive growth through increasing inequality among firms and negative effects on employment in the short run. Successful implementation will also require a rigorous assessment of international best policy practices to fit-for-purpose in the Thai context. Further, several enabling factors need to be in place for these technologies and approaches to be successful. These are discussed below.

The CPSD analysis emphasizes that unlocking opportunities would require addressing key investment issues and sector-specific challenges. Market distortions, on the one hand, and missing complementarities, on the other, are holding back private participation in markets.

INVESTMENT ISSUES

Limited competition and an uneven playing field are two key constraints to the emergence of an innovative private sector. Thailand ranks sub-optimally on indicators of competition against comparator countries across several global indices. Investor perceptions of business risks related to competition are high. There has been increasing concentration of ownership in a handful of firms, leading to their increasing market power as reflected in high markups, especially in the network sectors. Gaps in the effi-

cient functioning of a competitive regulatory framework create an uneven playing field for private sector participants.

Restrictions to FDI further reduce competition and stall the benefits of knowledge and innovation spillovers that might result from greater participation of foreign firms in the economy. Entry and operational restrictiveness have emerged as key factors driving the shrinking of FDI in Thailand, especially in the service sector. According to the OECD's FDI Regulatory Restrictiveness Index, Thailand's FDI liberalization has stalled over in the last 20 years, while regional competitors have opened their markets. An incomplete regulatory regime, capacity challenges, and the slow pace of reforms compared to regional peers are among the factors that contribute to these restrictions.

Low access to innovation financing further impedes the ability of firms, especially SMEs, to adopt new business models and technology. While the private sector's overall access to credit remains robust, the MSME sector remains underserved by the formal financial sector. Innovation finance remains shallow. Venture capital (VC) funding, a key source of innovation finance that specifically targets risky ventures, is only 0.03 percent of GDP – low compared to regional peers. (Please refer to the constraints in part III on Digital and Disruptive Technologies.)

Firms cite limited access to the workforce skills of the future as another key barrier to greater dynamism in the Thai economy. Thailand lags comparator countries in its share of high-skilled workers in the EAP region: Despite having a GDP per capita just under one-third that of Thailand, and a population only 14 percent larger than Thailand's, Vietnam's share of the region's high-skilled workers is roughly equivalent to Thailand's. Firms in Thailand complain of the unavailability of relevant skills, both technical and non-cognitive, and of the unsatisfactory performance of new hires. FDI restrictions are one of the key factors contributing to this lack of skills, while a weak Technical and Vocational Education and Training (TVET) system aggravates the problem.

SECTOR-SPECIFIC CONSTRAINTS

Digital and disruptive technologies

- **Thailand converged to a low-level equilibrium of highly complex digital regulations with low digital dynamism.** Unlike the leading countries in disruptive technology, Thailand largely has an innovation-hindering environment characterized by (a) high regulatory risk and uncertainty, (b) low de facto enforcement, and (c) a cycle of increasingly tight regulations because of the perception of excessive risks in the digital ecosystem. Government regulators face challenges in adapting and responding quickly to the rapid pace of progress in the digital service sectors. Further, overlapping responsibilities across key agencies engaged in advancing digital policy, such as the Digital Economy Promotion Agency (DEPA) and the National Innovation Agency (NIA), lead to inefficiency and policy inconsistency. The lack of transparency on rules and regulations increases uncertainty and coordination costs for the private sector. Regulatory gaps include:
  - A legal framework for risk capital financing that is less conducive to investment than regional peers: for example, the laws that govern the issuance of preference shares, tiering of classes of shares, creation of Employee Stock Option Plans (ESOPs), and convertible notes.

  - High capital gains taxes in venture capital/private equity (VC/PE) that discourage investment.
  - An unfavorable initial public offering (IPO) environment for early-stage firms, along with stringent requirements, which deters risk capital investment. SEC is making efforts to remove some constraints for SMEs and startups to access capital market funds through private placement offerings for SMEs (PP-SMEs), while the regulations for public offerings for SMEs (PO-SMEs) and LiVE Exchange (SME Board) are being discussed by policymakers.
  - Industrial data handling and data security policies that suffer from policy uncertainty and a lack of sharing and safeguard standards.
  - Limited online consumer and supplier protection, especially the limited traceability of imported goods via cross-border e-commerce, which reduces consumer confidence and trust in digital uptake.

- **There are regulatory challenges to a competitive market in the digital economy.** First, various stakeholders have expressed concerns about the role of corporate venture capital (CVC) in supporting competition and the growth of digital technology in Thailand. By some estimates, about 80 percent of risk capital in Thailand comes from CVC, which is extremely high.[8] While important, this funding has often been linked to biases and distortions generated by a misaligned incentive structure between entrepreneurs and financiers. Second, there is significant room for more private operators to participate in providing spectrum and infrastructure for digital services. While the concession regime has evolved, private operators are not able to fully compete with incumbents as they lack financial support available to competitors, including tax exemptions. Finally, the regulatory framework, and the absence of pro-competition regulation, create barriers to participation on a level-playing field for smaller digital and disruptive firms that could otherwise challenge the incumbents. These barriers include vagueness in the definitions of rules, a lack of transparency in implementation, uncertainty in enforcement, and high minimum requirements to become eligible for incentives. Together, they create high costs and formidable nonfinancial barriers for smaller firms. In addition, instruments that encourage adaptation, such as regulatory sandboxes, have opened up experimentation in a few sectors such as finance and tourism. However, these have not been expanded to other domains of the digital economy.

- **There is limited access to relevant human capital and financial solutions to drive the growth of DDT.** Thailand faces a dearth of IT, engineering, and programming skills and other STEM-related disciplines, which are critically needed in any digital economy. Investors often complain that Thai tech companies and entrepreneurs do not have sufficiently deep, differentiated experience in their sectors and are often mostly recent graduates. Foreign talent is largely absent, including professionals who could bring regional and global perspectives to the work – a situation worsened by restrictions on foreign ownership of firms. Further, access to finance for innovative firms across the funding life cycle is weak. Mid-sized firms are caught in the middle: they are typically beyond seed stage and therefore unable to benefit from government grants set aside for smaller firms yet are also unable to access later-stage VC funding, which is typically reserved for larger companies that have achieved some degree of regional expansion.

Circular economy

- **The regulatory framework governing circularity is neither aligned with international standards nor sufficiently targeted.** First, the current framework relies primarily on voluntary mechanisms and therefore misses the benefits from using additional regulatory and incentive instruments. For example, in the absence of mandatory requirements, sectoral ministries are not proactive in considering circularity in their strategies unless explicitly linked to the current definition of sustainability.[9] Second, although fiscal incentives have been introduced,[10] they are insufficiently targeted to address market failures, particularly for SMEs, which face high costs in adopting CE technology. Current incentives seem mis-targeted, with eligibility criteria that prioritize industry, company maturity and geography. Third, many of the sector-specific regulations have an inhibiting effect because they do not align with emerging international standards. These include laws and policies governing waste collection and its reclassification as secondary raw material, the reuse of material in packaging, and the use of recycling content in construction.
- **The lack of common understanding about the circular economy across the public and private sector and consumers alike, prevents a collective and targeted policy response and inefficient private sector action.** Success depends on the presence of a common definition of the circular economy used across government and industry. This could widen the focus of circular solutions from material/resource strategies to holistic business models. The availability of a monitoring and evaluation framework could enhance firms' ability to assess the financial viability of circular business models. Further, policy engagement with existing conglomerates could be further strengthened and leveraged if these corporate groups coordinate for enhanced standardization and increased economies of scale.
- **Government strategy and institutions governing circularity need tightening and strengthening.** First, the Bio Circular Green policy framework, the main policy instrument for circularity, is skewed toward certain sectors, undermining the original intent of a systematic and cross-industry approach. The strategy has become bio-centric, diminishing its appeal for stakeholders in certain sectors, such as manufacturing and construction, that are potentially substantial contributors to the circular economy. Second, there is institutional fragmentation: mandates overlap, and policy approaches are inconsistent. Many relevant agencies still do not recognize the value of this agenda nor provide supportive policy that could increase impact. This fragmentation translates to regulation which results in being piece-meal creating inefficiencies and transaction costs.
- **Critical supporting physical, financial and human capital infrastructure is inadequate.** First, an efficient reverse logistics system[11] is critical to ensure the continuous and efficient movement of secondary material and waste. Second, finance for non-conventional circular investments remains scarce. The existing financial products are biased toward renewable energy and energy efficiency. In addition, in comparison to traditional investments, the business case for investing in innovative circular approaches is currently more complex than traditional projects, creating uncertainty for financiers. Third, the absence of critical circular skills will prevent a wider adoption of the circular economy. These include designing for flexibility and adaptability, minimizing material use and waste generation in production and construction, adopting product-as-a-service models, and diversifying business to include repair, refurbishment, and replacement services. Finally, while Thailand has introduced several measures to establish a trading infrastructure for carbon credits, remaining gaps need to be bridged to ensure that firms and individuals can in fact offset their carbon footprints.

The strong relationship between addressing investment issues and promoting disruptive and digital technologies and the circular economy, should be highlighted. Thai firms must deploy productive capital investments to develop new business capabilities. It should be noted that the coronavirus pandemic has imposed additional pressure on fiscal spending. The fiscal deficit has expanded because of increased spending on pandemic relief and declining taxes – from 2.3 percent of GDP in FY2019 to 8.7 percent of GDP in FY2021 (Thailand Economic Monitor, 2021). Leveraging private sector development and investment will be critical for advancing the economic recovery.

Roadmap to unleash private-sector growth opportunities

The CPSD presents a package of practical recommendations that could address the key constraints analyzed, considering feasibility, expected timelines and key stakeholders. An agenda of economic reforms that can stimulate private investment and enhance the contribution of private innovation needs to be fast-tracked. It is important to highlight that the key to the successful implementation of reforms will be transparency and coordination across public sector agencies and with the private sector. This will also require having consistently up-to-date knowledge of the issues of all relevant stakeholders and the initiatives they are currently taking. A summary of the key recommendations is offered in the roadmap below. Table 3 presents a roadmap for investment reforms and Table 4 presents a roadmap for sectoral reforms opportunities. Annex I of the main volume highlights references from countries that are implementing similar measures.

Private investments

In the short term

- Bridge gaps in the Competition Act by eliminating exceptions for certain operators and encouraging cartel detection.
- Expand access to innovation finance by strengthening financial infrastructure, including open banking and a single, unified Secured Transaction (ST) Act.
- Ease hiring expatriate staff/foreign experts by making the SMART visa program fully digital.

In the medium term

- Open the FDI regime by reducing the number of service sectors that require a Foreign Business License (FBL) and by adopting a tailored, sector-specific approach to establish minimum capital requirements for FDI.
- Enhance TVET system efficiency by expanding private participation in its delivery and by strengthening oversight of the quality-assurance mechanism

Digital and Disruptive Technology (DDT)

In the short term

- Strengthen digital regulations by conforming financial regulations to international practices and standards and by introducing industrial data strategy and protection policies.

In the medium term

- Enhance contestability in digital markets by expanding early-stage capital market and by promoting more efficient spectrum allocation.

Circular Economy (CE)

In the short term

- Develop a common understanding of the circular economy across the public and private sectors and consumers alike by introducing a standard national definition.

In the medium term

- Strengthen the regulatory framework governing circularity through amendments in the waste, reuse, and recycling sectors.
- Facilitate investment in enabling physical and digital infrastructure to support the adoption of circular business models by the private sector.

TABLE 3: ROADMAP FOR INVESTMENT REFORMS

Opportunity	Recommendations	Enabling reforms in the immediate term	Enabling reforms in the medium-term	Complimentary reforms (if they appear in the same column)			Key stakeholders
LACK OF COMPETITION							
Competition law enforcement	Strengthen the enforcement and advocacy roles of Thailand's Office of Trade Competition Commission (OTCC) by building OTCC's capacity and publishing guidelines for competition enforcement.	√				●	OTCC
	Strengthen the governance functions of the OTCC by reducing ministry-related involvement in senior appointments and allowing for independent budget allocations.	√				●	OTCC
	Bridge existing gaps in the Competition Act: that is, eliminate exceptions for certain operators and implement a leniency program to encourage cartel detection.	√			●	●	OTCC, MOC
Competition incentives	Elevate the competition policy agenda as a whole and present it as a national economic policy issue for Thailand, through the representation of higher-level executive offices.	√		●		●	Office of the Prime Minister
	Conduct a review of potential SOEs' competition distortions (including network markets) using the competitive neutrality framework.		√	●	●	●	MOF, OTCC, Sector Regulators

Opportunity	Recommendations	Enabling reforms in the immediate term	Enabling reforms in the medium-term	Complimentary reforms (if they appear in the same column)			Key stakeholders
RESTRICTIONS ON FDI							
Easing of restrictions on hiring expatriate staff/foreign experts	• Make the SMART visa program fully digital, including by (i) not requiring documents to be subject to certification by the issuing organization or notarization or legalization by any government agency, and (ii) accepting all documentation in English (or Thai, if originally issued as such)	√			●	●	BOI, IB, MOL, MFA, ETDA
	• Review staff and capital ratios with a view to adopting a sector-specific approach, including for the requirement to employ at least four Thai nationals for every foreigner employed, and the requirement to have a capital increase of at least BHT 2 million for each foreign employee, depending on the form of investment		√		●		IB, MOL, MFA
	Continue to gradually allow more foreigners to practice their profession in Thailand. • Further clarify,[167] and reduce the number of professions that are prohibited under the Prescription of the Prohibited Occupations for Foreigners (2020, B.E. 2563); also stipulate a mandatory periodic review of the list. • Amend sector-specific laws to remove nationality requirements, for example, for legal, architecture and engineering services.		√			●	MOL, Profession-specific bodies, MFA
Open FDI regime, especially in service sectors	Further liberalize services sectors that are key to achieving the goals of Thailand 4.0: • Reduce the number of service sectors that require a Foreign Business License (FBL) by removing service sectors from List 3 of the FBA and publish guidelines to enable consistency in the approval process. • Remove the broad "Other service businesses" provision under List 3 of the FBA (item 21 of List 3) and add the clarification that "everything not on the list is permitted without restriction".		√	●	●		MOC, NBTC
	• Adopt a tailored, sector-specific approach to establishing minimum capital requirements for FDI. • Consider dispensing with the requirement to retain 25 percent of operating expenses for activities under lists 2 and 3 of the FBA.160		√	●			MOC, BOI
	Consolidate FDI restrictions contained in sectoral legislation under the FBA, systematize the negative list, and issue English translations of subordinate or sectoral legal documents.		√	●			MOC, COM, NA

Opportunity	Recommendations	Enabling reforms in the immediate term	Enabling reforms in the medium-term	Complimentary reforms (if they appear in the same column)	Key stakeholders
ACCESS TO FINANCE FOR INNOVATION					
Enhanced provider diversity, innovation, and reach	Strengthen the regulations that address risks to investors on crowdfunding platforms by articulating disclosure requirements, and test capital requirements.	√		●	SEC
Strengthened financial infrastructure	Develop an approach to open banking, starting with API standards for data sharing and a cross-industry approach to standards in order to promote competition.	√		●	BOT
	Establish a single, unified Secured Transaction (ST) Act, with a practical, standardized, and simple provision on the "Creation of Security Interest (SI), and "Priority Rules" for all types of movable assets. Establish a single, central, real-time registry that fully interfaces with financial institutions.	√		●	MOF, DBD
	Remove the legal impediments in the Credit Information Bureau Act (CIBA) to allow sharing of data from nonfinancial providers (for example, utility companies, d ata from retailers, and data from e-commerce operators)	√		●	MOF, NCB
Enhanced access by SMEs to value chains	Support the development and use of online and cloud-based accounting and e-invoicing platforms for SMEs	√		●	Department of Revenue, OSMEP
	Ensure effective implementation of a digital-factoring initiative to promote supply-chain financing and enable SMEs to access key value chains.		√	●	BOT, OSMEP
SKILLS FOR THE FUTURE					
Skills match	Introduce a skills-monitoring system comprising information about vacancies and wages to understand the nature of demand and identify signals of skill shortages.	√		●	MOE, MHESI, NXPO
	Bring the private sector's perspective to bear on curriculum design through a structured engagement that influences decisions of resource allocation for curriculum development, and oversight of results between the Ministry of Labor/ Technical and Vocational Education and Training (MOL/ TVET) agency and industry associations.		√	● ●	MOE, OVEC, MHESI, NXPO, private sector
TVET system efficiency	Reduce the challenges the private sector faces in participating in the TVET system by streamlining the procedures for accessing incentives and reporting.	√		●	BOI, MOL
	Strengthen oversight of the TVET system institutions under a renewed quality-assurance mechanism that follows placement outcomes of graduates and relies on market feedback information including wages, placement, turnover, and tenure.		√	●	MOE, MHESI, OVEC

Opportunity	Recommendations	Enabling reforms in the immediate term	Enabling reforms in the medium-term	Complimentary reforms (if they appear in the same column)	Key stakeholders
Increased labor force participation	Introduce pilot programs for reskilling of the country's aging labor force, such as the provision of basic and intermediate digital skills training, to test the value proposition and evaluate their potential scalability and relevance in the labor market.		√	●	MOL, private sector
	Introduce and test pilot regulations that increase female labor force participation – for example, increase the number of child development centers, and improve maternity benefits to lessen the current penalties on motherhood and on caring for the elderly, to understand which of these measures present higher additionality. These pilot interventions need to be coupled with rigorous impact evaluations to discern the potential effects of such policies in the labor market.		√	●	MSDHS, MOL, MOE

Note 1: Enabling reforms: Reforms in the immediate term are those that, if introduced at the outset, can be expected to "enable" positive spillovers for subsequent reforms, paving the way for cumulative effects in a particular field and for the medium term. **Complementary reforms** are those that mutually reinforce each other, thereby creating horizontal spillover effects. In the table, upto three sets of complementary reforms have been identified, which are tagged together in the three sub-columns under 'Complementary Reforms'.

Note 2: BOT – Bank of Thailand; BOI – Thailand's Board of Investment; COM – Council of Ministers; DBD – Department of Business Development; IB – Immigration Bureau; MHESI - Ministry of Higher Education, Science, Research and Innovation; MOC – Ministry of Commerce; MOE – Ministry of Education; MOF – Ministry of Finance; MOL – Ministry of Labor; MSDHS – Ministry of Social Development and Human Security; NA – National Assembly; NBTC – Office of The National Broadcasting and Telecommunication Commission; NXPO – Office of National Higher Education Science Research and Innovation Policy Council; OSMEP – Office of SME Promotion; OTCC – Office of Trade Competition Commission; OVEC – Office of the Vocational Education Commission; SEC – Securities and Exchange Commission.

In addition, the CPSD offers several reforms and priority action steps in digital and disruptive technology and the circular economy. These are presented in Table 4 below.

TABLE 4: ROADMAP FOR SECTORAL REFORMS OPPORTUNITIES

Opportunity	Recommendations	Enabling reforms in the immediate term	Medium-term reforms	Complimentary reforms (if they appear in the same column)			Key stakeholders
DIGITAL AND DISRUPTIVE TECHNOLOGIES							
Well-defined institutional responsibilities and sound experimentation in disruptive tech pilots (EEC)	Clarify roles and responsibilities in key digitalization policies and establish a monitoring and evaluation framework to track the progress of key programs and reforms. For example, in industrial data policies, this would mean startup ecosystem building, including early-stage risk capital attraction, and innovative and circular pilots that have been tested in traditional sectors and real-life settings, including those in EEC.	√		●	●		MDES, sectoral ministries
An attractive regulatory environment for digitalization	Conform financial regulations to international practices and standards by amending the Thai Civil and Commercial Code – for example, introducing Employee Stock Option Plans (ESOPs) and issuing convertible notes and preferred shares.	√		●			MOC, SEC
	Introduce industrial data strategy as well as protection policies to enable and safeguard data-intense solutions because they underpin digital transformation in a variety of traditional sectors such as retail, health, and finance.	√			●		MDES
	Enhance the use of matching equity funds schemes to de-risk investments and catalyze early-stage capital market (co-investment funds, fund-of-funds).		√	●			DEPA, NIA and NSTDA
High contestability in digital markets	Attract more regional financial venture capital to balance the excessively dominant role of CVC in the digital ecosystem; also, expose local large firms to international competition to prepare for a more open and innovation-driven economy.	√		●			DEPA, SEC
	Introduce online supplier protection schemes to prevent online platforms from abusing their market power to squeeze out informal third-party sellers and digital service providers. Create trust and fairness in the digital market to drive broad-based digital uptake.		√		●		ETDA
	Address the lack of competition in how the spectrum is assigned by (i) developing a spectrum roadmap, (ii) designing reserve prices according to market realities, and (iii) designing pro-competition spectrum auctions.		√				NA, OTCC, COM
Enriched pipeline of tech talent to drive digital transformation	Build up deep-tech capabilities and change the popular mindset and culture to make tech a promising career path by promoting successful industry transformation, use cases, and role models. Promote and provide incentives for local-international tech talent exchange by means of incubators, accelerators, diaspora networks, and corporate overseas exchange programs.		√	●	●		DEPA, NSTDA, private sector, academia

Opportunity	Recommendations	Enabling reforms in the immediate term	Medium-term reforms	Complimentary reforms (if they appear in the same column)			Key stakeholders
CIRCULAR ECONOMY							
Enhanced knowledge and understanding of the circular economy	Introduce a standard national definition of the circular economy in line with international frameworks, in coordination with the private sector, to be adopted in the new Circular Economy Action Plan currently being drafted. An example of this is China's Circular Economy Promotion Law.	√		●			Office of the PM, NXPO
	Implement awareness programs in collaboration with private stakeholders for the correct use of circular economy concepts by embedding CE in core modules of university curricula, business transformation guides, and case studies for the private sector. An example is Netherlands' Holland Circular Hotspot.	√		●			NXPO, academia, businesses, NGOs, MOAC, MOI, Consumers
	Expand the M&E framework to cover broader list of indicators, including sector-specific indicators underlying sector-specific circular economy road maps. For example, the OECD inventory of indicators.		√	●	●		NXPO, sectoral ministries, NCS-DA, MOI, MONRE
Institutional cohesion in the design and implementation of CE policy	Strengthen the public-private collaboration mechanisms under the BCG Committee for coordination to include SME participation, regular reviews of regulations, formulate R&D programs. Example: the City of Brussels' Regional Program for a Circular Economy (BRPCE).	√			●		NXPO, coordinating agency [to be created]
	Create a central circular economy agency or organization – along the lines of Finland's Innovation Fund, Sitra – to develop, implement and advance circular economy policy and to coordinate inter-ministerial action.		√		●		Office of the PM

Opportunity	Recommendations	Enabling reforms in the immediate term	Medium-term reforms	Complimentary reforms (if they appear in the same column)			Key stakeholders
Strengthened presence of comprehensive and cohesive policy framework	Remove inhibitory regulations and standards, specifically those identified in the priority sectors above. That is, (a) regulations on the use of recycled plastics for food containers, (b) specifications related to recycled content in aggregate and other building materials, and (c) material intensity conflicts with seismic building requirements.	√			●		sectoral ministries, NXPO, Private sector
	Introduce enabling regulatory and legal amendments and instruments such as (a) end-of-waste criteria for waste materials to support reuse and recycling, (b) updating the scope of green label products to include circular design, (c) simplifying the waste classification system down to one system in order to facilitate material exchange, and (d) allowing waste materials to move outside regional boundaries to encourage collaboration.		√		●		NXPO, private sector, coordinating agency [to be created]
	Improve cost-efficiency of incentives for R&D-based CE innovation and increase awareness of the TSCRIF in the private sector.	√		●		●	NXPO, academia private sector
	Introduce and evaluate pilot incentives for non-R&D-based innovation and diffusion of CE technology among businesses: Evaluate potential expansion of fiscal incentives for repair activities and remanufactured goods Consider FTAs on circular economy (for example, the Comprehensive and Progressive Agreement of Trans-Pacific Partnership – CPTPP - in agribusiness)		√		●	●	Coordinating agency [to be created], DOF
Availability of supportive infrastructure to pursue circular-economy opportunities	Facilitate investment in enabling physical and digital infrastructure, such as reverse logistics networks, transport infrastructure, the IoT, and blockchain to support the adoption of circular business models and to make the business case for adopting them.		√			●	MNRE, MOT, MDES, coordinating agency [to be created]

Note 1: Enabling reforms: Reforms that are to be enabled in the immediate term are those that, if introduced at the outset, can be expected to "enable" positive spillovers for subsequent reforms, paving the way for cumulative effects in a particular field and for the medium term. The distinction highlights reforms that could be sequential in nature and that have the property of creating vertical spillover effects from upstream reforms to downstream ones. Complementary reforms are those that mutually reinforce each other, thereby creating horizontal spillover effects. In the table, upto three sets of complementary reforms have been identified, which are tagged together in the three sub-columns under 'Complementary Reforms'.

Note 2: BOT – Bank of Thailand; BOI – Thailand's Board of Investment; COM – Council of Ministers; DBD – Department of Business Development; IB – Immigration Bureau; MHESI – Ministry of Higher Education, Science, Research and Innovation; MOC – Ministry of Commerce; MOE – Ministry of Education; MOF – Ministry of Finance; MOL – Ministry of Labor; MSDHS – Ministry of Social Development and Human Security; NA – National Assembly; NBTC – Office of The National Broadcasting and Telecommunication Commission; NXPO – Office of National Higher Education Science Research and Innovation Policy Council; OSMEP – Office of SME Promotion; OTCC – Office of Trade Competition Commission; OVEC – Office of the Vocational Education Commission; SEC – Securities and Exchange Commission.

PART I: OVERVIEW

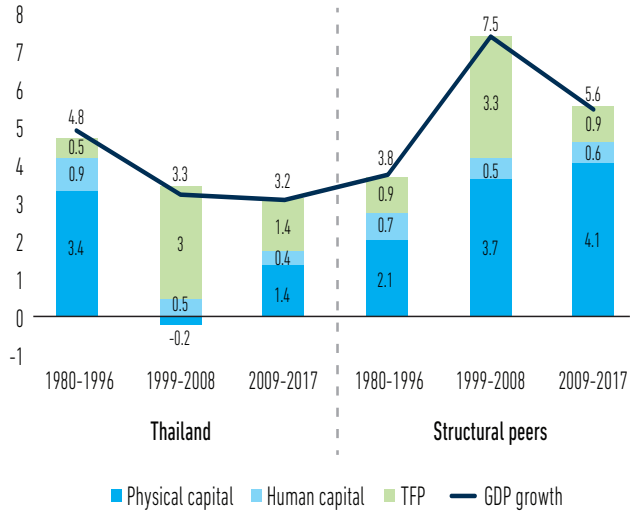
1. COUNTRY CONTEXT[12]

Thailand's rapid growth during the 1980s and 1990s was achieved through an export-led model enabled by conducive global trends, a dynamic policy environment, and stable macroeconomic conditions. Its subsequent stagnation, often characteristic of economies that reach the upper middle-income tier, has revealed several preexisting structural weaknesses that had been building. Past growth has also come at a cost to the environment, natural resources, and socio-economic inclusion. The COVID-19 shock has dealt a fresh blow to the economy, further exposing the competitiveness challenge facing Thailand.

The Thai economy experienced high growth in past decades, fueled by aggregate productivity growth and structural transformation. Since the 1960s, Thailand's economy has lifted millions out of poverty on the back of sustained growth and rising per capita incomes (Bandaogo, 2020). During the 1990s and the period preceding the 2008 financial crisis, the country enjoyed average annual GDP growth of more than 5 percent, and GDP per capita rose by almost 45 percent in PPP terms, faster than most of its regional and structural peers. The poverty headcount fell from 65 percent of the population in 1990 to 6.2 percent in 2019.[13] An open-trading policy, favorable macroeconomic conditions, an investor-friendly policy regime, and an export manufacturing orientation enabled this growth. Between 1999 and 2008, total factor productivity growth (TFP), at 3.6 percent, achieved its highest average annual rate in the country's history (figure 1).

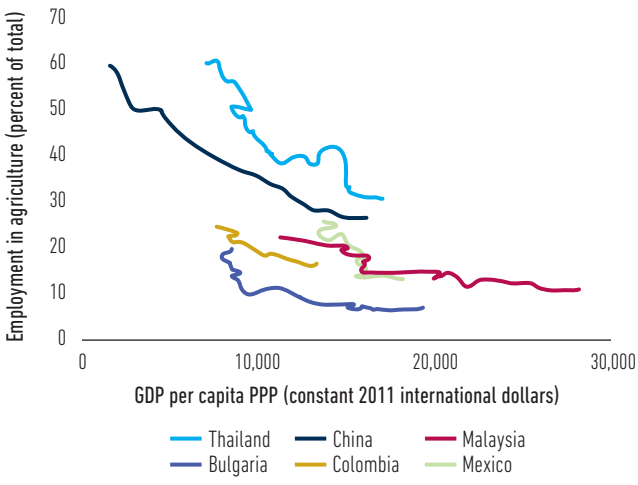
These productivity gains during the 1980–1996 period were driven by a large-scale shift of labor away from low-productivity agriculture toward high-productivity activities in the industrial and services sectors, causing agriculture's share of employment to fall and that for manufacturing and services to rise (figure 2). This was accompanied by a rise in workforce productivity.

FIGURE 1: GDP GROWTH WAS FUELED BY RISING TFP...



Source: WDI, World Bank staff estimates

FIGURE 2: ... AND STRUCTURAL TRANSFORMATION, WITH A LARGE-SCALE SHIFT OF THE LABOR FORCE FROM AGRICULTURE

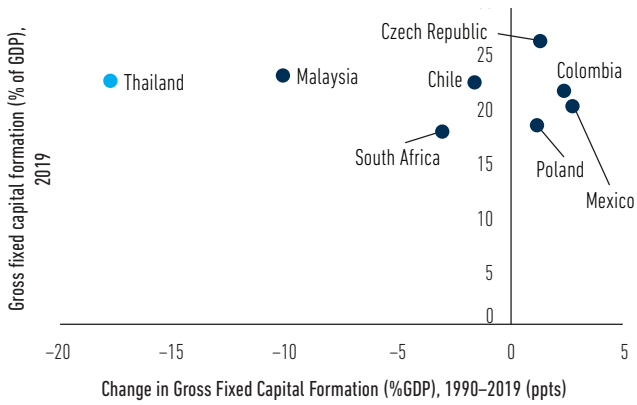


Source: WDI, World Bank staff estimates

However, growth has stalled in the past decade. Signs suggest that the productivity model driven by factor accumulation and structural change may have reached its limit.

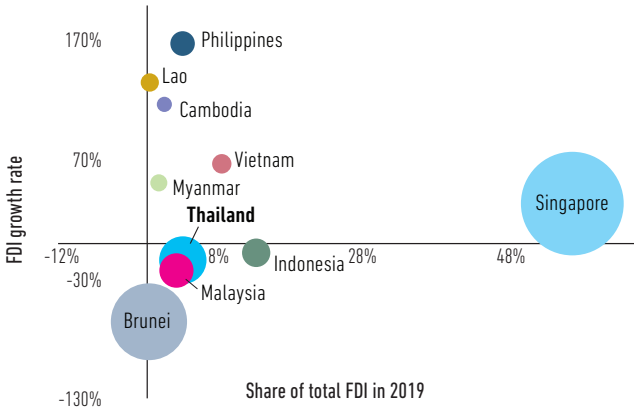
Thailand's economy, however, has lost much of its dynamism since the mid-2000s. TFP growth has stalled – going from a compound annual growth rate (CAGR) of 3.6 during the 1999–2008 period to 1.3 percent CAGR during 2009–2017[14] (WDI; World Bank Thailand Economic Monitor 2020) (annex B-1). The slowing rate of productivity has been accompanied by decreasing private investment, from more than 40 percent in 1997 to only 16.8 percent of GDP in 2019 – the weakest rate of growth among its peers (figure 3). The ratio of total investment to GDP in Thailand has been oscillating between 20.6 to 30.4 percent since the early2000s. In 2016 Thailand, like its comparator countries, experienced its most recent decline in total investment to GDP, reaching 20.9 percent but rebounded faster than its peers to reach 25.8 percent in 2019 (annex B-6). However, among regional peers, Thailand has had not only one of the smallest shares of FDI inflows but also a decreasing flow of FDI over the past 10 years (figure 4).

FIGURE 3: GROSS FIXED CAPITAL FORMATION (% GDP) IN 2019 VS. CHANGE IN CAPITAL FORMATION IN 1990–2019 (PPTS.)



Source: World Development Indictors

FIGURE 4: FDI FLOWS, THAILAND VS. SELECTED ECONOMIES

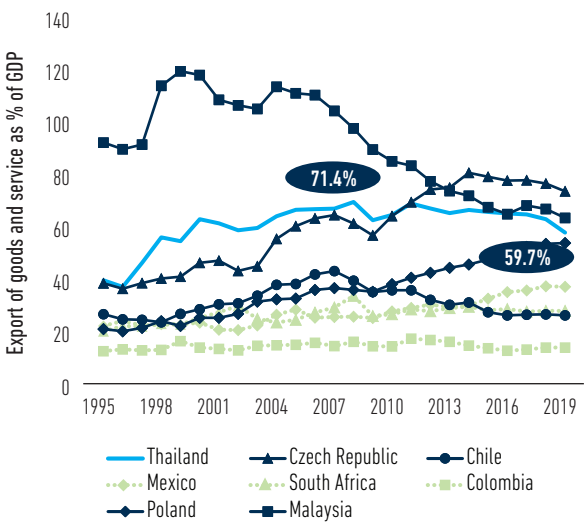


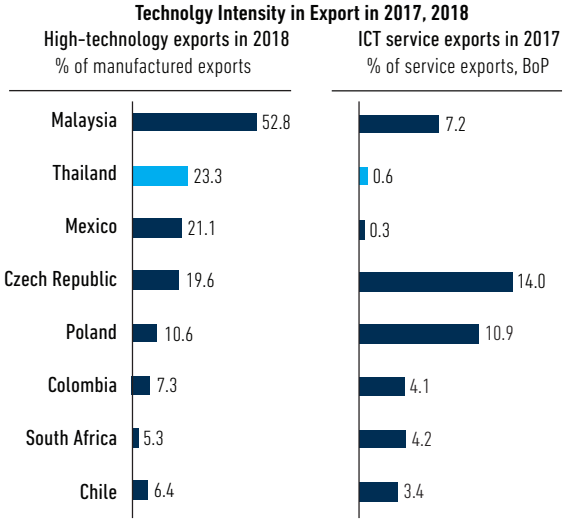
Note: (1) average y-o-y 2010–2014 vs 2015–2019); bubble size = GDP per capita in 2019

Source: World Development Indicators

Signs of stalling competitiveness can be seen in reduced export intensity and stalled participation in global value chains. Export intensity, which has recently been flat, declined from 71.4 percent in 2009 to 59.7 percent of GDP in 2019 (figure 5).[15] Thai firms tend to specialize in low-level final assembly, with little production of intermediate parts (Apaitan *et al.*, 2019). A report by the Asian Development Bank (2015) found that most Thai suppliers of foreign exporters remain in Tier 3 (and some in Tier 2), revealing a low level of sophistication in manufacturing.[16] Thus, the technology embedded in exports remains modest (figure 5).

FIGURE 5: SELECTED EXPORT PERFORMANCE METRICS IN THAILAND VS. PEERS

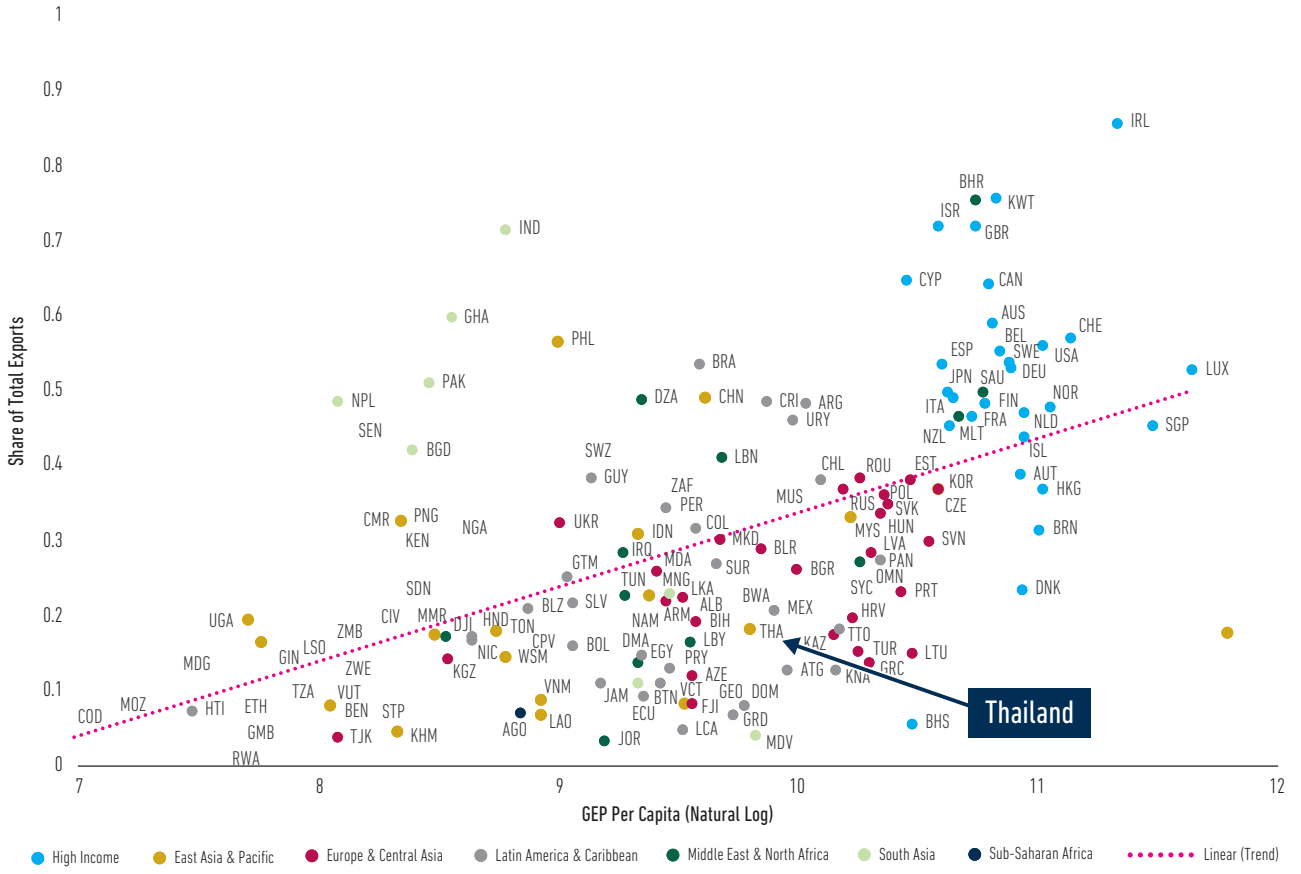




Source: WDI; World Bank staff estimates

These indicators suggest that Thailand's previously vigorous engine of growth is showing signs of obsolescence. The momentum of Thailand's diversification has slowed down, in part because exporters can no longer rely on low-cost wages for maintaining their competitive advantage. Thailand's export sector is stuck in a manufacturing model with modest forward linkages, and one that faces competition from neighboring countries that are moving up the value chain by advancing reforms, thereby eroding Thailand's advantage in low labor costs (annex B-2). In addition, the high backward GVC integration, when compared to its competitors, signals domestic constraints on production and on the availability of supporting services. Thailand is also highly dependent on tourism for service exports, but these exports have relatively few linkages and diversification prospects compared to other service subsectors. Subsequently, Thailand's participation in global innovator services has been below expectations for its level of income. Annex B-3 provides a typology of subsectors in services.

FIGURE 6: SHARE OF GLOBAL INNOVATOR SERVICES IN TOTAL SERVICE EXPORTS AND LOG OF GDP PER CAPITA, 2017

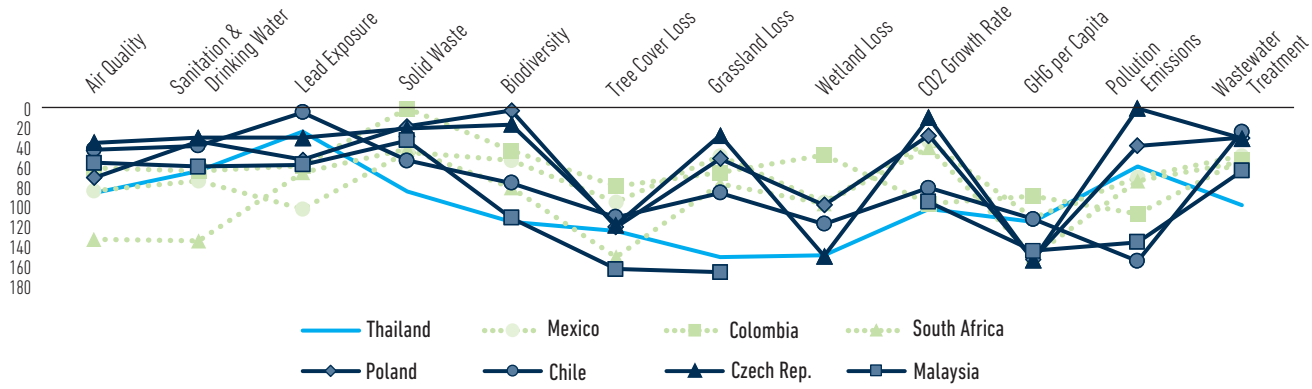


Source: Nayyar *et al.* (2021)

Further, Thailand's economic development has largely been neither sustainable nor inclusive.

Thailand's economic growth has come at a cost to the environment: the rate of environmental degradation has accelerated significantly over the past 20 years, compounded by the adverse effects of climate change. CO2 emissions have increased rapidly, from 80 million to 244 million tons per year between 1990 and 2015 (OECD, 2021). Natural disasters such as flooding and droughts have risen in frequency over the past several years, which in turn has had the frequent effect of dampening economic growth. Based on Yale's Environmental Performance Index (EPI), Thailand's environmental management lagged that of comparator countries in 2020 (figure 7).

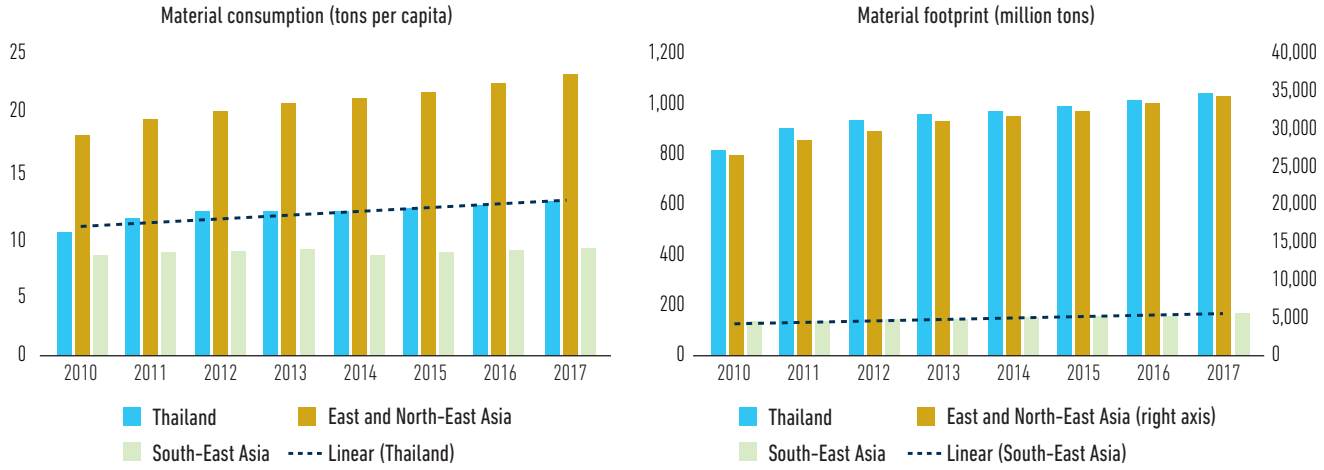
FIGURE 7: ENVIRONMENTAL INDICATORS RANKING (YALE ENVIRONMENTAL PERFORMANCE INDEX, 2020)



Source: Yale Environmental Performance Index, 2020

Thailand's forest, coastal and agricultural systems have been degraded significantly at a much higher rate than in comparable countries in the East Asia and Pacific region. Coastal communities face erosion, ocean waste, and illegal destructive fishing. Thailand's natural resources have also borne the brunt of its fast-growth model: the country's material footprint (extraction of raw materials for consumption) indicates that significant amounts of the country's raw materials have not only supported domestic demand but been exported to meet global demand (figure 8).

