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An Empirical Analysis of Tax Policy and Inward Foreign Direct Investment in Thailand

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Abstract

Over the past 50 years, Thailand has heavily promoted investment through tax policies such as tax sparing agreements and tax incentives. The ratio of corporate tax revenue to gross domestic product has declined since 2011, which is a significant problem for the country. A major concern is the use of tax incentives to promote economic development. However, there is inconclusive evidence as to whether inward foreign direct investment (FDI) generates growth in the Thai economy. This thesis contains three empirical essays that attempt to investigate these issues. Together, the three empirical essays provide a clear vision of the influence of tax policies on inward FDI and how FDI affects heterogeneous sectoral growth in Thailand.

The first empirical study aims to cast light onto the relationship between tax sparing agreements and inward FDI stock in Thailand from 178 jurisdictions, and to ascertain whether it differs depending on the level of economic development and the type of tax system in the investor countries. For this purpose, this study uses the Poisson pseudo maximum likelihood estimator in order to capture all observations, including zero

FDI inbound stock over the sample period 2001-2017. The empirical results suggest that tax sparing agreements without a sunset clause have a favourable impact on the location choices of foreign investors, especially for developing investors while tax sparing agreements with a sunset clause largely decrease the investment from developing countries than developed countries. Likewise, the effect of tax sparing agreements on foreign direct investment is no significant difference across worldwide and territorial tax systems of the investor country.

The second empirical study focuses on the effect of tax incentives, particularly tax holidays, granted by the Thai Board of Investment (BOI) on the investment and innovation of multinational firms (MNEs) and domestic firms in Thailand. Using administrative data on BOI promoted companies between 2009 and 2015, the empirical results show that tax holidays granted to multinational and Thai firms have a positive effect on their tangible and intangible assets up to two or three years after being promoted. MNEs invest substantially more in intangible assets than comparable firms when they benefit from both a tax holiday and a tax sparing provision, i.e. when the tax benefits received in Thailand are preserved at home under a special provision included in a bilateral tax treaty with Thailand. This study distinguishes MNEs from developing countries from MNEs from developed countries, as there is a clear trend for developing countries to have a worldwide tax system when most developed countries have a territorial tax system, leading thus to a tax burden disadvantage for the former firms. Once this disadvantage is mitigated by tax sparing, MNEs from developing countries seem to invest substantially more in physical investment.

The third empirical study assesses the heterogeneous sectoral effects of FDI on output growth in Thailand by using sector-level data and investigates whether these impacts differ across investors from developed and developing countries. This analysis utilises a panel

data sample of 10 economic sectors over 14 years from 2005 to 2018. By using difference estimators, I find strong evidence that the effects of FDI in the absence of economic sectors can blur actual impacts on output. FDI inflows in manufacturing and wholesale sectors have significant and positive effects on outputs in the Thai economy, whereas inward FDI in the primary sectors of agriculture and mining slows outputs. Likewise, the Thai economy is more likely to benefit from a transfer of technology and knowledge when FDI comes from a developing country rather than from a developed one.

Contents

List of Tables

List of Figures

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Declaration

I declare that, except where explicit reference is made to the contribution of others, that this dissertation is the result of my own work and has not been submitted for any other degree at the University of Glasgow or any other institution.

Chapter three *'Should Thailand Phase Out Tax Incentives for Investment'* is jointly authored with Professor Céline Azémar. As a main contributor of the paper and in accordance with my co-author, I received authorisation to include the paper as part of my dissertation.

Name: Saowalak BOONAIEM

Signature:

Name: Céline AZEMAR

Signature:

Abbreviations

ASEAN . . . . Association of Southeast Asian Nations

BEPS . . . . . Base Erosion and Profit Shifting

BOI . . . . . . The Board of Investment of Thailand

BTT . . . . . . Bilateral Tax Treaty

BvD . . . . . . Bureau van Djik

CIT . . . . . . Corporate Income Tax

DC . . . . Developed Country

EATR . . . . . Effective Average Tax Rate

EMTR . . . . . Effective Marginal Tax Rate

ETR . . . . . . Effective Tax Rate

FDI . . . . . . Foreign Direct Investment

GDP . . . . . . Gross Domestic Product

GMM . . . . . Generalised Method of Moments

GNI	Gross National Income
HFDI	Horizontal Foreign Direct Investment
IBFD	International Bureau of Fiscal Documentation
IMF	International Monetary Fund
IMF-CDIS . .	International Monetary Fund Coordinated Direct Investment Survey
IV	Instrument Variable
LDC	Developing Country
LM	Lagrange Multiplier
MNE	Multinational Enterprise
OECD	Organisation for Economic Co-operation and Development
OLS	Ordinary Least Squares
PIT	Personal Income Tax
PPE	Property, Plant and Equipment
PPML	Poisson Pseudo Maximum Likelihood
SBT	Specific Business Tax
SMEs	Small- and Medium-Sized Enterprises
STR	Statutory Corporate Tax Rate
TS	Tax Sparing Agreement
UNCTAD . . .	United Nations Conference on Trade and Development
VAT	Value Added Tax
VFDI	Vertical Foreign Direct Investment

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CHAPTER 1

Introduction to the Thesis

1.1   Background

Foreign direct investment (FDI) is crucial for developing and emerging economies. It provides capital that is not always as widely available in developing economies as it is in advanced economies. This capital enables developing countries to build their infrastructure. FDI also brings new technology and management skills to developing countries. The benefit of FDI is an important basis for their economic development. However, the effectiveness of inward FDI may depend on the general business environment in the developing country and the measures taken to maximise the effect of the inbound investment, for example the regulatory framework.

More than half of global inward flows in 2020, at 53.6%, occurred in Asia (United Nations, 2021). Asian countries are significant players in today's world economy and are

the main target of global trade and investment. In addition, there is competition among countries to attract FDI. Economic development is promoted through measures such as tax and non-tax policies. This thesis focuses on tax policy as a measure used to promote economic development as tax policy affects the host country's treasury.

Thailand is a good case study to examine the effects of tax policy on inward FDI, as it is one of the top five FDI destinations where the executives maintain their confidence on performance, and was considered to be one of the target location for investment in 2017 (United Nations, 2017). It is also ranked second, next to Singapore, for the highest FDI inflows in the region. Moreover, Thailand has heavily promoted investment through tax incentives over the past 50 years. Thus, it is logical to use Thailand as a case study for this thesis.

Figure 1.1 depicts the corporate income tax rate and the volume of inbound FDI stocks in Thailand over four decades, measured in millions of USD. The volume of inbound FDI stocks substantially increased from 1988 to 2020. The volume of inbound FDI stocks increased gradually between 2013 and 2014, which was the first financial year in which the government reduced the corporate income tax rate from 23% to 20%. In contrast, there are two significant downward trends which have only seen two brief interruptions: first in 1997 due to the Asian financial crisis, and second in 2015 because of the Bangkok bombing. The highest corporate income tax rate was 35% between 1980 and 1981. It was gradually reduced from 35% to 30% in 1982. In 2012, the rate stood at 23%, and the statutory tax rate for corporations has been 20% of net profits since 2013. However, the rates may be less than the statutory tax rate if companies are qualified to receive tax incentives (i.e., tax holidays).

2

Figure 1.1: Inward FDI stocks and corporate tax rate in Thailand from 1980 to 2020
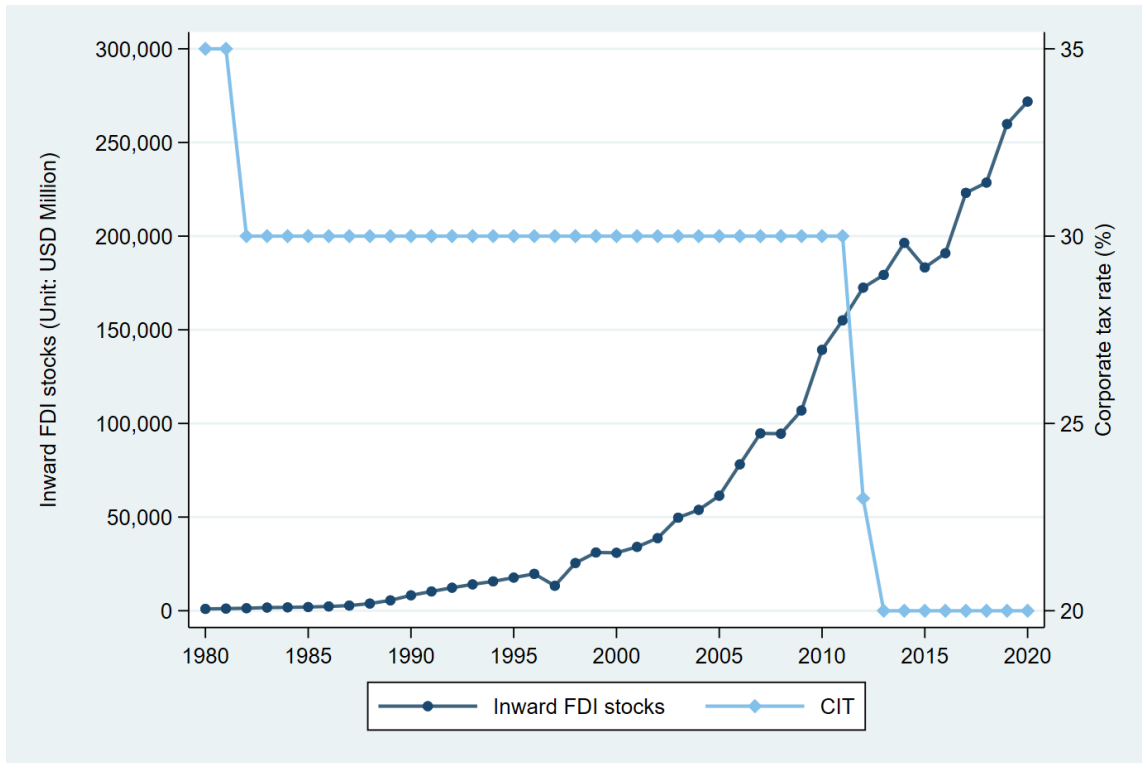
General Business Taxation in Thailand

In Thailand, business tax, also called corporate income tax (CIT) is a direct tax levied on both Thai and foreign companies. A Thai company means a company incorporated under the law of Thailand. The Thai company is subject to tax in Thailand on its worldwide net profits at the end of each accounting period. A foreign company means a company incorporated under foreign law. Generally, a foreign company is treated as carrying on business in Thailand if it has an office, a branch or any other place of business in Thailand, or has an employee, agent and representative or go-between carrying on business in the country. There are two types of CIT for a foreign company, as follows:

(i) A foreign company carrying on business in Thailand is subject to CIT only for net profit arising from or in consequence of business carried out in Thailand, at the end of each accounting period;

(ii) A foreign company, not carrying out business in Thailand but deriving certain types of income (i.e., service fees, interest, dividends, rents, professional fees) is subject to CIT on the gross amount received. It is collected in the form of withholding tax, by which the payer of income deducts the tax from the income at the rate of 10% of dividends and 15% of other income.

Foreign companies can pay tax rates less than normal tax rates if they are exempted or reduced under a tax treaty. CIT tax rates are not the foreign companies' only tax liability - there may also be withholding taxes and a branch profits remittance tax. Moreover, the company may be required to register for value added tax (VAT) purposes if their sale of goods and services is above 1.8 million Thai baht (approximately USD 51,090)[1] per year. Also, the specific business tax applies to certain business transactions, such as banking business, interest on loans and sales of immovable assets. Stamp duty is levied on certain contracts or instruments.

1.2 Motivation

CIT plays a vital role in the Thai tax system. Figure 1.2 depicts five taxes as shares of total tax revenue and the share of CIT in the GDP revenue of Thailand from 1990 to 2020. The ratio of CIT revenue to total tax revenue has been as large as the ratio of VAT revenue, which is an indirect tax, to total tax revenue. However, CIT revenue as a share of GDP reached a peak of 5.08% in 2011 and decreased to approximately 3.8%

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[1]The currency conversion is based on the rate in June 2022 (35.23 Thai baht/USD).

in 2020. A major concern is that several tax incentives have been granted to attract FDI in the hope of stimulating economic growth. However, there is limited empirical evidence on the effects of tax incentives on inward FDI and the performance of inward FDI in the presence of economic sectors in the Thai economy.

Figure 1.2: Tax revenue and the ratio of corporate tax revenue to GDP between 1990 and 2020
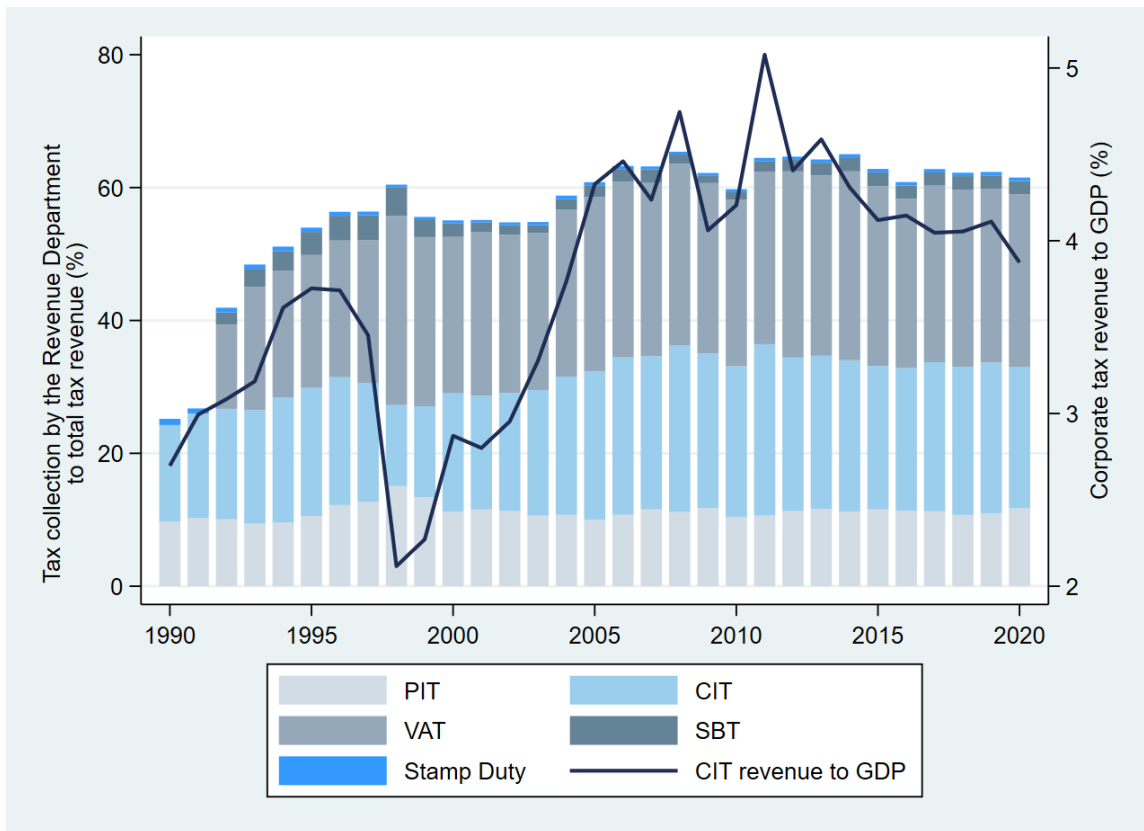
Notes: Figure 1.2 shows that CIT was relatively low during the Asian financial crisis of 1998. The ratio of corporate tax revenue to total tax revenue reached a peak of 25.80% in 2011 and decreased to approximately 21.20% in 2020. In addition, the ratio of corporate tax revenue to GDP in Thailand dramatically decreased from 5.08% in 2011 to 3.87% in 2020. Source: World Development Indicators Database and the Revenue Department of Thailand

Thailand grants generous tax incentives to encourage FDI, but the effectiveness of tax incentives may be limited. The use of tax incentives is a domestic policy that

reduces taxes on foreign corporations only in Thailand. Once income is repatriated, the foreign corporation must pay taxes on foreign income in its home country. As a result, the developing country's forgone tax revenue is thus transferred to the treasury of the company's home country when it pays its annual income tax. Tax sparing agreements should also be investigated to determine whether they effectively promote economic development. Thus, this thesis deals with tax policy, FDI inflows and economic growth. These three phenomena are linked in a causal chain as shown in Figure 1.3.

Figure 1.3: The causal chain

| Tax Policy
 •**Tax Sparing**
 •**Tax Incentives** | → | **Inward FDI**
 In the hope to stimulate economic growth | → | **Economic Growth** |
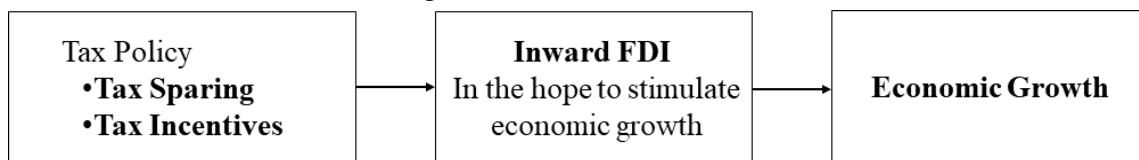
Source: Author's construction

1.2.1   Tax Sparing Agreement and FDI

A tax sparing agreement is a clause under a bilateral tax treaty between the source (host) and home country. The purpose of tax sparing is to promote economic development by ensuring that local tax incentives, used by the host country to attract FDI, are not nullified by the home country's tax system. Under tax sparing, the home country permits the resident company to receive benefit from the host country's fiscal grants by allowing a credit of foreign taxes that have been 'spared', that is, not actually paid in the host country.

The effect of tax sparing agreements on FDI activity has been largely ignored by the literature. As a result, the empirical evidence on this effect is very limited and suggests that a tax sparing agreement is found to be an effective measure in attracting foreign firms FDI (Hines, 1998; Azémar et al., 2007; Azémar and Dharmapala, 2019).

6

Additionally, there are two tax systems to impose tax on foreign income in the home country: worldwide and territorial tax systems. The worldwide tax system imposes tax on foreign income from both passive and active income, but only if foreign active income is repatriated to the home country in the form of dividends, while the territorial tax system only taxes passive income. Azémar and Delios (2007) investigate this effect using Japan to represent the worldwide tax system and France representing the territorial tax system. They find tax sparing has a favourable impact on Japanese firms in terms of location choice, while it has no influence on the French firms. In contrast to the work of Azémar and Dharmapala (2019), the results suggest that tax sparing has the same effect between worldwide and territorial tax systems when they used a sample of bilateral FDI stocks from 23 OECD countries in 113 developing economies. Hence, the findings of this relationship are inconclusive.

In Thailand, Gesaruang (1996) emphasises that Thailand considers tax sparing as a major measure for promoting economic development. As of now, Thailand has 61 bilateral tax treaties with 29 developed and 32 developing countries and 53 out of 61 countries concluded treaties with a tax sparing provision. I find that tax sparing agreements are heterogeneous according to the period of tax sparing relief. Some tax sparing provisions are for an unlimited period, mostly in bilateral tax treaties with developing countries. Some indication of a period of tax sparing provision - a sunset clause - is commonly found in bilateral tax treaties with developed countries. In addition, the effects of tax sparing on FDI from developing economies has not been examined thoroughly in previous related work, and there are no results to show whether tax sparing effects differ across tax systems.

1.2.2 Tax Incentives and FDI

After mentioning the relevance of tax sparing agreements to inward FDI, I would like to emphasise why this thesis deals with the use of tax incentives for promoting economic development in developing countries, particularly Thailand.

Developing countries often adopt fiscal incentives to attract inward FDI through multinational enterprises (MNEs) and achieve their development goals. However, the desire to attract MNEs intensifies tax competition among countries, leading to a decrease in corporate taxes over time that is not always compensated by an increase in the tax base. For instance, the ratio of corporate tax revenue to GDP in some developing countries is continuously decreasing. In the case of Thailand, as illustrated in Figure 1.2, the ratio of corporate tax revenue to GDP declined by 1.21%, from 5.08% in 2011 to 3.87% in 2020.

Additionally, the 141 member jurisdictions of the Inclusive Framework on Base Erosion and Profit Shifting (BEPS) have agreed to adopt a global minimum tax rate of 15% on corporate profits, ensuring that MNEs pay a minimum amount of tax no matter their location. This historical agreement would make the use of fiscal policy as a direct instrument of attractiveness ineffective. Thus, it is important to assess the role of tax incentives in developing countries to anticipate how these policies will affect their attractiveness.

In standard economic theory, tax incentives are expected to boost investment by increasing the amount of after-tax profit earned on new investments and existing capital stock. The effect is less clear on an empirical level as firms could benefit from a tax incentive for an investment which would have taken place anyway. One certainty is that these incentives create fiscal losses from the non-collection of taxes. For instance, in

Thailand, statistics in the National Budget report that tax revenue losses associated with the incentives granted by the Board of Investment (BOI) accounted for 1.51% of GDP in 2014 and 1.63% of GDP in 2015.

Based on previous evidence, the analysis of the effects of tax incentives on FDI generates mixed results. Reports based on a questionnaire sent to MNEs indicate that tax incentives are redundant as investment would have occurred even in the absence of these incentives (James, 2009; IMF, OECD, UN and World Bank, 2015; World Bank, 2018), and empirical analyses estimating the response of FDI to tax incentives in developing countries tend to find a positive effect (Klemm and Van Parys, 2012; Azémar and Dharmapala, 2019). Thus, this thesis aims to investigate the effect of tax incentives on the behaviours of MNEs in Thailand and compare the responses of MNEs and domestic firms to these incentives.

1.2.3 FDI and Economic Growth

Thailand grants several tax incentives to attract FDI in the hope of stimulating economic growth. However, the results are inconclusive as to whether FDI enhances output growth in Thailand. Answers to this question should yield new insight for economic development policy in Thailand.

The effect of FDI on economic growth has been extensively analysed in the literature. However, the findings of one study alone cannot indicate the existence of universal effects. Baldwin and Winters (2004) highlight that the effects of FDI differ based on time period, the country's characteristics and the country's residents. Similarly, Crespo and Fontoura (2007) confirm that not all forms of FDI contribute equally to output growth. Thus, this thesis focuses on the specific country of Thailand.

Nevertheless, measuring the impact of FDI on growth using an aggregate FDI could blur the actual growth effect if the different sectors of FDI contribute differently to economic growth. A large number of studies have assumed that FDI in different sectors has the same impact on a host country's economic growth by indicating the value of total inward FDI as an FDI measurement variable FDI. In contrast, Alfaro (2003), Massoud (2008) and Wang (2009) find FDI in different sectors generate different effects to economic growth. Furthermore, most studies on the effect of FDI on output growth have focused on situations in which advanced countries are the source of FDI, as it is typically these countries that make significant investments abroad. However, outward FDI by firms from developing countries has increased dramatically in recent years and accounted for nearly one-fifth of global FDI flow in 2015, from just 4% in 1995 (Perea and Stephenson, 2017). Until recently, there has been no evidence on the effects of FDI from developed and developing countries on the different sectors of the Thai economy.

1.3   Contributions of the Thesis

This thesis contributes to the literature by providing new findings on the effects of tax policy on inward FDI in Thailand. It also investigates whether FDI contributes to economic growth in Thailand. The aim of this thesis is to generate a clear vision of the influence of tax policies on inward FDI and how FDI affects the growth of the Thai economy.

Chapter two represents the first empirical chapter of the thesis and examines the impact of tax sparing agreements on inward FDI. The aim of this chapter is to investigate whether tax sparing is effective in attracting FDI in Thailand. Based on my experience, Thai tax negotiators put significant effort into convincing country partners to conclude

tax treaties with a tax sparing agreement because Thailand uses tax sparing agreements to promote economic development. However, there is no evidence to support the notion that tax sparing agreements encourage inward FDI in the case of Thailand. To investigate the effects of tax sparing on inward FDI, I use a sample of bilateral FDI from 178 investor jurisdictions in Thailand from 2001 to 2017 and use the Poisson pseudo maximum likelihood estimator (PPML) to capture all observations, including zero FDI inbound stock during the sample period of 2001-2017.

In addition, the first empirical chapter also concerns differences in the effects of tax sparing on inward FDI stock between developed and developing countries, in both worldwide and territorial tax systems. The effects of tax sparing on FDI from developing economies has not been thoroughly examined in previous related work, and there are no identical results to show whether tax sparing effects differ across tax systems. Answers to these questions should yield new insight into international tax policy in Thailand.

Chapter three reveals the second empirical chapter of the thesis, which covers the topic of whether Thailand should phase out tax incentives for investment. To shed some light on the costs and benefits of tax incentives, this chapter assesses the effect of tax incentives granted by the Thai Board of Investment (BOI), particularly tax holidays, on investment and innovation in Thailand between 2009 and 2015. This chapter uses administrative data on BOI promoted companies and control for a battery of fixed effects at the firm level, time level and with sector-year fixed effects to limit potential omitted variable bias.

To fill the gap in the literature, this chapter also distinguishes between the MNEs which benefit from a tax sparing agreement included in a bilateral tax treaty signed between

Thailand and their home country and other MNEs for which the tax benefits received in Thailand are not preserved at home under a bilateral convention. It also compares whether MNEs and domestic firms respond to tax incentives differently.

Chapter four represents the third empirical chapter of the thesis and assesses the impact of FDI on the Thai economy. This chapter attempts to reconcile the inconclusive evidence of the impact of FDI on growth in Thailand by considering the heterogeneity of economic sectors and investors' home countries. In particular, it investigates the effects of FDI on output growth by using yearly-disaggregated FDI data for 10 sectors from 2005 to 2018. I apply a standard fixed effect as the benchmark estimator. However, there are some potential problems with fixed effects, namely cross-sectional dependence, dynamic panel bias and reverse causality. Therefore, the analysis in this chapter uses difference estimators to capture these potential problems. The findings are useful for helping policy makers focus on target sectors where inward FDI promotes economic growth. Governments, especially in developing countries, grant fiscal incentives without realising the actual growth effects of such incentives; as a result, the tax expenses incurred by granting tax incentives may be greater than the benefits that a country gains from FDI.

The third empirical chapter also examines the heterogeneous sectoral growth impacts of FDI from 33 developed and 15 developing countries in Thailand. To my knowledge, this is the first empirical study to examine the heterogeneous sectoral growth impacts of FDI from developed and developing countries in Thailand. The inclusion of FDI source countries' levels of economic development contributes to the level of technological development of the host countries. Once host countries understand these effects, policy makers can create appropriate policies that generate the maximum benefit from FDI.

1.4 Structure of the Thesis

To achieve its aim and examine its arguments, this thesis includes five chapters. **Chapter one** is an introductory chapter. **Chapter two** investigates the effect of tax sparing agreements on inward FDI in Thailand. This chapter also provides an overview of tax sparing agreements, the advantage of the two tax systems and information on tax sparing agreements in Thailand. **Chapter three** is exclusively devoted to an assessment of the effects of tax incentives on inward FDI. This chapter also explores whether the responsiveness to tax incentives differs between MNEs and domestic firms. **Chapter four** addresses the effect of FDI on economic growth by considering the heterogeneity among economic sectors and levels of economic development in investors' home countries. Finally, **chapter five** concludes the thesis by summarising key findings and highlighting policy implications, limitations of the study and recommendations for further study.

Tax Sparing Agreements and FDI Nexus

2.1 Introduction

Attracting foreign direct investment (FDI) is an important policy goal for all countries. Developing countries often offer tax holidays to attract foreign direct investment in the country. Under tax holiday benefits, the multinational enterprises (MNEs) are not required to pay corporate income tax for a specified time period. However, the use of tax holidays is a local tax policy of the developing country. Once MNEs repatriate foreign income to the parent company, the parent company has a duty to pay taxes to the tax authority in the country where the parent company is located (i.e., the home country). The developing country's forgone tax revenue is thus transferred to the home country's treasury when the resident company pays its annual income tax at home.

Under the article of 'Elimination of double taxation' in bilateral tax treaties is a phenomenon called tax sparing, which connects a local tax incentive policy to an international tax practice. A tax sparing provision is a clause under a bilateral tax treaty between the source (host) and home country. The purpose of tax sparing is to promote economic development by ensuring that local tax incentives, used by the host country to attract FDI, are not nullified by the home country's tax system. Under tax sparing, the home country permits the resident company to receive benefit from the host country's fiscal grants by allowing a credit of foreign taxes that have been 'spared', that is, not actually paid in the host country.

In general, there are two tax systems to impose tax on foreign income in the home country: worldwide and territorial tax systems. The worldwide tax system imposes tax on foreign income from both passive and active income, but only if foreign active income is repatriated to the home country in the form of dividends, while the territorial tax system only taxes passive income. Thus, worldwide and territorial investors do not benefit from the same advantages provided by the tax sparing provision.

Tax sparing is not a new practice in terms of international tax policy, but the evidence on the effect of tax sparing on FDI is limited. Relevant earlier studies deal exclusively with tax sparing relief responsiveness on bilateral FDI between Organisation for Economic Co-operation and Development (OECD) or European Union countries and developing counties. Most of the studies confirm that the value of FDI stocks from tax sparing countries is higher than non-tax sparing countries. Indeed, FDI does not only come from developed countries, but also from developing countries. In Thailand, 86% of the FDI comes from developed regions, and 14% is from developing countries.[1] An estimate of the effects of tax sparing on FDI across countries should therefore be taken into account.

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[1]The information is from author's dataset.

Motivated by the potential importance of tax sparing on inward FDI stock in Thailand, the study presented in this chapter extends the study by Azémar and Dharmapala (2019) and offers two main contributions. First, it attempts to analyse the effects of tax sparing on inward FDI stock in Thailand by using a sample of investors from both developed and developing countries. Second, it investigates whether this effect differs across levels of economic development and tax systems in investors' home countries. The analysis and conclusion contained in this chapter could be useful to tax negotiators and policy makers in Thailand and other developing countries in designing tax sparing agreements that are more effective and efficient.

The first contribution offered by this chapter concerns the tax sparing effects on inward FDI stock from 178 investor countries in Thailand over the period 2001 to 2017. In this study's dataset, zero inward FDI stock is about 36% because some countries did not invest every year of the period of analysis. In order to avoid econometric issues, I address this problem using the Poisson pseudo maximum likelihood (PPML) with fixed effects estimator. To investigate the effects of tax sparing agreements on FDI, I code tax sparing agreements with a dummy variable by searching tax sparing clauses in all 60 bilateral tax treaties that Thailand has.[2] Nineteen jurisdictions signed tax sparing agreements during my study period. However, I find that tax sparing agreements are heterogeneous according to the period of tax sparing relief. The heterogeneity of tax sparing will be tested using exactly the same method as the main effect.

The second contribution offered by this chapter concerns differences in the effects of tax sparing on inward FDI stock between developed and developing countries, in both worldwide and territorial tax systems. The effects of tax sparing on FDI from developing economies has not been examined thoroughly in previous related work, and there are no

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[2]Thailand had 60 bilateral tax treaties in 2017, corresponding to the final year of the period of analysis.

identical results to show whether tax sparing effects differ across tax systems. Answers to these questions should yield new insight for international tax policy in Thailand.

The reminder of this chapter is organised as follows. Section 2 gives brief background information and empirical evidence on the effect of tax sparing provisions on FDI. Section 3 presents an overview of tax sparing provisions in Thailand. Section 4 introduces the empirical methodology and data. Section 5 presents empirical findings. Section 6, the conclusion, gives a brief summary and critique of the findings.

2.2   An Overview of Tax Sparing Agreements

Developing countries often offer tax incentives to encourage FDI, but the effectiveness of tax incentives may be limited. This is because the use of tax incentives is a domestic policy and has the effect of reducing the host country's tax on a foreign corporation in the host country. Once income is repatriated, the foreign corporation must pay taxes on foreign income in the home country.

In order to use tax incentives more effectively, developing countries have been trying to convince developed countries to permit foreign tax relief to their residents, not only on foreign taxes that have been paid, but also on taxes that are spared by the host country. 'Spared' in this context means the amount of taxes that foreign corporations do not have to pay the host country because of tax incentives – that is, the foreign corporation is given a foreign tax credit in the home country from tax not paid in the host country.

This situation creates income from cross-border transactions. The simplified cross-border transactions consist of two levels of tax impacts, as follows:

(i) Source or host country is a location where taxes are payable on income earned through overseas subsidiaries or branches and the withholding tax on the payments made by them;

(ii) Residence or home country is a location where taxes are payable on profits and capital received at home - and sometimes even if not received - from the entities in the other countries.

2.2.1   History

A tax sparing provision is not a new concept. It appeared for the first time in the bilateral tax treaty between the United States and Pakistan at the United States (U.S.) Senate hearings in 1957. However, the U.S. Senate rejected the tax sparing provision in the treaty and refused to ratify this tax treaty because of it (OECD, 1998). This treaty with tax sparing provision, therefore, was not legalised.

Surrey (1958) describes several serious objections to this treaty proposal. First, the proposed tax treaty with tax sparing went against the U.S. Congress standard. Shortly before proposing this treaty, the U.S. Treasury Department proposed to reduce the corporate tax rate of foreign income from 52% to 38%, and Congress did not approve. After that, there were similar proposals to reduce corporate tax rate on foreign incomes, none of which were approved. The U.S. Congress therefore has a tax policy standard against granting any preferential corporate tax rate on foreign income. Since tax sparing can reduce the effective tax rate on foreign income to zero, Congress has definitely not given approval to this treaty. Second, the U.S. was concerned that tax sparing would reduce the tax rate of the U.S. overseas investor compared to a domestic investor, and this goes against the principle of tax-burden equality. Third, tax sparing was seen as harmful to the U.S. tax policy, as the U.S. effective tax rate would be determined by foreign

governments. Foreign governments create tax policy for the domestic market, but this has an effect to the U.S. treasury because tax sparing allows American corporations credit for tax spared in the foreign countries. Fourth, tax sparing would discriminate among American corporations; a country that has a tax sparing agreement with the U.S. would appear to be more attractive than those without one, even if the tax concession provided in both countries was the same. Fifth, American corporations might quickly repatriate foreign profits rather than reinvest in the developing country.

The first international partners to officially include tax sparing provision in their treaties were Germany and India, who signed such an agreement on 18 March 1959. Developed countries, with the exception of the U.S., have granted tax sparing to developing countries in treaties for several reasons. For example, the Japanese government explained that they granted tax sparing in order to maintain the ability of developing countries to use tax incentives to attract foreign investors (Hines, 1998). Nevertheless, tax sparing is a bargaining tool. Some developing countries refuse to conclude tax treaties without tax sparing provision. Many developed countries have to accept tax treaties that include tax sparing provision in order to have treaties with developing countries. One reason developed countries want to obtain such treaties is that the treaties can reduce tax administration costs and help avoid tax evasion through the exchange of taxpayers' information (Dagan, 2000).

However, developed countries are often forced to include tax sparing in the treaty. Most of them indicate the usage of tax sparing with limitations. Tax sparing with time limitations is an option for the home country that is not sure whether to grant tax sparing. This approach limits the application of tax sparing benefits to a specified number of years. This term is commonly called 'the sunset' clause. The sunset clause did not appear in many of the earlier treaties, but became very popular in the mid-1980s.

After that, a large number of the tax treaties between developed and developing countries indicate a specified period of tax sparing relief. The treaty between Canada and Thailand (1984), for example, provides tax sparing credit to Canadian companies that raise income in Thailand for ten years from the date the tax treaty is effective, and no more. In the early days, tax sparing appeared only in bilateral tax treaties between developed and developing countries. Currently, it is also popular between developing countries.

2.2.2 Basic Provisions

Tax sparing is a term that describes a tax concession that foreign countries grant to certain activities to encourage those activities, and the home countries allow resident investors who locate their investment in the foreign countries to claim the tax credit that would have been paid abroad. Tax sparing is a policy behind the credit method. It can create a more favourable investment environment in the host countries with respect to taxation.

The objective of tax sparing is to preserve the tax incentives granted by one jurisdiction (a host country) by requiring another jurisdiction (a home country) to grant a tax credit for the taxes that would have been paid in the host country. This tax credit relief allows firms to enjoy tax concessions from the tax incentives in the host country by reducing the amount of tax due in their home country. It can be said that the home country loses revenue by granting tax sparing to the host country, while the host country would gain from tax sparing, as it could makes their tax incentives more attractive to foreign investors.

For this reason, tax sparing commonly appears in developing countries (host country) in order to promote economic development, because they often offer tax incentives,

while developed countries (home country) are generally eager to promote economic development in the developing country (Hines, 1998). Without tax sparing and with normal credit applied, no tax benefit remains, as the spared amount is transferred to the treasury of the home country. The host country's tax revenue forgone from its domestic tax incentives is transferred to the home country's treasury when foreign investors pay their annual income tax at home.

In addition, Gesaruang (1996) states that under the 1992 OECD Model Tax Convention, there is no mention of tax sparing, which Thailand considers a main measure to promote economic development. He also emphasises that many non-OECD Member countries are unhappy when they grant tax incentives to investors from developed countries and then find the taxes are collected by those resident countries. They believe the developed country's treasury is being enriched at the developing country's expense.

From the perspective of developed countries, OECD (1998) claims that they were initially more reluctant to include tax sparing in the treaty in 1990s, for various reasons. First, the primary objective for granting tax sparing is to promote economic development. Some developing countries in the 1960s have now reached an economic level equivalent to or better than some OECD member countries and may not need the assistance of tax sparing. Second, the cost of a tax sparing agreement is hard to assess for developed countries (home country) when there are no limits on the amount of tax sparing provided. Third, a number of tax incentives in developing countries are growing as distortive and inappropriate tools, whereas developed countries avoid creating this kind of tax incentive policy and widen their income tax base by a reduction of tax rates.

2.2.3   Tax Systems

Before moving to the example of tax sparing, an understanding of tax systems provides important context. The benefits derived by MNEs from tax sparing differ depending on tax systems.

The 1992 OECD Model Tax Convention recommends two methods of eliminating double taxation on foreign income: exemption and credit methods. These methods correspond to two tax systems. Countries generally have two distinct types of tax systems for the treatment of foreign income: a territorial tax system and a worldwide tax system. No country employs pure worldwide or territorial tax systems (Graetz, 2003), but every country has at least some features of these different systems of international taxation.

Territorial Tax System

The territorial tax system, or is often referred to as the 'exemption tax system' tends to be implemented by developed countries, including the Netherlands, France and Belgium. It is the first and oldest system that provides theoretical solution for eliminating international double taxation of income by imposing taxation in only one jurisdiction - a source-based tax (Barker, 2007). The source of income is associated with physical presence, where income is created within the territory of a state. This system only imposes tax on the income derived within the country, irrespective of the residence of the taxpayer, together with foreign income earned regularly with little or no effort on the part of the person receiving it, which is called passive income and includes interest and royalties. However, foreign profits made by a domestic company's operation abroad are not subject to the home country's corporate tax, even if dividends are repatriated to the parent company. This system exempts all foreign active income from tax in the home country, and covers passive income received from abroad.

