CHAPTER 4

PRESENTATION, ANALYSIS, AND INTERPRETATION OF DATA

4.1 Panel unit root test results

This study used five methods to examine the panel unit roots of the variables, including those by Levin, Lin, and Chu (2002), Im, Peasaran, and Shin (2003), Breitung (2000), Fisher-type ADF (1999), and Fisher-type PP (2001). Most of the results indicate the presence of unit roots. The method tests indicate that lnGDPi,t, lnImi,t, and lnExi,t fail to reject the null hypothesis of panel unit roots, which means that the time series of lnGDPi,t, lnImi,t and lnExi,t are non-stationary. Table 4.1 shows the panel unit root tests results on levels.

Table 4.1 Panel unit root tests results (levels)

	LLC	IPS	Breitung	ADF-Fisher	PP-Fisher
$LnGDP_{i,t}$	-3.4105 ***	-0.3145	0.4740	13.1536	21.8207
	(0.0003)	(0.3766)	(0.6822)	(0.6822)	(0.0160)
$LnIm_{i,t}$	-4.7569 ***	-1.5537 *	-0.4022	17.2874 *	27.6704 ***
	(0.0000)	(0.0601)	(0.3438)	(0.0682)	(0.0020)
$LnEx_{i,t}$	-4.1239 ***	-2.2851	-0.2948	21.9806	17.0131 *
	(0.0000)	(0.0112)	(0.3841)	(0.0152)	(0.0741)

Note: *** denotes statistical significance at 1% level,
* denotes statistical significance at 10% level.
Source: computed

According to all variables are non-stationary on levels, this study needs to take first difference or second difference. As well as after took the first difference in all variables, all variables accept the null of the panel unit roots. Its means that time series lnGDPit, lnImit and lnExit are stationary. Table 4.2 shows the results of the panel unit root tests. The series are integrated by an order of one, that is, I (1), at the 1% significance level.

Table4. 2 Panel unit root tests results (First Differences)

	LLC	IPS	Breitung	ADF-Fisher	PP-Fisher
$LnGDP_{i,t}$	-7.59756***	-2.74595***	-2.9945***	33.3381***	40.6997***
	(0.0000)	(0.0030)	(0.0014)	(0.0002)	(0.0000)
$LnIm_{i,t}$	-9.2294***	-3.74718***	-2.5092***	40.0477***	69.7434***
	(0.0000)	(0.0003)	(0.0061)	(0.0000))	(0.0000)
$LnEx_{i,t}$	-7.4843***	-2.9336***	-2.2918**	33.3415***	48.0808***
	(0.0000)	(0.0017)	(0.0110)	(0.0017)	(0.0000)

Note: *** denotes statistical significance at 1% level,
** denotes statistical significance at 5% level.
Source: computed

4.2 Panel co-integration test results

Table4.3 presents the panel co-integration test results of growth models of border trade and economic growth between Yunnan and other GMS members; the Pedroni and Kao residual co-integration tests were used. Here, seven kinds of Prdroni tests just have two kinds: Group-PP and Group ADF rejecting the null hypothesis (no co-integration). So this study rejected the Prdroni tests to focus on Kao tests only. Kao tests indicate that all variables are significant for rejecting the null hypothesis (no co-

integration). The results imply that all variables in the growth model between border trade and economic growth of Yunnan and other GMS members are co-integrated with each other.

Table4. 3: Panel co-integration Kao-test result (H_0: no co-integration)

Test Name	T-statistic	Probability
Kao-test	-1.565894	0.0587*

Adjusted R-squared	0.183895	Durbin-Watson Stat	1.896928
S.E. of regression	0.138684	S.D. dependent var.	0.153516

Note: * denotes statistical significance at 5% level. Source: computed

4.3 Panel co-integration estimation results

Table 4.4 presents the modeling results of the long-term relationships among border trade and economic growth between Yunnan and other GMS members according to the fixed-effects and random effects models (here, lnGDPi,t is the dependent variable). The results of all of the variables used in this section show that border trade exerted impacts on the economic growth of Yunnan and other GMS membersbetween1999and 2010.

Table 4.4: Panel co-integration estimation results ($LnGDP_{i,t}$ is dependent variable)

	Entity fixed effects model	Time fixed effects model	Time and entity fixed model	Entity random model
C	14.2045***	-3.759	23.8577***	14.1638***
	(31.0085)	(-1.6459)	(21.1838)	(12.1749)
$LnIm_{i,t}$	-0.0379	2.252***	-0.7995***	-0.0298
	(-0.3543)	(6.7504)	(-7.2698)	(-0.2793)
$LnEx_{i,t}$	0.2936***	-0.1608	0.03156	0.2894***
	(3.3214)	(-0.7142)	(0.4581)	(3.2883)
R-squared	0.9916	0.6366	0.9972	0.4688
Durbin-Watson stat	0.3505	0.0734	1.1587	0.3124

Note: *** denotes statistical significance at 1% level.
T-statistical is in Parentheses.
Source: computed

1) Entity fixed effects model

$$LnGDP_{i,t}=14.2045^{***}-0.0379LnIm_{i,t}+0.2936^{***}LnEx_{i,t} \quad (4.1)$$

(31.0085) (-0.3543) (3.3214)

The fixed-entity effects model suggests that the lnExi,t border export of all of the GMS members (including Yunnan) has a long-term positive effect on their economic growth the 1% level of statistical significance. However, the effects are non-obvious. Equation 4.1 shows the good regression R^2=0.9916 and a small D.W. =0.3505. Equation 4.1 also shows that when the border export of all of the GMS members increases by29.36%, their lnGDPi,t countries increases by only1%.

