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Fiscal expenditure and traffic sector growth: Evidence from panel error correction model and panel vector autoregression in China

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ABSTRACT

This paper applies panel error correction model (PECM) and panel vector autoregression (PVAR) to examine the effect of fiscal expenditure on traffic sector growth in China, using 31 provinces panel data for the time period 2007-2012. The empirical results support that in the short-term the dynamic effect of fiscal expenditure on traffic sector growth is negative in the east china, but in west china it is positive. In the long-term, the findings provide a clear support of a positive cointegration relationship between fiscal expenditure and traffic sector growth in the west china and in the east china. This study thus provides empirical evidence of long-run and causal relationships between fiscal expenditure and traffic sector growth for our sample of countries. The empirical evidence results also present the effect of government expenditure on traffic sector growth is stronger positive in the west china than in the east china significantly. So increasing the fiscal expenditure on traffic in the west china will bring more benefit.

Keywords: Fiscal expenditure, Traffic sector growth, PECM, PVAR

INTRODUCTION

Since the late 1980's, regional disparities have been increasing in China [1]. In response to these rising inequalities that Chinese government has adopt harmonious development policy. From the 1970s until now, Many researchers have focused on the issues that how to apply fiscal policy to solve the problem. Economists proposed several ways, such as the Gene coefficient, Theil index and other statistical indicators et., to study from various angles. Plenty of studies have been conducted on the impact of transport infrastructure development on regional economic growth over the last decades. There is now strong evidence that public investment in transportation infrastructures have been a powerful instrument to promote long-term growth (Aschauer, 1989; Munnell, 1990; Ozbay et al., 2003; Canning and Bennathan, 2007). Although regional disparities always being a hot topic, but the study of fiscal traffic expenditure on traffic sector growth from the regional perspective is less. Traffic sector (including transportation, warehousing and postal service, hereinafter it referred to traffic industry in China) is a basic industry of national economics. The mainly investment funds of traffic sector come from government expenditure in China, and it brings a huge influence to the development of relevant industries and economic growth [2].

The link between fiscal expenditure and growth has been an ongoing issue. Over the past decades, an amount of literatures had been directed towards identifying the elements of government expenditure that being significant association with economic growth. One view was that the efficiency of government spending was low. Arrow and kurz (1970)[3] made a pioneering contribution to the relationship between government expenditure and economic growth. They concluded that government spending only affect the growth rate to economy steady-state, but not affect growth in a stable-state. Grier (1989)[4]and Barro (2000)[5] found that there was negative correlation between the government expenditure scale and economic growth using some developed countries data. With the opposite point of view, other economists thought government protected the private property rights effectively by providing public goods due to the defect of market mechanism. Aschauer (1988) proposed that it's only a small influence of the government's consumer spending on economic growth[6]. Aschauer(1989) also confirmed that the government's expenditure on infrastructure will encourage productive investment from the private sector, so it promoted economic growth [7]. Rodrik (1994) pointed out that fiscal expenditure had a positive promoting effect on economic growth [8]. The main reason was that the effect of government investment could bring benefits for consumers, increase consumer spending and improve the civil demand. Government spending on traffic, agriculture, health, military, technological progress and public safety, could improve the government investment incentive and stimulating private investment growth, so as to promote economic growth [9]. The third view is that the relationship between fiscal expenditure and economic growth is uncertain(Sims, 1997[10]; Cohrane, 2001[11]; Daniel, 2001[12]).

On the other hand, most literatures have tested for the influence of government spending for transportation foundation to economic growth. Few studies provide some evidence on the relationships between government expenditure and traffic growth. In this paper, we examine the impact of government investment on traffic economic growth in China, employing Panel Vector Autoregression (PVAR). In contrast to the literature, this new test procedure is implemented on panel data. It is more efficient than those solely based on time-series data. We collect a panel data set which includes 31 provinces and cities in China, with the sample covering the period from 2007 to 2012. This paper includes 4 parts. Besides the introduction, the rest of the paper is as follows: Section 2 presents the description of methodology and data analysis. Section 3 discusses the empirical results. Section 4 presents our conclusions.