Foreign profits of territorial investors are thus taxed only in the host country and are exempted from taxation in the home country of the parent company. This means that foreign profits are only taxed in the country where the subsidiary is located. For passive income, this system permits the parent company credits for the withheld taxes paid abroad by its subsidiary, up to the value of the home tax liability, to avoid double taxation.

Worldwide Tax System

The worldwide tax system, or is often called the 'credit tax system', is a residence-based tax. This system is commonly used in developing countries. The worldwide income (foreign active and passive income alike) of resident individuals and entities is taxable at the home country tax rate, regardless of where the income is derived. This means that all residents pay the same tax, no matter where their income is earned. This system creates double taxation circumstances when the foreign income is taxed twice, which is unfair to taxpayers. In order to address this, the home country allows a tax credit for the foreign tax paid, or a deduction for foreign taxes paid. The international practice of this system is to allow a foreign tax credit.

However, the credit is usually limited to the tax that would have been paid had the income been earned in the home country. For example, the host tax rate is higher than the home tax rate, the MNE finds itself with excess foreign tax credits, because foreign taxes paid exceed the home country tax liabilities. In this case, after-tax profits would be the same as in the territorial tax system. In the U.S., the government permits taxpayers to use excess foreign tax credits in either two previous years or within next five years (Hines, 1999). On the other hand, taxpayers have to pay extra until they meet the value of the home tax liability if the host tax rate is lower than the home tax rate. This situation is known as 'deficit foreign tax credits'.

The worldwide tax system imposes foreign profits when the foreign profits are repatriated to the home country in the form of a dividend. U.S. tax legislation includes tax deferral for U.S. residents - profits from foreign affiliates that are reinvested in the host country are deferred until they are repatriated to the parent company through dividend payments. Once the dividends are repatriated, the parent company is subject to pay corporate income tax in the home county. However, the U.S. has no longer used the worldwide tax system since 2018.

These tax systems could generate different effects on FDI regarding tax sparing agreements. This is because investors from territorial tax system pay taxes only on foreign passive income, whereas investors from worldwide tax system involve taxes on foreign active and passive income. Correspondingly, Azémar and Delios (2007) investigate the effect of tax sparing on FDI across tax systems. They use Japanese MNEs as a worldwide investor, and French MNEs as a territorial investor. They find that Japanese MNEs locate their investment in countries with which the Japanese government has signed a tax sparing provision, more than in countries where there is no tax sparing provision. However, tax sparing provision has no influence on the location decisions of French firms. The benefits of tax sparing agreements to these tax systems is explained in Section 2.2.4 *The Advantage of Tax Sparing: Example*.

2.2.4   The Advantage of Tax Sparing: Example

In order to avoid double taxation on foreign income, there are two tax systems for the treatment of foreign income, as mentioned in Section 2.2.3 *Tax Systems*. Table 2.1 shows a simplified example of a tax calculation on passive income - royalties and interests. This table illustrates the advantage of tax sparing provision, which can be an

influential determinant to foreign location choice regarding taxation. Table 2.2 presents two simplified examples that illustrate the benefits of tax sparing between worldwide and territorial tax systems on foreign active income when dividend is repatriated. Both tables display examples of two tax differentials cases, when the Thai tax rate is lower than the home country tax rate in case I, and when the Thai tax rate is higher than the home country tax rate in case II.

Table 2.1: Territorial and worldwide tax system calculation - foreign passive income

Host country- Thailand	(1) With tax holiday	(2) Without tax holiday
Passive income (royalties, interest)	100	100
Withholding tax on passive income (15%)	0	15
Total tax paid in Thailand	0	15

Case I : Home country	(1.1) With tax holiday (TS)	(1.2) With tax holiday (no TS)	(2) Without tax holiday
Passive income received from Thailand	100	100	85
Gross passive income	100	100	100
Corporate tax (40%)	40	40	40
Creditable foreign tax	15	0	15
Net tax paid in home country	25	40	25

Thailand tax	0	0	15
Home country tax	25	40	25
Net passive income	75	60	60

Case II : Home country	(1.1) With tax holiday (TS)	(1.2) With tax holiday (no TS)	(2) Without tax holiday
Passive income received from Thailand	100	100	85
Gross passive income	100	100	100
Corporate tax (10%)	10	10	10
Creditable foreign tax	15	0	15
Net tax paid in home country	0	10	0

Thailand tax	0	0	15
Home country tax	0	10	0
Net passive income	100	90	85

Source : Formatted by OECD (2001) and Azémar and Dharmapala (2019), author's calculation

Table 2.2: Territorial and worldwide tax system calculation - foreign active income

Host country- Thailand	(1) With tax holiday	(2) Without tax holiday
Gross profits	100	100
Corporate tax (20%)	0	20
After-tax profits	100	80
Dividend	100	80
Withholding taxes on dividend (10%)	0	8
Total tax paid in Thailand	0	28

Case I : Home country	Tax system				
	(1.1) Territorial	(1.2) Worldwide with TS	(1.3) Worldwide without TS	(2.1) Territorial	(2.2) Worldwide
Income received from Thailand (Dividend)	100	100	100	72	72
Gross profit of dividend	0	100	100	0	100
Corporate tax (40%)	0	40	40	0	40
Creditable foreign tax	0	28	0	0	28
Net corporate tax	0	12	40	0	12

Thailand tax	0	0	0	28	28
Home country tax	0	12	40	0	12
After-tax profits	100	88	60	72	60

Case II : Home country	Tax system				
	(1.1) Territorial	(1.2) Worldwide with TS	(1.3) Worldwide without TS	(2.1) Territorial	(2.2) Worldwide
Income received from Thailand (Dividend)	100	100	100	72	72
Gross profit of dividend	0	100	100	0	100
Corporate tax (20%)	0	20	20	0	20
Creditable foreign tax	0	28	0	0	28
Net corporate tax	0	0	20	0	0

Thailand tax	0	0	0	28	28
Home country tax	0	0	20	0	0
After-tax profits	100	100	80	72	72

Source : Formatted by OECD (2001) and Azémar and Dharmapala (2019), author's calculation

Table 2.1

A parent company receives interest at 100 from its foreign subsidiary in Thailand. The Thai withholding tax rate of interests and royalties is 15%. This table includes two cases illustrating the tax rate differentials. Case I indicates that the home country statutory corporate tax rate is 40%, which is higher than the withholding tax rate in Thailand; and in case II the home country statutory corporate tax rate is 10%, which is lower than the withholding tax rate in Thailand.

The top of this table compares passive income tax paid in Thailand with regard to a tax holiday. With a tax holiday in Thailand, the subsidiary has tax benefits from paying passive income at zero tax withheld. If a tax holiday is not applied in Thailand, the subsidiary withholds tax of passive income payment at 15.

Regarding the home country tax calculation, there are three columns to explain three circumstances. The first column shows the tax calculation when Thailand provides a tax holiday and is granted tax sparing from the home country. The second column presents the tax calculation when Thailand grants a tax holiday but tax sparing is not applied. The last column illustrates the tax calculation when there is no tax holiday policy in Thailand, so no tax sparing is applied in this case. It is unnecessary to display the calculation from two tax systems of home countries in this table, because passive income accounts for taxable income in both systems.

In case I, the home country corporate tax rate is higher than the Thai withholding tax rate. In this case, the foreign tax payments on passive income are smaller than the value of the home tax liability. In column (1.1), the subsidiary benefits from tax holiday and the home country permits the resident company to claim tax 'spared' from Thailand. It implies

that the parent company has withheld tax at 15 as tax spared in the pocket. As a result, the company has tax liability in the home country at 25. This company therefore receives net passive income at 75. However, even if tax holiday is applied in column (1.2), but there is no tax sparing agreement, the tax benefits of the foreign company received from the Thai authorities is cancelled by income tax in the home country. Thus, in columns (1.2) and (2) the company pays the same amount of net passive income.

Case II indicates that the home country corporate tax rate is less than the withholding tax rate in Thailand. In this case, the company's foreign tax payment exceeds the home country tax liability. In column (1.1), the subsidiary paid zero withholding tax in Thailand, because of tax holiday. If tax sparing has been granted by the home country, the parent company can claim the full foreign tax credit that would have been paid in Thailand. Finally, the company has zero tax paid in both countries, and net passive income is 100.

Case II in column (1.2) displays the advantage of tax holiday when tax sparing is not applied. The subsidiary paid zero tax in Thailand, but the company has tax liability in the home country at 10 (100x10%). As a result, the net passive income is 90, which is smaller than when tax sparing is applied.

Case II in column (2) demonstrates the circumstance when the company receives the least net passive income at 85. This is because in this case no tax holiday and no tax sparing are applied. The subsidiary has tax liability to withhold tax on passive income payment in Thailand at 15, whereas the company is eligible to claim a foreign tax credit up to the value of the home country tax liability, which is 10.

Regarding tax rate differentials, the two simplified tax calculations on foreign passive income illustrate the benefit of a tax sparing agreement as shown in Table 2.1. However,

the question arises as to whether these results will have the same effect on foreign active income. The answer is shown in Table 2.2.

Table 2.2

This table shows a simplified example of a tax calculation on foreign active income. In general, there are two schemes to deal with foreign active income, as mentioned in Section 2.2.3 *Tax Systems*. This table illustrates the benefits of tax sparing on foreign active income between two tax systems.

The top of the table shows the host country tax calculation on active income regarding tax holiday. In this case, the subsidiary has gross profits at 100. In Thailand, the corporate tax rate is 20%, and withholding tax on dividend is 10%. Therefore, the effective tax rate is 28%. From the gross profits at 100, the subsidiary saves tax paid by 28 when tax holiday is applied on both profits and dividend payment in Thailand.

There are five columns in this table. The first three demonstrate the tax calculation when Thailand provides tax holiday. The next two columns display the tax calculation when no tax holiday is applied. This table presents the tax calculation on foreign active income, then tax systems should be taken into account for comparing the value of after-tax profits.

Under the territorial tax system, the parent company has no tax liability on repatriated foreign profits in the form of dividends in the home country. Hence, profits are only taxed in the host country where the subsidiary is located. Therefore, the corporate tax rate of the home country does not matter to the parent company, as illustrated by the fact that there is no difference between case I and case II. The important detail is that tax holiday policy

29

applies in the host country. As can be seen in columns (1.1) and (2.1), after-tax profits of the company where tax holiday is provided are at 100, while the after-tax profits of the company when no tax holiday is applied are just 72.

Under the worldwide tax system, the parent company is taxed on a worldwide basis in the home country so that the home country tax does matter. Case I illustrates a situation where the home country corporate tax rate is higher than the host country corporate tax rate. It indicates that the company is permitted to claim foreign tax credit, its foreign tax payment will be smaller than the home country tax liabilities on foreign income. Even if there is a tax holiday in Thailand and tax sparing is applied, in column (1.2), the company has to pay taxes at the amount of tax differential between the home and host countries' tax rate. The parent company receives after-tax profits at 88. In case if no tax sparing agreement is applied, the net profits are the same regardless of whether there is a tax holiday in Thailand. As shown in columns (1.3) and (2.2), both cases receive after-tax profits at 60.

The after-tax profits of case II differ from case I. Case II displays the home corporate tax rate lower than the host tax rate.[3] Where foreign tax payments exceed the tax liability in the home country of the parent company, there is an excess foreign tax credit. In that case, the subsidiary is permitted to claim no more tax credit than the home tax liability; the same effect is seen with the territorial tax system. In respect to the tax holiday, the worldwide tax system with tax sparing has the same after-tax profits as the territorial tax system, at 100. This is because the subsidiary benefits from a tax holiday in Thailand by paying zero tax, and can claim for tax spared (at 20) in the home country. In case of a tax holiday without tax sparing, in column (1.3), the subsidiary tax benefit received from Thailand is cancelled by the home country tax. It means that the parent company pays

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[3]The host tax rate means the sum of corporate tax rate on profits and withholding tax rate on dividends.

taxes at the home tax liability, with zero foreign tax credit. As a result, the after-tax profit in this case is at 80.

Based on this comparison, tax sparing has more influence on the location choice of worldwide investors than territorial investors. This is because the benefit of tax sparing is to preserve host country tax relief, in order to reduce the amount of home country tax imposed on the host foreign source income.

2.2.5   Empirical Evidence

The Impact of Tax Sparing on FDI

According to Single (1999), locations with tax holidays and tax sparing are more favourable for investment than tax holidays alone. However, the empirical literature on the impact of tax sparing agreements on FDI is limited. These few evidences mainly focus on the effect from developed countries in developing countries.

Based on my literature review, Hines (1998) offers the first empirical literature on the effects of tax sparing on the location and performance of foreign investment. He uses Japanese and U.S. company-level datasets as the basis for his study. In terms of econometric models, he adopts an ordinary least squares (OLS) method to analyse cross-sectional data from 67 recipient countries, with Japan granting tax sparing provision with 14 countries. Hines claims that Japan does not grant tax sparing on a random basis. Countries with whom Japan granted tax sparing have close economic or cultural ties, and are likely to receive large fractions of Japanese FDI. In contrast, the U.S. is unwilling to provide tax sparing for investment in any country. From his regression analysis, Hines points out that Japanese firms have FDI shares in countries with tax sparing agreements

31

1.4-2.4 times greater than in countries with no tax sparing. In addition, the results indicate that tax sparing encourages developing countries to provide tax incentives to foreign investors.

Azémar et al. (2007) fill the gaps in the work of Hines (1998). They claim that Hines applies recipient countries from developed and developing countries in the same sample, which can be inappropriate as the coefficients estimated are forced to be the same for both sets of countries, whereas the factors determining the location of FDI vary systematically between both groups of countries. The use of cross-sectional data also forbids the consideration of unobserved country-specific effects, which may influence the location of FDI. Thus, their studies focus on the impact of tax sparing provisions on Japanese FDI outbound to only a group of developing countries, to reduce asymmetrical factors. They use a panel data on the location decisions of Japanese MNEs in 26 developing countries between 1989 and 2000. As Hines (1998) claimed that Japan mostly grants tax sparing to countries with whom they share cultural, economic and geographical links, the authors control for these variables. The results show that the tax sparing provision increases the volume of FDI from Japanese firms 2.8 times greater in the countries with which Japan grants tax sparing provision. Importantly, their results are in line with Hines (1998), who finds that the volume of Japanese FDI is 1.4-2.4 times larger in countries with which Japan had tax sparing provisions.

Previous evidence investigate a particular country as an investor. To make this analysis more consistent, Azémar and Dharmapala (2019) collect data on bilateral FDI stocks from 23 OECD home countries in 113 recipient developing countries. They confirm that tax sparing provision is important to investors for making a foreign location decision and increases the volume of FDI from home countries by approximately 86%.

32

In addition, the effect of tax sparing can be differ on investment decisions between investors from worldwide and territorial tax systems, since the two systems do not benefit from the same advantages provided by tax sparing, as can be seen in Table 2.2. Azémar and Delios (2007) investigate this effect using Japan to represent the worldwide tax system and France representing the territorial tax system. This analysis applies both countries' outbound FDI to developing countries over the period 1990 - 2000. The results show that tax sparing has a favourable impact on Japanese firms in terms of location choice, while it has no influence on the French firms. In contrast to the work of Azémar and Dharmapala (2019), the results suggest that tax sparing has the same effect between worldwide and territorial tax systems.

Together, these studies outline that tax sparing provision has an influence on foreign investors' location decisions, from developed countries to developing countries, by indicating that the volume of FDI in the countries with tax sparing is greater than the countries without tax sparing. However, this effect across tax systems is not universally acknowledged. Moreover, investors are not only from developed countries, but are also from developing countries. There is currently no literature on this investigation.

The Impact of Bilateral Tax Treaty on FDI

When a tax sparing provision is part of the treaty, the effect of bilateral tax treaties on FDI needs to be examined. Tax treaties are mostly bilateral conventions negotiated between countries for the purpose of resolving double tax treaties that arise when two jurisdictions tax the same item of income. Questioning this, Dagan (2000) argues that bilateral tax treaties are not actually needed to eliminate double taxation, as double taxation can be eliminated unilaterally.

Many developing countries use scarce resources and invest time to enter into bilateral tax treaties with developed countries, because bilateral tax treaties signal a commitment to being a favourable investment environment, through measures such as offering a low withholding tax rate. On the other hand, the reason developed countries enter into bilateral tax treaties with developing countries is to prevent tax evasion. Baker (2014) claims that this could be a reason why MNEs do not choose to invest in a host country that has a tax treaty with their home country, thereby triggering a negative effect of bilateral tax treaties on FDI. This mechanism can be done through three channels: transfer pricing [4], exchange of information [5] and treaty shopping [6].

Most studies of the effects of bilateral tax treaties on FDI are cross-country investigations using developed countries as a home country and developing countries as a host country. The results are conflicting. The first study to demonstrate the effects of bilateral tax treaties on FDI activity was by Blonigen and Davies (2000). Their investigation uses a sample of U.S. tax treaties on outbound and inbound U.S. FDI stock over the period 1966-1992. The results highlight that bilateral tax treaties increase U.S. outbound activity, but not inbound activity. Similarly, Neumayer (2007) explores empirical evidence that bilateral tax treaties increase FDI to developing countries by using the U.S. FDI outbound stock from 1970 to 2001. He confirms that the existence of bilateral tax treaties are associated with a 22% higher FDI outbound stock. Additionally, he divides host countries to two sub-samples, to explore whether the effect of bilateral tax treaties differ from the two levels of economic development, namely low income versus

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[4]*Transfer pricing* is an ability of a contracting state to adjust the profits of an enterprise that transacted with an associated enterprise in the other state at amounts other than they would have if the enterprises were independent of one another.

[5]*Exchange of information* is a taxpayers information sharing between countries.

[6]*Treaty shopping* is a situation in which person who is not entitled to the benefits of a tax treaty use of an individual or legal person in order to obtain those treaty benefits that are not available for them directly. Entities in countries without a tax treaty or with high tax rates are able to route their funds through a country with a bilateral tax treaty specifying low withholding tax rates.

middle income countries. The results show that bilateral tax treaties have positive effects on middle income countries. For low income countries, there is no statistically significant effect.

A sample size of FDI recipient countries is also crucial to the findings of this effect. Barthel et al. (2010) use a sample of 30 home countries and 105 host countries. Their results show that bilateral tax treaties increase the bilateral FDI stocks between 27% and 31%. In contrast, Baker (2014) estimates the effect of bilateral tax treaties on FDI flows from 30 OECD countries to 206 non-OECD countries. His study reports that a bilateral tax treaty has no influence on a foreign firm's location decision. Moreover, Egger et al. (2006) distinguish between 67 country pairs with tax treaties and a further 719 pairs without, between the years 1985 and 2000. Their analysis indicates that new bilateral tax treaties decrease the volume of outward FDI stock from OECD countries.

Drawing this effect closer to Thailand, there is literature on the effect of bilateral tax treaties on FDI in the Asia Pacific region. Ohno (2010) evaluates this effect on Japanese FDI in 13 Asian countries from 1981 to 2003. He shows that while the new treaties have a significant positive impact on FDI, as time passes and these treaties become old or are revised, they lose their significance. This result is similar to a study by Dong (2019), who explores this effect among ten member countries of the Association of South East Asian Nations (ASEAN) from 1989 to 2016. The results indicate that bilateral tax treaties has no influence on FDI flows among the 10 ASEAN countries. However, when he investigates this effect in relation to the bilateral tax treaty's age, the coefficient of older bilateral tax treaties has a significantly negative impact on FDI inflows, indicating that the increasing number of bilateral tax treaties signed by ASEAN countries over time does not lead to more FDI inflows into the region.

The major problem with existing studies that directly address the effect of bilateral tax treaty on FDI is twofold. First, the impact on FDI of international tax issues in terms of bilateral tax treaties might differ between developed and developing countries. Developed countries have a highly efficient tax administration, while developing countries cannot compete with them. Also, the difference of tax system might have different effects on FDI. Second, earlier studies restricted their research to investors from OECD members. There are few studies on the effects of international tax agreements where developing countries are the investors, and also little evidence from the study of one specific developing country as a recipient country of FDI from both developed and developing countries' investors. The results of these effects on a single recipient developing country from both developed and developing countries are rarely acknowledged.

2.3 Thailand's Tax Sparing Agreement

A tax sparing provision is a clause under the article of 'Elimination of double taxation' in bilateral tax treaties. The literature estimates that approximately 3,000 effective bilateral tax treaties in the world (Quak and Timmis, 2018).

Thailand signed its first bilateral tax treaty in 1961, with Sweden. As of now, Thailand has 61 bilateral tax treaties with 29 developed and 32 developing countries. Gesaruang (1996) mentions that Thailand has always been the 'host country' when entering into the negotiation of bilateral tax treaties. Thai tax negotiators favour the United Nations (UN) Model Tax Convention, since it tends to preserve the taxing rights of the host country more than the OECD Model Tax Convention does. However, only a few treaties end up with the UN model. Gesaruang, a retired Thai tax negotiator expert, emphasises that Thailand considers tax sparing provision as a major measure for promoting economic development.

Table 2.3: Bilateral tax treaties between Thailand and developed countries

Country	Tax system	Effective date	Treaty status	Tax Sparing Provision		
				Included	Period	Status
Australia	Territorial	1 Jan. 1990	In Force	Y	10 years	Terminated
Austria	Territorial	1 Jan. 1986	In Force	Y	Unlimited	In Force
Bahrain	Territorial	1 Jan. 2004	In Force	Y	Unlimited	In Force
Belgium	Territorial	1 Jan. 1980	In Force	N		
Canada	Territorial	1 Jan. 1985	In Force	Y	10 years from tax incentive is granted	In Force
Cyprus	Worldwide	1 Jan. 2001	In Force	Y	Unlimited	In Force
Denmark	Territorial	1 Jan. 1965	Terminated	N		
		1 Jan. 2000	In Force	Y	10 years	Terminated
Finland	Territorial	1 Jan. 1987	In Force	Y	10 years	Terminated
France	Territorial	1 Jan. 1975	In Force	N		
Germany	Territorial	1 Jan. 1967	In Force	N		
Hong Kong	Territorial	1 Jan. 2006	In Force	Y	7 years	Terminated
Ireland	Worldwide	1 Jan. 2016	In Force	Y	10 years	In Force
Israel	Worldwide	1 Jan. 1997	In Force	Y	Unlimited	In Force
Italy	Territorial	1 Jan. 1978	In Force	N		
Japan	Territorial	1 Jan. 1963	Terminated	Y	Unlimited	Terminated
		1 Jan. 1991	In Force	Y	Unlimited	In Force
Korea (Rep.)	Worldwide	1 Jan. 1977	Terminated	N		
		1 Jan. 2008	In Force	Y	5 years	Terminated
Kuwait	Territorial	1 Jan. 2007	In Force	Y	Unlimited	In Force
Luxembourg	Territorial	1 Jan. 1999	In Force	Y	12 years	Terminated
Netherlands	Territorial	1 Jan. 1976	In Force	N		
New Zealand	Territorial	1 Jan. 1999	In Force	Y	10 years	Terminated
Norway	Territorial	1 Jan. 1964	Terminated	N		
		1 Jan. 2004	In Force	Y	10 years	Terminated
Singapore	Territorial	1 Jan. 1976	Terminated	Y	Unlimited	Terminated
		1 Jan. 2017	In Force	N		
Slovenia	Territorial	1 Jan. 2005	In Force	Y	10 years	Terminated
Spain	Territorial	1 Jan. 1999	In Force	Y	10 years	Terminated
Sweden	Territorial	1 Jan. 1961	Terminated	N		
		1 Jan. 1990	In Force	Y	Unlimited	In Force
Switzerland	Territorial	1 Jan. 1997	In Force	Y	Unlimited	In Force
UAE	Territorial	1 Jan. 2001	In Force	Y	Unlimited	In Force
UK	Territorial	1 Jan. 1981	In Force	Y	10 years from tax incentive is granted	In Force
USA	Worldwide	1 Jan. 1998	In Force	N		

Notes: This table shows the information of tax system, the status of tax treaties and tax sparing provisions in 2017 corresponding to the final year of the period of analysis. All bilateral tax treaties are downloaded from IBFD online database.

Table 2.4: Bilateral tax treaties between Thailand and developing countries

Country	Tax system	Effective date	Treaty status	Tax Sparing Provision		
				Included	Period	Status
Armenia	Worldwide	1 Jan. 2003	In Force	Y	Unlimited	In Force
Bangladesh	Worldwide	1 Jan. 1999	In Force	Y	Unlimited	In Force
Belarus	Worldwide	1 Jan. 2007	In Force	Y	Unlimited	In Force
Bulgaria	Worldwide	1 Jan. 2002	In Force	Y	Unlimited	In Force
Cambodia	Worldwide	1 Jan. 2018	In Force	Y	Unlimited	In Force
Chile	Worldwide	1 Jan. 2011	In Force	Y	Unlimited	In Force
China	Worldwide	1 Jan. 1987	In Force	Y	Unlimited	In Force
Czech Republic	Territorial	1 Jan. 1996	In Force	Y	Unlimited	In Force
Estonia	Territorial	1 Jan. 2014	In Force	Y	Unlimited	In Force
Hungary	Territorial	1 Jan. 1990	In Force	Y	Unlimited	In Force
India	Worldwide	1 Jan. 1987	Terminated	Y	Unlimited	Terminated
		1 Jan. 2016	In Force	N	███████	███████
Indonesia	Worldwide	1 Jan. 1982	Terminated	Y	Unlimited	Terminated
		1 Jan. 2004	In Force	Y	Unlimited	In Force
Laos	Worldwide	1 Jan. 1998	In Force	Y	Unlimited	In Force
Malaysia	Territorial	1 Jan. 1983	In Force	Y	Unlimited	In Force
Mauritius	Worldwide	1 Jan. 1999	In Force	Y	Unlimited	In Force
Myanmar	Worldwide	1 Jan. 2012	In Force	Y	Unlimited	In Force
Nepal	Worldwide	1 Jan. 1999	In Force	Y	Unlimited	In Force
Oman	Worldwide	1 Jan. 2005	In Force	Y	Unlimited	In Force
Pakistan	Worldwide	1 Jan. 1979	In Force	Y	Unlimited	In Force
Philippines	Worldwide	1 Jan. 1983	Terminated	Y	Unlimited	Terminated
		1 Jan. 2019	In Force	Y	Unlimited	In Force
Poland	Territorial	1 Jan. 1983	In Force	N	███████	███████
Romania	Worldwide	1 Jan. 1998	In Force	Y	Unlimited	In Force
Russia	Worldwide	1 Jan. 2010	In Force	Y	Unlimited	In Force
Seychelles	Territorial	1 Jan. 2007	In Force	Y	Unlimited	In Force
South Africa	Worldwide	1 Jan. 1997	In Force	Y	Unlimited	In Force
Sri Lanka	Worldwide	1 Jan. 1991	In Force	Y	Unlimited	In Force
Taiwan	Worldwide	1 Jan. 2013	In Force	Y	5 years	Terminated
Tajikistan	Worldwide	1 Jan. 2014	In Force	N	███████	███████
Turkey	Territorial	1 Jan. 2006	In Force	Y	3 years	Terminated
Ukraine	Worldwide	1 Jan. 2005	In Force	Y	10 years	Terminated
Uzbekistan	Worldwide	1 Jan. 2000	In Force	Y	Unlimited	In Force
Vietnam	Worldwide	1 Jan. 1993	In Force	Y	Unlimited	In Force

Notes: This table shows the information of tax system, the status of tax treaties and tax sparing provisions in 2017 corresponding to the final year of the period of analysis. All bilateral tax treaties are downloaded from IBFD online database.

As illustrated in Tables 2.3 and 2.4, 53 out of 61 countries concluded treaties with a tax sparing provision. Some tax sparing provisions are reciprocal agreements, especially with a developing country. Tax sparing provisions from developed countries mostly include a sunset clause to indicate a period of tax sparing provision.

Nevertheless, the main purpose of bilateral tax treaties is to avoid being taxed on the same income in both countries; Dagan (2000) concludes that double taxation could be more effectively eliminated by unilateral arrangements, which are less expensive and more flexible than tax treaties. In fact, Thailand has a Royal Decree Issued under the Revenue Code Regarding Revenue Tax Exemption (No.79) B.E. 2521 stipulating that tax paid to other country is an income exemption. Thus, a taxpayer who paid taxes to a country where has no a tax treaty with Thailand does not have a duty for paying taxes on the income in Thailand - unilateral arrangements.

An Example of Tax Sparing Clauses

In bilateral tax treaties between Thailand and signatory countries, there are three types of tax sparing clause. The first of these appears in the bilateral tax treaty between Thailand and Japan, 1963, where the clause offers an unlimited tax sparing period. Here is the clause indicates that tax sparing provision with unrestricted time is under article 14 states that

'...*For the purposes of the credit referred to in subparagraph (a) of this paragraph, there **shall be deemed to have been paid the amount of Thai tax reduced or exempted** under the provisions of paragraph 2 of Article VI or paragraph 3 of Article VII of the present Convention of the provisions of Sections 19(4) and 35 of the Promotion of Industrial Investment Act, B.E. 2505 (1962), of Thailand...*'

39

The second tax sparing clause comes with a sunset clause - a particular period of tax sparing practice such, for example, 10 years from the signing of the treaty. However, this clause can be extended by agreement between the countries. Thailand has never extended the clause with any country. This type of tax sparing clause often appears in bilateral tax treaties between a developed and developing country. The below clause is an example from the bilateral tax treaty between Thailand and Finland.

'...*The provisions of sub-paragraph (e)* **shall apply for the first ten years for which the Convention is effective** *but the Governments of the Contracting States may consult each other to determine whether this period shall be extended...*'

The third example of a tax sparing clause is a sunset clause that is still open for a new tax incentive regime. For example, the United Kingdom is the first country Thailand has signed a bilateral tax treaty with that includes tax sparing with a sunset clause; but this sunset clause is still open for a developing country as Thailand release new tax incentive.

'...*Provided that relief from United Kingdom tax* **shall not be given** *by virtue of this paragraph in respect of income from any source if the income arises in a period starting* **more than ten years after the exemption from or reduction of Thai tax was first granted** *in respect of that source...*'

Inward FDI and Tax Sparing Agreements in Thailand

Seven developed countries signed tax sparing agreements with Thailand between 2001 and 2017, as illustrated in Figure 2.1. Hong Kong, South Korea, Norway and Slovenia allow residents to benefit from tax sparing over a limited time, while the tax sparing period is longer for residents of Bahrain, Ireland and Kuwait. In all the mentioned countries,

except Ireland, the value of inward FDI stocks increased significantly after tax sparing agreements became effective. A possible explanation of why Ireland experienced reduced inward FDI stocks after the tax sparing agreement became effective is that Ireland is referred to as a tax haven while tax sparing provisions stipulate that tax authorities can reduce tax administration costs and help avoid tax evasion through exchanging taxpayers' information with other countries. Figure 2.2 details the 12 developing countries that signed tax sparing agreements with Thailand from 2001 to 2017. All 12 countries increased their FDI stocks in Thailand after tax sparing became effective.

In addition, Figure 2.3 shows that tax sparing provisions signed with Thailand reached a peak in 2008. In that year, 43 out of 51 bilateral tax treaties included tax sparing provisions, but since then, the number of tax sparing provisions has been decreasing (Appendix Table 2.A.3). Figure 2.3 also illustrates inward FDI stocks from the countries signed tax sparing with Thailand and the countries with non tax sparing agreement with Thailand. The value of inward FDI stocks from tax sparing countries is larger than from countries with no tax sparing between 2001 and 2017.

Figure 2.1: Inward FDI stocks from developed countries who signed TS over 2001-2017
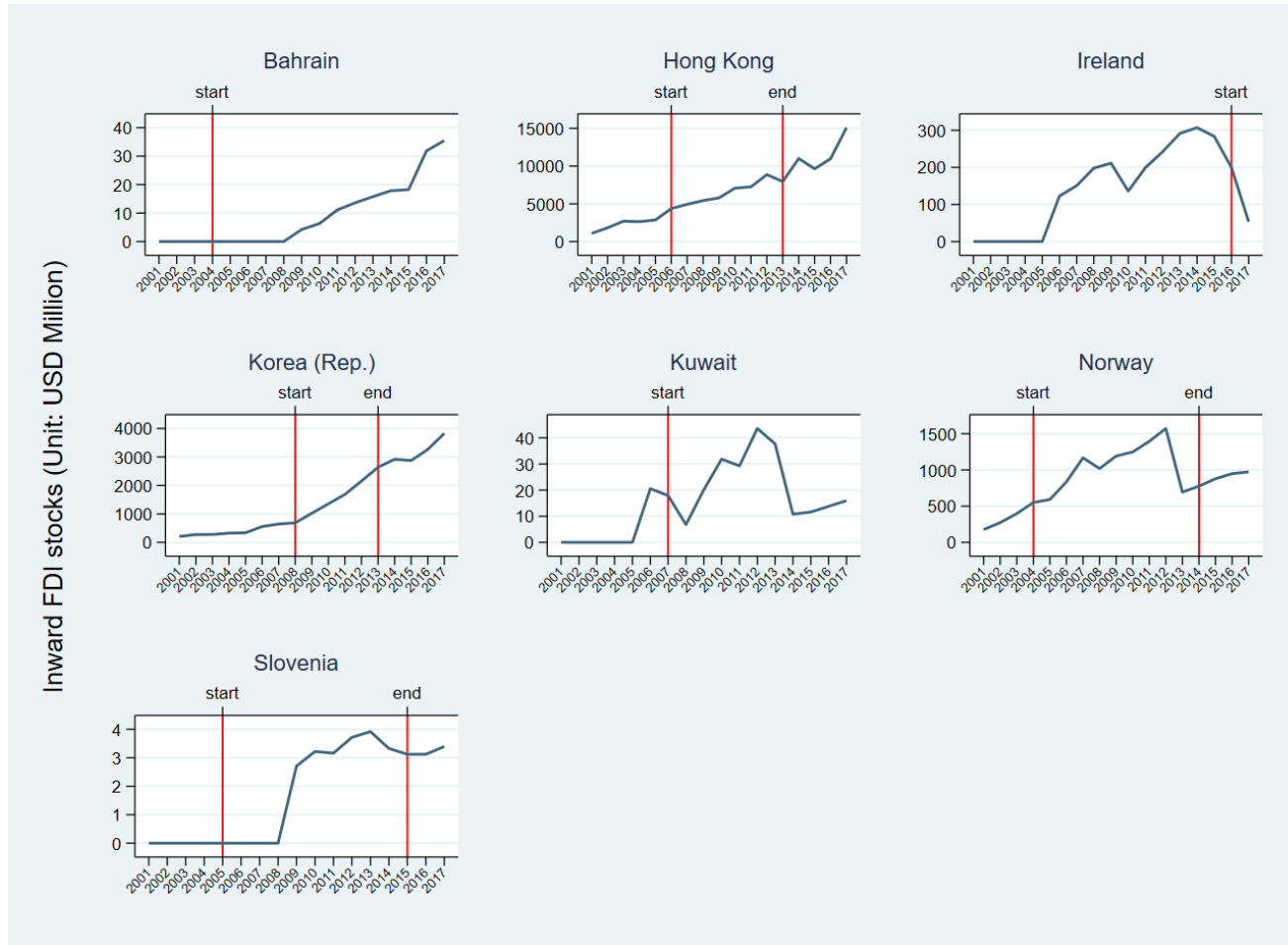
Notes: Figure 2.1 illustrates 7 developed countries signed TS with Thailand over the period of 2001 to 2017 corresponding to the period of analysis. The vertical line is the starting year of tax sparing benefits. It is also the end of tax sparing benefits if tax sparing agreement is terminated during this period (i.e., Hong Kong : the period of tax sparing benefits is from 1 January 2006 to 31 December 2012). Source: IMF-CDIS database, UNCTAD's bilateral FDI statistics and IBFD online database

Figure 2.2: Inward FDI stocks from developing countries who signed TS over 2001-2017
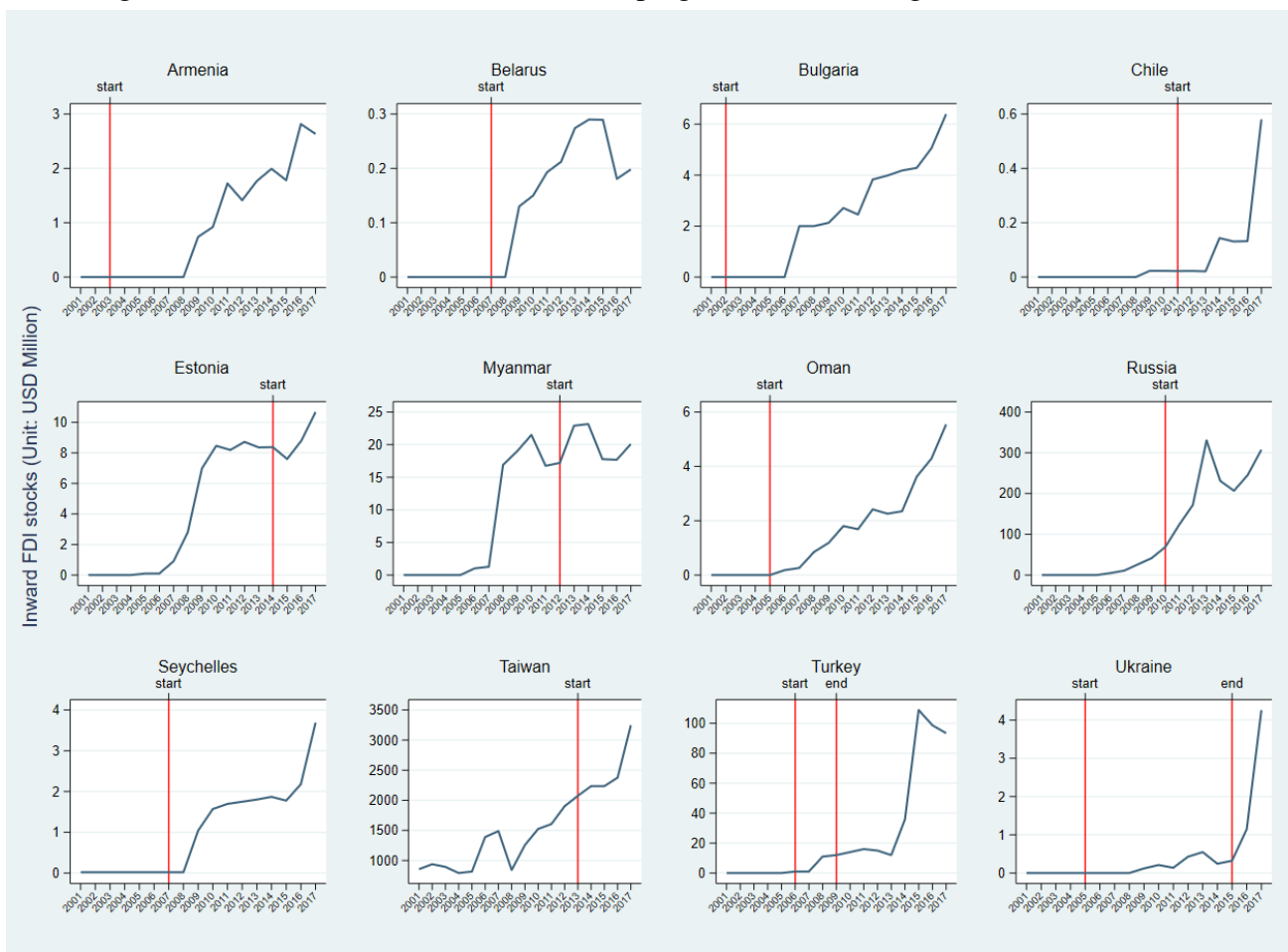
Notes: Figure 2.2 illustrates 12 developing countries signed TS with Thailand over the period of 2001 to 2017 corresponding to the period of analysis. The vertical line is the starting year of tax sparing benefits. It is also the end of tax sparing benefits if tax sparing agreement is terminated during this period (i.e., Turkey : the period of tax sparing benefits is from 1 January 2006 to 31 December 2018). Source: IMF-CDIS database, UNCTAD's bilateral FDI statistics and IBFD online database

Figure 2.3: Inward FDI stock and tax sparing in Thailand

Notes: Figure 2.3 displays the number of tax sparing provisions reached a peak in 2008. In that year, 43 out of 51 bilateral tax treaties included tax sparing provisions. Overall, the value of inward FDI stock from the countries with tax sparing provision is larger than the countries with no tax sparing over the period. Source: IMF-CDIS database, UNCTAD's bilateral FDI statistics and IBFD online database

2.4 Empirical Methodology and Data

2.4.1 Empirical Methodology

To estimate the nexus of tax sparing provision and FDI, it is common to use a gravity model. The gravity model was originally inspired by Newton's gravity equation. In terms of FDI, it is based on the idea that the proportion of FDI between different locations depends on the sizes and distances between them. Tinbergen (1962) was the pioneer of

theoretical and empirical literature on the gravity equation for international economics. The basic form of the gravity equation devised by him is as follows:

$$T_{ij} = A\frac{GDP_i^{\alpha}\ GDP_j^{\beta}}{D_{ij}^{\delta}} \tag{2.1}$$

where T_{ij} defines bilateral investment between country i and j, GDP_i^{α} defines the economic size of country i which measured by GDP, D_{ij}^{δ} defines the bilateral distance between country i and j and A is a normalising constant. The parameters α, β and δ are often estimated in a log-linear reformulation in the model (in equation 2.2). This equation explains bilateral investment using economic size and distance.

$$ln(T_{ij}) = ln(A) + \alpha\ ln(GDP_i) + \beta\ ln(GDP_j) - \delta\ ln(D_{ij}) \tag{2.2}$$

Adding stochastic component, the equation has the form

$$ln(T_{ij}) = ln(A) + \alpha\ ln(GDP_i) + \beta\ ln(GDP_j) - \delta\ ln(D_{ij}) + \epsilon_{ij} \tag{2.3}$$

Since the study by Santos Silva and Tenreyro (2006), the gravity model has been measured by two popular methods: OLS and Poisson pseudo maximum likelihood (PPML) estimators. Santos Silva and Tenreyro (2006) and Herrera (2010) claim that the log-linearised model estimated by OLS creates a problem when the dependent variable is zero because this approach drops the observation in which the dependent variable is zero. Consequently, it leads to an inconsistent estimate of the parameter of interest.