2) Time fixed effects model

$$LnGDP_{i,t}=-3.759+2.2521^{***}LnIm_{i,t}-0.1608LnEx_{i,t} \quad (4.2)$$

(-1.6459) (6.7504) (-0.7142)

The fixed-time effects model shows that the lnImi,t border import of the all of the GMS members(including Yunnan) has a long-term positive effect on their economic growth at the 1% level of statistical significance. Because Equation 4.2 yields poor regression R^2=0.6366 and very low D.W. =0.0734, we rejected the fixed-time effects model.

3) Time and entity effects model

$$LnGDP_{i,t}=23.8577^{***}-0.7995^{***}LnIm_{i,t}+0.03156LnEx_{i,t} \quad (4.3)$$

(21.1838) (-7.2698) (0.4581)

The time and entity effects models suggest that the lnImi,t border import of all of the GMS countries (including Yunnan) has a long-term negative effect on economic growth between countries at the 1% level of statistical significance. Equation4.3 yields good regression R^2=0.9972 and very high D.W.=1.1587. Border imports have significant effects on economic growth. When the border imports of the GMS members increased by 1%, their economies decreased by 0.7995%. Here, information is obtained from Equation 4.3.

4) Entity random effects model

$$LnGDP_{i,t}=14.1638^{***}-0.0298LnIm_{i,t}+0.2894^{***}LnEx_{i,t} \quad (4.4)$$

(12.1749) (-0.2793) (3.2883)

The random-entity effects model shows that the lnExi,t border export of all of the GMS members(including Yunnan) has a long-term positive effect on their e economic growth at the 1% level of statistical significance. Equation 4.4 shows poor

regression R^2=0.4688 and a very small DW=0.3124. Thus, we reject the random entity effects model.

The entity fixed effects model was compared with the time and entity fixed effects model by redundant fixed effects tests. The time and entity fixed effects model had larger degrees of freedom 15. For the entity fixed effects model the degrees of freedom just 4. We found that the time and entity fixed effects model is better than the entity fixed effects model. Table 4.5 indicates that the time and entity fixed effects model is the best model for this study.

Table 4.5 The redundant fixed effects tests results (H_0: no fixed effects)

Ebru Çağlayan(2010)

	Entity fixed effects model	Time and entity fixed effects model
Cross-section F	748.0618	1356.5561
	(0.0000)	(0.0000)
	[4,53]	[4,42]
Cross-section Chi-square	245.8349	292.1423
	(0,0000)	(0.0000)
	[4]	[4]
Period F		7.56433
		(0.0000)
		[11,42]
Period Chi-square		65.5382
		(0.0000)
		[11]
Cross-Section/Period F		499.4871
		(0.0000)
		[15,42]
Cross-Section/Period Chi-Square		311.3731
		(0.0000)
		[15]

Note: Probability is in Parentheses, Degree of freedom is in square bracket.
Source: computed

4.4 Granger causality test and Error-correction model (ECM) results

Table 4.4 shows the bi-directional and one-way relationships among border export, border import, and the economic growth between Yunnan and other GMS members based on the Granger causality test and ECM. The results indicate that just have GDP equation exist. It means that when GDP is dependent variable the border imports of all of the GMS countries have a one-way Granger causality relationship with their long- term and short-term economic growth. In the GDP equation, the ECM term is negative, which means that the short-term adjustment speed is fast at25.26% each year. Given the deviation of GDPi,t from its long-term equilibrium, as defined by its co-integration relationship, the Imi,t border import of all of the GMS members acts in a dynamic manner to correct this non-equilibrium.

Table 4.6: Granger causality test and ECM results

Dependent variables	Independent variables			
	$\Delta LnGDP_{i,t-1}$	$\Delta LnIm_{i,t-1}$	$\Delta LnEx_{i,t-1}$	$ECM_{i,t-1}$
ΔLnGDPi,t	0.6615***	0.0800*	0.0183	-0.2526***
	(7.2767)	(1.9529)	(0.6871)	(-3.3087)
ΔLnImi,t	0.4716	0.4220***	0.1359	-1.2986***
	(1.6366)	(3.1282)	(1.5838)	(-4.9500)
ΔLnExi,t	0.5731	0.0997	0.3138*	-0.7789***
	(1.1114)	(0.4537)	(1.8514)	(-3.8005)

Note: *** denotes statistical significance at 1% level,
* denotes statistical significance at 10% level.
T-statistical is in Parentheses.
Source: computed