Five Years of Thailand's Special Economic Development Zones: A failure to create development?

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Abstract

This study examines Thailand's establishment of SEZs in ten border provinces since 2015. The analysis is based on a panel data set covering 77 provinces over the period 2012-2020. It is found that Thailand's SEZs have not attracted significant levels of foreign investment into the country. Using a system GMM estimator, Thailand's SEZs have negative impacts on real gross provincial product and poverty reduction. This negative and significant outcomes highlight the lack of a favorable investment environment in the zones. I discuss some limitations in the Thai SEZ policy that may underlie its ineffectiveness.

Keywords: Special economic zone, foreign investment, Thailand
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1. Introduction

The past few decades have witnessed a massive proliferation of special economic zones (SEZs), especially in Asia and Africa.[2] The number of SEZs has increased from less than 100 in 1975 to more than 5,000 SEZs today, more than 1,000 of which were established in the last five years (UNCTAD, 2019). Yet, little has known about the impacts of SEZs on the economy.

In this era of economic globalization, SEZs can serve as an important tool to several developing countries to integrate into the world economy, thanks to a favorable investment environment and upgraded infrastructure in the zones (Ge, 1999; Gleason, Lee, & Mathur, 2002; Aggarwal, 2007; Bontempi & Prodi, 2009; Zeng, 2015; Warr and Menon, 2016). The benefits of SEZs also lie in export growth and (direct and indirect) employment creation (Farole and Akinci, 2011; Zheng, 2021). However, SEZs have been criticized for negative impacts on society and environment (Liu et al., 2007; FIAS, 2008; Parwez and Sen, 2016). Labor standards and poor employment conditions are also of concern (Ngai, 2004; Cross, 2009; ILO, 2017). Several factors (e.g., types and size of SEZs, business environment, and the incentives for local politicians) are found to play a crucial role in determining the success of SEZs (Farole, 2011; Zeng, 2015; Alkon, 2018; Frick et al., 2019). Overall, the literature contains mixed results on the impacts of SEZs on the economy.

The purpose of this paper is to examine the relative effects of the SEZs on real gross provincial product (GPP) and province-level poverty, using Thailand as a case study. Thailand provinces an excellent case study on this subject, given the recent establishment of special economic zones in 2015, and the availability of data covering a period of sufficient length for empirical analysis. The analysis is based on the Thai province-level panel data over the period 2012-2020. The estimation results from a system GMM estimator show that real output per capita in the SEZs grew at a slower rate than those outside the SEZs. The conclusions remain robust after various types of robustness checks. I also find that SEZs have a negative and significant impact on poverty reduction, suggesting a lower quality of life of people living in the zones after the establishment of SEZs. In addition, SEZs have not attracted significant levels of foreign investment into the zones and have not created significant jobs. I argue that the underlying reason for this result is possibly due to the feature of Thailand's SEZs that is not in line with country's stage of economic development.

The most important contribution of this paper is that I try to provide empirical evidence that the recent estabilishment of Thailand's special economic zones is not likely to provide a vehicle for attracting the labor-intensive tasks of fragmented production processes to the country. This is because SEZs seem to attract capital-intensive goods and high value-added activities. In addition, a large literature has examined the impact of SEZs by employing descriptive analyses and case studies of selected SEZs in Thailand (Thamwicha and Chaiprasit, 2017; Fongissara, 2019; Tangtipongkul et al., 2021). To the best of my knowledge, this paper is the first to study the relative impacts of Thailand's SEZs on provinces declared as special economic zones using empirical analysis.

The paper is structured as follows. Section 2 describes the establishment of SEZs in Thailand. In section 3, I outline the methodology. Section 4 reports the results. The last section summarizes the key findings and discusses future research.

[2] Special Economic Zone (SEZ) is commonly referred to a specialized export platform institution designed to physically, financially, and administratively encourage exporters to compete in the world market. Industrial activities are facilitated through fiscal and regulatory incentives and infrastructure support. SEZs are also known as Free Trade Zones (FTZs) or Export Processing Zones (EPZs).

