ผลกระทบจากสถานการณ์ความรุนแรงที่มีต่อการผลิตยางแผ่นดิบ: กรณีศึกษาของจังหวัดยะลา ประเทศไทย

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งานวิจัยนี้มีวัตถุประสงค์เพื่อศึกษาผลกระทบจากสถานการณ์ความรุนแรงต่อการเจริญเติบโตทางเศรษฐกิจในจังหวัดยะลา โดยวัดจากอัตราผลผลิตยางแผ่นดิบเป็นหลัก การศึกษานี้ใช้วิธีการทางเศรษฐมิติ 3 วิธี ได้แก่ Unit Root Tests, Vector Error Correction Model (VECM) และ Granger Causality Test โดยใช้ข้อมูลอนุกรมเวลาแบบรายเดือน ตั้งแต่เดือนพฤษภาคม 2547 ถึงเดือนสิงหาคม 2551 จากผลการศึกษา พบว่า สถานการณ์ความรุนแรงมีความสัมพันธ์ในเชิงลบอย่างมีนัยสำคัญทางสถิติต่อผลผลิตยางแผ่นดิบ นอกจากนี้ผลการทดสอบของ Granger Causality Test สนับสนุนว่าสถานการณ์ความรุนแรงเป็นสาเหตุที่ทำให้อัตราผลผลิตยางแผ่นดิบมีแนวโน้มที่ลดลง

คำสำคัญ: จังหวัดยะลา, สถานการณ์ความรุนแรง, อัตราผลผลิตยางแผ่นดิบ, Granger Causality, Unit Root Tests, Vector Error Correction Model

Impacts of Violence and Raw Rubber Production Growth: A Case Study of Yala, Thailand

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Abstract

The main objective of this study is to determine the impacts of violence on economic growth, based on raw rubber production in Yala, Thailand. The study used three econometric approximations. Unit Root Tests the Vector Error Correction Model (VECM) and the Granger Causality Test. Monthly data between May 2004 and August 2008 were used to analyze the relationship between the violence and the raw rubber production. This study demonstrates that there is a statistically significant negative relationship between the violence and the raw rubber production. The results obtained from the Granger Causality Test indicate that violence has caused the raw rubber production with no feedback.

Keywords: Granger Causality, raw rubber production, Unit Root Tests, Vector Error Correction Model, violence, Yala Province

Introduction

There are many factors affecting economic growth. Political and socio-economic factors are among the major determinants of growth. It is suggested that these factors have direct and indirect relationships with progress and regress in economic and social development. In this article, socio-economic factors, especially, violence, are the focus of the study.

Violent conflict is a threat to economic growth. Violence causes a slowdown in economic activities, which can be seen in terms of reduction in trade volume and, higher unemployment rates that have implications on poverty levels and income distribution. A study on the relationship between violence and economic growth by Imai and Weinsten (2000) found that civil wars have impacted domestic economies by reducing the levels of capital stock and growth. The occurrence of civil war initiates capital flight, and thus dramatically reduces private investment.

Furthermore, political economy models suggest that internal conflicts affect the aggregate domestic economy by worsening the government's fiscal balance as the expenditure is shifted from output enhancing activities into the conduct of war (Imai and Weinsten, 2000). The effects of violence on economic performance have been affirmed in several researches and studies, therefore, it is important to reduce and end the violence in order to stimulate economic activities and accelerate progress towards social development.

The evidence from various studies such as Chalk (2008), and Melvin (2007) have demonstrated that violence in the southernmost provinces of Thailand has negatively affected economic and social

development.

According to the Office of Commercial Affairs of Yala (2009-2010), agricultural products account for 70 percent of Yala's Gross Provincial Product (GPP), in which rubber related production constitutes the largest part of the output. This implies that rubber is an important determinant of economic growth since it drives the economic activity in this area. Given that rubber is an important variable for stimulating an economic activity in Yala, changes in the amount of total output of the raw rubber produced during the years of conflict underpin this study. It is set on the hypothesis that violence has significantly impacted the raw rubber production in Yala. The increasing violence rates have substantially reduced the raw rubber production in the province, which leads to the conclusion that violence has significantly decelerated economic activities in the area.

To explore the impact of violence on the economic growth in Yala, three econometric models, namely, the Unit Root Test, the Vector Error Correction Model (VECM), and the Granger Causality Test were employed to analyze the relationship between the violence and the raw rubber production, and to determine the effect of the violence on the raw rubber production. The direction of the causal relationships between the violence and the raw rubber production were also examined.

This article is organized into seven sections. The first section is the introduction. The second section is the review of literature, followed by the third section which pays particular attention to an overview of southernmost insurgency and economy. The fourth section explores the violence and the economic growth in the southernmost provinces

of Thailand. Model formulation will be shown in the fifth section. The sixth section is on empirical results, followed by the conclusion in the final section.