FIGURE 8: THAILAND'S PERFORMANCE ON SOME DIMENSIONS OF RESOURCE USE AND CONSUMPTION17

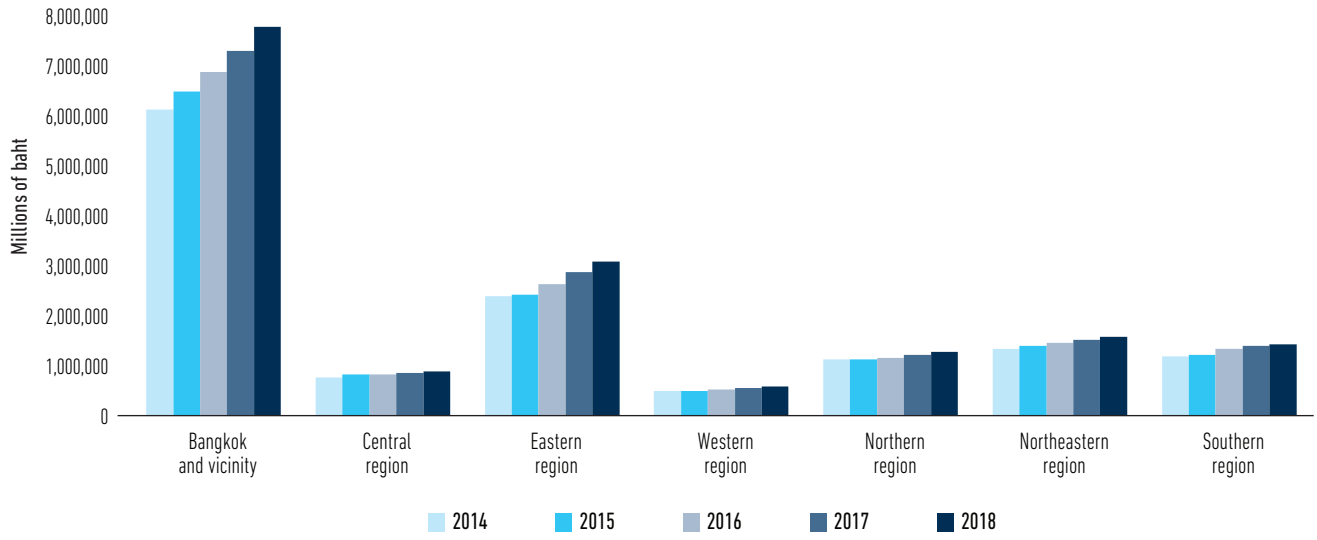


Source: UNESCAP data, https://sdghelpdesk.unescap.org/re/thailand.html.

Note: Northeast Asia includes the Peoples Republic of China, the Democratic People's Republic of Korea, Japan, Mongolia, and the Republic of Korea.

Finally, growth has not been inclusive across firm size and regions. Large firms continue to increase their market dominance and power (Srithanpong *et al.*, 2015) while SMEs show signs of stagnation (discussed further in the document). Differences in economic output across regions in Thailand are pronounced (figure 9). Demographics, the availability of natural resources, cross-border trade opportunities, and geography all play a role in explaining the variations in output. The OECD indicates that the disparity in per capita income between the poorest and richest regions of Thailand is similar to the difference between Zambia and Poland (OECD, 2018).

FIGURE 9: GROSS REGIONAL AND PROVINCIAL PRODUCT AT CURRENT MARKET PRICES (MILLIONS OF BAHT)

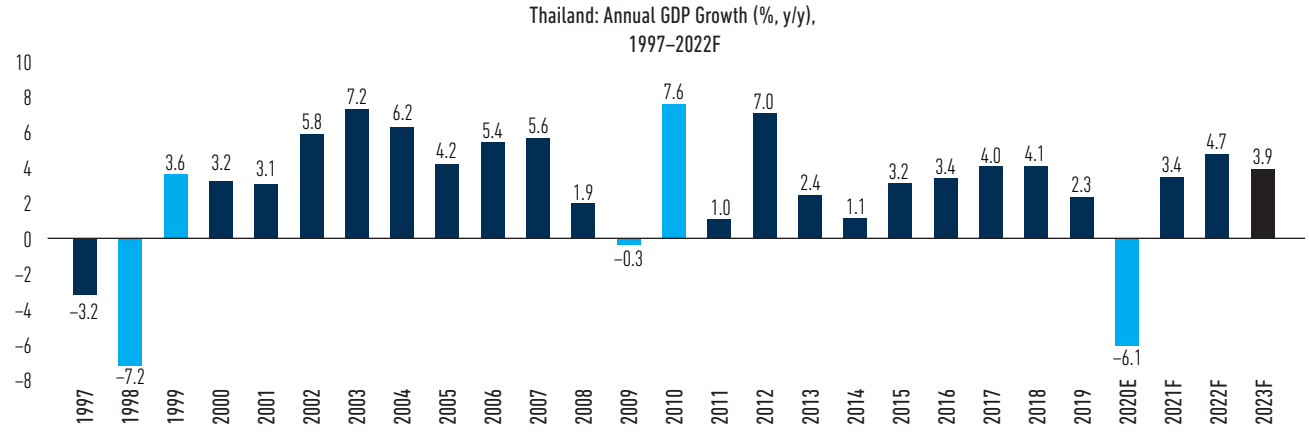


Source: National Statistical Office, Thailand

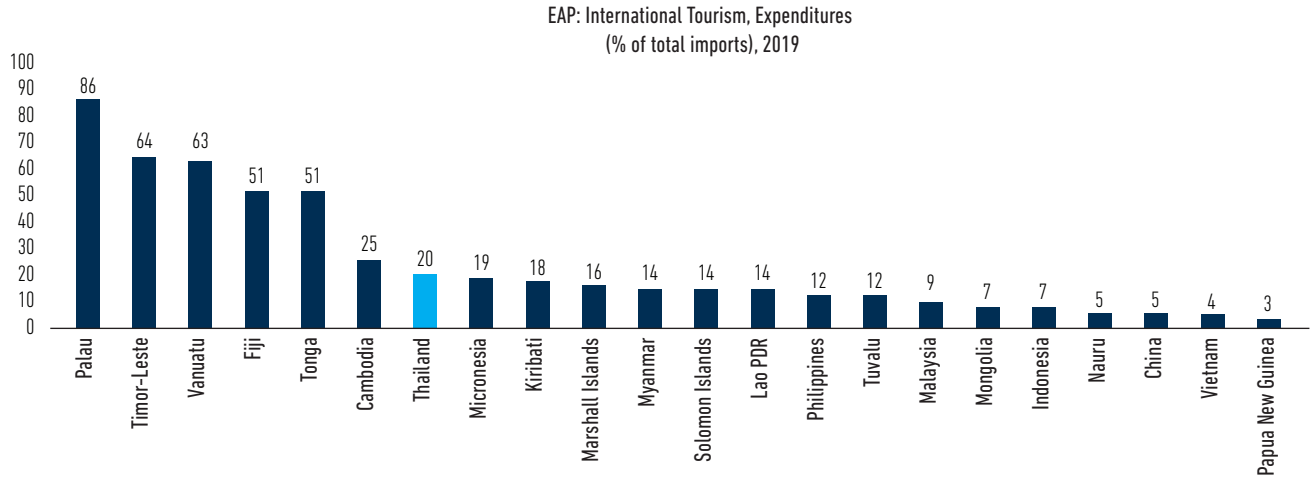
The COVID-19 pandemic has delivered a further massive shock to the economy, with potentially long-term repercussions.

The ongoing pandemic and lockdowns have led to the worst contraction to Thailand's growth since the 1997 Asian Financial Crisis. In 2020, the economy is estimated to have contracted by 6.1 percent, which is sharply steeper than the decline experienced during the 2008 Global Financial Crisis (0.3 percent) and second only to the 7.2 percent contraction in 1998 – the most severe full-year economic contraction of the past 25 years (figure 10). The contraction is almost twice as large as the GDP-weighted average contraction in the entire EAP region (excluding China).[18] One reason for this outsized impact on Thailand is the economy's heavy dependence on exports, which accounted for 55.8 percent of GDP between 2006 and 2016 (Apaitan *et al.*, 2019), particularly tourism. Prior to the COVID-19 crisis, tourism receipts accounted for about 20 percent of total exports, making Thailand one of the most tourism-dependent economies in the region.[19] Inevitably, the massive loss of tourism revenue – visitor arrivals fell to zero for six straight months when the pandemic started – along with lower export demand and weak consumer and investor sentiment, has slowed domestic activity sharply.

FIGURE 10: GDP GROWTH AND TOURISM DEPENDENCE



Source: NESDC and World Bank Group staff for forecasts



Source: CEIC

The outbreak has caused significant loss in economic output and employment across a range of sectors, reversing gains in poverty reduction (annex B-4). Domestic lockdowns, travel restrictions and supply-chain disruptions have led to severe revenue loss in many firms. The sectors most at risk of employment reduction due to COVID-19, including tourism, travel and entertainment, employed nearly 21 million workers before the pandemic. In addition, the economy has kept getting battered with successive waves of the pandemic from early 2021. Growth contracted by 0.3 percent year on year in Q3 2021 and this was the third deepest amongst regional peers. Poverty gains made in previous years have been marginally reversed by 0.2 percentage points in 2020 and have stabilized in 2021. An additional 200,000 people are estimated to have fallen into poverty since the pandemic began, though swift government stimulus and interventions have prevented another 700,000 people from doing so (Thailand Economic Monitor, December 2021).

Firms are facing severe liquidity constraints and COVID-19 has taken a disproportionate toll on SMEs. Government finances will be stretched as a big stimulus package is delivered to help counter the economic effects of the pandemic.

While Thailand's financial system remains resilient, increased corporate vulnerabilities and elevated levels of household debt pose significant risks. Lower economic activity is expected to impact the financial system through the reduced debt servicing capability of corporates, SMEs, and households. The household debt-to-GDP ratio, a source of vulnerability even prior to the crisis, has risen further, to almost 90 percent of GDP (end June 2021). Importantly, vulnerabilities in the corporate sector increased during the first half of 2020 owing to a deterioration in debt service capacity and liquidity, and this could impede future private investment.

Government action has been appreciably swift, but moving forward, the recovery will have to be led largely by the private sector. Public authorities approved monetary and fiscal measures totaling 9.3 percent of GDP in 2020 when the pandemic hit. However, the government would need to strengthen insolvency and restructuring frameworks to address financial distress and support viable firms going forward. A private sector-led recovery is an imperative. Court-sanctioned debt restructurings, out-of-court debt workouts, and simplified insolvencies for SMEs may be needed (Freund, 2021).

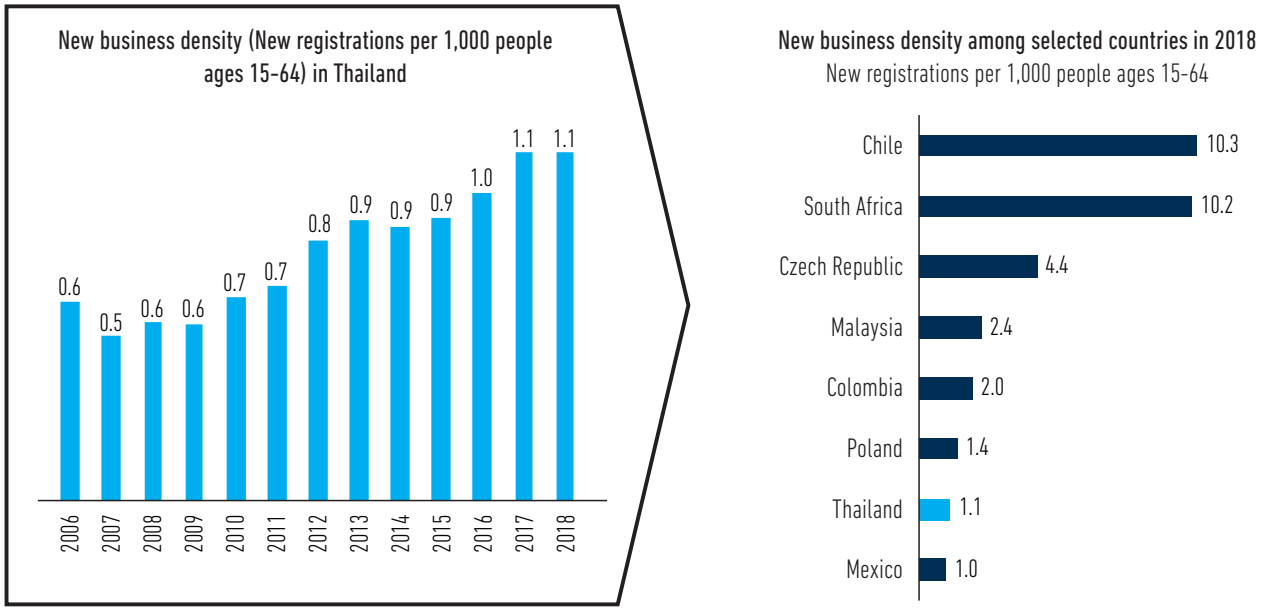
In addition, the financial sector's stability must be protected to support recovery. Additional regulatory and supervisory incentives may be required to foster action in promoting effective debt restructuring and manage nonperforming loans. Support should be directed to viable firms facing financial pressures from the COVID-19 shock. Debt is forecast to rise over the next two years. However, rather than curtail spending prematurely and raise taxes, the government should consider committing to fiscal discipline over the coming years and to implementing efficiency-generating reforms (World Bank, 2021).

2. THE STATE OF THE PRIVATE SECTOR

Thailand's private sector shows weaker new firm creation activity than its peers, and average firm size is becoming smaller.

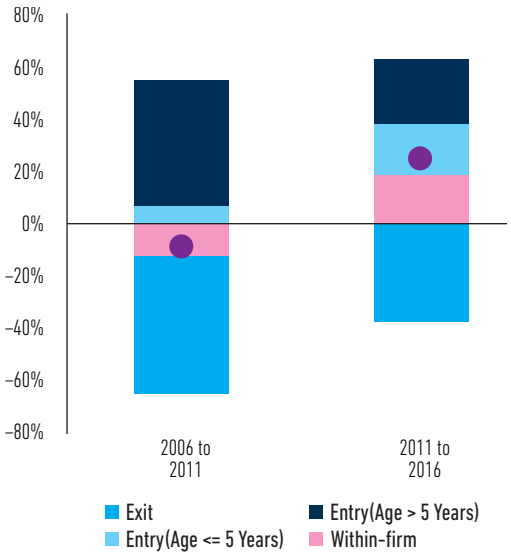
Private sector performance has also stalled, contributing to a slowdown in Thailand's growth. The rate of firm entry and exit (that is, as a proxy for "creative destruction" in the economy), a key determinant of productivity growth, is low for a country at Thailand's income level. In an economy, aggregate productivity is driven in part by the entry of highly productive firms (relative to the industry average), and the exit of low-productivity firms (Cusolito and Maloney 2018). However, the rate of entry of new firms has slowed in Thailand.[20] Consequently, firms have become smaller and older since 2015.[21] While the rate of entrepreneurship in Thailand has risen over the years, it still remains relatively low compared to peers. Thus, new business creation flattened at 1.1 per thousand in 2018, the lowest among its peers – for comparison, 10.3 in Chile, and 2.4 in Malaysia (WDI, 2020) (figure 11).

FIGURE 11: NEW ENTERPRISE FORMATION IN THAILAND, 2006–2018



Source: WDI, Thailand Economic Monitor, January 2020

FIGURE 12 ENTRY & EXIT OF FIRMS



Source: WDI, Thailand Economic Monitor, January 2020

Thailand's economic activity is dominated by many small enterprises, on the one hand, and a few very large firms, on the other, with most SME activity in the low-skilled wholesale and retail sectors. The ratio of SMEs'[22] value-added to total GDP has remained stable at 32 percent for several years, while the number of SMEs in the past 10 years has grown significantly – by more than 30 percent (BOT, 2020). There were approximately 3.1 million SMEs in 2020 (approximately 98 percent of the total private sector), of which 85.6 percent were micro-enterprises and 13 percent were small. SMEs accounted for approximately 40 percent of the total revenue and 30 percent of total asset share. Most operated in traditionally low-skilled retail trade, manufacturing, food, or beverage activities. In 2019, SMEs dominated the wholesale and retail activities, with an 84 percent share, and had a large presence in the services sector (48 percent). By contrast, the manufacturing sector was dominated by large enterprises that comprised 64 percent of firm activity.

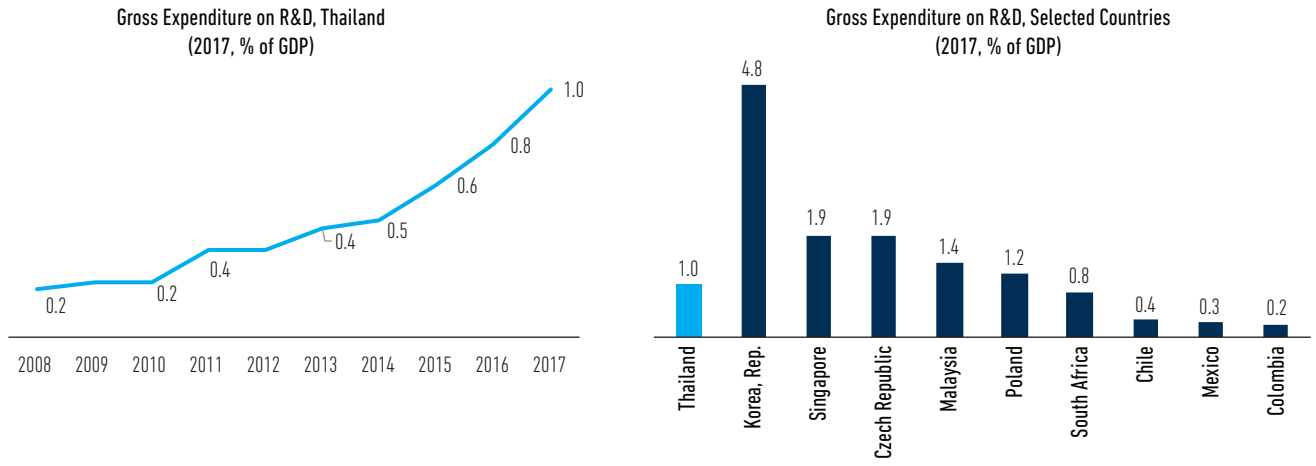
The informal economy remains large, and the COVID-19 pandemic has made it more difficult for firms to formalize. About 54 percent of the labor force in Thailand were engaged in employment associated with "informal work" in 2020 (NSO). A third of the total were self-employed. Informality is also linked to rural, often agricultural or service, jobs. Farming businesses are often informal and do not register their enterprise and hence are not represented in official statistics. It is therefore likely that the level of informality in Thailand has been underestimated owing to a lack of data on micro and small enterprises engaged in farming activities in the countryside.[23]

The lack of a comprehensive strategy for reducing informality will exacerbate the situation, especially after the pandemic. The COVID-19 pandemic has pushed firms and workers toward informality, through migration to the countryside and employment in agriculture. This phenomenon has served as a safety net for many households, but incomes have been hit hard. Although some relief has been channeled to informal off-farm workers, informal firms and workers are less likely to receive COVID-19 support, especially if they are migrants. Informal jobs offer little or no job security, workplace safety, or social protection and pay less than formal jobs. Informal enterprises also tend to lack access to formal credit channels and are usually less productive.

Innovative and growth-oriented businesses are few; large firms dominate export activity.

Technology adoption rates and the prevalence of innovation have not met expectations in recent years. In 2020, innovation and technology adoption were instrumental in helping firms to adapt to the negative impact of the COVID-19 pandemic through the reconfiguration of business processes and the embracing of digital solutions (Freund, 2020). Thailand's R&D expenditure as a percentage of GDP, although it has increased over time, continues to lag peers (annex B-5).[24]

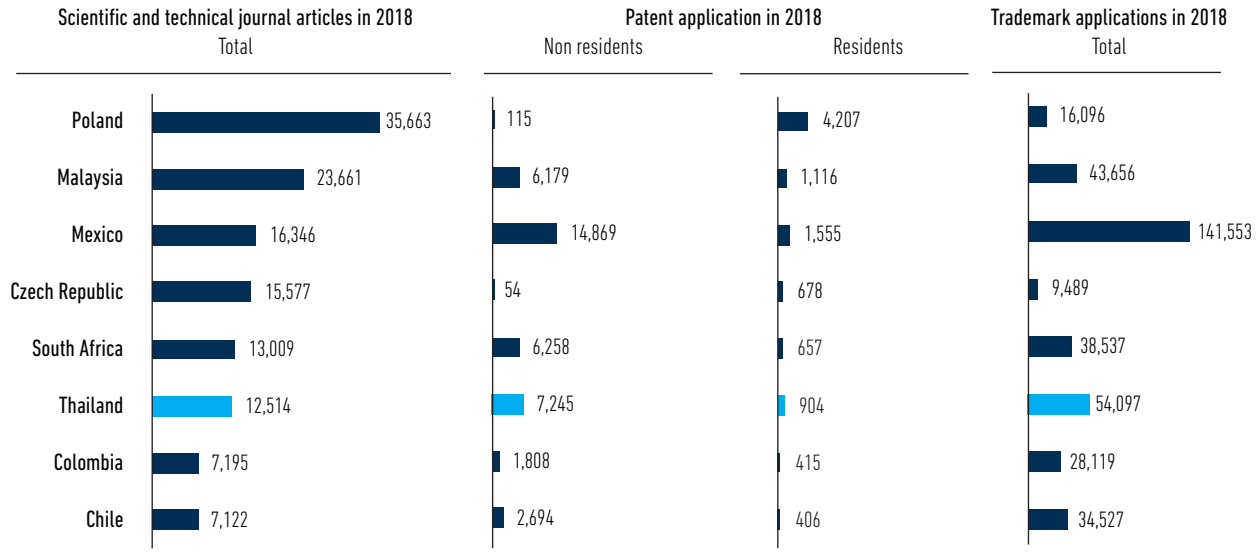
FIGURE 13: SELECTED METRICS FOR R&D-BASED INNOVATION



Source: UNESCO, European Commissions, Media reports, OECD

The prevalence of high-quality certifications among Thai firms (measured as the percentage of firms that hold international quality certifications) was 7.9 percent, lower than regional peers (11.5 percent) and all countries (14.8 percent) in 2016.[25] Thailand's benefits from investments in "knowledge capital" also remains modest in comparison (figure 14).

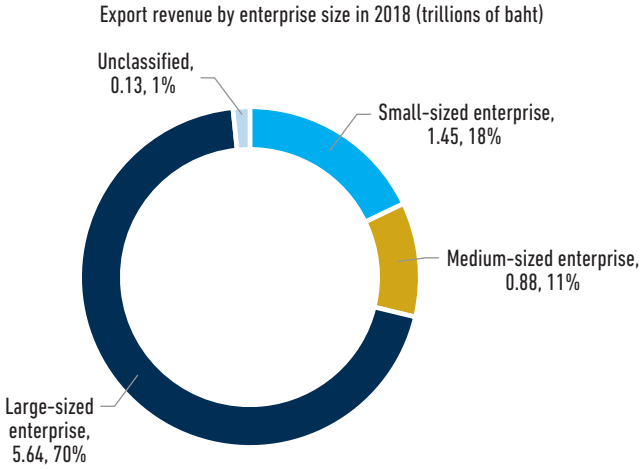
FIGURE 14: SELECTED INNOVATION RESULTS, 2018



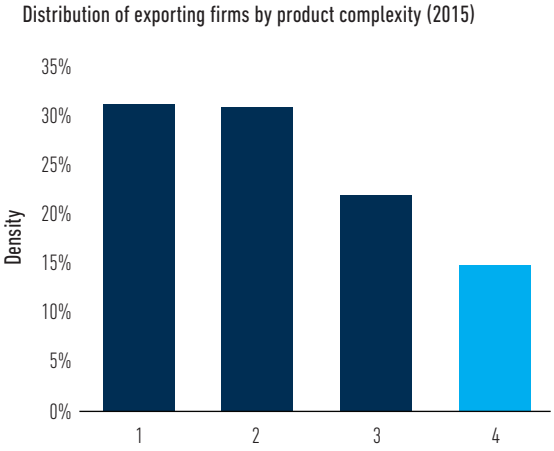
Source: World Development Indicators

Similarly, a small number of firms, specifically the larger ones, that have more access to innovation inputs have been the dominant participants in global trade. In 2018, only 5 percent of all registered firms engaged in exports, compared to the regional average of above 11 percent (WDI). In manufacturing, only 14 percent were export firms. Large enterprises accounted for over 70 percent of the total export revenue. Further, only 15 percent of exporting firms operate in the top complexity quartile, indicating the possible lack of innovation and inability to upgrade functions in the value chain (PIER+, 2019). SMEs have a lower degree of engagement in both backward and forward GVC participation.

FIGURE 15: EXPORT REVENUE BY ENTERPRISE SIZE AND COMPLEXITY OF EXPORTS



Source: Asian Development Bank Institute, Office of SME Promotion



Source: Apaitan *et al*, 2019. PCI: Product Complexity Index

Conglomerates play a substantial role in the economy and exert disproportionate market power; there is a geographic concentration of private sector activity.

The large firms are dominant conglomerates with very big business networks and high price markups. These firms are usually owned by a small number of families – 500 people accounted for 30 percent of total profit in the private sector and 36 percent of the total book value of Thai businesses in 2018. Further, they are part of big widespread business networks.[26] About 47 percent of corporate profit came from firms that belong to these business groups in 2017 (PIER+, 2018). Signs of market power in key sectors of the economy are reflected in substantial markups, with the average markup having increased since 2010 (Apaitan *et al*., 2019). The CPSD unpacks this issue in part II.

The geographic dispersion of firms shows the concentration of many smaller firms in less developed parts of the country. While the northern and northeastern provinces of the country have 42 percent of SMEs, these employ only 26 percent of workers. On the other hand, in 2017, the Bangkok Metropolitan area held 18 percent of SMEs, employing 30 percent of the total workforce, and contributing the dominant share of GDP and employment overall (ADBI, 2018). This geographic dispersion is not specific to Thailand, but it highlights the importance of strategies that look at generating widespread

and inclusive growth in the country. For Thai policymakers, initiatives such as the Eastern Economic Corridor (EEC) project[27] need to be designed with a focus on creating linkages to the wider domestic economy, relying on demonstration effects and levers such as technology adoption to generate multiplicative effects from agglomeration and economic growth.

The COVID-19 pandemic has accentuated the private sector's challenges, particularly for SMEs, accelerating the need for a more dynamic revival of the sector. COVID-19 and the subsequent lockdowns have had a negative impact on sales across firms, but SMEs have suffered disproportionately. This difference persists after controlling for initial labor productivity, firms' age and location, and firms' linkages to international markets, either via imports or exports. The impact on sales is higher for micro and small firms than for medium-size firms, while the impact on employment is highest for small firms (BOT, 2020).

3. MOVING FORWARD: LEVERAGING OPPORTUNITIES AND ADDRESSING CONSTRAINTS

As Thailand charts its way forward, it will be important for it to keep a close eye on the global and domestic megatrends that will shape the future of global growth because they will help determine the opportunities that open up for the country.

In assessing Thailand's growth prospects, several global, regional, and national trends emerge as tailwinds or headwinds for development. These include the acceleration of digitalization and automation, an increased focus on the climate change and resilience agenda, global trade realignments, and the country's aging population (figure 16). The COVID-19 pandemic has already accelerated the pace of some of these trends. These trends not only create opportunities for Thailand to leverage its comparative advantages but also underscore structural weaknesses in the economy.

The rapid growth of automation and digital technology in the production, delivery and use of goods and services adds urgency to adjusting the Thai development model. Digitally-driven technological transformation is one of the major long-term industry and business megatrends (Fitch Solutions 2020).[28] [29] Every major company is expected to have undergone a process of digital transformation by 2050. Technology companies in emerging markets tend to attract investor interest even during times of capital outflows from emerging markets. The race for digitization and digitalization will intensify as firms innovate to produce faster and lower-cost client solutions to satisfy fast-evolving consumer tastes.

Climate change, natural disasters, and the coronavirus pandemic highlight the urgency to build economic resilience. The threat to the environment of rapid unsustainable global growth, and its implications for an acceleration in climatic calamities, is a well-documented trend. Global action, most recently through the Paris Agreement, outlines national commitments to manage carbon emissions – which are being reaffirmed under the call to "build back better" after the pandemic. The *second* of the two long-term industry-disrupting megatrends is the push toward a low-carbon economy as firms respond to changing consumer expectations and government policy.

The changing global trade environment carries strategic implications for Thailand's competitive strategy. Escalating trade tensions between China and the United States in the months before the pandemic hastened the decline in the share of Chinese imports to the US, with the slack being picked up by Southeast Asian countries such as Vietnam and Thailand.[30] The signing of the Regional Comprehensive Economic Partnership (RCEP) in 2020 could also accelerate the trend of increased FDI from countries such as Japan, the Republic of Korea, and Taiwan into ASEAN.

Domestically, a key trend that will continue to affect the pace and quality of Thailand's growth is its rapidly aging population. Thailand is aging quickly and at a low-income level relative to other countries. The share of the population ages 65 or older is projected to rise from 13 percent in 2020 to 31 percent by 2060. Thailand's working-age population is projected to continue shrinking – from 71 percent of the population in 2020, to 66 percent by 2030, to 56 percent by 2060. This is the third-largest projected decline in the EAP region, after Korea and Japan. These trends could result in occupational and skills shortages, although raising labor productivity using technology and automation could counter this shift.

The COVID-19 pandemic is already influencing the pace of these trends, and while some of that effect may be temporary, the pandemic will likely leave a long-term imprint. *First*, the pandemic may hasten regional-level integration in economic activity as global value chains attempt to near-shore activities, resulting in growth in intraregional trade.[31] [32] For example, data show that China's imports from the ASEAN region have risen in 2020 year-on-year. *Second*, digital, and disruptive technologies are likely to rapidly gain pace across sectors, cementing some of the digital solutions that emerged as a response to the pandemic. *Third*, although Thailand remains highly exposed to the consequences of climate change from typhoons, and tropical diseases, there may be a stalling or reversal of this agenda as governments focus on immediate recovery of growth. For example, the planned transition from fossil fuels to renewable energy is now being challenged, and in some countries partly sidelined, by the unprecedented health emergency and economic crisis. The early collapse in oil and gas prices and the decline in coal prices may reduce support for renewable energy.

The importance of these trends for the Thai economy moving forward is reflected in the government's core strategy and vision. Transforming the country into a sustainable, value-added, innovation-driven, and knowledge-based economy is the prime goal of the government's National Strategy (2018–2037), underpinned by its development policy, Thailand 4.0. The implementing tool – the 12th National Economic and Social Development Plan (NESDP) 2017–2021 – enshrines this vision in its strategic pillars. Over the past several years, the government has mobilized stakeholders around a collective vision anchored in competitiveness. The Eastern Economic Corridor (EEC) project is a testament to this vision and its commitment to demonstrate how a new model can work. A more detailed discussion of the EEC is provided later in the document.

In the light of the stalled growth dynamics, and considering global trends, including the pandemic, Thailand needs to move to an innovation-led and knowledge-based growth model – which could come from moving toward more complex manufacturing and to innovative services.

The traditional, export-manufacturing model needs to be upgraded urgently if it is to remain a driver of growth. Historically, few countries have reached high income levels without developing an export manufacturing base. Examples are Uruguay, the Republic of Korea, Poland, and Hungary, all of which moved to high-income status.[33] Manufacturing offered the benefit of employing many unskilled or low-skilled workers and leveraging the scale of global demand. The spread of the geographical and functional *"unbundling"* global value chain operations opened the opportunity for exporters to tap into existing supply networks with great efficiency.

But the landscape has changed significantly in the past years. *First*, the megatrends mentioned earlier have influenced the way global trade in manufacturing is done – with increasing automation, toward the production of "greener" goods and services, and under the increasing influence of the political economy of trade. *Second*, the boundaries between manufacturing and services are blurring: a greater share of manufacturing is now value-added in upstream R&D activity or in downstream marketing in the form of embedded services.[34] The result is that the new manufacturing model, with its use of technology, upgraded skills, and an ecosystem that drives continuous innovation, is more sophisticated. Hence, traditional models to high-income growth may not be sufficient.

The service sector can increasingly drive economic transformation and move to better jobs if it transitions into highly productive activities. Thailand relies heavily on the tradable services of travel and tourism. However, these subsectors typically spawn few links to the rest of the economy and do not contribute significantly to diversification (McMillan *et al.,* 2017). Further, these sectors typically employ larger shares of low-skilled workers, which restricts the benefits of knowledge spillovers. On the other hand, as mentioned earlier, Thailand's participation in export-led global innovator services has been much lower than might be expected from its income level. But export-led global innovator services create greater linkages to other sectors of the economy, including manufacturing, and hence tend to be more productive. Moving to a greater share of these innovative services would therefore help Thailand support the increasing complexity of its manufacturing base, propel productivity, and create better jobs. However, this will again require building up the human capital base and developing advanced capabilities.

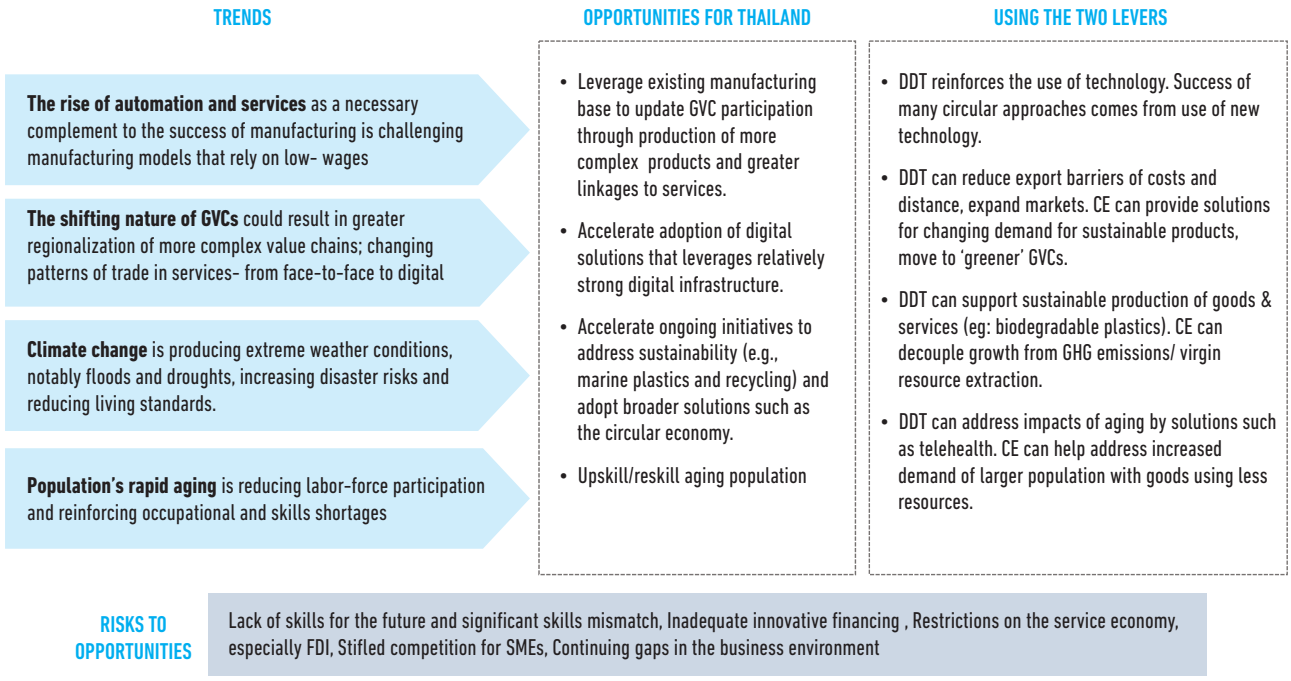
In short, the new growth model needs to have innovation at its core and rely on building technological capabilities for resilient growth. ***The adoption and expansion of digital and disruptive technologies, and of the circular economy, are two pivotal levers for this model.***

Exploiting digital and disruptive technologies and circular-economy approaches can propel the country toward greater development. In both these paths, innovation is a key driver of success. Technology can help drive productivity by (a) leveraging labor with financial capital and innovation (knowledge capital); (b) helping firms circumvent physical distance, and thereby increasing economic participation and markets; and (c) reducing exporting costs and barriers and enabling access to operational supporting services such as finding customers (online marketing) or delivering products (e-logistics) and financing (e-credit lines and financial insurance).

Circularity, defined in detail later, is innovative because it rests on a radically different and alternative way of producing and delivering goods and services. It is based on leveraging technology and innovative methods to enhance efficiency in production. It also offers a compelling solution to the challenge of climate change, carbonization, and resilient growth by reducing dependency on natural resources for production and by extending the use and life cycle of goods.

Both approaches create an opportunity for a country to move to higher-value-added domestic and global value chains as other countries demand more complex products and implement stringent rules on sustainable trade. Finally, both approaches can facilitate the economy's transition from its current state in COVID-19 shock to a new normal.

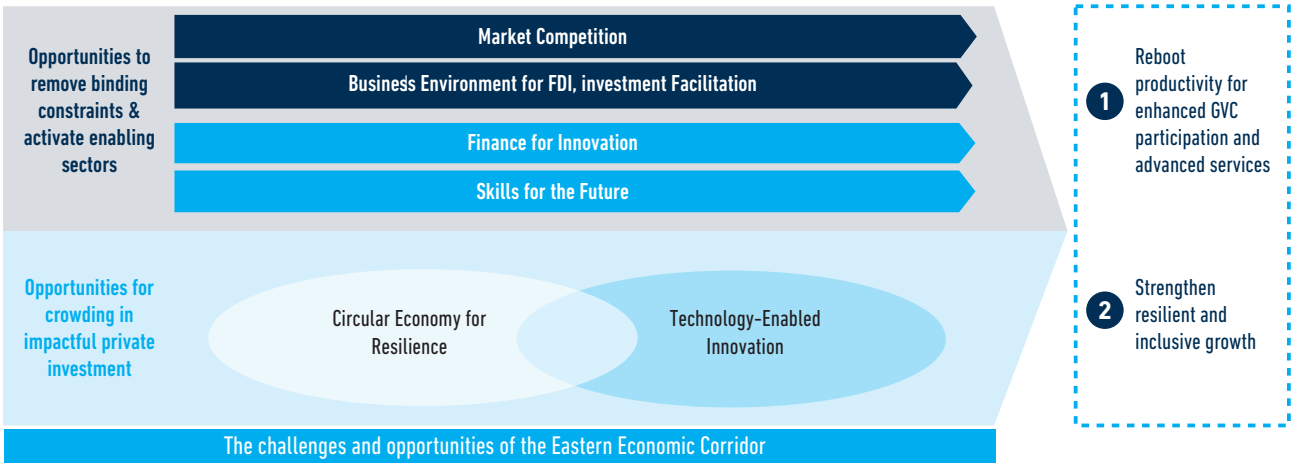
FIGURE 16: CURRENT AND FUTURE TRENDS, THEIR IMPLICATIONS FOR THAILAND'S DEVELOPMENT, AND USE OF DDT AND CIRCULARITY TO LEVERAGE TRENDS



Building fundamentals for this new growth model would require upgrading core institutional capabilities and addressing important gaps, including market competition and an enabling business environment, as well as innovation skills and finance conditions.

This CPSD therefore considers in detail four investment constraints that straddle several sectors: a lack of market competition, FDI restrictions, weak access to innovation finance, and inadequate skills for the future. Focusing on broader "fundamentals" implies addressing the cross-cutting issues that can unlock private investment and create markets. Promoting competition, removing restrictions to FDI, expanding skills for the future, and enabling access to innovation finance represent complementary investments to support this innovation-led growth model. This hypothesis has been vetted against (a) the government's vision (b) stakeholder consultations (c) the ability to build back better after COVID-19, and (d) complementarity with ongoing World Bank programs (figure 17).[35] A more detailed explanation of the steps toward narrowing the scope is given in annex G.

FIGURE 17: SCOPE OF THE CPSD



It is important to note that adopting the above two levers does come with certain risks and challenges in implementation. *First*, innovation imbedded in DDT and CE can bring second-order effects such as increasing inequality between populations in urban agglomerations and rural areas, and the lack of economic inclusion of workers in the least developed regions, such as the Northeast and the South. In the short run, there could also be a tradeoff with job loss as processes become automated. Deepening the use of digital technology has been often linked to "winner take call" dynamics, which lead to extreme outcomes that widen the gap between successful companies that forge ahead and those left behind. This is further discussed in the competition section.

Second, **evidence from a recent regional study highlights the fact that innovation policies and institutions in East Asia are often not fit-for-purpose (Cirera and Mason, 2021).** Innovation policy mixes are not well oriented to building firm capabilities, and governance of innovation agencies and research organizations remains weak.

Third, **related to this point are the existing gaps in several factors that are critical to the success of these approaches, such as a high-skilled workforce, a robust intellectual property framework, and a research infrastructure base.**

PART II: INVESTMENT CONSTRAINTS

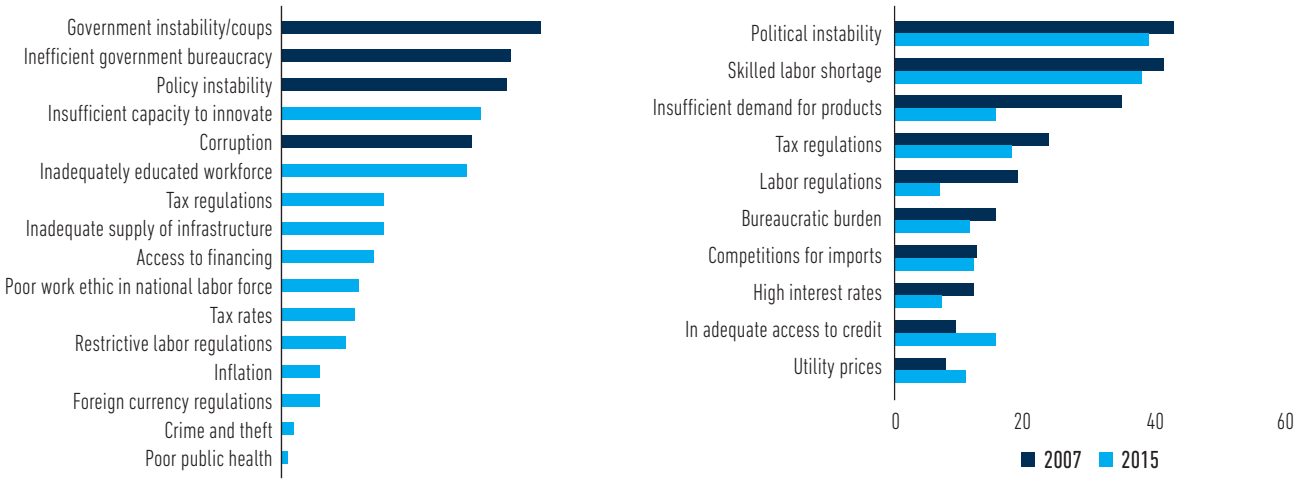
4. INTRODUCTION

This section addresses the main constraints holding back private investment in areas and sectors that promote productivity through capital, intangible knowledge, and know-how. The imperative to introduce reforms that promote investment in innovation capital is more important than ever because Thailand's regional neighbors have of late been bolder in pursuing parallel reforms.[36]

Thailand has improved its business environment compared to regional and aspirational peers, but gaps remain. The most significant improvements over the past five years have been made in getting credit and electricity, protecting minority investors, and paying taxes. However, gaps remain, especially in the regulatory framework governing trade. Thailand continues to have one of the highest costs and time requirements for border compliance among its peers. Trade treaties are a core part of the country's trade strategies and they provide a platform on which these challenges can be addressed.[37]

Political instability and tax regulations continue to affect the business environment and FDI flows. Several surveys of the private sector have cited political instability, inefficient government bureaucracy, and tax regulations[38] as prevailing issues (figure 18). The literature on the cross-country determinants of private investment and FDI highlights political stability, the rule of law, and the existence of a robust investor protection framework as positive influences (Poggi *et al.* 2016). Thailand, at 59th place, ranks relatively poorly against comparator countries in the 2020 Political Stability and Absence of Violence/Terrorism Index. In comparison, Singapore ranks first, Malaysia 21st, and Vietnam 29th.[39] On the World Bank's Governance Indicators, Thailand's rank on voice and accountability and political stability have worsened in the past decade, while the quality of the bureaucracy remains low compared to that of its regional neighbors.[40] In comparison, the rankings of its neighbors have improved, which will likely affect where foreign investment chooses to go within the region.[41] The country continued to witness political instability even during the COVID-19 pandemic, which was reflected in a lowering of its sovereign ratings by Moody's and S&P in April 2020, citing political tensions as one of the main reasons.[42]

FIGURE 18: MOST PROBLEMATIC HURDLES TO THE BUSINESS ENVIRONMENT: EXECUTIVE SURVEY (WEF, 2017) & ENTERPRISE SURVEYS (2007, 2016)



Source: World Economic Forum, WEF (2017); Enterprise Surveys (2007, 2016); World Bank

Thailand has made significant improvements in the protection of intellectual property rights (IPR), but effective enforcement needs to be enhanced. The protection of intellectual property rights is important for encouraging R&D investments, licensing agreements for technology, and promoting joint ventures between domestic and foreign firms. It is key for promoting innovation in emerging areas such as circularity, discussed later in the report. The promotion of FDI and the recent acceleration of firm digitalization as a reaction to the pandemic has increased the urgency to strengthen IP rights. Although Thailand's level of IP protection has improved and is on par with regional peers,[43] [44] opportunities for additional IP protection exist, for example, in the form of better enforcement of IP laws through interagency coordination (and the National Committee on IP Protection).