2. Special Economic Zones in Thailand

Thailand adopted a special economic zone programme in 2015 to establish ten special economic zones along the border regions of the country, listed in Table 1. The legal framework for SEZs was issued by in 2015. SEZs are divided into two phases: the first phrase covering the provinces of Tak, Mukdahan, Sakaeo, Trat, and Songkhla started in 2015 and the second phrase covering the provinces of Chiang Rai, Nong Khai, Nakhon Phanom, Kanchanaburi, and Narathiwat started in 2016. SEZs have a total area of 6,221 square kilometers. The largest special economic zone in terms of total area is the Chiang Rai SEZ, followed by the Tak SEZ and the Nakhon Phanom SEZ.

The available data reveal that 65 projects in 10 SEZs have been approved by the Board of Investment (BOI), with a total investment amount of about 13,000 million baht. Of 65 projects, 27 of which invested in the Tak SEZ. The Tak SEZ also has the highest number of new business registration between 2015 and 2022. The Songkhla SEZ is also able to attract few large projects, despite lower level of new business registration. However, there are many special economic zones that have not been able to attract investors such as Nakhon Phanom, Trat, and Narathiwat.

The purpose in establishing SEZs is to create prosperity in border areas and to improve the quality of life of people living in the zones, and to address security problems (NESDC, 2022). The zones are also created to serve as a gateway connecting with the neighboring countries. Thailand's SEZs are managed by the national committee n the development of special economic zones. Stated-owned land and pilot development areas are designated for rental and development in all SEZs. Land rental rate and fee are different in each zone. The government also sets up a "one-stop service center" (OSS) in all SEZs to facilitate investors and workers.

A firm wishing to locate in SEZs must submit investment project application to the BOI. There are two cases for a firm to receive fiscal incentives: 1) 13 groups of targeted activities designed by the National Committee on the Development of SEZ, and 2) general activities under the BOI announcement No. 2/2557. As shown in Table 2, businesses in the 13 targeted industries receive higher fiscal incentives from the BOI. In addition, each zone has different targeted activities depending on local competencies, limitation and demands (See Table A1 in the appendix). Besides these 13 targeted industries, additional targeted activities are, for example, construction materials, cosmetic products, paper, industrial plants, and animal feed.

Table 1 SEZs in Thailand

Phase	Zones	Regions	Areas (sq. km.)	Investment supported by the Board of Investment		Business Registration	
				Investment (million Baht)	Number of projects[a]	Register capital (million baht)	Number of new business registration[b]
Phase 1 (Started in 2015)	Tak	West	1,419	2,634	27	2,679	1,302
	Mukdahan	Southeast	579	392	3	1,446	762
	Sakaeo	East	332	1,881	6	331	154
	Trat	East	50	287	2	124	79
	Songkhla	South	552	4,686	11	1,134	346
Phrase 2 (Started in 2016)	Chiang Rai	North	1,524	136	5	1,962	1,210
	Nong Khai	Southeast	474	1,990	4	1,597	911
	Nakhon Phanom	Southeast	795	15	1	1,015	546
	Kanchanaburi	West	261	727	4	193	114
	Narathiwat	South	235	152	2	361	212
Total			6,221	12,900	65	10,842	5,636

Source: NESDC (2022)

Note: a The number of projects that have been approved for investment promotion from the Board of Investment and have started investment between 2015 and 2022.
b Total number of companies registered for business establishment in 10 SEZs between 2015 and 2022.

Table 2 The Investment Promotion Measures under BOI's List of Eligible Activities

General activities under the BOI's list of eligible activities	Targeted Activities (13 Industrial Sectors)
3 years exemption of corporate income tax (can be extended but not greater than 8 years)	8 years exemption of corporate income tax
Additional 50% reduction in corporate income tax for 5 years for investment projects listed in A1/A2 categories.	50 percent reduction of corporate for 5 years
- Double deduction from transportation cost, electricity and water bill - 25% deduction of infrastructure installation /construction costs from the project capital (in addition to the reduction for depreciation expenses) - Exemption of import duties on machinery, raw or essential materials for exporting products - Permission to employ unskilled foreign worker - Other non-tax incentives (i.e., land ownership and permission to employ skilled foreign exports)	Same as general activities

Source: Board of Investment (2022)

Note: Projects listed in A1 are knowledge-based activities which an emphasis to R&D (e.g., industrial zones or industrial estates, biotechnology, and electronic design). Projects listed in A2 are activities in infrastructure for the country's development, activities using advanced technology to create value-added.