Literature Review

It is widely accepted that violence has negative effects on economic and social development. Many studies have attempted to examine these effects by using qualitative and quantitative approaches. Rodrik (1997) applied the formula from his empirical study to investigate the effects of shock on growth using a sample of social conflicts from 92 countries from 1975-1989 and 1960-1975. The findings show that there is a close relationship between the levels of a country's ranking in conflict to the extent of growth collapse after 1975. The estimated slope coefficient indicates that a one standard-deviation increase in conflict is associated with a growth reduction by 1.2 percentage points.

Imai and Weinstein (2000) also did a study to empirically measure the economic impact of internal wars by applying pooled ordinary least squares regressions. The result shows that civil war has a negative impact on economic growth. The growth in capital stock is reduced as civil war drives down domestic investment. In particular, civil war reduces private investment because private agents are capable of responding to the increasing uncertainty of the economic environment.

Furthermore, Detotto and Otranto (2010) proposed a state space model to analyze the effects of crime on the economic growth. This methodology was applied to Italian data. The results confirmed that crime negatively influences an economic performance through several channels; crime discourages investment, reduces the competitiveness

of firms, and reallocates resources, thus creating uncertainty and inefficiency. A rise in crime rates by 1% reduces the real economic growth by approximately 0.00040% in a month. In addition, Detotto and Otranto also applied the Impulse Response Function (IRF) analysis. The finding illustrated that 1% increase in crime rates during the economic contractions caused a reduction in the economic growth by approximately 0.00041% in a month and by 0.00022% in a year, which is equal to 0.5 and 2.6 million Euros, respectively.

A similar study on the relationship between crime and the economic growth in Columbia has been done by Cardenas and Rozo (2008). The research found that a decline in total factor productivity has been the key channel linking crime and the economic growth. Higher crime rates have been associated with an economic inefficiency.

Verwimp and Bundervoet (2008) analyzed the effects of civil war on household welfare by using Burundian panel data for the period of 1998-2007. The research found that 25 war related deaths or injuries at the village level reduced consumption growth by 13%. The study also indicated that the violence afflicted on household members decreased growth, whereas membership of rebel groups increased it.

Rincke (2010) analyzed the links between crime and the economic performance in the U.S. Metropolitan Statistical Areas (MSAs) by using the lagged abortion rate as an instrumental variable. The study found a strong negative impact of the local crime rate on per capital earnings growth. By contrast, the results did not show any effect of crime on the growth per capital income sources other than earnings.

Bodea and Elbadawi (2008) analyzed the impact of organized political violence on economic growth by using a quantitative model

of the violence that differentiated three levels of political violence namely riots, coups, and civil wars. The study applied predicted probabilities of aggregate violence and its three manifestations to identify the growth effects in an encompassing growth model. Panel regressions suggested that organized political violence, especially civil wars, were found to be negatively and significantly associated with growth even after controlling the direct growth effects of some potential determinants such as ethnic fractionalization and democracy.

Similarly, Solimano (2004) focused his research on the relationship between economic development and conflict and terrorism. The study found that political violence retards economic development as it destroys human lives and economic assets and penalizes the accumulation of capital and wealth creation. In turn, the “classical problems” of underdevelopment – poverty, inequality and social exclusion along with institution that failed at conflict management breed political violence.

On the other hand, various techniques and methods were used to empirically examine violence and economic growth. Rincke (2010) used panel data with a reduced-form growth regression to analyze the causal link between crime and income growth in U.S. MSAs. This method was able to capture the growth-depressing effects of crime and not just the location decisions of more and less affluent households responding to local differences in crime rates. Verwimp and Bundervoet (2008) employed panel data with micro-level growth models to analyze the effects of civil war on household welfare. The panel data was a powerful tool used in the study to remove the omitted variable bias that could avoid spurious results.

Bodea and Elbadawi (2008) analyzed the impact of political violence on economic growth in an endogenous growth model which was estimated by a dynamic panel, “Generalized Method of Moments (GMM).” The model controlled potential endogeniety, most notably that of political violence; accounted for heterogeneity, and are robust to standard specification and diagnostic tests. Alternatively, Imai and Weinstein (2000) used pooled ordinary least squares regression to test the economic impact of internal wars. This is a common model used in the existing studies of this topic (Easterly and Levine 1997; Collier 1999)

In addition, Detotto and Otranto (2010) applied time series data with pure autoregressive (AR) model to detect the effects of crime on economic growth. AR processes are the preferable method since they can avoid dependence on model specifications, providing comprehensive methods for estimation and specification. Moreover, there are several advantages to using the time series in terms of the interpretability of results and applications as it allows the identification of dynamic processes and forecasting analysis.