2.Description of Methodology and data analysis

2.1. Description of Methodology

The evaluation for the spatial diversity effect of fiscal expenditure on traffic sector growth in a panel context is conducted in four steps. First, the order of integration in the fiscal expenditure and traffic sector growth series variables are tested for Stability using unit root test. Second, after having established the order of integration in the series, panel cointegration tests are used to examine the long-run relationships between the variables. Third, we use panel error correction model examine the equilibrium relationship between the variables in the long run and the fluctuation in the short run. When the variables become stationary after first differencing, linear combinations might exist by virtue of which the series become stationary without differencing. The last is to use PVAR (panel vector autoregression model) to check whether a stationary linear combination of nonstationary variables exists, and apply variance decomposition and impulse response technique to present the main factors of variables fluctuations and the dynamic shock process.

2.1.1. Panel Unit root tests

Before conducting cointegration analysis of variables, we uses panel data unit root tests the stability of all variables. We utilize LLC test, IPS test, Fisher-ADF test, Fisher- PP test. For all variables, the null hypotheses of a unit root cannot be rejected at their levels and first differences. For each estimation technique, we test for unit roots in the panel by using four types of models. The first model has a constant and a deterministic trend stationary.

The LLC test is the most far and wide used panel unit root test, based on the ADF(Augmented Dickey Fuller) test. The model is expressed as follows:

$$\Delta y_{it} = \eta y_{it-1} + \sum_{j=1}^{p_i} \beta_{ij} \Delta y_{it-1} + x_{it}^{'} \delta + \mu_{it} \tag{1}$$

where $\eta = \rho - 1$, Δ is the first difference operator, y_{it} is the series of observations for regions i, t=1,..,T time periods. We test the null hypothesis of $\eta = 0$ for all i against the alternative of $\eta < 0$, which presumes that all series are stationary. The LLC test procedure proceeds from the assumption of a homogenous panel.

The IPS(Im, Pesaran and Shin) test is an extension of the LLC test, relaxed the homogenous assumptions by allowing for heterogeneity in the autoregressive coefficients for all panel members (β varies across units under the alternative hypothesis). The alternative hypothesis implies that some or all of the individual series are stationary. In the IPS test, we conduct Panel Unit root tests for every cross section, firstly.

$$\Delta y_{it} = \eta_i y_{it-1} + \sum_{j=1}^{p_i} \beta_{ij} \Delta y_{it-1} + x_{it}^{'} \delta + \mu_{it} \tag{2}$$

the null hypothesis of the test:

$$H_0 : \eta_i = 0, \ for \ all \ i$$

the alternative hypothesis of the test:

$$H_1 : \begin{cases} \eta_i = 0, & for \ \ i = 1,2,3,...,N_1 \\ \eta_i < 0, & for \ \ i = N_1+1, N_1+2, N_1+3,...,N \end{cases}$$

After conduct panel unit root test, the t statistics of every cross section η_i is expressed as follows:

$$\bar{t}_{NT} = \left(\sum_{i=1}^{N} t_{iT_i}(p_i) \right) / N \tag{3}$$

IM-Pesaran-Skin give statistics threshold by simulating at the different level of significance, respectively.

Fisher-ADF test and Fisher-PP test apply the result of Fisher(1932)'s. They construct two statistics combining the different cross section's unit root η_i values. When individual-specific trends are included, the IPS test can suffer from a loss of power due to bias correction. He proposes an alternative test unit root which corrects for the loss of power and shows that it has greater power than the IPS test. The null hypothesis of Fisher-ADF test and Fisher-PP test is that the panel series exhibits non-stationary stationary, and the alternative hypothesis assumes that the panel series is difference.

Asymptotic Chi-square statistic is expressed as follow:

$$-2\sum_{i=1}^{N} \log(\pi_i) \to \chi^2(2N) \tag{4}$$

Where π_i is cross section i's unit root p-value, Chi-square statistical degrees of freedom is 2N.