There is investment expenditure required to build SEZs. This includes construction and running cost (operating cost). From 2015 to 2021, total budget for the SEZs is 49,601.20 million baht (See Tables A2 and A3 in the Appendix). These costs are mostly for infrastructure and transportation construction and customs, immigration, and quarantine (C. I. Q.).

The SEZs are still relatively small in terms of investment, compared with total investment outside the zones. Table 3 reports the number of applications submitted to the BOI for the special incentive scheme for the SEZs between 2015 and 2019. This figure indicates whether the SEZs can attract both foreign and Thai investors. During this period, the number of applications for the SEZs accounted for less than one percent of total applications. The data from the BOI reveal that the Eastern Economic Corridor, an area-based development initiative located in three provinces in eastern Thailand, attracted investment applications worth a combined 220 billion baht, accounting for about 40% of the total value of investment applications submitted to the BOI.

Table 4 shows the number of applications approved by the BOI for SEZs. Again, the share of the approved applications for the SEZs is small, compared with the applications for the special incentives available outside the SEZs. In conclusion, SEZs have not attracted significant levels of investment into the zones. In the section, I present the model used to formally investigate the effects of SEZs on the economy.

Table 3 Number of applications submitted to the BOI for the SEZs

Year	Applications submitted for the SEZs		Total applications	Total investment (Billion Baht)
	No. of project	Total investment (Billion Baht)		
2015	7	0.36	983	197.58
	(0.71)	(0.18)		
2016	32	7.97	1,455	524.34
	(2.20)	(1.52)		
2017	8	0.36	1,547	610.51
	(0.52)	(0.06)		
2018	8	0.8	1,490	483.81
	(0.54)	(0.17)		
2019	10	2.35	1,523	691.39
	(0.66)	(0.34)		
2020	17	12.34	1,717	481.15
	(0.99)	(2.56)		

Source: Office of the Board of Investment (2022)

Notes: The percentage of the application under SEZs to total applications is in parenthesis.

Table 4 Number of applications approved by the BOI for the SEZs

Year	Approved application		Total project	Total investment (Billion Baht)
	No. of project	Total investment (Billion Baht)		
2015	6	0.28	2,237	809.38
	(0.27)	(0.03)		
2016	26	5.51	1,688	861.34
	(1.54)	(0.64)		
2017	15	2.63	1,330	631.08
	(1.13)	(0.42)		
2018	8	0.65	1,470	549.5
	(0.54)	(0.12)		
2019	16	3.28	1,500	447.36
	(1.07)	(0.73)		
2020	20	12.86	1,501	361.41
	(1.33)	(3.56)		

Source: Office of the Board of Investment (2022)
Note: The percentage of the application under SEZs to total applications is in parenthesis.

3. Methodology

3.1 The model

The effects of the SEZs on developmental outcomes are estimated using a panel data set covering 77 provinces in Thailand, with data from 2012 to 2020. In this paper, I focus on two outcomes: real gross provincial product (GPP) per capita and poverty rate (POV).

The regression model takes the following form:

$$GPP_{it} = \alpha + \beta_1 SEZ_{it} + \beta_2 LABOR_{it} + \beta_3 BOI_{it} + \beta_4 MFG_{it} + \beta_5 SER_i + \beta_5 IGPP_i + \mu_i + v_t + \varepsilon_{it} \quad (1)$$

where GPP is real progress provincial product per capita (in log form), the subscripts i and t refer to province and year, respectively. The explanatory variables are listed below, with the postulated sign of the regression coefficient for the explanatory variables in parentheses.