Several estimation methods were applied in this study to analyze the relationship between violence and economic growth, which was represented by raw rubber production. Since this study aimed to explore the relationship between two variables, it was mainly devoted to analyzing the relationships; and the cause and the effect between these variables. The three methodologies, namely Unit Root Test, the Vector Error Correction Model (VECM) and Granger Causality Tests Based on VECM were the most suitable models to be employed in this study considering the purposes and objectives of the research.

The discussions below are arranged according to the steps taken in the analysis.

Unit Root Tests

As a requirement of the time series analysis, it was necessary to first examine the property of time series i.e., stationary properties. This was a crucial step to avoid spurious regression. The augmented Dickey-Fuller (ADF) test was used to test the unit roots.

If the ADF results showed that the series were integrated of order zero [I(0)], they were therefore stationary. On the contrary, if the results were integrated of order one [I(1)], and therefore were non-stationary, the multivariate cointegration procedure would be carried out in the next step (Gujarati and Porter, 2009).

Vector Error Correction Model (VECM)

In the next step, a VEC model was used to test the short-term cointegration between the variables. The VEC model is a restricted vector autoregression (VAR) model. There are several advantages to applying the VAR approach. Firstly, it is one of the most comprehensive, successful and flexible models for the analysis of multivariate time series. Secondly, it is a natural extension of the univariate autoregressive model to dynamic multivariate time series. Thirdly, the VAR model has proven to be useful for describing the dynamic behaviour of economic and financial time series and forecasting. Fourthly, it provides superior forecast to those from univariate time series models and elaborate theory-based simultaneous equations models. Lastly, forecasts from VAR models are flexible as they could be made conditional on the potential future paths of specified variables in the model. (Zivot and Wang, 2006)

Granger Causality Test Based on VECM

Lastly, the direction of causality in economic relationships was tested. Granger Causality is the test to explore the cause and the effect between these variables. Application of the Granger causality model is important because it allows us to analyze which variable precedes or leads the other, and, as we shall see, such leading variables are extremely useful for forecasting purposes (Studenmund, 2001). This test assumes that the information is relevant to the prediction of the variables, which is contained only in the time series data of these variables. Therefore, VECM is an ideal tool to examine the Granger causality among the variables in this study.

OVERVIEW

Southernmost Insurgency

Yala, Pattani, Narathiwat and Songkhla are located in the southernmost part of Thailand (Figure 1). These southernmost provinces have a distinct language, and social and, cultural structures and traditions, which are different from other parts of Thailand. In the provinces of Pattani, Yala and Narathiwat, around 80 percent of the population are Muslim and Malay (Melayu) is spoken as a major language. The inhabitants of these provinces are predominantly ethnic Malays who share many similarities with Malaysian Malays.

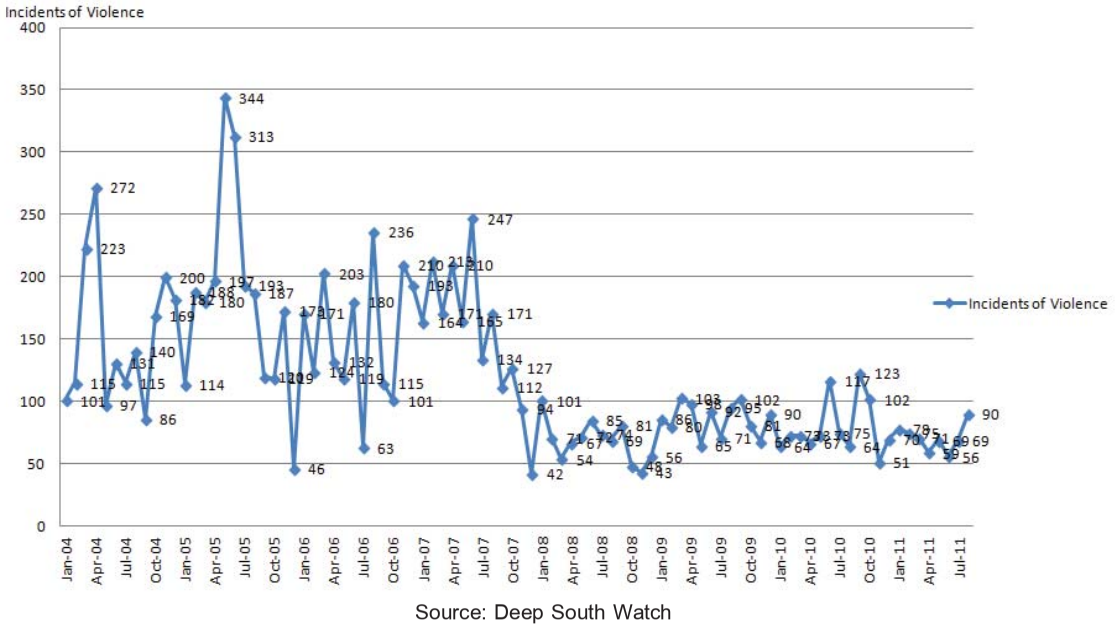
These southernmost border provinces are widely known as Thailand's conflict areas. The insurgency in these areas started from the armory robbery in the province of Narathiwat in January, 2004. After this incident, conflicts in the southernmost provinces have been escalating from shooting to arson and bombing attacks without the