In fact, this study's dataset has zero value on the dependent variable around 1,099 observations which is approximately 36%. Within these observations, there are 134 observations have tax sparing provisions. It is large proportion of zero value on the dependent variable which could create an inconsistent analysis.

45

Yotov et al. (2016) argue that the best solution to deal with the zero FDI problem is to estimate the gravity model in multiplicative form instead of logarithmic form. This approach is also recommended by Santos Silva and Tenreyro (2006). They apply the PPML estimator in the gravity model and Monte Carlo simulations, showing that the PPML estimator performs very well even when the proportion of zeros is large.

Furthermore, the recent literature on gravity model commonly uses the PPML estimator, especially the recent empirical work on the effect of tax agreements on FDI, including Azémar and Dharmapala (2019) and Petkova and Zagler (2019) who also use the PPML estimator in their studies. The PPML estimator will therefore be implemented in this study to account for zero FDI stocks and, more importantly, heteroskedasticity in FDI data.

This study's dataset is a panel data framework, which allows me to recognise relevant variables through time and identify specific time and country effects. The fixed effects estimators are widely available, and have been used in many empirical studies of bilateral investment and trade. The fixed effects estimator assumes the existence of an unobserved heterogeneous component that is constant over time, and it affects each country of the panel in a different way. Therefore, it becomes the final baseline economic specification, which is:

$$FDI_{it} = exp(\beta \, TS_{it} + \gamma \, X_{it} + \mu_i + \delta_t)\epsilon_{it} \tag{2.4}$$

where FDI_{it} is the stock of FDI from home country i in Thailand in year t. TS_{it} is a dummy variable which is equal to 1 if the home country i stipulates a tax sparing provision to their resident in year t. In addition, the vector X_{it} includes indicators of time-varying home country i, Thailand as a host county, and bilateral characteristics in

year t. Time-invariant of home characteristics enter in the model though home-country fixed effects μ_i. This model also includes dummies for each of the years in the dataset, to capture the influence of time trends δ_t and error term ϵ_{it}.

Furthermore, in order to directly investigate the question of differences in tax sparing provision on inward FDI stock in regard to the level of economic development in different countries, the tax sparing term is set to interact with a dummy variable for developed countries as follows:

$$FDI_{it} = exp(\beta\,TS_{it} + \phi\,TS_{it} \times DC_i + \gamma\,X_{it} + \mu_i + \delta_t)\epsilon_{it} \qquad (2.5)$$

where DC_i is a dummy variable which take the value of 1 if the home country i is a developed country.

Similarly, the econometric specification to answer the question of whether the effect of tax sparing agreements differs across worldwide and territorial home countries is:

$$FDI_{it} = exp(\beta\,TS_{it} + \varphi\,TS_{it} \times TAX_{it} + \gamma\,X_{it} + \mu_i + \delta_t)\epsilon_{it} \qquad (2.6)$$

where TAX_{it} is a dummy variable which take the value of 1 if the home country i adopts worldwide tax system in year t.

In these specifications, the estimated coefficients on the tax sparing term β represent the tax sparing elasticity for developing countries and territorial tax system countries. The coefficients on the interaction term, namely ϕ and φ, capture the differences between tax sparing elasticity for developed and developing countries, for worldwide and territorial tax system countries respectively. The tax sparing elasticity can thus be summarised as follows:

47

Level of country development

Tax sparing elasticity for developed countries : $\beta + \phi$

Tax sparing elasticity for developing countries : β

Type of tax system

Tax sparing elasticity for worldwide tax system countries : $\beta + \varphi$

Tax sparing elasticity for territorial tax system countries : β

2.4.2   Data

Dependent Variable

The dependent variable corresponds to the nominal value (in USD Million) of Thai *FDI inbound stock* from 178 investor countries (jurisdictions) for 17 years from 2001 through 2017. In fact, I collect this data from 208 jurisdictions, but I only adopt 178 jurisdictions (Appendix Table 2.A.1 and Table 2.A.2). Thirty jurisdictions are dropped from the analysis because the value of inward FDI stock is zero over the period of analysis. However, these omitted observations do not affect the findings.

This chapter applies FDI stock as the dependent variable instead of FDI inflow, because FDI stock is more commonly used in empirical studies. It represents the value of the investment, which accumulated debt and equity investment from parent companies plus reinvested profits of foreign affiliates, at the end of the period; while the FDI inflow is a transaction recorded during the reference period, typically a year or a quarter. Additionally, the FDI inflow can be a negative value, in which case it is dropped from the data set, leading to inconsistent estimators of the parameters of interest. These data are

collected from two sources, namely the International Monetary Fund Coordinated Direct Investment Survey (IMF-CDIS) database, and UNCTAD's Bilateral FDI Statistics.

Variables of Interest

1) Tax sparing provision

The measure of the impact of tax sparing provisions on FDI in Thailand is investigated by a simple dummy variable of tax sparing provision. These data are collected from the International Bureau of Fiscal Documentation (IBFD) online database. Most tax sparing provisions are indicated in the article 'Elimination of double taxation' of bilateral tax treaties. If one of the phrases 'shall be deemed to', 'Investment Promotion B.E.2520' or 'to promote economic development' is shown in the article, a dummy variable of tax sparing takes the value 1; otherwise it takes the value 0. In addition, it takes the value 1 only if tax sparing is effective. In some cases, the application of tax sparing benefits specifies the number of years (e.g., 10 years). Thus, the tax sparing dummy variable takes the value of 1 for 10 years from the effective year. This study also explores the influence of the tax sparing duration – an unlimited or limited tax sparing period. By doing so, I generate *TS unlimited*, indicating tax sparing provision without a time limit variable, which takes the value 1 since a tax sparing provision has been in effect; otherwise it is 0. *TS limited* indicates a limited time of tax sparing provision variable, which takes the value 1 only when tax sparing is effective. Once it is terminated, it takes value 0.

From 1961 until 2017, 52 out of 60 countries had bilateral tax treaties including tax sparing provisions with Thailand. Within the period studied, as illustrated in Table 2.5, 31 countries signed tax sparing provisions before 2001 and 21 countries signed tax sparing provisions with Thailand since 2001. Additionally, most developed countries concluded

tax treaties with a sunset clause, usually 10 years, whereas developing countries grant tax sparing provision with an unlimited period of tax sparing benefits.

Table 2.5: Summary tax sparing provisions

| | No. of countries | Country list | |
		Developed Countries	Developing Countries
Grant tax sparing before 2001	31		
Terminated before 2001	2	Australia, Finland	
Terminated between 2001-2017	6	Denmark, Luxembourg, New Zealand, Spain, Singapore	India
Unlimited	23	Austria, Canada, Israel, Japan, Sweden, Switzerland,UK	Bangladesh, China, Czech Republic, Hungary, Indonesia, Laos, Malaysia, Mauritius, Nepal, Pakistan, Philippines, South Africa, Sri Lanka Romania, Uzbekistan, Vietnam
Grant tax sparing in 2001	2		
Unlimited	2	Cyprus, UAE	
Grant tax sparing from 2002-2017	19		
Terminated in this period	6	Hong Kong, Korea (Rep.), Norway, Slovenia	Turkey, Ukraine
Terminated after this period	2	Ireland	Taiwan
Unlimited	11	Bahrain, Kuwait	Amernia, Belarus, Balgaria, Chile, Estonia, Myanmar, Oman, Russia, Seychelles

Source: All bilateral tax treaties are downloaded from IBFD online database.

2) Level of country development

In the growing openness of the global economy, MNEs are not only from developed countries but also from developing countries. Previous studies on the effect of tax sparing provisions on FDI have never investigated the effect of this on investors from developing countries, generally focusing on investors from developed countries.

Figure 2.4: Inward FDI stock and tax sparing in Thailand by groups
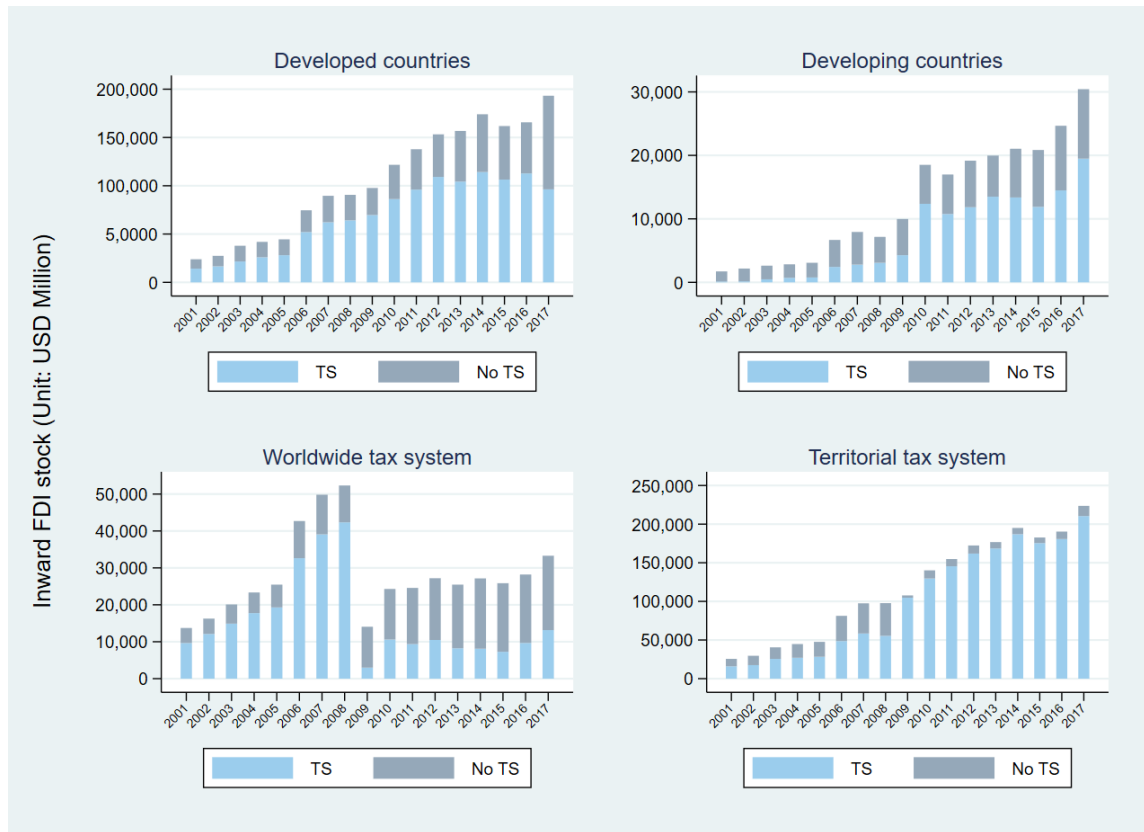
Notes: Figure 2.4 displays developed countries with TS have located their investment in Thailand more than the group with no TS, while the opposite was true for developing countries in the early part of the study period. Since 2010, the value of FDI inbound stock from developing countries with TS has been greater than developing countries without TS. In terms of tax systems, the value of FDI inbound stock from worldwide tax system with TS significantly dropped in 2009. This is because Japan changed its tax system to a territorial one in that year. At the same time, the number of FDI inbound stock in territorial tax system with TS sharply increased in 2009. Source: IMF-CDIS database, UNCTAD's bilateral FDI statistics and IBFD online database

The top-right of Figure 2.4 shows the value of FDI from developing countries in Thailand. Before 2009, the value of inward FDI stock from tax sparing developing countries was lower than the group of non-tax sparing signatory countries. The value of FDI from tax sparing signatory countries sharply increased in 2010 and afterwards, higher than the value of inward FDI stock from non-tax sparing developing countries. During the study period, 12 developing countries signed tax sparing agreements with Thailand. This leads to my question of whether tax sparing agreements increase the value of FDI stock

from not only developed countries but also developing countries. Moreover, it raises the question of whether these effects vary across different levels of economic development in countries. Knowledge of the effect of tax sparing on FDI regarding level of development would be very useful information, leading to tax negotiators and policy makers working more efficiently to handle tax sparing issues.

I measure the level of country development by using a simple dummy. The country variable, DC_i, takes value 1 when the home country is a developed country, otherwise it is 0. To classify a developed country, these data are collected from the World Bank Analytical Classifications. Home countries are considered to be developed countries if their Gross national income (GNI) per capita was higher than USD 9,205 in 2001, corresponding to the beginning of the period of analysis.

3) Tax system

As mentioned in Section 2.2.4 *The Advantage of Tax Sparing: Example*, the effects of tax sparing on inward FDI stock between worldwide and territorial tax investors could differ, since they do not benefit from the same advantages provided by tax sparing. The worldwide tax system taxes both foreign active and passive income, whereas the territorial tax system taxes only passive income. With the purpose of tax sparing, the home country allows a foreign tax credit that exceeds the amount of host country tax that has actually been paid under the tax incentive programme, in order to reduce the amount of home country tax imposed on the host foreign source income. The result of analysis is expected to show that the elasticity of the tax sparing variable from the worldwide tax system will be higher than with the territorial tax system.

To investigate this hypothesis, the tax system variable, TAX_{it} takes value 1 when the home country uses the worldwide tax system, otherwise it is 0. Tax system is a time-vary

variable. Table 2.6 presents a list of countries that have changed their tax systems during the period of analysis. These countries have changed tax system from worldwide to territorial tax system. The main purpose of adopting territorial tax system is to increase competitiveness of the home country. A headquarter or a 'resident' in a country with worldwide tax system is taxable from active and passive income, indicating that it is liable to pay taxes on dividend and passive income while a taxpayer from territorial tax system is liable to pay taxes on passive income only. Thus, effective tax rate of a country with territorial tax system is lower than a country with worldwide tax system. I collect this information from various sources - Azémar and Dharmapala (2019), PwC worldwide tax summary, Deloitte tax guide and highlights.

Table 2.6: A reform tax system country list

Country	Year
Czech Republic	2004
Estonia	2005
Greece	2001
Japan	2009
New Zealand	2009
Norway	2004
Poland	2004
Slovak Republic	2004
Slovenia	2004
Sweden	2003
Turkey	2006
United Kingdom	2009
United States	2018

Notes: All countries have changed tax system from worldwide to territorial tax system. Source :Azémar and Dharmapala (2019), PwC worldwide tax summary, Deloitte tax guide and highlights

Control Variables

This section presents the sources of control variables in turn, and explains why all these variables should be included in the estimation.

1) Gross domestic production (GDP)

According to the gravity model, GDP is a proxy to explain the economic size of countries. In the literature, it is common to hypothesise that foreign investors would have a strong incentive to locate their investment in a country where local demand is high. However, the study presented in this chapter does not include a local demand variable (host GDP), because Thailand is only a host country and year-fixed effects will drop the host GDP variable from the regression.

As a result, this analysis focuses only on the supply side. Martinez-Zarzoso (2003) and Martinez-Zarzoso and Nowak-Lehmann (2004) find that a high level of income in home countries suggests a higher amount of source of funds to invest abroad. In this situation, the result of GDP home countries is expected to be a positive relationship on FDI. I gather the data for home country GDP from the World Bank World Development Indicators database, measured in USD billions.

2) Geographical distance

Location distance could affect the investment, since the cost of operating overseas rise from the main headquarters to the destination. The distance can be claimed the most important determinant for cross-border investment. In the gravity model, geographical distance is generally included as an explanatory variable (Portes and Rey, 2005; Stone and Jeon, 2000). Geographical distance may cause countries to change from trade exporter to overseas investor in order to reduce transportation and production costs (Gopinath and

Echeverria, 2004). This implies that investing partners may be encouraged to invest directly in Thailand for the purpose of reducing transportation costs, information costs or to serve the customers better. The distance coefficient in Equation (2.4) is therefore expected to be positive. The geographical distance data come from the CEPII database and are measured in kilometres between Bangkok, the capital of Thailand, and the capital cities of investors.

3) Bilateral trade cost

Bilateral trade cost is regarded as the main variable that explains the choice between export and FDI, as well as one of the primary determinants for explaining the pattern of FDI (Miroudot and Ragoussis, 2009; Navaretti and Venables, 2004). In general, the set of this variable captures transport costs, tariffs and non-tariff barriers, and it varies across country pairs and industries.

Navaretti and Venables (2004) point out two reasons why MNEs locate investment abroad. One reason is that the main headquarters avoid costs associated with cross-border trade by supplying a market directly through an affiliate. This pattern of FDI is called 'horizontal direct investment'. The other reason is that firms find cheaper inputs abroad, so they split the production process geographically. This FDI activity is called 'vertical direct investment'.

In the relationship between bilateral trade cost and FDI, these two patterns of FDI lead to different indicators of the bilateral trade cost coefficient. It is a positive sign if MNEs are predominantly horizontal in nature, and trade complements FDI activity. It could have the opposite effect on FDI if MNEs are predominantly vertical and trade supplements FDI activity. Therefore, the coefficient of bilateral trade cost variable can be either positive or negative.

55

The bilateral trade cost data are collected from the ESCAP-World Bank Trade Cost Database. This provides a symmetric bilateral trade cost in agriculture and manufactured goods, excluding the petroleum sector.

4) Tax differentials

In open economies with free capital mobility, international tax differentials across countries are capable of affecting size and location of international capital flow. Higher/lower tax rates on profits or returns are likely to decrease/increase the after-tax rate of return and therefore change investors' incentives and decision-making in committing to investment (Hines, 1999). Similarly, various operational and financial activities of MNEs, including profit shifting, dividend reparations, royalty payments and allocation of real investment, are also likely to be sensitive to tax differences between countries that are in search of higher after-tax rate of returns. Watanabe (2010) claims that tax difference between countries is an important determinant of foreign assets investment, a conclusion arising from his investigation into the impact of tax differentials across countries on FDI from American MNEs over the period 1999 to 2004. He emphasises that a high corporate tax rate in the host country reduces foreign asset demands by decreasing the return on foreign investment. Examining the empirical evidence of the tax responsiveness of FDI, De Mooij and Ederveen (2003) explore the effect of tax rates on FDI after a 1% change in corporate tax rate, based on 25 empirical studies. They find that a 1% reduction in the host country corporate tax rate increases FDI in that country up to 3.3 %.

However, the effects of a tax differential on FDI could differ across two tax systems. Under a territorial tax system, the investors are subject to taxes on the foreign profits in the host country only. Thus, home taxes do not impact the amount of FDI. Conversely,

worldwide investors are taxed on foreign profits on home and host countries. Thus, home country tax does matter to worldwide investors.

Data on tax differentials are calculated based on the difference between home corporate tax rate and host corporate tax rate. Statutory corporate tax rates are collected from various sources. Corporate tax rates of OECD member countries are collected from the OECD database; other countries' corporate tax rates are collected from the Ernst and Young Worldwide Corporate Tax Guide, KPMG corporate tax database, PKF International Tax Guide and PwC tax booklet from 2001 to 2017, during which time the data has consistent overlapping.

5) Home financial crisis

Home financial crisis needs including as a control variable to isolate the effects of tax sparing from the effects of financial crisis in the home country on inward FDI stock. This analysis controls for home financial crisis, which takes the value 1 if the home country experiences a banking financial crisis; the value is 0 otherwise. These data are collected from Laeven and Valencia (2012) and the Behavioural Finance and Financial Stability-Harvard Business School database.

6) Political affinity

The political relationship between two countries could be an important determinant to a signatory of a tax sparing provision between countries to promote each other's economic development. The political affinities consist two variables, namely UN vote correlation and sum of polity indexes

The UN General Assembly Voting describes the point of international politics view of the country. The UN Voting variable is to identify and analyse preferences among member

57

states on issues that the UN General Assembly debates. There are three voting options; yes, no and abstain. If two countries have similar views on an international political issue, it could be claimed that there is a high possibility that they will sign a tax sparing provision, due to their political affinity. Therefore, this variable should be controlled in the estimation. The UN vote correlation is calculated from the dataset of United Nations General Assembly Voting Data (Voeten et al., 2009).

It is not only correlations in UN vote preferences that determine a signatory of tax sparing – the democracy of countries plays a part too. The level of democracy determines to what extent citizens have the freedom to express effective preferences about alternative policies and leaders, systems of checks and balances, and the rule of law. A host country that enjoys greater democratic rights could be more attractive to foreign investors than a country with less democracy. The democracy index of each country is collected from Polity IV Project: Political Regime Characteristics and Transitions of the Centre for System Peace. The democracy indicator has an 11-point scale (0 to 10); value 10 represents the highest level of democracy and 0 represents the opposite. I construct the polity indexes by sum of democracy indices between the home country and Thailand.

7) Bilateral tax treaty

The question could be raised whether this study investigates the effect of tax sparing provisions on FDI, or the effect of bilateral tax treaties on FDI if the estimation does not control for bilateral tax treaty. To be clear, this study separately tests the effect of bilateral tax treaties on FDI without controlling tax sparing provisions and tests the effect of tax sparing provisions without controlling bilateral tax treaties, in order to compare the results of both estimations. In order to do this, I gather information on bilateral tax treaties from the IBFD online database and generate *BTT* as a dummy variable that takes value 1 when it is effective and 0 otherwise.

Several empirical studies control for the colony, common language variables. These variables might play essential roles in FDI stock from similarity country backgrounds. However, Thailand has not been colonised by other countries, and is the only country that uses Thai as a common language. For this reason, this study does not include these variables in the dataset. Summary statistics and cross-correlation for all variables are available in Appendix Tables 2.A.4 and 2.A.5.

2.5 Estimation Results

2.5.1 The Impact of Tax Sparing on FDI

This analysis measures the effects of bilateral tax treaties without controlling tax sparing provisions and the effects of tax sparing agreements without controlling bilateral tax treaties. The purpose of this estimation is to answer the question of what is actually being measured - the effect of tax sparing on FDI, or the effect of bilateral tax treaties on FDI - by comparing the magnitude of the coefficient between tax sparing and bilateral tax treaties.

Table 2.7 presents the results of my exploration on the effects of bilateral tax treaties and the effects of tax sparing on FDI in Thailand, shown in columns (1) to (4) and columns (5) to (8) respectively. This table also provides the results of these effects regarding level of country development and tax systems of investor countries. All estimations include the full set of explanatory variables and control for fixed effects.

Starting from columns (1) and (2), both estimations assess the effects of bilateral tax treaties on FDI in Thailand. The only difference is that home country fixed effects are included in column (2). It is noteworthy that the coefficients of bilateral tax treaty

Dependent variable : Inbound FDI stock	Bilateral tax treaties				Tax sparing			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
BTTs	1.878***	1.879***	2.064***	0.558				
	(0.132)	(0.263)	(0.145)	(0.556)				
BTTs* developed country			-1.600**					
			(0.641)					
BTTs* worldwide tax system				1.476***				
				(0.491)				
TS					0.246***	-0.040	1.530***	-0.146
					(0.076)	(0.132)	(0.489)	(0.258)
TS* developed country							-1.609***	
							(0.503)	
TS * worldwide tax system								0.205
								(0.293)
Worldwide tax system				-1.473***				-0.208
				(0.511)				(0.326)
Ln home GDP	0.983***	0.247	0.246	0.244	1.003***	0.254	0.246	0.257
	(0.048)	(0.188)	(0.188)	(0.214)	(0.050)	(0.187)	(0.188)	(0.216)
Home financial crisis	-0.084	0.046	0.046	0.046	-0.009	0.048	0.043	0.047
	(0.108)	(0.032)	(0.032)	(0.033)	(0.116)	(0.032)	(0.032)	(0.032)
Bilateral trade costs	-0.015***	0.002	0.002	0.002	-0.015***	0.002	0.002	0.002
	(0.002)	(0.001)	(0.001)	(0.001)	(0.003)	(0.001)	(0.001)	(0.001)
Tax differential	-0.128***	-0.014	-0.014	-0.014	-0.116***	-0.014	-0.014	-0.014
	(0.006)	(0.023)	(0.023)	(0.023)	(0.007)	(0.022)	(0.022)	(0.023)
UN vote correlation	0.107	0.148	0.148	0.146	-0.030	0.148	0.146	0.150
	(0.371)	(0.239)	(0.238)	(0.225)	(0.357)	(0.238)	(0.238)	(0.224)
Sum of polity indexes	0.194***	0.358***	0.359***	0.358***	0.196***	0.348***	0.358***	0.349***
	(0.020)	(0.136)	(0.136)	(0.137)	(0.021)	(0.135)	(0.137)	(0.133)
Ln distance	-1.106***				-1.165***			
	(0.154)				(0.135)			
Observations	1,691	1,450	1,450	1,450	1,691	1,450	1,450	1,450
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Home Country FE	No	Yes	Yes	Yes	No	Yes	Yes	Yes

Notes: Table 2.7 presents the final baseline model (equation 2.4). This table shows the effects of bilateral tax treaties on inward FDI in columns (1) to (4) and shows the effects of tax sparing on inward FDI in columns (5) to (8). The estimated regression model in columns (1) and (5) excludes home country fixed effects. Robust standard errors are displayed in brackets. *** denotes statistical significance at the 1% level, ** at the 5% level, and * at the 10% level. A constant is included in each regression, but not shown in the table.

variables have almost the same sign and similar magnitude in those columns: 1.878 in column (1) and 1.879 in column (2). This means that time-invariant variables of each home countries do not induce bias when failing control for home fixed effects. When the estimation includes home country fixed effects, the coefficients of control variables change from statistically significant to insignificant. Bilateral distance between Thailand and the home country of the investor is omitted due to the fact that distance does not change over time - captured by the home country fixed effects.

Comparing the effects of bilateral tax treaties on FDI to the effects of tax sparing on FDI, columns (5) and (6) show the results of the effects of tax sparing on FDI in Thailand. The coefficients of the tax sparing variable are dissimilar between these columns. In column (5), the magnitude of the coefficient is 0.246, statistically significant at the one percent level when the estimation does not include home country fixed effects. As the Poisson specification takes an exponential form, these effect correspond to [100*[exp(0.246)-1]. Thus, the estimated coefficient implies that the inclusion of a tax sparing provision in a bilateral tax treaty increase FDI from the signatory country by 27.89%. Once control for the home country fixed effects is added, the coefficient has a negative sign and is statistically insignificant (column (6)). The results suggest that some time-invariant unobservable variables of home countries affect the impact of tax sparing agreement significantly. I then split the sample into two sub-sample groups according to level of country development and tax systems, which matched my purpose in this chapter.

To go further with this idea, the level of country development is added in columns (3) and (7). The developed country takes a value of 1 for the dummy variable and the developing country takes a value of 0. Column (3) adds the developed country dummy interacted with bilateral tax treaties to allow for different coefficients of bilateral tax treaties for developed and developing countries. The interaction term is statistically significant, indicating that the developed country is much less likely than the developing country to locate to Thailand in the presence of a bilateral tax treaty. Indeed, bilateral tax treaties increase the value of inward FDI stock from the developed country by a factor of 0.464 or 59.04%, while they increase the value of inward FDI stock from the developing countries by a factor of 2.064 or 7.88 times.

Likewise, column (7) includes the developed country dummy interacted with tax sparing to investigate whether the effect of tax sparing differs on the level of country

development. The estimated coefficient of the interaction term shows a negative sign and statistically significant, suggesting that tax sparing is less likely attractive to investors from developed country than investors from developing countries. The tax sparing coefficient with respect to developed countries is -0.079 while the tax sparing coefficient with respect to developing countries is 1.530.

One reason why investors from developed countries are less attractive than investors from developing countries to locate their investment in a country with a bilateral tax treaty or a tax sparing provision is that MNEs often under-report their income. Tax authorities from developed countries may perform monitoring and tax administration with more technological efficiency than developing countries, which do not have the expertise to fully monitor transactions.

To investigate whether the effect of tax sparing on FDI differs across tax systems, I generate a dummy variable of tax systems to the specification that treats bilateral tax treaties and tax sparing as exogenous, in columns (4) and (8) respectively. This dummy variable is a time-varying indicator, because some countries changed their tax systems during the study period (a list of countries that changed their tax system is shown in Table 2.6). It codes the value of 1 if the home country uses the worldwide tax system, and 0 otherwise. In column (4), the coefficient of interaction term is positive and statistically significant at the one percent level. Thus, FDI from worldwide tax systems are more responsive to bilateral tax treaties compared to FDI from territorial tax systems. In contrast, tax sparing provision does not make a significant difference in the estimated effect of tax sparing on FDI across tax systems, as can be seen in column (8). Although this result is unexpected, it is in line with Azémar and Dharmapala (2019) when investigating the effects of tax sparing agreements across worldwide and territorial

source countries on FDI. They claim that the worldwide home countries lose the strong effects of a tax sparing agreement on FDI because of tax deferral. The host developing country grants many tax benefits to encourage MNEs to reinvest their earnings in the country. If the company is attracted by host government policy and reinvests from all profits earned, the firm does not pay dividends. As a result, the parent company does not pay taxes on foreign profits in the home country, and tax spared is offered by the host developing country is not be used. Therefore, the benefit of tax sparing is no differ between worldwide and territorial tax systems.

2.5.2 The Heterogeneity of Tax Sparing

When I reviewed tax sparing provisions under a bilateral tax treaty, I find that the question of whether tax sparing is heterogeneous depends on the availability of a tax sparing relief period - an unlimited or limited period of tax sparing. Together with the fact that some countries are not fully satisfied with granting tax sparing relief but desire to sign a bilateral tax treaty for exchange of taxpayer information purposes, they conclude the negotiation of a bilateral tax treaty by including a tax sparing provision with a sunset clause. As shown in Table 2.5, 12 treaties between Thailand and developed countries that concluded with a sunset clause, and 11 treaties with unlimited tax sparing time, whereas with developing countries there are only 4 treaties with a sunset clause and 25 treaties without one. There are 14 treaties that have no tax sparing provisions. The total number of treaties is greater than the number of treaty partners, because some countries terminated a previous treaty and replaced it with a new one.

Table 2.8 reveals the effects of tax sparing provisions with and without a time limitation on inward FDI stock. Columns (1) to (3) show the effects of tax sparing provisions with

unlimited time on FDI, and columns (4) to (6) show the estimated results of tax sparing with a sunset clause on FDI.

Table 2.8: The heterogeneity of tax sparing provision on FDI

Dependent variable : Inbound FDI stock	TS unlimited			TS limited		
	(1)	(2)	(3)	(4)	(5)	(6)
TS unlimited	1.853***	2.041***	1.669***			
	(0.277)	(0.142)	(0.389)			
TS unlimited* developed country		-1.648**				
		(0.662)				
TS unlimited* worldwide tax system			0.197			
			(0.309)			
TS limited				-0.081	-0.628***	-0.112
				(0.133)	(0.090)	(0.240)
TS limited* developed country					0.548***	
					(0.162)	
TS limited* worldwide tax system						0.072
						(0.257)
Worldwide tax system			-0.192			-0.002
			(0.303)			(0.090)
Ln home GDP	0.247	0.246	0.239	0.253	0.253	0.257
	(0.187)	(0.188)	(0.216)	(0.188)	(0.188)	(0.219)
Home financial crisis	0.046	0.046	0.046	0.046	0.046	0.046
	(0.032)	(0.032)	(0.033)	(0.032)	(0.032)	(0.033)
Bilateral trade costs	0.002	0.002	0.002	0.002	0.002	0.002
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Tax differential	-0.014	-0.014	-0.014	-0.014	-0.014	-0.014
	(0.023)	(0.023)	(0.023)	(0.022)	(0.022)	(0.023)
UN vote correlation	0.148	0.148	0.144	0.147	0.147	0.149
	(0.239)	(0.238)	(0.225)	(0.238)	(0.238)	(0.223)
Sum of polity indexes	0.358***	0.359***	0.359***	0.348***	0.348***	0.348***
	(0.136)	(0.136)	(0.136)	(0.134)	(0.134)	(0.134)
Observations	1,450	1,450	1,450	1,450	1,450	1,450
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Home Country FE	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Table 2.8 shows the effects of tax sparing with unlimited time on inward FDI in columns (1) to (3) and the effects of tax sparing with limited time on inward FDI in columns (4) to (6). Columns (2) and (5) are based on equation 2.5 and columns (3) and (6) are estimated from equation 2.6. Robust standard errors are displayed in brackets. *** denotes statistical significance at the 1% level, ** at the 5% level, and * at the 10% level. A constant is included in each regression, but not shown in the table.

Column (1) estimates the effect of tax sparing with unlimited time on FDI. The coefficient of tax sparing unlimited time variable reaches a magnitude of 1.853,

statistically significant at the one percent level. It implies that tax sparing without a sunset clause increases inward FDI stock from the country that signed the tax sparing agreement without a sunset clause by 6.38 times. The effect of tax sparing when a sunset clause is included displays in column (4). The result is statistically insignificant, implying that limited tax sparing relief has no influence on FDI from the signatory country that signed a tax sparing agreement with a sunset clause. Additionally, it leads to my question of whether these estimated results are identical across the level of country development and tax systems.

Columns (2) and (5) of Table 2.8 present estimates that include the developed country dummy variables to investigate whether this effect differs across level of country development. Column (2) shows that tax sparing with unlimited time has a positive effect on FDI from both developed and developing countries, but with an effect that is much higher for FDI coming from developing countries. Column (5) displays the estimated effects of tax sparing with limited time when a limited tax sparing variable that interacts with a developed dummy variable is added to the specification. The result reveals both developed and developing investors have negative signs with statistically significant in the presence of tax sparing with a sunset clause. However, the elasticity of tax sparing with limited time in developing countries is higher than developed countries. It suggests that the developing countries are much likely to decrease their investment than the developed countries in the presence of tax sparing with a sunset clause.

With respect to tax systems, I investigate further whether the heterogeneity of tax sparing duration suggests any differences between worldwide and territorial tax systems. Column (3) includes the worldwide tax system dummy variable, and a tax spring with unlimited time interaction term with the dummy variable. The results show that the

interaction term has a positive sign, but there is no statistical significance. Similarly, in column (6) the coefficient of interaction term does not show any statistical difference. Both columns indicate that the heterogeneity of tax sparing agreements has no effect on either tax system. These results are the same as those in Table 2.7 column (8), where I estimate the effect of tax sparing on FDI across tax systems.

2.5.3   Endogeneity

Table 2.8 illustrates that tax sparing with unlimited time raises the volume of inbound FDI stock in Thailand; however, my variable of interest is potentially endogenous, which means that tax sparing with unlimited time might correlate with omitted variables or unobserved variables. Menaldo (2011) claims that one way of addressing the potential for endogeneity bias is to use instrument variables. I construct the instrument variable (IV) following Azémar and Dharmapala (2019), which is the most recent literature on the effects of tax sparing on FDI. They use the IV from the average number of tax sparing provisions signed between the home country and the neighbouring countries. They argue that recipient developing countries in the same region might be more likely to request tax sparing provisions from the home country for tax competition in the region. Thus, my IV is an average of tax sparing of neighbouring countries with the same home country. In this study, the neighbouring countries correspond to the 14 countries in the East Asia Pacific, following the World Bank classification.