The definition of asymptotic normal distribution is expressed as follows:

$$Z = \frac{1}{\sqrt{N}} \sum_{i=1}^{N} \phi^{-1}(\pi) \to N(0,1) \tag{5}$$

where ϕ^{-1} is the inverse of the normal cumulative distribution function.

2.1.2.Panel cointegration test

After testing the stability of variables, our empirical work involves evaluating the long-run relationship between traffic sector growth and fiscal expenditure for traffic sector using the panel cointegration technique due to Pedroni(1999). This technique is based on Engle and Granger two step test, allows for heterogeneity among individual members of the panel. So it is an improvement over conventional cointegration tests. Following the methodology employed by Pedroni, the cointegration relationship is specified as follows:

$$y_{it} = \alpha_i + \delta_i t + x_{it}^{'} \beta_i + \mu_{it} \tag{6}$$

$$y_{it} = y_{it-1} + e_{it}$$
$$x_{it} = \mathrm{x}_{it-1} + \varepsilon_{it}$$

$$\beta_i = (\beta_{1i}, \beta_{2i}, ..., \beta_{ki})^{'}, x_{it} = (x_{1i,t}, x_{2i,t}, ..., x_{ki,t})^{'},$$
$$t = 1,...,T, \quad i = 1,2,...,N$$

Where δ_i and β_i are individual-specific trends of every across section, we may assume they are null. Pedroni test supposes that every cross section is mutually independent. Error process is stable. Asymptotic covariance matrix is Ω.

$$\Omega = \lim_{T \to \infty} E\left[T^{-1} (\sum_{t=1}^{T} W_{\mathrm{it}})(\sum_{t=1}^{T} W_{it}^{'}) \right] = \Omega_i + \Gamma_i + \Gamma_i^{'} \tag{7}$$

Where Ω_i is contemporaneous covariances, Γ_i is weighted sum of Auto-covariance. Ω_i is expressed as follow:

$$\Omega_i = \begin{bmatrix} \Omega_{ei} & \Omega_{e\varepsilon i} \\ \Omega_{\varepsilon ei} & \Omega_{\varepsilon i} \end{bmatrix} \tag{8}$$

According to the unit root tests results, we performed Pedroni test analysis the balanced relationship among lnty and lnex in long-term, following the standard Engle-Granger approach. When apply Pedroni test to examine the stability of residual error, the null hypothesis and the alternative hypothesis are expressed as follow:

$(1) H_0 : \rho_i = 1 \qquad H_1 : (\rho_i = \rho) < 1;$
$(2) H_0 : \rho_i = 1 \qquad H_1 : \rho_i < 1;$

The first case, Pedroni test make it as within-dimension test to test the cointegration relationship of homogeneity panel data, it construct four panel statistics to test the null hypothesis, these are panel v- statistic, panel rho- statistic, panel pp- statistic, panel ADF- statistic. The null hypothesis is non- cointegration.

The second case, Pedroni test make it as between-dimension test to test the cointegration relationship of heterogenous panel data. it construct three panel statistics to test the null hypothesis, these are Group pp-statistic, Group ADF-statistic, Group rho-statistic. The null hypothesis is non- cointegration.

The seven statistics are expressed as follow:

$$\textit{Panel}\ \text{v-statistic: } Z_V = \Big(\sum_{i=1}^{N} \sum_{t=1}^{T} \hat{L}_{11i}^{-2} \hat{\mu}_{i,t-1}^{2}\Big)^{-1} \tag{9}$$

$$\textit{Panel}\ \text{rho-statistic: } Z_\rho = \Big(\sum_{i=1}^{N} \sum_{t=1}^{T} \hat{L}_{11i}^{-2} \hat{\mu}_{i,t-1}^{2}\Big)^{-1} \sum_{i=1}^{N} \sum_{t=1}^{T} \hat{L}_{11i}^{-2} (\hat{\mu}_{i,t-1} \Delta \hat{\mu}_{i,t} - \hat{\lambda}_i) \tag{10}$$