Source: en.wikipedia.org/wiki/South_Thailand_insurgency (2007)

Figure 1 Map of southernmost provinces Thailand

prospect of termination. The ongoing violence affects local people who have to live in a state of fear which has negatively impacted their psychological health. The root causes of the conflict are believed to stem from political discontent, unfair treatment by authorities, and socio-economic inequality between the locals and the rest of the country.

The statistical data in Figure 2 shows that the incidents of the violence in the province of Yala, Pattani, Narathwat and Songkha fluctuated from time to time. The violence reached its peak in May 2005 when there were around 344 reports of unrest. However, the instances of unrest decreased as from 2008, but the number of deaths



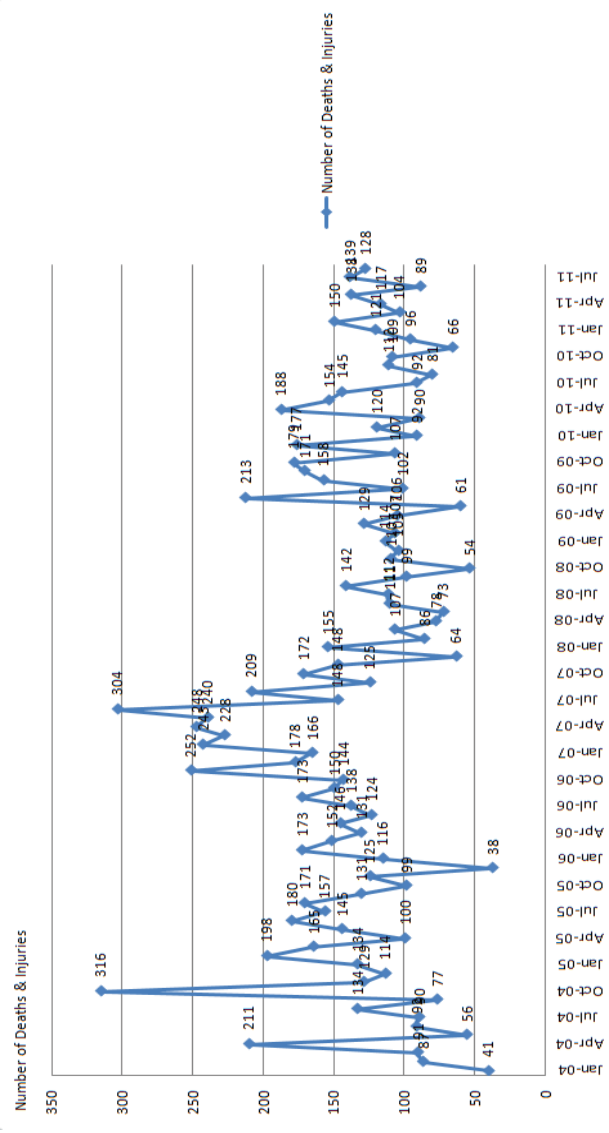
Source: Deep South Watch

Figure 2 Incidents of violence in the provinces of Yala, Pattani, Narathiwat and Songkla during January 2004 - August 2011

and injuries remain stable or on the increase (Figure 3). This is called, “qualitative violence,” which means that the insurgents raise the level of violence while the frequency of unrest tends to decrease.

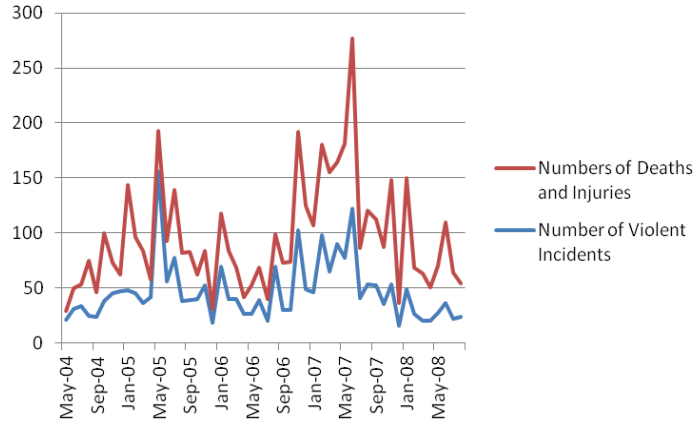
In the case of Yala, Figure 4 demonstrates the incidents of the qualitative violence in this area. This implies that the numbers of deaths and injuries in Yala tend to be higher than the frequency of unrest. However, the quantitative violence, rather than the qualitative violence, carries the risk of a psychological distress (e.g., depression, stress, anxiety, and anger). This is because the quantitative violence greatly influences the psychological health of the residents than the qualitative violence.