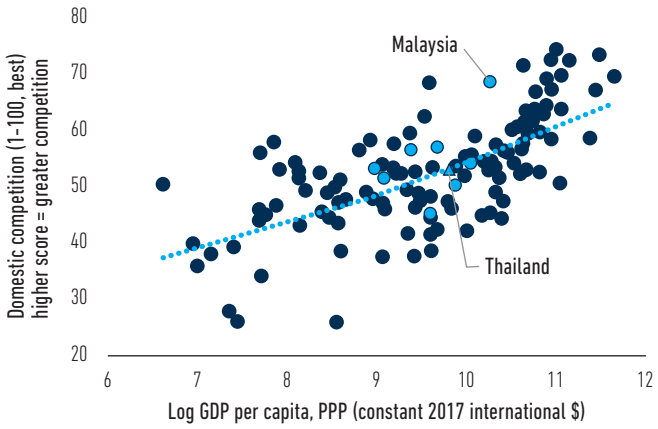
Thailand's recent track record on improving its access to, and the quality of, infrastructure has been mixed. The stock and quality of infrastructure has improved in most areas of transport and logistics, including road and railway connectivity and quality, according to the 2019 *Global Competitiveness Report*. The country ranked 32nd out of 160 countries on the Logistics Performance Index (2018), among the top in ASEAN.[45] Shipping connectivity has also been improving, reflected in improving Liner Shipping Connectivity Index rankings since 2018.[46] Thailand has also performed well in affordability and usage of mobile services. In 2020, more than 75 percent of Thailand's population used the internet and smartphones (Statista Research Department 2020a, 2020b). However, even though there is substantial internet penetration, internet prices are relatively high, in particular for high-usage mobile internet, partly driven by challenges in spectrum management, discussed in more detail in the Part III under Digital and Disruptive Technologies. Further, on other ICT-related infrastructure, the country trails its regional peers – ranking 74 out of 175 countries on ITU's ICT Development Index (IDI, 2018) specifically on metrics of computer access. On the digital adoption index (DAI, 2016), Thai business lagged its peers, at 0.57, versus Chile (0.82), Korea (0.75), Mexico (0.63) and Colombia (0.67), and at the same level as Malaysia (0.56).

While the above constraints are important, the CPSD uncovers four key opportunities that can improve Thailand's stalled productivity and innovation: (i) improved availability of skills for innovation, (ii) improved availability of finance for innovation, (iii) enhanced market competition, and (iv) the liberalization of FDI. Low levels of productive skills, including STEM, English language proficiency, and socio-cognitive skills, have emerged as constraints on businesses to operate and grow. Further, the Thai labor force has been contracting because of the aging population. Similarly, innovation finance is still embryonic in Thailand compared to its structural and regional peers. The size of VC funding is small relative to the country's level of income, and well behind all regional peers. Further, SMEs lack collateral financing for undertaking innovation and acquiring technology.[47] The dynamism of Thai businesses has been decreasing as firms on average have become smaller and older over the past five years (Banternghansa, 2019), while the market power of large corporations has been increasing, as measured by various markups (Apaitan *et al.*, 2019). FDI restrictions, especially in the services sector, impede the ability of the country to unleash the benefits of foreign investment not only within the sector but also across manufacturing. These four investment constraints are analyzed below.

5. COMPETITION

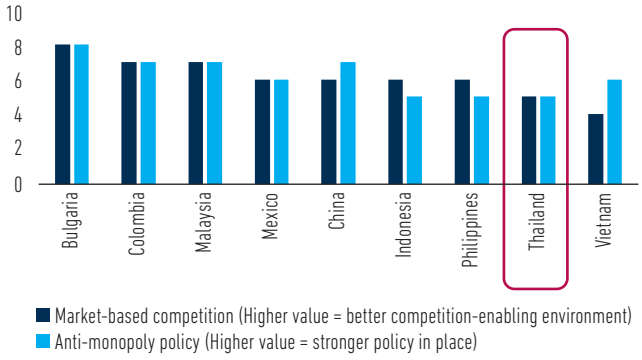
Enhanced competition in the Thai economy could boost growth in productivity and innovation. Globally, Thailand ranks 85th out of 141 countries in terms of the extent of market dominance according to the Global Competitiveness Report 2019.[48] On indicators specifically related to competition (2018–19), the perception of intensity of domestic competition in Thailand is lower compared to regional peers such as Indonesia, Malaysia, and China. Business activity in Thai markets is also perceived to be dominated by relatively few players, although some progress was made over the 2018–2019 period to reverse this. Based on perceptions from the latest Bertelsmann Stiftung's Transformation Index indicators,[49] the fundamentals of market-based competition (specifically, the regulatory interventions that enable competition) are considered less developed in Thailand than its peers. Additionally, competition laws to keep market structures and conduct that thwart competition in check also appear to be weak and lack effective enforcement (figure 19). For the size of its economy, Thailand is also performing below potential relative to some other countries in the region such as Malaysia (figure 20). Other comparator metrics on competition are given in annex C-3.

FIGURE 19: POOR DOMESTIC COMPETITION FOR THE SIZE OF THE THAI ECONOMY (DOMESTIC COMPETITION (1–7, BEST)



Source: World Economic Forum's Global Competitiveness Report (GCR), 2018–2019 and World Development Indicators (WDI), 2019.

FIGURE 20: MARKET-BASED COMPETITION AND COMPETITION LAW AND ENFORCEMENT ARE PERCEIVED AS WEAK



Source: Bertelsmann Stiftung's Transformation Index BTI, 2020

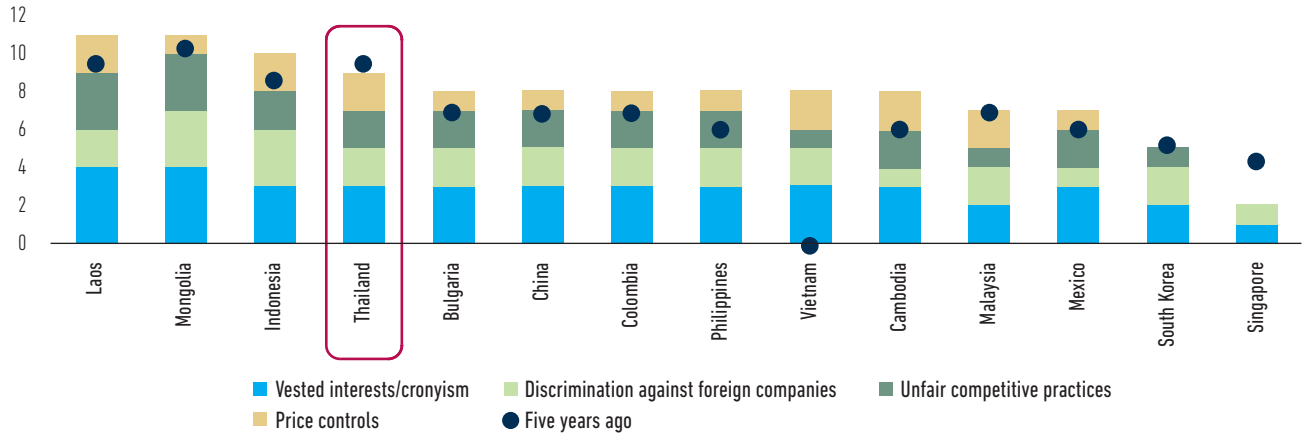
Note: The responses reflect conditions in the country at the end of January 2019.

Note: The BTI is a perception indicator based on in-depth assessments of countries and is managed by the Bertelsmann Stiftung.

Concentration of ownership in Thai markets has also risen over the last decade, increasing the market power of firms. Many of these large firms are connected through conglomerate networks, which in 2017 accounted for 70 percent of corporate revenue (Apaitan *et al.*, 2019). Firms in networks exhibit higher market power, as measured by markups. The markup of the median firm in Thailand increased from 9 to 17 percent from 2006 to 2016 (Apaitan *et al.*, 2020). Markups are also more evident in parts of the service sector; this is especially true for large and horizontally diversified networks (that is, networks with firms operating in the same industry).

Enhanced competition can improve investors' perception of the business attractiveness of the country (figure 21). Although there has been a slight improvement since 2016 (reflected below), the perceived level of operational business risk created by factors such as vested interests and favoritism, discrimination against foreign companies due to restrictive practices constraining FDI, unfair business practices, and prices controls, are still high in Thailand relative to most of its peers.

FIGURE 21: INVESTORS PERCEIVE BUSINESS RISKS RELATING TO COMPETITION IN THAILAND AS RELATIVELY HIGH *(INDIVIDUAL COMPONENT SCORE, 0 = BEST, 4 = WORST)*



Source: Economist Intelligence Unit (EIU) Risk Tracker, March 2021. Note: The EIU Risk tracker is a perception indicator as reflected by the Economist Intelligence Unit.

Inefficiencies in the regulatory framework are deterring competition. There are several levers in the regulatory environment available to an economy that can help either minimize distortionary interventions that impede competition or enforce laws to support it (figure 22). In Thailand, some of these levers are weak, inefficient, or absent.

FIGURE 22: A REGULATORY FRAMEWORK TO FOSTER COMPETITION

<table>
<tr><th colspan="3">HOW TO FOSTER COMPETITION IN PRODUCT MARKETS</th></tr>
<tr><td colspan="2">Minimize distortionary government interventions</td><td rowspan="2">Enforce and improve antitrust regulations</td></tr>
<tr><td>Sectoral regulation</td><td>State aid and SOE presence</td></tr>
<tr><td>Revise policies and regulations that promote market dominance: for example, lift restrictions on the number of firms that can operate and lift bans on private investment.</td><td>Control state aid to avoid favoritism and minimize distortions in competition</td><td>Tackle cartel agreements that raise the costs of key inputs and final products and reduce access to a broader variety of products</td></tr>
<tr><td>Eliminate government interventions that enable collusive outcomes or increase the costs of competing: for example, controls on prices and other market variables that increase business risk.</td><td colspan="2">Ensure competitive neutrality, including vis-a vis SOEs</td></tr>
<tr><td colspan="2">Reform government interventions that discriminate against and harm competition on the merits: for example, frameworks that distort the level playing field or grant high levels of discretion</td><td>Strengthen the antitrust and institutional framework to combat anticompetitive conduct (for example, abuse of dominance)</td></tr>
</table>

Source: World Bank-OECD (2017). Adapted from Kitzmuller M. and M. Licetti, "Competition Policy: Encouraging Thriving Markets for Development," Viewpoint Note No. 331, World Bank Group, August 2012

First, **as mentioned above, government policies impede foreign participation in key sectors of the economy either directly or through restrictive requirements, thereby stifling foreign competition.** Minimum capital requirements, restrictions on accessing certain sectors, and other non-regulatory barriers create hurdles for foreign firms hoping to compete. Restrictions are particularly severe in the service subsectors. This adversely impacts the availability of skills that are particularly relevant for driving Thailand's innovation agenda and labor productivity growth.

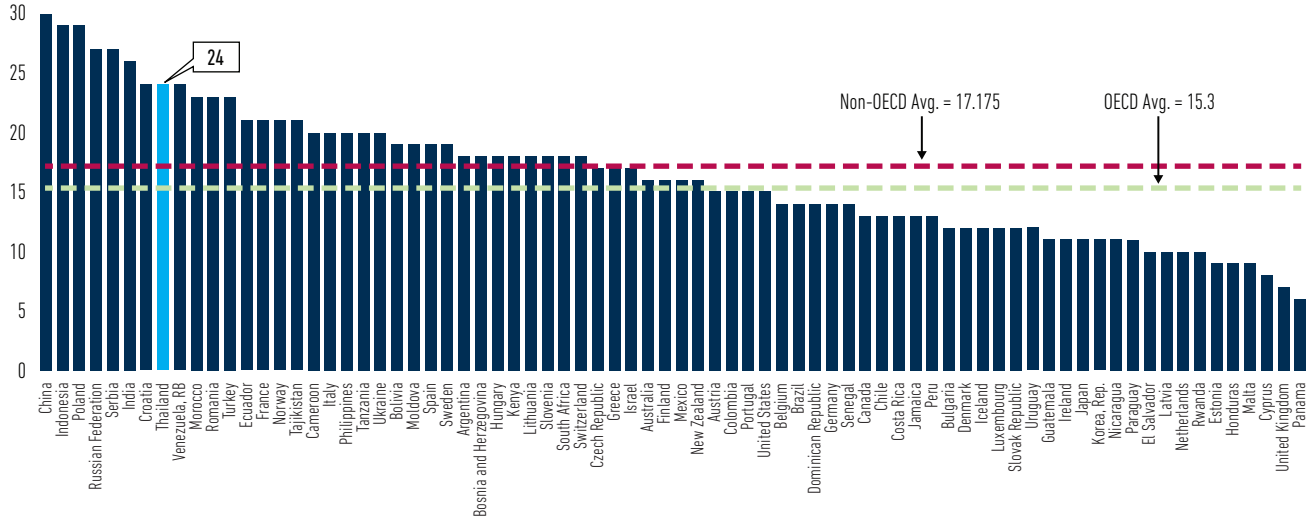
Second, **price controls in Thailand also restrain and distort competition in major markets of the economy, thus limiting productivity gains in key industries.** Price controls are prevalent in some sectors in agriculture and in several important consumer product markets. They are quite significant in share – prices of key goods and services that are administered in some form by the government (under the Price of Goods and Services Act) account for roughly one-third of the consumer price index (CPI) basket.[50] Further, the list continues to increase.[51] In addition, the prices of more than 200 products on the *watch list, priority watch list, and sensitivity list* are monitored, and manufacturers of products on the *watch list* must first notify the Committee before changing prices.[52] Preliminary results of a price comparison across countries, using data from 2010 to 2018, show that the prices of certain food products are, on average, higher in Thailand than in some comparator countries, even after controlling for proxies of potential demand and cost factors that impact prices such as income per capita, logistics performance, and applied tariff rates.[53]

Although these results can be explained by diverse factors, weak competition is likely a driver. These controls impact TFP adversely – a previous study from the Bank of Thailand drew a correlation between lower TFP for firms in Thai industries that were subjected to price controls (Ariyapruchya *et al.*, 2006). However, specific market/value chain assessments need to be conducted to understand in greater detail the competition issues affecting these markets.

Third, **Thailand's SOEs, which have a large footprint in the economy, play a dominant role in important markets.** Currently, there are 56 SOEs –43 wholly-owned and the remaining 13 majority-owned – with more than 300 subsidiaries operating across several segments of value chains. Their combined assets in 2018 stood at USD 422 billion, almost equivalent to the value of Thailand's annual GDP (US State Department 2020). They represent an unusually large segment of the market because they operate in more sectors or subsectors than do SOEs in the average OECD, non-OECD, or other upper-middle-income country, reflecting a higher degree of state involvement in commercial activities. Thailand features SOEs in at least 24 sectors (figure 23) compared to an average of 15 in OECD countries, 17 in non-OECD countries, and 18 in other upper-middle-income countries. They are particularly significant in the network sectors – energy, transport, telecom, and financial subsectors but also in other sectors that in other countries tend to be private-sector-driven (for example, accommodation and manufacturing).

Additionally, SOEs in Thailand, especially in the network sectors, have been shown to be less efficient than private firms, and there is some evidence that they are generally profitable only when acting as monopolies.[54] SOEs competing with private firms have typically suffered losses in the past (Tangkitvanich, 2015).

FIGURE 23: THE NUMBER OF SECTORS WITH SOE PRESENCE IN THAILAND IS CONSIDERABLY HIGHER THAN IN OTHER COUNTRIES



Source: Authors' elaboration based on data from Thailand's State Enterprise Policy Office (SEPO) at the end of 2018; and OECD-World Bank Product Market Regulation database 2013–2017

Thai SOEs are not subjected to the same discipline of market forces as their private counterparts, which may explain their reduced operational efficiency. For example, Thai SOEs enjoy several government financial benefits such as guarantees on debt and exemptions on debt, and some are exempted from having to comply with certain regulations. Unincorporated SOEs are also treated as state departments and so are exempted from paying corporate tax. The government also directly subsidizes several sectors such as energy (for example, fuel and electricity), rubber, and rice. While the government has

recently removed the price support program for sugar, it has raised oil subsidies (Apisitniran, 2019).[55] Moreover, until recently, SOEs were fully shielded from the competition law (see further below).

BOX 1: STATE-OWNED ENTERPRISES (SOES) AS INNOVATORS

SOEs need not be an impediment to competition. Rather, under the right conditions, they can de-risk innovation investments. Innovative interventions benefit from long-term horizons that allow for investments to yield returns, operational stability, and large pools of available finance. SOEs tend to enjoy these operating conditions. SOEs may also be in a position to internalize social costs, which can become hindrances to their private counterparts, especially when it comes to the adoption of new technology. Innovative SOEs can generate positive spillovers for private firms through forward and backward commercial linkages, engaging private firms as either clients or suppliers. Examples of SOEs that have played this role include the Republic of Korea's Pohong Iron and Steel Company (POSCO) and Shanghai's local SOEs (ADB, 2020).

A success factor in these examples is reportedly the strong collaboration between the SOEs and the private sector, for example, through the presence of private board members and advisers in R&D projects. The presence of competitive neutrality principles, such as transparency, and governance mechanisms to shield these projects from external political pressures and corruption have also contributed to their perceived success. However, successful implementation of innovative SOE-led projects can be challenging in developing countries, where governance arrangements for SOEs may be weak, or where the framework for competitive neutrality may not cover SOEs. In addition, relying on SOEs to advance innovation runs the risk of introducing market distortions and crowding out investment that may have been undertaken by private investors, leading to low impact additionality.

Fourth, an important component to ensure fair and non-distortionary regulations – the Regulatory Impact Assessment (RIA) – is incomplete and does not consider competition impacts. Although there have been recent moves to ensure the establishment of non-distortionary legislation in general, the lever – the RIA – does not cover secondary legislation nor the competition impacts of a law. This therefore provides loopholes in the drafting of subordinate laws that can create barriers to competition.

Finally, the country's competition law framework – the new Trade Competition Act (2017) – although a significant improvement over the old law, has gaps in implementation and enforcement. These include sector and firm exclusions in the oversight of the law, loopholes in the framework that leave it open to interpretation, and a suboptimal level of independence of the regulator. To elaborate:

i. **The Act has several exclusions from its application.** Some sectors (for example, energy, telecom, and insurance) that are governed by sectoral regulations with their own competition directives are excluded. This creates differential treatment across sectors and raises enforceability issues. Further, SOEs that are deemed necessary for security and the public interest, and NGOs, which includes several large business associations, are exempt from the law. Although some individual exemptions for anticompetitive behavior are possibly justified under the need to "facilitate business operations," such exemptions create opportunities for collusion among the big

market players. The new law also lacks specific obligations to apply a competition filter to state aid and other quasi-fiscal incentives that may distort market outcomes. Additionally, the law is not comprehensive enough to deal with competition issues relating to the digital economy that could affect sectors excluded from the competition law.

ii. **Thailand's Office of Trade Competition Commission (OTCC) can increase its autonomy.** Although the OTCC was established as an independent body, ministries still exert influence in the process for appointing commissioners, and this reduces its autonomy, which is critical for sound competition policy implementation.

iii. **The effectiveness of the Act is impeded by the nature of some clauses.** Specifically, the Act does not have a leniency program for the provision of information on cartels, which hinders the collection of evidence and effective cartel detection. Further, penalties that may not be commensurate with the severity of the action distort the OTCC's ability to effectively regulate competition.

iv. **Merger control also appears to be a challenge because there are multiple notification methods and tests, paired, in some cases, with low fines for failing to notify.** At present, there is a lack of clear definitions and guidelines for notification, assessment, and control of mergers. There are also overlapping activities without clarity of roles on merger controls.

v. **Besides the gaps in the law, guidelines that clarify how the OTCC approaches the assessment of anticompetitive cases in general are also missing.** Such guidelines are important to enable the private sector to understand how markets are defined, and how dominance, efficiency gains, vertical relations, exclusivities, and other competition-related concepts are defined and assessed. Some of these gaps are being addressed, with the OTCC aiming to develop business guidelines that provide examples of anti-competitive behavior, present economic analysis of cases, and clarify definitions of market dominance, merger control, and collusive practices.

vi. **Finally, the Act could be better aligned with global good practice if it were to consider cases that cause harm to consumers.** Previous decisions of the OTCC have stated that the law should focus on cases where there is harm to business operators – rather than on cases where there is direct consumer harm. This is a problematic interpretation of the law that could lead to the protection of cartels and the exclusion of certain abuse-of-dominance cases, resulting in potential harm to consumers.

There are opportunities to increase the efficiency of competition laws governing the digital and disruptive tech sector; these are discussed in part III that looks at the sector.

Besides the specific constraints mentioned above, competition is not sufficiently prioritized in the country's policy agenda. This would require creating mechanisms that strengthen the OTCC, including participation of the highest office, thereby sending a clear signal of its priority. For example, the Philippines is moving toward the adoption of a National Competition Policy spearheaded at the top by the president's office (following Australia, which also has a National Competition Council that advises the Competition Regulator). Similarly, the Republic of Korea has a seven-member Competition Council that includes both the prime minister and the Head of Competition Authority.

6. REMOVING RESTRICTIONS TO FDI

Attracting high-quality FDI flows could drive Thailand to its development vision. In most manufacturing and services sectors, foreign firms tend to be more productive, invest more in research and development (R&D), pay higher wages, and hire larger shares of skilled workers and women (OECD, 2021a). FDI brings not only capital, new technologies, marketing techniques, and management skills to a country but also increases the productivity of domestic industries through knowledge spillovers and increased competition.[56] The role of foreign investment in Thailand's efforts to enhance productivity and sustainable development is revealed by foreign firms' performance premium over average domestic firms.

Evidence also suggests that removing FDI restrictions and opening service sectors lead to higher investment flows and GVC participation, thereby facilitating knowledge transfer and innovation. Improvements in the quality of a country's legal and regulatory environment have long been linked to higher foreign direct investment (FDI) inflows.[57] The OECD has recently concluded that liberalizing FDI restrictions in emerging markets by about 10 percent, as measured by the OECD FDI Regulatory Restrictiveness Index, could increase bilateral FDI by 2.1 percent on average (Mistura and Roulet, 2019). This has been corroborated by evidence from investor surveys, which indicate that a supportive business climate is among the top priorities for foreign investors (GIC surveys in World Bank 2018, 2020). Modern services can enable more efficient and resilient supply chains and play an increasingly important role as inputs into advanced manufacturing and innovation. Empirical evidence shows that services liberalization promotes both gross trade and GVC trade (Lee, 2019).

FDI has played an important role in Thailand's GVC participation, paving the way for the country's graduation to upper-middle-income status in the early 2010s, but shrinking flows thereafter have been a cause of concern. Foreign investment in the automobile, electronics and textile sectors played a critical role in the export manufacturing sector. However, a large share of these investments involved lower value-added activities such as the assembly of imported components. Investment is dominated by Japanese manufacturing investors, but in recent years other investors from ASEAN, China and Europe have gained prominence. However, FDI inflows as a share of GDP in Thailand is below the ASEAN average, and more worrisomely, the gap has been widening in recent years. FDI in Thailand averaged USD 7.3 billion in 2011–2015, but only USD 5.8 billion in 2016–2019, a decline of 21 percent. Vietnam and Malaysia both received more FDI relative to their GDP, and in recent years Vietnam has becoming a favorite destination of foreign investors. The shifting composition of FDI adds to the concern about Thailand's already falling FDI, because new FDI projects are largely in nonmanufacturing and less tradable sectors. This is a problem because export-oriented manufacturing FDI is associated with rapid labor productivity growth, higher average wages, and higher investment rates.

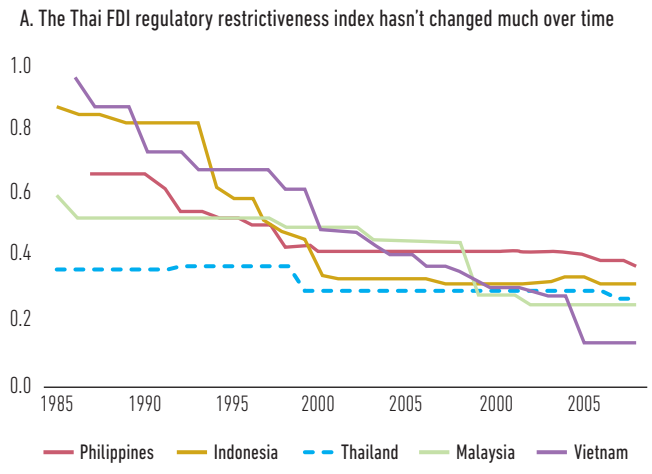
The determinants of FDI are varied, but entry and operational restrictiveness has emerged as a major deterrent to additional investment. Thailand's government has in recent years strengthened several policy dimensions that are important for attracting FDI.[58] Overall, Thailand therefore compares relatively favorably, or at least on par,

with other countries in the region in the areas of investment promotion, incentives, and investment protection. However, entry and operational restrictions for foreign investors are widespread, and a number of sectors that are considered pivotal for achieving the Thailand 4.0 vision remain FDI-restricted, thereby losing a source of technology and knowledge transfer.

In short, FDI liberalization has fallen behind in Thailand, and restrictions vary by sector, causing coordination inefficiencies. According to the OECD's FDI Regulatory Restrictiveness Index, FDI liberalization has stalled in the last 20 years at the same time that regional competitors have opened up their markets (figure 24). Rail freight transport, accounting services, and insurance services show the highest levels of restrictiveness, according to the OECD Services Trade Restrictiveness Index (STRI). The Foreign Business Act (FBA) is the centerpiece legislation governing FDI in Thailand. Although it has been amended four times in the last 20 years, bringing about modest improvements in financial services, marketing, human resources, and information & technology, sectoral legislation may impose additional, and superseding, requirements, which leads to a lack of transparency for foreign investors. The result is that the modestly positive changes that have been made to the FBA will have little beneficial effect unless sectoral legislation is changed. Looked at overall, the results can be considered liberalization-neutral because there is sector-specific legislation covering the same fields, or the items may be trivial (EABC, 2020).

Also, compared to OECD and other ASEAN countries, Thailand remains somewhat restrictive in primary and service sectors. Thailand's regulations and processes such as equity restrictions, approval processes, and investment screening remain more restrictive compared to regional peers, except for Malaysia and Vietnam.

FIGURE 24: OECD FDI REGULATORY RESTRICTIVENESS INDEX



Source: OECD.

Thailand exhibits a restrictive regime toward the entry of foreign personnel, despite the importance of specialized skills in high-value exports. The country has, on average, a more restricted service market relative to its ASEAN peers such as Malaysia and other regions in the world (World Bank 2016). Although Thailand seems to fair well compared to selected peers on competition in network services,[59] it scores below the comparator average on competition in professional services and ranks relatively low on competition in retail services (annex C-4). The OECD's Service Trade Restrictiveness Index (STRI) shows that restrictions to the movement of people are particularly binding for legal, controlling and accounting, architecture, and engineering workers. As discussed later, skills mismatches are prevalent in Thailand, with the largest shortages found among high-skilled workers in the services sector. To become a value-based, innovation-driven economy, Thailand must seek to attract human capital to bridge its skills gap. In the long term, this will require the development of local skills through targeted education and science and technology (S&T) policies, but in the short and medium term, skills should be drawn through targeted attraction of foreign specialists.

Prohibition to work in some sectors, and regulatory restrictions, are among the constraints that impede FDI in the service sector. *First*, trying to obtain work permits or visas is often referred to as the single most irksome constraint in the business environment and a disincentive to foreign investment. These complaints often relate to outdated processes considered time-consuming, unnecessary, and expensive (EABC 2020). The unreasonable conditions include lengthy paperwork that needs to be completed in Thai, location restrictions that hamper mobility, frequent reporting demands that are burdensome without yielding significant benefits, stringent staff-to-capital ratios, and substantial local hiring requirements.[60]

Second, **there are substantial coordination inefficiencies because oversight of restrictions on hiring expatriate staff and foreign experts lies with several different institutions – among them the Ministry of Labor, the Immigration Bureau, and profession-specific bodies who set their own rules and regulations.**

Third, **although there are exemption rules that may ease some of the restrictions, the discretionary application of these rules signals a lack of transparency and predictability to foreign investors and creates a "dual track" regime that can be exploited by privileged "insiders" who are given information others are not privy to.** In addition, legal loopholes, such as preferential share structures (that is, preferential shares held by Thai nationals), and indirect ownership structures exacerbate this subjectively administered system.

Foreign Business Licensing (FBL) remains an onerous process for foreign investors. Licensing – which is required in a high number of sectors – involves application to the Minister of Commerce, with approval from the Cabinet or the Director General, and with further approval from the Foreign Business Commission (FBC). Investments are evaluated based on considerations that are an exception among countries with progressive parameters to attract FDI (OECD, 2021a).[61] Further, according to stakeholder interviews, the overall process (typically 4–6 months) is too lengthy. The authorities may also impose multiple other conditions on an ad hoc basis.[62] Similarly, there are opportunities to streamline the Board of Investment (BOI) process, although it is less onerous than the foreign business licensing process (FBL) – requiring up to 90 working days depending on the investment value.[63] Global evidence shows that discriminatory screening is likely to act as a deterrent to FDI (Mistoura and Roulet, 2019).

Minimum capital requirements in Thailand, which are higher than in many other countries, act as a further deterrent to FDI. In 2019, 70 economies required a minimum amount of capital to be paid in by investors to register a business. Even where they exist, the amount required is typically much lower than what is required for foreign investors in Thailand (OECD, 2021b). Thailand has a minimum capital requirement of B2 million (approximately USD 64,000). The underlying rules to calculate this minimum requirement are considered onerous by the private sector, and they change from sector to sector. In some cases, the requirements are even higher than that.[64]

Resistance to reform and capacity challenges have also slowed the pace of FDI liberalization. The underlying political economy of reform – especially vested interests opposing changes – partly explains the slow pace of reforms. While the government has spearheaded FDI changes through the Board of Investment (BOI) in a more flexible way, by allowing for exemptions from FBA restrictions for investment projects that receive BOI promotion status, several issues remain. *First*, there is a bias toward reforms that benefit large investment projects, putting SMEs at a disadvantage. *Second*, the BOI's promotion and regulatory mandates have overburdened the agency, and its

capacity remains overstretched. Third, private sector feedback states that the frequent changes in the composition of Parliament does not enable serious legislative discussions. Finally, critics argue that the process for amending the FBA has not been transparent: The Department of Business Development of the Ministry of Commerce is responsible for an annual review under the auspices of the FBC, but it remains unclear whether studies are prepared for deliberations (OECD, 2021b). As an example of the slow speed of change, in 2019, the Foreign Business Commission identified four additional activities to be removed from the list,[65] yet as of the date of this writing, this has not yet resulted in any changes.

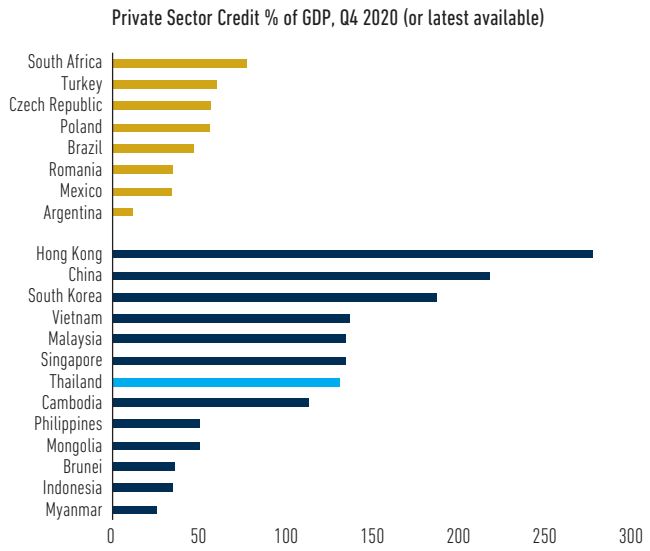
The government has responded to some of the above constraints – for example, the BOI introduced the SMART Visa Program – and several changes have been incorporated to address the low uptake. However, some challenges remain. The SMART Visa is a new type of visa offered to foreign experts, executives, entrepreneurs, and investors who wish to enter Thailand to work or invest in certain targeted industries. It offers various benefits for the applicant, including dispensing with the need for a work permit or a re-entry permit, and replacing the 90-day report requirement with a one-year report requirement. The SMART Visa is generally seen as a valuable tool to attract and facilitate FDI and bring in foreign professionals. Yet because of multiple paper-based and disconnected bureaucratic requirements, uptake has been slower than expected. The government has recently initiated several other supporting steps to attract foreign investors, for example, relaxing visa requirements for high-net-worth individuals, lowering or abolishing minimum income and savings requirements, and adding three further sectors to the list of approved sectors under this program. Since September 2021, paperwork related to applications has also been simplified.

The findings of the World Bank's Global Multinational Enterprise (MNE) survey suggest that addressing FDI restrictions in the light of COVID-19 is imperative (Saurav *et al*., 2020). The survey shows that, globally, FDI policy responses to the pandemic have not been uniform at the country level, with some respondents reporting business-friendly changes in local entry and operational rules, and others reporting new restrictions. Countries that significantly improve their regulatory environment will signal a more positive outlook to multinational affiliates who are weighing their future investment plans.

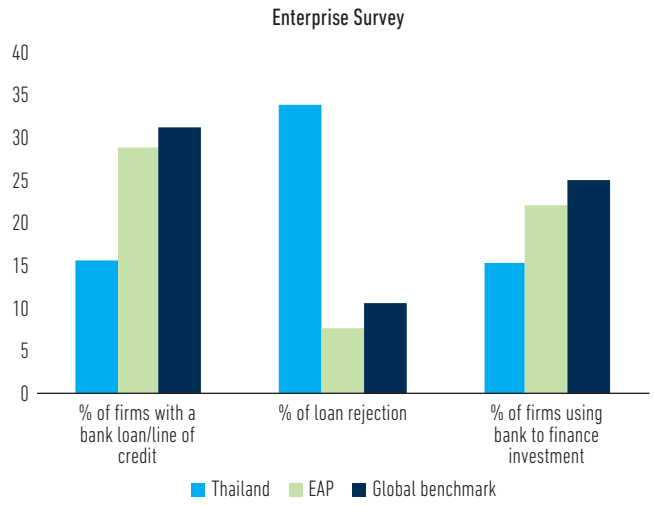
7. ACCESS TO INNOVATION FINANCE[66]

Although the credit available to the private sector in Thailand overall remains robust, the micro-, small- and medium-size enterprise (MSME) segment remains underserved by the formal financial sector. Access to finance remains a challenge for these smaller enterprises despite the fact that Thailand's ratio of private sector credit to GDP, at 132 percent at the end of September 2020, is on par with regional peers such as Singapore (134 percent) and Malaysia (135 percent) and higher than many other emerging markets (figure 25). The reason is concentration in the hands of a relative few. Based on the World Bank Enterprise Survey 2016, the percentage of Thai firms with a bank loan/line of credit is lower than the average for the EAP region, and a relatively high share of small enterprises (44.8 percent) have had loan applications rejected, compared to medium-size and large enterprises. In the OECD's review of SMEs in 2018, Thailand's access to finance dimension scored only 3 out of 4.87.

FIGURE 25 SHARE OF PRIVATE SECTOR CREDIT TO GDP



Source: IMF International Financial Statistics



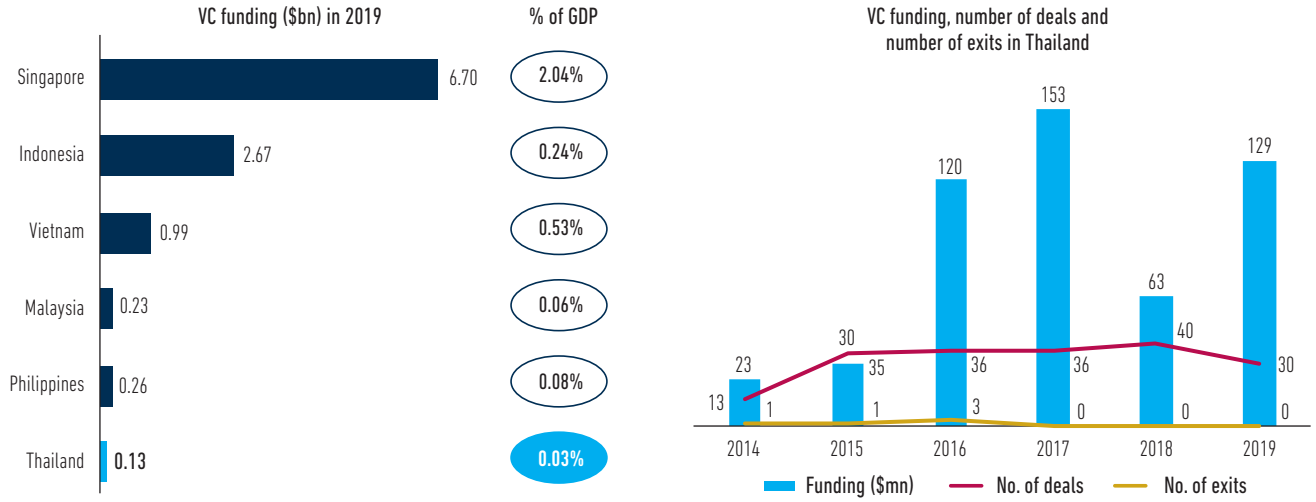
Source: World Bank Enterprise Survey, 2016

Commercial bank lending is the most common source of financing for MSMEs in Thailand, followed by lending from specialized financial institutions, with fintech and nonbank credit providers playing a lesser role. Commercial banks accounted for 88 percent of total lending to MSMEs in 2020 (USD 136 million). The SME loans represented approximately 20 percent of the total gross loans portfolio of commercial banks as of the end of December 2020, though the share has declined from an average of 33 percent over the 2016–2019 period.[67] The specialized financial institutions (SFIs) play an important role in SME financing, especially second-tier SME segments currently unserved by commercial banks.[68] Other financing sources for SMEs include leasing and factoring, which allow firms to overcome the constraint of providing bank loan collateral.

The government has also created a regulatory framework for lower-tier formal, semi-formal, and informal financial service providers that cater to the needs of lower-income households and small enterprises. As of June 2021, 71 nano-finance and more than 956 pico-finance providers were licensed to operate in Thailand. The Ministry of Finance has played an important role in promoting financial inclusion through pico-finance and pico-finance plus, in addition to nano-finance. However, their role in supporting MSME access to finance is limited. MSMEs in Thailand also have access to alternative sources of funding such as the Market for Alternative Investments (MAI) exchange,[69] crowdfunding, and venture capital, but these remain underutilized.

Innovation finance presents a significant opportunity for further deepening and development. Innovation financing has three sources: (a) government funding (primarily through grants), (b) VC funds that pool money from investors in order to take equity shares in high-growth, high-risk startups, and (c) corporate VC (CVC) units that are in-house financing arms of traditional sectoral firms. As discussed in the Digital Disruptive Technologies section of Part III, below, Thailand's innovation finance landscape remains underdeveloped – partly due to a lack of regional-level financial VC firms, and the overly dominant role of CVC. In addition, while there are high-net-worth individuals who have entered the innovation finance space, angel investors thus far play only a limited role in contributing to early-stage funding in startups and providing guidance and mentorship to aspiring entrepreneurs.

FIGURE 26: SIZE OF VENTURE CAPITAL FUNDING IN SOUTHEAST ASIA AND NUMBER OF DEALS AND EXITS IN THAILAND

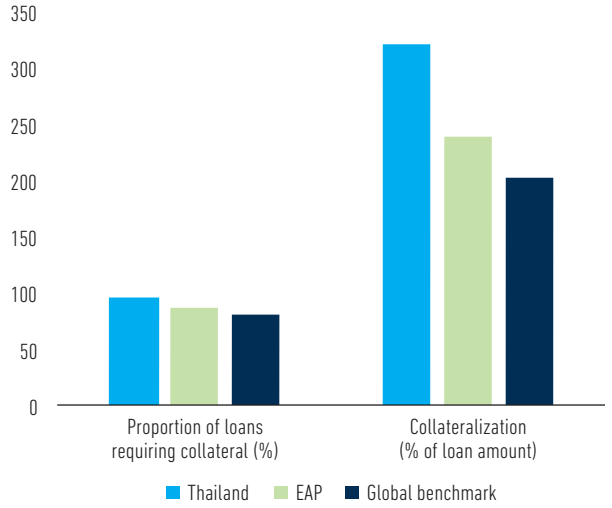


Source: SEA Venture Capital Landscape 2020, White Star Capital

There are several demand-side and supply-side constraints limiting MSME finance. The 2020 Bank of Thailand (BOT) Survey of SMEs[70] indicates that SMEs perceive the burdensome cost of technology adoption, the lack of reliable financial statements, and the narrowing of margins as central challenges to their business operations and their ability to seek finance. About 60 percent of SMEs, especially small enterprises, have operated their business without resort to automation, and some use only a few applications of technology and machines. Because of the unreliability of financial statements, SMEs must pay higher interest rates on the loans they obtain from financial institutions, which apply more stringent standards in considering loans to SMEs. Also, because of

the limitations on their business size and production capacity, most SMEs have weak bargaining power with suppliers over prices and credit terms, resulting in cost control and liquidity constraints. A lack of financial literacy among SMEs is one of the reasons many of the above limitations either arise or persist. Surveys have also stressed that due to these constraints, most SMEs are of their view that they cannot compete against large firms and against the competition arising from e-commerce platforms. Moreover, the 2016 World Bank Enterprise Survey pointed out that the collateral requirements for a loan in Thailand, at over 300 percent of the value of the loan, were much higher than the regional average of slightly above 200 percent (figure 27).

FIGURE 27: COLLATERAL REQUIREMENTS



Source: World Bank Enterprise Survey, 2016

Though significant progress has been made in strengthening the secured transactions regime, significant gaps remain, including the absence of a unified legal framework and collateral registry. The Business Security Act (BSA), passed in 2015, broadens the range of assets that can be used as collateral for SMEs that generally lack fixed assets, and for firms such as higher-technology startups (whose main asset may be their intellectual property) and agricultural enterprises. However, the BSA has not yet achieved the intended policy objectives because important gaps remain in the framework and in its effective implementation. The absence of a unified legal framework causes conflict in the registry system.

***First,* it is confined in scope to financial institutions and does not adequately cover nonbank credit providers.** Though lessors were recently added under ministerial regulations, registration challenges put them at a disadvantage to banks. Other nonbank credit providers are excluded from the scope altogether.

***Second,* the BSA does not adequately cover current assets such as inventory and accounts receivable and security rights of various claimants throughout the supply chain.** *Third*, although the collateral registry system built and operated by the Department of Business Development (DBD) is a step in the right direction, it is not functioning well. Often, several registries have records of a security right in the very same asset, registered by a different competing interest. The lack of a single, unified, authoritative framework leads to uncertainty and unpredictability when lenders engage in risk assessment and makes enforcement especially challenging. *Finally*, though revisions to the BSA have broadened the range of movable assets that can be accepted as collateral, its implementation by financial institutions remain limited. Key challenges include difficulties in valuation assessment, particularly the value of intellectual property rights and of startups, limited expertise on asset appraisal in the domestic market, and the limited capacity of financial institutions to develop movable, asset-based, lending products.

The credit reporting system is well developed but has a significant gap in the coverage of firms. Based on *World Economic Forum 2020*, the depth-of-credit-information index score is 7, with 8 being the best regulatory performance. However, credit bureau coverage, at 56.5 percent, is almost entirely focused on consumers (27.6 million), with very limited data on firms (0.3 million). While the credit infrastructure has improved over the last 15 years, the need for further enhancements is underscored by the entry of new financial service providers and platforms (fintech, P2P lending, crowdfunding),

advances in PromptPay,[71] and emerging initiatives on information-based lending. For instance, the Credit Information Business Act (CIBA) currently does not allow the collection of data from retailers and utilities. The law allows only the collection of data from members[72] and does not cover new financial service providers.[73]

Thailand has a strong insolvency legislative framework, but implementation could be improved. Ranked 24th, Thailand performs well on resolving insolvency (World Economic Forum, 2020). The country's creditor recovery, at 70.1 cents on the dollar, is high compared to the EAP average of 35.5. However, there are some gaps: court proceedings on insolvency matters are relatively lengthy, on average 1.5 years, compared to timeframes in peer countries. Further, in the light of lengthy reorganization processes that have an uncertain chance of success, some interested parties can strategically take advantage of insolvency procedures. As a result, in certain cases, financial institutions are inclined to misuse the insolvency system at an early stage.

P2P lending and crowdfunding platforms could expand financing for innovative SMEs, but stifling testing requirements and investor risk exposure remain a challenge. The regulation of P2P lending and crowdfunding platforms has been split between the SEC and the BOT. The SEC regulates security-based (equity and debt) crowdfunding platforms, under which corporate issuers can raise funds through the issuance of stocks or debentures, while the BOT regulates P2P lending platforms, under which individual borrowers, including SME owners, can obtain loans. In the BOT's sandbox, P2P lending platforms provide services to real borrowers and lenders in the market but within a limited scope as agreed by the platforms and the BOT. In addition, the BOT requires P2P lending platforms to test their solution in the BOT Sandbox environment before going to market, a process that can require two years or even longer.

