

Assessing Tax Incentives for Investment: A Case Study of Thailand

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Abstract

This study examines Thailand's tax incentives for investment. It takes into account important tax provisions under standard and preferential treatments, and computes effective average tax rates (EATRs) applied to the country's focused industries. It then compares Thailand's EATRs with those of ASEAN peers. Such industry-specific lens is crucial since the tax benefits offered as well as the composition of investment assets can vary substantially between industries. It finds that, Thailand's tax incentives are broadly comparable to those of its ASEAN peers. Under the maximum incentives, the EATRs range from 6-9% depending on the investment intensity in each industry. This suggests that, with the exception of targeted incentives for the biotech industry, there is not much need to expand tax or monetary incentives. The results also indicate that accelerated depreciation and investment tax allowances are two options that may perform better than tax holidays in term of minimizing the incentive redundancy.

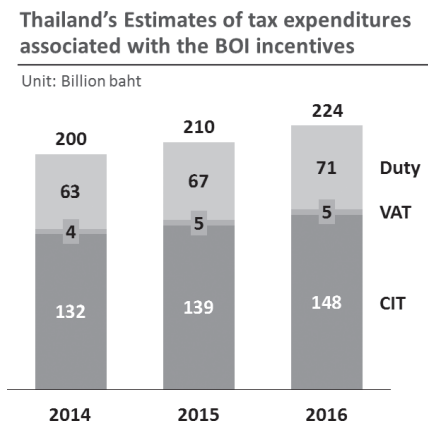
Keywords: Effective Average Tax Rate, Investment Incentives, Tax Holiday

1. Introduction

Tax incentives for investment are very popular among developing countries. Thailand is no exception. Its government has implemented several tax incentives. Examples are the activity-based incentive systems, the special economic zones, and the investment acceleration measures. Those measures have come on top of the statutory tax cut over 2012 to 2013 which brings the tax rate to 20%.

Those tax incentives, however, are costly and unlikely to compensate for all of the country’s shortcomings. According to the Fiscal Policy Office’s estimate, the tax expenditures associated with the incentives handed out by the Board of Investment account for 1.7% of GDP in 2014 and are just smaller than total personal income tax revenue (see Figure 1). More importantly, although empirical evidence suggests that tax does matter significantly on firms’ investment location decision (see, for example, Devereux and Griffith, 1998), it is just one of the determinants. Other factors such as resource availability, policy continuity and ease of doing business are also at play. It is unlikely that tax incentives will be able to compensate for all of the country’s shortcomings.

Figure 1. Thailand’s Estimate of Tax Expenditure associated with BOI Incentives



Note: CIT = Corporate income tax, VAT = Value added tax, and Duty = duty tax

Source: Budget Bureau, Fiscal Policy Office

It is, therefore, important to know where the country's tax incentives stand relative to its competitors.¹ If the tax incentives are at a comparable level with neighboring countries, then the government can refrain from throwing additional tax breaks and focus on addressing other important factors such as ease of complying to the tax law and infrastructure.

In practice, the tax incentives come in many formats. In the standard treatment, there are statutory tax rates, depreciation allowances, and various tax credits. Preferential tax regime includes not only tax holiday but also tax exemption cap and investment tax allowance.² For policy-making purpose, it is useful to be able to summarize the impact of taxation on the incentives concerning location choices in a single measure.

In this study, I investigate 2 questions: 1) how does Thailand's tax incentives compete with its ASEAN peers?, and 2) is there any sign of redundancy in the current incentive system? I answer these questions by computing the effective average tax rate (EATR) using the methodology proposed by Devereux and Griffith (2003). The EATR is a forward-looking tax rate and it measures the average tax rate a firm might expect to face on an investment over the possible distribution of profitability. It informs location choices. I then apply that framework to the tax context of four ASEAN countries which are the largest recipients of net FDI inflows (excluding Singapore)³. These countries are referred to as ASEAN4 throughout this article and include Indonesia, Malaysia, Thailand and Vietnam.

This paper contributes to the literature in two important ways. First it takes into account relevant features in the tax code used in the ASEAN

¹ In practice, many factors could influence the tax competitiveness of a country. These include, for example, tax burden and the amount of time taken to comply with tax regulations. This study focuses on only the tax burden aspect.

² Tax holiday is a period of time that the government exempts corporate income tax liabilities for a taxpayer. Tax exemption cap is a limit on total corporate income tax liabilities exempted usually in percent of the investment cost. Investment tax allowance is an allowance that can be set-off against certain percent of the pre-tax income each year until the allowance is fully utilized. Such allowance is typically given in percent of total investment cost.

³ Singapore has the highest amount of net FDI inflows in ASEAN but most of them is in the financial sector.

countries. Examples are Thailand's tax holiday with the cap on tax exemption and Malaysia's extra allowance on investment cost (Investment Tax Allowance). Second it examines the tax competitiveness with industry-specific lens. Previous studies have looked at maximum incentives or broad types of incentives such as those given to high-tech sector or those given to manufacturing industry. The tax benefits offered as well as the composition of investment assets, however, can vary substantially between industries. This will likely produce significant impacts on the group of industries that have been chosen by the Thai government as its short and medium term priorities (Sangsuphan, 2015). It consists of automobile, biotech, electronics, processed food, and tourism.