Violence in the southern-most provinces of Thailand has not only caused casualties in terms of deaths and injuries, it has also negatively impacted the economy of the region. Increasing violence has resulted in the reduction of agricultural outputs. For example, comparing rubber production between April 2004 and April 2005, the statistics show that it was reduced from 14,750 tonnes to 14,738 tonnes, which means that rubber production decreased by 0.08 percent (Chief Financial Officer Yala, 2005). The reduction in rubber production is related directly to the violence as the time for rubber tapping needed to be changed for security reasons. Rubber farmers were not able to tap the rubber at night, which is the best time to extract large amounts of latex. Instead it had to be tapped in the morning, which is not the proper time, thus reducing the total output. Given the co-relation between violence and agricultural production, rising violent incidents could cause severe damage to the economy in the long run.



Source: Deep South Watch

Figure 3 The number of deaths and injuries in the provinces of Yala, Pattani, Narathiwat and Songkhla during January 2004 - August 2011



Source: Deep South Watch

Figure 4 The number of violent incidents, and numbers of deaths and injuries in the province of Yala during May 2004-August 2008

Southernmost Provinces Economy

According to the Office of Commercial Affairs of Yala (2009-2010), agriculture, hunting and forestry, wholesale and retail trade, industry, construction, hotels and restaurants, and others, are accounted part of the gross provincial product (GPP) in Yala, in which agricultural production constitutes the largest part of the GPP, followed by wholesale and retail trade, industry, construction, and hotels and restaurants. However, the statistical evidences in Table 1 shows that more than 60 percent of GPP in Yala is covered by agriculture, hunting and forestry, wholesale and retail trade, and industry. This relates to the statistical evidence in Table 2, which shows that more than 90 percent of agriculture and 80 percent of industrial sectors in Yala rely on the raw rubber-related product manufacturing sector. In the case

Table 1 Yala Gross Provincial Product (GPP) at Constant 2009 Prices

GPP (Million Baht)	Year			
	2009	%	2010	%
Agriculture, Hunting and Forestry	20,988.00	49.69	20,841.00	48.89
Industry	2,850.00	6.75	2,568.00	6.03
Wholesale and Retail Trade	4,123.00	9.76	4,344.00	10.19
Hotels and Restaurants	540.00	1.28	534.00	1.25
Construction	941.00	2.23	1,362.00	3.19
Others	12,796.00	30.29	12,982.00	30.45
Total	42,238.00	100	42,631.00	100

Source: Adapted from Factsheet 2009-2010, Office of Commercial Affairs, Yala (2009-2010)

Table 2 Agricultural, Industrial and Trade Sectors of Yala Province in 2009 and 2010.

Variables	Year			
	2009	%	2010	%
Industrial Products (Million Bahts)				
■ Concentrated Latex	1,559.09	73.18	2,605.08	71.35
■ Standard Thai Rubber	103.92	4.88	190.53	5.22
■ Ribbed Smoked Sheet 3	123.42	5.79	104.59	2.86
■ Others	344.2	16.15	751	20.57
Total	2,130.63	100	3,651.20	100
Agricultural Produce (Ton)				
■ Raw Rubber	378,704.54	98.16	388,244.47	98.63
■ Oranges	7,113.69	1.84	5,376.21	1.37
Total	385,818.54	100	393,620.68	100

Source: Adapted from Economic Report 2009-2010, Chief Financial Officer, Yala (2009-2010)

of trade, according to the Chief Financial Officer of Yala, concentrated latex, standard Thai rubber, and ribbed smoke sheet 3 are the main exported products of Yala. Therefore, it can be concluded that raw rubber-related production is the main engine driving agriculture, trade, and industry in the area. The increase in raw rubber production will lead to greater agricultural and industrial products, and the value of exports, as a result, will affect the trade balance.

The abovementioned information implies that raw rubber-related production is the major determinant of GPP in Yala since it mainly drives agricultural products, trade, and industry in this area. Given that raw rubber production is the most important variable for stimulating economic activities in the area, change in the amount of raw rubber production during the years of conflict is the major justification for this study.