SEZ $(+ \text{ or } -)$	Special Economic Zones dummy variable
$LABOR$ $(+)$	Number of workforce (in log form)
BOI $(+)$	Value of investment projects approved by BOI
MFG $(+)$	Manufacturing output as share of a province's output
SER $(+)$	Services as share of a province's output
$IGPP$ $(+ \text{ or } -)$	Initial gross provincial product
α	A constant term
μ	Province fixed effects
v	Year fixed effects
ε	An error term

The key explanatory variable of interest is the special economic zones (SEZ). Ten border provinces are developed as special economic zones to stimulate Thailand's border trade and promote economic growth to border areas. However, these ten border provinces may not attract significant level of investment due to their locations, small incentives, and targeted industries that are not in line with country's current stage of economic development. The expected sign of the coefficient on SEZ is thus ambiguous. Labor ($LABOR$) is included to capture the effect of workforce on provincial output. As suggested by the standard production function, the expected sign of the coefficient on $LABOR$ is positive. Value of investment projects approved by the Board of Investment (BOI) is included to investigate whether investment in this scheme can stimulate economic activity in a province. Therefore, the expected sign of the coefficient on BOI is positive.

The share of manufacturing output to provincial output (MFG) is included to test whether a province with higher manufacturing share has higher rate of economic growth. Since Thailand's comparative advantage lies in manufacturing sector, the expected sign of the coefficient on MFG is positive. The share of services to provincial output (SER) is also included to examine its impact on real output. The expected sign of the coefficient of this variable is positive. Initial gross provincial product ($IGPP$) is included to capture the impact of the initial level of economic advancement on economic performance, testing the convergence hypothesis of neoclassical growth models. A poor province tends to grow faster than a rich province. However, this prediction depends on

several factors such as human capital and infrastructure. The expected sign of the coefficient on $IGPP$ can be positive or negative. Province fixed effects (μ) are included to capture a large proportion of the cross-province differences in output, allowing us to focus on the determinants of within-province variations. Period dummies (ν) are included to control for time effects or common shocks (e.g., the COVID-19 pandemic) that may affect both output and other independent variables.

In this paper, I also investigate the effect of the SEZs on province-level poverty rates. The estimating equation used in the empirical analysis is:

$$POV_{it} = \alpha + \beta_1 SEZ_{it} + \beta_2 GPP_{it} + \beta_3 LABOR_{it} + \beta_4 BOI_{it} + \beta_5 MFG_{it} + \beta_6 SER + \beta_7 IGPP_i + \mu_i + \nu_t + \varepsilon_{it} \quad (2)$$

where POV is poverty rate (in log form). Equation (2) includes real gross provincial product as a control variable, following the standard poverty regression equation. The expected sign of the coefficient on GPP is negative.

3.2 Data

The model is estimated based on a panel data set covering 77 provinces between 2012 and 2020.

Gross provincial product (GPP) per capita is measured in real term (Chain volumes measures, reference year = 2002). The data are taken from the National Economic and Social Development Council (NESDC, 2022). The data on the labor force ($LABOR$) come from the National Statistical Office of Thailand (NSO), the Ministry of Digital Economy and Society (MDES). The data on investment projects approved by the Board of Investment (BOI) are obtained from the BOI. The number of total workers includes both formal and informal employment. The data on manufacturing output share (MFG), initial GPP ($IGPP$), and poverty rate (POV) are obtained from the NESDC. Table 5 presents the summary statistics.

Table 5 Summary statistics

Variable	Obs.	Mean	Std. Dev.	Min	Max
SEZ	693	0.08	0.27	0.00	1.00
Real GPP per capita (Baht)	693	100,625.00	98,462.62	26,329.50	547,218.30
Poverty rate	693	11.16	9.95	0.00	65.16
Workforce	693	497,829.80	583,024.20	106,473.70	5,287,679.00
Manufacturing output share	693	20.45	18.18	1.09	85.68
Services share	693	56.06	16.11	13.05	94.72
Value of investment approved by BOI (million Baht)	462	7,023.55	21,952.04	0.00	224,269.60