The remainder of this paper is organized as follows. The next section describes related studies. Section 3 illustrates how the impact of taxes on the investment incentives is measured. The results and their policy implications are discussed in Section 4. The final section concludes the study.

2. Related Studies

This study is related to two sets of literature (see Table 1). The first set is on the formulation of the forward-looking effective tax rate on firm's investment decision. Auerbach (1979) and King and Fullerton (1984) have developed an approach to measuring the effective marginal tax rate (EMTR). This approach essentially assumes a profit-maximizing firm with risk-neutral shareholders and calculates the cost of capital (the minimum pre-tax rate of return necessary to earn zero post-tax economic profit) associated with its investment. The cost of capital is then used to construct the EMTR, which is relevant for decision on the firm's investment scale. For Thailand, Aemkulwat (2008) has estimated the EMTRs classified by funding methods and investor types.

Table 1: Related Studies

1 Formulation of Forward-Looking Effective Tax Rates	
Auerbach (1979), King and Fullerton (1984)	Effective marginal tax rate (EMTR), applicable for marginal investment
Devereux and Griffith (2003)	Effective average tax rate (EATR), applicable for an investment project with positive economic profit
2 Assessment of ASEAN tax incentives using EATR	
Klemm (2012)	Extending the EATR framework to incorporate long-term investment
Botman et al. (2010)	Focus on the Philippines; Max incentives
Abbas and Klemm (2013)	Suggest 'partial' race to bottom; Max incentives
Suzuki (2014)	Find some evidence of tax competition; Typical incentives
Wiedeman and Finke (2015)	Consider max incentives, incentives targeted at regional development and incentives targeted at high-tech activities

An important limitation of the EMTR is the fact that it assumes zero economic profit—making it applicable only for marginal investment projects in which the last unit invested yields just enough pre-tax return to break even after taxes. In many situations, however, a firm faces a choice between two projects that each earn more than its cost of capital. This includes cases when a firm with certain specific advantages, such as innovation and patents, decides where to locate its plants.

Devereux and Griffith (2003) has addressed this limitation by proposing the effective average tax rate (EATR). It computes the EATR by considering an investment project with positive economic profit and identifying the wedge between pre- and post-net present value (NPV) of the investment project. It thus helps inform policymakers on the measurement of the impact of taxes on the investment location decision. Many studies including Devereux and Griffith (1998) and Bellak and Leibrecht (2009) have found that the EATR has a significant impact on firms' decision regarding where to invest abroad.⁴

The second set of literature is on the assessment of ASEAN tax incentives using the effective average tax rates. Over the past several decades, ASEAN countries have adopted tax holiday incentives in order to attract

⁴ In particular, Devereux and Griffith (1998)'s results indicate that a percentage point drop in the UK EATR would raise the probability of a US firm placing its investment in the UK by one percent.

foreign direct investment. Klemm (2012) has extended the Devereux and Griffith EATR framework to accommodate those tax holiday incentives. Botman et al. (2010) computes the EATR for ASEAN countries with its focus mainly on the Philippines' tax policy options. It finds that the maximum tax holiday incentives lower the EATRs significantly and make the EATRs comparable among the ASEAN countries.

Similar to Botman et al., Abbas and Klemm (2013) also considers the EATR associated with maximum incentives. It studies the development of the EATR from 1996 to 2007 of 50 developing countries including many ASEAN countries. The study concludes that those countries have competed over the special tax incentives, so called the partial race to bottom. It, however, does not explicitly report the EATR. Suzuki (2014) estimates the EATR of 12 countries in East ASIA and considers the typical incentives, which are defined as average tax incentives for a typical project based on actual usage. It finds some evidence of tax competition over the period of 1991-2012. Wiedemann and Finke (2015) computes the EATR for Asia-Pacific countries including nine ASEAN countries. Under maximum tax incentives, it finds that the EATRs are pretty comparable among ASEAN countries with Thailand and Vietnam having the lowest effective tax rates.

3. Conceptual Framework

The analysis in this study measures the impact of taxation on location choice incentive by computing the EATR based on Devereux and Griffith (2003)'s methodology. In this section, I first discuss how the effects of tax on investment incentives are typically measured before illustrating the EATR computation framework.

3.1 How to measure the effects of tax on investment incentives

There is quite a large literature on how to measure the effect of taxes on incentives to invest. It is, however, important to distinguish between backward- and forward-looking tax measures. Both are useful but they are suitable for different objectives.

The backward-looking tax measures such as average tax rates are typically calculated using observed tax payments and scaling it with a measure of profit. They are simple and can capture many complexities of the tax code. They are also very good measures for distributional analysis of tax burden. However, the major drawback associated with the backward-looking measures is the fact that they do not reflect the effect on the incentives. Indeed, the tax liabilities of a firm at any point in time reflects the history of its investment up to that point through deductions of depreciation and losses carry-forward. This can induce endogeneity bias into regressions. For example, a period of high investment is likely to generate high depreciation allowances. This will lower the taxes paid and creates reverse causality in the regression.

On the other hand, the forward-looking tax measures such as effective tax rates are calculated for a hypothetical investment and can be computed for any well-defined investment project. They typically take into account all present and future values of cash flows associated with the project. Consequently, they are generally preferred measures when looking into the impact on incentives. The main drawback is that they are computed for a specific type of investment financed in a specific way. This makes it difficult to capture impacts when investment across projects is aggregated. Here I focus on the forward-looking effective tax rate approach.