$$\textit{Panel}\ \text{pp-statistic: } Z_\rho = \Big(\hat{\sigma}^2 \sum_{i=1}^{N} \sum_{t=1}^{T} \hat{L}_{11i}^{-2} \hat{\mu}_{i,t-1}^{2}\Big)^{-1/2} \sum_{i=1}^{N} \sum_{t=1}^{T} \hat{L}_{11i}^{-2} (\hat{\mu}_{i,t-1} \Delta \hat{\mu}_{i,t} - \hat{\lambda}_i) \tag{11}$$

$$\textit{Panel}\ \text{ADF-statistic: } Z_t = \Big(\hat{s}^{*2} \sum_{i=1}^{N} \sum_{t=1}^{T} \hat{L}_{11i}^{-2} \hat{\mu}^{*2}_{i,t-1}\Big)^{-1/2} \Big(\sum_{i=1}^{N} \sum_{t=1}^{T} \hat{L}_{11i}^{-2} \hat{\mu}^{*}_{i,t-1} \Delta \hat{\mu}^{*}_{i,t}\Big) \tag{12}$$

$$\textit{Group rho}-\textit{statistic}: Z_{\hat{\rho}} = \sum_{i=1}^{N} \Big(\sum_{t=1}^{T} \hat{\mu}_{i,t-1}^{2}\Big)^{-1} \sum_{i=1}^{T} (\hat{\mu}_{i,t-1} \Delta \hat{\mu}_{i,t} - \hat{\lambda}_i) \tag{13}$$

$$\textit{Group}\ \text{pp}-\textit{statistic}: Z_{\hat{t}} = \Big(\sum_{i=1}^{N} \hat{\sigma}_i^2 \sum_{t=1}^{T} \hat{\mu}_{i,t-1}^{2}\Big)^{-1/2} \sum_{i=1}^{T} (\hat{\mu}_{i,t-1} \Delta \hat{\mu}_{i,t} - \hat{\lambda}_i) \tag{14}$$

$$\textit{Group ADF}-\textit{statistic}: Z_t^{*} = \sum_{i=1}^{N} \Big(\sum_{t=1}^{T} \hat{s}_i^{*2} \hat{\mu}^{*2}_{i,t-1}\Big)^{-1/2} \sum_{i=1}^{T} \hat{\mu}^{*}_{i,t-1} \Delta \hat{\mu}^{*}_{i,t} \tag{15}$$

The seven statistics are normally distributed. When the statistics is compared to appropriate critical values: if critical values are go beyond, the null hypothesis of no cointegration is rejected. It implies that a long-run relationship between the variables does exist. By the above models, the relevant critical values can be found in Pedroni. With the null hypothesis of no cointegration, the panel cointegration test is essentially a test of unit roots in the estimated residuals of the panel: in the presence of a cointegrating relation, the residuals are expected to be stationary.

Kao test is similar with Pedroni test, based on Engle-Granger approach. Distinguished from Pedroni test, Kao test supposes that the same coefficient and different intercept of regression equation of every cross section at first stage. At the second stage, based on DF test and ADF test, Kao test examines the stationary test of residual error series of regression equation at first stage. Auxiliary regression model is expressed as follow:

$\mu_{it} = \rho \mu_{it-1} + v_{it}$
H_0 : *non* cointegration relationship(ρ=1).
H_1 : cointegration relationship($\rho < 1$,ρ=0).