BOX 2: DIGITAL FACTORING AND ITS BENEFITS

Digital factoring provides finance to the supplier by purchasing receivables and, depending on the model, can also provide other services, such as maintenance of accounts (ledgering), collection of receivables, and protection against buyers' payment default. The price of accounts receivable finance for SMEs is usually based on the risk profile of the large corporate buyer of SME products (an invoice debtor) and is thus insulated from the usual problems underlying SME finance (such as information asymmetry and a lack of appropriate security). The introduction of fintech platforms and modern IT solutions in the process could increase efficiency by increasing speed, extending the potential financing timeframe, and reducing the risks inherent in paper handling. It could also serve as a conduit for access to other formal financial services through credit information build-up and account usage.

Such finance becomes particularly efficient and accessible to many SMEs when offered through online platforms that interconnect buyers, financiers, and SME suppliers. These platforms could be owned and operated on a private basis or specifically developed for a public sector entity supporting SME access to finance such as a development bank. Accounts receivable finance offered through these platforms could be done as invoice discounting (a supplier-based product) or as a reverse factoring (a buyer-based product).

The speed and flexibility of the BOT's sandbox could be further improved. The BOT is reviewing the existing framework accordingly. However, other factors such as adjustments in either the platform's business model or target customers, as well as the lack of readiness of key platform partners, could also come into play and delay sandbox exit. Further, the platforms in the sandbox have a low number of borrowers and a very low ratio of borrowers to users who start the application process.[74] The relative lack of borrowers and lender awareness about P2P lending remains a key challenge but increasing awareness levels of P2P lending opportunities and improving the user experience are among the top priorities of the BOT and the platforms.

Thailand's fintech sector could play an important role to address access to finance but is constrained in growth by the availability of innovative finance itself. As will later be discussed in the section on disruptive technology (section III 12), the fintech sector is an emerging star in Thailand's digital economy. The number of fintech firms has grown significantly and they offer a good variety of products. However, also discussed later is the fact that the health and prospects of this sector are far from ideal because of the numerous constraints faced by digital startups in Thailand, one of which is limited access to innovative finance.

Another key constraint for fintech firms, as well as for tech firms and other banks seeking to diversify their products and services, is the absence of a well-formulated policy for open banking. Many banks have digital strategies to modernize their products and delivery channels and to enable the use of digitized data for decision-making purposes. The government needs to accelerate the adoption process by developing an open-banking approach, starting with an open Application Programming Interface (API) regulatory framework that would allow third-party providers (TPPs) to access the financial information of banking customers. The BOT initiated efforts to develop an API standard for financial sector in 2019, and the first API standard relating to data security and privacy for retail banking is expected to be implemented in 2022. Additionally, the BOT is in the process of drafting an Open Banking roadmap. Developing and enhancing standards for data sharing would also promote competition.

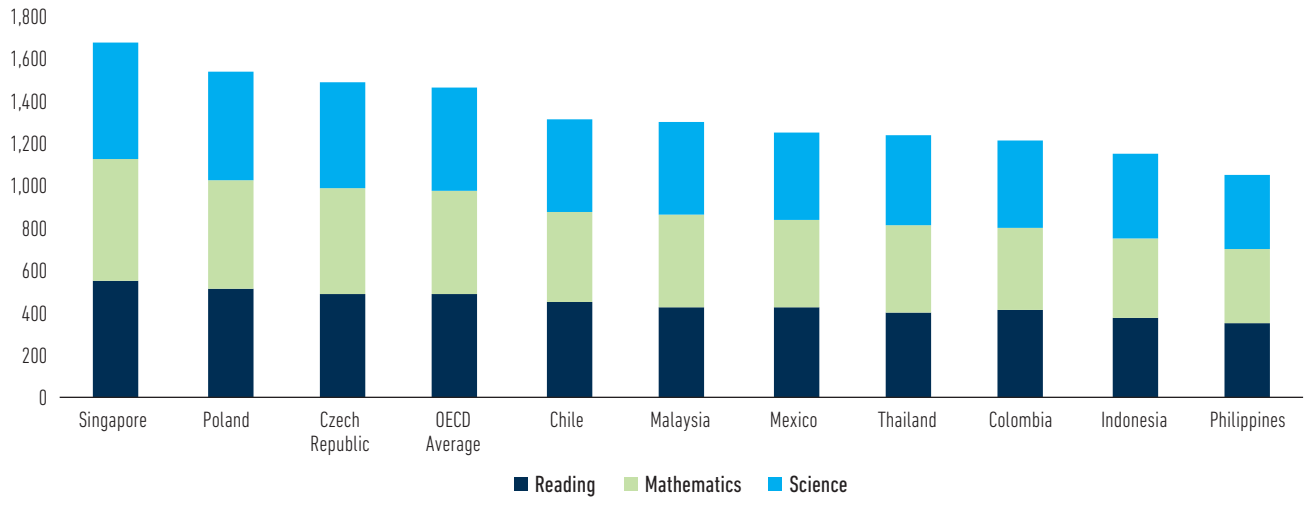
The government could also initially create a cross-industry data standards body (as was done in Australia) to guide technical security and privacy standards. Enabling customers to grant access to their financial data could then be a first step, consistent with supporting consumer data ownership. API standards for transaction execution and addressing whether or not to require institutions to make certain APIs available, could follow.

8. ACCESS TO AND AVAILABILITY OF SKILLS

Acquiring advanced skills is critical to building broad capabilities to generate sustained productivity and achieve Thailand's aspirations. According to a recent World Bank analysis, Thai firms that have a higher share of skilled workers and spend a larger share of their budget on R&D show significantly higher total factor productivity than other firms (World Bank, 2020). Workforce skills are critical to advancing innovation and productivity growth and expanding the pool of skilled occupations could help meet the needs of modern, innovative industries. Especially in a world doubly disrupted by the pandemic and automation, workers who fall behind in skills will likely face employment difficulties.

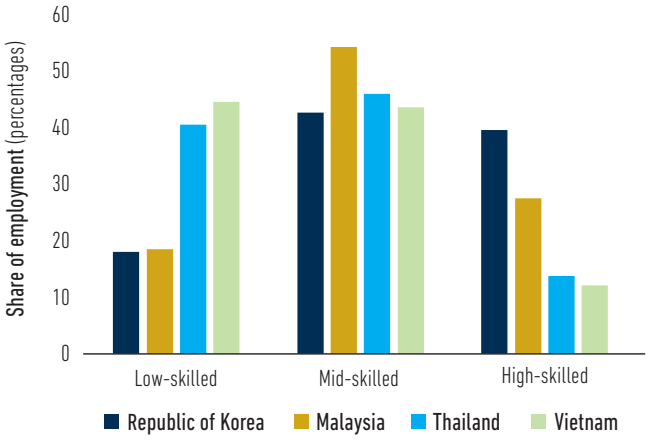
The Thailand labor pool presents opportunities for expansion in the skills needed for advancing innovation and economic growth. In the most recent (2018) Program for International Student Assessment (PISA) scores, Thai students largely lagged their regional peers and the OECD average on all dimensions, dropping further behind since 2015.[75] For example, compared to structural peers such as Mexico and regional peers such as Singapore, Thai students are underperforming in literacy (figure 28). English language proficiency is a particular constraint.[76] Underlying factors driving this declining performance are an unbalanced distribution of resources across schools in the country, and inefficiency of investment in education (World Bank, 2020). Trend analyses suggest that the number of high-skilled jobs in Thailand lags regional peers (Google Trends). Thailand's share in total jobs is roughly equivalent to that of Vietnam, which has a GDP per capita just under a third of Thailand's. Thailand, however, has a large concentration of mid-skilled workers (figure 29).

FIGURE 28 PISA SCORE 2018



Source: OECD PISA score report 2018

FIGURE 29: SHARE OF EMPLOYMENT BY SKILL LEVEL AND COUNTRY, 2019



Source: ILOSTAT.

Thailand has invested in establishing a substantive Technical and Vocational Education and Training (TVET) system, but enrollment rates need to be boosted, and skills learned in schools could be made more relevant. Thailand has a large TVET infrastructure with more than 400 institutes based on the German model, established in 1984. Students can attend a dual system that gives equal weight to practical experience gained in programs tied either to the Ministry of Education or state enterprises, or to the private sector. However, data show that upon completion of compulsory primary education, most Thai students choose to continue their education in high school rather than the vocational schools. The overall participation rate of 15- to 24-year-olds in vocational education and training was only 1.7 percent in 2020, considerably lower than the OECD average of 18 percent.[77,78] Further, only about 14 percent of all vocational students in Thailand are enrolled in programs linked to the private sector.

In view of this, business has signaled a skills mismatch, complaining of a lack of appropriate skills and the unsatisfactory performance of new hires. Firms from all sectors have cited significant difficulty in finding employees with the right skills, including computers and other technical skills (Enterprise Survey 2016). Given emerging global trends, especially concerning automation and digitization, Thailand has a significant gap in the availability of relevant skills (figure 31). Information management, user experience design, integrated systems technology, cloud computing, and the IoT, which are in high demand in the private sector, are not represented in the education curriculum (Rattanakhamfu, 2018). Data from the Thai Board of Investment show that demand from companies is highest for Engineering Technical graduates. On the other hand, the number of graduates with a bachelor's degree or higher in science and technology (S&T) is limited compared to graduates with the Social Science degrees (figure 30). In 2017, the number of S&T graduates was about 40 percent of the total, and this share has been decreasing. Further, the private sector states that new graduates in Thailand are weak in cognitive (problem solving) and non-cognitive, soft skills such as leadership and social skills (Chenphuengpawn and Rukkiatwong, 2019).

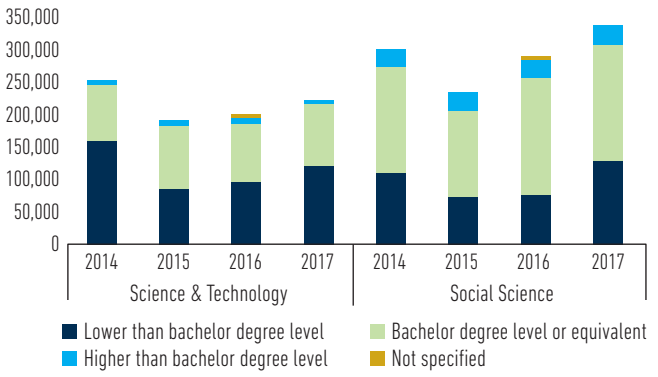
TABLE 5: NUMBER OF WORKERS DEMANDED BY BOARD OF INVESTMENT-PROMOTED COMPANIES

	Subject of Study	2018	2019	2020 (as of June 2020)
Bachelor's Degree or Higher	Engineering	2,679	2,349	4,194
	Science	1,015	1,081	1,286
	Agriculture	36	65	203
	Business	2,546	2,386	3,949
Vocational Degree	Technical	6,353	5,362	11,849
	Agriculture	105	161	569
	Business	1,155	1,276	1,852

Source: Thailand Board of Investment, retrieved from Digital Government Development Agency database

Note: The values quoted in the figure correspond to employment demand from approximately two years prior to the reporting to BOI.

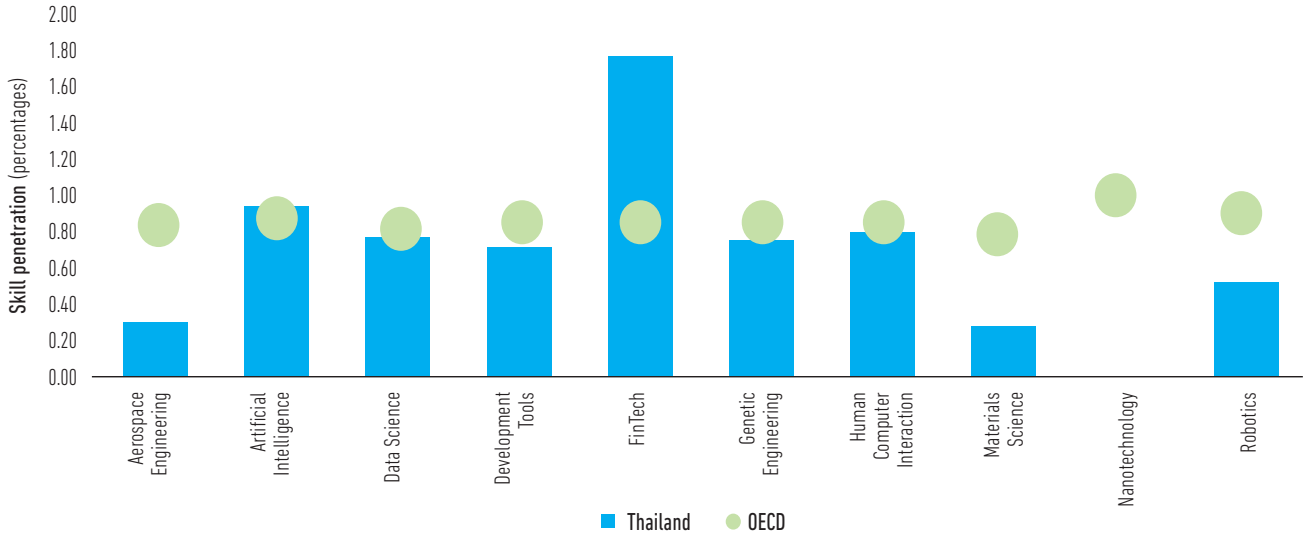
FIGURE 30: NUMBER OF GRADUATES DURING ACADEMIC YEARS 2014–2017 BY FIELD OF EDUCATION



Source: Office of the Higher Education Commission (data as of February 13, 2017), Office of Vocational Education Commission (data as of January 25, 2017) and Office of the Education Council (data as of February 26, 2017).

The quickening global pace of automation and digitalization further underscore the importance of reskilling and upskilling in Thailand. Even though the high cost of adopting automation technologies still deters automation and digitalization in Thailand, an ongoing analytical study[79] has already shown that, in 2020, 42 percent of the workforce in Thailand were at high risk of being supplanted by automation, with the largest threat to the accommodation, food services, and manufacturing sectors. [80] Medium-skills jobs, which comprise the largest pool of workforce available in Thailand, are at the highest risks of elimination. Disruptive technology skills are in high demand, but their availability is still limited – a major constraint to the adoption of technology, discussed later in Part III.

FIGURE 31: SKILLS PENETRATION OF DISRUPTIVE TECH SKILLS RELATIVE TO OECD AVERAGE



Source: World Bank Linkedin Data for Development

The challenge to the availability of skilled labor will be further aggravated by the declining proportion of Thailand's working age population. Thailand has one of the fastest-aging populations in the region. Its share of 65-plus population is expected to double (to 14 percent) in the next two decades, faster than was experienced in countries such as France and the US, and at income levels lower than other countries that have aged similarly (World Bank, 2021). This implies a decline in the share of the working-age population which, according to the UN, is expected to drop from 71 percent in 2020 (as a share of the total population) to 66 percent in 2030, declining further to 56 percent in 2060 (UN Department of Economic and Social Affairs, 2019).

The labor market faces additional challenges related to high informality and relatively low female labor force participation. Despite low unemployment rates, in 2020, approximately 53.8 percent of the Thai labor force was employed in the informal sector, mostly in agriculture and self-employment. Female workforce participation, at 67 percent in 2018, was low in part because women frequently drop out of the labor pool during motherhood. With an inadequate number of childcare centers to support their parenting responsibilities, and employer preferences biased toward hiring workers who are not raising children, the opportunity to return to employment for these women remains limited (Liao and Paweenawat, 2019).

Finally, the participation of skilled foreign professionals in the Thailand workforce is also low. As of February 2021, national data indicate that of approximately 2 million expatriates in the country, only 6.6 percent are highly skilled workers (such as technicians, executives, and managers), while the majority are low-skilled laborers working especially in construction and the agriculture sector.[81]

Against this backdrop, COVID-19 has dealt a further temporary but severe shock to the demand and supply of skills. The pandemic has had a severe negative impact on the workforce as businesses have closed. Unemployment rose in the early part of 2020, with recent graduates (the 20–24 age cohort) being the hardest hit.[82] Although some portion of those lost jobs returned in the latter part of the year, the recurrence of the coronavirus will likely again impact jobs. Average working hours have also declined, and the agriculture sector has seen the absorption of many of those who have lost their jobs.[83] In short, there are several constraints that impede the availability of skilled workers.

Giving children better access to early education and incorporating a stronger labor market orientation into school curricula, are two currently untapped opportunities for Thailand. During early childhood, the number of pre-primary education centers is low and mostly provided by the public sector. As of 2014, Thailand's net enrollment rate in pre-primary education was only about 60 percent, a rate much lower than Mexico (69 percent), Malaysia (86 percent), and Chile (94 percent).[84] The lack of access is worse in rural areas. Further, the underlying educational infrastructure remains insufficient. Around 64 percent of primary schools in Thailand face a shortage of teachers, not in terms of the pupil-teacher ratio but in terms of teachers per classroom (Sondergaard and Lathapipat, 2016). Several small schools in rural areas have less than 1 teacher per class, meaning that teachers oversee more than one class at a time.

Furthermore, the curriculum taught in vocational schools and in technical fields at the universities is misaligned with the needs of employers and is known to be outdated (Rattanakhamfu, 2018). The curriculum continues to be designed by academic staff or guided by the government with minimal inputs from the private sector. The Thailand Professional Qualification Institute's recently established E-workforce Ecosystem serves as an electronic system that links public databases located at MOL, MHESI and MOE. Prospective job applicants can post or update their skills profile in the database to let employers access it. This system can also provide policymakers with market information, opening the opportunity for cooperation in designing evidence-based policies.

The Thai Technical and Vocational Education and Training (TVET) system needs to enhance its systematic assurance system. A well-structured quality-assurance system with sound occupational standards and a qualifications framework is missing (Baraki and Kemenade, 2013).[85] The reasons are many, including (a) lack of willingness of firms to disclose operational information, (b) inconsistent practices across different institutions, and (c) high coordination costs because of the many stakeholders involved in the TVET structure, which limits the potential for scale.

The TVET system also suffers from perception issues, and the high cost of participation does not help (Chenphuengpawn and Rukkiatwong, 2019). One primary underlying reason for the limited number of participants is the generally negative attitude the society has toward vocational schools. Thais tend to view vocational schools as an inferior alternative to high school, making enrollment in these schools relatively low (Tarat and Sindecharak, 2020). The design of the program could improve its efficiency. Frequent job rotation does benefit newly graduating students, but it cost hiring firms more to

repeat training and interrupts their operations. In addition, although the government offers a tax deduction incentive to encourage private sector engagement, the procedures are cumbersome, with multiple approvals required from several government authorities. Establishing an independent intermediary agency to oversee the TVET system could be a solution to these problems – something that has been done successfully in Singapore. It is worth noting that the EEC could play a key role in increasing private participation in the TVET system by streamlining the procedures for firms to access financial incentives and reporting. The EEC has set an ambitious target of inducing private sector and TVET training providers to build advanced skills of approximately 500,000 workers within the next five years.

Current regulations to hire foreign workers deter high-skilled recruits who could contribute new technologies and ideas to the economy. As discussed earlier, FDI restrictions and cumbersome rules raise transaction costs for foreign professionals seeking to work in Thailand. Rules that set minimum capital requirements for hiring of expatriates, and the minimum wages to be paid to them, create barriers to their entry in SMEs.[86] Together, these contribute to a shortage of a skilled pool of professionals in important sectors of the economy such as accounting and law. Eliminating these constraints is the key to attracting high-skilled foreign workers. Additionally, greater effort to improve the admission system, and better employment terms for workers with desired skills and qualifications, may induce higher benefits from high-skilled expatriate employment.

To address some of the constraints highlighted above, Thailand might consider globalized policy practices. For example, Singapore's TVET system transformed itself to keep pace with fast-changing trends and demands for new skills. To raise national management efficiency, Singapore consolidated the number of vocational schools but increased the capacity per school, and then created a standardized system throughout the country under a new agency, the Institute of Technical Education. To ensure continuous reskilling and upskilling, Singapore also introduced a financial subsidy program for workers older than 40 in the form of vouchers.

The Republic of Korea's TVET system might offer another template for Thailand. The Korean government has actively collaborated with the private sector to set up an Information and Communication Technology (ICT) Promotion Fund, which, among other things, provides ICT infrastructure to academic institutions and promotes ICT learning. In partnership with the private sector, the government has also established ICT and innovation-driven educational institutions at all levels across the country. The UK and Australian governments have set up procedures for monitoring skill imbalances, and they publish regular "skilled occupation shortage lists" based on labor market data and inputs from the private sector. These lists are used to inform a range of policies, including curricula development and public employment programs. Recently, Malaysia has also introduced a similar tool — the Critical Occupations List — to inform both immigration and human resource development policies.

9. SUMMARY OF INVESTMENT RECOMMENDATIONS

As mentioned earlier, over the last few years the Thai government has been progressive in implementing a series of reforms to address the investment challenges mentioned in the preceding section. This has borne fruit in the country's improving rankings of across the indices referenced above. The government's Eastern Economic Corridor (EEC) initiative is a flagship program that leverages economic benefits from agglomeration. Its main proposal – to promote private investment in the knowledge economy – is fully aligned with the recommendations offered below.

However, stakeholder consultations have brought attention to the slowdown in the pace of reforms as well as their increasing complexity, especially in comparison to competitors in the region. Table 6 below highlights priority actions that must be fast-tracked to help Thailand achieve its aspirations for 2037. It is also imperative that the government signal policy certainty through stability and the rule of law and show increasing transparency in implementation. Greater coordination across public sector agencies, and with the private sector, would also increase the likelihood and impact of success. This will help Thailand, on the one hand, to address the structural inefficiencies and, on the other, emerge from COVID-19 in a more resilient way. A more comprehensive set of reforms is given in annex 1.

TABLE 6: HIGHLIGHTED PRIORITY ACTIONS

Opportunity	Recommendations	Enabling reforms in the immediate term	Medium-term reforms	Complimentary reforms (if they appear in the same column)			Key stakeholders
LACK OF COMPETITION							
Competition law enforcement	Strengthen the enforcement and advocacy roles of Thailand's Office of Trade Competition Commission (OTCC) by building OTCC's capacity and publishing guidelines for competition enforcement.	√				●	OTCC
	Strengthen governance functions of the OTCC by reducing ministry-related involvement in senior appointments and allowing for independent budget allocations.	√				●	OTCC
	Bridge existing gaps in the Competition Act: that is, eliminate exceptions for certain operators and implement a leniency program to encourage cartel detection.		√		●	●	OTCC, MOC
Competition incentives	Elevate the competition policy agenda as a whole and present it as a national economic policy issue for Thailand, through the representation of higher-level executive offices.	√		●		●	Office of the Prime Minister
	Conduct a review of potential SOEs' competition distortions (including network markets) using the competitive neutrality framework.	√		●	●	●	MOF, OTCC, Sector Regulators

Opportunity	Recommendations	Enabling reforms in the immediate term	Medium-term reforms	Complimentary reforms (if they appear in the same column)			Key stakeholders
RESTRICTIONS ON FDI							
Easing of restrictions on hiring expatriate staff/foreign experts	Make the SMART visa program fully digital, including by (i) allowing all documentation to be uploadable via a secure website, (ii) not requiring documents to be subject to certification by the issuing organization or notarization or legalization by any government agency, and (iii) accepting all documentation in English (or Thai, if originally issued as such).	√			●		BOI, IB, MOL, MFA, ETDA
	Continue to gradually allow more foreign professionals to work in Thailand. Further clarify[167] and reduce the number of professions that are prohibited under the Prescription of the Prohibited Occupations for Foreigners Act (2020, B.E. 2563). Stipulate a mandatory periodic review of the list. Amend sector-specific laws to remove nationality requirements, for example, for legal, architectural, and engineering services.		√		●		MOL, profession-specific bodies, MFA
Open FDI regime, especially in service sectors	Further liberalize service sectors critical to achieving the goals of Thailand 4.0: • Reduce the number of service sectors that require a Foreign Business License (FBL) by removing service sectors from List 3 of the FBA, and publish guidelines to enable consistency in the approval process • Remove the broad "Other service businesses" provision under List 3 of the FBA (item 21 of List 3) and add the clarification that "everything not on the list is permitted without restriction"		√	●	●		MOC, NBTC
	• Adopt a tailored, sector-specific approach to establish minimum capital requirements for FDI • Consider dispensing with the requirement to retain 25 percent of operating expenses for activities under List 2 and 3 of the FBA.160		√	●			MOC, BOI
	Consolidate FDI restrictions contained in sectoral legislation under the FBA, systematizing the negative list, and issue English translations of subordinate or sectoral legal documents.		√	●			MOC, COM, NA
ACCESS TO FINANCE FOR INNOVATION							
Enhanced provider diversity, innovation, and reach	Strengthen regulations to address risks to investors on crowdfunding platforms by articulating disclosure requirements, and test capital requirements relative to likely platform wind-down costs.	√			●		SEC
Strengthened financial infrastructure	Develop an approach to open banking, starting with API standards for data sharing and a cross-industry approach to standards to promote competition.		√		●		BOT
	Establish a single, unified Secured Transaction (ST) Act, with a practical, standardized, and simple provision on the "Creation of Security Interest (SI), and "Priority Rules" for all types of movable assets; establish a single, central, real-time registry that fully interfaces with financial institutions.		√				MOF, DBD
	Remove the legal impediments in the Credit Information Bureau Act (CIBA) to allow the sharing of data from nonfinancial providers—for example, utility companies, retailers, and e-commerce operators.		√				MOF, NCB

Opportunity	Recommendations	Enabling reforms in the immediate term	Medium-term reforms	Complimentary reforms (if they appear in the same column)			Key stakeholders
Enhanced access by SMEs to markets	Ensure effective implementation of a digital-factoring initiative to promote supply-chain financing and to enable SMEs to access to key value chains. Support the development and use of online and cloud-based accounting and e-invoicing platforms for SMEs.		√				BOT, OSMEP
	Ease the restrictions on SME participation in public procurement and finding new suppliers and markets – for example, market intelligence, business development services, and matching programs.	√					OSMEP
SKILLS FOR THE FUTURE							
Skills match	Introduce a skills-monitoring system comprising information about vacancies and wages to understand the nature of demand and identify signals of skill shortages.	√		●			MOE, MHESI, NXPO
	Bring the private sector's perspective to bear on curriculum design through a structured engagement that influence decisions of resource allocation for curriculum development, and oversight of results between the Ministry of Labor/Technical and Vocational Education and Training (MOL/TVET) agency and industry associations.		√	●		●	MOE, OVEC, MHESI, NXPO, private sector
TVET system efficiency	Reduce the challenges the private sector faces in participating in the TVET system by streamlining the procedures for accessing incentives and reporting.	√				●	BOI, MOL
	Strengthen oversight of the TVET system institutions under a renewed quality-assurance mechanism that follows placement outcomes of graduates and relies on market feedback information including wages, placement, turnover, and tenure.		√	●			MOE, MHESI, OVEC
Increased labor force participation	Introduce pilot programs for reskilling of the country's aging labor force, such as the provision of basic and intermediate digital skills training, to test the value proposition and evaluate their potential scalability and relevance in the labor market.		√		●		MOL, private sector
	Introduce and test pilot regulations that increase female labor force participation – for example, increase the number of child development centers, and improve maternity benefits to lessen the current penalties on motherhood and on caring for the elderly, to understand which of these measures present higher additionality. Needless to state, these pilot interventions need to be coupled with rigorous impact evaluations to discern the potential effects of such policies in the labor market.		√		●		MSDHS, MOL, MOE

Note 1: Enabling reforms: Reforms that are to be enabled in the immediate term are those that, if introduced at the outset, can be expected to "enable" positive spillovers for subsequent reforms, paving the way for cumulative effects in a particular field and for the medium term. The distinction highlights reforms that could be sequential in nature and that have the property of creating vertical spillover effects from upstream reforms to downstream ones. Complementary reforms are those that mutually reinforce each other, thereby creating horizontal spillover effects. In the table, upto three sets of complementary reforms have been identified, which are tagged together in the three sub-columns under 'Complementary Reforms'.

Note 2: BOT – Bank of Thailand; BOI – Thailand's Board of Investment; COM – Council of Ministers; DBD – Department of Business Development; IB – Immigration Bureau; MHESI – Ministry of Higher Education, Science, Research and Innovation; MOC – Ministry of Commerce; MOE – Ministry of Education; MOF – Ministry of Finance; MOL – Ministry of Labor; MSDHS – Ministry of Social Development and Human Security; NA – National Assembly; NBTC – Office of The National Broadcasting and Telecommunication Commission; NXPO – Office of National Higher Education Science Research and Innovation Policy Council; OSMEP – Office of SME Promotion; OTCC – Office of Trade Competition Commission; OVEC – Office of the Vocational Education Commission; SEC – Securities and Exchange Commission; CSD – National Committee on Sustainable Development; PRD – Public relations department.

10. THE EASTERN ECONOMIC CORRIDOR

The Eastern Economic Corridor (EEC), a special development zone, lies at the heart of Thailand's 4.0 strategy and aims to revitalize the economy and to address several of the investment constraints mentioned above. The government hopes to replicate the success of the Eastern Seaboard (ESB) project that was launched more than 30 years ago and that helped fuel Thailand's leap toward industrialization. Started in 2017, the EEC spans three provinces in the Eastern region – Chonburi, Rayong, and Chachoengsao – the location of the former ESB. Building on the success of its predecessor, the region already has an established industrial and infrastructure base. The initial plans of the EEC include state-of-the-art infrastructure – airports, high-speed rail, deep seaports, and 5-G networks – which will provide the foundation for the establishment of the ten "S-curve" industries outlined in the government's strategy.[87] The corridor is also envisioned as a gateway to regional trade, investment, and services. In 2020, the value of investment projects in targeted sectors totaled US$ 5.7 billion, with the highest value in automotive, chemicals and electronics.[88]

The EEC is designed to attract high-value investments and serve as a testing ground for new ideas, where new policies, initiatives and approaches can be tried and validated. The Board of Investment provides a package of privileges for investors comprising ownership of land and residence, entry to foreigners, taxes and tariff incentives, foreign exchange controls, and grants based on the type and size of investment: prioritizing knowledge base activities, technology, and innovation spillovers. The EEC also facilitates a conducive business environment and has introduced a regulatory sandbox, designed in collaboration with investors, to simplify rules and regulations. More specifically, through the EEC, the government has launched important initiatives that promote experimentation in digital innovation utilizing regulatory sandboxes and testbeds. For example, the EEC Digital Park aims to serve as a data hub and digital business cluster. This provides the opportunity to experiment with the regulatory framework required for data-intense industries and roll them out nationally. It also features a one-stop service (EEC OSS) that facilitates permit applications. The EEC also aims to create in close collaboration with the private sector, a pool of skilled workers with a focus on new skills, upskilling and reskilling, with training delivered through vocational education (the Sattahip model) and through short courses. Annex C-5 provides some of the key incentives and programs.

However, there are some risks that need to be addressed.

First, a rapidly changing environment and dynamic global trends imply that EEC authorities needs to continuously adjust the EEC strategy and make mid-course corrections. While the government has identified specific industries to target, it is important to ensure that the focus on building capabilities is constantly monitored to anticipate emerging global trends and the country's competitiveness potential. This will ensure that sector investment choices and the EEC service offerings not only match investor appetite but also generate spillovers into the domestic economy.

In addition, the success of the model depends on its ability to ensure linkages to the local economy and other regions of the country. The EEC's full potential lies in scaling knowledge spillovers effectively. However, a lack of inclusion of local communities and

SMEs, and across the country at large, in the growth model could undermine success. For example, there have been early instances of concerns voiced by neighborhood communities around land and water sharing, and the benefits arising from the EEC. SMEs form the backbone of the country's private sector and building the connective tissue between the successes in the EEC and the rest of the country is critical to ensure spillovers and inclusive growth. For example, incentives can be designed to link SMEs with larger corporations, including skilling opportunities, so they can benefit from the economic development. The 13th National Economic and Social Development Plan (NESDP) aims to exploit the experience acquired through the EEC's interventions by replicating what works (and avoiding what does not) in other regions' development zones. In doing so, the authorities plan to deliberately adjust implementation strategies to the conditions of each region.

Given the rapid pace of industrialization expected within the EEC, it is critical to keep in mind potential issues surrounding the sustainability of this growth. For example, the eastern regions are already water-stressed and recent droughts have exacted a heavy toll on them. Flooding is a regular threat and river pollution may worsen. Therefore, all initiatives in the EEC need to have a sustainability component to mitigate these potential ill-effects – testing and implementing circular and green economy principles at scale will be important (Board, 2021).

Finally, it is imperative to have a solid mechanism to learn from the implementation and adapt. Given the innovative nature of the planned corridor and the privileges given to investors to generate demonstration effects and learning, it will be necessary to build in a robust monitoring and evaluation system with regular data collection on relevant indicators and policy impact evaluation. Having this evidence will be critical to taking corrective action as needed and obtaining lessons that can ensure seamless scale-up within the rest of the country. Given the hiatus in private investment flows into Thailand because of COVID-19, it is even more imperative that these potential risks are mitigated to ensure that flows resume.

PART III:
MARKET OPPORTUNITIES

Circularity, and digital and disruptive technologies, bring positive spillover effects to traditional sectors but require a competitive infrastructure to be expanded effectively. As mentioned earlier, investing in developing DDT and CE capabilities can improve productivity in traditional sectors by decreasing the costs of finding new customers (e-marketing), of product delivery (e-logistics) and of the financing of operations (e-credit lines), or by optimizing resource utilization (energy efficiency). For instance, circular approaches in the automotive sector can lead to better input utilization, as in the use of recycled plastics, redesign of electronic content, and shared mobility as an end-service. Digital technology, by contrast, can boost tourism by improving planning, accommodation, transportation, and food services.

These two levers also need a robust enabling infrastructure to be effective and to have positive spillover effects on the rest of the economy. For example, among other things, circularity rests on sound reverse logistics and water and waste management systems; and widespread disruptive technology adoption requires well-designed shared network models for telecom and data centers.

These market opportunities can also support Thailand's decarbonization agenda and resilient growth model. For example, the use of big data analytics underlies precision farming, which increases sustainable agribusiness, while mobilitytech may increase the utilization rate of vehicles, thereby supporting greener transport solutions. **The deployment of renewable energy and green buildings supported by clean tech are among the most sought-after decarbonization investment opportunities.** Similarly, circularity enables the decoupling of growth from GHG emissions and virgin resource use, for instance, the use of alternative materials such as grass in the production of vehicle parts. CE approaches offer solutions to mitigate the grave threat of climate change that Thailand faces.

However, Thailand needs to keep pace with other countries in its readiness to adopt these technological approaches. While the country has done well by certain metrics around sustainability, it lags comparator countries in the EAP region on ecological sustainability metrics such as energy use, the EPI, and environmental standards certification (annex D-1). Similarly, using venture capital flows into digital businesses as proxies for the creation and maturity of the adoption of DDT, it has been found that Thailand lags other countries in the region such as Indonesia and Malaysia (annex D-1). **It has additionally been found that digital economy policies and venture capital regulations are inhibiting the process of experimenting with and adopting new DDTs.** These gaps need to be addressed if Thailand intends to remain competitive in an environment of increasing complexity in regional and global value chains, and of greater focus on sustainable trade, underscored by stringent private and public environmental standards.

It is equally important to assess and manage the potential, near-term, negative outcomes that adopting these two approaches may have on inclusive growth, particularly in the area of jobs. Circularity effects on jobs have been less studied in developing countries; most of the evidence has come from the EU. A 2018 European Commission study

showed that the rate of net job creation among companies that adopted circular economy measures ranged from 1.3 percent per year for larger companies to 8.4 percent for smaller ones (Circular Economy & Jobs, 2020). While circular business models can lead to better jobs that require higher skills, there could be job loss in the immediate term as traditional models of business are replaced with models that require less labor – for example, leasing goods versus manufacturing them. By contrast, the effects of technology on job losses have been more widely analyzed, although the net effects can vary depending on the time horizon, industry, and country. However, in the long run, the adoption of technology is thought to increase both productivity and the stock of jobs in a country (WDR, 2019). Therefore, Thailand's transition to deploying these two levers will have to be carefully assessed and managed.

11. DIGITAL & DISRUPTIVE TECHNOLOGIES[89]

The adoption and widespread use of Digital & Disruptive Technologies (DDT) are drivers of growth and productivity.

The wide adoption and use of digital technologies offer an opportunity for Thailand to attain its high-income status aspirations. Restoring Thailand's declining competitive advantage in core sectors such as tourism, electronics, electrical equipment manufacturing, automotive, and food and beverage requires an ecosystem that spurs digitalization and creates new sources of value addition.[90] Digital and Disruptive Technologies can be a driver of both productivity and resilient growth. For example, additive manufacturing, or 3D printing, allow cost-effective production of highly customized and complex products (for example, medical devices such as hearing aids) while optimizing material consumption (for example, for aviation components). It can speed up innovation by prototyping fully digitally designed products. This makes additive manufacturing a key technology for Thailand's green-growth trajectory.[91] Digitalization and automation of manufacturing can enhance the efficiency of production processes and improve quality.

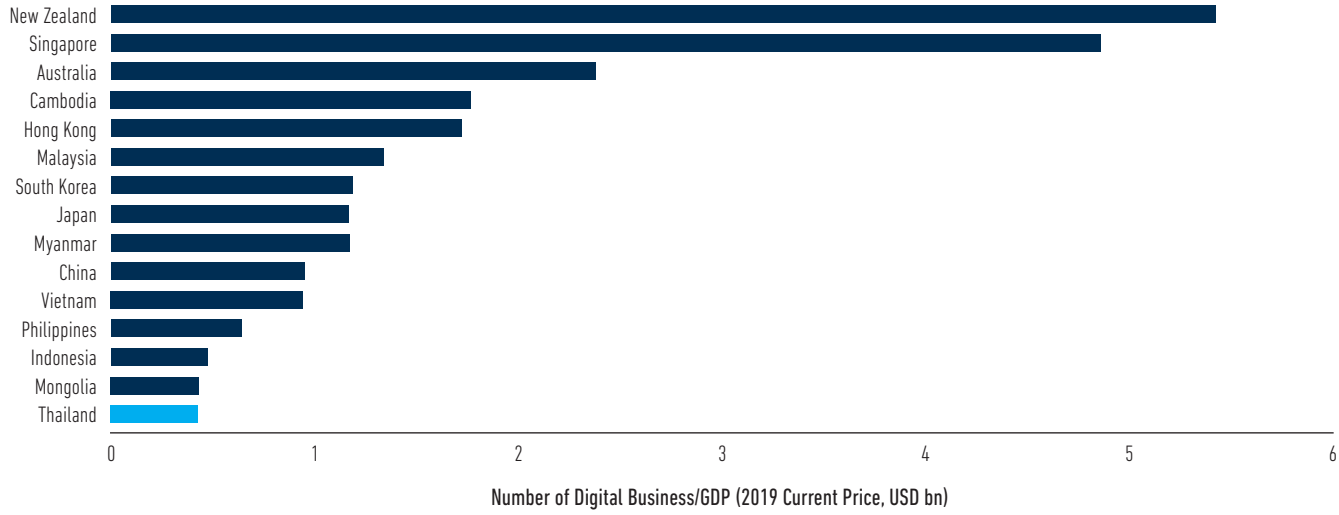
Similarly, in the case of agriculture, the use of digital technologies such as in precision farming can allow farmers to accurately track weather and soil conditions and better manage yields and sustainability, which is especially vital for climate adaptation. Lastly, the use of digital technologies offers opportunities to bridge the gender gap and encourage female labor force participation. Enhanced access to identification, financial services, and information can empower women to participate in entrepreneurial activities while increasing their bargaining power and engagement in the labor market.

The COVID-19 shock has induced firms to adapt their operations through the increased use of digital technology. It has led businesses to operate below capacity and, in some cases, to close, given the negative shock in demand, input supplies, and finance. At the same time, Thai firms have coped with the crisis by increasing their use of digital technologies, taking their business online, and allowing for remote work and operations. The volume of mobile and digital banking transactions in Thailand increased by almost 80 percent in 2020 – a staggering increase in one year (Economist Intelligence Unit 2021). However, smaller firms are generally finding it harder to adapt and transition to the new business models. From a consumer perspective, a recent survey found that 30 percent of Thailand's digital services consumers today are new consumers brought in by the COVID-19 pandemic, and 90 percent of them intend to remain (Google, Temasek and Bain, 2020).

The widespread diffusion of digital technology requires adequate infrastructure, a dynamic entrepreneurship ecosystem, and a supportive legal and regulatory environment. The country has a foundational digital infrastructure in place that supports its digital economy, as briefly mentioned in Part II. The growth of entrepreneurship and new, disruptive technology businesses can stimulate the adoption of digital technologies because they cultivate market demand (for example, through intelligent automation, cloud technology, and software-as-a-service) and put pressure on incumbents to keep apace. The entrance of Amazon, for example, pressured Walmart to strengthen its e-commerce

capabilities. The Thai digital entrepreneurship ecosystem, however, remains thin by comparison, with only a limited number of local and foreign digital solution firms relative to the size of its economy (figure 32). Since 2015, also, the rate of formation of new digital businesses has been slower in Thailand than in its regional peers (figure 33).

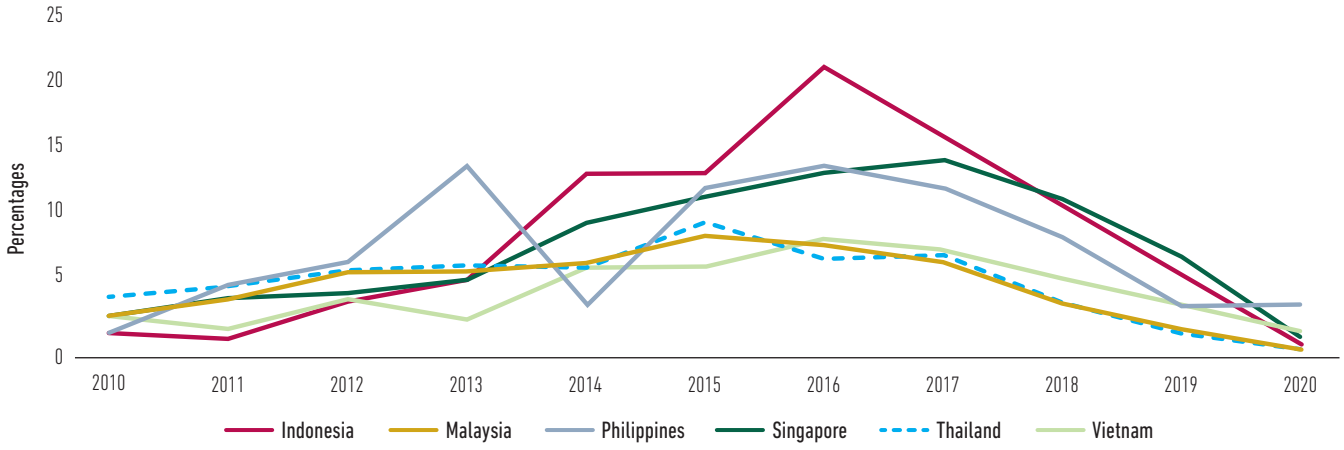
FIGURE 32: NUMBER OF DIGITAL BUSINESSES RELATIVE TO THE SIZE OF THE ECONOMY (SELECTED COUNTRIES IN EAP)



Source: World Bank Digital Business Database, based on data from CB Insights

Note: Digital businesses are digital solution providers that develop and manufacture digital technology products or provide digital services (that is, tech firms, the ICT sector, and the digital sector). Digitalized traditional businesses are not counted as digital businesses.

FIGURE 33: FORMATION OF NEW DIGITAL BUSINESSES IN SELECTED ASEAN COUNTRIES (2010–2020)



Source: World Bank Digital Business Database, based on data from CB Insights and Pitchbook.

Note: The percentage refers to the share of digital businesses headquartered in a particular country that were founded each year (out of all digital businesses founded between 1971 and 2020).

But Thailand has seen relatively strong recent developments in consumer-facing (B2C) industries. E-commerce, fintech, traveltech and foodtech are all successful sectors. More than 45 percent of identified digital platforms in Thailand are active in fintech and e-commerce.[92] Despite the challenges to fintech firms mentioned earlier, the number of fintech firms quadrupled between 2015 and 2018, and the volume of digital payment transactions increased by 169 percent between 2016 and 2020 (World Bank 2019).[93] Key fintech products are offered in payments, blockchain, retail investment, lending and credit and insurance. Thailand's fast growth suggest the potential to become an ASEAN hub for fintech, where Singapore currently leads.[94] Despite the fast growth of fintech, Thailand remains an average regional performer: fintech firms account for only 8 percent of the ASEAN region's financial technology companies (United Overseas Bank, PwC, and Singapore FinTech Association 2021).

Another bright spot is Thailand's e-commerce sector, which has benefitted from the growth of fintech. In 2020, this sector represented 3 percent of total retail sales (Parchariyanon, 2020) but is expected to grow at more than 13 percent annually from 2020 and 2022 (Lago, 2019). Foodtech and traveltech solutions support two key economic sectors – tourism and food & beverage – and have seen significant investment activity from regional and domestic investors.[95]

This CPSD analysis identifies market opportunities in DDT by prioritizing digital subsectors and focusing on underlying general-purpose technologies instead of traditional economic sectors.