3.2 Computation of the EATR

The computation of effective tax rates in the study is based on a methodology, which was originally developed by King and Fullerton (1984) and Devereux and Griffith (2003), and later modified by Klemm (2012). It considers a profit-maximizing behavior of a firm with risk-neutral shareholders. For simplicity, the analysis here assumes 1) no capital income at the personal income tax level and 2) equity finance is adopted to finance the investment.

Suppose a firm invests in period t and hence increases its capital stock by one unit. The resulting capital stock is assumed to be slowly disinvested over time through depreciation. The cost of the investment is assumed to be one unit. The net present value (NPV) of the investment can be calculated as:

$$R_t = dV_t = \sum_{j=0}^{\infty} \frac{dD_{t+j}}{(1+i)^j} \quad (1)$$

where R_t is the net present value to the shareholder of the investment, V_t is the equity value of the firm, D_t is the dividend paid by the firm, and i is the discount rate. Note that, abstracting from risk, the discount rate equals the nominal interest rate: $(1 + i) = (1 + r)(1 + \pi)$, where r = real interest rate and π = inflation rate.

The allocation of funds remaining from the investment can depend on the way in which the project was financed. If the project was financed by retained earnings, the analysis assumes that all remaining funds are returned to shareholders in the form of dividend payment. If the project was financed by new equity, it assumes that the firm repurchases its shares using the same amount of money and leaves the total number of outstanding shares unaffected. In the absence of personal taxation, both types of equity financing yield the same return.

The dividend paid is, in turn, determined by the firm's flow of funds equation. In absence of taxes, this can be written as:

$$D_t = F(K_{t-1}) - I_t, \quad (2)$$

where K_{t-1} is the capital stock, I_t is the investment undertaken, and $F(K_{t-1})$ is output of the investment. Furthermore the additional unit of capital stock is assumed to generate $F'(K_{t-1}) = p + \delta$, where p = the real rate of return on the investment and δ is the economic depreciation rate.

The pre-tax NPV of the investment (R_t^*) is:

$$R_t^* = -1 + \frac{(1 + \pi)(p + \delta)}{(1 + i)} \sum_{j=0}^{\infty} \left(\frac{(1 + \pi)(1 - \delta)}{(1 + i)} \right)^j = \frac{p - r}{r + \delta} \quad (3)$$

In the presence of taxes, the computation is a little more complicated. The dividend in equation (2) becomes:

$$D_t = (1 - \tau)F(K_{t-1}) - I_t + \tau\phi(I_t + K_{t-1}^T), \quad (4)$$

where τ denotes the statutory corporate income tax rate, and ϕ denotes the depreciation tax allowance rate, and K_{t-1}^T is the capital stock for tax purposes. Note that, for tax purposes, the capital stock is assumed to evolve according to $K_t^T = (1 - \varphi)K_{t-1}^T + I_t$. The post-tax NPV(R_t) can then be written as

$$R_t = \frac{(p + \delta)(1 - \tau)}{r + \delta} - 1 + A, \quad (5)$$

where $A \equiv \tau\phi \sum_{j=0}^{\infty} \frac{dI_{t+j} + K_{t+j-1}^T}{(1+i)^j}$ denotes the present value of the depreciation allowances.⁵

Now consider the three terms on the right hand side of equation (5). The first term represents the present value of the investment returns. The second term represents the present value of the cost of investment which equals 1. The final term represents the present value of the depreciation allowances and its value depends on the depreciation method chosen. For declining balance method, A becomes

$$A = \tau\phi \sum_{j=0}^{\infty} \left(\frac{1-\phi}{1+i} \right)^j = \frac{\tau\phi(1+i)}{\phi+i}. \quad (6)$$

If the allowance is instead given at the same rate in subsequent periods on a straight line basis until the whole cost of the investment had been allowed, then the allowance will be given for T periods where $T = \frac{1}{\phi}$. A then becomes

$$A = \tau\phi \sum_{j=0}^{T-1} \left(\frac{1}{1+i} \right)^j. \quad (7)$$

The effective average tax rate (EATR) is computed as the present value of the corporate income paid (the difference between the pre-tax and post-tax values of the investment) divided by the net present value of the income stream in the absence of tax. That is,

$$EATR = \frac{R^* - R}{p \sum_{j=1}^{\infty} \frac{(1-\delta)^{j-1}}{(1+r)^j}} = \frac{R^* - R}{p/(r+\delta)}. \quad (8)$$

The analysis so far assumes that the statutory tax rate (τ) remains constant throughout. It is possible to allow for time-varying tax rates (τ_j). The tax holiday scheme adopted by many developing countries is the case where

⁵ Note that the analysis implicitly assumes that the firm has sufficient taxable profit to absorb this allowance.

there is a period of Y years at the beginning of the investment project during which the statutory tax rates (τ_j) are set to zero.