Kao test 's test statistics is given, it is as follow:

$$\mathrm{DF}_{\rho} = \frac{T\sqrt{N}(\hat{\rho}-1)+3\sqrt{N}}{\sqrt{10.2}} \quad (16)$$

$$\mathrm{DF}_{t} = \sqrt{1.25}t_{\rho} + \sqrt{1.875N} \quad (17)$$

$$\mathrm{DF}_{\rho}^{*} = \frac{\sqrt{N}T(\hat{\rho}-1)+3\sqrt{N}\hat{\sigma}_{v}^{2}/\overline{\sigma}_{v}^{2}}{\sqrt{3+36\hat{\sigma}_{v}^{4}/(5\overline{\sigma}_{v}^{4})}} \quad (18)$$

$$\mathrm{DF}_{t}^{*} = \frac{t_{\rho}+\sqrt{6N}\hat{\sigma}_{v}^{2}/2\overline{\sigma}_{v}}{\sqrt{\hat{\sigma}_{v}^{2}/(2\overline{\sigma}_{v}^{2})+3\hat{\sigma}_{v}^{2}/(10\overline{\sigma}_{v}^{2})}} \quad (19)$$

When p>0(ADF test), its statistics is expressed as follow:

$$ADF = \frac{t_{\bar{\rho}}+\sqrt{6N}\hat{\sigma}_{v}^{2}/2\overline{\sigma}_{v}}{\sqrt{\hat{\sigma}_{v}^{2}/(2\overline{\sigma}_{v}^{2})+3\hat{\sigma}_{v}^{2}/(10\overline{\sigma}_{v}^{2})}} \quad (20)$$

2.1.3 Panel error correction models (PECM)

Based on the cointegration test of our variables, the next step evolves estimating the long-run relationship and the short-run relationship. In this section, we apply panel error correction model(PECM) to estimate. We employ a three step process. The first step involves the estimation of the residuals from the long-run model. The second step involves the corresponding distribution lag autoregressive model , the last involves constructing dynamic error correction model. The dynamic error correction model used is specified as follows:

The long run effect of fiscal expenditure on traffic sector growth is as follow.

$$\ln ty_{it} = \mathrm{a}_0 + \phi \ln ex_{it} + \mu_{it} \quad (21)$$

$$EMC_{i,t} = \ln ty_{it} - \phi \ln ex_{it} \quad (22)$$

The long run effect of traffic sector growth on fiscal expenditure is as follow.

$$\ln ex_{it} = \mathrm{a}_0 + \varphi \ln ty_{it} + \varepsilon_{it} \quad (23)$$

$$EC_{i,t} = \ln ex_{it} - \varphi \ln ty_{it} \quad (24)$$

The corresponding distribution lag autoregressive model（ARDL（1，1））is as follows:

$$\ln ty_{it} = b_0 \ln ty_{it-1} + \kappa_0 \ln ex_{it} + \kappa_1 \ln ex_{it-1} \quad (25)$$

$$\ln ex_{it} = \rho \ln ex_{it-1} + \zeta_1 \ln ty_{it} + \zeta_2 \ln ty_{it-1} + \varepsilon_{it} \quad (26)$$

Construct panel error correction model(PECM)：

$$\Delta \ln ty_{it} = \alpha_{1i} + \gamma EMC_{i,t-1} + \sum_{k} \eta_{1k} \Delta \ln ex_{i,t-k} + \mu_{i,t} \quad (27)$$

$$\Delta \ln ex_{it} = \alpha_{2i} + \nu EC_{i,t-1} + \sum_{k} \beta_{2k} \Delta ty_{i,t-k} + \varepsilon_{i,t} \quad (28)$$

Where D denotes the difference operator; EMC is the lagged error correction term derived from the long-run cointegrating relationship; r and v are adjustment coefficients, when r<0, v<0, it implies the error correction mechanism is existed; when r=0, v=0, it implies the long run relationship isn't existed; k is the number of lags determined by the SIC (schwarz information criterion), u is the serially uncorrected error term. β and η are the short fluctuations effect of every variables on explained variable.