The CPSD takes "digital markets" as a unit of analysis to examine "substantive" cross-sectoral digitalization opportunities. Rather than examining traditional sectors such as agribusiness, tourism and health for opportunities in digitalization, the CPSD framework relies on the analysis of digital subsectors in the wider economy (such as e-commerce, fintech, SaaS) and of general-purpose technologies (GPTs) (such as AI/ML, and IoT), which underpin the development of several industries and generate spillovers across them (represented by the inner two circles in figure 34). This focus adopts the OECD's standard definition for measuring the digital economy, hence making this analysis comparable to other countries' digital economy assessments (UNCTAD, 2019). Further, this cross-sectoral approach enables the strengthening of the "complementary factor conditions" – such as digital infrastructure, tech and managerial skills – that are needed for traditional sectors to succeed in their digitalization strategies.

The approach also centers on investigating the digital startup and venture capital ecosystem, for several reasons (figure 35):[96] First, analyzing risk capital flows in digital startups allows the capture of early market signals for wider business digitalization opportunities (further explained in the next paragraph). Second, policies that target the development of ecosystem competencies instead of individual companies have been shown to be more impactful, given the patterns of fluid mobility across industries (Goswami, Medvedev, and Olafsen, 2018). Third, an ecosystem approach can bring benefits to a wide range of young and small firms. For example, new digital solutions such as Software as a Service (SaaS) can bring down capital expenditure investments for budget-constrained small firms and therefore offer SMEs more affordable modular digitalization opportunities (annex D-2).

FIGURE 34: THREE CONCENTRIC DEFINITIONS OF THE DIGITAL ECONOMY

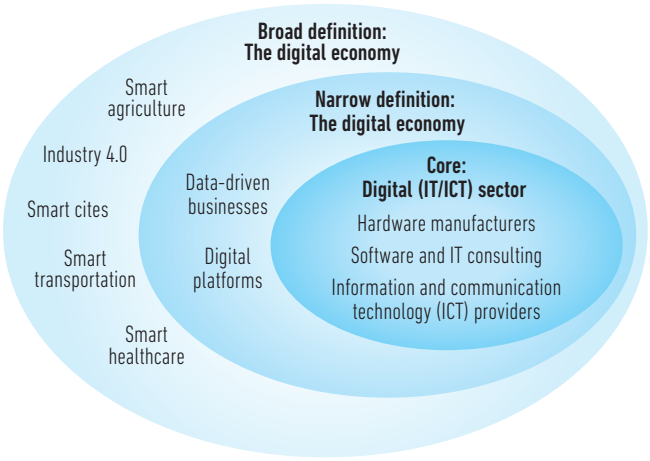
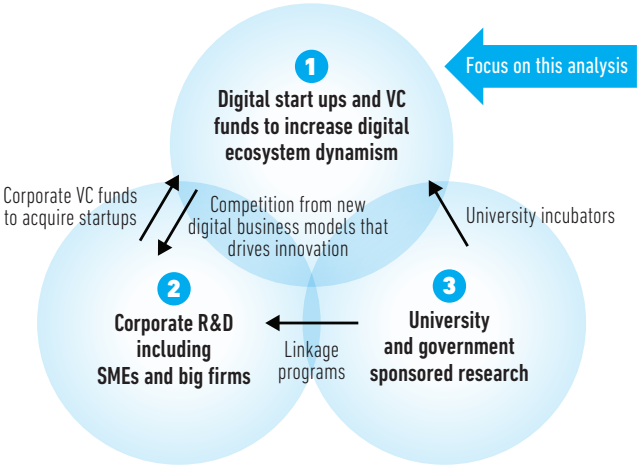


FIGURE 35: OVERVIEW OF THREE CHANNELS THAT DRIVE THAILAND'S DIGITALIZATION



Source: Adapted from Bukht and Heeks. 2017. Defining, Conceptualizing and Measuring the Digital Economy, p. 13.

Note: This chapter covers the inner two circles in Figure 34, which is the narrow definition of the digital economy (which includes the core digital IT/ICT sector as well as platform and data economy). Right panel highlights the three typical channels to drive digitalization.

Risk capital investment analysis and in-depth discussions with investors have been central to understanding the constraints and opportunities to further develop the digital ecosystem. Regional funding flows of risk capital – especially from VC/PE funds – into Thailand's digital sectors and general-purpose technologies (GPTs) have been considered in this CPSD, given that they are a reliable indicator for technology investment viability and market maturity. These investment flows have been assessed across different stages of a market's growth cycle: from pre-seed to seed, then to early and later growth stages, and up to the firms' exits. Larger deal sizes and higher exit rates (for example, via IPOs or M&As) suggest the presence of market-ready digital technologies and their ability to disrupt traditional sectors. The assessment builds on two new global databases of the World Bank that contain information on about 200,000 digital businesses worldwide – covering 34,000 firms that have their headquarters in the EAP region. Through cross-country analyses and inter-regional benchmarking, the report identifies the areas in which Thailand has lagged other peers and where it could catch up and become a digital leader. Details of the methodology are given in the technical appendix to this CPSD.

This cross-cutting approach to the digital economy identifies opportunities for further sectoral deep dives of digital transformation. A subsequent analytical task may single out specific traditional (analog) sectors and assess approaches to their digital transformation. An analysis that looks at traditional sectors with potential for digitalization would require a different set of data and methodology, which is likely to be time- and cost-intensive, and beyond the scope of this CPSD analysis. However, the technical appendix includes some initial examples of how such in-depth analysis of the digitalization of traditional sectors could be approached (for example, for agribusiness or tourism).

Five B2B digital sectors and four B2C industries show the highest promise for digitalization, with an investment potential of approximately USD 1.8 billion of additional funding per year.

As mentioned earlier, Thailand has developed relative strengths in four consumer-facing (B2C) industries: e-commerce, fintech, traveltech and foodtech. These four sectors stand out when examined from the viewpoint of (a) the total volume of investment flows into them, (b) the number of top VC/PE deals they account for, and (c) the number of digital businesses that reach exit stage (for example, M&As or IPOs). In Thailand, these four sectors have constantly ranked at the top across all three dimensions (Table 7).

TABLE 7: THAILAND'S MOST DYNAMIC DIGITAL SECTORS BASED ON SELECTED PERFORMANCE INDICATORS

Digital business sector[a]	Indicators		
	Total investment between 2008 and 2020 (in USD m)[b]	Number of top deals (n=195)[c]	Number of exits (e.g. IPO, M&A, n=231)[d]
E-commerce	3,288	26	25
FinTech	339	18	15
Traveltech	2,589	8	11
Foodtech	2,378	9	88

Source: World Bank Digital Business Database based on data from CB Insights and Pitchbook

Note:
a Digital sector taxonomy is provided by the data sources and it largely corresponds to ISIC Rev 4. sections 61, 62 and 63. See details in the annex D.
b The total investment covers pre-seed/seed to VC, PE, debt and other interim investments between funding stages. There were n=195 deals that account for 50 percent of total funding with n=78 unique companies (since a company can operate in multiple sectors).
c Top deals are the 50 percent largest deals (these are n=195 deals).
d Exits include IPOs, buyouts, mergers and acquisitions, asset sales, dividend recap and secondary market sales. Thailand exits n = 231 company-industry pairs, Exit company N =107.

But Thailand shows significant opportunity for improvement in five sophisticated industries versus regional peers. These are mobilitytech, big data and analytics, health tech, digital media and entertainment tech (see Table 8 below). Annex D-3 provides some examples of types of firm activity in these sectors. Several explanations for Thailand's limited funding flow into these industries are examined further in the next section.

TABLE 8: TOP DIGITAL BUSINESS SECTORS IN THAILAND AND ASIAN FRONTIER MARKETS

Top Sectors in Asian Frontier Markets (Mainland China, Hong Kong, India, Indonesia, Japan, Republic of Korea, Singapore and Taiwan)		Top Sectors in Thailand
E-commerce	**Big Data & Analytics**	**E-commerce**
FinTech	**MobilityTech**	**FinTech**
	HealthTech	**TravelTech**
	Digital Media	**FoodTech**
	EntertainmentTech	

Source: World Bank Digital Business Database, based on CB Insights and Pitchbook data

Note: As in table 7, top sectors are those that are top-ranked across three indicators: the top 50 percent deals by total volume of investment flows into them, the top 50 percent in terms of the number of top deals they account for, and the number of digital businesses that reached exit stage (for example, M&A, IPOs).

Unlocking investment in these nine top digital sectors together could bring an estimated additional capital flow of USD 1.8 billion per year (Table 9). If the digital startups in these sectors keep improving their products and business models, they may be able to attract VC/PE investments the way startups in Asian frontier markets have done. This estimated value corresponds to the size of additional VC/PE investments that would be possible if Thailand were to catch up with the Asian frontier markets in these sectors relative to their GDP. In e-commerce and fintech, where Thailand has had recent success, there is room for additional funding of about USD 0.6 billion per year. Thailand's foodtech and traveltech has attracted more investment than its regional peers, suggesting that the leaders could leverage their strengths and build internationally competitive firms – in other words, funding is no longer a binding constraint.

Specific B2B applications show gaps with the frontier that Thai leaders can pay more attention to. This is especially important as these applications can play a critical role in driving digital adoption in "offline" or "analog" traditional industries. For example, mobilitytech firms may offer digital logistics solutions that help traditional businesses upgrade their delivery processes. Similarly, traveltech may increase the uptake of digital booking solutions by small hospitality businesses that otherwise would have not been able to digitalize their businesses. See Table 10 for further examples of traditional sectors that would benefit from digital solutions.[97]

TABLE 9: THAILAND'S FUNDING GAP/ MARKET POTENTIAL IN KEY DIGITAL BUSINESS INDUSTRIES COMPARED TO ITS ASIAN PEERS

Focus of Thailand's Strategy	Thailand's Annual Funding Gap or Surplus Relative to Asian Frontier Markets (in USD mio)	
Catch up	MobilityTech	-390
	EntertainmentTech	-326
	Big Data and Analytics	-285
	Digital Media	-208
	HealthTech	1.8
Keep growing and scale	E-Commerce	-354
	FinTech	-276
Scale and lead	FoodTech	24
	TravelTech	167

Source: World Bank Global Digital Business Database, based on CB Insights and Pitchbook data

Note: The estimates compare Thailand's current investment flows with its potential flows if Thailand were to attract the same amount of funding in these sectors as the Asian frontier markets do (adjusted for the size of their economies, that is, by GDP). Details about the methodology can be found in the technical appendix of the CPSD.

TABLE 10: EXAMPLES OF TRADITIONAL SECTORS THAT WOULD BENEFIT FROM GROWTH IN HIGH-POTENTIAL DIGITAL SECTORS AND THE ADOPTION OF SUCH TECHNOLOGIES

Digital sectors with high potential in Thailand	Examples of traditional sectors that may benefit (non-exhaustive list)
E-commerce	Professional services, logistics, agriculture
Fintech	Retail, tourism, transport, banking, insurance, real estate
Foodtech	Food and beverage, agriculture, healthcare
Traveltech	Transport, logistics, aviation, tourism
Healthtech	Health and social work, leisure and sport industry, food and beverage
Big Data & Analytics	Agriculture, finance/insurance, health/ social work, tourism, retail, manufacturing, logistics
Entertainmenttech	Advertising, media, sports
Mobilitytech	Logistics, tourism, aviation
Digital Media	Advertising, publishing

Harnessing the power of IT, intelligent automation, and big data will further drive digitalization. General-purpose technologies (GPTs) can be adapted to a wide range of different contexts and underpin an increasing number of digital solutions, new applications, and innovative business models – across sectors.

Table 11 identifies the GPTs that are the most frequently used core inputs for the top 9 digital sectors in question. These are information technology, intelligent automation, cloud technology and computing, and big data and analytics. While these technologies can enhance the entry and growth of digital businesses, they are also crucial for the development of Thailand's wider economy (that is, digitalized traditional businesses).

TABLE 11: THAILAND'S DIGITAL BUSINESS SECTORS: THE MOST FREQUENTLY USED GENERAL PURPOSE TECHNOLOGIES WITH THE MOST GROWTH OPPORTUNITIES

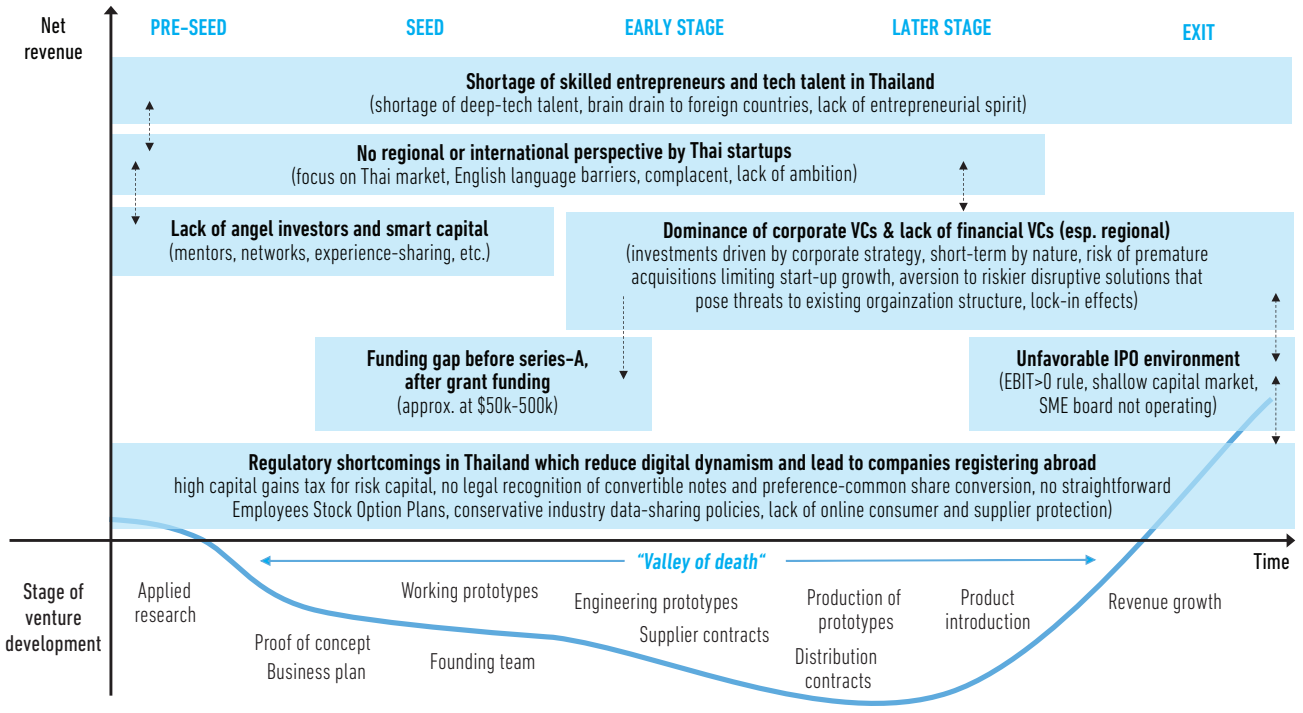
		9 Digital Sectors that Thailand Can Consider to Further Develop, or solidify leadership								
General Purpose Technology	Total Tech Usage Frequency	E-commerce	Fintech	Foodtech	Traveltech	Healthtech	Big Data & Analytics	Entertain-menttech	Mobilitytech	Digital Media
1. Information Technology (unified communication, telephony integration)	1003	24%	12%	11%	6%	8%	22%	5%	4%	9%
2. Intellligent Automation (packaged software/ analytics)	456	26%	11%	14%	6%	6%	19%	4%	4%	11%
3. Cloud Technology & Computing	125	29%	14%	12%	7%	4%	10%	8%	7%	10%
4. Big Data and Analytics (Data lake creation, data ingestion)	113	24%	21%	11%	6%	6%	13%	7%	6%	7%
5. Computer Components (Computer Chips, Processor)	24	17%	8%	8%	4%	12%	32%	5%	1%	13%
6. Security (Penetration Testing, network architecture)	17	17%	4%	8%	0%	8%	58%	0%	0%	4%
7. Robotics (R&D Services)	9	24%	6%	6%	0%	24%	35%	0%	0%	6%
8. Artificial Intelligence & Machine Learning	4	33%	0%	11%	11%	11%	22%	0%	0%	11%
9. Internet of Things	2	25%	0%	0%	0%	0%	75%	0%	0%	0%

Note: Thai Digital Businesses in Top Deals N = 61; a digital business can have multiple tech usages and operate in multiple digital sectors, which is why the total tech usage frequency is more than N=61. The percentage shows tech use frequency across digital subsectors for each GPT; hence each row adds up to 100 percent. Red percentages refer to the two largest frequencies in a column, and red subsectors indicate the areas in which Thailand has the potential to unlock higher volumes of investment.

Despite the government's ambition to embrace the digital economy, Thailand faces high regulatory risks, a relative dearth of digital and entrepreneurial skills, and risk capital that is too limited to promote the wide adoption of digital and disruptive technologies.

Although digital and disruptive technologies are well-integrated into Thailand's growth aspirations, several constraints remain at most business stages of firms' development. "Digital Thailand" and "Thailand 4.0" are core to the government's vision for the digital transformation of the Thai economy, with the focus on ten "S"-curve industries.[98] The NESDP (2017–2021) also emphasizes support for new entrepreneurs and for SMEs that utilize innovation and digital technology, with an emphasis on public-private partnership (PPP) investments, the creation of funds, and government investment in higher-risk disruptive technologies (National Economic and Social Development Board, Thailand, 2017).[99] Furthermore, the Eastern Economic Corridor (EEC) has made the expansion of digital and disruptive technologies a key component of its strategic initiatives. However, several challenges currently limit the potential for digital technology development, experimentation, and mass deployment (figure 36).

FIGURE 36: KEY CONSTRAINTS IN THE THAI DIGITAL BUSINESS ECOSYSTEM: AN OVERVIEW



First, simplifying digital regulations could add dynamism to the digital economy (Table 12). Unlike the leading countries in disruptive technology, Thailand has an innovation-hindering environment of high regulatory risks and uncertainty, low de facto enforcement, and a cycle of ever-increasing and riskier regulation based on the government's perception of new risks in the digital ecosystem. Stakeholders have also suggested that the Thai government cannot respond with adequate regulations at the speed required to meet the pace of change in the digital economy. Regulatory sandboxes, which have been used in the finance sector, could be expanded to other domains.

For example, given that data analytics represents one of the general-purpose technologies with large growth potential, the Thai government needs to introduce enabling data policies that allow for data-intense firms to enter the market and grow, as well as for analog sectors to adopt data-driven solutions. According to stakeholders, the government is aware of the complexities in the regulatory system – for example, those created by overlapping responsibilities – and has taken initial steps to reduce these, but more needs to be done.100 The existing gaps in regulations that govern the digital ecosystem are in the paragraphs that follow.

TABLE 12: SIMPLIFIED DEPICTION OF STAKEHOLDERS' OVERALL PERCEPTION OF THAILAND'S REGULATORY APPROACH AND DIGITALIZATION DYNAMISM IN RELATION TO OTHER COUNTRIES

		Digitalization dynamism (number of new digital business models operating in the country)	
		Low	**High**
Degree of regulation (government's inclination to manage regulatory risks)	Low	Example: Many low-inocme countries	Examples: United States, China, Indonesia
	High	**Thailand** (among others)	Examples: EU countries, UK, Singapore, Korea

Note: This is a simplified depiction based on interviews with various stakeholders in Thailand. For the list of interviewed organizations, see annex F.)

There are constraints leading to firms registering outside Thailand: *First*, Thailand's law on issuance of preference shares, tiering of classes of shares, creation of Employee Stock Option Plans (ESOPs), and convertible notes are less attractive than that of its regional peers. While domestic investors can work around these issues through experienced lawyers, international investors are at a significant disadvantage and stuck facing complexities and risks that become significant deterrents to foreign investment.

Second, **high capital gains taxes on VC/PE (20 percent of Corporate Income Tax) discourage investments in Thailand, a key reason why many Thai startups choose Singapore as their tax corporate headquarters.** It ought to be noted that the government has revealed plans to waive some of the "Capital Gains Tax for investment in Thai Start Ups" to enhance the attractiveness of the Thai startup ecosystem compared to regional peers. This is expected to take place in the first half of 2022.

Third, **an unfavorable IPO environment for digital startups with strenuous requirements deters risk capital investment.** Per current listing requirements, startups can only launch an IPO (and hence exit) if their EBIT (earnings before interest and taxes) is positive.[101] This poses a challenge for startups that prioritize revenue growth over (short-term) profitability. In addition, the limited experience of the Stock Exchange of Thailand (SET) in handling IPOs of digital startups further increases valuation uncertainty. The result is that startups, which are inherently difficult to value, prefer the more startup-experienced stock exchanges of Singapore and the United States. Given that in general SET is one of the most vibrant stock exchanges in the region, this is a missed opportunity for Thailand's digital ecosystem. The SEC has taken measures to enhance SMEs and startup companies' access to funds in the capital markets through private placement offerings for SMEs (PP-SME), while public offerings for SMEs (PO-SME) and LiVE Exchange (SME Board)[102] are planned to be implemented next.

Policy predictability and improved standards for data handling and security could expand the development of critical GPTs such as cloud computing and big data analytics. Laws governing the sharing of public data are available but, in the name of security and confidentiality, recent amendments to the Official Information Act (April 2021) introduced restrictions on, and raised penalties for, disclosing government data – raising concerns that this may limit publicly intended data sharing.

In addition, data remain fragmented across different government bodies and hence under different data sets, a practice that departs from international data standards. Thailand also lacks a regulatory framework for security standards and a marketplace to make non-personal or industry data available and sharable. While the country has taken important steps toward introducing the Personal Data Protection Act (PDPA) in harmonization with EU legislation, caution is needed to ensure effective implementation and enforcement, specifically on criminal penalties for data breaches, which are high.[103] The PDPA represents an important foundation for regulating personal data. The target date for full implementation has been extended to May 2022. Regulations regarding cross-border access of digital data also remain opaque. Finally, the Computer-Related Offences Act and Cybersecurity Act have unclear clauses around the nature and implications of offences, and this has been cited as a deterrent to foreign firms who would like to invest in Thailand.

Strengthened online consumer and supplier protection, especially the traceability of imported goods via cross-border e-commerce, could boost consumer confidence and trust in digital uptake. While there are several pieces of consumer protection legislation in place, none govern the protection of online consumers.[104] E-commerce platforms must be registered, but existing revenue floors for registration preclude small e-commerce operators from registering, which impedes law enforcement. Further, third-party (often informal) sellers in e-commerce can face unfair market practices by platforms because of most-favored nation (MFN) pricing agreements and exclusive contracts entered between the sellers and the platforms. Moreover, Thailand does not have an online dispute resolution (ODR) mechanism that could be used to resolve the large volume of small-value disputes that are typical in the e-commerce or digital service delivery space. There is also no legislation in Thailand that governs the liabilities of cross-border e-commerce businesses for imported products sold on their platforms, and hence when there are problematic transactions involving foreign products, it is difficult to track the accountable party.

Second, well-defined mandates and responsibilities across agencies engaged in digital policy could increase efficiency and policy consistency. The conflicting responsibilities between DEPA and NIA result in confusion and a lack of transparency for private operators about rules and regulations, which increases uncertainty and coordination costs. The regulatory approaches taken by these agencies can also create conflict in the interpretation of policy application. Some ministries are more progressive, embracing new digital business models, while others are more conservative, resulting in two sets of rules governing the same issue (for example, around convertible notes). This problem of unclear roles and responsibilities further dilutes the resources the government has allocated to digital transformation, leading to a lack of ownership, accountability, and progress toward digital transformation.

Third, Thailand faces the need to expand the availability of skills critically needed in the digital economy. In 2017, the International Labor Organization (ILO) estimated a skills gap in ICT in Thailand of more than 45,000 specialists, including computer equipment-related occupations, IT executives and programmers (International Labor

Organization 2019). Investors often complain that Thai tech entrepreneurs do not have deep, differentiated experience in their sectors and tend to be mostly recent graduates. Foreign tech and investor talent is relatively sparse, including professionals who could bring a regional or global perspective and clientele to the work – a situation worsened by recent foreign ownership restrictions. Skill trends analytics reveal wide gaps in the Thai labor pool for computer hardware, data storage technologies, enterprise software, software testing, human-computer interaction, and scientific computing (see, below).[105] These are "must have" skills for Thailand if the country is to catch up with the Asian frontier markets that are stronger in B2B applications and deep-tech industries.

BOX 3: PROMOTING INNOVATIVE STARTUPS AND ATTRACTING FOREIGN TALENT: SELECTED INTERNATIONAL EXAMPLES

Chile: Start-Up Chile aims to attract early-stage entrepreneurs, regardless of nationality. It offers a 24-week training program in which selected entrepreneurs working in startups less than two years old each receive Ch$20 million (about US$28,000) in grants as seed capital. Launched in 2010, by 2015 Start-Up Chile had attracted more than 1,000 startups. In 2015, the also government launched a new program to support high-potential startups that need additional capital to grow, either within Chile or elsewhere in Latin America. It offered each qualifying startup up to Ch$60 million (about US$85,000) of additional capital through a co-financed grant under which recipients match at least 30 percent of the investment. To support female entrepreneurs, S Factory has been introduced as a pre-accelerator designed to "turn innovative ideas into scalable businesses." Selected entrepreneurs each receive Ch$10 million (about US$14,000) in grants and 12 weeks of mentoring and training, after which they can apply to Start-Up Chile. By 2020, Start-Up Chile had been replicated in more than 16 other countries in Africa, Asia, Europe, and North and South America.

Poland: Bridge Alfa, launched in 2012 by the National Center for R&D, aims to support young innovative startups by co-financing private seed venture capital funds. Startup Hub Poland, launched in 2012, is one of the seed VC firms funded by Bridge Alfa. Startup Hub Poland finances early-stage and IP-intensive projects (startups and concept-stage firms), mainly from Polish diaspora centers and the Central and Eastern European (CEE) region. The hub selects the most promising projects and provides $100,000 in financing for a 3-month pre-incubation (proof of principle and proof of concept) to evaluate the technology, adjust the business model where needed, and check the feasibility of acquiring of intellectual rights. Following pre-incubation, it then offers financing of up to $250,000 to the best companies and simultaneously links startups with later-stage VC partners. Since its inception until early 2016, Startup Hub Poland has evaluated more than 500 technologies and business concepts and financed more than 20 young companies. Additional information about it can be found at http://startuphub.pl.

Finland: The NIY (Young Innovative Companies) Program of the Finnish National Technology Agency, Tekes, provides bridge financial support to young, promising enterprises, solicits active public–private collaboration, and includes capacity-boosting policy initiatives. Its objective is to generate new innovative enterprises by boosting the growth and internationalization of the most promising small businesses. The program is designed to support the overall development of business operations. NIY was created to address the difficulties small enterprises face in raising private funding for innovative ventures because of the high risks investors perceive. The program is highly selective, and it offers support according to demonstrated milestone achievements. An evaluation found that program participants experienced 120 percent faster sales growth than comparable (through a propensity score matching) non-participant firms, with differences persisting over three years (Autio and Rannikko, 2016).

Source: Startup Chile 2015; The Search for Unicorns: Facts and Fiction of High Growth Entrepreneurship in Developing Countries, p. 80 (World Bank, 2018); (Grover *et al.* 2018)

FIGURE 37: CRITICAL DIGITAL SKILL PENETRATION IN THAILAND COMPARED TO OTHER ASIAN COUNTRIES

Source: World Bank-LinkedIn Digital Data for Development: Industry and Skills Trends, 2015–2020

Note: The darker the blue, the higher the relative penetration of digital skill adoption.

Fourth, regional risk capital for digital enterprises is relatively absent, while conglomerate-led finance remains dominant. Mid-size ventures (targets for series B and C financing) present financing gaps at critical stages of the business cycle. A funding gap at pre-series A exists for firms which are not small enough to leverage early-stage government financing, yet not big enough to attract series A financing, resulting in a funding gap in the range of USD 0.3 million to USD 1 million per year. Several government bodies provide funding to startups (especially NIA and DEPA) at early stages of the business cycle, typically through grants to private firms (although on a limited scale). In addition, through the planned SME Board, the SEC will initiate steps to improve exit options for venture capital investors in Thailand. More viable exit options can increase the country's attractiveness to private VCs/PEs to invest in startups.

However, currently, critical government funding and/or support are insufficient at three crucial stages: (a) at the seed stage, funding is available but there is a lack of non-financial support in the form of managerial support and commercial relationships, which are indispensable for sustaining growth until maturity – that is, until venture-capital readiness; (b) government funding remains weak at the R&D stage, where government grants are critical for covering large upfront costs in research-intensive sectors such as healthtech and data and analytics; and (c) finally, matching funds that would help de-risk and increase the attractiveness of investments are underutilized. Crucially, the

absence of regional VC operators in Thailand deprives startups of "smart" capital in the form of regional market experience, know-how and networks.

Finally, the dominance of corporate venture capital (CVC), large banks (for fintech) and some SOEs have shaped the character of competition in the digital ecosystem.

- **Stakeholders have expressed concerns regarding the role of CVC in the growth of digital technology markets in Thailand.** By some estimates, about 80 percent of risk financing in Thailand comes from CVC.[106] This ratio reflects the strong role of conglomerate finance in the Thai economy, which typically dominates energy, media, telecommunications, banking, and finance (see section 6 on competition). While important, this funding has been often linked to bias and distortions. Investments can be driven by corporate interest, which may lead to a strengthening of their market power position. In addition, CVC operators are more likely to acquire startups and integrate them into their own operations, leading to concentration. The low cost of capital allows them to invest at valuations which would not be sustainable for financial investors. This can create unrealistic valuation expectations among founders that then limit their ability to raise follow-on rounds and keep growing into a mature tech business.

- **Opening the provision of spectrum and infrastructure to a wide set of private operators could increase the quality of digital services.** Thailand has considerably less spectrum available for use by telecom operators than many other countries. Reports suggest that high amounts of spectrum have been assigned in perpetuity to government bodies (police, military, intelligence) but remain unused – that is, not auctioned for private sector use. While the concession regime has evolved, few private operators are able to participate in spectrum auctions. A clear roadmap for spectrum management is also missing. High spectrum prices also create barriers to access for private telecom operators' firms which are not market leaders. Expanding opportunities for private operators to participate on digital platforms using disruptive technologies such as the IoT and cloud computing could expand private investment in the provision of digital services.

- **The fintech sector has developed significantly over the past years, but market contestability remains challenging for newcomers.** Electronic Know Your Customer (e-KYC) regulations have created barriers to newcomers seeking to participate and compete with traditional banking. For example, regulations require lending institutions to verify customers, but this is difficult for fintech firms who must verify clients' identities with the database of the Ministry of Interior. That process is not yet fully online, and it involves the payment of a fee to check this information, which complicates the operation of digital financial platforms. It is important to note that for regulators, striking the right balance between protecting data privacy and promoting innovation is not straightforward. Many regulators would err on the side of caution, favoring privacy concerns, which may disincentivize entry. In addition, large fintech firms who seek to obtain banking licenses must currently overcome barriers to acquire these, since the Bank of Thailand does not issue licenses on a rolling basis, and the last round of licenses were issued several years ago. The BOT is exploring the possibility of introducing digital banking licenses with the objective to promote competition and financial inclusion for currently underserved individuals and SMEs.[107] Furthermore, alternative credit scoring mechanisms using data tend to be more efficient for fintech firms, however only a few players have obtained authorization for its use by regulators. Additionally, the clauses of the Personal Data Protection Act (PDPA), which exclude operations of data undertaken by a credit bureau company, create further barriers for fintech firms against using traditional

credit bureaus. Also, the coexistence of multiple QR code schemes for all electronic payments may negatively affect fintech firms. Finally, some fintech operators have cited difficulty accessing the regulatory sandbox, which seems to be dominated by firms affiliated to traditional banks.

- **Asymmetric bargaining power between platforms and third-party sellers or digital service providers can create a lack of fair, transparent, and predictable terms for business.** This can be reflected in unfavorable platforms' services: examples of these practices are platforms that prohibit consumers from linking up with any businesses that are outside the platform, platforms that use data on transactions to develop their own products that then compete alongside the products of the small businesses, or the absence of mechanisms for providers to follow up on complaints with the functionality of the platform. Developed digital markets such as the EU are able to regulate large platforms through so-called "gatekeeper regulation" in order to foster transparency and competition and to reduce the risk of dominant platforms exercising their market power against certain users.

Moreover, the inadequate regulatory framework, and relative absence of pro-competition regulation, create barriers for smaller firms – especially disruptive digital startups – seeking to participate on a level playing field. These barriers include vagueness in the definitions of rules, a lack of transparency in implementation, uncertainty in enforcement, and high minimum requirements to be eligible for incentives. Together, they create burdensome costs and nonfinancial barriers for smaller firms. Annex D-4 and annex D-5 outline in more detail the potential effects of a noncompetitive environment in the digital and disruptive technologies area. It bears stating that excessive regulatory barriers for e-commerce firms can disincentivize their registration. For example, the need to coordinate across different agencies makes the process of registration time- and resource- intensive. Yet if the firms do not register, they cannot avail themselves of state incentives.

Below is a summary of recommendations for advancing digital and disruptive technology in Thailand.

SUMMARY OF RECOMMENDATIONS

Opportunity	Recommendations	Enabling reforms in the immediate term	Medium-term reforms	Complimentary reforms (if they appear in the same column)			Key stakeholders
DIGITAL AND DISRUPTIVE TECHNOLOGIES							
Well defined institutional responsibilities and sound experimentation in disruptive tech pilots (EEC)	Clarify roles and responsibilities in key digitalization policies and establish a monitoring and evaluation framework to track the progress of important programs and reforms. For example, in industrial data policies, this would mean startup ecosystem building, including early-stage risk capital attraction, and innovative and circular pilots that have been tested in traditional sectors and real-life settings, including those in EEC.	√		•	•		MDES, sectoral ministries

Opportunity	Recommendations	Enabling reforms in the immediate term	Medium-term reforms	Complimentary reforms (if they appear in the same column)			Key stakeholders
An attractive regulatory environment for digitalization	Conform financial regulations to international practices and standards by amending the Thai Civil and Commercial Code – for example, introducing Employee Stock Option Plans (ESOPs) and issuing convertible notes and preferred shares.	√		●			MOC, SEC
	Introduce an industrial data strategy as well as protection policies to enable and safeguard data-intense solutions because they underpin digital transformation in a variety of traditional sectors such as retail, health, and finance.	√			●		MDES
	Enhance the use of matching equity fund schemes to de-risk investments and catalyze early-stage capital markets (co-investment funds, fund-of-funds).		√	●			DEPA, NIA and NSTDA
High contestability in digital markets	Attract more regional financial venture capital to balance out the excessively dominant role of CVC in the digital ecosystem and to expose local large firms to international competition to prepare for a more open and innovation-driven economy.	√		●			DEPA, SEC
	Introduce online supplier protection schemes to prevent online platforms from abusing their market power to squeeze out informal third-party sellers and digital service providers. Create trust and fairness in the digital market to drive broad-based digital uptake.		√		●		ETDA
	Address the lack of competition in how the spectrum is assigned by (i) developing the spectrum roadmap, (ii) designing reserve prices according to market reality, and (iii) designing pro-competition spectrum auctions.		√				NA, OTCC, COM
Enriched pipeline of tech talent to drive digital transformation	Build up deep-tech capabilities and change the popular mindset and culture to make tech a promising career path by promoting successful industry transformation use cases and role models. Promote and provide incentives for local-international tech talent exchange by means of incubators, accelerators, diaspora networks, and corporate overseas exchange programs.		√	●	●		DEPA, NSTDA, private sector, academia

Note 1: Enabling reforms: Reforms that are to be enabled in the immediate term are those that, if introduced at the outset, can be expected to "enable" positive spillovers for subsequent reforms, paving the way for cumulative effects in a particular field and for the medium term. The distinction highlights reforms that could be sequential in nature and that have the property of creating vertical spillover effects from upstream reforms to downstream ones. Complementary reforms are those that mutually reinforce each other, thereby creating horizontal spillover effects. In the table, upto three sets of complementary reforms have been identified, which are tagged together in the three sub-columns under 'Complementary Reforms'.

Note 2: BOT – Bank of Thailand; BOI – Thailand's Board of Investment; COM – Council of Ministers; DBD – Department of Business Development; IB – Immigration Bureau; MHESI – Ministry of Higher Education, Science, Research and Innovation; MOC – Ministry of Commerce; MOE – Ministry of Education; MOF – Ministry of Finance; MOL – Ministry of Labor; MSDHS – Ministry of Social Development and Human Security; NA – National Assembly; NBTC – Office of The National Broadcasting and Telecommunication Commission; NXPO – Office of National Higher Education Science Research and Innovation Policy Council; OSMEP – Office of SME Promotion; OTCC – Office of Trade Competition Commission; OVEC – Office of the Vocational Education Commission; SEC – Securities and Exchange Commission; CSD – National Committee on Sustainable Development; PRD – Public relations department.

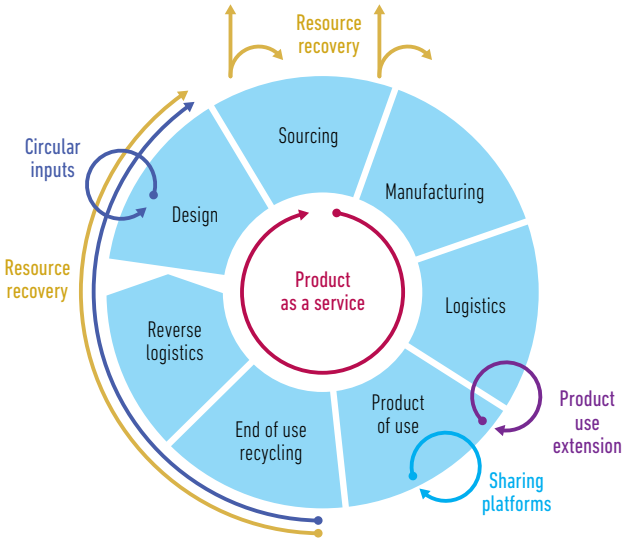
12. THE CIRCULAR ECONOMY

The Circular Economy presents a paradigm shift in thinking about the competitiveness and resilience of sectors and industries in Thailand.

The Circular Economy (often shortened to just "circularity") is an innovative approach to building an economy centered on creating a closed-loop system that replaces the traditional "take-make-waste" production model with one based on reducing waste disposal, turning waste materials into inputs for other goods or industrial processes, and increasing resource productivity by keeping them in use for as long as possible – through refurbishing, reprocessing, and reusing resources. More formally, it can be described as "an economic productive system that replaces the 'end-of-life' concept with sharing, reusing, repairing, remanufacturing, repurposing, recycling and recirculating nutrients in technical or biological cycles" (Ellen MacArthur Foundation, 2015).[108] Annex D-6 provides a more detailed definition and description of circularity.

Circularity can become a vital lever with which Thailand can enhance productivity and innovation and do it in a resilient and sustainable manner. Since it is a shift in business-as-usual thinking, it requires innovation in design and business models to facilitate the continuous exchange of materials, products, and assets that marks the essential dynamism of a circular economy.

FIGURE 38 CIRCULAR ECONOMY REPRESENTATION



Source: Accenture

According to an analysis by Accenture, the adoption of circular-economy business models is estimated to be a business opportunity that will be worth USD 4.5 trillion globally by 2030.[109] Further, circularity can promote innovation in its supporting ecosystem. In the light of the proliferation of innovative financing for circularity in capital markets and in funds, there are signs that the global financial sector has recognized this business opportunity. There is also early evidence of above-average returns in some cases. Leading economies are employing the circular economy to help drive their growth and innovation, including the EU, Germany, Netherlands, Singapore and China.

Finally, circularity provides an additional means to achieving Thailand's climate change goals of reducing GHG emissions by 20–25 percent by 2030, as committed in Thailand's updated Nationally Determined Contribution (NDC) reflected in the Paris Agreement.[110] Renewable energy and energy efficiency will be able to address 74 percent of GHG emissions, but the remaining 26 percent will come from the production and delivery of goods and services.[111]

Digital and innovation megatrends will reinforce circularity. Disruptive technologies will be a major enabler of circular-economy business models and products.[112] The trend toward greener GVCs on the one hand and need to mitigate increasing supply chain risks on the other will also provide an impetus to companies to switch to circular-economy procurement models.[113]

Thailand has already incorporated aspects of the circular economy in its national strategies, plans and policies. Annex D-7 provides a detailed overview of the different levels at which circular-economy principles have been adopted, including in the 20-year National Strategic Framework, in the 12th National Economic and Social Development Plan (NESDB), and in sub-plans at the different ministry and sector levels. Of particular note is the Bio-Circular-Green Policy (BCG), which focuses directly on the circular economy by introducing a new model for sustainable economic growth in seven key areas, and has targets to reduce resource use and GHG emissions (NXPO, 2021).[114] Even though the majority of the policy strategies are currently aspirational, and its policy instruments voluntary rather than mandatory, Thailand has emerged ahead of other ASEAN countries in a recent assessment by the Economic Research Institute for ASEAN and East Asia (ERIA) on Circular Economy Policy Readiness (Anbumozhi *et al*., 2020).

Thailand's approach[115] to identifying opportunities for the circular economy has prioritized three sectors – food and agriculture, construction, and thirdly, electronic and electrical appliances. Specific circular-economy approaches within these three sectors have been identified for sizing opportunities.

The analysis was introduced to prioritize opportunities and define data, metrics, and frameworks. This involves a three-stage approach:

1. In the first stage, nine strategic sectors in Thailand were assessed for circular-economy potential across several dimensions covering both economic and circularity potential. This resulted in a final list of three sectors.

2. In the second stage, these three sectors were mapped through their value chains to identify opportunities for adoption of circular-economy approaches based on global and regional circular-economy and industry trends, potential for private sector involvement, and ability to positively influence other sectors. Based on this analysis, 15 circular economy approaches in the three sectors were identified.

3. In the third stage, 6 out of the 15 areas of potential opportunities were selected for sizing market opportunity, based on those with the highest impact.

BOX 4: FIFTEEN AREAS IN THREE SECTORS ASSESSED FOR CIRCULAR-ECONOMY OPPORTUNITIES

I. Food and Agriculture

- Upstream, farmers can make use of *regenerative agriculture and aquaculture farming* to enhance the flow of nutrients into soil and water, *precision agriculture* that uses information technology to provide resources that are needed for optimum crop and soil health (no more, no less), embrace the *sharing of agriculture equipment* to allow access to plant or higher-technology equipment through cheaper lease models in preference to more expensive purchase models.
- Midstream, there is an opportunity to *reduce material input* for processing by redesigning the product or manufacturing process.
- Downstream, there is an opportunity to *collect the organic waste* generated at different points in the value chain (post-harvest, processing, retail, postconsumer) and divert it for processing into high-value materials and products.

II. Construction

Circular-economy opportunities are pursued across building/infrastructure life cycles.

- In the design and construction stage, architects and engineers can adopt many different circular-economy design approaches such as switching some primary materials like gypsum to *bio-based construction materials*, often made from agricultural wastes. It can also involves specifying *recycled construction material* made from secondary materials such as crushed concrete from demolition sites.
- At the operational stage of assets, developers and operators can adopt *flexible and shared spaces* to improve the utilization rates of building and infrastructure. Designing spaces with the needs of different users in mind and easy reconfiguration supports this.
- At the end-of-life stage of construction assets, instead of simply demolishing them, asset owners can explore *asset retrofit* to extend the lifespan of existing assets by making aesthetic changes, repurposing space, and extending or changing their functionality to meet the new demand. If the building needs to be taken down, de-construction instead of outright demolition can support the *reuse of construction material* in new buildings and infrastructure.

III. Electronic and Electrical Appliances

- At the design stage, firms can investigate *material intensity-reduction* strategies, methods and technologies that reduce the quantity of precious metals and bulk material inputs required to produce a product. To further reduce primary material use, manufacturers can explore *device remanufacturing* and *parts recycling*. Both require used devices to be returned to the manufacturer.
- Beyond this, manufacturers might explore new business models and additional services in conjunction with these opportunities. For example, *device sharing* can be provided to consumers to improve the utilization of devices by allowing multiple users to have access to a device in the same period or one after another.
- *Device repair* is also a win-win for both manufacturers and end-users, to extend the lifetime of a device by providing maintenance and repair services to restore defective products to their original or a more upgraded functional specification.

Adopting the six prioritized circular-economy approaches mentioned above could yield returns to the private sector through increased revenues and reduced costs – to an estimated cumulative total of approximately USD 1.6 billion by 2026.

The six opportunities that have been prioritized and estimated for potential are those with a high likelihood of scale-up and the opportunity to offer cross-sectoral spillover benefits. Regenerative farming is already being practiced on several farms in Thailand and can be scaled up. Transforming organic waste into products through the circular economy can diversify income opportunities for stakeholders operating in the food and agriculture value chain. In the construction sector, technologies are a key driver for both construction material reuse and flexible and shared spaces. Device remanufacturing and device sharing are both inclusive opportunities that have an influence on various parts of the value chain. They represent untapped low-hanging fruit that requires investments in technologies, training, and reverse logistics across the electronic and electrical appliances (EEA) sector.