3.3 Estimation method

Equations 1 and 2 are estimated using the system GMM estimator. In order to address endogeneity issues in panel settings, the system GMM uses internal instruments which utilizes lags of regressors as instruments (Arellano and Bover, 1995; Blundell and Bond, 1998; Windmeijer, 2005). The key identifying assumption of this estimator is that the estimators have a first-order serial correlation but not a second-order serial correlation. In addition, there is no over-identified instrumentation. While the estimates are sensitive to lag length, the system GMM is more appropriate to estimate Equations 1 and 2 than other estimators (e.g., fixed-effect estimator and difference GMM) due to two reasons. First, time-invariant regressors can be included in system GMM. This regressor would disappear when estimating the model using the fixed-effect estimator. Second, exogenous features of the instruments for the SEZs are not available. It is therefore not possible to estimate the model using the instrument variable (IV) estimator. With these reasons, the system GMM seems most appropriate estimator for the subject at hand.

4. Results

Table 6 reports the effects of the SEZs on real gross provincial product per capita. According to column (1), the coefficients on the SEZs is negative and statistically significant at the 5% level. This implies that economic growth in ten SEZs provinces is lower than that in non-SEZ areas. As shown in Columns (2) to (4), the findings withstand controlling for other relevant explanatory variables. The estimate of the coefficient on the SEZs ranges from 2.4 to 2.9%. Note that the coefficients on other explanatory variables are not significantly different from zero, except services' share in output shown in columns (2) and (3).

Table 6 The effects of the SEZs on real gross provincial product per capita

Dependent variable: Real gross provincial product (log)				
	(1)	(2)	(3)	(4)
Special Economic Zones (SEZ)	-0.029**	-0.025*	-0.027*	-0.024*
	(0.013)	(0.014)	(0.015)	(0.014)
Labor force (LAB)	0.050	0.032	-0.072	0.050
	(0.039)	(0.046)	(0.098)	(0.050)
Investment (BOI)	-0.020	0.052	0.037	
	(0.182)	(0.179)	(0.166)	
Manufacturing output share (MFG)		0.001	0.000	-0.001
		(0.002)	(0.002)	(0.002)
Services share (SER)		0.002*	0.002**	0.001
		(0.001)	(0.001)	(0.001)
Initial GDP ($IGDP$)			0.090	
			(0.095)	
Number of firm ($FIRM$)				-0.000
				(0.000)
L.1 ln GPP	0.972***	0.937***	0.910***	0.988***
	(0.087)	(0.086)	(0.083)	(0.086)
L.2 Ln GPP	-0.019	0.029	-0.006	0.023
	(0.099)	(0.103)	(0.112)	(0.094)
Constant	-0.155	-0.177	0.880	-0.857
	(0.306)	(0.330)	(1.052)	(0.777)
Year dummy	Y	Y	Y	Y
Number of observations	462	462	462	462

Note: ***, **, * indicate the level of statistical significance at 1%, 5%, and 10%, respectively.

Table 7 reports the effects of the SEZs on province-level poverty rates. As shown in Column (1), the coefficient on the SEZs is positive and statistically significant at the 10% level. This suggests that poverty rate among 10 special economic zones is higher than that in other provinces. The results cast doubt on the objective of the SEZ development policy aimed to enhance the well-being and quality of life of people living in rural areas. Note however that the coefficient on the SEZs is positive but not statistically significant when using the number of firm ($FIRM$) instead of the number of BOI project (BOI).

Table 7 The effects of the SEZs on poverty

Dependent variable: Poverty rate (log)				
	(1)	(2)	(3)	(4)
Special Economic Zones (SEZ)	0.390*	0.423*	0.491**	0.320
	(0.219)	(0.219)	(0.223)	(0.207)
Labor force (LAB)	-0.577	-0.555	0.611	-0.346
	(0.548)	(0.636)	(1.223)	(0.402)
Investment (BOI)	0.717	0.628	0.387	
	(2.150)	(2.229)	(2.281)	
Real gross provincial product (ln) ($RGPP$)	-0.890***	-1.007***	-0.357	-1.108***
	(0.254)	(0.319)	(0.617)	(0.311)
Manufacturing output share (MFG)		0.002	0.018	0.014
		(0.017)	(0.018)	(0.016)