2.1.4 Panel vector autoregression (PVAR)

In the last, we introduce PVAR(panel vector autoregression) methodology. PVAR combined with panel data and vector autoregression advantage. It made all variables in the system as endogenous. Holtz-Eakin (1988) employed it firstly [13]. It needn't distinguish between the endogenous variables and exogenous variables. So we specify a

PVAR model as follows:

$$Y_{it} = \beta_i + \sum_{j=1}^{m} \alpha_i Y_{i,t-j} + e_{it} \qquad (29)$$

Where Y_{it} is a two-variables vector $\{\ln ty_{it}, \ln ex_{it}\}$; ty_{it} is traffic sector growth, which traffic sector GDP; ex_{it} is fiscal expenditure on traffic sector. β_i is individual-level effect. e_{it} is random disturbance of the normal distribution. j is lagged order. i represents province. t represents time.

In this model, "individual heterogeneity" in the levels of the variables is been by introducing fixed effects. Since the fixed effects are correlated with lags of the dependent variables. Using the mean-differencing procedure to eliminate fixed effects, it would create biased coefficients. To avoid this problem, we apply forward mean-differencing. It refers to the 'Helmert procedure'. We can use lagged regressors as instruments and estimate the coefficients by system GMM. Then we present variance decompositions and analyze the impulse-response. To distinguish the difference among our two samples (i.e. 'the east china' and 'the west china'), we examine them respectively.

2.2 Data analysis

Our main objective is to analyze the spatial diversity of fiscal expenditure on traffic sector growth in this paper. Base on the different level of economic growth and geographical location, we split 31 provinces and cities in China into two samples, and analyze the difference. We refer to these two groups as 'the east china' (developed regions) and 'the west china' (developing regions). The east china includes Beijing, Tianjin, Shandong, shanghai, Zhejiang, Jiangsu, Guangdong, Fujian, Liaoning, Hainan, Hebei, which are located in the east china. The west china includes Jiangxi, Jilin, Inner Mongolia, Anhui, Henan, Hubei, Heilongjiang, Guizhou, Yunnan, Gansu, Guangxi, Qinghai, Xinjiang, Sichuan, Shanxi, Hunan, Shannxi, Chongqing, Xizang, Ningxia, which are located in the west china. All data of China's 31 provinces from 2007 to 2012 are available in the National Statistics Bureau of china, China Compendium of Statistics (2008-2013), China Statistical Yearbook (2008-2013). Data analysis and model operation are completed by using Eviews6.0 and Stata10.0 software. Summary statistics for the data are given in Table 1-2.

Table 1 Summary statistics of data in the west china

Variable	Obs	Mean	S. D.	Min	Max
lnex	120	4.493	0.856	2.137	6.076
lnty	120	5.794	0.950	2.991	7.078

Table 2 Summary statistics of data in the east china

Variable	Obs	Mean	S. D.	Min	Max
lnex	66	4.561	1.064	2.138	6.279
lnty	66	6.735	0.828	4.459	7.831

3. Empirical results. In this section, based on panel unit root test and panel cointegration test, we conduct PECM and VAR estimation. Then we examine variance decomposition and impulse response.

Table 3. The results of unit root test in the east china

	Individual effects				Individual effects and linear trends			
Method	lnty	D(lnty)	lnex	D(lnex)	lnty	D(lnty)	lnex	D(lnex)
L.L.C	0.38	-9.86[a]	-6.74[a]	-9.21[a]	-10.26[a]	-13.15[a]	-5.29[a]	-48.76[a]
IPS	2.51	-2.64[a]	-0.13	-2.91[a]	0.18	-0.48	0.67	-6.96[a]
Fisher-ADF	5.19	35.04[b]	21.32	37.87[b]	19.48	22.79	12.72	75.34[a]
Fisher- PP	6.15	35.19[b]	39.51[b]	40.19[b]	31.65[c]	41.31[a]	20.84	102.26[a]

Note: a, b, c denotes a statistic is significant at the 1%, 5% and 10% level of significance, respectively.