With the IV, I employ the method of treatment effect as described by Egger P. (2011). He estimates the trade effects of preferential trade agreements by treating the agreement as an endogenous determinant of bilateral trade. Thus, to address the endogeneity problem

Table 2.9: Endogeneity

	Pr[TS unlimited$_{it}$ = 1 | .] First stage probit (1)	E(FDI$_{it}$) IV Poisson (2)	E(FDI$_{it}$) Poisson (3)	E(FDI$_{it}$) Poisson (4)	E(FDI$_{it}$) Poisson (5)	E(FDI$_{it}$) Poisson (6)
TS unlimited $_{t+2}$					-0.112 (0.238)	-0.119 (0.111)
TS unlimited $_{t+1}$				-0.088 (0.288)		0.067 (0.211)
TS unlimited $_t$		0.830** (0.328)	1.806*** (0.292)	1.856*** (0.303)	1.674*** (0.307)	1.722*** (0.317)
TS unlimited $_{t-1}$			-0.017 (0.143)	0.013 (0.200)		-0.235 (0.175)
TS unlimited $_{t-2}$					0.182 (0.158)	0.334*** (0.091)
Ln home GDP	-0.027 (0.032)	1.038*** (0.088)	0.241 (0.184)	0.238 (0.185)	0.200 (0.186)	0.197 (0.186)
Home financial crisis	-0.233 (0.149)	-0.199 (0.165)	0.063** (0.030)	0.059* (0.030)	0.074** (0.030)	0.074** (0.030)
Bilateral trade cost	-0.004*** (0.001)	-0.008* (0.005)	0.002 (0.001)	0.002* (0.001)	0.002* (0.001)	0.002* (0.001)
Tax differential	-0.025*** (0.005)	-0.104*** (0.020)	-0.014 (0.023)	-0.015 (0.023)	-0.014 (0.023)	-0.014 (0.023)
UN vote correlation	-0.062 (0.188)	-0.446 (0.516)	0.171 (0.223)	0.168 (0.223)	0.185 (0.212)	0.187 (0.212)
Sum of polity indexes	0.010 (0.009)	0.191*** (0.035)	0.323** (0.126)	0.323*** (0.125)	0.269*** (0.088)	0.269*** (0.087)
Ln distance	-0.381*** (0.075)	-1.066*** (0.216)				
TS neighbouring countries (IV)	3.392*** (0.328)					
Observations	1,713	1,691	1,450	1,450	1,261	1,261
Year FE		Yes	Yes	Yes	Yes	Yes
Home Country FE			Yes	Yes	Yes	Yes

Notes: Table 2.9 presents the endogenous test of tax sparing with unlimited time. Columns (1) and (2) use an IV to solve the endogeneity problem. The IV is the average number of tax sparing provisions in neighbouring countries with the same home country. Columns (3) to (6) use panel fixed effects to solve the endogeneity problem by adding up to two lead and two lagged levels of tax sparing in the estimations. Robust standard errors are displayed in brackets. *** denotes statistical significance at the 1% level, ** at the 5% level, and * at the 10% level. A constant is included in each regression, but not shown in the table.

I have treated tax sparing with unlimited time as an endogenous determinant of FDI, as shown in Table 2.9.

The results of Table 2.8 are estimated by the Equation (2.4), which transform to the conditional expectation function is

$$E(FDI_{it} \mid TS_{it}, X_{it}, \mu_i, \delta_t) = exp(\beta TS_{it} + \gamma X_{it} + \mu_i + \delta_t) E(\epsilon_{it} \mid TS_{it}, X_{it}, \mu_i, \delta_t) \quad (2.7)$$

The effect of tax sparing with unlimited time on FDI under the assumption of exogenous tax sparing with unlimited time is

$$E(\epsilon_{it} \mid TS_{it}, X_{it}, \mu_i, \delta_t) = 1 \tag{2.8}$$

If the omitted or unobserved variables have an influence simultaneously on the presence of tax sparing with unlimited time and the volume of inward FDI stock in Thailand, tax sparing with unlimited time will be an endogenous. For example, tax sparing with unlimited time and ϵ_{it} could be positive correlated and the coefficient of tax sparing with unlimited time overestimated, while ϵ_{it} could be negative correlated and the coefficient of tax sparing with unlimited time underestimated. If this situation happens, the question will be raised whether omitted or unobserved variables are associated with the chance to sign an unlimited time tax sparing provision.

To address this problem, I first estimate a probit binary response model of tax sparing with unlimited time on IV and other controls (Table 2.9 column (1)). I use a probit binary response model because the dependent variable, which is a tax sparing with unlimited time, can take only two values – 1 when tax sparing with unlimited time is applied in the treaty, and 0 otherwise. I apply the following reduced-form equation for TS_{it},

$$TS_{it} = \begin{cases} 1 & \text{if} \quad Y_{it}\,\zeta \geq v_{it} \\ 0 & \text{if} \quad Y_{it}\,\zeta < v_{it} \end{cases} \tag{2.9}$$

where Y_{it} is a vector of variables affecting a country i the likelihood of signing an unlimited tax sparing agreement with Thailand in year t. The elements of Y_{it} include

all variables of X_{it} and tax sparing of neighbouring countries which is an instrument variable. It could be an endogeneity if the error v_{it} and ϵ_{it} are not independent.

I then compute the fitted probabilities of the neighbouring country, and add the fitted probabilities and IV into the model by using IV Poisson GMM estimator in Table 2.9 column (2).

The results from both columns of the endogeneity test show that the average of tax sparing agreement signed with the neighbouring country has a positive effect on unlimited time of tax sparing, with the 3.392 magnitude of coefficient significant at the one percent level in the first stage probit model (Table 2.9 column 1), indicating that each unit increase in tax sparing neighbouring countries increases the probit index by 3.392 standard deviations.

The coefficient estimated on endogenous tax sparing with unlimited time in Table 2.9 column (2) still has a statistically significant positive, with a smaller magnitude of coefficient, 0.83, compared to Table 2.8 column (1). Indeed, the probability of signing a tax sparing provision with unlimited time raises when the home GDP and the sum of democracy level between investor country and Thailand is high. On the other hand, an increase in bilateral trade cost, tax differential and bilateral distance reduces the probability of signing an unlimited time of tax sparing provision.

However, Baier and Bergstrand (2007) argue that IV does not solve endogeneity problem well than panel fixed effects. Additionally, tax sparing with unlimited time in a country in a given year may be dependent on a change in investment activities in that country in a prior year, thereby FDI causing tax sparing agreement. In order to

confirm that there is no reverse causality, Baier and Bergstrand (2007) and Azémar and Dharmapala (2019) suggest to add a future level of tax sparing with unlimited time to the regression model. Moreover, the adjustment of cross-border investment in response to tax sparing policy changes will not be instantaneous. Thus, columns (3) to (6) include up to two lead and two lagged levels of tax sparing with unlimited time dummy in the estimations, as shown in columns (3) to (6). Including lagged variables in the estimation is also useful for checking the robustness of the original results.

The results in columns (3) to (6) in Table 2.9 reveal tax sparing with unlimited time variables are statistically significant at the present time ($TS\ unlimited_t$) on inward FDI stock in these estimations. The magnitude of tax sparing unlimited time at time *t* in these columns is still close to the original results in Table 2.8 column (1). These results suggest that tax sparing with unlimited time variables are strictly exogenous to inward FDI stock, $TS\ unlimited_{t+1}$ and $TS\ unlimited_{t+2}$ are uncorrelated with the concurrent inward FDI stock. The negative sign of the coefficient estimated on the leads might suggest that firms delay investment temporarily in anticipation of a coming bilateral tax treaties. All in all, these results confirm tax sparing with unlimited time causes FDI and not vice versa.

In column (6), the estimated coefficient of $TS\ unlimited_{t-2}$ is statistically significant at the one percent level. It could be a reason that firms take two years to adjust their investment for responding to tax sparing policy changes. However, the magnitude of two year lagged tax sparing unlimited period variable is much smaller than no lagged variable.

2.6　Conclusion

This chapter attempts to better understand the role of tax sparing provisions in fostering the cross-border economic activities of MNEs, and fill a gap in the Thai economic literature regarding international tax policy issue.

Thailand is an example of a developing country that provides a wide range of tax incentives for attracting foreign investors. It also includes a high number of tax sparing agreements in its treaties. The present study is mainly designed to determine the effect of tax sparing provision on foreign location choice, and to investigate whether this effect differs across the level of economic development and tax systems. To do so, I create a dataset of 178 jurisdictions, in the presence of the developed and developing countries – with territorial and worldwide tax systems alike – as the investors and Thailand as the recipient country, over a period of 17 years.

The results suggest that the heterogeneity of tax sparing provisions is crucial to the analysis of tax sparing provisions' effect on FDI. When I investigate the overall of tax sparing provision effects on inward FDI stock, it does not show any statistical difference on inward FDI stock. The results also show that developed countries are less likely to increase their investment when tax sparing provision is granted, compared to developing countries.

When the heterogeneity of tax sparing provisions is taken into account according to the period of tax sparing relief, the results of tax sparing's effect on FDI are changed. Tax sparing provisions without a sunset clause increase the value of FDI by 6.38 times. This effect differs according to respective levels of economic development, but there is no difference across tax systems. Tax sparing without a sunset clause has more influence on

the decisions of investors from developing countries. However, a tax sparing provision with a sunset clause reduces the value of FDI from developed and developing countries alike, but the developing countries are more likely to reduce their investment than the developed countries, and there is no different effect across the two tax systems.

In conclusion, tax sparing provision is a useful policy in the context of taxation for attracting FDI in developing countries. Researchers should take tax sparing agreement into account when investigate the effects of taxes on FDI. However, in the case of Thailand, tax sparing provision can decrease the value of foreign direct investment when tax sparing agreement indicates a sunset clause. Therefore, tax negotiators and policy makers should be more careful to indicate a sunset clause in tax sparing agreements.

2.A Appendix

Table 2.A.1: A list of developed countries

Jurisdiction		
Andorra	Greece	Northern Mariana Island
Aruba	Greenland	Norway
Australia	Guam	Portugal
Austria	Iceland	Qatar
Bahamas	Ireland	San Marino
Bahrain	Israel	Singapore
Belgium	Hong Kong	Slovenia
Bermuda	Italy	Spain
Brunei Darussalam	Japan	Sweden
Canada	Korea, Rep.	Switzerland
Cayman Island	Kuwait	United Arab Emirates
Cyprus	Liechtenstein	United Kingdom
Denmark	Luxembourg	United States
Finland	Monaco	Virgin Islands, British
France	Netherlands	Virgin Islands (U.S.)
Germany	New Zealand	

Table 2.A.2: A list of developing countries

Jurisdiction			
Afghanistan	Dominican Republic	Lithuania	Senegal
Albania*	Ecuador	Madagascar	Serbia
Algeria	Egypt	Malawi*	Seychelles
American Samoa*	El Salvador*	Malaysia	Sierra Leone
Angola	Equatorial Guinea*	Maldives	Slovak Republic
Antigua and Barbuda	Eritrea	Mali	Solomon Islands*
Argentina	Estonia	Malta	Somalia
Armenia	Eswatini	Marshall Islands	South Africa
Azerbaijan	Ethiopia	Mauritania	South Sudan
Bangladesh	Faroe Islands	Mauritius	Sri Lanka
Barbados	Fiji	Mexico	St. Kitts and Nevis*
Belarus	Gabon	Micronesia, Fed. Sts*.	St. Lucia
Belize	Gambia	Moldova	St. Vincent and the Grenadines
Benin*	Georgia	Mongolia	Sudan
Bhutan	Ghana	Montenegro	Suriname*
Bolivia*	Grenada*	Morocco	Syrian Arab Republic
Bosnia and Herzegovina	Guatemala*	Mozambique*	Tajikistan
Botswana	Guinea	Myanmar	Tanzania
Brazil	Guinea-Bissau	Namibia	Timor-Leste
Bulgaria	Guyana	Nauru*	Togo*
Burkina Faso*	Haiti	Nepal	Tonga*
Burundi	Honduras	Nicaragua*	Trinidad and Tobago*
Cabo Verde*	Hungary	Niger	Tunisia
Cambodia	India	Nigeria	Turkey
Cameroon	Indonesia	North Macedonia	Turkmenistan*
Central African Republic	Iran, Islamic Rep.	Oman	Turks and Caicos Islands
Chad*	Iraq	Pakistan	Tuvalu*
Chile	Isle of Man	Palau*	Uganda
China	Jamaica	Panama	Ukraine
Colombia	Jordan	Papua New Guinea	Uruguay
Comoros*	Kazakhstan	Paraguay*	Uzbekistan
Congo, Dem. Rep.	Kenya	Peru	Vanuatu
Congo, Rep.	Kiribati*	Philippines	Venezuela, RB
Costa Rica	Kosovo*	Poland	Vietnam
Cote d'Ivoire	Kyrgyz Republic	Puerto Rico	West Bank and Gaza
Croatia	Lao PDR	Romania	Yemen, Rep.
Cuba	Latvia	Russian Federation	Zambia
Curacao*	Lebanon	Rwanda	Zimbabwe
Czech Republic	Lesotho	Samoa	
Djibouti	Liberia	Sao Tome and Principe*	
Dominica	Libya	Saudi Arabia	

Notes : The symbol '*' indicates the country has zero inward FDI stock in Thailand over the period 2001-2017.

Table 2.A.3: Number of tax sparing agreement

Year	No. of Tax sparing agreement
2001	31
2002	31
2003	32
2004	34
2005	37
2006	39
2007	42
2008	43
2009	40
2010	40
2011	39
2012	40
2013	40
2014	40
2015	37
2016	35
2017	36

Table 2.A.4: Summary statistics (178 jurisdictions)

Variable	N	Mean	Std. Dev.	Min	Max
BTTs	3,014	0.293	0.455	0	1
TS	3,014	0.211	0.408	0	1
TS unlimited	3,014	0.166	0.372	0	1
TS limited	3,014	0.039	0.195	0	1
developed country	3,014	0.259	0.438	0	1
Worldwide tax system	2,963	0.658	0.475	0	1
Ln home GDP	2,960	23.890	2.906	6.548	30.601
Home financial crisis	2,997	0.058	0.235	0	1
Bilateral trade costs	1,965	218.535	122.732	25.363	922.652
Tax differential	2,656	-1.7	10.8	-30	35
UN vote correlation	2,202	0.146	0.236	-0.424	1
Sum of polity indexes	2,384	10.299	5.287	0	19
Ln distance	3,014	8.940	0.674	6.264	9.889

Table 2.A.5: Cross-correlation table (178 jurisdictions)

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
BTTs (1)	1.000												
TS (2)	0.803	1.000											
TS unlimited (3)	0.692	0.862	1.000										
TS limited (4)	0.315	0.392	-0.090	1.000									
Developed country(5)	0.382	0.180	0.062	0.211	1.000								
Worldwide tax system (6)	-0.243	-0.096	0.004	-0.168	-0.403	1.000							
Ln home GDP (7)	0.501	0.332	0.258	0.165	0.231	-0.075	1.000						
Home financial crisis (8)	0.149	0.032	0.011	0.055	0.193	-0.166	0.199	1.000					
Bilateral trade costs (9)	-0.492	-0.384	-0.307	-0.163	-0.341	0.195	-0.590	-0.113	1.000				
Tax differential (10)	0.068	0.003	0.001	-0.010	-0.039	0.033	0.315	0.015	-0.116	1.000			
UN vote correlation (11)	-0.036	0.095	0.122	-0.014	-0.191	0.128	0.060	-0.136	-0.102	0.045	1.000		
Sum of polity indexes (12)	0.212	0.090	0.013	0.132	0.251	-0.163	0.236	0.187	-0.164	-0.061	-0.239	1.000	
Ln distance (13)	-0.345	-0.403	-0.375	-0.128	0.020	-0.076	-0.157	0.031	0.262	0.054	-0.248	0.195	1.000

Should Thailand Phase Out Tax Incentives
for Investment?*

3.1   Introduction

'Striking the right balance between an attractive tax regime for domestic and foreign investment, by using tax incentives for example, and securing the necessary revenues for public spending, is a key policy dilemma.' (IMF, OECD, UN and World Bank, 2011).

Over the past two decades, most developing countries have been actively promoting the establishment of multinational enterprises (MNEs) within their boundaries to achieve their development goals. Among the measures undertaken, fiscal incentives have become a sizable phenomenon as they are easy to implement, they allow for visible attractive changes in the short-run without requiring direct use of government funds, they can compensate for some deficiencies of the business environment (Bénassy-Quéré et al., 2005; Azémar and Delios, 2008; Brülhart and Schmidheiny, 2015), and they allow to

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channel investment in particular regions, sectors or activities. However, the desire to attract MNEs intensifies tax competition between countries leading to a decrease of corporate taxes over time which is not always compensated by an increase in the tax base. For instance, the ratio of corporate tax revenues to GDP in some developing countries like Thailand is continuously decreasing. To reduce tax competition between countries, increase public fiscal receipts and facilitate economic recovery after the COVID-19 pandemic, 141 jurisdictions have agreed to adopt in 2023 a global minimum tax rate by setting a worldwide 15% minimum effective tax rate on corporate profits, ensuring that a minimum of tax is paid no matter the location of their MNEs. This historical agreement would make the use of fiscal policy as a direct instrument of attractiveness ineffective. With this political context, assessing the role of tax incentives in developing countries is important to anticipate the effects of this policy on their attractiveness.

There is a paradoxical dichotomy in the literature on business taxation. On the one hand, there is a consensus that corporate taxes have a negative effect on the location and investment of MNEs. From the pioneering studies of the 1980's using aggregate time series data (Hartman, 1984; Boskin and Gale, 1987; Newlon, 1987; Young, 1988; Murthy, 1989) to recent bilateral FDI or firm level panel data analysis (Egger et al., 2008; Merz et al., 2017) four decades of literature converge toward a negative and statistically significant elasticity between FDI and corporate taxes in both developed and developing countries.[1] However, the analysis of the effects of tax holidays on investment, the most popular tax concessions offered by developing countries, being used by more than 70 percent of them (World Bank, 2018), generate mixed results. Reports based on a questionnaire sent to multinational firms indicate that tax holidays are redundant since investment would have taken place anyway (IMF, OECD, UN and World Bank, 2015;

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[1]See for instance the meta-analyses of De Mooij and Ederveen (2003, 2005); Feld and Heckemeyer (2011); Heckemeyer and Overesch (2017).

78

World Bank, 2018). The scarce empirical analyses estimating at the macroeconomic level the response of FDI to tax holidays in African, Latin American, and Caribbean countries tend to find a positive but fragile effect (Van Parys and James, 2010; Klemm and Van Parys, 2012).

The investigation of the effect of tax incentives on investment should ideally be based on firm level data to account for the complexity of the tax situation faced by MNEs. First, tax incentives are rarely granted to all the companies and when they are granted, they can diverge in terms of magnitude and years of availability. Second, MNEs face different tax systems at home which can mitigate the effect of tax incentives provided on their profits generated abroad. Using administrative data on tax incentives granted by the Thai Board of Investment (BOI) over the period 2009-2015, the aim of this paper is to address this gap in the literature by assessing the effect of those incentives at the micro-level, on the investment and innovation of MNEs and domestic firms in Thailand. The BOI data is merged with the Orbis database[2] to dispose of data on the financial statement and production of the firms. The dependent variable is in turn the total assets of the firm, and the investment in tangible and intangible assets. Tangible assets correspond to physical investment including for instance building, plant and machinery. Intangible assets, by including copyrights, patents, software, training of workers, investment in R&D, are used as a proxy for innovation. The identification strategy relies on the inclusion of a battery of fixed effects (at the firm level and with sector-year fixed effects) to limit potential omitted variable bias. The results suggest that tax holidays are associated with a 18 percent higher investment in tangible assets and 16 percent higher investment in intangible assets for MNEs. Thai firms' response is large with an increase of 55

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[2]The Orbis database provides data on firms' financial and productive activities from balance sheets and income statements together with detailed information on firms' domestic and international ownership structure for over 400 million companies across the world.

percent and 21 percent of both types of investments, respectively. Those estimates are statistically significant and substantial in magnitude and last up to two or three years with a graduating decreasing effect.

Firms having a BOI approved project do not necessarily benefit from full tax exemptions, but might be entitled to other advantages. Therefore, we also distinguish the effects of tax holidays from other tax incentives such as exemptions on import duties on machinery or on raw materials, and non-tax incentives such as the permit to own land or to bring in Thailand skilled workers. These other tax and non-tax incentives, which can be linked to physical investment and international trade only have a positive effect on the investment in tangible assets of MNEs.

Regarding MNEs, the effectiveness of tax incentives can be influenced by the tax system of a multinational's home country and by the inclusion of a tax sparing provision in a bilateral tax treaty. Indeed, multinationals can benefit from tax incentives in the host country if those incentives are not nullified by higher taxes in the home country. For instance, MNEs headquartered in a worldwide tax system have to pay taxes at home on their worldwide active and passive income and MNEs headquartered in a territorial tax system have to pay taxes at home on their foreign passive income.[3] In both instances, firms might not be able to benefit from the tax incentives provided abroad, unless the home country has agreed to provide a tax sparing for the taxes which should have been paid abroad but are forgone due to a tax incentive programme in the host country. Often included in bilateral tax treaties (in the article 'Elimination of double taxation') between developed and developing countries and between two developing countries, the effect of this provision on the discussion of the influence of tax holidays has been largely ignored

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[3] 'Active' business income corresponds to the income generated by normal business operations in the host country and other income (such as interest and royalties) is referred to as 'passive' income.

by the literature. The few papers investigating the effects of this provision on FDI suggest that they play a substantial role though since FDI tends to be 2 times larger in countries in which they benefit from tax sparing agreements (Hines, 2001; Azémar et al., 2007; Azémar and Dharmapala, 2019). Due to data limitations, those papers were not able to identify whether FDI and MNEs actually benefited from tax holidays. With a more granular and rich database, this chapter addresses this caveat and confirms the importance of tax sparing. The results suggest that firms benefiting from both tax holidays and tax sparing invest 54 percent more in intangible assets than comparable firms benefiting from neither advantage, and 30 percent more than firms benefiting from a tax holiday not preserved by tax sparing.

Heterogeneity in responsiveness to tax holidays is also assessed by considering the level of economic development in MNEs' home country. Our sample of firms presents the advantage to include MNEs from developing countries and, in terms of taxation, developing countries diverge from developed ones for at least two reasons. The first one is the tax system. Most developed countries have now adopted a territorial tax system when a worldwide tax system is still the norm in many developing countries. For the reasons mentioned above, this difference has strong implications in terms of tax burden faced by both groups of firms on their active income. Second, the capacities of tax authorities in the home country can vary with the level of economic development. If taxes on income earned abroad are avoided at home, the role of tax sparing can be expected to be limited. We find no robust evidence of a different effect of tax holidays on the investment of firms from developing countries as compared to developed countries.

Regarding tax sparing, firms from developed and developing countries increase total investment and investment in tangible assets. One notable difference is that for firms

from developing countries, the increase in tangible assets is at the expense of investment in intangible assets. If we consider that investment in tangible assets is susceptible to increase active income while investment in intangible asset can increase both active and passive income, an increase in tangible assets is expected from worldwide/developing firms once the tax disadvantage of those firms is eliminated by tax sparing. Financial constraints, which might be higher for firms from developing countries may explain the substitution effect between both types of investments.

The paper is organised as follows. The next section reviews the literature on tax policy to attract FDI. Section 3 presents the tax incentive scheme as provided by the BOI in Thailand and provides stylised facts. Next, an empirical section analyses the effect of tax incentives on MNEs and domestic firms. The last section offers concluding remarks.

3.2   Related Literature

A large number of studies have focused on the effects of tax policy on MNEs location and investment. This section discusses the literature by disentangling the broad term tax policy into different specific measures such as the statutory tax rates, the average and marginal effective tax rates and finally tax incentives such as tax credits and tax holidays. This discussion is aimed at shedding light on the reasons why the tax burden might affect differently MNEs activity depending on how it is measured and depending on where the MNEs are in their decisional processes. As described by Devereux (2007), an MNE faces four levels in a decision tree (Figure 3.1). The first two levels correspond to discrete choices: whether to produce abroad or export and where to locate investment. The third and fourth levels describe continuous choice in terms of level of investment and how to allocate capital expenditure and profit between host and home countries. To inform our

Figure 3.1: A decision tree for multinational firms
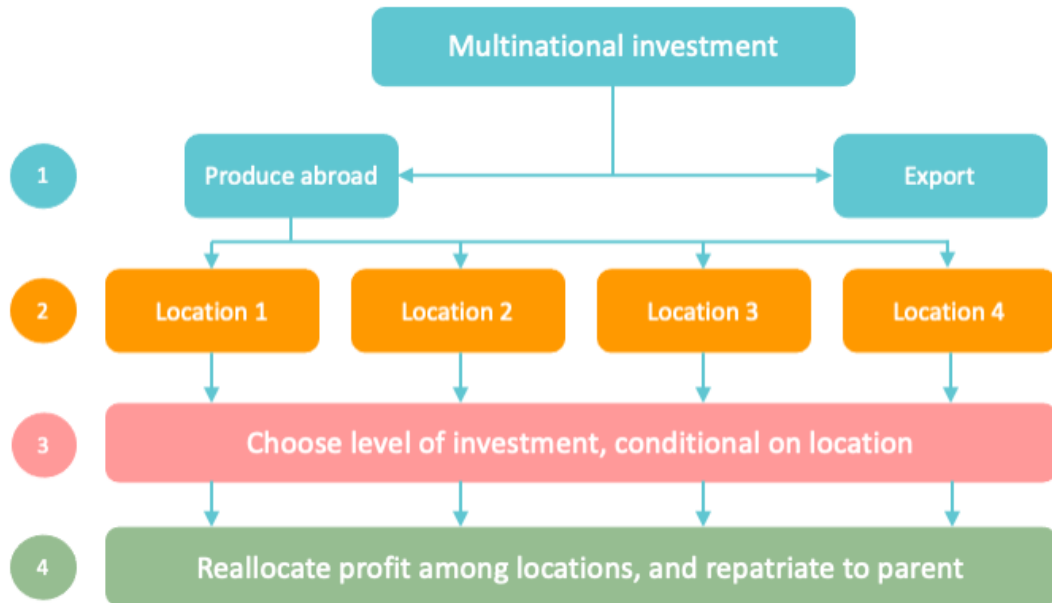
empirical analysis, this section reviews relevant literature regarding levels 2, 3 and 4 of the decision tree with an emphasis on levels 3 and 4 since MNEs have already chosen Thailand as a location for investment.

3.2.1 Tax Rates

Statutory Corporate Tax Rate (STR)

The statutory corporate tax rate is the rate imposed by law on taxable income of companies. As emphasised by Overesch and Rincke (2011), it is the simplest indicator of expected tax payments for firms. However, contrary to the effective tax rate, it does not account for the tax base and should thus be perceived as a proxy for the tax burden. From a research perspective, the statutory tax rate presents the advantage of being readily available for a large number of countries and years. It is therefore the measure mainly used

to assess the effect of the tax burden on MNE location and investment (level 2 and 3 of the decision tree). Meta-analyses find substantial 'statutory tax' semi-elasticities of financial (balance of payments) and real (e.g. capital expenditures) FDI of about -2.5-3% (De Mooij and Ederveen, 2003, 2005; Feld and Heckemeyer, 2011). In addition, this tax measure is often used in studies focusing on tax base erosion and profit shifting (BEPS). In that case, contrary to real activity, the location of profit is not affected by the tax base. Therefore, profit shifting of firms, from one jurisdiction to another, is expected to be determined primarily by the statutory tax rate (Devereux, 2007). Using statutory tax rates, ample evidence of profit shifting, mainly through the manipulation of transfer prices, is provided by Swenson (2001), Clausing (2003), Bartelsman and Beetsma (2003), Bernard et al. (2006), Azémar (2010), Cristea and Daniel (2016), and Davies et al. (2018) (level 4 of the decision tree).

Effective Tax Rate (ETR)

A more appropriate tax measure affecting MNE decisions about where to locate and how much to invest is the effective tax rate. A common measure of the effective tax rate is the percentage of income actually paid by a company after taking into account investment promotion (such as depreciation rules), loss-carry rules, thin capitalisation, or tax credit (R&D promotion and broader tax incentives). Since it is based on actual tax payments, this backward-looking tax measure captures the 'true' tax burden on investments of firms. The effective tax rate can also be forward-looking and thus computed based on hypothetical investment projects, reflecting the tax burden on future cash flows rather than taxes paid. It can be calculated for marginal and average income and is called 'effective marginal tax rate (EMTR)' and 'effective average tax rate (EATR)', respectively.

The literature provides several variants of corporate effective tax rates, but the most common is the one calculated by Devereux and Griffith (2003). Their measure of the EATR has the advantage to correspond to a weighted average of an EMTR and an adjusted statutory tax rate, summarising the distribution of the effective tax rates for an investment project at different level of profitability. The EMTR corresponds to marginal investment and as the rate of profit rises, the effective tax rate converges to the adjusted statutory tax rate. By impacting the firms' post-tax profits, the EATR should influences the discrete decision to produce abroad. By measuring the tax burden on the cost of capital, the EMTR should either influence the magnitude of investment in a new location or the incremental investment in an existing affiliate.

The relevance of those more complex measures of the tax burden in influencing the strategic decisions of MNEs tends to be supported by the literature. Mainly based on OECD/EU countries, this literature finds a negative effect of backward-looking and forward-looking tax rates on FDI (Gorter and Parikh, 2003; Bénassy-Quéré et al., 2005; Egger et al., 2008; Overesch and Wamser, 2008; Buettner and Wamser, 2009). The EATR appears to be a more suitable tax measure than the EMTR to explain discrete location choices by MNEs (Devereux and Griffith, 1998). With investment (fixed assets (PPE) or financial data), the statutory tax rate could be more robust than the EMTR or the EATR (Wijeweera et al., 2007).

3.2.2 Tax Incentives

Tax incentives in developing countries are common. About 72% of developing countries offer tax incentives taking the form of cost-based tax incentives (e.g. investment allowance, accelerated depreciation allowance or tariff reduction) and profit-based tax

incentives (e.g. tax holidays, tax rate reduction or loss carry forwards) (World Bank, 2018). Among those tax advantages, tax holidays are the most widely used instrument.

Many developing countries believe that tax incentives are necessary to attract foreign capital and can even compensate for having a weaker investment climate than their neighbours.[4] Standard economic theory predicts that tax incentives boost investment by increasing the amount of after-tax profit earned on new investments and existing capital stock. Empirically, the effect is less clear as firms might benefit from a tax incentive for an investment which would have taken place anyway. One certainty is that those incentives create fiscal losses from the non-collection of taxes. For instance in Thailand, tax revenue losses associated with the incentives granted by the Board of Investment (BOI) accounts for 1.51% of GDP in 2014 and 1.63% of GDP in 2015.[5] Thus, using tax incentives could be justified only if the decrease in taxes is more than compensated by an increase in the tax base, which is not always the case, especially for developing countries.

Mixed Evidence

Paradoxically, if the empirical literature has reached a consensus that the corporate tax rate has a negative effect on FDI, both at the extensive and intensive margins, the evidence is mixed regarding favourable deviation from the general tax code. The Global Investment Competitiveness survey conducted in 2017 by World Bank (2018), interviewed 754 international business executive having multinational firms in developing countries. It indicates that on the factors affecting investment decisions, a low tax rate

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[4]This argument is supported by the tax competition literature. When asymmetry among countries is taken into account, a major finding is that country with a large market or strong agglomeration economies can afford to impose a higher corporate tax burden than a smaller country because it offers a more attractive environment (Haufler and Wooton, 1999, 2010; Baldwin and Krugman, 2004; Ottaviano and van Ypersele, 2005; Azémar et al., 2020).

[5]The statistics come from the National Budget No.5 Economic and fiscal outlook for fiscal year 2015.

is considered to be important (between critically important to somewhat important) for 89% of the respondents and a withdrawal of tax incentives is only a reason for exiting an investment for 5% of the respondents having an affiliate shut down in a developing country. Tax incentives are ranked 7 out of 10 after political stability, market size, and macroeconomic stability, for instance. Duty-free imports, tax holidays, and VAT exemptions are considered to be the top three most important incentives for investors. However, as documented by James (2009), investor surveys in several developing countries show substantial redundancy ratios. In most of the surveys, including Thailand, more than 70% of the investors claim that they would have invested even without tax incentives (Table 3.1).

Table 3.1: Redundancy ratio for incentives based on investor surveys

Country	Redundancy ratio for incentives	Country	Redundancy ratio for incentives
Burundi (2011)	77%	Rwanda (2011)	98%
El Salvador (2013)	37%	Serbia (2009)	71%
Guinea (2012)	92%	Tanzania (2011)	91%
Jordan (2009)	70%	Thailand (1999)	81%
Kenya (2012)	61%	Tunisia (2012)	58%
Mozambique (2009)	78%	Uganda (2011)	93%
Nicaragua (2009)	15% (51% for non-exporting firms outside free zones)	Vietnam (2004)	85%

Source : James (2009)

Redundancy levels obtained via investor surveys have caveats though, as the answers and the behaviour under a counterfactual situation may diverge. Wells and Allen (2001) compare the growth rates of FDI and the number of projects approved in Indonesia before and after the elimination of tax holidays in 1984. They find no significant difference between both periods. Turning to econometric analyses, which are particularly scarce for

developing countries, the evidence is fragile. Focusing on 12 CFA Franc Zone countries in Sub-Saharan Africa over the period 1994-2006, Van Parys and James (2010) find no effect of tax holidays on investment projects. Only the tax holidays targeted to exporting firms show a positive but small impact on investment in magnitude. More robust results concern the tax compliance cost as reducing the complexity of tax incentives and uncertainty (by extending the legal guarantees for investors), significantly increase FDI. Klemm and Van Parys (2012) investigates the impact of tax incentives on FDI in 40 Latin American, Caribbean and African countries between 1985 and 2004. They find that providing tax holiday has a positive effect in attracting FDI in Latin America and the Caribbean but not in Africa. Investment allowances do not appear to affect FDI.

At least two reasons can explain the discrepancy between a solid empirical evidence of the effect of corporate taxes on FDI and the fragile evidence of the effect of tax holidays. The first one comes from the fact that the implementation of a tax holiday does not necessarily decrease the effective tax rate. The second reason is that the effectiveness of tax holidays is probably reduced by the absence of control for tax sparing agreements in the identification strategy of this specific literature. This chapter discusses in turn both possibilities.

Tax Holidays and Effective Average Tax Rates

Using the Devereux-Griffith framework, previous studies emphasise that tax holidays do not necessarily reduce the EATR because capital allowance reductions are such that they outweigh the merits of tax holidays or because the tax holidays might penalised investment in long-lived assets if depreciation allowances cannot be deferred until after the holiday (Mintz, 1990; Botman et al., 2010; Klemm, 2010). As emphasised by Mintz (1990), with accelerated depreciation allowances and capital goods generating high

income after the tax holiday, the firm might face substantial effective taxes if it does not benefit from depreciation deductions anymore. Thus, the positive effect of tax holiday on investment might depend on the possibility to defer depreciation allowances until after the tax holidays or on the length of the holidays. In the same vein, Botman et al. (2010) and Suzuki (2014) explore the impact of tax holidays on the effective tax rates of Asian countries. They both find that the impact of tax holidays on the EATR depends on the respective tax schemes of the countries considered. Indeed, they find that the impact of tax holidays on the EATR decreases with the size of capital allowance rates, implying that countries with generous depreciation rates require longer tax holidays to reduce the EATR.

Tax Incentives and Tax Sparing Provision

The effectiveness of tax incentives can be influenced by the tax system of the home country since firms have to pay taxes at home on some income earned abroad. Tax systems around the world can be classified either as territorial or worldwide tax systems. With a territorial tax system, profits made by resident corporations operating abroad are not subject to the home country corporation tax on their active income. Other forms of income earned abroad, such as interest and royalties, corresponding to passive income, are taxed in the home country. With a worldwide tax system, both active and passive incomes are taxed at home. To avoid double taxation, firms can claim at home a foreign tax credit on the taxes paid abroad. Mechanically, tax incentives decrease the amount of this foreign tax credit which can be claimed at home. They leave unchanged the global tax burden of the firm but decrease the fiscal receipts of the host country while increasing the treasury of the home country. To consider this issue and to contribute to economic development, since the 1960s a number of developed countries have included a tax sparing provision in some of their bilateral tax treaties with developing countries (see example below: Thailand -

Japan, 1990). In the present age, this provision can also be found in an increasing number of bilateral tax treaties between developing countries. Tax sparing's objective is to allow non-residents to obtain a foreign tax credit for taxes that have been 'spared' under an incentive programme abroad. In other words, it ensures that fiscal incentives granted by the host country accrue to the investor.

Tax Sparing Provision included in Thailand-Japan's bilateral tax treaty, 1990

Article 21. 4. (a) For the purposes of the credit referred to in paragraph 2 above, the term **'Thai tax payable' shall be deemed to include the amount of the Thai tax which would have been paid under the laws of Thailand if the Thai tax had not been reduced or exempted** *in accordance with: (i) the provisions of the sections 31, 33, 34, 35(2), 35(3), 35(4) or 36(4) of the Investment Promotion Act, B.E. 2520 (1977), as effective on the date of the signature of this Convention; or (ii) any provision referred to in (i) above as modified after the date of signature of this Convention or any other* **special incentive measure designed to promote economic development in Thailand** *which may be introduced in future in the Thai tax laws in modification of, or in addition to, the existing measures referred to in (i) above, provided that an agreement is made between the two Governments in respect of the scope of the benefit accorded to the taxpayer by the said provision so modified or the said measure.*

Three empirical papers consider the role of tax sparing, Hines (2001), Azémar and Delios (2008) and Azémar and Dharmapala (2019), find a positive effect of tax sparing on FDI in developing countries. Using cross-sectional data for 1990 on the location of Japanese investment in 67 countries, Hines (2001) finds that Japanese FDI stocks in tax sparing countries are 1.4 to 2.4 times larger than in the absence of tax sparing agreements. Similar results are obtained by Azémar et al. (2007) with panel data on Japanese FDI in 29 source countries between 1989 and 2000 (i.e. Japanese FDI flows being 2.8 times larger in tax sparing countries). Finally, Azémar and Dharmapala (2019) consider the effect of tax sparing provisions using panel data on bilateral FDI stocks from 23 OECD countries in 113 economies over the period 2002-2012. Their results suggest that tax sparing agreements

are associated with up to 97 percent higher FDI with an effect concentrated in the year following the entry into force of the provision in the bilateral tax treaty. All in all, those studies highlight the importance of considering tax sparing provisions when investigating the impact of tax incentives on FDI in developing countries.