With the tax holiday of Y years, Klemm (2012) has shown that the post-tax NPV of equation 5 becomes:

$$R_t = \frac{(p + \delta)}{(r + \delta)} \left[1 - \tau \left(\frac{1 - \delta}{1 + r} \right)^Y \right] - 1 + A \quad (9)$$

where $A = \tau\phi \left(\frac{1 + \iota}{i + \phi} \right) \left(\frac{1 - \phi}{1 + i} \right)^{Y+1}$ for declining balance method and

$$A = \begin{cases} \frac{\tau\phi(1+i)}{i} \left[\left(\frac{1}{1+i} \right)^{Y+1} - \left(\frac{1}{1+i} \right)^{1/\varphi} \right] & \text{if } Y < \frac{1}{\phi} - 1 \\ 0 & \text{otherwise} \end{cases} \quad \text{for straight-line method.}$$

Incorporating special incentive schemes employed by ASEAN4 into this framework is relatively straightforward. My analysis has taken into account the following schemes: tax rate reduction after holiday expiration (all countries), tax holiday with cap on the tax exemption (Thailand), accelerated depreciation⁶ (Malaysia), and investment tax allowance (Malaysia). Detailed discussion on this is available in the appendix.

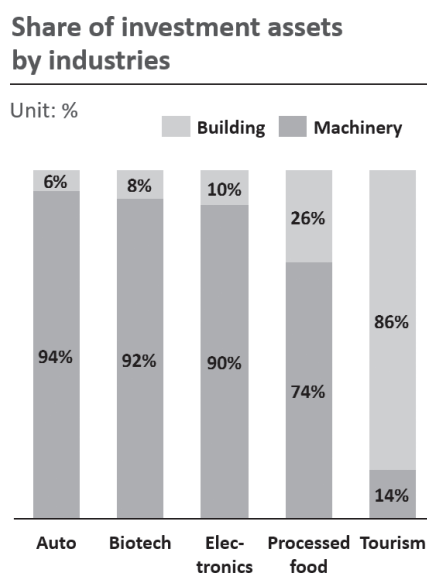
The computation of EATR is necessarily based on a few parameter assumptions. I assume the real interest rate of 5% and the headline inflation of 2%. Those two parameters are based on Thailand's average values of headline inflation and minimum lending rate of over the period of 2011-2015.⁷ To be consistent with previous studies, e.g. Devereux and Griffith (2003), Suzuki (2014) and Wiedemann and Finke (2015), I assume that the investment yields the profit rate of 20%. Also, following Suzuki (2014), economic

⁶ Accelerated depreciation is a depreciation method that allows greater depreciation rate in the earlier years of the life of an investment asset than the rate under the traditional straight-line method. This results in higher present value of the total depreciation allowance and lower present value of tax liabilities.

⁷ According to the Bank of Thailand, the average headline inflation from 2011 to 2015 is 2.0%, while the average minimum lending rate of all commercial banks over the same period is 6.9%. The real interest rate is based on the difference between the minimum lending rate and the headline inflation rate.

depreciation rates are assumed to be 12.25% for machines and 3.6% for building. Finally, I calibrate the shares of investment assets employed by each industry using the Office of National Economics and Social Development Board's Input-Output Table of Thailand (2010). As expected, automobile, biotech and electronics are heavily machinery-intensive, whereas tourism puts more emphasis on structures (see Figure 2).

Figure 2. Share of Investment Assets by Industries



Source: National Economics and Social Development Board

4. EATR Estimation and Implications

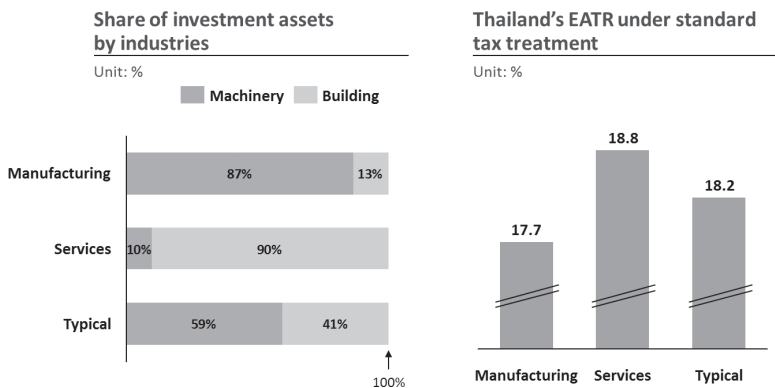
In this section, I first examine how each country fares under the standard tax treatment. I then show how preferential tax regimes have lowered effective average tax rates for the focused industries. Finally, I investigate the incentive redundancy of the current incentive system.

4.1 Standard Tax Treatment

An investment project typically requires a combination of investment assets. The mix of investment assets varies across industries and it also affects

the incentives. For example, producing Solid State Drive (SSD) would emphasize investment in machinery, whereas launching a hotel would require relatively more structures. The tax code allows relatively higher rate of depreciation allowance for machinery investment. That explains why the EATR for manufacturing is 17.7%, about a percentage point lower than services (see Figure 3). The EATR for a typical (or average) investment is 18.2%.

Figure 3. How the standard tax treatment affects investment incentives across industries (Thailand, 2016)







Source: National Economics and Social Development Board and author's estimates

Comparing the EATR on typical investment with the other ASEAN4 countries (see Figure 4), I find that Thailand's standard tax treatment currently appears to be the most competitive among the ASEAN5 nations (Figure 5). Combining Thailand's statutory tax rate of 20% to the very generous depreciation allowance results in the EATR being slightly above 18%. This is significantly below the average EATR for ASEAN4 of 20.9%. Interestingly, Vietnam has the same statutory tax rate as Thailand but its depreciation allowance rate on machinery is about half of Thailand. That results in its EATR being over 19%.