3.1 Panel Unit root tests results.

The results of the panel unit root tests from LLC, IPS, Fisher-ADF, Fisher-PP for the level and first differenced series of $\ln ty_{it}$ and $\ln ex_{it}$ are reported in Table 3-4. The results show for all the two variables in level form, the null hypothesis of unit root cannot be rejected in the east china and in the west china. The results of the panel unit root tests suggest overwhelmingly that these variables are not stationary in level form. By taking the first difference, the results show the IPS test, Fisher-ADF test, the LLC test and Fisher- PP reject the null hypothesis at the 5% significance level. It gives conclusive evidence of panel unit root. Overall, all the panel unit root test techniques reject the null hypothesis for the differenced series *lnex* and *lnty*. The results of the ADF t-tests at the aggregate level suggest that the null of unit roots is rejected for all variables at the 5% significance level. This evidence is consistent with the conventional wisdom in the macroeconomics literature that lnty and lnex are the I(1) process in the east china and the west china. We take this as an indication that stationarity in growth rates is a good approximation for all the variables. Therefore, it is concluded that all the variables are non-stationary.

Table 4. The results of unit root test in the west china

	Individual effects				Individual effects and linear trends			
Method	lnty	D(lnty)	lnex	D(lnex)	lnty	D(lnty)	lnex	D(lnex)
L.L.C	-1.61[b]	-9.63[a]	-2.41[a]	-53.84[a]	-7.37[a]	-68.04[a]	-42.39[a]	-46.99[a]
IPS	3.54	-2.76[a]	2.29	-19.80[a]	0.98	-16.78[a]	-4.26[a]	-12.7[a]
Fisher-ADF	13.16	60.35[b]	12.34	181.49[a]	25.05	115.8[a]	114.47[a]	136.62[a]
Fisher- PP	23.15	64.55[b]	12.11	193.48[a]	41.5	170.97[a]	175.82[a]	173.73[a]

3.2 Panel cointegration test results

Table 5 The results of cointegration test in the east china

Within dimension test statistic		Between dimension test statistic	
Panel v-Statistic	15.92 [a]	Group rho – statistic	3.66
Panel rho-Statistic	2.85	Group pp- statistic	-3.81[a]
Panel PP-Statistic	-3.27[a]	Group ADF- statistic	-18.2[a]
Panel ADF-Statistic	-8.51[a]		
Kao test	-3.27a		

Table 6 The results of cointegration test in the west china

Within dimension test statistic		Between dimension test statistic	
Panel v-Statistic	3.97[a]	Group rho – statistic	1.84
Panel rho-Statistic	-0.037	Group pp- statistic	-16.64[a]
Panel PP-Statistic	-7.495[a]	Group ADF- statistic	-1.69[b]
Panel ADF-Statistic	-2.01[b]		
Kao test	-5.73[a]		

Table 7 The results based on panel ECM models in the east china

dependent variable	Δlnty	dependent variable	Δlnex
independent variable	coefficient	independent variable	coefficient
long- run equilibrium relationship：		long- run equilibrium relationship：	
lnex	0.226a	lnty	3.505b
Short-term relationship：		Short-term relationship：	
ECM	-0.444a	EC	-0.501
Δlnex	-0.148a	Δlnty	-0.965
constant term	2.618a	constant term	-0.569

Table 8 The results based on panel ECM models in the west china

dependent variable	Δlnty	dependent variable	Δlnex
independent variable	coefficient	independent variable	coefficient
long- run equilibrium relationship：		long- run equilibrium relationship：	
lnex	0.537b	lnty	7.229a
Short-term relationship：		Short-term relationship：	
ECM	-0.730a	EC	-1.353a
Δlnex	0.149a	Δlnty	-1.337
constant term	3.106a	constant term	-20.773a

Table 3-4 show that the results of the panel cointegration from the seven statistics of Pedroni. Group ADF-Statistic, Panel PP-Statistic, Panel v-Statistic and Panel ADF-Statistic all strongly reject the null hypothesis at less than 5% significance level, and Kao test also strongly reject the null hypothesis at less than 1% significance level in the east china and the west china. So we obtain strong evidence that two variables have cointegration relationship either in the east china or the west china.