3.3   Tax Incentives in Thailand

Over the last decade, the ratio of corporate tax revenues to GDP in Thailand has dramatically decreased, as shown in Figure 3.2. Corporate tax revenue as a share of GDP reached a peak of 5.08% in 2011. After that year, the figure decreased to approximately 3.8% in 2020, mainly due to a substantial decrease of the STR. This STR, which remains unchanged between 1982 and 2011, decreased from 30% to 23% in 2012, to then decrease from 23% to 20% in 2013. It is, since 2012, well below the average STR of ASEAN countries (Figure 3.3). In addition to a decline in the STR, the decrease in the ratio of corporate tax revenues to GDP can be due to generous tax incentives granted by Thailand and to tax planning activities by MNEs leading to a shift of income outside Thailand.

Applying for a Tax Exemption

Thailand provides a wide range of tax incentives, the majority of them being tax holidays of various durations. The Board of Investment (BOI) is the investment promotion agency responsible for granting those tax incentives under the Office of the Prime Minister. It follows a rule-based approach as the allocation is based on detailed guidelines and firms have to file tax returns during the holiday period. The BOI grants tax and non-tax incentives to certified investment projects. A certified investment project is usually called a BOI-promoted company, and this certification is available to both foreign

Figure 3.2: Corporate tax revenue as a share of gross domestic product and statutory corporate tax rate
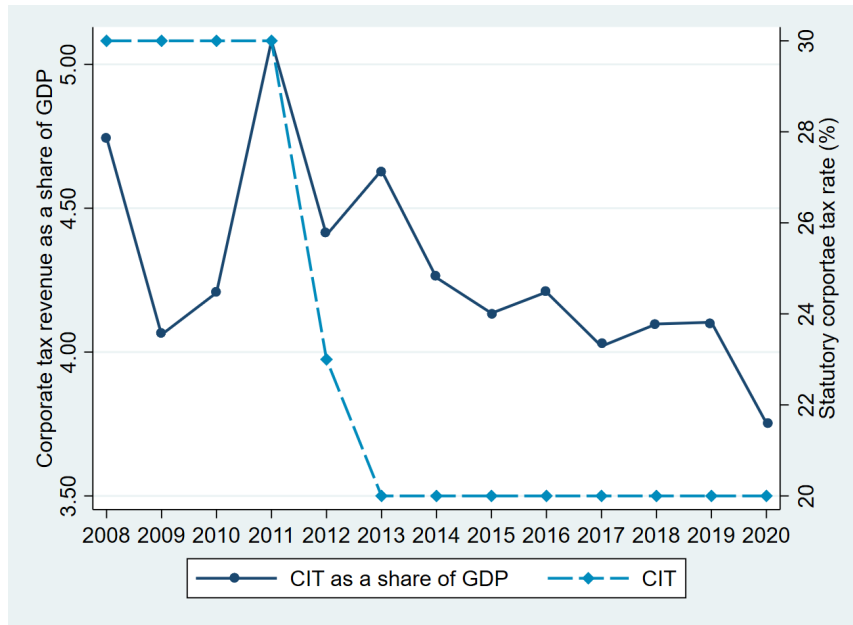
Source: Ministry of Finance, Thailand and World Development Indicators

Figure 3.3: Statutory corporate tax rates in Thailand and ASEAN countries
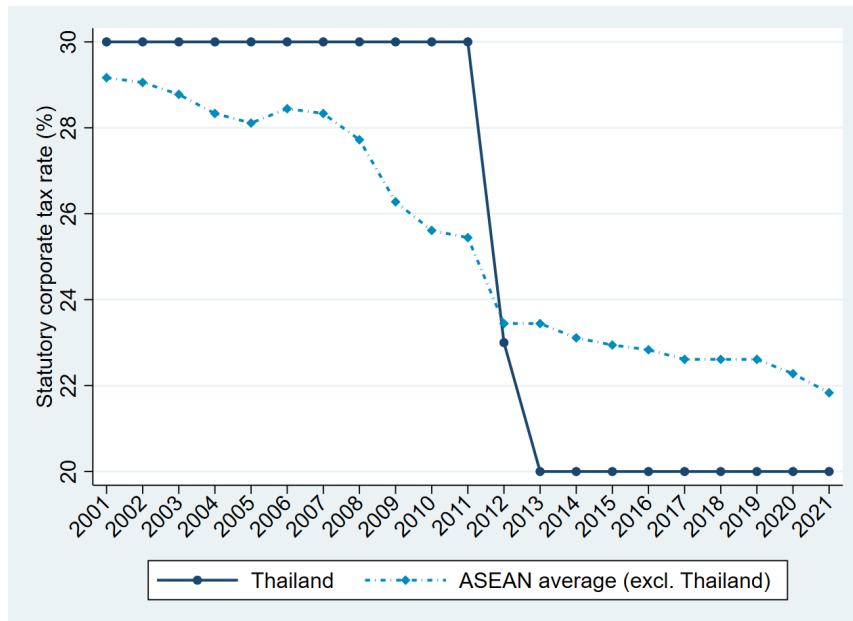
Source: Ministry of Finance, Thailand and World Development Indicators

and domestic investors. Firms which are interested in receiving these benefits must submit their investment plans to the BOI for approval. The procedure has been unchanged since 2000 and includes the following steps:

Step 1 The firm needs to submit a '*BOI application for promotion*'. This form provides general information about the firm, the shareholding structure, the number of Thai and foreign employees over the last three years, and the firm's investment project plan.

Step 2 The BOI contacts the firm for an interview.

Step 3 The BOI evaluates whether the project should be approved by considering a number of criteria such as the project's value added which should not be less than 20% of revenues, whether the project is based on modern production processes, or whether an ISO 9000 or a similar international standard certification has been obtained within two years (see Table 3.A.1 in Appendix).

Step 4 Once the project has been approved, the firm must submit a '*promotion acceptance form*' to agree with the condition requested and the incentives offered by the BOI. This form provides information about when the firm is planning to purchase land and capital, import machinery and the starting date of full or partial operation.

Step 5 Finally, in order to benefit from tax incentives, the firm must submit a '*company establishment form*' and the BOI then issues a '*tax exemption certificate*' and a '*promotion certificate*' to the firm which will be attached to its tax return for the tax auditor's consideration.

It is important to note that the tax exemption granted is specifically only for the profit generated by a certified investment project. For instance, if a company has two activities, namely a BOI activity and a non-BOI activity, the tax credit is only applicable for the profit generated by the BOI activity. Table 3.2 presents five scenarios of profit and loss for

a company having both a BOI activity (with full tax exemption) and a non BOI activity. In case 1, the firm does not pay taxes on the profit from the BOI activity but pays taxes on the profit generated by the non-BOI activity. When the BOI activity generates losses, these losses can be deducted from the taxable income of the non-BOI activity (cases 2 and 3). In case 4, no taxes are paid because all the profit results from the BOI activity. In case 5, both activities have losses and no taxes are paid either.

Table 3.2: Example of tax exemption's calculations with a statutory tax rate of 20%

Case study	Profit of BOI activity	Profit of Non-BOI activity	Taxes paid
1. Both activities have profits	300	200	Tax paid: 40 on TI=200
2. Loss in BOI and profits in non-BOI	-300	400	Tax paid: 20 on TI= 100
3. Loss in BOI and profits in non-BOI	-300	200	0
4. Profits in BOI and loss in non-BOI	300	-200	0
5. Both activities have losses	-300	-200	0

*TI corresponds to taxable income.

Location-Based Approach vs Industry-Based Approach

Over the period 2000-2014, the BOI provided incentives based on the location of investment. Table 3.3 presents those incentives per provinces sorted in three zones depending on their level of development. For instance, a firm located in zone 3, the least developed zone, can benefit from a tax exemption on the profit generated by the BOI activity for up to eight years, plus 100% reduction on import duties if it imports machinery in Thailand, plus five years of import duties exemption on raw materials for use on a production meant to be exported.

Since 2015, the BOI has moved from a location-based approach toward an industry-based approach and certified projects are classified in two main groups, namely

94

Table 3.3: Tax and duty privileges under Board of Investment Announcement No. 1/2543

Investment Zone	Exemption		
	Corporate income tax	Import duties on machinery	Import duties on raw materials for use in production for export
Zone 1 (6 provinces) Bangkok, Nakhon Pathom, Nonthaburi, Pathum Thani, Samut Prakan and Samut Sakhon	3 years	50 % reduction	1 year
Zone 2 (12 provinces) Kanchanaburi, Chachoengsao, Chon Buri, Nakhon Nayok, Ayutthaya, Phuket, Rayong, Ratchaburi, Samut Songkhram, Saraburi, Suphanburi and Ang Thong	3-5 years	50 % reduction	1 year
Zone 3 The remaining 58 provinces	up to 8 years	100 % reduction	5 years

Source : The Board of Investment of Thailand

Group A and Group B. As Table 3.4 shows, firms in Group A can benefit from corporate income tax incentives, machinery and raw materials import duty incentives and other non-tax incentives while firms from Group B are only allowed to benefit from machinery and raw materials import duty incentives and other non-tax incentives. Projects fall into one of the four categories A (A1-A4) or the two categories B, depending on their activities. Activities eligible for promotion are listed per sector at a very granular level and made available to investors. For instance, firms in the sector 'Agriculture and Agricultural Products' would benefit from the most generous tax incentives (category A1: tax holidays with no-cap and for up to eight years) if their activity corresponds to 'Economic forest plantation (except for Eucalyptus)' and under the conditions that the project has a research and development activity, that the total plantation reaches a pre-determined critical size and that the project is approved by the Ministry of Natural Resources and Environment. In addition to those industry-based incentives, in order to attract and stimulate more investment in activities that could contribute to sustainable economic development, the BOI has adopted merit-based incentives for competitiveness enhancement (based on

R&D, support academic/ research institute, IP acquisition/licensing fees), and area-based incentives to reduce social and economic disparities with decentralisation (projects located in the 20 provinces with the lowest per-capita income) and industrial area development (industrial estates/zones). In 2021, the BOI launched the technology-based incentives (based on biotechnology, nanotechnology, advanced material technology and digital technology) providing incentives even more generous than the A1 category with 10 years corporate income tax exemption.

Temporary Tax Exemptions Turning into Permanent Ones

Since the BOI only considers new investment projects, firms may seek to roll over a tax holiday by incorporating a new firm with a new project, creating a new project under the current firm that may qualify for it or slightly changing the existing project upon expiration. Moreover, the BOI allows firms to have several qualified projects at the same time. This case could create a situation where making temporary tax exemption from tax holidays turns into permanent tax exemptions.

Table 3.4: Criteria for granting investment incentives by the Board of Investment in 2015[a]

Criteria for granting incentives	Exemption of corporate income tax	Exemption of import duties on machinery	Exemption of import duties on raw materials used in production for export	Non-tax incentives[b]	Merit-based incentives[c]			
					Competitiveness Enhancement	Decentralisation		Industrial area development
Activity-based incentives					Additional corporate income tax exemption	Additional corporate income tax exemption	Deduction of expense[d]	Additional corporate income tax exemption
Group A								
A1	8 years (no cap)	Yes	1 year	Yes	1-3 years (no cap)	-	Yes	-
A2	8 years (100% of investment value)	Yes	1 year	Yes	1-3 years	-	Yes	-
A3	5 years (100% of investment value)	Yes	1 year	Yes	1-3 years	3 years	Yes	1 year
A4	3 years (100% of investment value)	Yes	1 year	Yes	1-3 years	3 years	Yes	1 year
Group B								
B1	-	Yes	1 year	Yes	1-3 years	3 years	Yes	-
B2	-	-	1 year	Yes	-	-	-	-

Notes : [a] This table shows criteria for granting investment promotion in the year 2015 corresponding to the final year of the period of analysis.

[b] Non-tax incentives : permit to own land, permit to bring into Thailand skilled workers and experts to work in investment promoted activities.

[c] Merit-based incentives is an additional incentive on the top of activity-based incentives. This additional incentives is for the activity which meets the criteria of each programme (i.e. competitiveness enhancement, decentralisation and industrial area development).

[d] Double deduction from the costs of transportation, electricity and water supply for 10 years and an additional 25% deduction of the cost of installation or construction of facilities.

Source : The Board of Investment of Thailand

3.4 Empirical analysis

3.4.1 Data description

We construct a firm-level longitudinal database of Thai and multinational firms located in Thailand for the period 2009 to 2015 using two sources of data: (i) the Orbis database of Bureau van Djik and (ii) administrative data on companies having promoted investment projects provided by the Thai BOI. The data from the BOI indicate whether the company is a promoted company, which obtained the BOI incentives (i.e., tax holidays, exemptions of import duties on machinery, or on raw material used in production for export, and other non-tax incentives) and do not include firm-level characteristics. Therefore, we merge the BOI data with the Orbis database (using firms' name) which encompasses firms' financial statements and their production activity. We only include firms with unconsolidated accounts and information on the location of their parent company. If the parent is Thai, the firm is considered to be a domestic firm. A firm is considered to be foreign if 10% or more of the equity is owned by a foreign corporation.

We clean the Orbis dataset by following Kalemli-Ozcan et al. (2015). First, we drop observations with no financial information. Second, we drop the entire company in all years if total assets is negative in any year. Finally, we keep observations for which country code created based on the BvD ID numbers corresponds to BvD's country ISO code (*Thailand*). After this cleaning process, our sample is composed by 356,793 observations with 103,340 Thai firms (95.78% of the sample) and 4,543 foreign firms (4.22% of the sample). During the period of analysis, 4,326 Thai firms have been approved by the BOI and 3,140 of them benefit from full tax exemption. For foreign firms, 7,505 firms have been approved and 3,050 of them benefit from tax holidays (Table 3.5).

Table 3.5: Promoted companies: domestic firms and foreign firms in Thailand

Year	Domestic firms				Foreign firms			
	Total dom.	BOI approved	BOI approved to total dom.(%)	Tax exemption	Total MNEs	BOI approved	BOI approved to total MNEs (%)	Tax exemption
2009	17,124	352	2.056	237	1,883	694	36.856	318
2010	17,079	406	2.377	293	1,951	748	38.339	366
2011	17,486	481	2.751	367	1,989	781	39.266	387
2012	19,302	514	2.663	404	2,347	949	40.435	432
2013	86,597	848	0.979	607	4,017	1,449	36.072	544
2014	89,770	899	1.001	656	4,119	1,479	35.907	582
2015	89,516	826	0.923	576	4,059	1,405	34.614	421

Notes : This information is from authors' dataset.

3.4.2 Empirical specification

The objective of this study is to analyse the impact of tax incentive on investment and innovation of domestic and foreign firms in Thailand over the period 2009-2015. We estimate the following equation:

$$Ln\,asset_{ist} = \beta_1 taxhol_{ist} + \delta_i + \eta_{st} + \varepsilon_{ist} \qquad (3.1)$$

where the subscripts *i*, *s* and *t* denote firm, sector and time respectively. The dependent variable, *asset* denotes in turn, the log of total asset, the log of tangible asset, and the log of intangible asset. Tangible asset is a measure of capital that reflects the level of physical investment while intangible asset can be considered as a proxy for innovation. *taxhol* is a dummy variable which takes the value one if the firm benefits from tax holidays in year *t*. The δ_i coefficient denotes firm-specific fixed effects capturing time-invariant unobservable factors at the firm level. The η_{st} coefficient denotes the set of sector-year fixed effects capturing unobserved time-invariant heterogeneity among firms across sectors and common shocks to firms belonging to the same sector in a given year. ε_{ist} is an idiosyncratic error term.

We then augment this baseline equation to consider the role of tax sparing provisions which can potentially amplify the effect of tax incentives on investment and innovation since it allows foreign firms to obtain at home a tax credit for the foreign taxes that have been 'spared' abroad.

$$Ln\,asset_{ist} = \beta_1 taxhol_{ist} + \beta_2 TS_{ist-1} + \beta_4 taxhol_{ist} \times TS_{ist-1} + \delta_i + \eta_{st} + \varepsilon_{ist} \quad (3.2)$$

where *TS* is a dummy variable which takes the value one when a tax sparing provision is included in a bilateral tax treaty (BTT) between Thailand and the home country of the foreign firm in year $t - 1$. The tax sparing variable is constructed using the 'Date of Entry into Force' of the bilateral tax treaty, but it is one year lagged because most bilateral tax treaties are effective on January of the taxable year following the year in which the BTT enters into force.

In our sample, as shown in Table 3.6, foreign firms come from 76 developed and developing countries. Among those countries, 47 have a BTT with Thailand. The tax sparing dummy variable is built based on the reading of those 47 BTTs which come from the International Bureau of Fiscal Documentation (IBFD) online database. Most tax treaties follow a common format, based on the OECD or UN Model Treaties and the tax sparing provision, if included, appears in the article 'Elimination of double taxation'. In some cases, the tax sparing provision is accompanied by a sunset clause indicating the number of years it is effective (e.g., 10 years). Thus, the dummy variable tax sparing takes the value 1 for 10 years. This is the case for 34 developed and developing countries between 2009 and 2015. Some tax sparing provisions agreed with developing countries can be reciprocal agreements. Finally, we consider the tax system of the home country with a dummy variable 'worldwide' taking the value 1 if the home country has a worldwide tax system and the value 0 if it has a territorial tax system. This coding of

the home countries is based on various sources such as Markle (2016), PwC worldwide tax summary, Deloitte tax guide and highlights. Figure 3.4 shows that foreign firms benefiting from tax holidays mainly come from territorial tax system having a tax sparing agreement with Thailand. Given the large difference between this category of firms and the other ones (territorial tax system without tax sparing and worldwide tax system with and without tax sparing), we can expect the results of the effect of tax sparing on investment to be driven by this category. Table 3.7 provides summary statistics for Thai and foreign firms.

Table 3.6: List of investor countries and tax sparing provisions (2009-2015)

| Level of economic development | Bilateral tax treaty with Thailand (47) | | | No bilateral tax treaty (29) |
| | Tax sparing (34) | | No tax sparing (13) | |
	Worldwide tax system (18)	Territorial tax system (16)		
Developed countries	Cyprus Israel Korea, Rep. (terminate 2013) Oman	Austria Bahrain Canada Denmark (terminate 2010) Hongkong (terminate 2013) Hungary Japan Luxembourg (terminate 2011) Norway (terminate 2014) Singapore Switzerland Taiwan (start 2013) United Arab Emirates United Kingdom	Australia Belgium Finland France Germany Italy Netherlands New Zealand Poland Spain Sweden United States	Bahamas Barbados Bermuda Brunei Darussalam Cayman Islands Greece Iceland Ireland Liechtenstein Monaco Portugal Qatar Saudi Arabia Virgin Islands, British
Developing countries	Bangladesh Chile (start 2011) China India Indonesia Mauritius Myanmar (start 2012) Pakistan Philippines Russian Federation (start 2010) South Africa Sri Lanka Ukraine Vietnam	Malaysia Seychelles	Turkey	Brazil Curacao Gambia Grenada Iran Kazakhstan Kenya Nigeria Panama Papua New Guinea Samoa Suriname Swaziland Syrian Arab Republic Tunisia

Figure 3.4: Foreign firms benefiting from tax holidays and tax sparing status
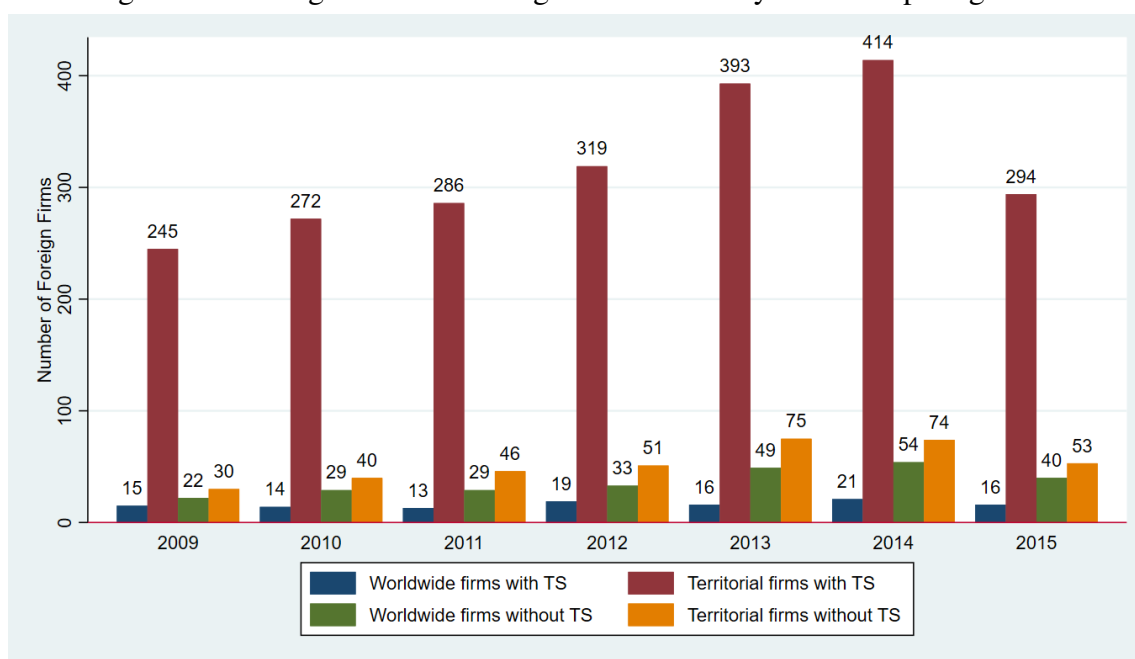
Source: Authors' data set

Table 3.7: Summary statistics

	Mean	Std. Dev.	Min.	Max.	Observations
All firms					
Ln total assets	5.767	2.303	0	18.586	356,793
Ln tangible assets	3.390	2.940	0	17.328	321,312
Ln intangible assets	0.377	1.394	0	15.774	320,896
Tax holidays	0.017	0.130	0	1	357,239
Thai firms					
Ln total assets	5.571	2.151	0	18.586	336,446
Ln tangible assets	3.181	2.788	0	17.328	301,718
Ln intangible assets	0.272	1.206	0	15.774	301,309
Tax holidays	0.009	0.096	0	1	336,874
MNEs					
Ln total assets	9.016	2.303	0	18.185	20,347
Ln tangible assets	6.609	3.316	0	15.762	19,594
Ln intangible assets	1.988	2.589	0	13.448	19,587
Tax holidays	0.150	0.357	0	1	20,365
Tax sparing	0.685	0.465	0	1	19,051
Tax holidays* Tax sparing	0.123	0.328	0	1	19,051

3.5 Empirical results

3.5.1 Baseline Estimates

We first investigate the effect of tax incentives on total assets, tangible assets and intangible assets by exploring whether these effects differ across Thai firms and multinational firms. All specifications include firm and sector-x-year fixed effects. All estimations report standard errors clustered at the firm level.

Table 3.8 presents the estimation results of our baseline regression (Equation 3.1). For all firms, Thai firms and foreign firms, the results suggest a positive effect of tax holidays on total assets. Benefiting from tax holiday increases investment in total assets of Thai firms by 27.3% and of foreign firms by 8.8%. Those positive and statistically significant coefficient estimated on tax holiday are interesting for at least two reasons. First, they suggest that when a firm benefits from a tax holiday on a BOI approved investment project that the investment going to this project is not displacing investment by the firm in other projects. The total assets that we observe are the total ones for the firm including the investment for BOI approved projects and other projects. If the investment going to BOI approved projects was only replacing investment to other projects, the net effect on total assets would be null. In addition, those results indicate that firms benefiting from tax incentives tend to invest more than comparable firms which are not benefiting from them. This tends to mitigate the position of the literature including the one of the IMF being that firms which have been granted tax holiday would have invested anyway. Indeed, our results suggest that if firms might have invested anyway without tax holiday, that they invest more when they benefit from them.

We then turn to the analysis of the effects of tax holidays on physical capital, measured by tangible assets, and on innovation, proxied by intangible assets. To benefit

103

Table 3.8: Tax holidays and investment

Variables	All firms			Thai firms			Foreign firms		
	Ln total (1)	Ln tang (2)	Ln intang (3)	Ln total (4)	Ln tang (5)	Ln intang (6)	Ln total (7)	Ln tang (8)	Ln intang (9)
Tax holidays	0.183***	0.371***	0.196***	0.273***	0.553***	0.211***	0.088***	0.176***	0.162**
	(0.017)	(0.039)	(0.051)	(0.029)	(0.067)	(0.070)	(0.013)	(0.033)	(0.072)
Constant	5.770***	3.342***	0.438***	5.571***	3.128***	0.316***	9.067***	6.625***	2.299***
	(0.002)	(0.005)	(0.004)	(0.003)	(0.005)	(0.003)	(0.009)	(0.021)	(0.034)
Observations	356,793	321,312	320,896	336,446	301,718	301,309	20,347	19,594	19,587
Number of firms	107,883	97,391	97,369	103,340	93,029	93,007	4,543	4,362	4,362
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sector x Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Table 3.8 presents the baseline model (equation 3.1). It reports the effect of tax holidays on total assets, tangible assets and intangible assets in all firms (columns (1) to (3)), Thai firms (columns (4) to (6)) and foreign firms (columns (6) to (9)). Standard errors clustered at the firm-level are displayed in brackets. *** denotes statistical significance at the 1% level, ** at the 5% level, and * at the 10% level. A time trend is included in each regression, but not shown in the table.

from tax holidays, the approved BOI investment project needs to involve a minimum of investment (about 10 millions Thai baht until 2014 and 1 million Thai baht in 2015[6], see Table 3.A.1 in Appendix). The nature of the investment is not specified as long as a modern production process is used (involving the use of new machinery), that the firm uses adequate environmental measures to reduce the impact on the environment and that it obtains an ISO certification.[7] Those requirements can push the firm to innovate by increasing its investment in intangible assets (which encompasses copyrights, trademarks, patents, computer software and licences). The results suggest that Thai firms benefiting from tax holidays increase substantially their investment in physical capital (by up to 55%) as well as their investment in intangible assets (by about 21%). Benefiting from tax holidays increase the tangible assets of foreign firms by 17.6% and the intangible assets by a similar amount of 16.2%. In a developing country where a technological gap between domestic firms and foreign firms can be expected, and which could prevent domestic firms from benefiting from spillovers generated by foreign firms, this increase

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[6]Approximately USD 283,800 until 2014 and USD 28,380 in 2015. The currency conversion is based on the rate in June 2022 (35.23 Thai baht/USD).

[7]Being ISO certified is expected to ensure that customers get consistent, good-quality products and services.

in intangible assets facilitated by tax holidays could improve their absorptive capacities. All in all, this positive relationship between tax incentives and R&D, innovation, could enhance national competitiveness.

Interestingly, the elasticity between tax incentives and total assets and physical investment is much higher for Thai firms than for foreign firms. A possible explanation for this difference might be that Thai firms can only decrease their tax burden via official tax incentives provided by the government whereas multinational firms, with their international activities, have more opportunities to conduct tax planning.

3.5.2 BOI Approved Investment, Tax Incentives and Lasting Effects

The stylised facts show that a firm having a BOI approved investment project does not necessarily benefit from full tax exemptions. Indeed, about 73% of Thai firms and 41% of foreign firms having a BOI approved project, also benefit from corporate tax holidays (see Table 3.5). However, BOI approved firms which cannot benefit from tax holidays can still enjoy other incentives such as exemptions of import duties on machinery, or on raw material used in production for export, or other non-tax incentives (such as permit to own land, permit to bring into Thailand skilled workers and experts to work in investment promoted activities).

In Table 3.9, we investigate the effect of having a BOI approved project on the investment of Thai and foreign firms. Then, to disentangle the effect of other incentives from tax holidays, we include in the model the dummy variable other incentives. The coefficient estimated on the dummy variable BOI, which takes the value one when a firm has a BOI approved investment project, is only statistically significant when it is included alone. Once we add the dummy variable tax holidays, the coefficient estimated

on BOI loses its statistical significance with one exception though; benefiting from other incentives increase the tangible assets of foreign firms by 13%. This diverging effect between Thai firms and foreign firms might be due to the fact that foreign firms are more involved in international trade than domestic firms and thus benefit more from incentives targeted to their import and export. The other advantages are also related to the international status of the foreign firms such as bringing expatriates or owning land in Thailand. Finally, since those advantages are mainly related to machinery, raw materials and land, their impact on investment was expected to predominantly be on tangible assets.

When a tax holiday is provided, it is for a limited number of years and it is accompanied with an initial mandatory investment. We then want to capture the possibility that the effects of tax holidays change over time. In other words, is the change in investment only a contemporaneous effect or does it last over time and for how long? In Tables 3.10 and 3.11, three lags are included to the baseline regression for Thai firms and foreign firms, respectively. The results show that the positive effect of a tax exemption lasts for at least two years and up to four years with a graduated decreasing effect from the year of being a BOI approved investment project with tax exemption to the next years. For both Thai and foreign firms the positive effect of a tax exemption on physical investment is mainly a contemporaneous effect, with most of the increase happening in year t (and $t + 1$ for Thai firms) while the positive effect on innovation lasts for two additional years. If those results tend to suggest a lasting effect of tax exemptions regarding intangible assets, they have to be interpreted with caution though as the period of analysis corresponds to 7 years and thus, it restricts the number of lags that can be used when a tax exemption is provided close to 2009. In addition, these coefficients are strongly correlated and this multicollinearity makes it difficult to estimate the incidence of tax exemption at each lag.

Table 3.9: BOI, tax incentives and tax holidays

	Thai firms						Foreign firms					
Variables	Ln tang (1)	Ln tang (2)	Ln tang (3)	Ln intang (4)	Ln intang (5)	Ln intang (6)	Ln tang (7)	Ln tang (8)	Ln tang (9)	Ln intang (10)	Ln intang (11)	Ln intang (12)
BOI incentives	0.576*** (0.072)		0.158 (0.189)	0.222*** (0.074)		0.079 (0.224)	0.266*** (0.061)		0.130* (0.071)	0.193 (0.139)		0.046 (0.161)
Tax holidays		0.553*** (0.067)	0.418** (0.174)		0.211*** (0.070)	0.143 (0.211)		0.176*** (0.033)	0.137*** (0.039)		0.162** (0.072)	0.148* (0.083)
Constant	3.126*** (0.005)	3.128*** (0.005)	3.127*** (0.005)	0.315*** (0.004)	0.316*** (0.003)	0.316*** (0.004)	6.548*** (0.031)	6.625*** (0.021)	6.582*** (0.032)	2.248*** (0.060)	2.299*** (0.034)	2.284*** (0.063)
Observations	301,718	301,718	301,718	301,309	301,309	301,309	19,594	19,594	19,594	19,587	19,587	19,587
Number of firms	93,029	93,029	93,029	93,007	93,007	93,007	4,362	4,362	4,362	4,362	4,362	4,362
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sector x Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Table 3.9 shows the effect of having a BOI approved project and using tax holidays on the investment of Thai and foreign firms in columns (1) to (6) and columns (7) to (12), respectively. A time trend, firm fixed effects and sector-year fixed effects are included in each regression. Standard errors clustered at the firm-level are displayed in brackets. *** denotes statistical significance at the 1% level, ** at the 5% level, and * at the 10% level.

Table 3.10: Thai firms : lagged effect of tax holidays

	Dependent Variable : Ln total asset				
	(1)	(2)	(3)	(4)	(5)
Tax holidays$_t$	0.273***	0.158***	0.115***	0.066***	0.063***
	(0.029)	(0.022)	(0.022)	(0.022)	(0.022)
Tax holidays$_{t-1}$		0.110***			0.052***
		(0.018)			(0.018)
Tax holidays$_{t-2}$			0.070***		0.045**
			(0.021)		(0.019)
Tax holidays$_{t-3}$				0.059***	0.059***
				(0.019)	(0.019)
Constant	5.571***	5.734***	5.976***	6.576***	6.624***
	(0.003)	(0.003)	(0.003)	(0.005)	(0.005)
Observations	336,446	228,638	141,815	66,129	62,935
Number of firms	103,340	89,759	76,842	19,289	18,441
Adjusted R-squared	0.028	0.022	0.025	0.031	0.031

	Dependent Variable : Ln tangible asset				
	(1)	(2)	(3)	(4)	(5)
Tax holidays$_t$	0.553***	0.371***	0.303***	0.169***	0.166***
	(0.067)	(0.059)	(0.063)	(0.055)	(0.055)
Tax holidays$_{t-1}$		0.219***			0.097**
		(0.051)			(0.049)
Tax holidays$_{t-2}$			0.032		-0.006
			(0.074)		(0.071)
Tax holidays$_{t-3}$				0.011	0.020
				(0.062)	(0.061)
Constant	3.128***	3.264***	3.516***	4.102***	4.149***
	(0.005)	(0.005)	(0.007)	(0.009)	(0.010)
Observations	301,718	209,864	131,477	63,077	60,163
Number of firms	93,029	82,240	69,851	18,653	17,855
Adjusted R-squared	0.016	0.021	0.015	0.022	0.022

	Dependent Variable : Ln intangible asset				
	(1)	(2)	(3)	(4)	(5)
Tax holidays$_t$	0.211***	0.022	-0.054	-0.166**	-0.180***
	(0.070)	(0.070)	(0.076)	(0.065)	(0.066)
Tax holidays$_{t-1}$		0.158***			-0.090
		(0.060)			(0.060)
Tax holidays$_{t-2}$			0.155**		-0.097
			(0.069)		(0.074)
Tax holidays$_{t-3}$				0.104	0.104
				(0.075)	(0.077)
Constant	0.316***	0.358***	0.427***	0.616***	0.639***
	(0.003)	(0.004)	(0.006)	(0.008)	(0.009)
Observations	301,309	209,826	131,443	63,046	60,137
Number of firms	93,007	82,238	69,852	18,656	17,857
Adjusted R-squared	0.020	0.019	0.016	0.008	0.009

Notes: Table 3.10 includes three lags of tax holidays in the baseline regression (equation 3.1) for Thai firms. Standard errors clustered at the firm-level are displayed in brackets. *** denotes statistical significance at the 1% level, ** at the 5% level, and * at the 10% level. A time trend, firm fixed effects and sector-year fixed effects are included in each regression, but not shown in the table.

Table 3.11: MNEs : lagged effect of tax holidays

	Dependent Variable : Ln total asset				
	(1)	(2)	(3)	(4)	(5)
Tax holidays$_t$	0.088***	0.040***	0.025**	0.008	0.010
	(0.013)	(0.011)	(0.011)	(0.013)	(0.012)
Tax holidays$_{t-1}$		0.045***			0.016
		(0.011)			(0.012)
Tax holidays$_{t-2}$			0.029**		0.014
			(0.012)		(0.012)
Tax holidays$_{t-3}$				0.015	0.020*
				(0.012)	(0.012)
Constant	9.067***	9.220***	9.399***	9.686***	9.697***
	(0.009)	(0.009)	(0.009)	(0.010)	(0.011)
Observations	20,347	15,640	11,540	7,730	7,575
Number of firms	4,543	4,191	3,873	2,344	2,291
Adjusted R-squared	0.083	0.042	0.039	0.020	0.025
	Dependent Variable : Ln tangible asset				
	(1)	(2)	(3)	(4)	(5)
Tax holidays$_t$	0.176***	0.077***	0.062*	0.024	0.020
	(0.033)	(0.026)	(0.032)	(0.022)	(0.021)
Tax holidays$_{t-1}$		0.024			0.001
		(0.028)			(0.029)
Tax holidays$_{t-2}$			0.044		0.001
			(0.038)		(0.017)
Tax holidays$_{t-3}$				0.062	0.063*
				(0.038)	(0.035)
Constant	6.625***	6.800***	7.038***	7.371***	7.402***
	(0.021)	(0.022)	(0.022)	(0.022)	(0.022)
Observations	19,594	15,175	11,222	7,553	7,412
Number of firms	4,362	4,049	3,735	2,289	2,244
Adjusted R-squared	0.023	0.022	0.021	0.016	0.017
	Dependent Variable : Ln intangible asset				
	(1)	(2)	(3)	(4)	(5)
Tax holidays$_t$	0.162**	0.062	0.084	-0.009	0.007
	(0.072)	(0.071)	(0.079)	(0.080)	(0.080)
Tax holidays$_{t-1}$		0.135*			-0.007
		(0.075)			(0.084)
Tax holidays$_{t-2}$			0.211**		0.107
			(0.090)		(0.091)
Tax holidays$_{t-3}$				0.111	0.103
				(0.100)	(0.103)
Constant	2.299***	2.380***	2.462***	2.672***	2.674***
	(0.034)	(0.038)	(0.042)	(0.047)	(0.062)
Observations	19,587	15,172	11,219	7,549	7,408
Number of firms	4,362	4,049	3,735	2,289	2,244
Adjusted R-squared	0.103	0.076	0.058	0.039	0.040

Notes: Table 3.11 includes three lags of tax holidays in the baseline regression (equation 3.1) for foreign firms. Standard errors clustered at the firm-level are displayed in brackets. *** denotes statistical significance at the 1% level, ** at the 5% level, and * at the 10% level. A time trend, firm fixed effects and sector-year fixed effects are included in each regression, but not shown in the table.

3.5.3 Tax Exemption Effectiveness

The Role of Tax Sparing

When a tax incentive is provided to a foreign firm, it decreases its tax liability in the host country and consequently the tax credit that the firm can claim at home on its income earned abroad. However, under tax sparing, foreign income that has benefited from a tax incentive program in the host country is treated by the home country as if it has been fully taxed in the host country. Therefore, the effect of tax incentives on investment can be amplified when the host country has agreed a tax sparing provision with the home country.

Table 3.12: Tax holidays and tax sparing provisions

Variables	All MNEs					
	Ln total (1)	Ln tang (2)	Ln intang (3)	Ln total (4)	Ln tang (5)	Ln intang (6)
Tax holidays$_t$	0.086***	0.173***	0.157**	0.082***	0.218***	-0.120
	(0.013)	(0.033)	(0.072)	(0.018)	(0.054)	(0.102)
TS$_{t-1}$	0.112***	0.197***	0.293***	0.111***	0.207***	0.232***
	(0.014)	(0.033)	(0.043)	(0.015)	(0.035)	(0.042)
Tax holidays$_t$* TS$_{t-1}$				0.006	-0.070	0.425***
				(0.017)	(0.046)	(0.106)
Constant	8.991***	6.490***	2.097***	8.991***	6.484***	2.132***
	(0.013)	(0.030)	(0.046)	(0.013)	(0.031)	(0.045)
Observations	20,347	19,594	19,587	20,347	19,594	19,587
Number of firms	4,543	4,362	4,362	4,543	4,362	4,362
Adjusted R-squared	0.088	0.027	0.106	0.088	0.027	0.108
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Sector x Year FE	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Table 3.12 shows the role of tax sparing on foreign firms' investment (equation 3.2). Columns (1) to (3) present the effect of tax sparing while controlling for tax holidays. Columns (4) to (6) include the interaction term between tax sparing and tax holidays. Standard errors clustered at the firm-level are displayed in brackets. *** denotes statistical significance at the 1% level, ** at the 5% level, and * at the 10% level. A time trend is included in each regression, but not shown in the table.