The impact of the depreciation allowance on the EATR is similar to what is observed by Botman et al. (2010) and Wiedemann and Finke (2015). In those studies, the differences between the statutory tax rate and the EATR under the standard tax are around 1-2 percentage points in all countries.

Figure 4. Overview of Standard Tax Treatments across ASEAN4

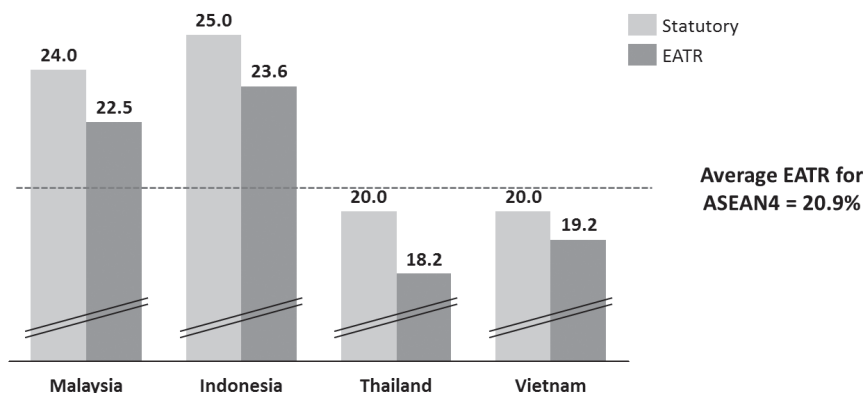
	 Indonesia	 Malaysia	 Thailand	 Vietnam
Statutory Rate	• 25%	• 24%	• 20%	• 20%
Depreciation Allowance	• Building: 5% • Machine: 12.5%	• Building: 3% • Machine: 14%	• Building: 5% • Machine: 20%	• Building: 5% • Machine: 10%
Remarks	• N/A	• Recently cut the tax rate from 25% (2015) • Accelerated depreciation for 1 st year: 10% building, 20% machine	• Temporary incentive for 2016: double the depreciation allowance rates	• Recently imposed a series of cuts: 22% (2015) and 25% (2014)

Source: PWC, Deloitte and national tax authorities

Figure 5. EATR under the standard tax treatment across ASEAN4 (2016)

EATR under standard tax treatment across ASEAN4 (2016; Typical Investment)

Unit: %

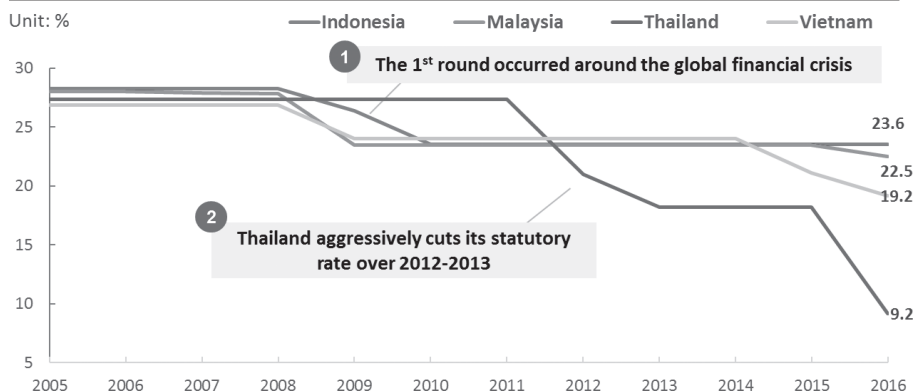


Source: Author's estimates

Looking back over the past decade puts Thailand's recent tax cut into perspective (Figure 6). The tax development in the region is characterized by rounds of tax cuts. The first round appears to occur around the global financial crisis in 2008. All countries except Thailand has cut their statutory tax rates. Three years later, Thailand has aggressively cut its statutory tax rate from 30 to 20%. This delayed response from Thailand has potentially triggered another round of 'race to the bottom'. Vietnam and Malaysia have already resumed cutting their tax rates. This development of EATR supports the finding of tax competition over investment tax incentives by Abbas and Klemm (2013).

Figure 6. Development of EATR under the standard tax treatment across ASEAN5

EATR under standard tax treatment across ASEAN4 (2005-2016)



Source: Author's estimates

4.2 Preferential Tax Regimes

The standard tax treatment alone does not give complete picture about the region's tax landscape. All ASEAN4 countries offer tax-holiday type of incentives. They vary on the number of years. Several countries modify the tax holiday incentives. Thailand, for example, imposes the limit on the amount of tax exemption during the holiday (exemption cap). Malaysia interestingly gives 2 options: 1) tax holiday and 2) investment tax allowance (ITA) which works by granting an allowance in percent of total investment cost. This allowance can be set-off against a certain percent of the pre-tax income each

year until fully utilized. The ITA is given on top of the standard depreciation. The incentive scheme in Vietnam consists of basic rate, preferential basic rate and temporary reductions. This results in a tax system with effectively four tax rates over the investment horizon.