According to the Rubber Research Institute of Thailand, rubber plantation is the main economic activity in Southern Thailand, employing large numbers of people. In 2008, the total land area of rubber plantations in Thailand consisted of 16,889,686 fields (Rubber Research Institute of Thailand, 2010). Around 80 percent of these (approximately 11,339,658 fields) are located in the southern provinces. Suratthani province has the largest area of rubber plantations, followed by Nakhonsithammarat, Songkhla, Trang and Yala.

Violence and economic growth in southern thailand

There have been very few studies on the violence and the economic growth in southern Thailand. Chalk's study (2008) on the violence in southern Thailand concluded that the insurgency under the operation

of Bersatu, Barasi Revolusi Nasional (BRN), Patani United Liberation Organization (PULO), and new PULO, which have carried out a coordinated series of bombings, incendiary, and shooting attacks has resulted in considerable economic damage.

Another study by Melvin (2007) examined the link between international conflicts and the Muslim communities of southern Thailand. He found that from the 1960s they were affected by an international revival of Islam that was stimulated to a significant degree by international events such as the Iranian revolution and the conflict in Afghanistan during the 1980s but also reflecting social, economic and political developments within the Muslim world.

Abuza (2006) examined the development funds in southern Thailand during the years of conflict. He found that in 2009, Narathiwat and Pattani registered no private investment projects, while Yala had only one worth $2.1 million. Without security, investment and economic growth will remain limited.

The model

In this section, I build a simple regression model for empirical estimation, the model is specified as:

$$\text{RAW RUBBER} = \beta_0 + \beta_1 \text{ VIOLENCE} + \varepsilon_t \qquad (1)$$

where RAW RUBBER is the production of raw rubber in Yala measured in tons; VIOLENCE is the frequency of violence in terms of shooting attacks, bombing and arson in Yala; β's are the parameters to be estimated; and ε_t is a disturbance term. It is hypothesised that the relationship between the violence and the raw rubber production is negative.

Sources of Data

This study utilizes the data on the incidents of violence which consist of shooting, arson and bombing attacks in Yala province, collected from Deep South Watch. According to the statistical data in Figure 2, the incidents tended to increase in 2004 and to decrease from 2008. Therefore, to analyze the strong relationship between the violence and the raw rubber production, the monthly time-series data from May 2004 to August 2008 was most suitable and was applied in this research. The Chief Financial Officer, Yala (2005-2010), provided the data on Yala's raw rubber production which is recorded in tons.

Results

Unit Root Tests

Table 3 shows the results of the augmented Dickey-Fuller test (ADF) using lag length K = 1 for VIOLENCE and k = 8 for RAW RUBBER as suggested by the Akaike Information Criterion (AIC). All tests are conducted with intercept. The ADF test concludes that the series are integrated of order 0 [I(0)] and therefore are stationary at 5% level of significance for VIOLENCE and 1% level of significance for RAW RUBBER.

Table 3 Results of ADF Tests for Unit Root.

Variable	Level
RAW RUBBER	-6.305923***
VIOLENCE	-3.125583**

Notes: The values in the table are t-statistics; ***,**,* indicating significance at 1%, 5% and 10%, respectively.

Vector Error Correction Model (VECM)

The next step was to apply the Vector Error Correction Model (VECM) to test the short-term dynamic behaviour between the violence and the raw rubber production.

The VECM results with 7 lags are given as:

$$\Delta \text{RAW RUBBER} = -1673.409 - 2.537473\ \text{ECT} - 116.1726\ \Delta \text{VIOLENCE} \quad (2)$$
$$(-1.26854)\quad (-5.72060)\qquad (-2.49427)$$

where the values in the parentheses are the t-statistics.

The results indicate that violence is an important determinant of the raw rubber production in the short term, and it is significant at 1% level. The coefficient of the violence is negative. The study suggests that an increase in 1 incident of the violence will lead to a decrease in the raw rubber production by 116.1726 tons in the short term.

Granger Causality Test

The Granger causality test with 7 lags was used to examine the direction of causality between the violence and the raw rubber production in the short term. The results in Table 4 suggest that the rubber production changes are caused by the violence with no feedback.

Table 4 Granger Causality Test.

	Δ RAW RUBBER*	Δ VIOLENCE*	ECT**
Δ RAW RUBBER	-	18.02429	- 2.537473
		(0.0119)	(-5.72060)
Δ VIOLENCE	6.730262	-	-0.001751
	(0.4575)		(-1.01708)

* Chi-square statistics, the values in parentheses are the probability.

** The values in parentheses are the t-statistics.

The empirical results prove that the violence has a significant impact on the raw rubber production; the higher the instances of the violence, the lower the values of the raw rubber production.