In Table 3.12, we restrict the sample of firms to foreign firms and consider the role of tax sparing on their investment by including a dummy tax sparing which takes the value 1 when a tax sparing provision is included in a BTT between Thailand and the home country

of the foreign firm in year $t-1$. The tax sparing variable is constructed using the 'Date of Entry into Force' of the bilateral tax treaty, but it is one year lagged because most bilateral tax treaties are effective on January of the taxable year following the year in which the BTT enters into force.

With firm fixed-effects, we focus on the within firm effect of tax sparing when this change occurs during the period of analysis. From Table 3.6, we identify nine home countries[8] out of the 34 tax sparing ones, in which new tax sparing agreements entered into force or in which existing tax sparing agreements were terminated over 2009-2015.

As can be seen in columns 1-3 on Table 3.12, the coefficient estimated on the dummy tax sparing is consistently positive and statistically significant, indicating that foreign firms invest more in tangible and intangible assets once they benefit from tax sparing. The magnitude of this effect which corresponds to an increase of 20% and 30% respectfully, while controlling for tax holidays, is substantial.

We then interact the tax sparing dummy variable with the dummy tax holidays to investigate whether tax holidays have a stronger effect on investment for firms benefiting from tax sparing. This interaction term presents the benefit to consider the tax sparing agreements entered into force prior to 2009, which corresponds to the majority of them. The coefficient estimated on this interaction term is only statistically significant for intangible assets. This result indicates that firms benefiting from tax holidays do not invest more in tangible assets under tax sparing. This result is probably driven by the fact that territorial firms largely dominates worldwide firms in the sample of firms benefiting from tax holidays (Figure 3.4). Importantly, the profit generated from investment in

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[8]Those countries are Chile, Denmark, Hongkong, South Korea, Luxembourg, Myanmar, Norway, Russia and Taiwan.

tangible asset falls into the category active income which is exempt at home for territorial firms. The tax sparing provision does not change the global tax paid by territorial firms on their active income earned abroad and this is reflected by the non statistical significance of the coefficient estimated on the tax sparing dummy. However, investment in intangible assets is likely to increase passive income (via royalties and interest) which is taxed at home for both territorial and worldwide firms. The positive role of the tax sparing provision, which decreases the global tax burden of both types of firms with regards to passive income, tends to be confirmed by the results as the coefficient estimated on the interaction term between tax sparing and tax holiday is positive and statistically significant. The differential between firms benefiting from both tax holidays and tax sparing, relative to firms benefiting from neither of them is about 54% (obtained by adding all three coefficients and multiplying by 100). Firms benefiting from a tax holiday invest 30% more in intangible assets when they benefit from a tax sparing provision, than firms benefiting from tax holidays without tax sparing.

Globally, the results of this section reinforce the findings of Azémar and Dharmapala (2019) who had to make assumptions about tax holidays received by firms. Using actual tax holidays, we also show the importance of tax sparing in encouraging investment and this even with a sample dominated by territorial firms. This indicates the continuing relevance of tax sparing in a world in which most home countries are territorial.

Sectors' Heterogeneity

The effect of tax holidays can vary from one sector to another. Tables 3.13 and 3.14 allow for a different elasticity between tax holidays and tangible assets and intangible assets, respectively. In both tables, the coefficients estimated on the dummy tax holidays is very close to the average effect for most of the sectors, corresponding to an increase

112

of about 36% of tangible assets and 18-20% of intangible assets. However, a few sectors diverge from this average effect. Regarding tangible assets, the highest effects are estimated on construction where benefiting from tax holidays more than triple investment (coefficient with a magnitude of 2.38) and on electricity, finance and transport, where investment is more or less doubled. The lowest magnitudes are estimated on manufacturing and wholesale (with an increase of 23% for both sectors). Regarding intangible assets, this is the sector electricity which is the most responsive to tax holidays (with an increase of 130%) and the sector manufacturing which is the least responsive (with an increase of 11%). In the presence of tax holidays, the sector finance reacts very differently from the other sectors by displacing intangible assets (-90%) for tangible asset (+112%). The other sectors do not deviate significantly from the average effect.

Table 3.13: Tax holidays and sectors: tangible asset (all firms)

Variables	Ln tangible asset								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Tax holidays	0.366***	0.346***	0.321***	0.370***	0.621***	0.365***	0.371***	0.342***	0.388***
	(0.038)	(0.036)	(0.036)	(0.039)	(0.085)	(0.039)	(0.039)	(0.039)	(0.042)
Tax holidays* agriculture	0.260								
	(0.481)								
Tax holidays* construction		2.030**							
		(0.986)							
Tax holidays* electricity			0.986***						
			(0.328)						
Tax holidays* finance				0.746*					
				(0.441)					
Tax holidays* manufacturing					-0.390***				
					(0.093)				
Tax holidays* mining						0.389			
						(0.436)			
Tax holidays* real estate							-0.012		
							(0.373)		
Tax holidays* transport								0.581***	
								(0.208)	
Tax holidays* wholesale									-0.158*
									(0.093)
Constant	3.342***	3.342***	3.341***	3.342***	3.342***	3.342***	3.342***	3.342***	3.342***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Observations	321,312	321,312	321,312	321,312	321,312	321,312	321,312	321,312	321,312
Number of firms	97,391	97,391	97,391	97,391	97,391	97,391	97,391	97,391	97,391
Adjusted R-squared	0.015	0.016	0.016	0.015	0.016	0.015	0.015	0.016	0.015
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sector x Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Table 3.13 presents the effect of tax holidays on investment in tangible assets for all firms across 10 sectors and controls for fixed effects at the firm level and with sector-year fixed effects. Accommodation is a baseline sector. Standard errors clustered at the firm-level are displayed in brackets. *** denotes statistical significance at the 1% level, ** at the 5% level, and * at the 10% level. A time trend is included in each regression, but not shown in the table.

Table 3.14: Tax holidays and sectors: intangible asset (all firms)

Variables	Ln intangible asset								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Tax holidays	0.202***	0.182***	0.136***	0.198***	0.346***	0.187***	0.207***	0.183***	0.215***
	(0.052)	(0.050)	(0.051)	(0.051)	(0.095)	(0.051)	(0.052)	(0.053)	(0.053)
Tax holidays* agriculture	-0.346								
	(0.247)								
Tax holidays* construction		1.089							
		(0.885)							
Tax holidays* electricity			1.164***						
			(0.288)						
Tax holidays* finance				-1.098***					
				(0.178)					
Tax holidays* manufacturing					-0.235**				
					(0.112)				
Tax holidays* mining						0.630			
						(0.513)			
Tax holidays* real estate							-0.555		
							(0.420)		
Tax holidays* transport								0.244	
								(0.197)	
Tax holidays* wholesale									-0.178
									(0.192)
Constant	0.438***	0.438***	0.437***	0.438***	0.438***	0.438***	0.438***	0.438***	0.438***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Observations	320,896	320,896	320,896	320,896	320,896	320,896	320,896	320,896	320,896
Number of firms	97,369	97,369	97,369	97,369	97,369	97,369	97,369	97,369	97,369
Adjusted R-squared	0.029	0.029	0.030	0.029	0.029	0.029	0.029	0.029	0.029
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sector x Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Table 3.14 presents the effect of tax holidays on investment in intangible assets for all firms across 10 sectors and controls for fixed effects at the firm level and with sector-year fixed effects. Accommodation is a baseline sector. Standard errors clustered at the firm-level are displayed in brackets. *** denotes statistical significance at the 1% level, ** at the 5% level, and * at the 10% level. A time trend is included in each regression, but not shown in the table.

Level of Economic Development

Our database has the advantage to consider multinational firms coming from developing countries as well as tax sparing provisions signed between Thailand and other developing countries. Very little is known in the literature about the effect of tax incentives on FDI from developing countries. In addition, the few papers considering the role of tax sparing focus on tax sparing agreements signed between developed and developing countries when the number of tax sparing agreements signed between developing countries is substantial. For instance, as documented by Table 3.6, Thailand has a tax sparing provision with 16 developing countries including India, Pakistan, Malaysia, South Africa, Chile, and Bangladesh for instance.

Most bilateral tax treaties follow a common format, based on the OECD or UN Model Treaties, and the tax sparing provision is quite standard across treaties providing thus the same advantages to firms when the BTT is signed between a developed country and a developing country or between two developing countries. However, the effect of tax sparing on investment may diverge between firms coming from developed and developing countries for at least two reasons. The first one has to do with the tax system of the home country. For instance, Table 3.6 indicates that most developing countries having signed a tax sparing provision with Thailand have a worldwide tax system, whereas the majority of developed countries having signed this provision with Thailand have a territorial tax system. Secondly, the capacities of tax authorities in the home country can vary with their level of economic development. Tax sparing should have an effect on investment only if taxes are incurred at home on income earned abroad, not if they are avoided. In 2009, the G20 called on the Global Forum on Transparency and Exchange of Information for Tax Purposes and since 2016, with the Inclusive Framework on Base Erosion and Profit Shifting (BEPS), 141 members contribute to the development of measures to combat

116

profit shifting. To support countries with lower capacities, G20 countries have developed a number of actions including 'political dialogue, outreach and induction programmes, bilateral capacity building, and the Tax Inspectors Without Borders (TIWB) initiative' (OECD, 2021a). According to the OECD (2021a), this support is fruitful and developing countries have made substantial progress in building capacity relative to income shifting. However, the report also indicates that the application of the arm's length principle and Country-by-Country reporting remain complex for those countries and that additional support would be required to strengthen their administrative practices.

Table 3.15: Tax holidays, tax sparing and investment from developing countries (foreign firms)

Variables	Ln total (1)	Ln tang (2)	Ln intang (3)	Ln total (4)	Ln tang (5)	Ln intang (6)
Tax holidays$_t$	0.088***	0.170***	0.185**	0.084***	0.161***	0.160**
	(0.014)	(0.034)	(0.078)	(0.013)	(0.034)	(0.074)
Tax holidays$_t$* developing countries	-0.011	-0.055	-0.251			
	(0.055)	(0.160)	(0.218)			
TS$_{t-1}$				0.112***	0.205***	0.324***
				(0.015)	(0.034)	(0.048)
TS$_{t-1}$* developing countries				-0.030	-0.114	-0.443***
				(0.039)	(0.095)	(0.082)
Constant	9.199***	6.749***	2.367***	9.120***	6.607***	2.164***
	(0.009)	(0.022)	(0.035)	(0.013)	(0.032)	(0.049)
Observations	18,938	18,272	18,267	18,938	18,272	18,267
Number of firms	4,186	4,032	4,032	4,186	4,032	4,032
Adjusted R-squared	0.091	0.026	0.107	0.096	0.030	0.111
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Sector x Year FE	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Table 3.15 shows the heterogeneous response of developing country firms compared to developed country firms by interacting a dummy variable 'developing countries' with a dummy variable 'tax holidays' (columns 1-3) and with a dummy variable 'tax sparing' (columns 4-6). Standard errors clustered at the firm-level are displayed in brackets. *** denotes statistical significance at the 1% level, ** at the 5% level, and * at the 10% level. A time trend is included in each regression, but not shown in the table.

To consider divergences in the behaviour of firms, in Table 3.15 we allow for an heterogenous response of firms coming from developing countries as compared to firms coming from developed countries by interacting a dummy variable developing countries

with the dummy variable tax holidays (columns 1-3) and with the dummy variable tax sparing (columns 4-6). Using the World Bank classification, the dummy developing countries takes the value 1 when a country falls into the categories upper-middle income, lower middle income or low income in 2009. The coefficient estimated on the interaction term between the dummy variables tax holidays and developing countries is negative but not statistically significant indicating that foreign firms coming from developing and developed countries boost their investments in response to tax exemptions in a similar way. In column 3, when we focus on intangible assets, the magnitude of the coefficient estimated on the interaction term is large, though. This large effect suggests that the uncertainty is substantial, casting doubt on the relevance of the effect estimated. Therefore, we cannot entirely rule out the possibility that firms from developing countries have a smaller elasticity than firms from developed countries, between tax exemptions and investment in intangible assets.

In columns 4-6, the dummy developing countries is then interacted with the dummy tax sparing. The results are very similar to the ones obtained in columns 1-3. Tax sparing has a positive effect on investment in total asset and tangible asset by firms from developing countries but tend to have a negative effect on investment in intangible assets. The net effect of tax holidays and tax sparing on investment tend to be positive since total asset increases, but it appears that firms substitute intangible assets for tangible assets when they can benefit from lower taxes. The dichotomy between the tax system of developed countries which tends to be territorial and the one of developing countries which tends to be worldwide can shed light on this result. When competing against other foreign firms from developed countries, firms from developing countries face a disadvantage in terms of tax burden as they have to pay income at home on their active income earned in Thailand, when this is not the case for firms from developed countries. Once this disadvantage is

eliminated by tax sparing, they tend to invest more in tangible assets (at the expense of intangible assets) maybe to catch-up with their developed competitors.

3.6 Conclusion

Thailand, like a substantial number of developing countries, promotes heavily investment activities via generous tax incentives. Those incentives have a negative impact on corporate tax revenue as a share of GDP which decreased by almost 2% over the period of 2011 to 2020. As suggested by the literature of tax incentives, a major concern is that tax holidays and incentives in general might have little effect on the behaviour of companies, harming then the economy of developing countries. The study presented in this chapter assesses the impact of tax holidays on domestic and foreign investment in Thailand using administrative data on BOI promoted companies. The results reveal that tax holidays increase investment in tangible and intangible assets of both Thai and foreign firms. This positive effect lasts up to three years with a longer effect on intangible assets. The effect of tax holidays is amplified for foreign firms benefiting from a tax sparing provision, especially with regard to their investment in intangible assets. Finally, other tax and non tax incentives, related to international trade activities or to the international status of firms mainly benefit foreign firms with no significant effects on domestic firms.

The recent agreement on a global minimum tax rate should directly support developing countries domestic resource which is of critical importance to recover from the COVID-19 pandemic. However, since this agreement will make tax incentives ineffective, its positive effect on revenue would occur only if developing countries manage to maintain their attractiveness with a higher tax burden for MNEs. Developing countries are indeed quite reliant on foreign direct investment and on corporate income taxes. The literature on

119

tax competition is quite pessimistic on that respect. A key insight of this literature is to consider that countries are not symmetric and that a country with a large market can afford to impose a higher corporate tax rate than a smaller country because it offers a more attractive environment due to its larger market (Haufler and Wooton, 1999, 2010; Azémar et al., 2020). A unique global minimum tax rate could largely benefit markets which are mostly composed of large or developed countries, when tax incentives cannot be used anymore to compensate for those asymmetries in attractiveness.

3.A Appendix

Table 3.A.1: Criteria for project approval

Criteria	Location-based	Industry-based
Granting Incentives	Zone 1: the six provinces surrounding Bangkok Zone 2: the 10 provinces surrounding Zone 1 plus Phuket and Rayong Zone 3: the remaining provinces in the north, north-east and far south of Thailand, as well as the Laem Chabang Industrial Estate	Activity-based incentives : - Group A (A1-A4) - Group B (B1 and B2) Plus merit-based incentives if applicable : - Merit on competitiveness enhancement - Merit on decentralization - Merit on industrial area development
Minimum capital investment	10 million baht (excluding cost of land and working capital)	1 million baht (excluding cost of land and working capital)
Minimum value-added	Must not be less than 20% of revenue, except for projects in agriculture and agricultural products, electronic products or projects granted special approval by the Board.	Must not be less than 20% of revenues, except for projects in agriculture and agricultural products, electronic products, and coil centres, all of which must have a value-added of at least 10% of revenues.
Debt-to-equity ratio	Must not exceed 3 to 1 for a newly established project. Expansion projects shall be considered on a case by case basis.	Must not exceed 3 to 1 for a newly established project. Expansion projects shall be considered on a case by case basis.
Production process	Modern production processes must be used.	Modern production processes must be used.
Machinery	New machinery must be used. In case of imported machinery, its efficiency must be certified by a trusted institute and the Board's approval must be obtained.	New machinery must be used. In case of imported machinery, its efficiency must be certified by a trusted institute and the Board's approval must be obtained. - The used machinery not over 5 years old is allowed to be counted as investment capital for the calculation of the cap on corporate income tax exemptions; however, import duty exemption cannot be granted. - For the used machinery over 5 years old but not exceeding 10 years old, only press machines are allowed to be counted as investment capital for the calculation of the cap on corporate income tax exemptions; however, import duty exemption cannot be granted.

(Continued on next page)

Criteria	Location-based	Industry-based
Environmental protection	Adequate environmental protection systems should be installed. For projects with a potential environmental threat, the Board shall prescribe special conditions on both the location of the project and on the treatment of pollution.	- Adequate and efficient guidelines and measures to protect environmental quality and to reduce environmental impact must be installed. The Board will give special consideration to the location and pollution treatment of a project with potential environmental impact. - Projects or activities with type and size that are required to submit environmental impact assessment reports must comply with the related environmental laws and regulations or Cabinet resolutions.
Project feasibility	For projects with investment value of over 500 million baht, (excluding cost of land and working capital), the project's feasibility study must be submitted.	For projects with investment value of over 750 million baht, (excluding cost of land and working capital), the project's feasibility study must be submitted.
Quality standard	Projects that have investment capital of 10 million baht or more (excluding cost of land and working capital) must obtain ISO 9000 certification or similar international standard certification within 2 years from the full operation startup date, otherwise corporate income tax exemption shall be reduced by one year.	Projects that have investment capital of 10 million baht or more (excluding cost of land and working capital) must obtain ISO 9000 or ISO 14000 certification or similar international standard certification within 2 years from the full operation startup date, otherwise corporate income tax exemption shall be reduced by one year.
Foreign investors	For a project in agriculture, animal husbandry, fishery, mineral exploration and mining and other activities which are not permissible to foreigners, Thai nationals must hold shares totalling not less than 51% of the registered capital. Other activities, in all zones, foreign investors may hold a majority or all shares in promoted projects.	For a project in agriculture, animal husbandry, fishery, mineral exploration and mining and other activities which are not permissible to foreigners, Thai nationals must hold shares totalling not less than 51% of the registered capital. Other activities, there are no equity restrictions for foreign investors except as otherwise specified in other laws.
Tax holiday (years)	Up to 8 years	Up to 13 years

Notes : foreigners are not permitted to invest in nine activities which are indicated under List One annexed to the Foreign Business Act, B.E. 2542: (1) Radio and television station business; (2) Rice farming, plantation or crop growing; (3) Livestock farming; (4) Forestry and timber processing from a natural forest; (5) Fishery, only in respect of the catchment of aquatic animals in Thai waters; (6) Extraction of Thai medicinal herbs; (7) Trading and auction sale of antique objects of Thailand or objects of historical value of the country; (8) Making or casting Buddha Images; and (9) Land trading.
Source : Announcement of the Board of Investment No. 1/2543 Policies and Criteria for Investment Promotion and Announcement of the Board of Investment No. 2 /2557 Policies and Criteria for Investment Promotion

The Impact of FDI on the Thai Economy: A Sector-Level Analysis

4.1 Introduction

Economic growth is a primarily determinant of the well-being of a nation. A change of a few percentage points in the growth rate of a nation can have significant consequences for the well-being and living standards of that nation's citizens. Since the gaps between developed and developing countries have been significant for over four decades, developing countries often offer special incentives to attract foreign direct investment (FDI). Countries often choose to offer such incentives due to two possible benefits: capital accumulation and knowledge transfer from multinational enterprises (MNEs). The recipient country receives new inputs and new technologies to be used in production processes through the capital accumulation of MNEs and benefits from new technological and management skills through knowledge transfer. Therefore, FDI may have substantial effects on the entire economy of the recipient (host) country and thus promote economic growth.

The effect of FDI on economic growth has been extensively analysed in the literature. However, the findings of one study alone cannot indicate the existence of universal effects. Baldwin and Winters (2004) claim that the activities of a foreign-owned firm in another country may not be the same as those that that firm engages in elsewhere. Similarly, Crespo and Fontoura (2007) confirm that not all forms of FDI contribute equally to output growth.

A large number of studies have assumed that FDI in different sectors has the same impact on a host country's economic growth by indicating the value of total inward FDI as an FDI measurement variable. In contrast, Aykut and Sayek (2007) and Chakraborty and Nunnenkamp (2008) argue that FDI in the primary sector contributes little to economic growth because of few links to the local economy, whereas investments in the manufacturing sector are generally believed to generate the most significant growth effects given that such investments are the most relevant in terms of the diffusion of advanced technologies. For the services sector, empirical results are ambiguous (Alfaro, 2003; Massoud, 2008). Thus, measuring the impact of FDI on growth using an aggregate FDI could blur the actual growth effect if the different sectors of FDI contribute differently to economic growth.

Furthermore, most studies on the effect of FDI on output growth have focused on situations in which advanced countries are the source of FDI, as it is typically these countries that make significant investments abroad. However, outward FDI by firms from developing countries has increased dramatically in recent years and accounted for nearly one-fifth of global FDI flow in 2015, from just 4% in 1995 (Perea and Stephenson, 2017). It is crucial to analyse whether the effects of FDI by firms from developed and developing countries on output growth differ. This argument contributes to the level of

technology development and the technological catch-up of the host countries. Once host countries understand these effects, policy makers can create appropriate policies by which to generate maximum benefit from FDI.

The Board of Investment (BOI) of Thailand, a developing country, has consistently offered tax incentives for small- and medium-sized enterprises (SMEs), headquarters of MNEs and large companies in the hope to stimulate economic growth. In 1999, 81% of these incentives were redundant (FIAS, 1999) - that is, these investments would have been undertaken even had the incentive not been offered. This redundancy percentage is a dated statistic, but no cost-benefit analysis has been conducted concerning these incentives since 1999. Another concern from granting several tax incentives is that tax incentives may risk directing resources to firms that are less productive.

As shown in Figure 4.1, Thai corporate income tax revenue as a percentage of gross domestic product (GDP) has decreased over the last four years. Corporate income tax (CIT) revenue as a share of GDP has declined by almost 1.7%, from 5.65% in 2011 to 4% in 2017. Thailand faces a trade-off between increasing their tax revenues to finance public goods and granting tax incentives in an attempt to attract FDI in the hope of stimulating economic growth. The question arises as to whether Thailand should grant tax incentives to all new investment projects or specify a target-sector in particular need of economic development. As FDI can promote growth through capital accumulation and the subsequent knowledge transfer to the Thai economy, the impact of FDI on growth in each sector warrants investigation.

This chapter attempts to reconcile the inconclusive evidence concerning the effect of FDI on economic growth by considering the heterogeneity among economic sectors and

Figure 4.1: Corporate income tax revenue as a % of GDP in selected ASEAN countries
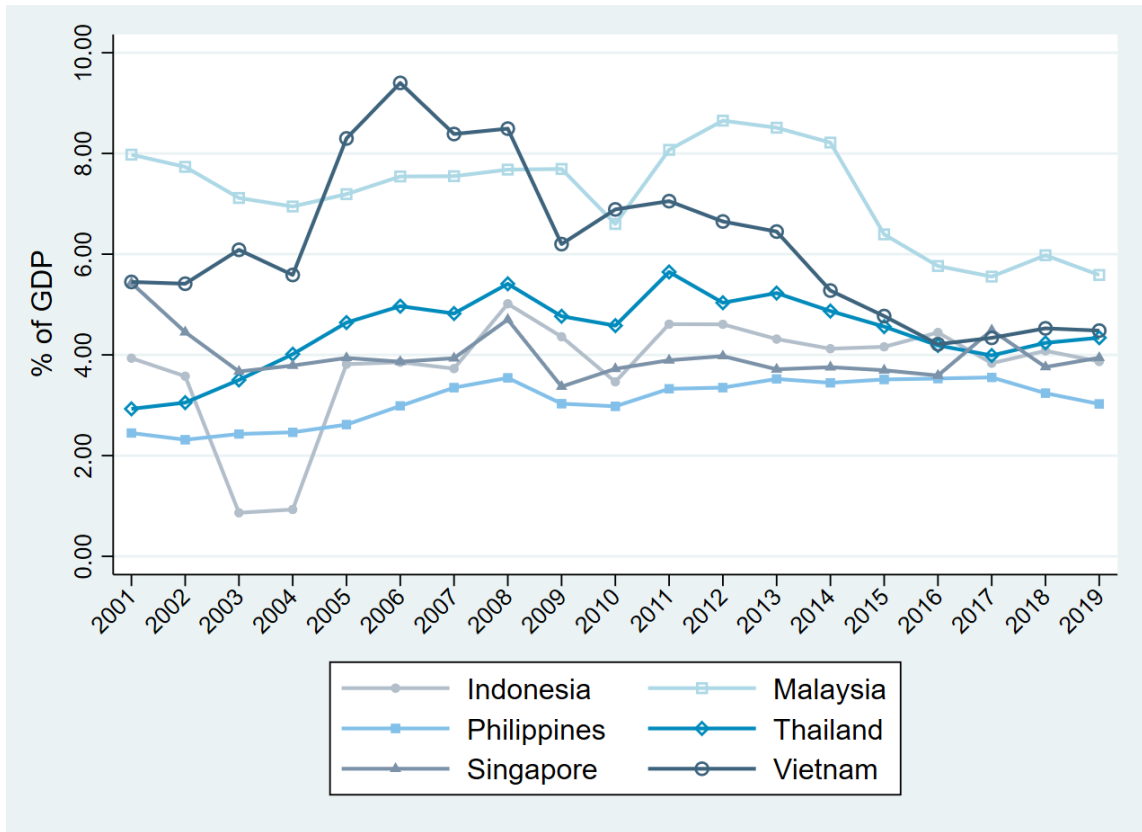
levels of economic development in investors' home countries. Due to data limitations, this chapter does not cover spillover effects across sectors. To my knowledge, this is the first empirical study to examine the heterogeneous sectoral growth impacts of FDI from developed and developing countries using disaggregated sector-level data in Thailand. This chapter involves an analysis of a unique dataset consisting of yearly-disaggregated FDI data for 10 sectors over the period 2005 to 2018. I use a panel data analysis rather than time-series and cross-sectional analyses because it is more informative, allows the tracking of individual histories and reflects dynamics across variables.

Before proceeding, it is worth noting that Ingham et al. (2020) is very similar to the present study. Using Egypt as an FDI recipient country, they study the sector-level impact

of FDI on growth from 1990 to 2007. The authors find that manufacturing and petroleum are drivers of Egypt's economy. However, the present study differs from their study in two major respects: First, several studies claim that the effects of FDI on growth are not one size fits all, as these effects could depend on the host country's characteristics. Hence, the study presented in this chapter focuses on the Thai economy. Second, I further investigate whether the sectoral effects of FDI by investors from developing and developing countries on outputs differ. The objective of this second point is to determine the level of absorptive capacity in both the overall Thai economy and 10 specific sectors thereof.

In doing so, this chapter investigates the effects of FDI on economic growth. The benchmark estimator is a standard fixed effect. However, there are some potential problems with fixed effects, namely cross-sectional dependence, dynamic panel bias and reverse causality. Alternative estimators are therefore included in this chapter. First, Driscoll and Kraay (1998) approach is to correct the standard errors. Second, Arellano and Bond (1991) estimation is used to overcome endogeneity problem and dynamic panel bias. Finally, I test reverse causality using Granger causality test with Lopez and Weber (2017) technique.

The results of the analysis presented in this chapter indicate that analysing data on the output effects of FDI without taking into account economic sectors cannot explain the actual effects. The result shows that FDI has negative and significant effects. In contrast, I estimate the analysis including economic sectors by adding dummy variables of 10 economic sectors in the estimation. I find that FDI in manufacturing and wholesale sectors increases economic growth. These findings suggest that the level of capital accumulation in the manufacturing sector could be higher than in other sectors, while wholesale could be more productive than local firms based on their output growth in the Thai economy.

127

Moreover, I obtain significant findings when I investigate whether these effects are identical for inward FDI from developed and developing countries. For many decades, Thailand has received significant FDI from developed countries, but the results suggest that FDI from developed countries has no positive impact on output growth in any sector; however, it does have negative effects on two primary sectors, namely agriculture and mining. While analysing the effect of FDI from developing countries, I find that firms from developing countries in the manufacturing, construction and wholesale sectors positively affect the Thai economy. This finding suggests that Thailand can better absorb technology transfer and knowledge concerning advanced activities from developing countries than developed countries and that Thailand's technological and management skills are still relatively underdeveloped compared to those of developed countries.

This chapter is organised as follows: Section 2 presents previous empirical evidence on the relationship between FDI and economic growth. Section 3 provides a brief overview of FDI and economic growth in Thailand. Section 4 introduces the study's methods, analytical approach and data, while Section 5 presents the results of the empirical analysis. Finally, Section 6 concludes this chapter.

4.2   Previous Literature

This section summarises how FDI affects the host economy. In particular, it presents the findings of previous empirical literature on the effects of aggregate FDI on growth and the heterogeneous sectoral growth effects of FDI. Lastly, it presents how MNEs from developed and developing countries may have different effects on the host country's economy.

Since FDI may affect host countries' output through increasing productivity of labour and capital, there are various empirical studies on this relationship. However, the empirical evidence on this effect is inconclusive. This statement is confirmed by Almfraji and Almsafir (2014) who review 18 empirical studies published between 1994 and 2012 on the relationship between FDI and economic growth, with each study using different data sets and methods. Their main finding is that a positive relationship exists between FDI and economic growth; and in some cases, however, the relationship is negative or even null. As suggested by Baldwin and Winters (2004), the effects of FDI differ based on time period, country characteristics and the residents of a country. Thus, the results of a single study cannot serve as evidence for the existence of universal effects.

Aoki and Todo (2008) identify two approaches to analyse empirical studies on this relationship: using macro data, such as country- or sector-level data, and using micro data, such as firm-level data. The use of micro data is mainly found in the literature concerning spillovers from foreign to domestic firms, which is not related to the objectives of this research. The study presented in this chapter focuses solely on the sectoral growth effects of FDI by determining whether the effects of FDI from developed and developing countries differ. Hence, sector-level data is applicable in this study.

4.2.1   Aggregate FDI Effects on Growth

FDI has a direct economic impact on value-added trade, jobs and income. It may raise the income levels and growth rate of the host country through technology and knowledge transfers. It may also increase demand for the products of domestic firms as a result of foreign companies' purchases of intermediate goods from domestic firms. According to United Nations (2013), the value-added trade of MNEs accounted for nearly 30%

129

developing countries' GDP on average compared to 18% in developed countries during the period from 2012 to 2013.

Blonigen and Wang (2004) argue that including host countries with advanced economies and developing countries in the same pool when estimating the effect of FDI on economic growth is problematic, as this effect could depend on the host country's characteristics. The authors claim that developing countries could attract more vertical foreign direct investment (VFDI) than developed countries because developing countries are labour intensive, and the effect of FDI in these countries is likely to differ as a consequence. However, previous empirical evidence suggests that horizontal foreign direct investment (HFDI) is significantly more common than VFDI in developed and developing countries alike. For example, Azémar and Desbordes (2010) investigate the heterogeneous nature of FDI from U.S. multinationals in 21 developed and 22 developing countries. In their analysis, they separate the sample groups into these two categories, and the results indicate that HFDI dominates VFDI in both developed and developing countries.

Some empirical studies note that FDI seems to increase growth only in economies that have appropriate initial conditions, including high levels of human capital, financial sector development and policies that promote international trade. For example, Aoki and Todo (2008) claim that FDI does not promote economic growth in general; rather, it enhances economic growth only in countries with high absorptive capacity (i.e., countries with high levels of human capital, supportive trade policies and efficient economic institutions). Similarly, Blomstrom et al. (1992) argue that low-income countries are not able to exploit FDI due to a lack of sufficient technological development. This is because the main benefits of FDI in host countries derive from acquiring new technologies and

management skills from MNEs. In contrast, Carkovic and Levine (2002) find no evidence of a consistent link between growth and FDI when investigating per capita income level. In order to explore actual growth effects, an analysis should focus on a particular country, as cross-country estimations could blur the results.

With regard to the Association of Southeast Asian Nations (ASEAN) member countries, the results of studies on the direct effects of FDI on economic growth in Thailand are inconclusive. Bende-Nabende et al. (2001) investigate the impact of FDI through spillover effects on the economic growth of the ASEAN-5[1] between 1970 and 1996. They estimate this impact by pooling the sample and using the ordinary least squares (OLS) and three-stage least squares (3SLS) estimations. Their study reveals that FDI has a negative relationship with economic growth in Singapore and Thailand, whereas a positive and significant relationship exists for Indonesia, Malaysia and the Philippines. The reason for this is that Singapore has a percentage ratio of FDI to gross domestic capital formation of 59.3 during the period of their analysis, which indicates that more than half of investment is coming from FDI. The issue could be that FDI crowded out domestic investment in Singapore. In the case of Thailand, most FDI was invested in the real estate industry in the period investigated in the study; however, this industry was overvalued at the time. Thus, the impact of FDI on economic growth is not positive for Thailand, which could explain why the impact of FDI on growth is negative. Marwah and Tavakoli (2004) also investigate the effect of FDI on economic growth in Indonesia, Malaysia, Philippines and Thailand, focusing on the period 1970 to 1998. They argue that cross-country regressions may not be robust due to the potentially faulty nature of the one-size-fits-all assumption when it comes to countries, and therefore they estimate this effect for each country separately. Their results suggest that FDI has a positive correlation

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[1]ASEAN-5 refers to Indonesia, Malaysia, the Philippines, Singapore and Thailand

with economic growth in all four countries.

Another strand of the literature focuses on the causal relationship between FDI and growth, as this relationship could be bi-directional. Moudatsou and Kyrkilis (2011) examine the causal relationship between FDI and economic growth in EU and ASEAN countries from 1970 to 2003. Their empirical results reveal that only one EU country, Finland, exhibited inward FDI-induced economic growth and that this relationship was not bi-directional. In the ASEAN country sample, the authors find a bi-directional relationship between economic growth and FDI for Indonesia, but not for Thailand, Singapore and Philippines. In contrast, Chowdhury and Mavrotas (2006) examine the causal relationship between FDI and economic growth over the period 1969 to 2000 for three developing countries, namely Chile, Malaysia and Thailand. They find strong evidence of a bi-directional causality between the two variables in Thailand and Malaysia, whereas it is GDP that prompted FDI in Chile. Both of these studies investigate the causal relationship in Thailand, but their results are not identical. My assumption is that the few years' difference in the periods investigated in the two studies could have led to different results.

4.2.2   Sector Analysis of the FDI-Growth Relationship

The relationship between FDI and economic growth has been investigated among economic analysts, academics and researchers in the field of development economics for over a decade. However, not many studies focus on sector-specific analysis of the FDI-growth relationship; that said, a limited number of economic studies consider the importance of certain sectors in the FDI-growth relationship. This section presents a brief summary of studies investigated the impact of FDI on the growth of different sectors or, in some cases, on a specific sector of the economy.

Differences in sector characteristics could result in FDI having different effects on economic growth. Blomstrom et al. (1994) emphasise that various sector characteristics, such as local competitive pressure and the availability of skilled labour, can affect the efficiency of foreign investment. For example, if the host country faces high local competitive pressure or has a large unskilled labour force in a sector, foreign firms may find it difficult to operate. Thus, technology transfer from foreign firms is slow in these circumstances. In contrast, if foreign firms have no difficulty in accessing local markets and skilled labour is available, FDI generally increases the economic growth of host countries through technology transfer and positive spillovers.

Earlier studies focus mainly on three traditional economic sectors: primary, secondary and tertiary (Table 4.A.1 in Appendix presents a list of activities in each sector). For example, Alfaro (2003) examines the effects of FDI on economic growth by distinguishing three FDI sectors - primary, manufacturing and service - for 47 countries over the period between 1980 and 1999. She finds that these sectors exert different influences on economic growth. FDI inflows into the primary sector tend to have a negative effect on growth due to limited spillover potential, whereas FDI inflows in the manufacturing sector tend to have a positive effect. However, Alfaro's obtains an ambiguous result relating to the impact of FDI inflows in the service sector. She emphasises the importance of these findings given that some countries target or contemplate targeting certain types of FDI over others through special incentives. Similarly, Massoud (2008) investigates this effect on the Egyptian economy between 1974 and 2005. His findings are in line with those of Alfaro (2003), as he determines that FDI in the agriculture sector depresses economic growth, while FDI in manufacturing when interacting with human capital promotes economic growth and FDI in the service sector has no effect in Egypt.

Wang (2009) also confirms the impact of FDI in the manufacturing sector. He claims that previous empirical studies underestimated the growth effect of manufacturing FDI because they used aggregate data. Thus, he analyses a dataset containing sector-level data on 12 Asian economies in the period between 1987 and 1997 in his dataset. His study indicates that FDI inflow in manufacturing sectors is critical for enhancing economic growth, whereas other sectors cannot generate a positive stimulus. A possible reason why FDI in the manufacturing sector generates more growth than FDI in other sectors is that the level of capital stocks and the value of investments in manufacturing are higher than FDI in other sectors. In particular, the manufacturing sector mainly uses advanced technology, which could create positive externalities within the sector. As a result, FDI in the manufacturing sector induces economic growth in host countries.

In a causality analysis, Jana et al. (2019) examine the causal relationship between FDI and sectoral growth in India from 1995 to 2016. Their findings suggest that inward FDI does not contribute to agricultural output growth, whereas FDI inflow in the manufacturing sector is found to affect the sector's output positively. Similarly to the manufacturing sector, the service sector shows bidirectional causality with regard to growth. This finding is in line with the previously mentioned empirical evidence provided by Alfaro (2003) and Massoud (2008), except for the effects on the service sector.

4.2.3 The Impact of Heterogeneity among FDI Source Countries on Growth

In general, FDI predominantly comes from advanced countries. However, the global outward FDI stock from developing countries has been rising since 2003, and the inward FDI stock from developing countries to Thailand has been increasing since 2006, as

shown in Figure 4.2. It is thus worth exploring whether the effects of FDI from MNEs in developing and developing countries differ.

The consensus regarding economic growth due to FDI revolves around the inherent differences between host and investor countries in areas such as technological development, labour quality and infrastructure. The positive effects of FDI can be observed when some of the host country's characteristics align with those of the investing country. Wang and Blomstrom (1992) claim that the main difference between the foreign affiliate and the domestic host country company lies in their access to advanced production technology. For example, the average time takes for technologies to be transferred by MNEs - which are mainly from developed countries - to their subsidiaries in developed countries is shorter than the time taken to transfer technologies to developing countries.

Therefore, acknowledging this effect could be useful in allowing host countries to increase their levels of technological development. It would be helpful to describe, in a straightforward way, how local firms could acquire technological and management skills from MNEs. Acknowledging this effect could also assist policy makers to implement appropriate policies intended to promote economic development.