This study considers the 5 focused industries (auto, biotech, electronics, processed food, and tourism) and assigns maximum incentives to each of them.⁸ For Thailand, all industries except biotech receive the tax holiday of 8 years with the exemption cap plus the extra 5 years of 50% tax rate reduction (see Figure 7). Biotech is the only industry that is not capped by the tax exemption limit. This reflects the emphasis of the government on that particular industry. It is also important to note that those tax incentives are available to both domestic and foreign investors. Figures 8 lists the maximum tax incentives by industries for the other ASEAN4 countries.

Figure 7. Thailand's Maximum Incentives across Focused Industries

	<u>Examples of Qualified Activities</u>	<u>Max Incentives</u>
Auto	<ul style="list-style-type: none"> High-tech auto parts, ABS, tires Decentralization merit, SEZ 	<ul style="list-style-type: none"> 8-year holiday (With cap) Extra 5 years of 50% rate reduction
Biotech	<ul style="list-style-type: none"> Biotech Activities Need to locate in approved scientific parks 	<ul style="list-style-type: none"> 8-year holiday (No cap) Extra 5 years of 50% rate reduction
Electronics	<ul style="list-style-type: none"> Electronics design Decentralization merit, SEZ 	<ul style="list-style-type: none"> 8-year holiday (With cap) Extra 5 years of 50% rate reduction
Processed Food	<ul style="list-style-type: none"> Medical food and food supplements Decentralization merit, SEZ 	<ul style="list-style-type: none"> 8-year holiday (With cap) Extra 5 years of 50% rate reduction
Tourism	<ul style="list-style-type: none"> Recreation park, Conference center, Racing car stadium Competitiveness, Decentralization merit, SEZ 	<ul style="list-style-type: none"> 8-year holiday (With cap) Extra 5 years of 50% rate reduction

Notes: ABS = Anti-lock Braking System, SEZ = Special Economic Zone

Source: Board of Investment (BOI)

⁸ These are the five industries that have been chosen by the Thai government as its short and medium term priorities (Sangsuphan, 2015).

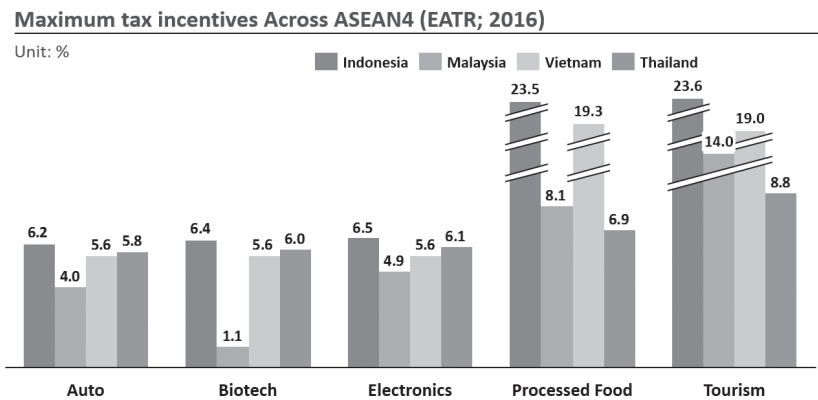
Figure 8. Maximum tax incentives by industries across ASEAN4

	Examples of Qualified Activities	Max Incentives
Auto	<ul style="list-style-type: none">• High-tech auto parts, ABS, tires• Decentralization merit, SEZ	<ul style="list-style-type: none">• 8-year holiday (With cap)• Extra 5 years of 50% rate reduction
Biotech	<ul style="list-style-type: none">• Biotech Activities• Need to locate in approved scientific parks	<ul style="list-style-type: none">• 8-year holiday (No cap)• Extra 5 years of 50% rate reduction
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Tourism	<ul style="list-style-type: none">• Recreation park, Conference center, Racing car stadium• Competitiveness, Decentralization merit, SEZ	<ul style="list-style-type: none">• 8-year holiday (With cap)• Extra 5 years of 50% rate reduction

Source: PWC, Deloitte and national tax authorities

Under the maximum tax incentives, Thailand’s EATRs are significantly lower than that under the standard treatment. They range from around 6-9% depending on the investment intensity (see Figure 9). The first four industries are relatively intense in machinery and their EATRs are around 6-7%. Tourism, on the other hand, puts more emphasis on structures and its EATR is around 9%.

Figure 9. EATR under maximum incentives across ASEAN4 (2016)



Source: Author’s estimates

Thailand's maximum incentives are broadly comparable to ASEAN peers in most sectors (see Figure 9). Its EATRs for all sectors except biotech are the lowest or within 1-2 percentage point from the country with most attractive incentive. One exception is Biotech where Malaysia has been putting a strong emphasis on. Its EATR is 5 percentage point lower than Thailand's. This suggests that, with the exception of targeted incentives for the biotech industry, the government should refrain from throwing any more tax or monetary incentives and focus on fixing structural shortcomings.

Comparing these findings with those obtained by the previous studies is a little difficult. This is because this study takes industry-specific lens, whereas the previous studies have looked at broad types of sectors such as manufacturing or high-tech industry. Nevertheless, they are generally in line with the previous studies. For example, Wiedemann and Finke (2015) finds that Thailand's EATR under the maximum incentives is around 7-8%. As a comparison, this study finds that Thailand's EATRs under the maximum incentives range from 6% to 7% for automobile, biotech, electronics and processed food.