Other potential sectors that were identified but not included are automotive and electric vehicles (EV), and plastic input materials. Based on the metrics used in the methodology, they ranked below the three identified sectors for investment opportunities in the medium term. These were also omitted from this study due to parallel sector analysis by IFC and the World Bank. However, it is important to note that critical EV parts such as electronic sensors fall within the EEA sector (see table 13 below) – thus creating an opportunity to raise the competitiveness of the EV sector in general. Similarly, waste management and energy were considered as part of the sector circularity potential. More details are available in the technical appendix to the CPSD.

If the specific six activities in the three sectors were to be adopted, stakeholders in the value chains could achieve additional net revenue streams or cost savings of an estimated total of USD 1.6 billion per year. That annual estimate, in this case, has been calculated for the year 2026 to coincide with the end of Thailand's BCG Economic Policy timeline.[116] Of this total, it is estimated that approximately 24 percent would come from revenue generation and 76 percent from cost savings.

It is important to state that data constraints due to limited reporting on the benefits of the topic make it difficult to fully formulate the business case for the circular economy – a gap that will be highlighted later in this section that covers constraints. Annex D-8 presents case examples of firms who are engaged in each of the six priority areas.

Besides the financial benefits, these opportunities will also contribute to reducing greenhouse gases. These reductions will come from changes made across the life cycle of the materials, products, and assets under consideration, which currently account for 10 to 26 percent of Thailand's total greenhouse gas emissions. Such changes would include switching from fossil-fuel based products to those made from renewable resources, and increased reuse and recycling of resource-intensive materials. This could help Thailand meet, if not surpass, the country's 2030 carbon mitigation targets. New investments could build on the momentum Thailand will have been gaining in pursuing circular economy opportunities.

TABLE 13: HIGH-IMPACT CIRCULAR-ECONOMY OPPORTUNITIES IN THAILAND

Opportunity description	Key stakeholders involved	Market trends supporting uptake	Scalability	Main investments required	Potential benefits in 2026
Regenerative farming Regenerative farming practices enhance the flow of nutrients into soil and water in the farm's surrounding natural ecosystem. This improves the natural ecosystem that the farm uses rather than destroying it	• Farmers	The Thai government is supporting regenerative farming through existing policies relating to organic and sustainable agriculture	62 percent of the food and agriculture sector – Applicable to raw agriculture products and animal products	• Industry organizations, NGOs or food manufacturers investing in upskilling farmers and fishermen to help them understand the process and benefits of regenerative farming	**Quantitative:** Business level: THB 5,996 (USD 191) net value creation per regenerative rice farm of 2.4 ha Sector level: THB 11.1 billion (USD 355.1 million) net value creation **Qualitative:** • Increased farmer income through more diversified product portfolios • Improved soil health and fertility • Increased crop yield and productivity • Reduced water pollution
Organic waste to products Organic waste to products refers to the processing of agricultural and food waste into intermediate or end-products such as animal feed, construction materials and bioplastics	• Farmers • Food manufacturers • Food retailers • Logistics service providers • Product manufacturers	Market value of eco-friendly food packaging is projected to grow 25 percent from last year to around THB 2.1–2.4 billion in 2021, signaling a broader trend around bio-based products	72 percent of the food and agriculture sector – Applicable to agricultural production, postharvest storage and handling, food processing and distribution	• Logistics service providers or product manufacturers investing in (reverse) logistics services to transport organic waste to product manufacturers • Organic waste generators or product manufacturers investing in R&D related to new bio-based materials and products • Product manufacturers investing in new product manufacturing facilities	**Quantitative:** Business level: THB 1,749 (USD 56) net value creation per family farm of 4 ha THB 963.2 million (USD 30.7 million) net value creation **Qualitative:** • Reduced greenhouse gas emissions from the landfill disposal of organic waste • Support toward product development and entrepreneurship in various sectors • Increased availability of renewable alternatives

Opportunity description	Key stakeholders involved	Market trends supporting uptake	Scalability	Main investments required	Potential benefits in 2026
Construction material reuse Construction materials are reused in the construction of new buildings and infrastructure assets. In turn, these assets are designed for deconstruction so that the materials can be reused again at end-of-use	• Construction clients • Designers • Architects • Engineers • Suppliers • Construction contractors • Deconstruction contractors • Materials exchange platforms • Logistics service providers	Sales of construction materials may improve by 0.2–1.9 percent in 2021, an estimated market value of THB 803–817 billion, suggesting sustained demand in construction materials, in which reused construction materials could penetrate	74 percent of the construction sector – Applicable to all construction assets but to varying degrees depending on the extent that design for deconstruction can be adopted	• Industry organizations, construction clients, architects, engineering and construction contractors investing in technical knowledge and supporting software to design for deconstruction • Industry organizations, construction clients, contractors or material suppliers investing in R&D of deconstruction techniques and durable materials • New and existing companies looking to roll out material passport services or material exchange platforms	**Quantitative:** Business level: THB 63.4 million (USD 2.0 million) cost savings per average real estate portfolio size of 120,690 m2 Sector level: THB 8.5 billion (USD 271 million) cost savings **Qualitative:** • Creation of new markets for secondary materials • Diverted waste from landfill • Reduce embodied carbon of construction assets • Reduced exposure to primary material supply chain shocks
Flexible and shared spaces Flexible and shared spaces make use of underutilized spaces for short-term use by other occupants and users	• Construction clients • Landlords / Estate managers • Architects • Engineers • Occupants • Proptech providers	Asia Pacific has outpaced the rest of the world in the growth of flexible and shared workspaces. "By 2030, flexible workspaces could comprise 30 percent of corporate commercial property portfolios worldwide," says Jeremy Sheldon JLL Asia Pacific117	11 percent of the construction sector – Applicable to most office, retail, and leisure and some residential buildings	• Landlords, estate managers, or third-party space providers investing in space-sharing platforms • Construction clients or proptech providers investing in space utilization monitoring technologies	Quantitative: Business level: THB 47.3million (USD 1.51 million) cost savings per developer looking to develop on average 39,180 m2 office space a year Sector level: THB 1.8 billion (USD 58.7million) cost savings **Qualitative:** • Reduced fixed costs (rent) for anchor tenants leasing space • Supports user flexibility • Supports professional networking • Support entrepreneurship in various sectors

Opportunity description	Key stakeholders involved	Market trends supporting uptake	Scalability	Main investments required	Potential benefits in 2026
Device remanufacturing Device remanufacturing requires products to be designed for disassembly and manufacturers to put in place take-back schemes so that devices can be returned to them to be rebuilt	• Product designers • Product manufacturers • Consumers • Logistics service providers	There is an opportunity for Thailand to create an integrated electric vehicle supply chain by attracting investment in the production of important electric vehicle components such as motors, inverters, on-board chargers, electrical parts and sensors	34 percent of the electrical appliances & electronics sector - Applicable to all the electronics and electrical appliances but to varying degrees, depending on whether the product range can have a remanufacturing program	• Product manufacturers investing in product design and remanufacturing skills training • Logistic services providers or product manufacturers investing in (reverse) logistics services related to take-back schemes • Industry organizations, product manufacturers or new industry service providers investing in product passport systems	**Quantitative:** Business level: THB 119 million (USD 3.79 million) cost savings per firm averaging 35,142 remanufactured products annually Sector level: THB 23.5 billion (USD 748 million) cost savings **Qualitative:** • Creation of highly skilled jobs • Reduced greenhouse gas emissions from primary product production • Reduced embodied carbon of products • Reduced exposure to primary material supply chain shocks
Device sharing Device sharing makes product use more intensive by allowing multiple users to have access to it. The sharing mechanism could be renting through lease agreements, performance-based contracts or product-as-a-service contracts	• Product manufacturers • Product retailers • Sharing marketplace providers • Consumers	Domestic sales volume of electrical appliances is forecast to rise by 3.0–4.0 percent per year from 2021–2023. Thai consumers have already witnessed the rise of Laundry Bar Thai and Double A, which have paved the way for other SMEs	13 percent of the electrical appliances & electronics sector – Applicable to finished electrical appliances and computer equipment and components	• Product manufacturers, product retailers or sharing marketplace service providers investing in B2C, B2C and C2C sharing / exchange platforms • Exchange platform providers or logistic services providers investing in (reverse) logistics services transporting devices from one user to another • Exchange platform providers or provenance technology providers investing in device provenance services	**Quantitative:** Business level: THB 1.6 million (USD 50,612) cost savings per condominium of 450 units Sector level: THB 4.7 billion (USD 148.7 million) cost savings **Qualitative:** • Maximize device uptime rates • Reduced greenhouse gas emissions from primary product production • Supports the shift in consumer consumption behaviors toward access in preference to ownership (à la online streaming of music) • Increased access to devices

There are, however, some significant constraints to circular economy adoption that center on a lack of knowledge about, and understanding of, its basic operational principles and, second, weaknesses in the policy and governing framework needed to enable its emergence and growth.

Thailand is at an early stage in its circular economy transition. To facilitate the transition, policymakers and market players should address the constraints that are hindering progress in circular economy adoption. These constraints have been analyzed at a national, sector-agnostic level as well as across the three focus sectors, using the Ellen MacArthur Foundation Toolkit for Policymakers.[118] The critical barriers are highlighted below.

The focus of the BCG Economic Model remains skewed to specific sectors, which is at cross-purposes with the circular economy's systemic and cross-industry approach. The current BCG implementation strategy suggests that the circular economy is largely bio-centric, sidelining the potential appeal to stakeholders in sectors such as manufacturing and electronics, which in fact present high potential for circularity growth. The BCG committees are in the process of preparing a five-year Circular Economy Action Plan to also cover plastics, food and construction. While sector-specific plans are helpful, this must be accompanied by an overarching sector-agnostic or sector-neutral approach to promote the cross-sector implementation of circularity.

Developing a common understanding of the circular economy across the public and private sectors and consumers alike would create an opportunity to advance a collective, unified, and targeted response, both on the policy level and on the private sector level. There is currently no shared common definition of the circular economy employed in government and industry. The result is that circularity tends to be misinterpreted essentially as mere waste management. The lack of a deeper and broader understanding of the circular economy also exacerbates the degree to which circularity in Thailand is centered on material strategies rather than holistic business models (Tangwanichagapong *et al.*, 2020).

Further, this translates into the way metrics are used to monitor and evaluate circularity. Presently, they focus primarily on recycling and waste generation (Tangwanichagapong *et al.*, 2020). As a result, what counts as the "successful" achievement of performance targets is likely to be distorted because the metrics are measuring values and criteria that are substantially narrower than those envisioned by the circular economy in its broadest sense. In addition, firms lack knowledge and capacity to assess the financial viability of these business models and without that, they are not likely to embark on exploring the models in the first place. Currently, there are only a few institutions or agencies that are exploring the circular economy as a viable concept in Thailand, and most of this research is at a relatively early research and development stage, not close to implementation. Fourth, large conglomerates who do participate in the circular economy tend to work in isolation, which not only limits standardization but also limits potential economies of scale.

All the above also provide obstacles to SMEs who might be looking to the larger corporations to reduce the upfront costs of adoption. Further, these problems limit funding to very narrow channels of circularity such as biomaterials and recycling, rather than strategies and processes across the entire value chain. Finally, a lack of awareness among consumers, especially among Thailand's growing middle-income bracket, can slow down the demand for circular-economy products, which in turns dampens the impetus to supply such products at all.

Balancing policy strategy and institutions governing circularity could boost private incentives to adopt circular technology. Although circularity exists across several agencies and levels, as shown earlier, many relevant agencies still do not acknowledge the agenda or provide the kind of supportive policy that would create collective, synergistic impact if they all acted in unison. Some government ministries have their own budgets under specific programs. For example, the Ministry of Industry (MOI) has an ongoing Eco-Industrial Town project that extends to include closed-loop materials flows. Further, many of the committees that are associated with the circular-economy agenda hold R&D mandates, and place considerably less emphasis on implementation or on the importance of coordinating with implementing agencies such as provincial administration bodies, the Ministry of Finance (MOF), or the Ministry of Natural Resources and Environment (MNRE). This fragmentation also contributes to the current approach to circular-economy regulation, which overlooks the cross-cutting nature of a circular economy and the fact that a circular economy involves incorporating many more industries and stakeholders.[119] Finally, a stronger mandate at the subnational level for adoption of the circular economy agenda would strengthen the linkages between the national and provincial initiatives.

As a result, the government of Thailand has the opportunity to employ additional regulatory and fiscal incentives to expand the current framework and he policy toolkit beyond the existing voluntary mechanisms. Stakeholders within both the public and private sectors have cited this as a hindrance to circular-economy uptake. For the public sector, without mandatory requirements, ministries in different sectors are not proactive in considering circularity within strategies that are not explicitly related to sustainability.[120] For the private sector, only large corporations and MNCs embrace circular-economy strategies, and even then, primarily from a corporate social responsibility (CSR) perspective. But even in their CSR activities, domestic and regional players are usually limited in what circular approaches they can use. This means that practices will not be aligned across the value chain, which is a critical requirement for making the business case for the circular economy. In sum, because the circular economy is fundamentally a holistic phenomenon with internal components that function synergistically and reinforce one another, attempting to realize it or justify it – or even just explain it – through piecemeal, ad hoc, unsystematic, or individualized approaches is likely to run into formidable challenges.

Fiscal incentives have been introduced, but they seem insufficiently targeted to addressing market failures. The Board of Investment (BOI) of Thailand has introduced tax and non-tax incentives to promote the circular economy in relation to different activities or technologies.[121] The Program Management Unit for National Competitiveness (PMU-C) operates under the framework of NXPO as one of the grant-funding bodies for different research topics, including the circular economy. But for most SMEs, these incentives are either irrelevant or inapplicable, or may not be large enough for taking on the risk of early adoption or making up for the elevated costs of exploring circular-economy opportunities. With eligibility criteria that prioritize specific industries which are narrow in scope, current incentives seem mis-targeted.[122]

The adoption of circular approaches can be expanded through targeted regulations and standards.

- *Thai law needs to expand the transportation of waste material across geographical areas*. Section 18 of the Public Health Act of Thailand states that collecting, transporting or disposing of sewage or waste within the area of any local government shall be the authority of that local government (Public Health Act

1992). By limiting the collection and management of waste to geographic localities, Thai law currently hinders the ability for industries to close the loop across their value chains, which are widely spread across space. This also makes waste material management commercially unviable for certain lines of business work. This is exacerbated by the fact that local administration units, being self-governed individual entities, generally do not collaborate closely (Kojima 2019).

- *Creating a more comprehensive set of national end-of-waste criteria that allow waste to be reclassified as products or as secondary raw materials can be a gamechanger.*
- *New laws could expand the use of recycled plastic packaging in the food sector:* An example is the Ministry of Health Notification No. 295 (2005), which in Clause 8 prohibits the use of plastic containers made from recycled plastic to contain food, except fruit of which the peel is not consumed (such as oranges). All plastic containers for food must therefore be made of new, non-recycled plastic. Amending this law would be a significant step to reducing plastic waste in, for example, the food and agriculture sector by allowing post-consumer plastic waste such as PET bottles to be recycled into high-value, food-grade bottles and food containers. This will of course require a solid recycling system that can ensure quality recycled material to be reused.
- *Expanded standards that promote material reduction, reuse, and recycling:* Thailand does not have any reliable standards related to recycled concrete aggregate. As a result, both users and manufacturers lack confidence in commercially using recycled concrete as they lack suitable guidelines.[123]

The absence of supporting infrastructure prevents capturing quick successes at the local level. A reverse logistics system is critical to ensuring the continuous and efficient movement of secondary material and waste. For example, in the case of construction, stakeholders have pointed out the inefficiency of the concrete value chain because of the logistics.[124] Most of the concrete demand in Thailand comes from the Bangkok metropolis, and demolition of old buildings and concrete structures provide an ample source of recycled concrete aggregates. However, the main aggregate quarries are located outside of Bangkok in Saraburi Province, requiring several hours of transportation via road and barge to reach construction sites in Bangkok. This is a clear barrier to the feasibility of recycled concrete aggregate opportunities.

Similarly, in the electronics and electricals industries, because of the absence of regulatory requirements for e-waste management, there are only a few centralized and properly designed dismantling, recycling and disposal facilities that operate in a health- and safety-controlled environment. This also leads to a large informal sector working under poor hygiene conditions and illegal e-waste recycling activities. The lack of infrastructure and regulation also means that recycling, and investing in recycling activities, have an increased cost of production, disincentivizing companies from participating in recycling activities. Finally, a comprehensive Extended Producer Responsibility (EPR) regulatory framework is critical to incentivize the recovery of waste for secondary use. A draft Bill on National Waste Management is currently being discussed by policy makers. However, it would be important to ensure that this Bill is comprehensive to cover the entire production process from design onward, and that it is passed rapidly.

Access to finance for specific circular-economy investments remains scarce. The circular economy is not explicitly mentioned in the Thailand Sustainable Financing Framework, unlike renewable energy and energy efficiency.[125] The existing financial offering seems biased toward renewable energy and energy efficiency. In addition, in comparison to

traditional projects, the business case for investing in innovative circular-economy strategies comes across as somewhat novel and experimental, increasing the uncertainty of financiers. For example, selling a product as a service is based on future recurring revenues rather than the underlying value of the asset, which impacts cash-flow streams and collateral availability. Thus, commercial banks tend to favor investments in solar farms and solar energy – typically financed through green loans and bonds – which are regarded as tried-and-tested established opportunities. They are often less willing to finance circular-economy projects undertaken by smaller businesses. The Thai government, under the Thailand Science Research and Innovation Fund (TSRIF),[126] currently funds the upstream research of circular-economy strategies, but the financing for transferring proven circular-economy technology presents a huge gap. One of the 17 programs under its SRI fund focuses on elevating competitiveness in the Bio-Circular-Green and Sharing Economy. Finally, subnational borrowing for circular initiatives in infrastructure use, such as waste/water management, could also attract financing.

A mature and vibrant carbon credit market can enable sustainable growth and facilitate the dissemination of circular business models. Thailand has since 2013 introduced several initiatives to develop carbon credits. Among others, the country relies on a basic trading infrastructure that includes a registry and a trading platform under the Voluntary Emissions Trading Scheme (Thailand V-ETS). This scheme has been expanded over the past years to cover some of the main GHG-intensive sectors such as cement, pulp and paper, iron and steel, and petrochemicals. Capacity building and outreach activities have also been rolled out under this program to introduce the European Topic Centre (ETC) concept to stakeholders. Thailand has also launched a carbon offsetting program (T-COP) and a Voluntary Emissions Reduction Program (T-VER) over the last several years to allow individuals and firms to better manage their GHG emissions. Most recently, in 2021, a strategic plan has also been developed for ETS implementation in the Eastern Economic Corridor. As the global carbon-credit market develops, Thailand will need to keep up and accelerate its supporting activities to ensure that individuals and firms alike can access service solutions to offset their carbon footprint.[127]

The current low level and availability of critical circular-economy skills will prevent wider adoption of circular-economy processes and initiatives if it persists. New capabilities need to be widely available to fully transition firms into circularity. The specific competencies required in Thailand are yet to be defined although, much like in Europe, where core and enabling circular jobs are extensively studied, they will likely break down along the lines of the skills needed for these same seven high-level tasks: preserve and extend existing goods, incorporate digital technology, design for the future, collaborate to create joint value, prioritize regenerative resources, use waste as a resource, and rethink business models. This presents a challenge because Thailand already has a shortage of skilled workers for key growth industries as required under the Thailand 4.0 strategy. However, Thai policymakers are beginning to promote and facilitate environmental education, as shown by the Thailand Environmental Education for Sustainable Development Partnership (EESD),[128] a network of educators, teacher-educators, and academics supported by MNRE, and recent research further encourages a targeted focus on vocational education and training (Circle Economy 2021). A circular-economy curriculum has just been developed and is being implemented as an elective curriculum at 10 universities to help promote and educate young people about the circular economy. But education and training in the informal sector is also critical because waste pickers play an important role in the recovery of raw materials and recycling.

A summary of recommendations for promoting the circular economy in Thailand is given below.

SUMMARY OF RECOMMENDATIONS

Opportunity	Recommendations	Enabling reforms in the immediate term	Medium-term reforms	Complimentary reforms (if they appear in the same column)			Key stakeholders
CIRCULAR ECONOMY							
Enhanced knowledge and understanding of the circular economy	Introduce a standard national definition of the circular economy in line with international frameworks, in coordination with the private sector, to be adopted in the new Circular Economy Action Plan currently being drafted. An example of this is China's Circular Economy Promotion Law.	√		●			Office of the PM, NXPO
	Implement awareness programs in collaboration with private stakeholders for the correct use of circular economy concepts by embedding CE in core modules of university curricula, business transformation guides, and case studies for the private sector. An example is Netherlands' Holland Circular Hotspot.	√		●			NXPO, academia, businesses, NGOs, MOAC, MOI, Consumers
	Expand the M&E framework to cover a broader list of indicators, including sector-specific indicators underlying sector-specific circular economy roadmaps. For example, the OECD inventory of indicators.		√	●	●		NXPO, sectoral ministries, NCSDA, MOI, MONRE
Institutional cohesion in the design and implementation of CE policy	Strengthen the public-private collaboration mechanisms under the BCG Committee for coordination to include SME participation and regular reviews of regulations and formulate R&D programs. For example, the City of Brussels' Regional Program for a Circular Economy.	√			●		NXPO, coordinating agency [to be created]
	Create a central circular economy agency or organization – along the lines of Finland's Innovation Fund, Sitra – to develop, implement and advance circular economy policy and to coordinate inter-ministerial action.		√		●		Office of the PM

Opportunity	Recommendations	Enabling reforms in the immediate term	Medium-term reforms	Complimentary reforms (if they appear in the same column)			Key stakeholders
The presence of a comprehensive and cohesive policy framework	Remove inhibitory regulations and standards, specifically those identified in the priority sectors above. That is, (a) regulations on the use of recycled plastics for food containers, (b) specifications related to recycled content in aggregate and other building materials, and (c) material intensity conflicts with seismic building requirements.	√			●		sectoral ministries, NXPO, private sector
	Introduce enabling regulatory and legal amendments and instruments such as (a) end-of-waste criteria for waste materials to support reuse and recycling, (b) updating the scope of green label products to include circular design, (c) simplifying the waste classification system down to one system in order to facilitate material exchange, and (d) allowing waste materials to move outside regional boundaries to encourage collaboration.		√		●		NXPO, private sector, coordinating agency [to be created]
	Improve cost-efficiency of incentives for R&D-based CE innovation and increase awareness of the TSCRIF in the private sector.	√		●		●	NXPO, academia private sector
	Introduce and evaluate pilot incentives for non-R&D-based innovation and diffusion of CE technology among businesses: • Evaluate potential expansion of fiscal incentives for repair activities and remanufactured goods. • Consider FTAs on circular economy (for example, CTPP in agribusiness).		√		●	●	Coordinating agency [to be created], DOF
Availability of supportive infrastructure to pursue circular-economy opportunities	Facilitate investment in enabling physical and digital infrastructure, such as reverse logistics networks, transport infrastructure, the IoT, and blockchain to support the adoption of circular business models and to make the business case for adopting them.		√			●	MNRE, MOT, MDES, coordinating agency [to be created]

Note 1: Enabling reforms: Reforms that are to be enabled in the immediate term are those that, if introduced at the outset, can be expected to "enable" positive spillovers for subsequent reforms, paving the way for cumulative effects in a particular field and for the medium term. The distinction highlights reforms that could be sequential in nature and that have the property of creating vertical spillover effects from upstream reforms to downstream ones. Complementary reforms are those that mutually reinforce each other, thereby creating horizontal spillover effects. In the table, upto three sets of complementary reforms have been identified, which are tagged together in the three sub-columns under 'Complementary Reforms'.

Note 2: BOT – Bank of Thailand; BOI – Thailand's Board of Investment; COM – Council of Ministers; DBD – Department of Business Development; IB – Immigration Bureau; MHESI – Ministry of Higher Education, Science, Research and Innovation; MOC – Ministry of Commerce; MOE – Ministry of Education; MOF – Ministry of Finance; MOL – Ministry of Labor; MSDHS – Ministry of Social Development and Human Security; NA – National Assembly; NBTC – Office of The National Broadcasting and Telecommunication Commission; NXPO – Office of National Higher Education Science Research and Innovation Policy Council; OSMEP – Office of SME Promotion; OTCC – Office of Trade Competition Commission; OVEC – Office of the Vocational Education Commission; SEC – Securities and Exchange Commission; CSD – National Committee on Sustainable Development; PRD – Public relations department.

ANNEXES

ANNEX A: POLICY RECOMMENDATIONS

ANNEX A-1: ROADMAP FOR INVESTMENT REFORMS

Opportunity	Recommendations	Enabling reforms in the immediate term	Medium-term reforms	Complimentary reforms (if they appear in the same column)			Key stakeholders
MARKET COMPETITION							
Competition incentives	Elevate the competition policy agenda as a whole and present it as a national economic policy issue for Thailand, through the representation of higher-level executive offices.	√		●		●	Office of the PM
	Review and revise the guidelines of the Regulation Impact Assessment (RIA) to include the effects of new draft regulations on competition.	√		●		●	COM, NA, MOC, OTCC
	Conduct a review of potential SOEs' competition distortions (including network markets) using the competitive neutrality framework.		√	●	●	●	MOF, OTCC, Sector Regulators,
	Assess and revise the Price of Goods & Services Act to enable a gradual removal of price controls.		√	●			CTOPGS
	Ease restrictions on foreign participation in certain sectors (elaborated in the FDI section)		√			●	MOC, BOI
	Strengthen the enforcement and advocacy roles of Thailand's Office of Trade Competition Commission (OTCC) by building OTCC's capacity and publishing guidelines for competition enforcement.	√				●	OTCC
	Strengthen the governance functions of the OTCC by reducing ministry-related involvement in senior appointments and allowing for independent budget allocations.	√				●	OTCC
Competition law enforcement	Bridge the existing gaps in the Competition Act: that is, eliminate exceptions for certain operators and implement a leniency program to encourage cartel detection.	√			●	●	OTCC, MOC
FDI RESTRICTIONS							
Open FDI regime, especially in service sectors	Further liberalize service sectors that are key to achieving the goals of Thailand 4.0: • Reduce the number of service sectors that require a Foreign Business License (FBL) by removing service sectors from List 3 of the FBA, and publish guidelines to enable consistency in the approval process. • Remove the broad "Other service businesses" provision under List 3 of the FBA (item 21 of List 3) and add the clarification that "everything not on the list is permitted without restriction."		√	●	●		MOC, NBTC
	Adopt a tailored, sector-specific approach to establishing minimum capital requirements for FDI. Consider dispensing with the requirement to retain 25 percent of operating expenses for activities under List 2 and 3 of the FBA.160		√	●			MOC, BOI

Opportunity	Recommendations	Enabling reforms in the immediate term	Medium-term reforms	Complimentary reforms (if they appear in the same column)			Key stakeholders
Transparency of FDI legal and regulatory regime162	Consolidate FDI restrictions contained in sectoral legislation under the FBA, systematize the negative list, and issue English translations of subordinate or sectoral legal documents.		√	●			MOC, COM, NA
	Fix legal loopholes under the FBA – such as the possibility of circumventing equity restrictions through a preferential share structure or indirect ownership structures – by including a level of control or managerial influence under the definition of "foreigner."		√	●			MOC, COM, NA
	Streamline BOI's mandate by liberating it from the provision of non-tax incentives (following FBA amendments).		√	●			COM, NA, BOI
Easing of restrictions on hiring expatriate staff/foreign experts	Make the SMART visa program fully digital, including by (i) allowing all documentation to be uploadable via a secure website, (ii) not requiring documents to be subject to certification by the issuing organization or notarization or legalization by any government agency, and (iii) accepting all documentation in English (or Thai, if originally issued as such).	√			●		BOI, IB, MOL, MFA, ETDA
	Dispense with the 90-day reporting requirement and limit the TM.30 requirement for foreigners.	√			●		IB, MFA
	Facilitate the entry of business visitors by further defining what constitutes "work" and by strengthening Thailand as an HQ destination.	√					MOL, MFA
	Review staff and capital ratios with a view to adopting a sector-specific approach,165 including the requirement to employ at least four Thai nationals for every foreigner employed, and the requirement to have a capital increase of at least BHT 2 million for each foreign employee, depending on the form of investment.		√		●		IB, MOL, MFA
	Continue to gradually allow more foreign professionals to work in Thailand. Further clarify167 and reduce the number of professions prohibited under the Prescription of the Prohibited Occupations for Foreigners (2020, B.E. 2563); also stipulate a mandatory periodic review of the list. Amend sector-specific laws to remove nationality requirements, for example, for legal, architecture and engineering services.		√		●		MOL, Profession-specific bodies, MFA
SKILLS FOR THE FUTURE							
Skills match	Bring the private sector's perspective to bear on curriculum design through a structured engagement that influence decisions of resource allocation for curriculum development, and oversight of results between the Ministry of Labor/Technical and Vocational Education and Training (MOL/TVET) agency and industry associations.		√	●		●	MOE, OVEC, MHESI, NXPO, Private Sector
	Expand the availability of lifelong learning models through e-learning platforms, tax incentives, and voucher systems, in partnership with the private sector. Metacognitive and cognitive skills should remain a focus.	√			●	●	MOE, MOL, NFE, DOP, BOI
	Introduce a skills-monitoring system comprising information about vacancies and wages to understand the nature of demand and identify signals of skill shortages.	√		●		●	MOE, MHESI, NXPO
	Link re-skilling and training in emerging sectors to targeted incentives for firms to hire workers.	√			●	●	MOL, MHESI, NXPO, OVEC

Opportunity	Recommendations	Enabling reforms in the immediate term	Medium-term reforms	Complimentary reforms (if they appear in the same column)			Key stakeholders
TVET system efficiency	Strengthen oversight of the TVET system institutions under a renewed quality-assurance mechanism that follows placement outcomes of graduates and relies on market feedback information including wages, placement, turnover, and tenure.		√	●			MOE, MHESI, VEC
	Combine training programs with job-search assistance programs that are demand-based and results-oriented through performance-based financing.	√		●		●	MOL, MOE, TCC, FTI, NFE
	Reduce the burden on the private sector to participate in the TVET system by streamlining of procedures for accessing incentives and reporting.	√				●	BOI, MOL
Increased labor force participation	Introduce pilot programs for reskilling of the country's aging labor force, such as the provision of basic and intermediate digital skills training, to test the value proposition and evaluate their potential scalability and relevance in the labor market.		√		●		MOL, Private Sector
	Explore retirement age adjustment through mechanisms such as age/longevity indexing and employment incentives provision.		√		●		MOL
	Introduce and test pilot regulations that increase female labor force participation – for example, increase the number of child development centers, and improve maternity benefits to lessen the current penalties on motherhood and on caring for the elderly, to understand which of these measures present higher additionality. Needless to state, these pilot interventions need to be coupled with rigorous impact evaluations to discern the potential effects of such policies in the labor market.		√		●		MSDHS, MOL, MOE
ACCESS TO FINANCE FOR INNOVATION							
Enhanced provider diversity and innovation	Strengthen regulation to address risks to investors on crowdfunding platforms by articulating disclosure requirements, and test capital requirements relative to likely platform wind-down costs.	√			●		SEC
	Promote the development of alternative sources of finance to increase the availability of early-stage finance		√				SEC, MOF, NIA
Enhanced SME access to markets	Ease restrictions on SME participation in public procurement and finding new suppliers and markets – for example, market intelligence, business development services, and matching programs.	√		●			OSMEP
	Ensure effective implementation of the digital factoring initiative to promote supply chain financing and to enable SMEs access to key value chains.		√	●			BOT, OSMEP
	Support the development and use of online and cloud-based accounting and e-invoicing platforms for SMEs.	√					Department of Revenue, OSMEP

Opportunity	Recommendations	Enabling reforms in the immediate term	Medium-term reforms	Complimentary reforms (if they appear in the same column)			Key stakeholders
Strengthened financial infrastructure	Develop an approach to open banking starting with API standards for data sharing, and a cross-industry approach to standards to promote competition.	√			●		BOT
	Establish a single, unified Secured Transaction (ST) Act, with a practical, standardized, and simple provision on the "Creation of Security Interest (SI), and "Priority Rules" for all types of movable assets; establish a single, central, real-time registry that fully interfaces with financial institutions.	√				●	MOF, DBD
	Remove the legal impediments in the Credit Information Bureau Act (CIBA) to allow the sharing of data from nonfinancial providers—for example, utility companies, retailers, and e-commerce operators.		√			●	MOF, NCB

Note 1: Enabling reforms: Reforms that are to be enabled in the immediate term are those that, if introduced at the outset, can be expected to "enable" positive spillovers for subsequent reforms, paving the way for cumulative effects in a particular field and for the medium term. The distinction highlights reforms that could be sequential in nature and that have the property of creating vertical spillover effects from upstream reforms to downstream ones. Complementary reforms are those that mutually reinforce each other, thereby creating horizontal spillover effects. In the table, upto three sets of complementary reforms have been identified, which are tagged together in the three sub-columns under 'Complementary Reforms'.

Note 2: BOT – Bank of Thailand; BOI – Thailand's Board of Investment; COM – Council of Ministers; DBD – Department of Business Development; IB – Immigration Bureau; MHESI – Ministry of Higher Education, Science, Research and Innovation; MOC – Ministry of Commerce; MOE – Ministry of Education; MOF – Ministry of Finance; MOL – Ministry of Labor; MSDHS – Ministry of Social Development and Human Security; NA – National Assembly; NBTC – Office of The National Broadcasting and Telecommunication Commission; NXPO – Office of National Higher Education Science Research and Innovation Policy Council; OSMEP – Office of SME Promotion; OTCC – Office of Trade Competition Commission; OVEC – Office of the Vocational Education Commission; SEC – Securities and Exchange Commission; CSD – National Committee on Sustainable Development; PRD – Public relations department.

ANNEX A-2: POLICY RECOMMENDATIONS FOR IMPROVING DIGITAL AND DISRUPTIVE TECHNOLOGIES

Opportunity	Recommendations	Enabling reforms in the immediate term	Medium-term reforms	Complimentary reforms (if they appear in the same column)			Key stakeholders
Enriched pipeline of tech talent to drive digital transformation	Build up deep-tech capabilities and change the popular mindset and culture to make tech a promising career path by promoting successful industry transformation use cases and role models. Promote and provide incentives for local-international tech talent exchanges by means of incubators, accelerators, diaspora networks, and corporate overseas exchange programs (see for example programs in Singapore, the Republic of Korea or the Netherlands).[129]		√	●	●		DEPA, NSTDA, private sector, academia
An attractive regulatory environment for digitalization	Conform financial regulations to international practices and standards by amending the Thai Civil and Commercial Code – for example, introducing Employee Stock Option Plans (ESOPs) and issuing convertible notes and preferred shares.	√		●			MOC, SEC
	Introduce industrial data strategy as well as protection policies to enable and safeguard data-intense solutions because they underpin digital transformation in a variety of traditional sectors such as retail, health, and finance.	√			●		MDES
	Enhance the use of matching equity funds schemes to de-risk investments and catalyze early-stage capital market (co-investment funds, fund-of-funds). For example, Israel's Yozma program successfully brought in foreign venture capital investors by providing matching funds.[130] Similarly, Singapore's SG Equity scheme attracts investments through a fund-of-funds approach.[131]		√	●			DEPA, NIA and NSTDA
High contestability in digital markets	Attract more regional financial venture capital to balance out the excessively dominant role of CVC in the digital ecosystem and also expose local large firms to international competition to prepare for a more open and innovation-driven economy.	√		●			DEPA, SEC
	Introduce online supplier protection schemes to prevent online platforms from abusing their market power to squeeze out informal third-party sellers and digital service providers. Create trust and fairness in the digital market to drive broad-based digital uptake.		√		●		ETDA
	Design schemes that facilitate or mandate interoperability between silos, for example, QR code standardization, access to APIs, and open banking-style arrangements.		√		●		MDES, BOT, ETDA
	Address the lack of competition in how the spectrum is assigned by (i) developing a spectrum roadmap, (ii) designing reserve prices according to market realities, and (iii) designing pro-competition spectrum auctions.		√			●	MDES for policy, NBTC
Well-defined institutional responsibilities and sound experimentation in disruptive tech pilots (EEC)	Clarify roles and responsibilities in key digitalization policies, and establish a monitoring and evaluation framework to track progress of important programs and reforms. For example, in industrial data policies, this would mean startup ecosystem building, including early-stage risk capital attraction, and innovative and circular pilots that have been tested in traditional sectors and real-life settings, including those in EEC.	√		●	●		MDES, sectoral ministries
Agile regulation to support digital dynamism	Develop sectoral roadmaps based on public-private dialogue and deep-dive analyses into the digitalization of high-opportunity sectors such as tourism, food/agribusiness, and health. These can be used as a starting point to map out and streamline digital regulations, identify policy experiments aimed at crowding in private investment, and incorporate international good practices.	√		●			DEPA

TABLE OF RECOMMENDATIONS FOR ADDRESSING COMPETITION IN DIGITAL AND DISRUPTIVE TECHNOLOGIES

Opportunity	Recommendations	Enabling reforms in the immediate term	Medium-term reforms	Complimentary reforms (if they appear in the same column)			Key stakeholders
Create certainty in digital regulation enforcement and remove barriers for SMEs	Rationalize and clarify regulatory requirements (for example, registration requirements, data protection and cyber security) for firm entry and operations in digital markets to reduce entry costs and uncertainty, especially for small businesses engaged in the provision of digital solutions, and suppliers to platform firms.	√				●	MDES
Revise regulations to support the development and provision of innovative financial services	Foster innovation among fintech firms by rolling out digital lending licenses on non-discriminatory terms, implementing e-KYC approaches that offer alternatives to face-to-face customer verification, and facilitating access to regulatory sandboxes for fintech firms.		√				BOT, MOF, MDES, MI
Promote level playing fields and competitive neutrality	Level the playing field and ensure competitive neutrality in digital markets by (i) ensuring that potentially unfair impacts on the level playing field are minimized when designing government alliances with large platforms, (ii) ensuring that policy and financial incentives for investments in digital markets are granted transparently to minimize discrimination and discretion, and (iii) not favoring SOEs over private firms in the provision of digital technologies and inputs.		√		●	●	MDES, EEC, BOI, OPM
Enhance the capacity for enforcing the Competition Law in digital markets	Strengthen the capacity of the OTCC to enforce the competition law in order to tackle anticompetitive practices by firms in digital markets (see section on Competition Law in Thailand).	√				●	OTCC
Ease restrictions for foreign participation	Open up foreign participation in digital markets and adjacent services, such as telecom, and the provision of disruptive technologies and services (see the FDI section of the CPSD).		√			●	MOC, MOF, MOI

ANNEX A-3: POLICY RECOMMENDATIONS FOR DEVELOPING CIRCULAR ECONOMY

Opportunity	Recommendations	Enabling reforms in the immediate term	Medium-term reforms	Complimentary reforms (if they appear in the same column)			Key stakeholders
CIRCULAR ECONOMY							
Enhanced knowledge and understanding of the circular economy	Introduce a standard national definition of the circular economy in line with international frameworks, to be adopted in the new Circular Economy Action Plan currently being drafted. An example of this is China's Circular Economy Promotion Law.	√		●			Office of the PM, MHESI
	Encourage information and awareness on circular economy as a concept • Exposure on TV programs and news • Posters, social media campaign, websites, and so on.	√		●			PRD, MHESI, CE implementing agency, NGOs, businesses, consumers
	Implement awareness programs for the correct use of circular economy concepts by embedding CE in core modules of university curricula, business transformation guides, and case studies for the private sector. An example is Netherlands' Holland Circular Hotspot.	√		●			MHESI, academia, private sector, NGOs, MOAC, MOI, consumers
	Expand the M&E framework to cover broader list of indicators, including sector-specific indicators underlying sector-specific circular economy road maps. For example, the OECD inventory of indicators.		√	●	●		MHESI, CSD, sectoral ministries
	Engage the informal sector on participation in formal circular economy initiatives to ensure they are not left out of the transition to a circular economy.		√	●	●	●	CE implementing agency, MNRE
Institutional cohesion for design and implementation of CE policy	Strengthen the public-private collaboration mechanisms under the BCG Committee for coordination to include SME participation, regular reviews of regulations, formulate R&D programs. Example: the City of Brussels' Regional Program for a Circular Economy.	√			●		BCG Committee, private sector
	Appoint a central circular economy agency or organization – along the lines of Finland's Innovation Fund, Sitra – to develop, implement and enforce circular economy policy and to coordinate inter-ministerial action.		√		●		Office of the PM
	Create sector-specific circular economy roadmaps that highlight roles, actions, targets, indicators and timelines.		√		●		Sectoral ministries, MHESI, CE implementing agency, private sector
Presence of a comprehensive and cohesive policy framework	Remove inhibitory regulations and standards, specifically those identified in the priority sectors above. That is, (a) on the use of recycled plastics for food containers, (b) specifications related to recycled content in aggregate and other building materials, and (c) material intensity conflicts with seismic building requirements.	√			●		Sectoral ministries, MHESI, private sector
	Evaluate incentives for R&D-based CE innovation and increase awareness of the TSCRIF in the private sector.	√		●		●	MHESI, academia, private sector

Opportunity	Recommendations	Enabling reforms in the immediate term	Medium-term reforms	Complimentary reforms (if they appear in the same column)			Key stakeholders
Presence of a comprehensive and cohesive policy framework *(continued)*	Introduce enabling regulatory and legal amendments and instruments such as (a) end-of-waste criteria for waste materials to support reuse and recycling, (b) updating the scope of green label products to include circular design, (c) simplifying the waste classification system down to one system in order to facilitate material exchange, and (d) allowing waste materials to move outside regional boundaries to encourage collaboration.		√		●		MHESI, private sector, CE implementing agency
	Introduce and expand incentives for non-R&D based innovation, and transfer, diffusion of CE technology among businesses: • Expand BOI incentives to the top-priority sectors identified above • Consider tax incentives for repair activities/ remanufactured goods • Consider FTAs on circular economy (for example, CTPP in agribusiness)		√		●	●	CE implement-ing agency, BOI, MOF, MOC
	Strengthen extended producer responsibility (EPR) in the current draft of National Waste Management Bill to cover full production cycle, and pass for implementation.	√			●		MNRE, MOI, sectoral ministries, manufacturers
	Expand the Green Public Procurement (GPP) programs to explicitly include circular criteria to help create markets.		√		●	●	MNRE, sectoral ministries
Provision of supportive infra-structure to implement circular-economy opportunities	Invest in enabling physical and digital infrastructure, such as reverse logistics networks, transport infrastructure, the IoT, and blockchain to support the adoption of circular business models and to make the business case for adopting them.		√			●	MOT, MDES, MNRE, CE implementing agency
Provision of financing for CE	Develop accessible financial and funding mechanisms to incentivize high-impact or innovative circular practices.		√			●	CE implementing agency, MOF, BOI, banks
Creation of linkages between CE initiatives	Develop spatial planning policies that build on Thailand's eco-industrial parks in EEC and other economic zones: • Policies to inform the development of industrial symbiosis opportunities between enterprises • Development of resource management facilities	√			●	●	Ministry of Interior, MOI, NESDB, EECO

Note 1: Enabling reforms: Reforms that are to be enabled in the immediate term are those that, if introduced at the outset, can be expected to "enable" positive spillovers for subsequent reforms, paving the way for cumulative effects in a particular field and for the medium term. The distinction highlights reforms that could be sequential in nature and that have the property of creating vertical spillover effects from upstream reforms to downstream ones. Complementary reforms are those that mutually reinforce each other, thereby creating horizontal spillover effects. In the table, upto three sets of complementary reforms have been identified, which are tagged together in the three sub-columns under 'Complementary Reforms'.