Figure 4.2: Global FDI outward stock and inward FDI stock in Thailand
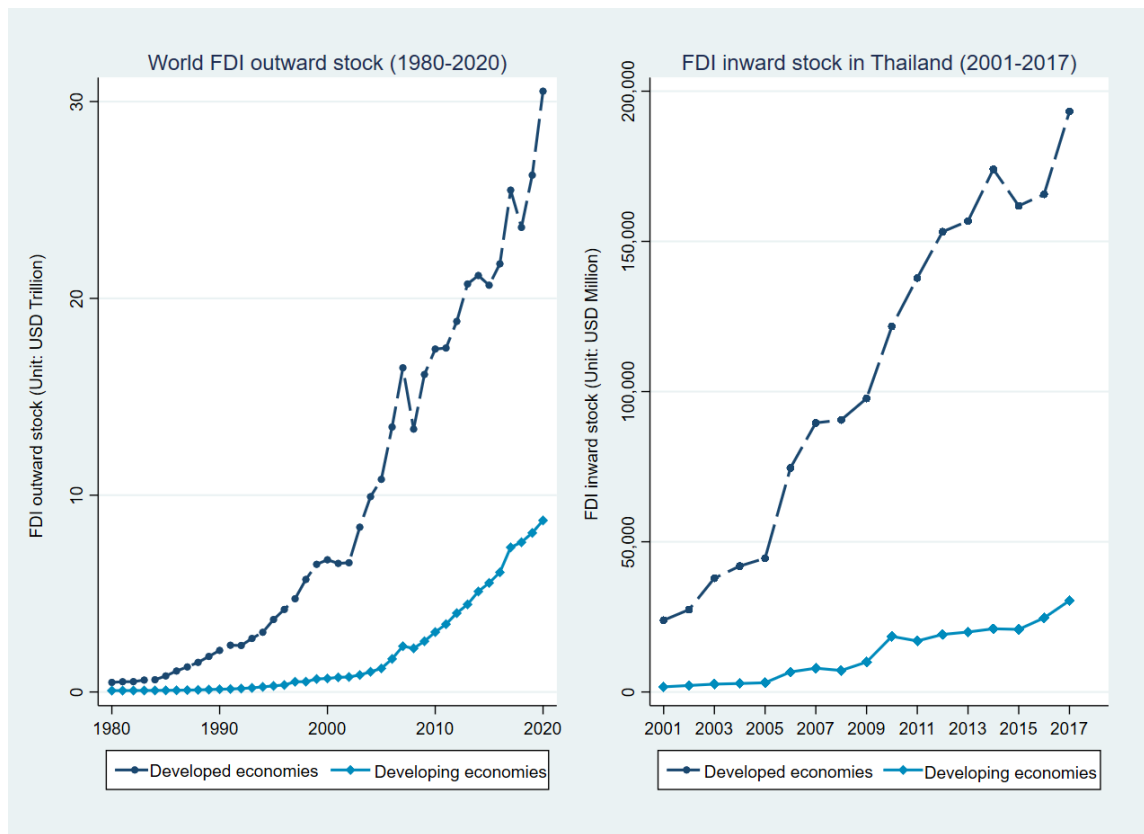
4.3   FDI and Economic Growth in Thailand

In the 1960s, Thailand had a poorly developed agricultural economy although the main economic activity in Thailand was agriculture. In the early stage of its FDI policy, Thailand initiated its import substitution policy, which continued until 1972. In the late 1970s, the government of Thailand began its programme of liberalisation through export promotion by enacting Investment Promotion Act No.1. In subsequent years, the Thai economy has experienced a stable growth rate with relatively low inflation and external debt. Together with the real average labour productivity, gross fixed capital formation and real output grew rapidly until the financial crises that begin in mid-1997.

Thailand's position in terms of the most attractive countries for foreign FDI improved from 11th in the 1970s to sixth in the 1990s (Damooei and Tavakoli, 2006). At that time, East Asian countries had attracted more than USD 200 billion in FDI flows. Thailand, the Philippines, Indonesia and Malaysia accounted for approximately one fourth of this total figure. Thailand is one of the top 12 developing countries in terms of receiving FDI flow. It increased from 1.9% in 1985 to 2.6% in 1995 (Bhalla, 1999).

There is substantial empirical evidence of FDI and economic growth in Thailand during the 1990s. However, this evidence is inconclusive, as it depends on the scope of studies. Kotrajaras et al. (2011) find a positive and significant long-run relationship between FDI and economic growth for Thailand in the period between 1990 and 2009. In a short-run analysis by Kohpaiboon (2003) and Jansen (1995), FDI was found to have increased economic growth through export promotion in the periods 1970 to 1999 and 1987 to 1991.

In contrast, Bende-Nabende et al. (2001) argue that FDI had negative effects on growth in Thailand based on data from 1970 to 1996. One possible explanation is that most FDI was directed into the real estate industry, which was overvalued as a consequence of the land and property inflation. Likewise, Damooei and Tavakoli (2006) investigate the effects of FDI and imports on economic growth between 1970 and 1999. They find that Thai economic growth is more dependent on imports than FDI since the pattern of real gross output closely follows that of real imports.

There have been many studies on the effects of FDI and economic growth in the 1990s. In that era, Thailand's economic development was very successful. Figure 4.3 shows that the GDP and FDI net inflows were going in the same direction at the beginning of the

137

period. Following the 1997 Asian financial crisis, however, FDI net inflows became more volatile, particularly in 2005.

In 2006, the country was plunged into a political crisis when former Prime Minister Thaksin Shinawatra was ousted by a military coup. The situation escalated again in 2010, leading to violent demonstrations intended to bring down the new government. Finally, a military intervention resulted in the deaths of people, which attracted considerable international attention. In 2011, Thailand suffered from historical natural disasters and thus related to the economic downturn. At the same time, Japan was affected by the tsunami. It forced many Japanese investors to reduce their investment in Thailand. As a result, a number of manufacturing companies had to shut down production. These events brought down the value of both FDI inflows and the country's GDP.

According to United Nations (2014), the sectoral composition of FDI has changed dramatically since 2013. FDI in the services and infrastructure sectors have risen strongly in developing countries, where the urbanisation of populations represents significant market potential for consumer-oriented economic investments. Similarly, the focus of Thailand's economic structure shifted from agriculture to manufacturing to services over the period between 1993 and 2009 (Koonnathamdee, 2013). In the past, the main economic activity was in the agriculture sector. After Thailand heavily promoted FDI, the focus of the country's economy shifted to manufacturing. In 2009, the manufacturing sector's share of investment decreased, while the service sector's share increased.[2]

Puapan (2014) presents the most recent work on the sectoral composition of FDI inflows in relation to economic growth in Thailand. He investigates the sectoral economic impact of FDI on the Thai economy using a panel dataset for the period between 2005 and

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[2]The economic activities of the service sector are shown in Table 4.A.1 in Appendix.

2013. Puapan finds that FDI has contributed positively to Thailand's economic growth and to five of nine sectors, namely manufacturing, construction, financial, wholesale and retail trade and agriculture, each of which shows strong statistically significant positive effects of FDI on value-added output. He conducts an OLS analysis to test for the direct impact of foreign investment on different sectors in each regression; however, he does not control for time-fixed effects and a lagged dependent variable. These two variables are widely included in the empirical analysis on economic growth. In particular, the lagged dependent variable is important because it could affect the present value (which is referred to as an autocorrelation problem). Thus, his results might lead to overestimations.

As illustrated in Figure 4.3, there is a co-movement between FDI and GDP over time despite weak linkages in some periods. Large fluctuations in FDI net inflows compared to the previous decade to the country were reported in the 2010s, and the FDI net inflows do not seem to have been stable in recent years. There are two possible reasons for this circumstance: the previously mentioned political issues in the country are the first. The second is that neighbouring countries (Vietnam, Myanmar and Laos) have low labour costs. These countries are new FDI destinations in the Southeast Asian region. In 2020, the FDI net inflows reached their lowest value due to the outbreak of the COVID-19 pandemic.

FDI in different sectors could impact a host country's economy differently. Figure 4.4 displays the value of FDI inflows and the contributions to GDP in real terms for 10 different sectors. This figure explains that the effects of FDI on output should not have been investigated in aggregate FDI data. For example, FDI in the mining and electricity sectors decreased in 2009, while FDI in the agriculture, construction, transportation and wholesale sectors increased in the same year. Using aggregate FDI data in the analysis reports the mean value of FDI; consequently, it could yield unreliable results.

Figure 4.3: GDP and FDI net inflows in Thailand (1972-2020)
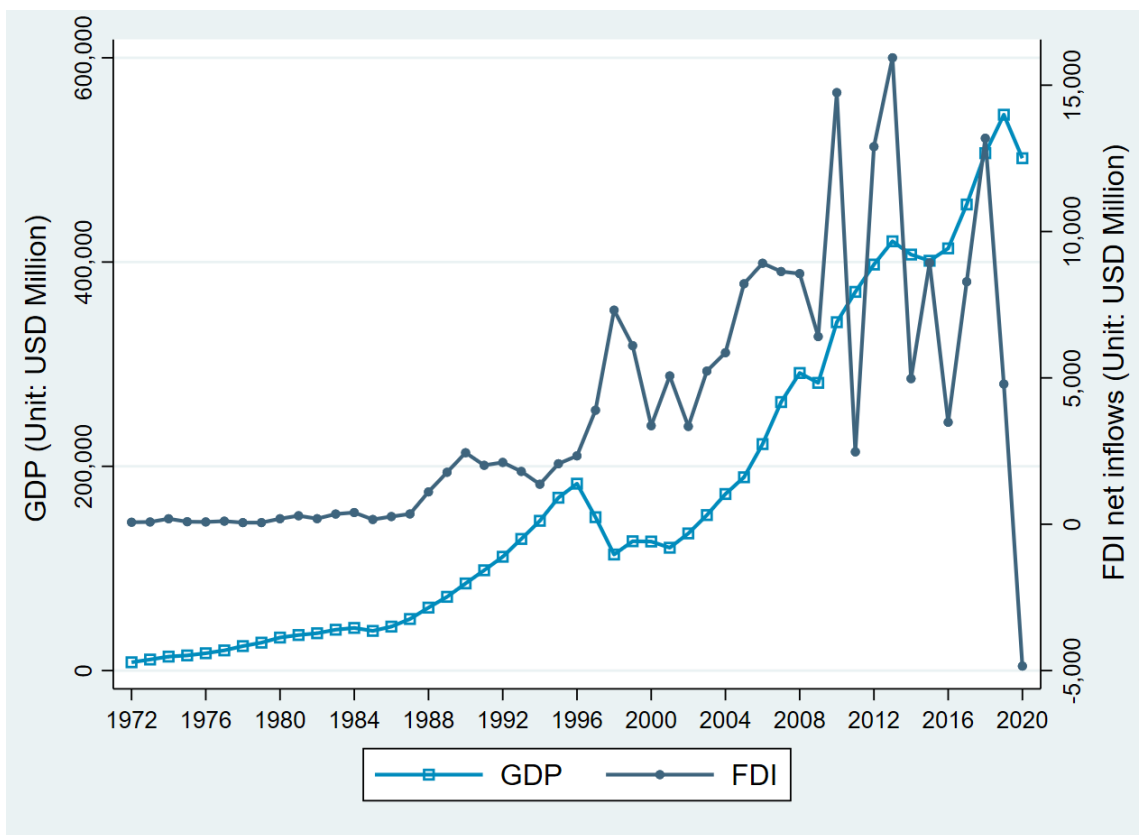
Source: World Development Indicators

Figure 4.4: Sectoral FDI and GDP

Notes: Figure 4.4 displays the value of FDI inflows to and the contributions to GDP in real terms for 10 different sectors. This figure explains the investigation of the effects of FDI on output should not have done in aggregate FDI data. For example, FDI in mining and electricity sectors decreased in 2009, while FDI in agriculture, construction, transportation and wholesale sectors increased in the same year. Using aggregate FDI data in the analysis reports the mean value of FDI; as a result, it could yield unreliable results. Source: Bank of Thailand statistics and NESDC database

4.4 Methodology and Data

4.4.1 Data

Since this chapter focuses on the influence of FDI on output growth in a single-country context, the variables - particularly the control variables - differ from those of cross-country panel data studies.

This dataset covers 10 sectors in the annual period from 2005 to 2018 (14 years). All nominal variables are in term of the local currency (Thai baht) and are calculated using the 2002 GDP deflator (index 2002 = 100), which is available from the World Development Indicators database. Additionally, all variables are in the logarithms, with the exception of the time dummies.

Dependent Variable

The dependent variable is sector-wise GDP, which is a measure of output growth in this study. This data comes from the Office of the National Economic and Social Development Council of Thailand (NESDC). Since this is not a cross-country analysis, the sector-wise GDP per capita is no longer to be applied in the model.

Variable of Interest

The variable of interest is FDI net inflows at the sector level, which, following Alfaro (2003) and Ingham et al. (2020), is measured in log form of the ratio of inward foreign-issued capital to output. I use FDI in the current year since it is more likely to affect output than the lagged FDI is (Iamsiraroj and Ulubaşoğlu, 2015). I also check the effect of sectoral FDI on output by using FDI in the current year (FDI_t) and lagged one

to two years (FDI_{t-1} and FDI_{t-2}). The results, which are presented in Table 4.A.3 in Appendix, show that only the current year has statistical significance. This data is obtained from the website of the Bank of Thailand (BOT), which reports inward FDI for 10 sectors and 48 home economies. The period of study begins in 2005 because this is the first year for which this data is available on the BOT website.

As shown in Table 4.1, among the 48 home economies, there are 33 developed countries and 15 developing countries. I classify the level of country development using the World Bank's classification. Home countries are considered developing countries if their gross national income (GNI) per capita was lower than USD 10,725 in 2005, which corresponds to the beginning of the period of analysis.

Table 4.1: List of home economies

Level of development	Home countries
Developed countries	Australia, Austria, Bahamas, Belgium, Bermuda, British Virgin Island, Brunei, Cayman Island, Cyprus, Denmark, Finland, France, Germany, Hong Kong, Ireland, Italy, Japan, Kuwait, Liechtenstein, Luxembourg, Netherlands, New Zealand, Qatar, Saudi Arabia, Singapore, South Korea, Spain, Sweden, Switzerland, Taiwan, UAE, UK, USA
Developing countries	Cambodia, China, India, Indonesia, Iran, Laos Malaysia, Mauritius, Myanmar, Oman, Panama, Philippines, Russia, Samoa, Vietnam

Control Variables

Due to the single-country context, the control variables used in this study differ from those of cross-country panel data studies. I derive the model specification from

143

the standard Cobb-Douglas production function; thus, the control variables are domestic investment and labour force at the sector-level data.

Domestic investment indicates the total amount of local investment in capital by the economic sector that is actually used to expand the capital stock.[3] To identify this variable, I follow Wang (2009) by indicating the domestic investment variable as the difference between net capital stock this year and last year minus inward FDI $[(K_{it} - K_{(it-1)}) - FDI_{it}]$. This variable is measured as a share of sector-wise GDP. The labour force is the number of employees (in thousands) in the sector. These control variables are obtained from the NESDC.

Tables 4.2 and 4.3 present the descriptive statistics for the regression variables. Table 4.2 presents the summary statistics for the pooled data, which include the mean, standard deviation, minimum and maximum values for all variables. To compare the difference between sectors, Table 4.3 displays the summary statistics of each of the 10 sample sectors (a correlation between variables is presented in Appendix Table 4.A.2.). In terms of FDI inflows, the three sectors with the highest average FDI inflows as a share of GDP are real estate, financial and insurance activities and manufacturing sectors. This ranking is identical to that of FDI inflows from developed and developing countries. With respect to domestic investment, the transportation sector is ranked first in terms of log share of GDP, followed by the electricity, gas and air conditioning supply and real estate sectors. Regarding employment, agriculture, wholesale and retail trade and manufacturing are the top three sectors in terms of employing the highest number of workers. Regarding market size, manufacturing is the largest sector in terms of its contribution to GDP, followed by the wholesale and retail trade and agriculture sectors.

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[3]The capital stock cannot be directly used as a variable in this paper. Due to data limitations, the capital stock is not defined in terms of whether it is from a foreign or domestic source.

144

Table 4.2: Summary statistics

Variable	Unit	Mean	Std. Dev.	Min.	Max.	N
ln GDP	Log of THB, millions	13.084	0.801	12.081	14.864	140
ln FDI	Log of share of GDP	0.028	0.062	-0.233	0.314	140
ln FDL DC	Log of share of GDP	0.016	0.038	-0.13	0.227	140
ln FDI LDC	Log of share of GDP	0.011	0.04	-0.24	0.198	140
ln domestic investment	Log of share of GDP	0.073	0.349	-1.704	1.242	140
ln employ	Log of thousand persons	6.999	1.745	3.708	9.644	140

Table 4.3: Summary statistics for regression variables by economic sector

Accommodation and food service activities				
Variables	Mean	Std.Dev.	Min	Max
ln GDP	12.644	0.358	12.246	13.304
ln FDI	0.004	0.013	-0.015	0.031
ln FDI DC	0.002	0.004	-0.004	0.009
ln FDI LDC	0.002	0.014	-0.020	0.035
ln dom inv	0.100	0.098	-0.034	0.300
ln employ	7.830	0.076	7.730	7.947

Agriculture, forestry and fishing				
Variables	Mean	Std.Dev.	Min	Max
ln GDP	13.632	0.150	13.353	13.850
ln FDI	0.000	0.001	0.000	0.002
ln FDI DC	0.000	0.000	0.000	0.001
ln FDI LDC	0.000	0.000	0.000	0.001
ln dom inv	0.096	0.092	-0.063	0.227
ln employ	9.524	0.100	9.371	9.644

Construction				
Variables	Mean	Std.Dev.	Min	Max
ln GDP	12.367	0.097	12.225	12.507
ln FDI	-0.002	0.017	-0.031	0.025
ln FDI DC	-0.002	0.013	-0.031	0.018
ln FDI LDC	0.000	0.010	-0.017	0.022
ln dom inv	0.110	0.075	-0.043	0.263
ln employ	7.729	0.059	7.656	7.841

Electricity, gas and air conditioning supply				
Variables	Mean	Std.Dev.	Min	Max
ln GDP	12.272	0.143	12.081	12.526
ln FDI	0.002	0.037	-0.086	0.062
ln FDI DC	0.004	0.020	-0.024	0.051
ln FDI LDC	-0.002	0.022	-0.060	0.036
ln dom inv	0.282	0.391	-0.851	0.732
ln employ	4.675	0.081	4.551	4.844

Financial and insurance activities				
Variables	Mean	Std.Dev.	Min	Max
ln GDP	13.196	0.284	12.835	13.599
ln FDI	0.099	0.098	-0.021	0.314
ln FDI DC	0.053	0.085	-0.130	0.227
ln FDI LDC	0.038	0.065	-0.043	0.198
ln dom inv	-0.385	0.241	-0.733	-0.098
ln employ	6.044	0.192	5.759	6.302

Manufacturing				
Variables	Mean	Std.Dev.	Min	Max
ln GDP	14.715	0.094	14.523	14.864
ln FDI	0.039	0.019	0.009	0.076
ln FDI DC	0.029	0.015	0.007	0.064
ln FDI LDC	0.010	0.008	-0.004	0.021
ln dom inv	-0.051	0.081	-0.264	0.057
ln employ	8.655	0.075	8.576	8.772

Mining and quarrying				
Variables	Mean	Std.Dev.	Min	Max
ln GDP	12.526	0.164	12.205	12.770
ln FDI	-0.002	0.076	-0.233	0.124
ln FDI DC	0.003	0.015	-0.025	0.033
ln FDI LDC	-0.006	0.075	-0.240	0.120
ln dom inv	0.007	0.093	-0.223	0.150
ln employ	4.114	0.178	3.708	4.372

Real estate activities				
Variables	Mean	Std.Dev.	Min	Max
ln GDP	12.360	0.047	12.306	12.474
ln FDI	0.126	0.040	0.010	0.173
ln FDI DC	0.059	0.042	-0.002	0.132
ln FDI LDC	0.062	0.039	0.009	0.117
ln dom inv	0.259	0.757	-1.704	1.242
ln employ	5.712	0.795	4.662	6.652

Transportation and storage				
Variables	Mean	Std.Dev.	Min	Max
ln GDP	13.108	0.129	12.918	13.342
ln FDI	0.003	0.012	-0.011	0.030
ln FDI DC	0.006	0.012	-0.005	0.036
ln FDI LDC	-0.003	0.011	-0.029	0.020
ln dom inv	0.332	0.241	-0.115	0.781
ln employ	7.006	0.102	6.831	7.139

Wholesale and retail trade				
Variables	Mean	Std.Dev.	Min	Max
ln GDP	14.017	0.167	13.805	14.342
ln FDI	0.015	0.016	-0.018	0.050
ln FDI DC	0.010	0.013	-0.020	0.030
ln FDI LDC	0.005	0.008	-0.009	0.020
ln dom inv	-0.018	0.070	-0.170	0.058
ln employ	8.699	0.049	8.615	8.753

4.4.2 Model Specification and Analytical Approach

Model Specification

The purpose of this chapter is to determine whether FDI in 10 different sectors exerts different effects on sector-wise GDP over 14 years spanning from 2005 to 2018. The methodology of this study follows Ingham et al. (2020), Carkovic and Levine (2002) and Alfaro (2003). The baseline specification takes the following form:

$$lnY_{it} = \beta_0 + \beta_1 lnY_{it-1} + \beta_2 lnFDI_{it} + \beta_3 lnDOM_{it} + \beta_4 lnL_{it} + \delta_i + \epsilon_{it} \qquad (4.1)$$

where, for sector i and time period t, *Y* is GDP in real terms, *FDI* is the share of FDI in GDP, *DOM* is the share of domestic investment in GDP, *L* is the number of employees, δ captures sector-specific effects and ϵ represents idiosyncratic errors.

Next, I estimate the impact of FDI heterogeneity on sector-wise GDP for 10 economic sectors by introducing nine dummy regressors and employing the following coding scheme: (1) accommodation and food service activities, which is used as the benchmark in Equation (4.2); (2) agriculture, forestry and fishing *(FDI_A* =1 and 0 otherwise); (3) construction *(FDI_C* =1 and 0 otherwise); (4) electricity, gas, steam and air conditioning supply *(FDI_E* =1 and 0 otherwise); (5) financial and insurance activities *(FDI_F* =1 and 0 otherwise); (6) manufacturing *(FDI_MF* =1 and 0 otherwise); (7) mining and quarrying *(FDI_MI* =1 and 0 otherwise); (8) real estate activities *(FDI_R* =1 and 0 otherwise); (9) transportation and storage *(FDI_T* =1 and 0 otherwise); and (10) wholesale and retail trade and repair of motor vehicles and motorcycles *(FDI_W* =1 and 0 otherwise). I follow the format of the analysis above. The general specification for these effects is then

$$lnY_{it} = \beta_0 + \beta_1 lnY_{it-1} + \beta_2 lnFDI_{it} + \beta_3 lnFDI\_A_t + \beta_4 lnFDI\_C_t$$

$$+ \beta_5 lnFDI\_E_t + \beta_6 lnFDI\_F_t + \beta_7 lnFDI\_MF_t + \beta_8 lnFDI\_MI_t$$

$$+ \beta_9 lnFDI\_R_t + \beta_{10} lnFDI\_T_t + \beta_{11} lnFDI\_W_t + \beta_{12} lnDOM_{it}$$

$$+ \beta_{13} lnL + \delta_i + \epsilon_{it}$$

(4.2)

Thereafter, I develop the regression model for analysing the effect of FDI on sector-wise outputs and determining whether these impacts differ depending on whether FDI comes from MNEs from developed and developing countries. The general specification for these effects is

$$lnY_{it} = \beta_0 + \beta_1 lnY_{it-1} + \beta_2 lnFDIDC_{it} + \beta_3 lnFDILDC_{it} + \beta_4 lnDOM_{it}$$

$$+ \beta_5 lnL_{it} + \delta_i + \epsilon_{it}$$

(4.3)

where, for sector *i* and time period *t*, *Y* is GDP in real terms, *FDIDC* is the share of sum FDI inflows from developed countries in GDP, *FDILDC* is the share of sum FDI inflows from developing countries in GDP, *DOM* is the share of domestic investment in GDP, *L* is the number of employees. δ captures sector-specific effects and ϵ represents idiosyncratic errors.

Analytical Approach

I estimate this analysis using panel data analysis because it is more informative than time-series analysis. My dataset contains a time dimension of 14 years and a cross-sectional dimension of 10 sectors. Since the time dimension is larger than the cross-sectional dimension in the dataset, one may argue that my model may suffer from

serial correlation, which means that it would produce spurious results when using panel regression with non-stationary variables. Thus, I check whether the variables contain a unit root.

Unit root test

I check the unit root using the Levin-Liu-Chu (LLC) test by Levin et al. (2002) using a demeaned model with and without trend. I use the LLC approach because my panel is strongly balanced. The hypothesis for the LLC test are as follows:

H_0 : each time series contain a unit root

H_1 : each time series is stationary

The null hypothesis is rejected for all variables (Table 4.4), which means that all variables are stationary.[4] Thus, this study can be conducted using panel regression analysis. I adopt a traditional approach to investigate this relationship by using a static fixed effects model. Thereafter, I implement three alternative approaches to overcome potential issues that may be caused by a fixed effects model. The estimation procedure of this study is shown in Figure 4.5.

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[4]The power of LLC unit root tests is low; however, the robustness check of the estimated results will be done by the difference GMM estimator if there is a serial correlation problem.

Table 4.4: Panel unit root test result

Variables	without trend	with trend
ln GDP	-1.690**	1.770**
	(0.046)	(0.038)
ln domestic investment	-0.774**	-2.390***
	(0.039)	(0.008)
ln employment	-1.992**	-2.926***
	(0.023)	(0.002)
ln FDI	-5.2049***	-4.049***
	(0.000)	(0.000)

Notes: Table 4.4. presents the result of a panel unit root test using the Levin-Liu-Chu test. The results show adjusted t* value. The value in parentheses are p-values which *** denotes statistical significance at the 1% level, ** at the 5% level, and * at the 10% level.

Figure 4.5: Estimation Procedure
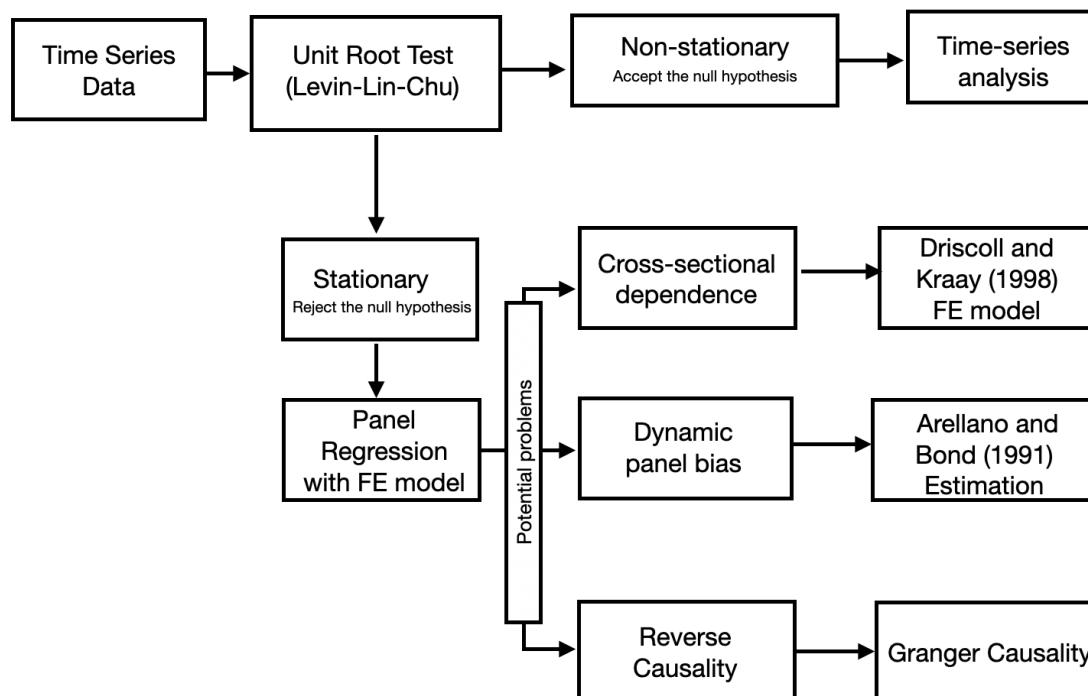
Source: Author's construction

Benchmark estimator: Fixed effects model

The methodology begins with the fixed effect model and time dummies. One may question my choice to use a fixed effects model instead of a pool OLS and random effects model. Pooled OLS is a highly restrictive model since it imposes common intercept and slope coefficients for all cross-sections and thus disregards individual heterogeneity. In my dataset, individual heterogeneity is extremely important since there are 10 different sectors and 48 sources of inward FDI. For the random effects model, the errors in any period are assumed to be uncorrelated with the past, present and future, a condition known as strict exogeneity (Arellano, 2003). In practice, this assumption is often invalid. Additionally, the random effects estimator is an efficient estimator for partial data, as it is well-suited to explaining all of the observations in the whole observation.

I test whether the fixed effects model is appropriate using Mundlak (1978) approach, which is an alternative to the Huasman test. This approach supports my model using a robust estimator of the variance-covariance matrix, while the Huasman test does not. The result supports my initial idea and suggests that the fixed effects model is appropriate.[5] This result suggests that there are some time-invariant unobservable factors which are related to regressors. Consequently, sector fixed effects δ_i is included in the model.

In addition, there are some potential problems with the fixed effects model, namely cross-sectional dependence, dynamic panel bias and reverse causality.

Cross section dependence [6]

A standard assumption in panel data models with fixed effects is that the error terms are independent across cross-sections, as specified by the following:

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[5]The null hypothesis is rejected with a p-value of 0.000 when I estimate the baseline specification.

[6]Cross-section dependence is known as spatial autocorrelation in the spatial literature.

$$Cov(\epsilon_{it}, \epsilon_{jt}) = 0, \text{ for all } t, \ i \neq j \tag{4.4}$$

Cross-sectional dependence is caused by unobserved factors. They are correlated with the disturbance terms across panels but uncorrelated with the regressors and the fixed effects. As a result, the parameter coefficients are consistent but not efficient, and the estimated standard errors are biased (Hoyos and Sarafidis, 2006). In the dynamic panel data model, if cross-sectional dependence is present in the disturbance, the Generalised Method of Moments (GMM) estimator approaches developed by Anderson and Hsiao (1981), Arellano and Bond (1991) and Blundell and Bond (1998) will be inconsistent.

Thus, the cross-sectional dependence test is crucial for this study. There are two common approaches for testing cross-sectional dependence in the economic growth context, which were respectively developed by Breusch and Pagan (1980) and Pesaran (2004). For this purpose, the first approach is to use the Lagrange multiplier (LM) test. This test is valid for fixed N and $T \to \infty$. The latter approach is valid for situations in which T is relatively small and N is relatively large or both are of a similar size. In this study, N and T are of similar size; furthermore, T is small. The first approach may be subject to large bias. Thus, the second approach is applicable for this study. The Pesaran test statistic for cross-sectional dependence is given by

$$CD = \sqrt{\frac{2T}{N(N-1)}} \left(\sum_{i=1}^{N-1} \sum_{j=i+1}^{N} \hat{\rho}_{ij} \right) \tag{4.5}$$

where $\hat{\rho}_{ij}$ is the sample estimate of pair-wise correlation of the residuals.

The hypotheses used to analyse cross-sectional dependence are presented below:

H_0 : cross-sectional independence

H_1 : cross-sectional dependence

The null hypothesis is rejected if the p-value is less than the 5% level, indicating that cross-sectional dependence is present in the data. However, this approach has a possible drawback should the null hypothesis not be rejected. Hoyos and Sarafidis (2006) state that if there is a positive correlation between errors in some individuals and a negative correlation in some individuals, this situation could result in the null hypothesis not being rejected. Driscoll and Kraay (1998) proposed one technique by which to correct standard errors in a fixed effects regression model, namely the use of a nonparametric covariance matrix estimator which produces heteroscedasticity-consistent standard errors that are robust to very general forms of spatial and temporal dependence. Their technique, therefore, will be included in this chapter.

Dynamic panel bias

Since my baseline regression model is a dynamic specification which includes the lagged dependent variable on the right-hand side of the equation, the fixed effects model could be problematic (Roodman, 2009). The issue can be explained as follows:

General dynamic regression equation:

$$y_{it} = \beta_0 + \beta_1 y_{i,t-1} + \beta_2 x_{i,t} + \delta_i + \epsilon_{i,t} \tag{4.6}$$

To eliminate the sectoral fixed effects, take first difference of Equation (4.6)

$$y_{i,t} - y_{i,t-1} = \beta_1(y_{i,t-1} - y_{i,t-2}) + \beta_2(x_{i,t} - x_{i,t-1}) + (\epsilon_{i,t} - \epsilon_{i,t-1}) \tag{4.7}$$

In Equation (4.6), $y_{i,t-1}$ is possibly correlated with the fixed effects in the error term ($\epsilon_{i,t-1}$). This is an endogeneity problem commonly known as 'dynamic panel bias' (Nickell, 1981).

For example, all economies experienced a negative shock from a change in government policy in 2012, so that shock appears in the error term. Ceteris paribus, the standard deviation of its average unexplained lagged dependent variable for the entire period of study is lower; indeed, the coefficients of both the lagged dependent variable and the fixed effect were both lower in 2013. This positive correlation violates a necessary assumption for OLS consistency. This bias is very severe with large observations (N) and less of an issue if the time dimension is large (Roodman, 2009).

A popular estimator to overcome this issue is the Arellano-Bond estimation, commonly called the 'difference GMM', which was proposed by Arellano and Bond (1991). The main feature of this estimation is transforming the data to remove the fixed effects since fixed effects cause dynamic panel bias as shown in Equations (4.6) and (4.7). This approach can deal with endogeneity problems which cause dynamic panel bias.

To deal with this endogeneity problem, an instrument variable is needed. The lagged dependent variable qualifies as an instrument variable because of its autoregressive path. The assumptions of the difference GMM approach are that (1) sequential exogeneity means that no past values affect future error terms and (2) that the absence of autocorrelated errors indicates that the error terms are not serially correlated. The latter assumption is explained in Equations (4.8) and (4.9).

$$E\left(y_{i,t-k} \cdot (\epsilon_{i,t} - \epsilon_{i,t-1})\right) = 0 \quad for \quad k \geq 2; \quad t = 3, ..., T. \tag{4.8}$$

$$E\left(x_{i,t-k} \cdot (\epsilon_{i,t} - \epsilon_{i,t-1})\right) = 0 \quad for \quad k \geq 2; \quad t = 3, ..., T. \tag{4.9}$$

Since the difference GMM estimator generates one column for each time period, each variable and lags to that time period, the number of instruments is almost the same as the sample size. This situation may lead to an over-fitting problem in which the estimation suffers from a proliferation of instruments. To limit instrument proliferation, the collapse instrument function is applied to this model.

The instrument matrix of the form is as follows:

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & \cdots \\ y_{i1} & 0 & 0 & 0 & 0 & 0 & \cdots \\ 0 & y_{i2} & y_{i1} & 0 & 0 & 0 & \cdots \\ \vdots & \vdots & \vdots & y_{i3} & y_{i2} & y_{i1} & \cdots \\ \vdots & \vdots & \vdots & \vdots & \vdots & \vdots & \ddots \end{pmatrix}$$

A collapse instrument function is employed, and one instrument is constructed for each variable and each lag distance. As a result, the number of instruments is reduced when compared to the standard approach. However, this model might be less efficient than a standard procedure.

The collapse instrument variables matrix is as follows:

$$\begin{pmatrix} 0 \\ y_{i1} \\ y_{i2} \\ y_{i3} \\ \vdots \end{pmatrix}$$

Reverse causality

When considering a lengthy time span, the direction of causality between the variable of interest and output should be tested. I adopt a panel Granger causality technique proposed by Dumitrescu and Hurlin (2012) to examine the direction of causality. Thus, I initially took into account the following framework:

$$y_{i,t} = \alpha_i + \sum_{k=1}^{K} \gamma_{i,k} y_{i,t-k} + \sum_{k=1}^{K} \beta_{i,k} x_{i,t-k} + \epsilon_{i,t} \quad i = 1, 2, ..., N \text{ and } t = 1, 2, ..., T \quad (4.10)$$

This test approach assumes that the null hypothesis has no causal association for any units available (*x* and *y*) in the panel data. Therefore, if H_0 is rejected, the study will suggest that causality between *x* and *y* exists.

The findings are a pair-wise Granger causality test with a bootstrap application technique. The results show Z(Z-bar) and $\tilde{Z}$(Z-bar tilde) estimates because Dumitrescu and Hurlin (2012) claim that these tests exhibit good finite sample properties even when both *T* and *N* are small. The results of these causality tests indicate that there is no bidirectional relationship in this dataset. The results are shown in Table 4.A.4 in Appendix.

4.5 Empirical results

4.5.1 The Impact of FDI on the Thai Economy

Table 4.5 presents the effects of FDI inflows on the Thai economy over the period between 2005 and 2018. I consider two alternative levels of analysis: (i) the impact of FDI on the Thai economy in the absence of 10 economic sectors, as presented in columns

(1) to (4), and (ii) the heterogeneous sectoral output effects of FDI, as shown in columns (5) to (8). The standard fixed effect in columns (1) and (5) serves as a benchmark to be compared with the alternative estimators presented in columns (2) to (4) and (6) to (8).