It is important to note that although it is possible that a small number of firms may qualify or be willing to fulfill the requirements needed for the maximum tax incentives, this set of EATRs is useful for comparing the generosity of the maximum incentives across ASEAN4.

4.3 Redundancy Examination

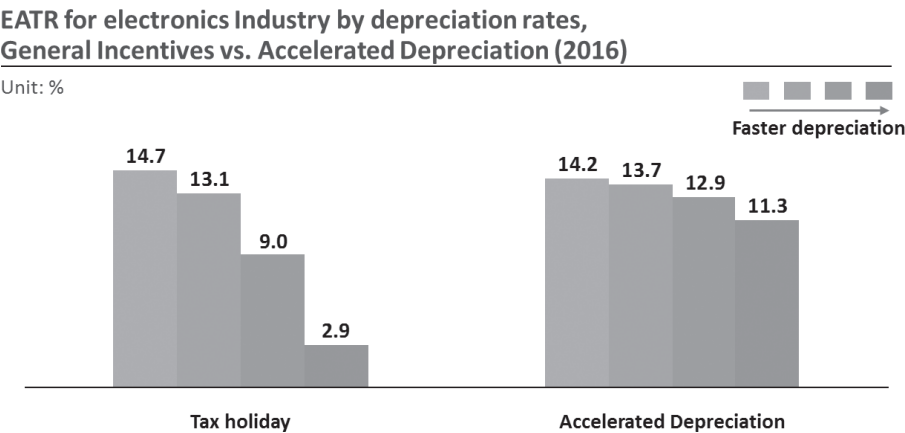
In addition to maintaining sufficiently attractive tax incentives, policymaker has to minimize the foregone revenue. One way to achieve that is to avoid potential redundancy in the incentive scheme. Here I investigate two questions. First, are the tax incentives more attractive for investing in short-lived assets? If that is true, then we may simply be drawing companies that tend to be foot-loose. Second, are the tax incentives more attractive for highly profitable firms? If that is the case, it is possible that they have invested even without the tax incentives offered.

In each question, I compare the resulting EATRs under the current tax holiday system to the alternative incentive system which involves accelerated

depreciation and investment tax allowance (ITA). The accelerated depreciation scheme increases the depreciation rates during the first year of investment to 40% and 10% for machinery and building, respectively. The ITA proposed here is similar to the scheme employed by Malaysia. With the ITA, an investor can deduct 60% of the investment cost against 70% of pre-tax income each year until fully utilized. One advantage of the alternative system over the tax holiday is that it avoids providing tax planning opportunities for investors who may try to shift taxable income earned by associated firms into the tax-holiday firm.

With the tax holiday, the EATR declines significantly as economic depreciation rates increase (see Figure 10). It will be almost zero for an investment in which all assets completely depreciate just before the end of the holiday. In contrast, under the accelerated depreciation scheme, the EATRs do not decline as much when economic depreciation rates increase. This illustrates how the tax holiday tends to favor foot-loose industries. Consequently, if the goal is to attract long-lasting assets, the accelerated depreciation may be a better policy option.

Figure 10. EATR for electronics industry by economic depreciation rates,



Notes: Economic depreciation rates for machinery are 6.3%, 12.5%, 25% and 50%, while the rates for buildings are 1.8%, 3.6%, 7.2% and 14.4%.

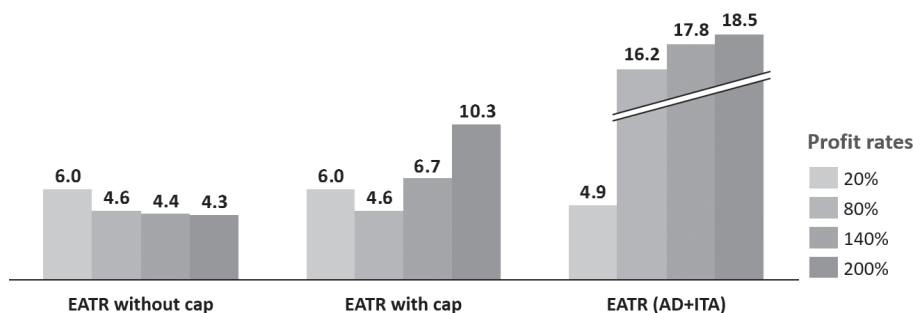
Source: Author’s estimates

Another finding is that, under the tax holiday, the effective tax rates become significantly lower for firms with higher profits (see Figure 11). This possibly signals redundancy in the current incentive system. Incentives may be offered to firms that would have invested without them. Therefore, making the incentives well-targeted is very important when handing out the tax holiday without the tax exemption cap. With the cap, the effective tax rates are significantly higher for very profitable firms. Using the same Biotech example, the tax exemption cap starts kicking in at the profit rate of 140% and significantly raises the EATR for firms with very large profits. This supports BOI's practice in putting the tax exemption cap on the tax holiday given to most activities.

Figure 11. EATRs under maximum incentives for biotech industry by incentive instruments

Maximum incentives given to biotech industry (EATR by profit level)

Unit: %



Notes: 1) Profit rates range from 20% to 200% to illustrate how EATRs would change for firms with higher profit levels. 2) AD = Accelerated depreciation, ITA = Investment tax allowance.