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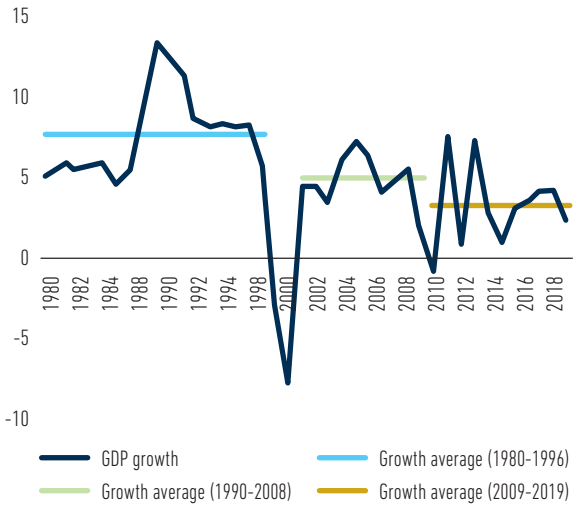
ANNEX B: SECTION I – OVERVIEW

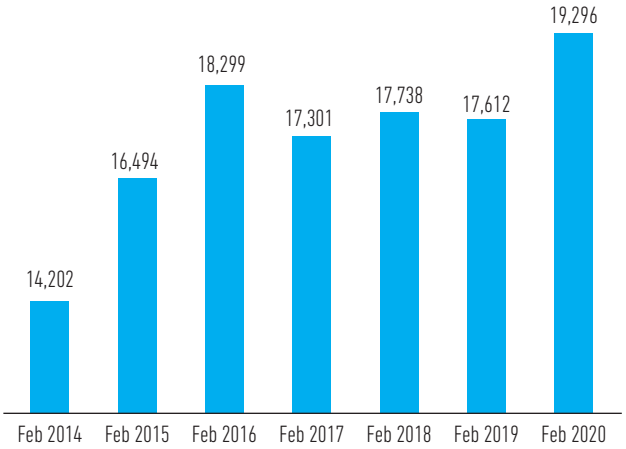
ANNEX B-1: PERIODS OF THAI GROWTH AND TFP TRENDS



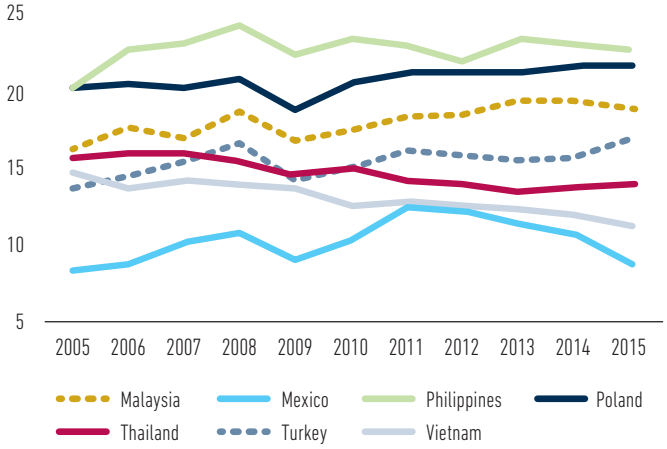
Country	GDP per capita 2019 (cons. US$)	TFP y-o-y average growth 1999-2008	TFP y-o-y average growth 2009-2017
Thailand	6,503	3.6%	1.3%
Mexico	10,276	0.3%	-1.3%
Colombia	7,843	0.8%	-0.2%
South Africa	7,346	0.2%	-3.4%
Chile	15,092	0.5%	1.0%
Poland	17,387	1.7%	1.0%
Czech	23,834	1.2%	0.7%
Malaysia	12,478	4.1%	-0.3%

Source: Thailand Economic Monitor, 2020

ANNEX B-2: PREVIOUS DRIVERS OF GROWTH ARE NOW INADEQUATE

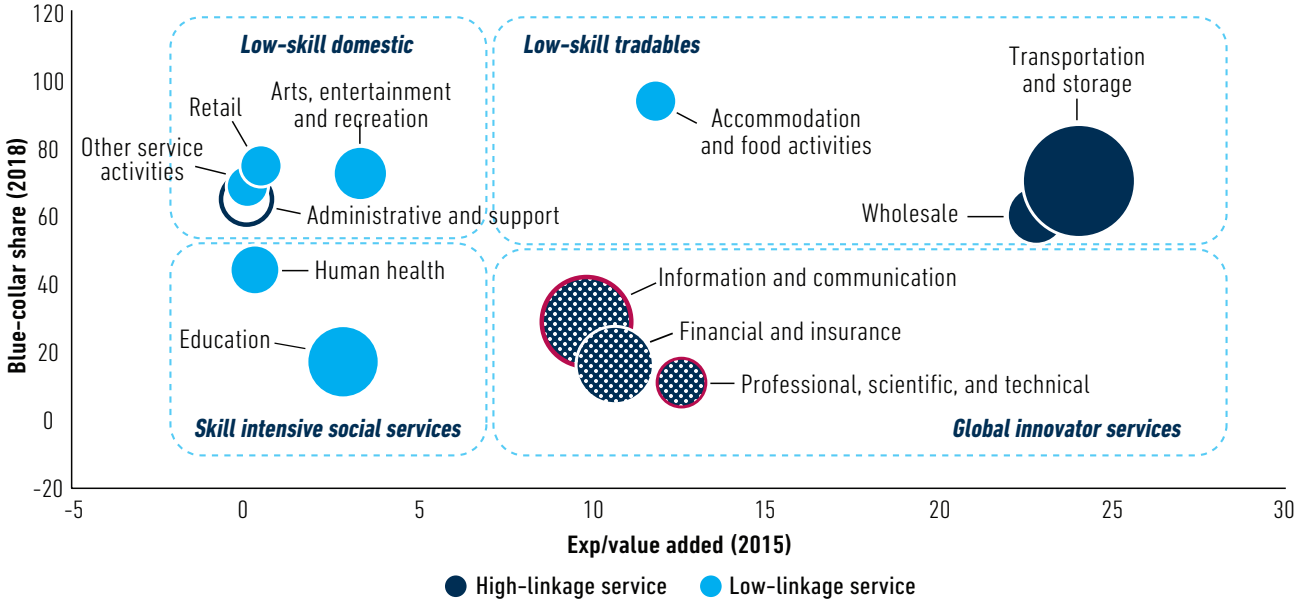


Source: Bank of Thailand



Source: World Bank RAS (forthcoming)

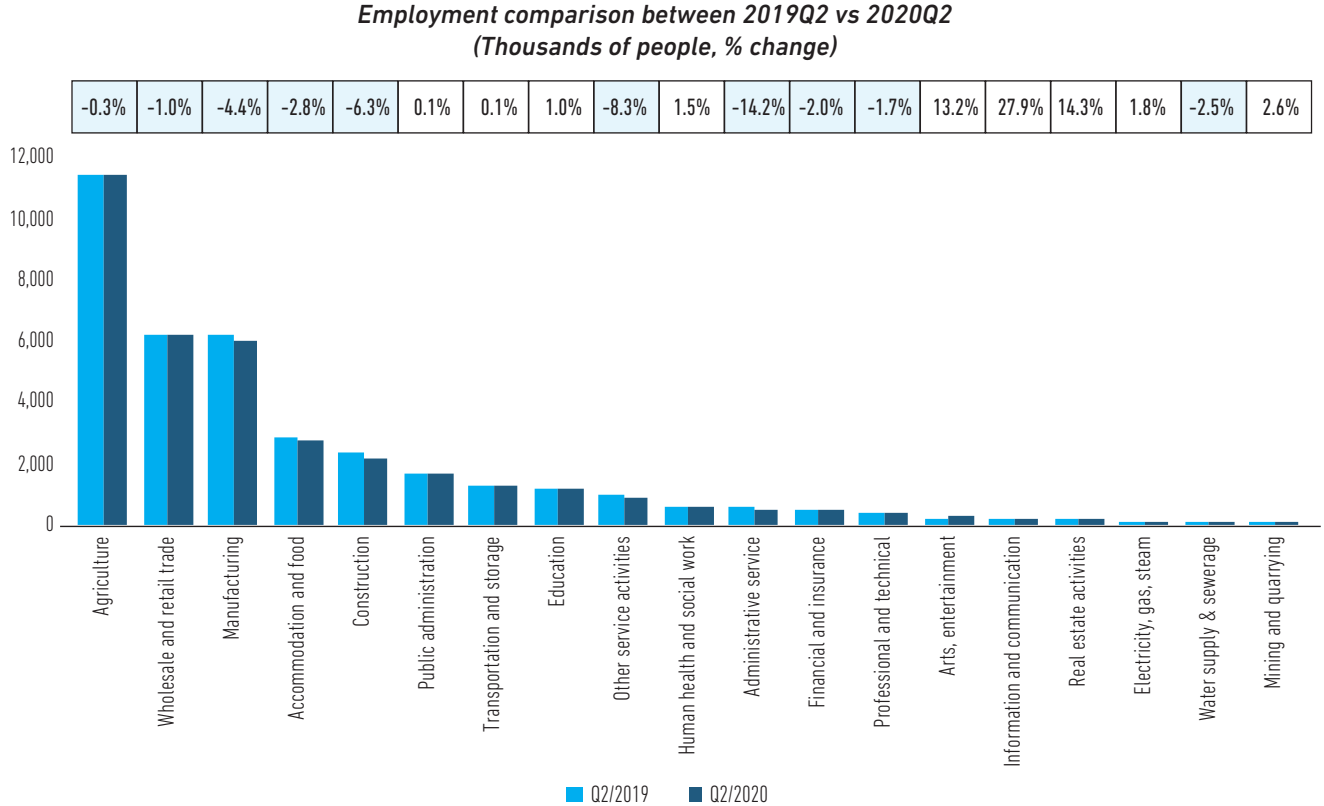
ANNEX B-3: TYPOLOGY OF THE SERVICES SECTOR (NAYYAR ET AL. 2021)



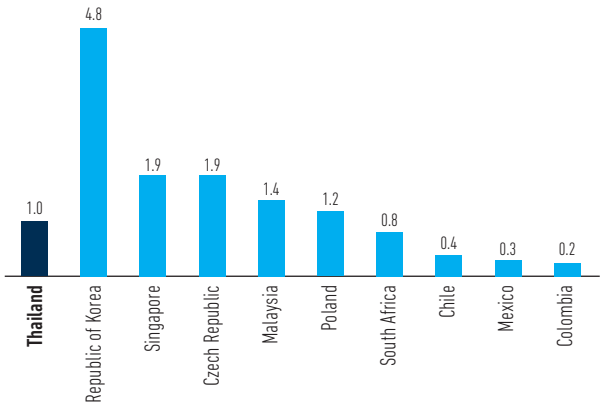
Source: Nayyar, Gaurav; Hallward-Driemeier, Mary; Davies, Elwyn. 2021. At Your Service? : The Promise of Services-Led Development. Washington, DC: World Bank. https://openknowledge.worldbank.org/handle/10986/35599.

Note: The dark and light blue colors distinguish high-linkage subsectors from low-linkage subsectors; the dotted bubbles refer to sectors with high level of offshorability (above 75th percentile); red outlines refer to sectors with high level of R&D (above 50th percentile).

ANNEX B-4: EFFECTS OF COVID-19 ON EMPLOYMENT

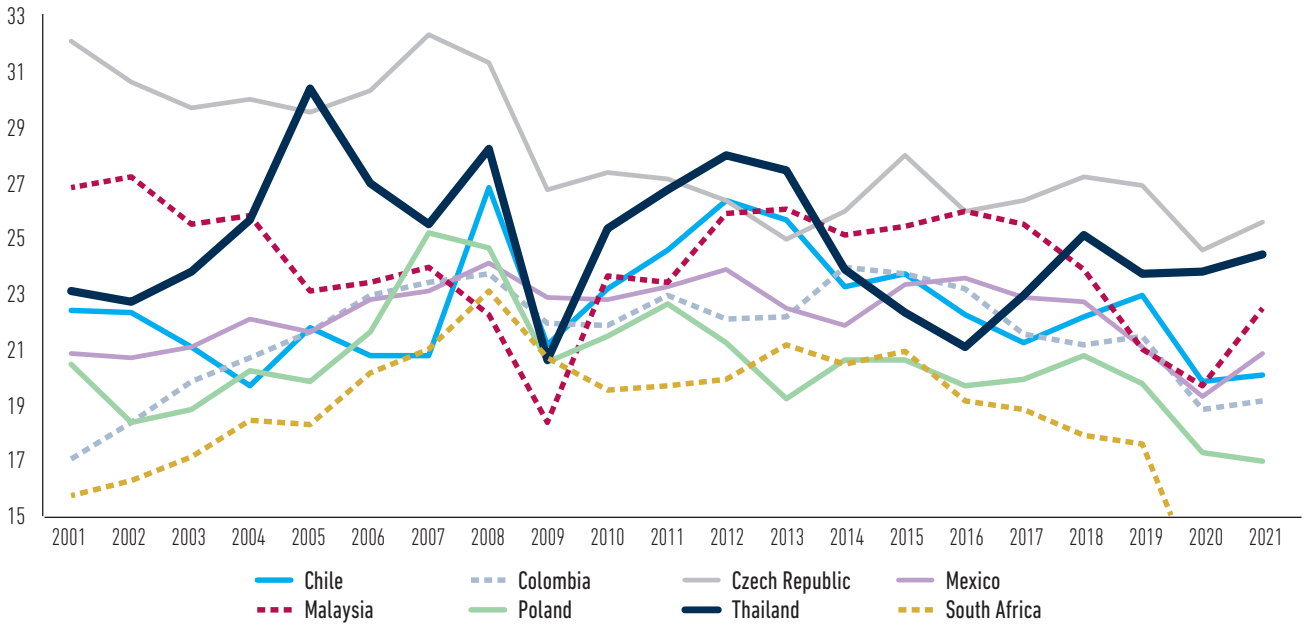


ANNEX B-5: LACK OF INNOVATION INPUTS AMONG FIRMS IN THAILAND



Ranking among 141 economies	Thailand	South Korea	China	Singapore
Internet users % of adult population	90	9	93	24
Growth of innovative companies	35	37	42	14
Companies embracing disruptive ideas	32	42	25	13
International co-inventions	61	15	50	5
Scientific publications	39	18	13	23
Patent applications	66	2	32	15
Research institutions prominence	43	11	2	21

ANNEX B-6: TOTAL INVESTMENT AS PERCENTAGE OF GDP, 2001–2020



ANNEX C: SECTION II – INVESTMENT CONSTRAINTS

Annex C-1: The Importance of International Trade Agreements and the Impact of the Regional Comprehensive Economic Partnership (RCEP) on Thailand

Participation in trade agreements has been a key component of Thailand's trade strategy. While Thailand's top trading partners are other ASEAN countries, China, Japan, and the United States, Thai exports to China have been growing particularly fast, as have those to ASEAN countries (growing at double-digit average annual rates since the 1980s – faster than its exports to the rest of the world). At present, Thailand is party to 13 preferential trade agreements (PTAs), mostly bilaterally or collectively with other ASEAN countries. It also benefits from PTAs with several other countries, including the United States, and is member of multiple subregional cooperation frameworks. At the multilateral level, the WTO's recent Trade Policy Review of Thailand acknowledges the country's efforts to liberalize and strengthen its trade policy framework, further aligning with WTO norms.[132] From the perspective of the CPSD, such international trade agreements provide platforms for Thailand to leverage domestic policy reforms to boost its international competitiveness vis-à-vis other countries.

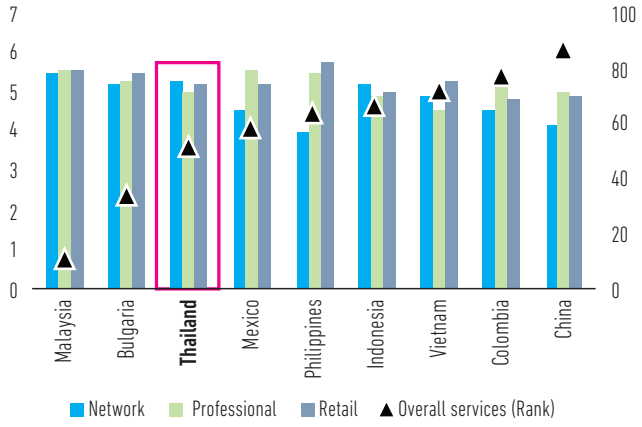
Given emerging megatrends in the world economy, including the potential regionalization of GVCs in the light of escalating US-China trade tensions and the impacts of COVID-19, regional cooperation on trade has particular significance for Thailand. The Regional Comprehensive Economic Partnership (RCEP), signed in November 2020 by 15 countries in EAP, including Thailand, is the world's largest trading bloc, accounting for around one-third of world GDP and world population, and one-quarter of world exports and imports.[133] The agreement has 20 chapters that cover a wide variety of provisions: trade in goods, trade in services, rules of origin, government procurement, intellectual property, sanitary measures, technical standards, and investment, among others. It does not include any provisions on the environment or labor. Tariffs are expected to be reduced over a 20-year period, starting with a large drop upfront. An important part of the agreement relates to common "rules of origin" that could reduce substantially trade costs among members and boost trade among them, consolidating GVCs in the region. For trade in services, a divided approach was taken: some countries have positive lists such as Thailand while others have adopted a negative list approach.

According to recent analysis by the World Bank, the RCEP is likely to have a positive impact on trade and income among its member countries, particularly in agriculture and manufacturing exports.][134] Gains from the RCEP are expected to be relatively modest for Thailand, especially compared to other non-ASEAN countries, partly because of the existence of the other multiple trade agreements mentioned above, which to some degree already address barriers on trade from other RCEP countries.[135] For example, it has been estimated that the Thai-EU FTA, which also goes beyond trade in goods to cover a wider range of other issues including the movement of capital, investment and labor, e-commerce, IPR and the environment, could stimulate greater benefits for Thailand than the RCEP. There is also the Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CP-TPP), which transformed the Trans-Pacific Partnership (TPP) after the United States withdrew its participation.[136] The CP-TPP entered into force in January 2019 after ratification by seven of the participating countries. A number of other economies have expressed interest in joining the CP-TPP, including Thailand.

Given the important role that these trade agreements could play for Thailand, a more detailed analysis of the potential impacts, including of the RCEP and CP-TPP, is recommended.

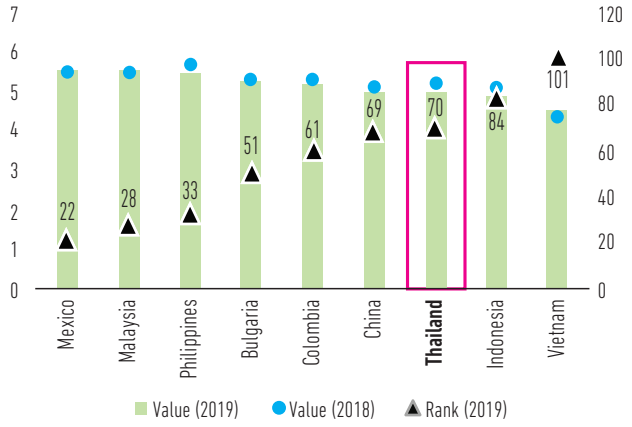
Annex C-2: Restrictions to foreign competition in the services sector

FIGURE 39: THAILAND IS BELOW COMPARATOR AVERAGE IN COMPETITION IN PROFESSIONAL SERVICES VALUE (1-7 BEST), RANK 1-140 (WORST)



Source: Authors' elaboration based on data from the World Economic Forum's Global Competitiveness Report (GCR), World Economic Forum, 2018-2019.

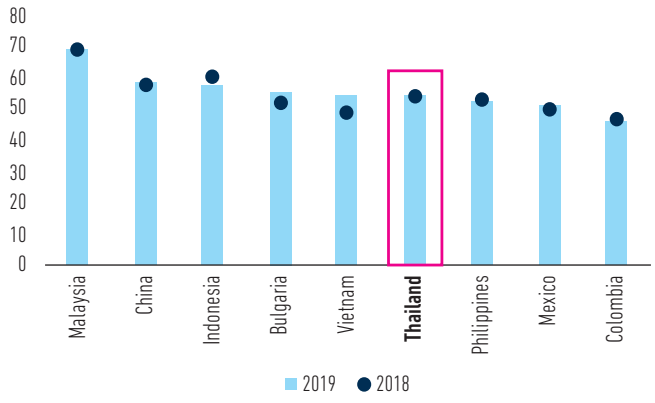
FIGURE 40: THAILAND RANKS RELATIVELY LOW IN COMPETITION IN PROFESSIONAL AND RETAIL SERVICES 2019, VALUE (1-7 BEST), RANK 1-140 (WORST)



Source: Authors' elaboration based on data from the World Economic Forum's Global Competitiveness Report (GCR), World Economic Forum, 2018-2019

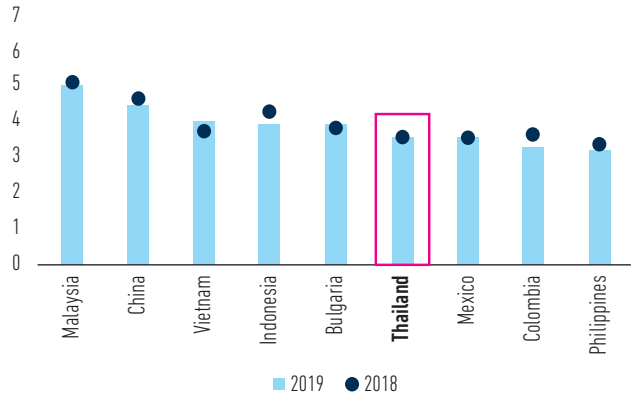
Annex C-3: Perceptions on restrictions to foreign competition in the services sector

FIGURE 41: PERCEPTION OF INTENSITY OF DOMESTIC COMPETITION IS LOW



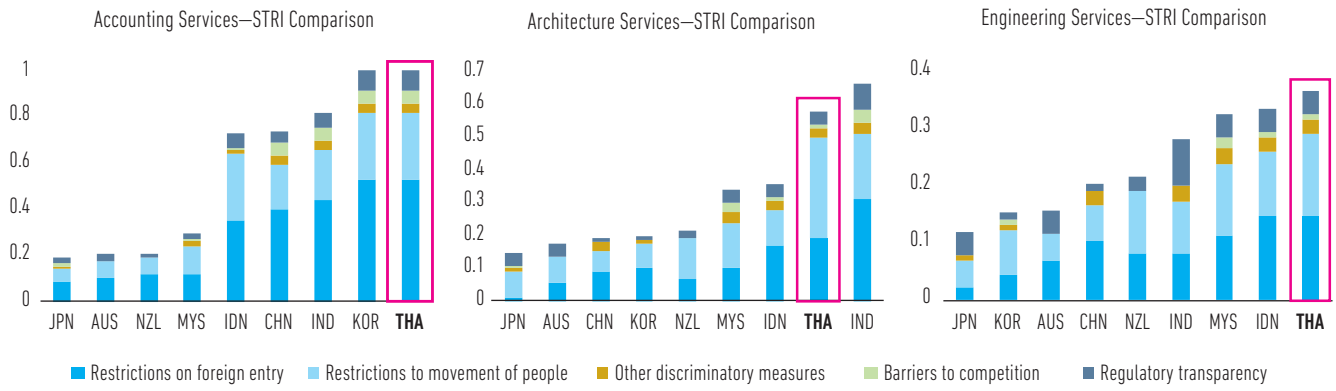
Source: World Economic Forum's Global Competitiveness Report (GCR), World Economic Forum, 2018–2019

FIGURE 42: BUSINESS ACTIVITY IS PERCEIVED AS DOMINATED BY RELATIVELY FEW PLAYERS, EXTENT OF MARKET DOMINANCE, 1–7 (BEST)



Source: World Economic Forum's Global Competitiveness Report (GCR), World Economic Forum, 2018–2019.

Annex C-4: Restrictions on competition based on STRI



Annex C-5: Select EEC Incentive Programs

AREA OF TARGET	KEY INCENTIVES & PROGRAMS
Business Environment	• **Transportation and Logistics Infrastructure:** The government is to invest heavily in the construction of high-speed rail, dual-track railways, intercity motorways, airports, and seaports expansion to accommodate the greater traffic in the area that will result from the expansion of economic activity and investment. • **5G Infrastructure:** To create a digital ecosystem for businesses and residents, giving them the opportunity to adopt a digital lifestyle and industrial applications. • **EEC Sandbox:** The government is to allow some relaxation of regulations and restrictions on innovation testing and development in the EEC area. For example, that drone testing can go beyond a restricted height in other areas. • **EEC One Stop Service (EEC-OSS):** A facilitation center for businesses and investors seeking help and support for their business operations. The key activity is to facilitate license and permit application processes.
Skills	• **EEC Job and Skills Expo:** An event organized by the Ministry of Labor to facilitate employment matching. Also, the MOL is building and updating its jobs database. • **The Vocational Education Excellent Centers:** A program initiated by the Ministry of Education covering vocational training in cutting-edge fields such as new-generation automobile, automation & robotics, and aviation & tourism technology. • **Cooperative and Work Integrated Education (CWIE) program:** A joint program between the Ministry of Higher Education, Science, Research and Innovation and several universities in the EEC area to develop and equip students with the skills that businesses will need in the future. • **Investment incentives:** The BOI also reinforcing the aspiration to expand skills by providing incentives to firms that invest in strengthening the Thai workforce with skills needed in the Thailand 4.0 era. • **EEC Human Development Center (HDC) Model**[137] – **EEC Model Type A:** A long-term training plan in which academic institutions will collaborate with private partners to develop curricula, design workshops, and select candidates who match private employers' demand. Successful individuals who participate in the program will receive a Vocational Degree and automatically be eligible for internships and employment guarantees at the partner company after graduation. The private sector is to bear 100 percent of program financing. – **EEC Model Type B**: A module of short-term courses, this is a non-degree training program intended to reskill and upskill the current labor force. It builds on the same principles and approaches as EEC Model type A, but here the financing is split 50:50 between the public and private sectors. Graduates will still be eligible for employment guarantees of 1 year minimum.

AREA OF TARGET	KEY INCENTIVES & PROGRAMS
Attracting Foreign Investment	• **CIT Incentives:** In addition to BOI tax incentives, investors in the EEC area can get corporate income tax holidays of up to 10 years, along with CIT reductions of as much as 50 percent for a maximum of 3 years, depending on the type of activities and investment location. • **Import Duty:** Import duties are also eligible for exemption if the imported materials are for production or R&D purposes. • **Special Deductions:** Business can request for additional tax deductions if their expenses in production line upgrading and R&D activities on technology and innovation are deemed to warrant such deductions. However, foreign staff in the EEC will still be subject to personal income tax of 15 or 17 percent. • **Financial Transaction:** The EEC will allow businesses to use foreign currencies in local transactions; the Promoted Zones will be exempt from the Foreign Currency Exchange Control Act. • **Land and Real Estate Ownership:** Foreigners are eligible to own land and real estate in the country for business and for residence. • **Immigration and Living in Thailand:** The EEC will extend the length of stay for foreign experts, executives and specialists and their dependents beyond the duration allowed in the Immigration Law. • **Other Privileges:** Businesses in the EEC area will receive the same privileges as those in Duty-Free Zones, Bonded Warehouses, and Free Zones.
Disruptive Technology	• **EECd, Digital Park:** A designated area to promote exploration and development of new digital technologies and innovation. This also will include the establishment of a digital innovation testbed, a data center, and an IoT institute. • **EECi, Innovation Platform:** A key flagship project of the EEC to promote innovation in several areas, including biotechnology, foodtech, aerospace, synchrotron technology, automation and robotics.
Circular Economy	• **Circular and Green Economy Theme:** The EEC aims to enhance low-carbon industries and businesses through a range of technologies such as agricultural waste management, precision farming, and a digital platform for green and circular solutions. The EEC will also promote the production of biofuel and bioenergy from waste to combat waste and pollution.

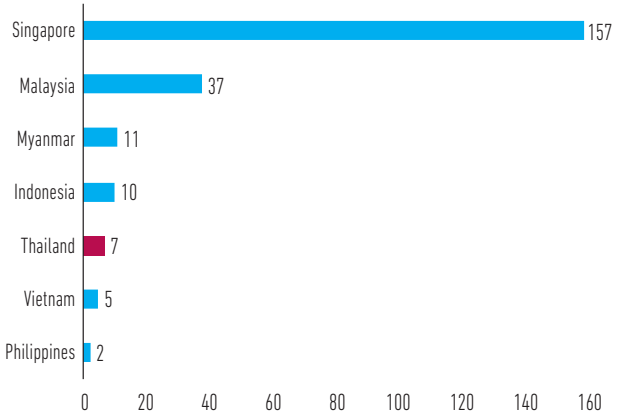
ANNEX D: SECTION III – MARKET OPPORTUNITIES

Annex D-1: Comparison of Thailand with Peers: Circular Economy and Digital and Disruptive Technology Readiness

Circular Economy Policy Readiness

Country	Sustainability Scores	Ecological Sustainability Scores
Cambodia	10.8	0.0
Indonesia	0.0	33.2
Malaysia	51.4	45.8
Philippines	37.8	61.3
Singapore	54.1	100.0
Thailand	59.5	26.6
Viet Nam	13.5	14.8
Japan	70.3	93.0
Germany	100.0	87.1
United States	70.3	45.0

Total funding of digital businesses per USD 1000 GDP (2019)



Note: The data were normalized based on values obtained from Readiness for the Future of Production (WEF, 2018) and the Global Innovation Index. Sustainability is measured based on six indicators: alternative and nuclear energy use, CO_2 intensity, CH_4 intensity, N_2O intensity, baseline water stress, and wastewater treatment. Ecological sustainability is measured based on three indicators: energy use, the Environmental Performance Index (calculated by research teams at Yale and Columbia Universities), and environmental standards certification (ISO 14001).

Source: WEF (2018); Global Innovation Index.

Annex D-2: The potential of Software as a Service (SAAS) as a driver of low-cost digitalization

Software as a Service (SaaS) is a business model in which the operation of software – for example, for enterprise resource planning (ERP) or customer relationship management (CRM) – is centrally hosted and offered to customers on a subscription basis. It builds on cloud services and is sometimes referred to as "on-demand service" or "platform as a service." The SaaS industry, it is estimated, will grow by over 20 percent (CAGR) per year over the next decade, generating annual revenue of more than USD 780 billion by 2030.

SaaS exemplifies how digital businesses can drive digital adoption in the wider economy. Rather than paying high upfront costs for IT hardware (for example, servers) and software, SaaS allows companies to spread the cost over time. From an accounting perspective, SaaS moves costs from capital expenditures (capex) into operating expenditures (opex) – and thereby also becomes a more predictable cost factor for companies. SaaS reduces the burden for companies to install, maintain, secure and regularly update sophisticated hardware and software infrastructure in-house. In addition, SaaS providers can roll out new solutions more flexibly because they centrally control their development and delivery while being able to scale more easily. By following a modular "mix-and-match" approach, SaaS is tailored to each customer's demands and each solution flexibly grow together with both the customer and the company.

The lower upfront costs, predictability, flexibility and customization are especially of advantage to SMEs. SaaS allows SMEs to access innovative digital solutions at earlier stages in their business cycle which previously only larger corporations would have been able to afford. Due to the lower initial costs, it reduces lock-in effects for customers and may

increase competition between SaaS providers. However, switching between different SaaS solutions may be difficult too if there are restrictions on data portability and a lack of interoperability with competitors' solutions. The cost-saving potential therefore depends on the subscription model, the lock-in effects, and the alternative software solutions.

Overall, SaaS provides a unique opportunity for Thai companies, particularly SMEs, to reap the benefits of digital transformation, increase their productivity, and explore innovative capabilities. SaaS is therefore a good example of the positive impact of digital businesses on the digitalization of Thailand's wider economy. A thriving local SaaS start-up ecosystem may contribute to SMEs' uptake of digital technologies.

Annex D-3: Examples of Firm Activity in Prioritized Digital Sectors

The table below provides a non-exhaustive list of illustrative examples within the 9 digital-priority subsectors identified in the digital disruptive technology section, in Part III. The examples are based on solutions from various digital businesses worldwide.

Digital Subsector	Illustrative examples
Mobilitytech	App-based ride-sharing solutions, travel route optimization technology, traffic monitoring and tracking technology; communication solutions between electric vehicles (EVs) and charging stations; in-car operating systems featuring gesture and/or voice control; and solutions to optimize charging and the use of EV batteries.
Entertainmenttech	Music and video streaming applications; animation studios and gaming products; e-sports; augmented-reality entertainment products.
Big data and analytics	Software applications for integrating, visualizing and analyzing information (for example, structured and unstructured datasets); just-in-time or real-time data platforms; data mining and web scraping to put together large datasets.
Digital media	Content creation and aggregation of digital media (including television, newspaper, and radio); distribution of digital media; algorithm-driven content creation solutions; interactive broadcast solutions.
Healthtech	Telehealth solutions (for example, online doctor consultations); artificial intelligence-driven medical diagnostics (for example, cancer scans); wearable healthtech devices; big data solutions for drug development.
E-commerce	Online marketplaces for hiring local service professionals; automated e-commerce customer management applications.
Fintech	Digital payment solutions; algorithm-driven mini-loan solutions; automated business accounting software; smart investment automation applications.
Foodtech	Technology to improve or optimize food and beverage production, distribution, purchasing and consumption; restaurant review platforms; food safety assessment solutions; food e-marketplace, food lifestyle media; food subscription firms.
Traveltech	Technology to improve the travel and tourism value chain; travel booking platforms; automated travel aggregation solutions; travel review and discovery platforms; travel security software; virtual augmented-reality travel experiences.

Annex D-4: Digital & Disruptive Technologies: Examples of government involvement that can crowd out smaller private firms

Government's direct involvement in digital markets		Possible competition implications
Logistics	Thai Post's privileged position as an SOE, and its partnerships with select private players like DHL and Kasikornbank in e-commerce.138	• In small-package delivery services, Thai Post has access to public property land and below-market rent for locations for warehouses. • Thai Post has monopoly rights only on letter and postcard delivery but can regulate express mail, parcels, and small packages.139 Its monopoly over postal services obliges other postal service companies to pay Thai Post certain fees.140 • Potential for a non-level playing field in delivery service markets with Thai Post's presence and a courier service provider. • Potential for favoring a bank operator over other banks and payment players for receiving payments from e-commerce. • Questions over whether competition policy can be used here, given the exemption of SOEs from the law.
E-commerce platforms	Thaitrade.com, a B2B2C e-marketplace platform established by the Ministry of Commerce originally for exports, is now looking to go national.	• Platforms owned by the government or that have some government involvement could be favored over other platform competitors through regulations, incentives, subsidies, and so on, thereby undermining the level playing field in digital markets and disincentivizing new entry and investment. • Vertical integration and conglomeration of Thai Trade with, for example, Thai Post could affect e-commerce markets. • Questions over whether competition policy can be used here given exemption of SOEs from the law.
Digital technology providers	A telecom firm has shifted its business to digital services and expects to achieve a 25-percent market share of IoT devices.141 An internet service provider is looking to switch operations from cloud provider to platform provider.142	• SOEs receive advantages in access to spectrum, which is essential for delivery of some digital business models such as those relying on the IOT (for example, Industry 4.0) (see section B.3.1.d). • SOEs participating in the provision of digital technologies required for development in digital markets could crowd out private investment in disruptive technologies such as big data, IoT, cloud computing. • There are questions over whether competition policy can be used here, given the exemption of SOEs from the law.

Annex D-5: Competition aspects in DTT

Government Interventions that can distort competition in Thai Digital Markets

REGULATION THAT AFFECTS COMPETITION

General digital markets

- PDPA's burdensome requirements and lack of clarity reduces investment and affects small firms disproportionately.
- Uncertainty of enforcement and criminal penalties associated with PDPA, Cybersecurity Act and Computer-Related Offences Act could dampen investment.
- Foreign Business Act creates high barriers to entry in Thailand of disruptive digital firms.
- Low availability of spectrum at some of the highest prices in the world can produce more expensive, lower quality mobile broadband services that limit the adoption of cutting-edge digital technologies.

E-commerce

- Excessive and cumbersome regulation for firms to register and supply products through E-commerce favor incumbents and disincentives investment.
- Difficulties for small business to stablish individual payment systems.

FinTech

- Barriers for FinTech vis a vis commercial banks to comply with Know Your Customer regulation due to absence of approved alternative client verification.
- Mandatory credit bureau check to provide loans blocks entry of digital loan FinTech that rely on alternative data to provide these services.
- Barriers for obtaining banking services licenses for new entrants to the financial market.

MISSING PRO-COMPETITION REGULATION

- No "gatekeepers" regulation to oversee platform from abusing providers and users that depend on them.
- No clear regulation to deal with reports from MSMEs of abusive behavior platforms.
- Lack of regulation for data exchange/sharing between platforms.
- No QR code standardization for electronic payments and lack of regulation for the opening of PromptPay infrastructure and network to FinTech players.
- Lack of involvement of digital firms in the regulatory sandboxes to develop digital regulation.

NEED FOR COMPETITIVE NEUTRALITY AND LEVEL PLAYING FIELD

SOEs and competitive neutrality

- SOEs enjoy benefits not available to private firms (e.g., government guarantees, and exemptions on debt, taxes and regulation) that erase competitive neutrality.
- SOEs are entering such as E-commerce platforms and digital services like IoT and cloud technology which can crowd out private investment.
- SOEs are partnering with established private firms which can unlevel the playing field in competitions in parcel delivery, logistics and payment collection for E-commerce.

Incentives for investment and level playing field

- Incentives programs and alliances with strong digital market players, especially in ECC, could help entrench market position of dominant players in E-commerce.
- PromptPay's lack of interoperability with other electronic payments services/FinTechs could entrench dominance of commercial banks.
- BoI's good practice of incentives open to all firms except SOE's should be maintained in digital, but incentives granted to firm are not published reducing transparency.
- PromptPay as the only medium through which recipients of welfare and personal income tax refunds can access their funds favors commercial banks over FinTechs.

Annex D-6: Definition and Descriptive of Circular Economy

A globally accepted definition of the Circular Economy is still elusive, and this has pushed academic researchers to analyze a wide range of related concepts and methods in search of such a general definition. In order to have a reference framework, we settled on a definition formulated variously by a number of different authors including Kirchherr *et al.*, Urbinati *et al.*, and the Ellen MacArthur Foundation: "A circular economy describes a productive economic system that is based on business models which replace the **'end-of-life'** concept with reducing, alternatively reusing, repairing, remanufacturing, recycling and recovering materials in production, distribution and consumption processes, to return into a technical or biological cycle. The CE model operates at the micro-level (products, companies, consumers), **meso-level** (eco-industrial parks), and **macro-level** (city, region, nation, and beyond), with the aim to accomplish **economic sustainability**, which implies creating economic prosperity (GDP growth), social progress (employment generation) and environmental innovation (renewable energy, urban mining)."

Circularity has been captured in many different frameworks that cover a spectrum of activities, from recycling to rethinking products. These include the 3R/5R/10R framework, which defines different circular activities from "recovery" through "remanufacturing" to "refusing" (see figure below). In order to categorize businesses, five basic circular economy models exist. These include: (1) making goods that are repairable or durable (that is, extending the life cycle of a good) (2) promoting the sharing economy and the leasing or servitizing of products (that is, product-as-Service, for instance, renting washing machines instead of buying them) (3) take-back and re-use (for example, refund of deposits for taking back bottles) (4) the use of recycled materials for making new products; and (5) making products themselves recyclable.

Circular Economy Frameworks ordered by complexity.

INCREASING COMPLEXITY

EMF's 3 principles	10R Framework	5R Framework	5 Circular Economy Business Models	Some Examples
Regenerate Natural System	Refuse: Make product redundant		1. **Circular Supplies:** Rethink/ Reduce by providing renewable energy, bio-based or fully recycle input material to replace single-use inputs. 2. **Resource Recovery:** Recover/ Recycle useful resources/energy out of disposed products. 3. **Product Life Extension:** Repair/ Refurbished/ Remanufacture by extending working lifecycle of products and components. 4. **Sharing Platform:** Enable increased utilization rates of products by making possible shared use/ access/ownership. 5. **Product as a Service:** Offer product access (any stage of life cycle) and retain ownership to internalize benefits of resource productivity.	Tel Aviv based start-up **Redefine Meat** combines 3D modeling, food formulations and food printing to create plant-based meat alternatives that have the same appearance, texture, and flavor as animal meat, with a 95% less environmental footprint. **Michelin** sells mobility or 'tires as a service', as customer pay per miles driven. Customers don't own the tires- maintenance is firm responsibility. By adopting this model, Michelin is incentivized to develop longer lasting tires with inputs that can be recovered and reused. **BmW**'s dashboard is made out of a fast-growing type of grass and its lining is made from recycled plastic bottles. **Philips** is redesigning its customer electronics/healthcare devices in a modular way for easy disassembly where customers can replace specific broken parts without having to throw the whole product. They are also leasing their devices to institutional buyers like hotels (e.g. irons)/hospital (MRI machines) **Walt Disney Resorts** sends its food waste to a nearby 5.4 MW anaerobic digestion facility owned and operated by Harvest Power, where it is converted to biogas to generate electricity. This is used to power Central Florida and WDR. **Hubba** is Thailand's first technology-driven co-working space chain and cooperate innovator with a mission to enable businesses to grow globally through community collaboration.
	Reduce: Increase product efficiency in manufacture or use	Reduce		
	Rethink: Make product use more intensive (e.g. sharing)			
Keep Products & Materials in Use	Reuse: By another consumer	Reuse		
	Repair: Of defective product/ part for reuse	Repair		
	Refurbish: Restore and bring up to date	Refurbish		
	Remanufacture: Use parts of discarded product for new product for same function			
Design out Waste & Pollution	Repurpose: Use parts of discarded product for new product with different function			
	Recycle: Process material to obtain same (high grade) or lower quality (low grade)	Recycle		
	Recover: Incineration of material with energy recovery			

Source: Adapted from The Circle Economy (www.circle-economy.com) and the Ellen MacArthur Foundation

Annex D-7: The adoption of circular economy principles in Thailand's 20-year National Strategic Framework and the 12th NESDB Economic and Society Development Plan

Strategy and Plans	**1st Level – Thailand's 20-year National Strategy Framework (2018–2037)**
	The National Strategy on Competitive Enhancement
	The National Strategy on Eco-Friendly Development and Growth
	2nd Level – Master Plans under the National Strategy
	12th Economic and Social Development Plan (2017–2021)
	National Reform Plan
	3rd Level – Sub-Plans and Action Plans
	Policy and Plan for Enhancement and Conservation of National Environmental Quality (20-Year Environment Plan)
	Sustainable Consumption and Production Roadmap (2017–2036)
	National Solid Waste and Hazardous Waste Management Master Plan (2016–2021)
	Plastic Waste Management Roadmap (2018–2030)
	Environmental Quality Management Plan (2017–2021)
	The National Strategy on Waste Electrical and Electronic Equipment (WEEE) Management
	Industrial Development Action Plan (2019–2037)
	National Master Plan on the Cleaner Production and Cleaner Technology
	The 20-Year Agriculture and Cooperative Strategy (2017–2036)
	The 5-Year Agriculture Development Plan (2017–2021)
	The National Organic Agriculture Development Strategy (2017–2021)
	Green Procurement Plans & Environmental Labels/registration in Thailand
Policy	Thailand 4.0
	Bio-Circular-Green Economic (BCG) Policy
	Eastern Special Development Zone Act B.E. 2561 (2018)
	Green Industry Policy
Laws	Enhancement and Conservation of Environmental Quality Act (1992)
	Waste Electrical and Electronic Equipment Act (draft)

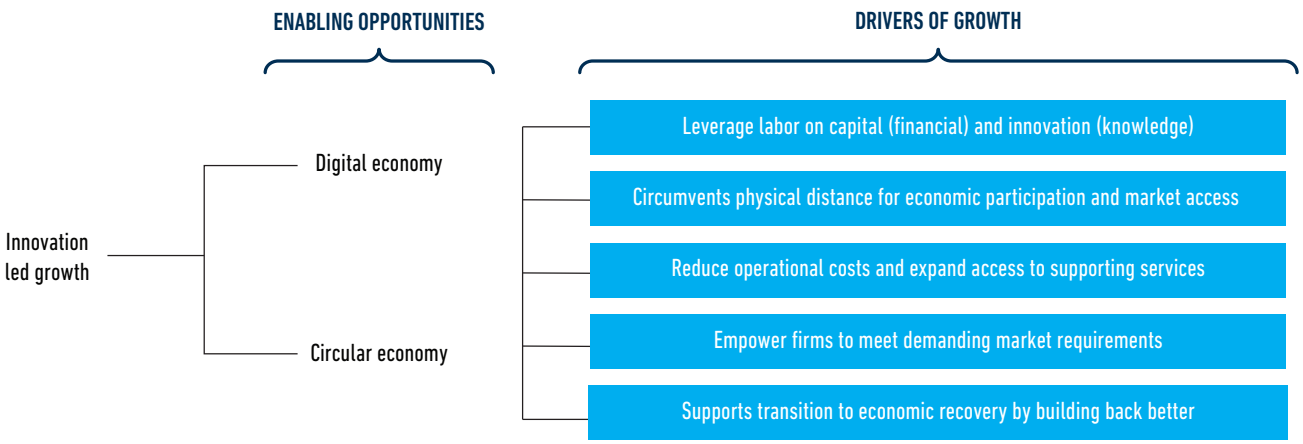
ANNEX E: LIST OF INTERVIEWED STAKEHOLDERS

Types of Stakeholders	List
Government Agencies: Ministry/ Department/Organizations	• Bank of Thailand (BOT) • Thailand's Board of Investment (BOI) • Department of Business Development (DBD) • Digital Economy Promotion Agency (DEPA) • Eastern Economic Corridor Office (EECO) • Electronic Transactions Development Agency (ETDA) • Fiscal Policy Office (FPO) • National Innovation Agency (NIA) • National Science and Technology Development Agency (NSTDA) • Office of National Higher Education Science Research and Innovation Policy Council (NXPO) • Office of SME Promotion (OSMEP) • Office of The National Broadcasting and Telecommunication Commission (NBTC) • Office of National Higher Education Science Research and Innovation Policy Council (NXPO) • Office of Trade Competition Commission (OTCC) • Securities and Exchange Commission (SEC)
Private Sector Associations	• British Chamber of Commerce Thailand (BCCT) • The Joint Foreign Chambers of Commerce in Thailand (JFCCT) • The Federation of Thai Industries (FTI) • Thai Chamber of Commerce (TCC) • Thai Retailers Association • The Thai Foundation for Consumers • Thai Fintech Association
Financial Institutions/ VC firms /PE firms and intermediary organizations (incubators/accelerators)	• 500 TukTuks • AddVentures • Bangkok Bank • Beacon Capital • Expara • Gobi Partners • Krungsri Finnovate • Lakeshore Capital • Lombard Investments • Monk's Hill • OpenSpace Ventures • PTT Ventures
Private Enterprises/Businesses	• AIS • Amity Corporation • Doctor Raksa • Ecartstudio • Microsoft Thailand • N-Squared eCommerce • Pomelo Fashion • SEA Group (Shopee) • Sertis Group • Techfarm • True Corporation
Think tank/Advisory Company	• Thailand Development Research Institute (TDRI) • Baker McKenzie • Kudun and Partners

ANNEX F: NARROWING THE SCOPE OF THE CPSD

The CPSD scope has been fleshed out based on an assessment of several criteria. Two are (a) strategic considerations that relate to sectors connectivity and spillovers, and (b) practical considerations of alignment with the Thai government's and World Bank's strategies, complementing ongoing World Bank engagements and ensuring inputs from extensive stakeholder consultations with the private and public sectors. Guidance from World Bank management has also been a key input in defining the ultimate scope of the diagnostic. The figure below presents a sample of the types of questions that were posed to assess and screen the sectors.