CONCLUSION

This study has applied several empirical approaches to analyze the effects of the violence on the raw rubber production in Yala from May 2004 to August 2008 by using monthly data. Several econometric approximations such as Unit Root Tests, VECM and Granger Causality Tests were employed to determine the effects.

The empirical results show that there is a significant negative relationship between the violence and the raw rubber production. The study indicates that the violence has a negative impact on the economy by reducing an economic activity, especially the raw rubber production. The study suggests that an increase in 1 incident of violence leads to a decrease in the raw rubber production by 116.1726 tons in the short term.

Furthermore, the Granger Causality test results show that the violence causes the raw rubber production with no feedback; the higher the instances of the violence, the lower the amount of the raw rubber production. Therefore, violence hampers economic growth, which is represented by the raw rubber production.

The violence in the southernmost provinces of Thailand has stirred up social and economic problems. It has adversely impacted the psychological condition of the residents in these areas who continue to live in a state of fear. Large numbers of people have lost their family members, relatives and friends in various incidents.

The violence has also worsened the economic situation as people living in these areas feel insecure about earning their livelihood. The

empirical evidence from this study demonstrates that violence is the main factor influencing economic growth as it has negatively affected the rubber production.

The reduction in the rubber production could be attributed to the change in the time of rubber cultivation due to security concerns. The ongoing violence, has provoked a sense of fear among rubber farmers, and has thus decelerated the economic growth, as can be seen in terms of the reduction in numbers of raw rubber plantations.

This study suggests that the effects of violence on economic growth should be paid more attention by the government. The government should pay more attention in order to find socio-economic solutions to the conflict. An efficient and effective socio-economic policy needs to be carried out by the government in order to initially reduce and then end the violence, which will lead to improvements in the socio-economy of the southern-most provinces of Thailand.

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APPENDIX A

Statistical Data

Table A.1 Violence Incidents and Raw Rubber Production of Yala Province during 2004-2008

Variables	Year				
	2004	2005	2006	2007	2008
Violence Incidents	423	647	540	748	321
Raw Rubber (Ton)	211,006	212,181	237,506	210,651	261,359

Sources: Violence Number adopted from Deepsouth Watch,
Raw Rubber Production adopted from Economic Report 2004-2008, Chief Financial Officer Yala

APPENDIX B

Computer Output of EViews

FIGURE B.1 *EViews* **output of raw rubber Unit Root Tests**

Null Hypothesis: RAW_RUBBER has a unit root
Exogenous: Constant
Lag Length: 8 (Automatic - based on AIC, maxlag=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.305923	0.0000
Test critical values:	1% level	-3.592462	
	5% level	-2.931404	
	10% level	-2.603944	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(RAW_RUBBER)
Method: Least Squares
Sample (adjusted): 10 52
Included observations: 43 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
RAW_RUBBER(-1)	-3.203754	0.508055	-6.305923	0.0000
D(RAW_RUBBER(-1))	2.272665	0.424806	5.349891	0.0000
D(RAW_RUBBER(-2))	2.094190	0.397670	5.266153	0.0000
D(RAW_RUBBER(-3))	1.675361	0.364076	4.601683	0.0001
D(RAW_RUBBER(-4))	1.458964	0.311355	4.685851	0.0000
D(RAW_RUBBER(-5))	1.243960	0.257177	4.836982	0.0000
D(RAW_RUBBER(-6))	0.938549	0.208000	4.512251	0.0001
D(RAW_RUBBER(-7))	0.791562	0.178350	4.438255	0.0001
D(RAW_RUBBER(-8))	0.510848	0.152883	3.341434	0.0021
C	58956.76	9425.790	6.254835	0.0000
R-squared	0.669501	Mean dependent var		-626.5426
Adjusted R-squared	0.579365	S.D. dependent var		11653.18
S.E. of regression	7557.827	Akaike info criterion		20.89898
Sum squared resid	1.88E+09	Schwarz criterion		21.30856
Log likelihood	-439.3280	Hannan-Quinn criter.		21.05002
F-statistic	7.427677	Durbin-Watson stat		2.157435
Prob(F-statistic)	0.000008			