Table 4.5: FDI inflows and GDP

Dependent variable : Ln GDP	Total FDI				FDI*Sector dummy			
	(1) Standard FE	(2) Driscoll and Kraay FE	(3) GMM	(4) GMM IV collapse	(5) Standard FE	(6) Driscoll and Kraay FE	(7) GMM	(8) GMM IV collapse
ln GDP$_{t-1}$	1.015***	1.015***	0.979***	0.953**	1.009***	1.009***	0.979***	0.873**
	(0.065)	(0.048)	(0.059)	(0.314)	(0.066)	(0.052)	(0.061)	(0.344)
ln domestic investment	-0.035**	-0.035***	-0.032*	-0.030	-0.028	-0.028**	-0.026	-0.016
	(0.014)	(0.008)	(0.015)	(0.027)	(0.017)	(0.010)	(0.018)	(0.037)
ln employment	0.005	0.005	0.010	0.014	0.003	0.003	0.007	0.022
	(0.018)	(0.011)	(0.020)	(0.039)	(0.021)	(0.013)	(0.023)	(0.040)
ln FDI	-0.184**	-0.184	-0.181**	-0.180*	-0.965**	-0.965	-0.974**	-1.003**
	(0.076)	(0.112)	(0.073)	(0.088)	(0.389)	(1.178)	(0.397)	(0.381)
ln FDI*agriculture					-22.246*	-22.246	-22.437**	-23.127**
					(9.935)	(15.984)	(9.985)	(9.927)
ln FDI*construction					-0.001	-0.001	0.005	0.026
					(0.697)	(1.991)	(0.709)	(0.666)
ln FDI*electricity					0.683	0.683	0.681	0.674
					(0.432)	(1.157)	(0.436)	(0.426)
ln FDI*finance					0.678	0.678	0.692	0.741
					(0.418)	(1.165)	(0.427)	(0.410)
ln FDI*manufacturing					1.655*	1.655	1.735*	2.020**
					(0.761)	(1.659)	(0.810)	(0.896)
ln FDI*mining					0.960**	0.960	0.964**	0.977**
					(0.421)	(1.257)	(0.428)	(0.413)
ln FDI*real estate					0.889	0.889	0.926	1.061
					(0.636)	(1.330)	(0.652)	(0.812)
ln FDI*transport					0.705	0.705	0.740	0.865
					(0.620)	(1.996)	(0.652)	(0.658)
ln FDI*wholesale					1.019**	1.019	1.036**	1.100**
					(0.436)	(1.755)	(0.452)	(0.403)
Observations	130	130	120	120	130	130	120	120
R-squared	0.934	0.934			0.936	0.936		
Pesaran test (p-value)	0.130				0.145			
No. of instruments			87	27			96	36
AR(2)(p-value)^a			0.399	0.466			0.422	0.672
Sargan test(p-value)^b			0.107	0.258			0.067	0.372

Notes: Table 4.5 presents the effects of FDI inflows on the Thai economy over the period 2005-2018. Columns (1) to (4) show the impact of FDI on the Thai economy in the absence of 10 economic sectors (equation 4.1). Columns (5) to (8) display the heterogeneous sectoral output effects of FDI inflows (equation 4.2). The standard fixed effects model is presented in columns (1) and (5), and the alternative estimators are presented in columns (2) to (4) and (6) to (8). R-squared values from the fixed effects model in columns (1), (2), (5) and (6) are very high due to overfitting models. The constant values are not shown in the table. Robust standard errors in parentheses. *** denotes statistical significance at the 1% level, ** at the 5% level, and * at the 10% level.
^{a} The null hypothesis is that the errors in the first difference regression exhibit no second order serial correlation.
^{b} The null hypothesis is that the instrument are not correlated with the residuals.

Average Effects of FDI on Thailand's Economy

Table 4.5 columns (1) to (4) display the results of FDI on the Thai economy in the absence of the economic sector. The results report the four specifications. Column (1) presents the results of the benchmark specification, which is a standard fixed effects model. As discussed previously, a standard fixed effects estimator may be inefficient if cross-sectional dependence is present. The p-value of the Pesaran test in column (1), which is higher than 0.05, means that the null hypothesis of cross-sectional independence cannot be rejected. Indeed, the parameter estimates are unchanged in column (2), but the statistically significant difference of FDI decreases from 5% in the first column to 10% in column (2). This suggests that average FDI inflows may not have had as pronouncedly negative impact as indicated by the initial results.

Furthermore, difference GMM estimators are used in columns (3) and (4) to overcome possible endogeneity problems and dynamic panel bias. Since the difference GMM does not provide evidence of second-order serial correlation, the estimated parameters are broadly in line with those former fixed effect columns. The difference between these two GMM models is that the collapse instrument function is applied in column (4) to avoid the proliferation of instruments problem. I check whether the estimation is overidentification using the Sargen test. The p-values of both columns are not lower than 0.05 and are not close to 1.000, indicating that the set of instruments is valid. The number of instruments decreases from 87 in column (3) to 27 in column (4). However, a small number of instruments reduces the efficiency of estimation. Thus, the results in column (4) do not show strong effects compared with those in the former column.

The results presented in these columns indicate that two results common across all models are the significance of the lagged dependent variable terms and FDI's share

158

of GDP. The positive signs of lagged output coefficients are in line with theoretical expectations, indicating that the performance of economic activities in the the current year depends on the performance of economic activities in the previous year. In contrast, the coefficients of FDI inflows as a share of GDP when ignoring sector are negative signs, which indicates that productivity performance is depressed. A possible explanation is that average FDI inflows could have negative effects on the Thai economy. However, not all economic sectors may create the same effects. This view suggests that the economic sector should be that the economic sector should be included in the estimation.

Additionally, I observe that domestic investment has a negative and significant effect on growth in all estimations, with the exception of the collapsed GMM estimator in column (4). One possible explanation for this result lies in the fact that a growing capital stock may lead to excess capacity if there is insufficient demand in Thailand. As a result, the excess capacity of capital stock puts downward pressure on the profits and output of local firms. Another possible explanation is, as emphasised by World Bank (2018), foreign firms could increase competition in local input and output markets, which would reduce the performance of local firms. Finally, the number of employee coefficients is very small and shows positive signs in all estimations, but there is no statistical significance.

The Heterogeneous Sectoral Output Effects of FDI

Columns (5) to (8) of Table 4.5 present the direct effects of sectoral FDI inflows on sectoral output growth. The findings confirm the results presented earlier, with the exception of those concerning domestic investment; the coefficients for these control variables become slightly smaller when economic sector is controlled for. However, the lagged output remains strongly significant, whereas the coefficients of domestic

159

investment become statistically insignificant for almost all estimations, with the exception of column (2). A possible explanation for this outcome may be that there is a correlation between the errors of some sectors and the errors of domestic investment, as this model can correct cross-sectional dependence in the errors.

The most interesting finding is that FDI in the manufacturing and wholesale sectors has positive coefficients and is statistically significant. These results indicate that FDI in the manufacturing and wholesale sectors is more likely to generate output growth than FDI in the accommodation sector. They are only two sectors, which FDI stimulates growth (the within-sector effect). This finding is in contrast to the analysis mentioned above and confirms that, as shown in columns (1) to (4), ignoring the economic sector can obscure the actual effect of FDI on output growth.

FDI inflows to agriculture and mining sectors, which are commonly considered primary sectors, is less likely to induce output growth than FDI in accommodation. Both sectors have negative coefficients and are statistically significant. The results regarding these sectors are in line with Alfaro (2003) when investigating the effects of different types of FDI on economic growth using cross-sectional data on 47 countries over the period from 1980 to 1999. In particular, the large negative magnitude of agriculture could be explained by the fact that this sector is generally reserved to local firms. Thus, foreign firms may face high local competitive pressure due to an entry barrier. Moreover, the agriculture sector is labour-intensive. With a large number of unskilled labourers, foreign firms may find it difficult to operate. As a result, the output from FDI is likely to be smaller for agriculture than the manufacturing and wholesale sectors, which foreign firms can access more easily.

160

Another possible explanation is that Thailand is a developing country, with a level of technological development that is considerably below that of developed countries. Thus, FDI in manufacturing, an advanced economic sector, could be more productive than in the primary sector. As a result, FDI in manufacturing is more likely to generate output growth than FDI in other sectors. It would be beneficial to Thailand were local firms able to acquire technological and management skills from foreign firms; however, I cannot conclude that doing so would generate positive spillovers for local firms, as this topic is beyond the scope of this study. In addition, the wholesale and retail trade sector is categorised as a service sector. These findings confirm that the wholesale and retail trade sector serves as a growth engine in the Thai economy, which is consistent with the findings of Koonnathamdee (2013).

4.5.2   Heterogeneity among FDI Source Countries

Previous literature has not investigated the question of whether the effects of FDI from developed and developing source countries differ. Investigating this question could contribute to technological development in Thailand. It would also be useful in allowing policy makers to create policies intended to obtain maximum benefit from FDI.

Table 4.6 illustrates the effect of FDI on output growth based on the level of economic development of the FDI source country. The results indicate that the impact of FDI from advanced economies and developing countries on output growth differs significantly, while three control variables, namely the lagged dependent variable, domestic investment and labour, confirm the findings previously presented in columns (1) to (4) of Table 4.5

Columns (1) and (3) of Table 4.6 indicate that FDI inflows from developed countries have significant negative effects in the absence of the economic sector. This finding, while

Table 4.6: The effects of FDI from developed and developing countries

Dependent variable : Ln GDP	(1) Standard FE	(2) Driscoll and Kraay FE	(3) GMM	(4) GMM IV collapse
ln GDP$_{t-1}$	1.015***	1.015***	0.981***	0.943**
	(0.068)	(0.056)	(0.063)	(0.312)
ln domestic investment	-0.035*	-0.035***	-0.032*	-0.029
	(0.016)	(0.010)	(0.017)	(0.028)
ln employment	0.005	0.005	0.010	0.016
	(0.022)	(0.015)	(0.023)	(0.040)
ln FDI DC	-0.194**	-0.194	-0.179**	-0.163
	(0.073)	(0.141)	(0.075)	(0.149)
ln FDI LDC	-0.202	-0.202	-0.212	-0.222
	(0.208)	(0.166)	(0.216)	(0.171)
Observations	130	130	120	120
R-squared	0.934	0.934		
Pesaran test (p-value)	0.133			
No. of instruments			88	28
AR(2)(p-value)[a]			0.380	0.477
Sargan test (p-value)[b]			0.097	0.264

Notes: Table 4.6 presents the effect of FDI inflows on output based on the level of economic development of the FDI source country (equation 4.3). The standard fixed effects model is presented in columns (1), and the alternative estimators are presented in columns (2) to (4). The constant values are not shown in the table. Robust standard errors in parentheses. *** denotes statistical significance at the 1% level, ** at the 5% level, and * at the 10% level.
[a] The null hypothesis is that the errors in the first difference regression exhibit no second order serial correlation.
[b] The null hypothesis is that the instrument are not correlated with the residuals.

preliminary, suggests that, on average, FDI from developed countries depresses output in Thai economies.

In contrast, the estimated coefficients of average FDI from developing countries in all estimations in Table 4.6 have negative signs and lack of statistical significance. Given the small sample size of FDI inflows from developing countries, the confidence interval is wide; thus, it is difficult to reject the null hypothesis that FDI from developing countries has no effect on output growth. However, there is a possibility that the result may have been significant had the sample size of FDI from developing countries been larger than or as large as the sample size of FDI from developed countries. Based on this estimation, I conclude that, on average, FDI inflows from developing countries have no effect on the Thai economy in the absence of the economic sector.

Based on the findings presented in Table 4.5, FDI can obscure the actual output if the regression model ignores economic sectors. To explore the actual effect, Table 4.7 illustrates the results of the effects of inward FDI from developed and developing countries on output growth in the presence of 10 economic sectors.

Table 4.7: Decomposition inward FDI

Dependent variable : Ln GDP	Developed countries (DC)				Developing countries (LDC)			
	(1) Standard FE	(2) Driscoll and Kraay FE	(3) GMM	(4) GMM IV collapse	(5) Standard FE	(6) Driscoll and Kraay FE	(7) GMM	(8) GMM IV collapse
ln GDP$_{t-1}$	1.052***	1.052***	1.040***	0.950***	1.010***	1.010***	0.986***	0.835**
	(0.080)	(0.058)	(0.095)	(0.237)	(0.074)	(0.051)	(0.063)	(0.364)
ln domestic investment	-0.036	-0.036***	-0.0348	-0.0283	-0.042**	-0.042***	-0.041**	-0.030
	(0.023)	(0.008)	(0.024)	(0.028)	(0.017)	(0.006)	(0.018)	(0.026)
ln employment	-0.003	-0.003	-0.001	0.013	-0.001	-0.001	0.003	0.023
	(0.025)	(0.016)	(0.028)	(0.030)	(0.020)	(0.010)	(0.021)	(0.041)
ln FDI DC	-0.998	-0.998	-1.087	-1.775	-0.373**	-0.373***	-0.361**	-0.289*
	(0.780)	(4.069)	(0.790)	(2.241)	(0.146)	(0.122)	(0.150)	(0.158)
ln FDI LDC	-0.174	-0.174	-0.177	-0.206	-0.662*	-0.662	-0.650*	-0.574
	(0.229)	(0.157)	(0.239)	(0.184)	(0.344)	(1.105)	(0.341)	(0.419)
ln FDI DC*agriculture	-35.903**	-35.903*	-35.79**	-34.89**				
	(14.816)	(19.880)	(15.01)	(15.38)				
ln FDI DC*construction	-0.306	-0.306	-0.217	0.473				
	(0.799)	(4.650)	(0.852)	(2.079)				
ln FDI DC*electricity	0.736	0.736	0.824	1.506				
	(0.967)	(4.258)	(1.001)	(2.241)				
ln FDI DC*finance	0.853	0.853	0.946	1.667				
	(0.801)	(4.208)	(0.804)	(2.359)				
ln FDI DC*manufacturing	1.605	1.605	1.722	2.626				
	(0.941)	(4.062)	(1.061)	(2.466)				
ln FDI DC*mining	-2.731*	-2.731	-2.556*	-1.197				
	(1.271)	(4.444)	(1.385)	(3.948)				
ln FDI DC*real estate	0.882	0.882	0.967	1.631				
	(0.909)	(4.093)	(0.912)	(2.343)				
ln FDI DC*transport	0.931	0.931	1.035	1.845				
	(0.803)	(4.010)	(0.867)	(2.412)				
ln FDI DC*wholesale	0.917	0.917	1.017	1.791				
	(0.708)	(3.998)	(0.760)	(2.317)				
ln FDI LDC*agriculture					6.791	6.791	6.535	4.943
					(28.454)	(38.018)	(28.643)	(28.949)
ln FDI LDC*construction					1.561**	1.561	1.512**	1.208
					(0.570)	(1.781)	(0.570)	(0.873)

(Continued on next page)

163

Dependent variable : Ln GDP	Developed countries (DC)				Developing countries (LDC)			
	(1) Standard FE	(2) Driscoll and Kraay FE	(3) GMM	(4) GMM IV collapse	(5) Standard FE	(6) Driscoll and Kraay FE	(7) GMM	(8) GMM IV collapse
ln FDI LDC*electricity					0.232 (0.388)	0.232 (1.043)	0.202 (0.388)	0.018 (0.495)
ln FDI LDC*finance					-0.405 (0.611)	-0.405 (1.198)	-0.428 (0.601)	-0.574 (0.784)
ln FDI LDC*manufacturing					2.458* (1.139)	2.458 (1.817)	2.547* (1.254)	3.101* (1.461)
ln FDI LDC*mining					0.665 (0.397)	0.665 (1.111)	0.643 (0.392)	0.510 (0.538)
ln FDI LDC*real estate					0.445 (0.553)	0.445 (1.266)	0.455 (0.578)	0.517 (0.628)
ln FDI LDC*transport					0.580 (0.359)	0.580 (1.970)	0.567 (0.358)	0.487 (0.447)
ln FDI LDC*wholesale					1.522** (0.647)	1.522 (1.804)	1.488** (0.639)	1.274 (1.094)
Observations	130	130	120	120	130	130	120	120
R-squared	0.941	0.941			0.940	0.940		
Pesaran test (p-value)	0.096				0.077			
No. of instruments			97	37			97	37
AR(2)(p-value)[a]			0.364	0.427			0.572	0.607
Sargan test(p-value)[b]			0.082	0.226			0.063	0.345

Notes: Table 4.7 presents the effects on the Thai economy of inward FDI from developed and developing countries in the presence of 10 economic sectors. Columns (1) to (4) display the results of inward FDI from developed countries with the accommodation sector as a benchmark while columns (5) to (8) display the results of inward FDI from developing countries. The standard fixed effects model is presented in columns (1) and (5). The alternative estimators are presented in columns (2) to (4) and (6) to (8). The constant values are not shown in the table. Robust standard errors in parentheses. *** denotes statistical significance at the 1% level, ** at the 5% level, and * at the 10% level.
[a] The null hypothesis is that the errors in the first difference regression exhibit no second order serial correlation.
[b] The null hypothesis is that the instrument are not correlated with the residuals.

Columns (1) to (4) of Table 4.7 present the results for FDI inflows from developed countries by sector. Again, the results for the three control variables, namely the lagged dependent variable, domestic investment and labour, confirm previous findings (columns (5) to (8) of Table 4.5). FDI inflows from developed countries in agriculture have a negative and significant effect in all estimations, indicating that such FDI in agriculture is more likely to reduce output growth compared to FDI inflows from developed countries to the accommodation sector. In the mining sector, the results indicate an ambiguous effect, while, in the manufacturing sector, it has a positive but insignificant effect. In this case, the coefficients of FDI in the agriculture sector are very large, ranging from -36.901 to -36.665, with very large standard errors. These results must therefore be interpreted

with caution. Estimates for FDI in the mining sector lose their statistical significance in columns (2) and (4), but the coefficients show negative signs in all estimations. Additionally, their significance level is smaller compared with the results presented in columns (5) and (7) of Table 4.5; they change from 5% to 10%. While the estimated results of FDI in advanced industries such as the manufacturing sector show the largest positive effects, but they are statistically insignificant in all estimations.

The remaining columns of Table 4.7 (columns (5) to (8)) present intriguing findings. The results for the common control variables, including the lagged dependent variable and labour, are similar to those in Table 4.5, while domestic investment tends to have a negative effect output growth in the presence of FDI from developing countries in 10 economic sectors. Additionally, FDI inflows from developing countries to the construction, manufacturing and wholesale sectors are found to serve as a growth engine in the Thai economy, as since their coefficients have positive signs and are statistically significant.

Regarding the manufacturing sector, the estimated results are shown to be positive and statistically significant at the 10% level in almost estimations, with the exception of column (6). The magnitude of FDI inflows from developing countries to the manufacturing sector is quite large, ranging from 1.796 to 2.527. This indicates that a 1% increase in the share of FDI inflows from developing countries to the manufacturing sector on sector-wise GDP will increase output in the manufacturing sector by 1.796% to 2.527% *ceteris paribus*. A possible explanation is that the amount of capital that developing countries invest in manufacturing could be large. At the same time, it can be assumed that FDI increases competitive pressure on the local market due to the negative signs of the estimated coefficients of domestic investment.

Correspondingly, columns (5) and (7) show that FDI in the construction and wholesale sectors from developing countries is more likely to increase output growths than FDI in accommodation. They have positive effects on sectoral output growth. The explanation for FDI in the construction and wholesale sectors is similar to that regarding the impact of FDI inflows from developing countries to the manufacturing sector presented previously. The reason why column (6) does not show a statistical sign may be that there is a correlation between the errors of some sectors, as this model can correct cross-sectional dependence in errors. For column (8), the difference GMM with the collapse instrument variables estimator, this estimator may be less efficient than a standard procedure. Thus, the results presented in columns (6) and (8) are not significant.

A comparison of the two sources of inward FDI reveals that FDI inflows from developing countries, especially in the construction, manufacturing and wholesale sectors, affect output growth, while FDI inflows from developed countries seem to have no effect on output. These results may be explained by the fact that the technology gap or the difference in terms of investment environment between Thailand and developing countries is small; hence, productivity gains are likely to occur when developing countries invest in Thailand. In contrast, developed countries have more advanced technologies. Infrastructure, local firms and labourers in Thailand are likely to be restricted in its ability to absorb technology and knowledge from developed countries, especially in the agriculture and mining sectors. As a result, FDI inflows from developed countries to these sectors slow output growth.

4.6   Conclusion

From 1980 to 1997, FDI in the Thai economy grew continually.   Since 2005, however, FDI inflows have been fluctuating.   The Thai government heavily promotes fiscal incentives to attract foreign investors, although there is no consistent evidence of a positive effect of FDI on the growth of the Thai economy.

This study provides additional evidence that analysing FDI while ignoring economic sector may blur the actual effect of FDI and lead to such ambiguous results.   The contribution of this study thus lies in distinguishing among the impacts of inward FDI in different sectors on output growth.   I test whether different sector-level FDI inflows have different effects on each sector's output.   In addition, I investigate whether these effects differ across investors from developed and developing countries.   The aim of the latter point is to explore the level of technology development of Thailand and to confirm whether FDI from developed countries contributes more to the growth of the Thai economy than FDI from developing countries.

The panel regression based on a sample of different sources of FDI in 10 economic sectors over the period of 2005 to 2018 shows that different types of FDI have different impacts on output.   In general, FDI inflows in the manufacturing and wholesale sectors play a crucial role in enhancing Thailand's GDP. In contrast, inward FDI in the agriculture and mining sectors seem to reduce outputs in these sectors, while inward FDI in other sectors does not have any effects on sector-wise GDP.

In addition, the analysis allows for the identification of differences in the output responses to FDI from developed and developing countries, which previous studies have not investigated. First, the findings indicate that FDI from developed countries has

a negative effect on Thai economies, but this is not the case for FDI from developing countries. With 10 economic sectors being taken into account, inward FDI from developed countries in the agriculture and mining sectors reduces those sectors' outputs, while FDI from developing countries shows positive effects on outputs in the construction, manufacturing and wholesale sectors.

These findings indicate that the Thai economy is likely to benefit from a transfer of technology and knowledge in advanced sectors of the economy, such as construction and manufacturing and wholesale, particularly when such transfers occur from developing countries (as opposed to developed). In primary sectors such as agriculture and mining, inward FDI from developed countries could slow outputs. This finding could be explained with reference to the fact that foreign firms face an entry barrier because the primary sector is generally reserved to local firms.

The most important limitations are rooted in the fact that this research uses sector-level data. Variables in this level data are very limited. It would be intriguing to analyse these effects using more control variables, such as the quality of human capital, government expense and R&D. It would also be interesting for a future study to investigate the effects of FDI spillovers across sectors, which this study is unable to analyse due to data limitations.

Finally, this study's findings suggest that future research in this field should use disaggregated FDI data when analysing the actual effects thereof. Policy makers, especially in developing countries, should focus on target sectors where inward FDI is likely to promote future growth; however, they should also be aware that target sectors could also have allocative distortions since investments in non-target sectors are put at

a competitive disadvantage. Governments occasionally grant fiscal incentives without realising the actual growth effects of such incentives; as a result, the tax revenue losses incurred by granting tax incentives may be greater than the benefits that a country may gain from FDI.

4.A Appendix

Table 4.A.1: Economic sector

Sectors of the Economy	
Primary sector	Agriculture, forestry and fishing
	Mining and quarrying
Secondary sector	Construction
	Manufacturing
	Electricity, gas, steam and air conditioning supply
Tertiary sector	Accommodation and food service activities
	Financial and insurance activities
	Real estate activities
	Transportation and storage
	Wholesale and retail trade; repair of motor vehicles and motorcycles

Table 4.A.2: Pairwise correlation

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
(1) ln FDI	1.000												
(2) ln domestic investment	-0.151	1.000											
(3) ln employment	-0.158	-0.033	1.000										
(4) ln FDI*agriculture		-0.025	0.049	1.000									
(5) ln FDI*agriculture		-0.008	0.218	-0.014	1.000								
(6) ln FDI*construction		-0.003	-0.019	0.004	0.006	1.000							
(7) ln FDI*electricity		0.223	-0.023	-0.002	-0.003	0.001	1.000						
(8) ln FDI*finance		-0.335	-0.137	-0.022	-0.035	0.009	-0.004	1.000					
(9) ln FDI*manufacturing		-0.105	0.281	-0.028	-0.045	0.012	-0.005	-0.070	1.000				
(10) ln FDI*mining		0.006	0.024	0.001	0.002	-0.000	0.000	0.002	0.003	1.000			
(11) ln FDI*real estate		0.094	-0.237	-0.030	-0.048	0.012	-0.006	-0.074	-0.094	0.003	1.000		
(12) ln FDI*transport		0.121	-0.001	-0.008	-0.014	0.004	-0.002	-0.021	-0.027	0.001	-0.029	1.000	
(13) ln FDI*wholesale		-0.073	0.219	-0.021	-0.034	0.009	-0.004	-0.053	-0.067	0.002	-0.071	-0.020	1.000

Table 4.A.3: FDI and lagged term of FDI

Variables	(1)	(2)	(3)	(4)
ln GDP$_{t-1}$	1.015***	1.013***	1.012***	1.015***
	(0.065)	(0.067)	(0.068)	(0.066)
ln domestic investment	-0.035**	-0.033**	-0.037**	-0.039**
	(0.014)	(0.014)	(0.014)	(0.016)
ln employment	0.005	0.003	0.007	0.001
	(0.018)	(0.019)	(0.020)	(0.020)
ln FDI$_t$	-0.184**		-0.210*	-0.249**
	(0.076)		(0.107)	(0.089)
ln FDI$_{t-1}$		-0.008	-0.069	0.003
		(0.060)	(0.081)	(0.098)
ln FDI$_{t-2}$				-0.062
				(0.102)
Observations	130	130	130	120
R-squared	0.934	0.932	0.934	0.929
Year FE	Yes	Yes	Yes	Yes
Sector FE	Yes	Yes	Yes	Yes

Notes: The constant values are not shown in the table. Robust standard errors in parentheses.
*** denotes statistical significance at the 1% level, ** at the 5% level, and * at the 10% level.
This table presents one- and two-lagged FDI in the benchmark estimation. The economic
motivation for including lagged FDI is partly due to nature investment activity. One may
directly change one's cash flows to capital stock in the year of inward FDI, while others may
make the actual investment in the later year. Thus, it is reasonable to include one or two lagged
levels of the FDI variable. Since the lagged FDI variables are statistically insignificant, the current
year of inward FDI is included in the econometric specification.

Table 4.A.4: Granger causality bivariate models

Null hypothesis	Zbar-Stat	Z-bar tilde-Stat
GDP does not Granger cause FDI	5.297***	3.095***
	(0.000)	(0.002)
FDI does not Granger cause GDP	0.923	0.238
	(0.356)	(0.812)
GDP does not Granger cause domestic investment	1.153	0.388
	(0.249)	(0.698)
Domestic investment does not Granger cause GDP	0.472	-0.058
	(0.637)	(0.955)
GDP does not Granger cause labour	1.582	0.669
	(0.114)	(0.504)
Labour does not Granger cause GDP	0.105	-0.297
	(0.917)	(0.767)
GDP does not Granger cause accommodation	1.240	0.694
	(0.215)	(0.488)
Accommodation does not Granger cause GDP	-0.330	-0.331
	(0.741)	(0.740)
GDP does not Granger cause agriculture	-0.705	-0.576
	(0.481)	(0.565)
Agriculture does not Granger cause GDP	-0.684	-0.562
	(0.494)	(0.574)
GDP does not Granger cause construction	0.594	0.273
	(0.553)	(0.785)
Construction does not Granger cause GDP	-0.683	-0.562
	(0.494)	(0.574)
GDP does not Granger cause electricity	1.586	0.920
	(0.113)	(0.357)
Electricity does not Granger cause GDP	-0.593	-0.503
	(0.553)	(0.615)
GDP does not Granger cause finance	2.470***	1.604***
	(0.000)	(0.000)
Finance does not Granger cause GDP	-0.485	-0.432
	(0.627)	(0.665)
GDP does not Granger cause manufacturing	2.776***	1.698*
	(0.006)	(0.090)
Manufacturing does not Granger cause GDP	-0.355	-0.347
	(0.723)	(0.729)
GDP does not Granger cause mining	0.885	0.463
	(0.376)	(0.644)
Mining does not Granger cause GDP	-0.183	-0.235
	(0.855)	(0.814)
GDP does not Granger cause real estate	1.229	0.687
	(0.219)	(0.492)
Real estate does not Granger cause GDP	3.211***	1.982**
	(0.001)	(0.048)
GDP does not Granger cause transport	2.167**	1.300
	(0.030)	(0.194)
Transport does not Granger cause GDP	-0.707	-0.577
	(0.479)	(0.564)
GDP does not Granger cause wholesale	0.442	0.173
	(0.658)	(0.862)
Wholesale does not Granger cause GDP	-0.284	-0.301
	(0.777)	(0.764)

Notes: The value in parentheses are p-values which *** $p<0.01$, ** $p<0.05$, * $p<0.1$

Summary and Conclusion

5.1 Introduction

This final chapter provides a review and summary of the key findings, policy implications attainable from the empirical results, limitations of the empirical study, recommendations for further study and concluding remarks regarding the three empirical studies.

5.2 Review and Summary of the Results

This thesis attempts to investigate the effectiveness of tax policy on inward FDI in Thailand. Due to the decreased ratio of corporate tax revenue on GDP in Thailand, a major concern is granting tax incentives. The effectiveness of tax incentives can also be influenced by the inclusion of a tax sparing provision in a bilateral tax treaty. With heavily promoted investment through tax policies for attracting FDI, there is an inconclusive result regarding the impact of FDI on economic growth in Thailand.

The thesis reveals that the heterogeneity among FDI source countries is very important to the empirical analysis. This outcome contributes to the literature about the effect of tax policy on FDI, which commonly focuses on the heterogeneity among FDI recipient countries (e.g. Blonigen and Wang (2004) and Azémar et al. (2007)) rather than among FDI source countries. In this thesis, I focus on the heterogeneity among FDI source country in a specific FDI recipient country -Thailand - in order to have a clear vision of the influence of tax policies on inward FDI and how FDI affects the growth of the Thai economy.

This thesis consists of three main empirical chapters, which focuses mainly on the effect of tax sparing agreements on inward FDI, the impact of tax incentives on multinational and local firms' behaviours and the impact of FDI on the Thai economy. The main objective of the thesis is specifically to investigate the role of international and domestic tax policies on FDI and also the role of FDI in the pursuit of growth of the Thai economy.

Chapter two, the first empirical chapter of the thesis suggests that the heterogeneity of tax sparing provisions is very important to the analysis of tax sparing provision on FDI. When I investigate the overall of tax sparing provision effects on inward FDI stock with a fixed effects model, it does not show any statistical difference on inward FDI stock. It also reports that compared to developing countries, developed countries are less likely to increase their investment when a tax sparing provision is granted.

Once the heterogeneity of tax sparing provisions is calculated according to the period of tax sparing relief, the results of the tax sparing effect on FDI are changed. A tax sparing provision without a sunset clause increases the value of FDI by 6.38 times. This

175

effect differs across the levels of economic development, but there is no difference across tax systems. Tax sparing without a sunset clause has more influence on the decisions of investors from developing countries. On the other hand, a tax sparing provision with a sunset clause reduces the value of FDI from both developed and developing countries, but the developing countries are much more likely to reduce their investment than the developed countries are, and there is no difference in effect across the two tax systems.

Chapter three, the second empirical chapter explores the impact of tax incentives, particularly tax holidays, on multinational and domestic firms' behaviour in Thailand. The results suggest that the elasticity between tax holidays on one hand and total assets and physical investment on the other is much higher for Thai firms than for foreign firms. The difference might be that Thai firms can only decrease their tax burden via official tax incentives provided by the government whereas multinational firms, with their international activities, have more opportunities to conduct tax planning. Thai firms that benefit from tax incentives substantially increase their investment in physical capital (by up to 55%) as well as their investment in intangible assets (by about 21%) while foreign firms that benefit from tax incentives increase their tangible assets by 18% and their intangible assets by a similar amount of 16%. These estimates are statistically significant and substantial in magnitude and last for up to three years with a gradually decreasing effect.

Additionally, other BOI incentives such as exemptions of import duties on machinery or on raw material used in production for export or other non-tax incentives (e.g., permits to own land and permits to bring skilled workers and experts into Thailand to work in investment promoted activities) are also significant for tangible investment of foreign firms. This might be due to the fact that foreign firms are involved in international trade

and thus benefit more from incentives targeting their imports and exports. This finding is in line with OECD (2021*b*) when it mentioned that the BOI plays an influential role in enhancing Thailand's economic development.

Focusing on MNEs, the study presented in chapter 3 finds that firms benefiting from both tax holidays and tax sparing invest 54% more in intangible assets than comparable firms benefiting from neither advantage, and 30% more than firms benefiting from a tax holiday not preserved by tax sparing. Regarding the level of development of the home country of MNEs, this chapter finds no robust evidence of a different effect of tax holidays on the investment of firms from developing countries as compared to developed countries.

Chapter four, the last empirical chapter of this thesis investigates the impact of FDI on growth in the Thai economy. It is important to note that the findings suggest that analysing FDI while ignoring the economic sector and heterogeneity of FDI source countries can blur the actual effect of FDI.

This chapter reveals that, on average, FDI inflows slow the growth of the Thai economy; however, FDI inflows in the manufacturing and wholesale sectors are found to generate positive effects on growth in the presence of 10 economic sectors, indicating that these two sectors play a crucial role in enhancing Thailand's GDP. In contrast, inward FDI in the agriculture and mining sectors seems to reduce outputs in these sectors, while inward FDI in other sectors does not have any effects on sector-wise GDP. Regarding the heterogeneity among FDI source countries, the result suggests that inward FDI from developed countries in the agriculture and mining sectors reduces those sectors' outputs, while FDI from developing countries has positive effects on outputs in the construction, manufacturing and wholesale sectors.

The findings in the fourth chapter can be attributed to the fact that, the Thai economy is likely to benefit from a transfer of technology and knowledge in advanced sectors of the economy, such as construction, manufacturing and wholesale, particularly when such transfers come from developing rather than developed countries. In primary sectors such as agriculture and mining, inward FDI from developed countries can slow outputs. This finding could be explained with reference to the fact that foreign firms face an entry barrier because the primary sector is generally reserved to local firms.

5.3   Policy Implications

Thailand faces a trade-off between increasing their tax revenues to finance public goods and offering tax incentives in an attempt to attract FDI in the hope of stimulating economic growth. Together, the three empirical essays provide a clear vision of the influence of tax policies on inward FDI and how FDI affects heterogeneous sectoral growth in Thailand. The lesson from Chapters 2 and 3 suggests that tax sparing agreements and tax incentives can be important tools to foster economic development through some forms of inward FDI in Thailand, while Chapter 4 reveals that not all sectors' growth is driven by FDI.

Currently, Thailand has signed a tax sparing agreement with and without a sunset clause depending on a signatory country. However, not all forms of tax sparing provisions encourage FDI in Thailand. Based on the findings of Chapter 2, Thailand should continue to convince a potential signatory country to conclude a bilateral tax treaty without a sunset clause. In contrast, tax sparing agreement with a sunset clause is likely to be less effective than the one with an unlimited tax sparing period. Thus, tax negotiators should not force a potential signatory country that they are not generally delighted to include a tax sparing

clause in a bilateral tax treaty. Most of them finally accept to include a tax sparing with a sunset clause in order to conclude tax treaties. A reason they want to obtain such treaties is that the treaties can reduce tax administration costs and help avoid tax evasion through the exchange of taxpayers' information.

In terms of domestic tax policies for attracting FDI, Thailand widely grants tax incentives. According to the national budget, tax revenue losses due to BOI incentives accounted for 1.51% of GDP in 2014 and 1.63% of GDP in 2015. However, carefully designed tax incentives may help reduce the country's revenue forgone and correct market failures. The study presented in Chapter 3 finds that tax holidays, which are provided by the BOI, enhance investment in multinational and domestic firms even though previous evidence mentions that firms might have invested without tax incentives (James, 2009; IMF, OECD, UN and World Bank, 2015; World Bank, 2018).

Thailand should continue to grant tax holidays to encourage investment in Thailand; however, the effects of tax holidays on tangible and intangible investment last up to two or three years after being promoted. This suggests that a tax holiday is only effective in the short term. In order to achieve long-term development, the country could consider cost-based tax incentives (i.e., accelerated tax depreciation, investment tax credit) instead of profit-based tax incentives (i.e., tax holidays and exemption on profits). The country should also be aware of the costs and benefits of tax incentives. For example, firms responding positively to tax incentives by increasing their investment could increase the country's revenue through value-added tax, personal income tax and increase social benefits. These benefits should be greater than the foregone tax revenues and other indirect costs such as administrative costs.

Nevertheless, tax holidays and other tax incentives are affected by the base erosion and profit shifting (BEPS) project. The BEPS project, Pillar 2, aims to reduce tax competition among countries as well as the incentive to shift profits to low- or no-tax jurisdictions. This project has established a worldwide 15% minimum effective tax rate on corporate profits, ensuring that a minimum of tax is paid no matter the location of MNEs. Where the tax paid by the group on profit in a jurisdiction falls below the minimum 15% level, the rules then require countries to impose top-up taxes on certain entities within the group in order to bring the overall taxation of jurisdictional profit up to the minimum level. Thus, the member countries which grant tax incentives to attract FDI may consider providing new incentives in areas outside the scope of Pillar 2 (such as employment incentives) or increase the direct grants offered.

The finding in the last empirical chapter suggests that not all sectors' growth is driven by FDI. In Thailand, FDI in manufacturing and wholesale sectors generate economic growth while FDI in primary sectors (i.e., agriculture and mining sectors) fails to enhance growth. The study results support the BOI's current policy that has changed the concept of granting tax incentives from location-based incentives to sector-specific incentives since 2015. This finding could be useful to ensure that the benefits that Thailand gains from FDI are greater than the tax expenses incurred by granting tax incentives. However, policy makers should be aware that sector-specific incentives could also have allocative distortions since investments in non-tax incentive sectors are put at a competitive disadvantage.

Finally, the belief that FDI from advanced economies generates growth in the Thai economy is likely to be invalid based on the study presented in Chapter 4. The findings suggest that only inward FDI from developing economies generates growth, particularly

in the manufacturing, construction and wholesale sectors. This could be a reason that Thailand lacks the capabilities to absorb the FDI-related technology transfer from developed countries, which have a relatively high level of technology development.

5.4   Limitations of the Empirical Study

This thesis has made a conscious attempt to make the findings as reliable as possible in order to push policy makers in Thailand to improve tax policies, but a number of weaknesses remain regarding data limitation. In particular, Chapter 4 investigates the heterogeneous sectoral growth effects of FDI; however, the chapter is unable to cover inter-sector linkages due to data limitation. Thus, the scope of the study in chapter four focuses on the within-sector growth effects of FDI.

5.5   Recommendations for Further Research

Regarding the tax determinant of bilateral FDI, researchers should take tax sparing agreement into account when investigating the effects of taxes on FDI. A tax sparing provision is a useful policy for attracting FDI in developing countries (Chapter 2).

Additionally, Chapter 3 relying on the host's domestic tax incentives suggests that using total assets as a dependent variable could distort the actual result. Thus, researchers should focus on a specific investment (tangible and intangible assets) when investigating the effects of tax incentive on investment. It would also be interesting for future research to include both profit-based and cost-based incentives when analysing the effectiveness of investment incentives in Thailand, which could identify a potential removal of tax incentives.

Finally, the last empirical study in Chapter 4 emphasises that using aggregate FDI data could blur the actual growth effects to the Thai economy. To investigate the actual growth effects of FDI, researchers should focus more on sector-specific growth effects than on the aggregate FDI.

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