FIGURE F.1



Several potential sectors and themes were considered based on initial consultations with World Bank experts and private and public sector stakeholders. The table below summarizes the results from the assessment and those results that were considered in the subset for further discussion.

FIGURE F.2

Sectors		Strategic considerations		Practical considerations		High Contribution
		Contribution to Increasing Productivity	Contribution to Resilient and Inclusive Growth	Addressing COVID risks and Leveraging Opportunities	Alignment with WBG strategies and programs	
Investnment opportunities	1 Tourism (incl. Green Tourism)	Low	High	High	Moderate	X
	2 Health (Private care for ageing population/med. tourism)	Moderate	Moderate	High	Moderate	X
	3 Disruptive technology	High	High	High	Moderate	√
	4 E-Mobility (EVs and E-Public Transport)	High	High	Low	High	√
	5 Solid Waste and Water	High	High	Low	High	√
	6 Renewable Energy	Moderate	High	Low	Moderate	X
	7 Agribusiness	Moderate	Low	Moderate	Low	X
Cross cutting constraints & enabling sectors	A Climate Financing	High	High	Low	High	√
	B Innovation and upgrading Financing (Fintech, VC etc)	High	High	High	Moderate	√
	C Municipal Finance	High	High	Moderate	High	√
	D Financial systems and regulation	High	High	Moderate	High	√
	E Skills/Education	High	High	High	High	√
	F Absence of Competition	High	High	High	High	√
	G Business Environment Constraints (FDI for Services)	Moderate	Moderate	Moderate	Moderate	X
	H Business Environment Constraints (IPR)	Moderate	Moderate	Low	Moderate	X

As the last step, based on further guidance from management during the concept stage, and feedback received from teams working on ongoing activities, a decision was made to exclude climate smart infrastructure and related activities from the scope of the CPSD. The overarching approach and guidance was to focus primarily on competitiveness and innovation and to approach infrastructure (such as transport, logistics, and telecommunications) as an enabler of competitive industries in Thailand.

ANNEX G: DEFINITION OF THAI MICRO-, SMALL-, AND MEDIUM-SIZE ENTERPRISE

		Micro		Small		Medium	
	Type of Business	Revenue (mill. THB)	Employment (person)	Revenue (mill. THB)	Employment (person)	Revenue (mill. THB)	Employment (person)
Old Definition (Before 2018)	Manufacturing			≤ 50	≤ 50	50 – 200	51 – 200
	Services			≤ 50	≤ 50	50 – 200	51 – 200
	Wholesale			≤ 50	≤ 25	50 – 100	26 – 50
	Retail			≤ 30	≤ 15	30 – 60	16 – 30
New Definition (2018 Onwards)	Manufacturing	≤ 1.8	≤ 5	≤ 100	≤ 50	100 – 500	51 – 200
	Services/Whole-sale/Retail	≤ 1.8	≤ 5	≤ 50	≤ 30	50 –300	31 –100

ANNEX H: REFERENCE OF POLICY PRACTICE FOR SELECTED RECOMMENDATIONS

Recommendation	Lessons from other countries, and examples of initiatives that have helped achieve a similar goal	Country
CIRCULAR ECONOMY		
Enhanced knowledge and understanding of circular economy **Implement awareness programs for the correct use of circular economy concepts through imbedding such concepts in core modules of university curricula, business transformation guides, and case studies for the private sector**	Chile's Ministry of Agriculture published the "Circular Economy Program for the Agrofood Sector" report that identified circular business opportunities in five subsectors including wine, livestock, fruit, vegetables and cereals. The aim of the report was to promote emerging circular economy opportunities and to highlight successful initiatives that have been implemented locally.	Chile
	Finland's Innovation Fund, Sitra, has funded the inclusion of the circular economy across the nation's entire education system. This amounts to around EUR 4 million (USD 4,566,000) to support the development of study packages and teaching materials. This has helped to raise public awareness of what the circular economy is and society's role in it. In 2021, a survey conducted by Sitra revealed that 88 percent of Finns believe they have a role to play in advancing the circular economy.	Finland
	The Netherlands' Holland Circular Hotspot is a private-public platform upon which businesses, knowledge institutes, and local authorities gather to stimulate entrepreneurship in circular economy. The platform offers businesses access to a network of Dutch circular pioneers, stimulates public-private sector collaboration, exchanges knowledge on international market opportunities, provides visibility to Dutch circular economy innovations and best practices, and facilitates access to financial instruments and programs among businesses.	Netherlands
Strengthen the presence of a comprehensive and cohesive policy framework **Accelerate incentives for R&D-based, and CE innovation and increase the private sector's awareness of the work and role of Thailand Science Research and Innovation (TSRI)**	In all the examples shown in this annex, the key lesson is that funding mechanisms need to be matched with good promotion and be undertaken in close collaboration with the private sector – to answer the question, how it can be adopted by businesses, circular business models? Hearing from the private sector will in turn help Thailand Science Research and Innovation (TSRI) and the BOI to revise their support programs to match the needs of the private sector. UK Research and Innovation (UKRI), the national R&D funding agency, invested GBP 3.5 million (USD 4,786,000) in 2021 to launch a CE-Hub, led by the University of Exeter. The Hub seeks to coordinate national efforts and forms part of the GBP 30 million (USD 41,026,000) UKRI Interdisciplinary Circular Economy program.	The United Kingdom
	Japan has taken a targeted approach to innovation spending to support circular economy initiatives in the private sector and to bring them to commercialization. For example, the Ministry of Economy, Trade and Industry (METI) has established a grant program to accelerate the commercialization of rare earth recycling technologies, which has enabled Honda and the Japan Metals and Chemicals Company (JMC) to scale their technology to an operational level. They now operate a recycling facility capable of recovering 400 tons of rare earths per year.	Japan

Recommendation	Lessons from other countries, and examples of initiatives that have helped achieve a similar goal	Country
	The City of Montreal is collaborating with the venture capital firm Foundation to launch a CAD 30 million (USD 24 million) investment fund dedicated to the circular economy. The fund will target small- and medium-size enterprises with innovative business models, or businesses that seek to transform their model by incorporating circular economy principles.	Canada
	By 2013, KRW 926 billion (USD 777,981,300) had been loaned through the Recycling Industry Promotion Fund to 2,227 businesses to target the development of recycling technology and the construction/upgrading of recycling facilities.	The Republic of Korea
	In South Australia, Green Industries SA provides funding to help businesses, industry and government manage their waste, climate and circular economy initiatives through 10 programs, including the Circular Economy Market Development Grant and the Recycling Modernization Fund. Its total expenditure in 2019– 2020 was AUD 70.6 million (USD 50,858,000).	Australia
	In 2019, Business Finland, the national innovation funding agency, launched a circular economy program to fund EUR 300 million (USD 342,459,000) over a four-year period to support joint R&D projects among businesses, academia and municipalities. In 2021, they made EUR 17 million (USD 19,406,000) available for businesses looking for investment grants to foster the circular economy and green growth in ways that exceed current environmental standards.	Finland
	The Netherlands is planning to launch a circular economy investment platform that is still under discussion. In 2020, it made a one-off sum of EUR 80 million (USD 91,322,000) available for circular projects that reduce carbon emissions from groundworks, roadbuilding and hydraulic engineering. It also made EUR 8 million (USD 9,132,200) available for programs that aim to advance the transition to a circular economy in a variety of sectors.	Netherlands

Recommendation	Lessons from other countries, and examples of initiatives that have helped achieve a similar goal	Country
DIGITAL AND DISRUPTIVE TECHNOLOGY		
Create high contestability in digital markets **Attract more regional financial venture capital to balance out the overly dominant role of CVC in the digital ecosystem and also expose local large firms with international competition to prepare for a more open and innovation-driven economy**	Crowd in expertise and funding from regional financial VCs by setting up co-investment (equity) or risk-sharing funds, including beyond-seed-stage investments. Set up VC (co-investment) funds at arms length from government institutions with clear rules for government involvement and exits, and let private investors take a lead role in making investment decisions and committing to a longer-term duration of the fund. A number of countries such as Israel, Brazil and Singapore have set up such co-investment funds to crowd in private investment. Israel's Yozma Fund helped successfully catalyze the VC industry, which is now one of the largest VC financing centers in the world. Bring financial regulations into compliance with international practices and standards to avoid an exodus of digital businesses to other countries (for example, employee stock option plans, and the issuance of convertible notes and preferred shares).	Israel (Yozma Funds) Brazil (INOVAR)
Provide attractive regulatory environment for digitalization **Introduce industrial data strategy and protection policies for data-intense solutions because they underpin digital transformation in a variety of traditional sectors (retail, health, finance, and so on)**	Employ high-level political leadership to drive a public data-sharing initiative and enhance inter-ministerial cooperation. Open data initiative can enable local firms to build data solutions serving the economy. Enforce transparency in data-sharing arrangements (for example, access rules, security measures) and clear rules on data safeguards and the issuing of practical implementation guidelines. For example, Estonia's data-sharing infrastructure X-Road, a distributed information platform, forms the backbone of the country's digitalization initiatives by connecting different information systems and allowing the secure exchange of public and private data, ensuring interoperability through the use of common APIs and open standards. Also, the government of Japan formulated a template for contracts on the use of artificial intelligence or data that can be used for contracts between private-sector companies. Such clauses facilitate data-sharing agreements between different parties and increase legal clarity. Promote voluntary arrangements for industry data sharing (for example, through templates for data-sharing contracts).	Estonia Japan

Recommendation	Lessons from other countries, and examples of initiatives that have helped achieve a similar goal	Country
RESTRICTIONS ON FDI		
Make the SMART Visa program fully digital	Security risks associated with the use of ICT for service delivery, such as the risks of identity theft, forgery of documents, and challenges in collecting biometric data need to be addressed. In Moldova, this was done by building partnerships with airlines flying passengers to Moldova to verify the validity of their Moldovan e-Visa by asking applicants to pay the visa fee with a debit or credit card issued in their name, and contracting companies specializing in verifying the validity of scanned documents. Before digitizing processes, however, the underlying process architecture needs to be assessed and reformed. Flexibility and adaptability in these visa programs that are designed to attract skilled foreign workers is critical. For example, the EU's Blue Card program, designed to attract highly qualified individuals to work and reside in the EU from developing countries, underwent recent changes in 2021 aimed at strengthening the attractiveness of the card. These include a lower threshold for minimum salaries, and easier movement within the EU.	Moldova European Union
Further liberalize services sectors that are key to achieving the goals of Thailand 4.0	In the attempt to liberalize service sectors, the political economy of a country needs to be taken into consideration because services liberalization tends to be met with resistance from vested interests. It is therefore usually necessary to develop a broad stakeholder engagement strategy and build alliances with sectors, academia, and civil society. It has been demonstrated that benchmarking the country's level of restrictiveness against that of its competitors and peers, along with an analysis of projected positive impacts of the liberalization, helps to convince stakeholders of the need for reforms. Indonesia's Omnibus Law is a good example of the kind of comprehensive and complementary measures that sometimes need to be taken to liberalize an economy and attract foreign investment. In this case, besides removing restrictions to foreign investment across numerous sectors, the government has also made changes in the policy that regulates foreign workers to facilitate an inflow of skilled foreign workers in the liberalized sectors.	Jordan Indonesia

Recommendation	Lessons from other countries, and examples of initiatives that have helped achieve a similar goal	Country
COMPETITION		
Strengthen enforcement and advocacy by building the capacity of Thailand's Office of Trade Competition Commission (OTCC) and publishing guidelines for the enforcement of greater competition	***Advocacy*** • Malaysia, Singapore: several market studies with public consultations. • Singapore: Established a Policy and Markets Division for continual engagement with other government agencies to gain a better understanding of the markets they oversee, and to provide competition advice. • The Republic of Korea: Collaboration between the Fair Trade Commission, sector regulators, and the Regulatory Reform Committee. ***Enforcement*** • Indonesia, Malaysia, Singapore: Published guidelines clearly state how the competition authority analyses cases, and the economic factors it takes into consideration, with clear examples. • Singapore, Malaysia: The law allows enough time for aggrieved parties to collect evidence and information and conduct analyses of cases (Singapore: In mergers of up to 150 days, there is no time frame for investigations of anticompetitive practices; Malaysia: Up to 150 days for investigations) • Singapore: Competition authority has yearly training calendars to improve the technical capacity of its personnel.	Singapore Malaysia The Republic of Korea Indonesia
Elevate the competition policy agenda as a whole and present it as a national economic policy issue for Thailand, through the representation of higher-level executive offices	*In some countries the reform has been spearheaded by higher-level government officials or bodies (for example, the Prime Minister's Office)* • The Republic of Korea's successful regulatory reform agenda (partly designed to level the playing field against conglomerates while maintaining scale to remain internationally competitive) was led by a seven-member council, including the Prime Minister and the head of the competition authority. Additionally, competition is a regular part of Regulatory Impact Assessments framework, and relies on collaboration between the competition authority, sector regulators, and the Regulatory Reform Committee. • Australia's government-wide National Competition Policy – overseen by the Productivity Commission – encompasses a range of pro-competition microeconomic reforms across the economy, with positive impacts on productivity. • The Philippines is now moving toward adopting a National Competition Policy (NCP) similar to that of Australia and has passed a Philippine Competition Act that requires the establishment of such a policy. The President has signed an order directing government agencies to adopt and implement the NCP, a milestone in mainstreaming competition policy across the country's public sector.	The Republic of Korea Australia Philippines
Strengthen governance of the OTCC by reducing ministry-related involvement in senior appointments and allowing for independent budget allocations	The Republic of Korea: The Fair-Trade Commission's members are recommended by the chairperson of the Commission, with no involvement of other high-level actors (for example, the ministries). Botswana: The Competition and Consumer Authority has financial independence from the executive branch. Its budget depends on the National Assembly and fees charged by the Authority.	The Republic of Korea Botswana

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World Economic Forum. 2017. Global Competitiveness Report. Geneva. https://www.weforum.org/reports/the-global-competitiveness-report-2017-2018

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ENDNOTES

1 For the report, the CPSD uses data from three sets of countries for benchmarking: (i) *structural comparators*—Mexico, Colombia, and South Africa, (ii) *aspirational comparators*—Malaysia, Chile, Poland, and the Czech Republic, and (iii) *regional comparators*—Vietnam, Indonesia, Philippines, and China. The first two, structural and aspirational peers, represent countries with similar economic characteristics to Thailand. The construct is normally ad hoc but based on important determinants such as similarities in the economic composition of production and exports. Regional peers, on the other hand, are selected by geographic proximity, income, and the relative size of the economies.

2 World Bank. 2021. "Long COVID" East Asia and Pacific Economic Update (October), World Bank, Washington, DC.

3 Global innovator services are services that rely on a high-skilled workforce and that have deeper linkages with other sectors of the economy.

4 In identifying the scope of this diagnostic, assessment of traditional sectors such as agribusiness, tourism and automotive were also considered. When vetted against the framework for selection (see annex G for details of metrics and criteria), it was agreed that Thailand's growth required an innovative approach to thinking about private sector potential. This would be in line with the maturity of the economy and the national ambition to grow.

5 See, for example, Werner Raza, Jan Grumiller, Hannes Grohs, Jürgen Essletzbichler, and Nico Pintar, Post COVID-19 Value Chains: Options for reshoring Production Back to Europe in a Globalised Economy (policy paper requested by European Union, Committee on International Trade) (Belgium: EU, 2021), https://www.europarl.europa.eu/RegData/etudes/STUD/2021/653626/EXPO_STU(2021)653626_EN.pdf.

6 These nine subsectors are the top digital and disruptive solutions providers (by funding volume and firm maturity) in the Asian frontier markets, made up of Mainland China, Hong Kong, India, Indonesia, Japan, the Republic of Korea, Singapore and Taiwan, with the potential to drive digitalization in the broader economy. The funding gap estimates are derived by comparing Thailand's current investment flows with potential flows if Thailand were to attract the same amount of funding into these sectors (adjusted for the size of the economy). By looking at investment flows, this analysis identifies digital solutions that investors believe are market-ready and scalable rather than latent technological opportunities that are yet to realize real-life scalable applications.

7 "Going Circular: Growth of a New Paradigm toward Green/Sustainable Growth," Internal IFC note, Asia Strategists & Economists Team, June 2021.

8 By contrast, other regions such as the United States exhibit the opposite ratio: CVC funds about 20 percent.

9 For example, in 2020, the Ministry of Energy announced a Ministerial Regulation Prescribing Type and Size of Building and Standards, Criteria and Procedures in Designing Buildings for Energy Conservation. This regulation mandates energy-efficient design for buildings of certain uses (such as hospitals, educational institutions, hotels, and so on) with a total area of 2,000 square meters or more. Although this has been a major step toward improving overall resource efficiency, the Green Building Code inadvertently overlooks the circularity of buildings across their life cycle, from design to deconstruction.

10 These include, for example, 8 years of corporate income tax exemption; exemption and reduction of import duty on machinery, raw materials, R&D materials; 25 percent deduction on installation and construction of facilities; and permits to own land; no restrictions on foreign currency; and work permit and visa facilitation.

11 Reverse logistics refers to managing the return, recovery, and remarketing of varying product models. It involves planning, implementing, and controlling the efficient inbound flow as well as the storage of goods and related information to recover value or make proper disposal.

12 The CPSD uses data from three sets of countries for benchmarking: (i) Structural comparators: Mexico, Colombia, and South Africa (ii) aspirational comparators: Malaysia, Chile, Poland, and the Czech Republic, and (iii) regional comparators: Vietnam, Indonesia, Philippines, and China. Structural and aspirational peers represent countries with similar economic characteristics to the one being analyzed. The construct is normally ad hoc but based on important determinants such as similarities in the economic composition of production and exports. Regional peers are selected by geographic proximity, income, and the relative size of the economies.

13 These poverty data use a $5.50 a day poverty line and 2011 PPP rates as reported by the World Development Indicators.

14 From 2006 to 2011, manufacturing firms became less productive, and productivity declined sharply for domestically oriented industries such as transport equipment, leather, furniture and publishing.

15 Exports of goods and services as a percentage of GDP.

16 A vendor and a direct supplier are the same thing – they can also be called Tier 1 suppliers. Tier 2 refers to companies that directly supply Tier 1. Typically, Tier 2 sub-suppliers supply raw materials or services to Tier 1. Tier 3 refers to companies that directly supply Tier 2 (SAI & IFC, 2010).

17 Domestic material consumption (DMC) measures the total amount of materials directly used by an economy to meet the demands for goods and services from within and outside that country. "Material footprint" refers to the total amount of raw materials extracted to meet final consumption demands. It is one indication of the pressures placed on the environment to support economic growth and to satisfy the material needs of people (UNESCAP, 2015).

18 The EAP region (excluding China) is estimated to have contracted by 3.7 percent in 2020.

19 In 2019, tourism receipts as a percentage of total exports were 9.2 percent in Indonesia, 4.5 percent in China, and 4.2 percent in Vietnam.

20 The stock of firms 5 years old or younger in Thailand has been decreasing over time. Source: World Bank, Thailand Economic Monitor 2020.

21 The average age of firms increased from 18 to 22 years between 2011 and 2016 (Apaitan et al., 2019).

22 SMEs are categorized by the number of their employees and their annual revenue. In manufacturing: Micro Enterprise <THB 1.8 million and employees <5; Small Enterprise <THB 100 million and employees <50; Medium Enterprise <THB 500 million and employees <200. In services and merchandising: Micro Enterprise <THB 1.8 million and employees <5; Small Enterprise <THB 50 million and employees <30; Medium Enterprise <THB 300 million and employees <100.

23 Thailand counts agriculturists as MSMEs if they register as an entity or at least have some business activity. But if they are ordinary farmers who engage only in planting/farming and have no other business activity and are not a registered entity, they are not counted as MSMEs.

24 The domestic business community has seen low investment rates for research and development and limited patenting in recent years.

25 World Bank enterprise surveys, 2016.

26 The high market concentration in Thailand compared to selected countries was captured in the high comparative density of monopolies in the market (in 2016), based on the Thailand Economic Monitor of 2020.

27 Eastern Special Development Zone is a special economic zone of three provinces in eastern Thailand. It is managed by the EEC Office, a public agency that promotes investment and innovation and coordinates closely with other public authorities and the private sector to ensure the success of investments and projects.

28 Fitch Solutions. 2020. Toward 2050: Megatrends in Industry, Politics and the Global Economy. https://your.fitch.group/rs/732-CKH-767/images/megatrends-2020-summary.pdf.

29 Megatrends can be defined as those that will be global in scope, will be sustained, and will have a major impact on the economic landscape. This analysis, undertaken in 2020, is based on a survey of more than 1,000 senior executives across 12 industries in 5 countries.

30 Gayed, Michael A. "Exodus from China: Who Stands To Benefit In The Shifting Global Supply Chain?" (2020), internal brief, Asia Country Economics & Strategy.

31 The analysis and debate on this topic of trends in global value chains are ongoing, and the evidence and arguments remain mixed.

32 World Bank, Thailand Economic Monitor, Oct 2020.

33 Nayyar, Gaurav; Mary Hallward-Driemeier, and Elwyn Davies. 2021.

34 Hallward-Driemeier, Mary, and Gaurav Nayyar. 2017.

35 In defining the scope of this CPSD, several other sectors and themes were considered, the key ones being tourism, health, automotive and electric vehicles, agribusiness, climate-smart infrastructure including solid waste and water, renewable energy, and municipal finance.

36 Examples of such reforms include Indonesia's recent Omnibus Law on Job Creation, which has removed major restrictions to investment, Vietnam's reduction of minimum paid-up capital in its retail trade sector, and the Philippines CREATE initiative, which has reduced the Corporate Income Tax.

37 The recently signed Regional Comprehensive Economic Partnership (RCEP) framework is expected to deliver significant benefits to its members, but it is estimated that Thailand's share of the pie will be relatively small compared to that of other countries because of its multiple existing trade treaties. Annex C-1 provides a brief overview of the RCEP.

38 A thorough tax reform is also needed. It could include broadening the tax base, reviewing tax rates, reducing tax exemptions and deductions, and enhancing tax collection, along with further efforts to reduce the economy's large informal sector.

39 The comparator countries analyzed were Colombia, Mexico, South Africa, Poland, Malaysia, the Czech Republic, Chile, Indonesia, Singapore, and Vietnam (Cornell University, INSEAD and WIPO 2020).

40 Data from World Governance Indicators, Political Risk Services, and the International Country Risk Guide (ICRG).

41 The literature on cross-country determinants of FDI has found that political stability, the rule of law, and investor protection frameworks are among the institutional variables that most positively influence foreign investment, although empirical evidence varies across countries and regions, Thailand SCD.

42 Both Moody's and S&P lowered the rating for Thailand from positive to stable, while Fitch maintained its outlook at stable, but referred to growing political tensions as a cause of concern.

43 For example, the rate of unlicensed software installations has decreased from 72 percent in 2011 to about 66 percent in 2017 (OECD 2021).

44 In recent years, Thai policy makers have introduced a series of measures in the context of advancing the Thailand 4.0 strategy, which include amendments to the Copyrights Act (2017), the introduction of the IP roadmap (2016), and legislative amendments to the Customs Act.

45 Not only is a growing share of the population connected to the internet, but also internet speeds in Thailand are among the fastest in the world. According to the Speedtest Global Index, in the first quarter of 2021 Thailand ranked in the top 10 countries with the fastest broadband internet, with an average fixed broadband download speed of up to 230 Mbps in March.

46 http://unctadstat.unctad.org.

47 Charoenrat and Harvie, 2017.

48 Extent of market dominance refers to the perception of corporate activity dominated by a few business groups or spread across firms

49 The indicators of Bertelsmann Stiftung's Transformation Index (BTI) answer the following questions based on expert judgment: (i) To what level have the fundamentals of market-based competition developed (including the low importance of administered pricing, currency convertibility, no significant entry and exit barriers in product and factor markets, freedom to launch and withdraw investments, and no discrimination based on ownership (state/private, foreign/local) and size? (ii) To what extent do safeguards exist to prevent the development of economic monopolies and cartels, and to what extent are they enforced (including the existence of antitrust or competition laws and enforcement)? and (iii) To what extent has foreign trade been liberalized, including conditions, tariff and non-tariff measures for market access, import licensing and customs valuation, export subsidies and "countervailing duties" on allegedly subsidized imports, import quotas and export limitations, contingency trade barriers (anti-dumping procedures, "safeguards" – restrictions of imports to protect a specific domestic industry from serious injury), replacement of non-tariff with tariff measures, and information on the country's participation in the WTO? See The Bertelsmann Transformation Index 2020 https://www.bti-project.org/en/home.html.

50 In general, prices of goods and services administered in some form account for roughly 35 percent of the CPI basket, with items in the energy and public transportation categories alone forming about 13 percent of the basket (Direkudomsak, 2016). There are currently 55 products (50 goods and 5 services) on the list, including staple food products.

51 Some of the products on the price control list include consumer foods (garlic, rice paddy, milled rice, corn, eggs, cassava, wheat flour, powdered/fresh milk, sugar, vegetable/animal oil and pork); farm-related products (fertilizers, pesticides, animal feed, tractors, and rice harvesters), construction materials,

paper, petroleum and medicines. More recently, medical face masks, synthetic fiber used as a raw material to make medical face masks, alcohol and alcohol-based hand sanitizer, and recyclable paper have been added to the list. "Thailand's Commerce Ministry Maintains Price Controls for 55 Items." CTN News, January 14, 2021. https://www.chiangraitimes.com/economy-business/thailands-commerce-ministry-maintains-price-controls-for-55-items.

52 The Central Committee on Prices of Goods and Services (CCP) under the Price of Goods and Services Act B.E. 2542 (1999), is empowered to issue notifications prescribing certain goods or services as controlled goods or services.

53 These are preliminary ordinary least squares (OLS) estimates based on 2010–2018 Economist Intelligence Unit (EIU) and Numbeo data for seven comparator countries – Colombia, Vietnam, China, Indonesia, Philippines, Mexico, and Malaysia – and for the following products: Numbeo – apples (1kg), bananas (1kg), beef round (1kg or equivalent back leg red meat), chicken breasts (boneless, skinless, 1kg), eggs (regular, 12), lettuce (1 head), white bread (500g), local cheese (1kg), milk (regular, 1 liter), onion (1kg), oranges (1kg), potatoes (1kg), tomatoes (1kg), and white rice (1 kg); and EIU – apples (1 kg), bananas (1 kg), roast beef (1 kg), imported cheese (500 g), fresh chicken (1 kg), eggs (12), lettuce (one), pasteurized milk (1 l), onions (1 kg), oranges (1 kg), potatoes (2 kg), tomatoes (1 kg), white bread (1 kg), and white rice (1 kg), based on data downloaded as of January 15, 2019. The estimates rely on the accuracy of EIU and Numbeo price data.

54 Poggi, Cecilia, Martin Sanchez, Eduardo Miguel, Pajnapa Peamsilpakulchorn, Roma Chavapricha, Lars M. Sondergaard, Smita Kuriakose, et al. 2016. Thailand – Systematic Country Diagnostic: Getting Back on Track: Reviving Growth and Securing Prosperity for All.

55 https://www.bangkokpost.com/business/1752449/fuel-subsidies-agreed-for-three-months; https://www.businesstimes.com.sg/asean-business/the-return-of-fuel-subsidies-in-asean-maybank-kim-eng.

56 Qiang, Steenbergen and Liu 2021; World Bank, 2018 and 2020; Echandi, Krajcovicova and Qiang, 2015.

57Akame, Ekwelle, and Njei, 2016; Buchanan, Le, and Rishi, 2012; Daude and Stein, 2007; Gani ,2007; Globerman and Shapiro, 2002; Vogiatzoglou 2016; Wei 2000; Wernick, Haar, and Singh, 2009.

58 In 2013, corporate income tax (CIT) was reduced from 30 percent to 20 percent to align Thailand with other ASEAN economies. In addition, technology-based investments can receive a CIT exemption of up to 13 years from the Board of Investment (BOI). Thailand's incentives regime is generally described as generous (OECD, 2021). Investment protection standards in Thailand are also generally in line with international standards, and the country displays a reasonable record in contract enforcement and the rule of law. The government has in recent years further strengthened Thailand's legal and institutional framework for protecting investors' intellectual property rights. Thailand's investment promotion agency, the BOI, is generally considered as one of Thailand's most effective government institutions and serves as an example to the country's peers around the world of how to successfully attract FDI (OECD, 2021).

59 Telecommunications, utilities, postal, transport, and so on.

60 For example, companies must respect quotas when hiring foreign nationals: four local nationals must be employed for every foreigner, and only up to ten foreign work permits can be requested per company.

61 Investments are evaluated based on their advantageous and disadvantageous effects on national safety and security, national economic and social development, public order or good morals, national values in arts, culture, traditions and customs, natural resources conservation, energy, environmental preservation, consumer protection, size of undertakings, employment, technology transfer and research and development.

62 Conditions that apply for issuing the license include the ratio of capital to loans for the operation of permitted businesses; number and origin of foreign directors; amount of the minimum capital to be maintained, and the period of time for maintaining it in the country; and technology level implied in the investment.

63 Projects with investment value not exceeding 200 million TBH are considered within 40 working days; those with investment value between 200 and 2000 million TBH are considered within 60 days; and those within investment value larger than 2000 million TBH (approximately 65 million USD) are considered within 90 working days.

64 For activities falling under the FBA, the minimum capital requirement is 25 percent of the average estimated expenses for three years of operation, or B3 million (approximately 100,000 USD), whichever is higher.

65 These include i) telecommunications business (type 1 license) in accordance with the Telecommunications Business Act; ii) treasury center in accordance with the Exchange Control Act; iii) certain aircraft maintenance; and iv) high value-added software development activities.

66 For the purposes of this note, the analysis focuses on access to finance for innovative SMEs, which includes young firms. Access to finance related to finance provided through credit, loans, loan guarantees or investments, such as stocks or equity. For simplicity, the analysis excluded other important sources of innovation finance such as grants for innovation, the provision of technical assistance that has not been tied to a financing intervention, or any form of nonlending fiscal incentives such as tax benefits for innovation (R&D tax incentives).

67 Source: Bank of Thailand.

68 Mainly government-owned Government Saving Bank (GSB), Bank for Agriculture and Agricultural Cooperatives (BAAC), SME Development Bank (SMEDB), and Thai Credit Guarantee (TCG) Scheme.

69 The Market for Alternative Investments (MAI) was established by Thailand Stock Exchange in 1998 as an alternative stock market for SMEs.

70 The Bank of Thailand conducted a nationwide survey and in-depth interview of SMEs in 2020. The survey covered 2,416 SMEs nationwide.

71 PromptPay is a real-time electronic fund transfer system launched in January 2017. It was part of a national strategy aimed at the development of an integrated digital payment infrastructure. It enables consumers, businesses and government agencies to make real-time payments in Thai baht. PromptPay could be a good source of credit-scoring data for SMEs.

72 Currently National Credit Bureau (NCB) has 108 members. They include 17 commercial banks, 6 specialized financial institutions (SFIs), 21 nonbank institutions, 56 hire purchase firms, a number of consumer finance providers, a number of PICO finance operators, a number of leasing firms, and 8 other financial institutions.

73 To address these constraints, the government is currently undertaking a review of the law to expand the type of information and the scope of data collection, and to extend the scope of members and data disclosure.

74 This includes users who start the process but do not finalize it, as well as users who apply but are not approved.

75 OECD, PISA 2018.

76 Education First, EF English Proficiency Index: A Ranking of 100 Countries and Regions by English Skills. https://www.ef.com/assetscdn/WIBIwq6RdJvcD-9bc8RMd/legacy/__/~/media/centralefcom/epi/downloads/full-reports/v10/ef-epi-2020-english.pdf.

77 Sources: Office of the Vocational Education Commission and the Bureau of Registration Administration, Department of Provincial Administration (2020), calculated by the World Bank.

78 Sources: OECD (2020).

79 Thailand Transformation, 2021.

80 Thailand Transformation, 2021.

81 Foreign Worker Administration Office under the Department of Employment.

82 World Bank. 2021. Thailand Economic Monitor. Washington, DC: World Bank Group.

83 Due to the lockdowns and business closures, about 1 million workers eventually relocated from industrial and tourism cities and business centers to their rural hometowns to pursue agricultural activities (Bank of Thailand, September 2020, Monetary Policy Report).

84 The World Bank Database.

85 Having occupational standards and a qualification framework helps workers know what skills they are missing and assess themselves against their peers, making the direction of improvement clearer for every individual. This qualification framework should include standardized tests that are able to assess learners' knowledge, skills, and competency.

86 Registered capital of at least 2 million Baht (approx. USD 64,000) is required to hire one expatriate. For reference, a micro-enterprise is defined as one with less than 1.8 million Baht (approx. USD 57,000) and a small enterprise is defined as one with 1.8 million to 100 million Baht (USD 57,000 to USD 3.1 million).

87 The EEC management is targeting 12 industries, including advanced agriculture and biotechnology, food for the future, biofuel and biochemical, medical care, intelligent electronics, automation and robotics, next generation automotive, aviation, digital, high-value and medical tourism, defense, education, and human resource development.

88 Amid the global pandemic, the EEC management has focused on health, digital, and logistics, while featuring cross-cutting topics, including the circular economy and human resource development.

89 "Disruptive technologies" is a term coined by Harvard Business School professor Clayton Christensen in the early 1990s. It describes innovative technologies that make products and services more accessible and affordable to a larger population. They tend to start at the bottom of the market and move up market where they subsequently replace existing technologies. They are disruptive in that they may radically change the way organizations and peo-

ple operate, creating new markets and new business models and suspending older ones. See also the Clayton Christensen Institute, Disruptive Innovation, https://www.christenseninstitute.org/disruptive-innovations.

90 Digital Technology is a subset of Disruptive Technologies. Digitalization refers to the use of digital technologies to change a business model and provide new value-adding opportunities. Digitalization is therefore regarded as a process that transforms a traditional firm into a digitalized business. In recent years, especially since COVID19, the concept of the "digital economy" has been gaining importance, although its definition and measurement in national statistical and data-analysis initiatives have not quite kept pace with its growth (OECD, 2020). A Roadmap Toward a Common Framework for Measuring the Digital Economy, https://www.oecd.org/sti/roadmap-toward-a-common-framework-for-measuring-the-digital-economy.pdf). The "narrow" definition of a digital economy comprises digital businesses that develop and manufacture digital technology products or provide digital services (that is, the ICT sector or digital sector). This definition is narrow in that it does not cover traditional sectors of the economy such as retail, tourism and agribusiness that are highly digitalized and should be included in the definition. For example, Walmart still counts as a retail firm, and CapitalOne still counts as finance, even though they are increasingly looking more like tech firms in parts of their business models and organization structures.

91 See also Quinlan and Hart (2020).

92 Thomson Reuters, Factiva, Crunchbase.

93 Bank of Thailand.

94 Source: World Bank Global Digital Business Database, based on data from the CB Insights private equity company and from Pitchbook. According to these sources, some 310 fintech companies currently operate in Singapore.

95 Foodtech refers to digital businesses that develop and use technology to improve food and beverage production, distribution, purchasing and consumption. It also includes restaurant aggregators and review platforms, food e-marketplaces, food lifestyle media, and pre-packaged food subscription firms. Traveltech refers to firms that develop and use technology to improve the travel and tourism value chain. Examples are travel-booking platforms, and travel review and discovery platforms, but also travel security software.

96 The digital start-up ecosystem, corporate research and development (through technology adoption by firms in sectors), and university or government-sponsored research are intertwined, interdependent and interrelated: for instance, universities operate startup incubators and cooperate with corporate R&D. Corporations, for their part, seek to increase entrepreneurial drive by collaborating with startups – for example, by setting up corporate VC arms to acquire new technology solutions. And digital startups, in turn, commercialize new ideas that were incubated at universities. At the same time, startups challenge established corporations by disrupting existing business models and therefore may pose an innovation-increasing threat to traditional corporations that pressures them to evolve or else be sidelined.

97 An exhaustive list is not feasible given the extensive possible applications of these solutions.

98 These include agriculture and biotechnology, smart electronics, medical and welfare tourism, automotive, food, biofuels and biochemicals, the digital economy, healthcare, automation and robotics, and aviation and logistics.

99 See the third development target, p. 26. See also section 3.1.2.

100 For example, it is currently thought that recent draft amendments of the Civil and Commercial Code are having the effect of reducing the constraints on startup financing. Moreover, the government has increasingly used regulatory sandboxes in sectors such as in fintech to allow for experimentation by the private sector.

101 https://www.set.or.th/en/products/listing2/set_business_p1.html.

102 Private Placement Offering for SMEs (PP-SME) – In early 2020, the SEC launched the Notification of the Capital Market Supervisory Board, which allows eligible SMEs incorporated as limited company to offering newly issued securities to specific group of investors. The regulations are intended to alleviate conditions and obstacles that often block the progress of SMEs. SMEs that meet the criteria can offer common stock or convertible debentures (CDs) to private placement without first having to submit documents for approval. However, the investors are limited to institutional investors, private equity, venture capital, and angel investors. The rules can also be applied to ESOPs to attract talented people to work with SMEs. There are currently 16 successful cases that have raised total funds of more than 245 million baht (USD xxx). Public Offering for SMEs (PO-SME) & LiVE Exchange (SME Board). In addition, the SEC, together with the SET, has collaborated to set up a scheme that will enable eligible SMEs and startups (such as those that have been able to raise funds from VC) to raise funds through public offerings to the qualified investors. The regulations have been eased in some areas to suit these eligible entrepreneurs. In addition, they are able to list their shares on a platform called SEC Classification. LiVE Exchange, a secondary market for trading the stocks of SMEs, will be officially launched during the first quarter of 2022. The scheme applies the concept of light-touch supervision, aiming to assist SMEs to access funds and attract investors via the capital markets.

103 In particular, the Thai government needs to carefully assess how the enactment of the Personal Data Protection Act affects competition in digital markets because it disproportionally affects smaller businesses (see chapter 5 on competition). Smaller firms do not have the resources to ensure compliance with the Act (for example, fulfilling the extensive registration requirements). This is worsened by existing ambiguities surrounding definitions and implementation procedures, which may disincentivize investments in digital markets and, especially, impact small businesses.

104 For example, Thailand's Consumer Protection Act and the Direct Selling and Direct Marketing Act do not clearly mandate that businesses must make all terms and agreements transparent, and that they must inform consumers about such information and ensure that the consumer acknowledges all details before placing the order. Given that e-commerce consumers cannot inspect goods and services before buying them, the mandatory availability of sufficient information is key.

105 World Bank-LinkedIn Digital Data for Development Initiative.

106 By contrast, other regions such as the U.S. feature the opposite ratio (CVC funds about 20 percent).

107 The BOT issued a regulation for digital personal loan providers in 2020 that will facilitate the use of digital technology and alternative data in extending personal loans to clients who do not have collateral.

108 The Ellen MacArthur Foundation. 2015. Toward a Circular Economy: Business Rationale for an Accelerated Transition. https://www.ellenmacarthurfoundation.org/assets/downloads/TCE_Ellen-MacArthur-Foundation_9-Dec-2015.pdf.

The Ellen MacArthur Foundation. 2015. Delivering the Circular Economy: A Toolkit for Policymakers. https://www.ellenmacarthurfoundation.org/assets/downloads/publications/EllenMacArthurFoundation_PolicymakerToolkit.pdf.

The Ellen MacArthur Foundation. 2015. Growth Within: A Circular Economy Vision for a Competitive Europe. https://www.ellenmacarthurfoundation.org/assets/downloads/publications/EllenMacArthurFoundation_Growth-Within_July15.pdf.

109 *Waste to Wealth: The Circular Economy Advantage*, Accenture, 2015.

110 Thailand Office of Natural Resource and Environmental Policy and Planning, 2020.

111 Globally, this share is 55 percent and 45 percent for the two sources of emissions, respectively.

112 The Internet of Things allows manufacturers to track and monitor business processes at a distance, thus enabling circular models such as car-sharing platforms, product-as-a-service models, or 3D-printing. This facilitates the modularization of production, improves maintainability, and extends the durability of goods.

113 This would mean firms increasing the proportion of bio-based versus fossil fuel-based material that they use for packaging in order to reduce the risk of commodity price volatility and lessen their reliance on importing markets.

114 These areas are agriculture, food, energy and bio-chemicals, medical supplies and vaccines, medical equipment, tourism and the creative economy, and the circular economy (recycling laws, repurposing agriculture waste, and so on).

115 The approach was piloted for the Thailand CPSD and relied on narrowing down subsectors based on their potential for circularity.

116 The impact potential of the circular economy is defined as a product of the overall adoption rate of the particular circular-economy opportunity, the number of "units" addressed, and the financial benefits per unit. Circular activities bring two kinds of direct financial benefits to businesses: (i) increased revenues from additional sales and/or a higher unit price (net value creation), and (ii) cost savings from materials, components or labor (cost savings).

117 https://www.jll.com.sg/en/newsroom/asia-pacific-outpaces-the-rest-of-the-world-in-growth-of-flexible-work-spaces.

118 https://www.ellenmacarthurfoundation.org/resources/apply/toolkit-for-policymakers.

119 There are different approaches to address this. For example, in the Netherlands, the circular economy agenda is led by the Ministry of Infrastructure and Water Management who also coordinate among other ministries as well as the private sector, academia and civil society. In Finland, an independent public foundation operating under the Finnish Parliament – Sitra – leads circular economy and fosters collaboration between various ministries, businesses, and other stakeholders.

120 For example, in 2020, the Ministry of Energy announced a Ministerial Regulation Prescribing Type of Size of Building and Standard, Criteria and Procedure in Designing Building for Energy Conservation. This regulation mandates energy-efficient design for buildings of certain uses (such as hospitals, educational institutions, and hotels) with a total area of 2,000m2 or more. Although this has been a strong step toward improving overall resource efficiency, the Green Building Code inadvertently overlooks the circularity of buildings across their life cycle from design to deconstruction.

121 These include, for example, 8 years of corporate income tax exemption; exemption and reduction of import duty on machinery, raw materials, R&D materials; 25 percent deduction on installation and construction of facilities; and permits to own land; no restrictions on foreign currency; and work permit and visa facilitation.

122 The approved activities (bioenergy and biofuels, biotechnology R&D, waste and recycling, and eco-friendly chemicals/polymers) and the targeted core technologies (including biotechnology, digital technology, nano-technology and advanced material technology) that businesses can claim against cover a narrow scope. The incentives do not cover activities such as remanufacturing or product servitization. They also do not cover upfront product design changes or business model transformations, which do play a large role in circular economy transition.

123 https://www.researchgate.net/publication/322568065_Influencing_Factors_in_Production_and_Use_of_Recycle_Concrete_Aggregates_RCA_in_Thailand.

124 Gruenwald, H. (1). Recycled Concrete Aggregate (RCA) Thai reverse logistics supply chain management for ready mix plants. Engineering and Applied Science Research, 43, 57–59. https://ph01.tci-thaijo.org/index.php/easr/article/view/69692.

125 Thailand's Sustainable Financing Framework includes the following categories: 1. Clean Transportation 2. Renewable Energy 3. Energy Efficiency 4. Sustainable Water and Wastewater Management 5. Sustainable Management of Living Natural Resources and Land Use 6. Terrestrial and Aquatic Biodiversity Conservation 7. Green Buildings. Kingdom of Thailand Sustainable Financing Framework July 2020. https://www.pdmo.go.th/pdmomedia/documents/2020/Jul/KOT%20Sustainable%20Financing%20Framework.pdf.

126 The funding is made possible through an instrument that contributes to the financing of the circular economy: the Program Management Unit for National Competitiveness Enhancement (PMU-C).

127 For more information, please see http://carbonmarket.tgo.or.th.

128 See, for example, "Launch of the Thailand Environmental Education for Sustainable Development Partnership," EESD website, October 7, 2019, https://esdteachers.bangkok.unesco.org/?p=1012.

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