FIGURE B.2 *EViews* **output of violence Unit Root Tests**

Null Hypothesis: VIOLENCE has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic based on AIC, MAXLAG=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.125583	0.0310
Test critical values:	1% level	-3.568308	
	5% level	-2.921175	
	10% level	-2.598551	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(VIOLENCE)
Method: Least Squares
Sample (adjusted): 3 52
Included observations: 50 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
VIOLENCE(-1)	-0.550953	0.176272	-3.125583	0.0030
D(VIOLENCE(-1))	-0.307328	0.139151	-2.208593	0.0321
C	26.08047	9.180904	2.840731	0.0066
R-squared	0.453520	Mean dependent var		-0.140000
Adjusted R-squared	0.430265	S.D. dependent var		35.02245
S.E. of regression	26.43521	Akaike info criterion		9.445395
Sum squared resid	32844.56	Schwarz criterion		9.560117
Log likelihood	-233.1349	Hannan-Quinn criter.		9.489082
F-statistic	19.50248	Durbin-Watson stat		2.099520
Prob(F-statistic)	0.000001			

FIGURE B.3 *EViews* **output of Vector Error Correction Model (VECM)**

Vector Error Correction Estimates
Sample (adjusted): 9 52
Included observations: 44 after adjustments
Standard errors in ( ) & t-statistics in [ ]

Cointegrating Eq:	CointEq1	
RAW_RUBBER(-1)	1.000000	
VIOLENCE(-1)	67.87962	
	(35.6749)	
	[1.90273]	
C	-22759.31	
Error Correction:	**D(RAW_RUBBER)**	**D(VIOLENCE)**
CointEq1	-2.537473	-0.001751
	(0.44357)	(0.00172)
	[-5.72060]	[-1.01708]
D(RAW_RUBBER(-1))	1.623972	0.001637
	(0.38057)	(0.00148)
	[4.26719]	[1.10830]
D(RAW_RUBBER(-2))	1.431563	0.001187
	(0.34956)	(0.00136)
	[4.09533]	[0.87524]
D(RAW_RUBBER(-3))	1.016352	0.001000
	(0.31178)	(0.00121)
	[3.25982]	[0.82627]
D(RAW_RUBBER(-4))	0.867641	0.001460
	(0.25116)	(0.00097)
	[3.45451]	[1.49828]
D(RAW_RUBBER(-5))	0.747302	0.001213
	(0.20934)	(0.00081)
	[3.56978]	[1.49262]

Error Correction:	D(RAW_RUBBER)	D(VIOLENCE)
D(RAW_RUBBER(-6))	0.533591	0.000315
	(0.19936)	(0.00077)
	[2.67650]	[0.40714]
D(RAW_RUBBER(-7))	0.423367	0.000171
	(0.15889)	(0.00062)
	[2.66460]	[0.27704]
D(VIOLENCE(-1))	114.1743	-0.786975
	(51.5846)	(0.20019)
	[2.21334]	[-3.93123]
D(VIOLENCE(-2))	129.9279	-0.320703
	(62.7771)	(0.24362)
	[2.06967]	[-1.31640]
D(VIOLENCE(-3))	132.9516	0.006564
	(66.1475)	(0.25670)
	[2.00993]	[0.02557]
D(VIOLENCE(-4))	135.6120	0.023770
	(67.9798)	(0.26381)
	[1.99489]	[0.09010]
D(VIOLENCE(-5))	76.08723	-0.017790
	(69.0443)	(0.26794)
	[1.10201]	[-0.06640]
D(VIOLENCE(-6))	-69.74055	-0.022934
	(62.2874)	(0.24172)
	[-1.11966]	[-0.09488]
D(VIOLENCE(-7))	-116.1726	0.032567
	(46.5758)	(0.18075)
	[-2.49427]	[0.18018]
C	-1673.409	-2.825772
	(1319.16)	(5.11930)
	[-1.26854]	[-0.55198]

Error Correction:	D(RAW_RUBBER)	D(VIOLENCE)
R-squared	0.746696	0.543260
Adj. R-squared	0.610997	0.298577
Sum sq. resids	1.81E+09	27290.69
S.E. equation	8044.792	31.21967
F-statistic	5.502599	2.220264
Log likelihood	-448.1720	-203.8957
Akaike AIC	21.09873	9.995261
Schwarz SC	21.74752	10.64406
Mean dependent	249.0373	-0.522727
S.D. dependent	12898.47	37.27677
Determinant resid covariance (dof adj.)		6.31E+10
Determinant resid covariance		2.55E+10
Log likelihood		-652.0666
Akaike information criterion		31.18485
Schwarz criterion		32.56354

FIGURE B.4 *EViews* **output of Granger Causality Tests**

VEC Granger Causality/Block Exogeneity Wald Tests
Sample: 1 52
Included observations: 44

Dependent variable: D(RAW_RUBBER)			
Excluded	Chi-sq	df	Prob.
D(VIOLENCE)	18.02429	7	0.0119
All	18.02429	7	0.0119
Dependent variable: D(VIOLENCE)			
Excluded	Chi-sq	df	Prob.
D(RAW_RUBBER)	6.730262	7	0.4575
All	6.730262	7	0.4575