Table 7 The effects of the SEZs on poverty (continue)

Dependent variable: Poverty rate (log)				
	(1)	(2)	(3)	(4)
Services share (SER)		0.002	-0.004	0.007
		(0.010)	(0.011)	(0.010)
Initial GDP ($IGDP$)			-0.987	
			(0.732)	
Number of firm ($FIRM$)				0.000
				(0.000)
L.1 poverty rate (log)	-0.149	-0.162	-0.177	-0.042
	(0.141)	(0.135)	(0.126)	(0.138)
L.2 poverty rate (log)	0.125*	0.111	0.085	0.187***
	(0.069)	(0.070)	(0.082)	(0.065)
Constant	18.91*	19.68**	8.297	17.45***
	(7.993)	(8.338)	(13.55)	(6.473)
Year dummy	Y	Y	Y	Y
Number of observations	457	457	457	457

Note: ***, **, * indicate the level of statistical significance at 1%, 5%, and 10%, respectively.

In addition, the estimate of the coefficient on real gross provincial product per capita is significantly different from zero with the expected (positive sign), providing strong support for the standard economic growth-poverty reduction nexus. This indicates that the overall increase in economic output, not in particular activities under the SEZs, still plays a key role in reducing poverty.

5. Discussion

The findings from Tables 6 and 7 cast doubt on the effectiveness of Thailand's special economic zones located in 10 border areas in attracting significant level of investment, generating economic growth in the zones, and improving the overall standard living of people living in rural areas. In this section, I will first try to explain why SEZs in Thailand have not attracted investment and then proceed to discuss the role of SEZs within trade and development policy of Thailand.

5.1 Why did Thailand's SEZs have relatively low levels of investment?

First, as discussed by Warr and Menon (2016), there are four domestic factors that are most important for a firm to decide to invest in the SEZs: 1) labor costs, 2) labor relations, 3) reliability and cost of infrastructure, and 4) ease of importing and exporting without costly delays. Given Thailand's development strategy in which labor-intensive export-oriented industrialization has been implemented for decades, labor costs play a crucial role in attracting investors either inside or outside the SEZs. According to the ILO (2022), the statutory gross monthly minimum wage in Thailand is US$220, higher than most ASEAN member states. Monthly manufacturing wages, perhaps a good guide to those paid in the SEZs, have increased from 10,154 Baht in 2011 to 13,559 Baht in 2020. Wages in manufacturing sector grew at a faster than rate between 2012 and 2020 than in agriculture. While raising wage can be viewed as an outcome along the process of economic development, it suggests that the scope for expanding labor-intensive manufacturing in SEZs is small if productivity does not increase. Table A4 in the Appendix reports labor productivity in each manufacturing sector between 2016 and 2019. Several targeted industries for special incentives in SEZs saw a decline in labor productivity, for example, leather products, rubber and plastic products, medicine, motor vehicles and parts and textiles. The gems and jewelry industry and the medical device industry also posted a notable decline in labor productivity during this period. Therefore, increasing labor costs and declining labor productivity in targeted industries in SEZs have make investments in labor-intensive manufacturing less attractive. Educational investment is required to raise the productivity of the workforce, offsetting the costs of higher wages.

Second, special economic zone is created to reduce the costs of doing business, thereby attracting investment into the zone. Warr and Menon (2016) point out that ability to attract investment into the zone is not whether the SEZ programs make investment climate improvements over their domestic environments but whether the investment environment within the zone is more competitive than that in alternative international sites that are available to a firm looking to reduce the costs associated with poor domestic infrastructure, property rights, red tape, and trade restrictions. In addition to the SEZs in ten border provinces, Thailand's Eastern Economic Corridor

(EEC) was established in 2018. The EEC spans three provinces in eastern Thailand. This initiative is central to the strategy "Thailand 4.0" aimed at transforming the country into an innovative, value-based economy. Target industries are the S-curve and new S-curve industries: next-generation automotive, intelligent electronics, advanced agriculture and biotechnology, food for the future, high-value and medical tourism, automation and robotics, digital, avaiation and logistics, comprehensive healthcare, and biofuel and biochemical industries. While the SEZs and the EEC are not necessarily competing, some targeted activities in these two policy initiatives overlap such as agro-industry, electronics, and automation. Inability to attract significant levels of investment into the zones for the past five years suggest that the SEZs in ten border provinces do not offer more significant cost advantages compared to the EEC or other sites outside the SEZ.