Source: Author's estimates

In addition to the tax exemption cap, a combination of accelerated depreciation and investment tax allowance can help minimize the incentive redundancy. As shown in Figure 11, for firms with moderate profit, the combination of accelerated depreciation and investment tax credit generates EATRs comparable to those under the tax holiday. On the other hand, for highly profitable firm, the combination generates substantially higher tax rates.

4.4 Limitations

The framework here provides a helpful way to summarize the effects of tax policy on investment incentives. However, it is important to note its limitations. First it considers only taxation at the domestic corporate level and does not take into account personal and international taxations. Since the analysis focuses essentially on the small open economy context, it is possible that the marginal providers of funds are foreign firms or individuals and their tax treatments may differ from that of domestic investors. In order to evaluate the country's industry-specific tax competitiveness, it would therefore be sensible to abstract from capital income taxes at the personal income level. Future studies focusing on investment decisions associated with particular home countries could take a look at the international taxation aspect.

Second this study assumes equity financing. Debt-financing is likely to yield lower EATR because of the ability to deduct interest expenses in all countries. It is, however, unlikely to materially impact the competitiveness evaluation.

5. Conclusion

This study evaluates the impact of taxation on the location choice incentives using the EATR measure. It assumes the perspective of a firm adopting equity finance and takes into account tax provisions under both standard and preferential tax treatments. The results indicate that, from the taxation perspective, Thailand is an attractive destination for international capital. With the exception of the Biotech industry, its EATRs under the maximum incentives are lowest or within 1-2 percentage point of the most competitive country. Another important finding concerns the choice of tax instruments employed under the preferential tax treatment. It finds that the tax holiday tends to favor foot-loose companies as well as those with large profit. This finding supports BOI's practice in imposing the tax exemption cap on most activities. It also suggests that policymakers should also consider the scheme involving accelerated depreciation and investment tax allowance. Those two instruments are likely to outperform the tax holiday in term of avoiding the potential redundancy.

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Appendix: Incorporating special incentive schemes employed by ASEAN4 into the EATR framework

The analysis in this study has taken into account the following schemes: tax rate reduction after holiday expiration (all countries), tax holiday with cap on the tax exemption (Thailand), accelerated depreciation (Malaysia), and investment tax allowance (Malaysia).

Tax holiday with subsequent tax rate reduction

All ASEAN4 countries have allowed tax rate reduction for a certain period after the tax holiday period ends. With such scheme, the post-tax NPV becomes

$$R_t = \frac{p + \delta}{r + \delta} \left\{ 1 - \alpha \tau \left(\frac{1 - \delta}{1 + r} \right)^Y \left[1 - \left(\frac{1 - \delta}{1 + r} \right)^Z \right] - \tau \left(\frac{1 - \delta}{1 + r} \right)^{Y+Z} \right\} - 1 + A \quad (A1)$$

where α denotes the tax rate reduction in percent and A is defined as:

$$A = \phi \alpha \tau \sum_{j=Y+1}^{Y+Z} \left(\frac{1 - \phi}{1 + i} \right)^j + \tau \phi \left(\frac{1 + \iota}{i + \phi} \right) \left(\frac{1 - \phi}{1 + i} \right)^{Y+Z+1}$$

for declining balance method and

$$A = \begin{cases} 0 & \text{if } \frac{i}{\phi} - 1 \leq Y \\ \alpha \tau \phi \left(\frac{1 + i}{i} \right) \left[\left(\frac{1}{1 + i} \right)^{Y+1} - \left(\frac{1}{1 + i} \right)^{1/\phi} \right] & \text{if } Y < \frac{i}{\phi} - 1 \leq Y + Z \\ \tau \phi \left(\frac{1 + i}{i} \right) \left[\left(\frac{1}{1 + i} \right)^{Y+Z+1} - \left(\frac{1}{1 + i} \right)^{1/\phi} \right] & \text{if } Y + Z < \frac{i}{\phi} - 1 \end{cases}$$

for straight-line method.

Tax holiday with cap on the amount of tax exemption

For most activities, Thailand has limited the tax exemption during the tax holiday period up to 100% of the investment cost. The analysis has incorporated that provision by computing the exempted tax as the difference

between the after-tax return with the tax holiday and the after-tax return without the tax holiday. If the exempted tax is above the limit, the portion of the exempted tax over the limit (C) is then subtracted from the after-tax return with the tax holiday. That is, $EATR = \frac{R^* - R + C}{p/(r + \delta)}$.

Accelerated depreciation

Malaysia has allowed a higher depreciation allowance rate during the first year of investment. The analysis has incorporated that provision by computing the increase in the present value of total depreciation allowance associated with accelerated depreciation and add that to the present value of total depreciation allowance associated with normal treatment.

Investment tax allowance

Malaysia has given an investor an investment tax allowance (ITA) option. The ITA works by granting an allowance of a certain percent of total investment cost incurred within 5 years. This allowance is to be set off against up to a certain percent of the pre-tax income every year until fully utilized. The analysis has incorporated that provision by computing the present value of the investment tax allowance and add it to the after-tax return associated with the standard tax treatment.