5.2 The role of SEZs within the trade and development policy of Thailand

Thailand's special economic zone policy is an attempt of the Government of Thailand to pursue the so-called "industrial policy"—that is, a non-neutral inter-industry incentive covering a wide set of policy tools—to promote economic growth and innovation, aimed to transform the economy to high value-added, knowledge-based economies. This keen attempt can be seen from a series of policy initiatives such as the Thailand 4.0 policy and the EEC. However, this emphasis on targeted industries in SEZ seem to hark back to the era of import-substitution industrialization (ISI), under which domestic industry was promoted through trade protection and other measures.

The current promotion of targeted industries in 10 border provinces seems to be inconsistent with the objective of achieving economic development through an export-oriented development strategy. Over the past few decades, "global production sharing" (GPS)—cross-border dispersion of production processes within vertically integrated global industries—has been the defining chateractistics of Thailand's trade. This phenomenon is spurred by rapid advancement in production technology, reduction in communication and transportation cost, and trade liberalization reform. In addition, GPS is primarily driven by the 'market forces' not industrial policies or "picking the winner" strategy. In recent years, there has been a rapid increase in product coverage of global production sharing such as electronics, garments, automobiles, electrical machinery, and office equipment. These products are not necessarily lie within the targeted business activies in Thailand's SEZs. Additionally, investment incentives provided by the government do not necessarily increase the relative cost advantage of producing or assembling a given part, which is the essence of GPS, in the supply chain. Recent study by Jongwanich and Kohpaiboon (2020) found that, among several industrial policy tools, only lowering tariff protection and providing investment incentives throught the BOI generate positive and significant impacts on firm productivity. However, providing investment incentives can incur significant costs in terms of forgone government revenue. Inability to increase firm productivity could therefore be the reason why economic growth in 10 special economic zones did not increase signifnicaintly as expected.

6. Conclusion

This paper has examined Thailand's recent establishment of special economic zones in ten border provinces since 2015. It is found that SEZs have not attracted investment into the zones. The results from an econometric analysis reveal that real output per capita in the SEZs grew at a significant slower rate than non-SEZ areas. In addition, the effect of the SEZs on poverty reduction is negative, suggesting that people living in the zone experienced a decline in their quality of life.

The findings of this paper cast doubt on the key feature of Thailand's SEZs. The SEZs may not sufficiently create a more favorable investment environment compared with alternative international sites outside the SEZs. Policy makers should ensure that the SEZs in ten provinces offer higher significant cost advantages to firms in specific industries compared to non-SEZs area within Thailand including the EEC. Moreover, increasing manufacturing wages and relatively high minimum wage may discourage labor-intensive manufacturing to make a new investment in the zones, thereby failing to generate new employment. Investment in education and special training to workers can help increase labor productivity, thereby offsetting such increasing cost.

Future research may survey industrial firms located in the SEZs and compare their characteristics (e.g., size, productivity, and input source) with non-SEZ firms. This comparison will allow us to observe differences between them. To explain relatively low investment in SEZs, one could study multinational corporation's investment decisions in moving to the zones. Lastly, future research can ask SEZs firm on their experiences in the zones (i.e., management of the zones by public sector, recruitment, OSS center, and additional costs).

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Appendix

Table A1 Targeted activities for special economic zones

13 Targeted Industries	Tak	Sa Kaeo	Trat	Mukdahan	Songkhla	Chiang Rai	Nong Khai	Nakhon Phanom	Kanchanaburi	Narathiwat
1. Agro-industry, fishery industry, and related activities	X	X	X	X	X	X	X	X	X	X
2. Ceramic products	X							X	X	X
3. Textile, garment, and leather products	X	X			X	X	X	X	X	X
4. Furniture or parts	X	X			X	X		X	X	X
5.Gems and jewelry or parts	X	X				X		X	X	X
6. Medical devices or parts	X	X				X		X	X	X
7. Engine and vehicle parts, machinery, equipment, and parts	X	X						X	X	X
8. Electronics and electrical appliances industries	X	X		X				X	X	X
9. Plastic products	X	X				X		X	X	X
10. Medicine	X	X				X		X	X	X
11. Logistics	X	X	X	X	X	X	X	X	X	X
12. Industrial zones and industrial estate	X	X	X	X	X	X	X	X	X	X
13. Tourism promotion service and activities to support tourism	X	X	X	X	X	X	X	X	X	X

Source: NESDC (2022)

Table A2 Allocated budget for SEZ in Thailand between 2015 and 2021

Year	Total Revenue (Million baht)
2015	2,377.75
2016	6,168.91
2017	10,267.52
2018	9,883.50
2019	8,757.98
2020	6,393.90
2021	5,751.64
Total	49,601.20

Source: NESC (2022)

Table A3 Allocated budget for SEZ in Thailand by categories between 2015 and 2019

Categories	2015	2016	2017	2018	2019
Infrastructure	26.88	118.90	220.79	254.17	126.48
Customs/Immigration/Quarantine	32.59	36.75	42.43	53.61	43.32
One Stop Services (Investment and Trade)	-	1.04	1.38	-	-
Public health	-	9.85	21.38	5.35	5.35
Labor	-	1.95	2.94	-	-
Natural Resource Administration	-	1.43	0.32	-	-
Security and life and properties protection	5.22	-	0.82	-	-
Water resources	9.59	30.75	56.94	29.12	3.48
Waste disposal	-	2.29	-	-	-
Planning and studies	1.14	12.65	6.31	12.56	-
Industrial estates	-	0.67	4.44	17.76	-
Total	75.41	216.27	357.75	372.57	178.63

Source: NESDC (2022)

Table A4 Labor productivity by manufacturing sector between 2016 and 2020

Sector	2016	2017	2018	2019	2020	Δ2020 − 2016
Food products	98.46	97.99	98.43	99.89	98.43	-0.03
Beverages	100.13	101.96	99.48	112.03	108.58	8.45
Tobacco products	99.97	89.92	83.64	85.25	95.10	-4.87
Textiles	100.02	101.85	106.07	105.35	94.91	-5.11
Wearing apparel	100.06	98.45	101.91	98.91	103.48	3.42
Leather and related products	101.21	98.38	102.99	94.88	78.32	-22.89
Paper and paper products	100.05	103.26	102.44	102.61	108.46	8.40
Coke and refined petroleum products	100.14	104.00	99.06	92.28	92.39	-7.75
Chemicals and chemical products	99.74	100.26	101.62	100.99	98.63	-1.11
Basic pharmaceutical products	99.94	105.86	113.65	109.18	89.95	-9.99
Rubber and plastics products	100.07	101.53	90.86	87.52	89.42	-10.64
Non-metallic mineral products	100.01	99.63	104.51	105.18	104.90	4.90
Basic metals	99.98	102.15	104.13	97.38	96.23	-3.75
Fabricated metal products	99.97	99.47	104.68	97.83	92.10	-7.87
Computer, electronic and optical products	99.83	97.28	97.95	95.40	96.79	-3.04
Electrical equipment	99.80	97.59	96.96	98.08	102.60	2.80
Other machinery and equipment	100.30	87.35	87.40	93.33	93.62	-6.67
Motor vehicles, trailers, and semi-trailers	99.81	106.00	115.71	108.93	90.78	-9.03
Other transport equipment	99.94	102.91	112.06	108.01	94.72	-5.23
Furniture	99.89	113.73	108.45	110.50	109.43	9.55
Other manufacturing	99.97	91.85	90.12	86.65	83.89	-16.08
Total	99.72	100.72	101.66	99.68	95.91	-3.80

Source: Ministry of Industry (2022)