3.3 Panel ECM results

As shown in Table 7-8, there are equilibrium long-run and short-run effects of fiscal expenditure on traffic sector. The effect of fiscal expenditure on traffic sector is significant positive in a long-term in the west china and in the east china. The increase of fiscal spending can promote traffic sector growth in the east china and the west china, but it is stronger in west china than in east china. The effect of fiscal expenditure on traffic sector is significant negative in a short run in the east china, is significant positive in a short term in the west china. This means the increase of fiscal spending will restrain traffic sector growth in the east china, but is promotion in west china. It means promoting the efficiency of fiscal spending in the west china will bring more benefit. Table 7 also displays the effect of traffic sector growth on fiscal spending is significant. It is positive in a long run in the east china. The development of traffic sector could promotion regional growth, while government policy-makers always use policy instruments to accelerate regional growth, so traffic sector growth could promotion fiscal spending increase indirectly. But it is negative in a short run on account of the lagging effect. According to Table 8, in a long run, the effect of traffic sector growth on fiscal spending is significant positive in the west china. The traffic growth has significant impact on fiscal spending in long-term.

3.4 Panel VAR estimation. In this section, we present the estimation results for the PVAR model using the two-step SYS-GMM approach. In Table 9-10, we report the estimation.

Table 9. Estimation of parameter in the east china

Independent variable	Dependent variable: lnty		
	b-GMM	se-GMM	z-GMM
lnty(t-1)	0.292	0.086	3.4
lnex(t-1)	0.119	0.031	3.84
Independent variable	Dependent variable: lnex		
	b-GMM	se-GMM	z -GMM
lnty(t-1)	-0.316	0.449	-0.7
lnex(t-1)	0.693	0.18	3.84

Table 10. Estimation of parameter in the west china

Independent variable	Dependent variable: lnty		
	b-GMM	se-GMM	z-GMM
lnty(t-1)	0.140	0.195	0.72
lnex(t-1)	0.186	0.069	2.69
Independent variable	Dependent variable: lnex		
	b-GMM	se-GMM	z -GMM
lnty(t-1)	-0.510	0.714	-0.71
lnex(t-1)	0.846	0.246	3.44

Table 9-10 show that the lagged lnex has significantly positive direct effect on lnty in the east china, while the lagged lnty hasn't significant impact on lnex either in the east china or the west china. The effect of fiscal expenditure on traffic sector growth in the west china is stronger positive than in the east china. It means that government investment on traffic sector will bring more advantage in west china.

3.4 Variance decomposition results

Table 11-12 present the results of Variance decompositions in the east china and the west china.

Table 11. Variance decompositions in the east china regions

	s	lnty	lnex
lnty	10	0.418	0.582
lnty	20	0.418	0.582
lnex	10	0.006	0.994
lnex	20	0.006	0.994

Table 12. Variance decompositions in developed regions

	s	lnty	lnex
lnty	10	0.567	0.433
lnty	20	0.567	0.433
lnex	10	0.125	0.875
lnex	20	0.124	0.876

From Table 11-12, we find that fiscal spending is important factor for the fluctuation of traffic sector growth, the impact in east china is more than in west china. Traffic sector growth itself is the main explanation variables for their long-run movements, but in west china is bigger than in east china.

3.5 Impulse response results

In this section, we conduct impulse-response functions together with 5% errors bands generated through Monte Carlo simulations with 1000 repetitions. Fig.1-2 show the responses of fiscal expenditure and traffic sector growth to one standard deviation shock. From Fig.1, we find the response of lnty to lnex shock reach the top in the first period, then decline quickly, but always is positive in the east china and in the west china. But the response of lnty to lnex shock in west china is stronger than in the east. In east china, the response of lnex to lnty shock isn't significant, but is negative in east china while is positive in west china. Fig.1-2 also show that the response of lnty to lnty shock is positive in the second period then decline, the response of lnex to lnex shock is in the trend of decline, but positive all always in the east china. While in the west china, it is stronger than east china.

CONCLUSION

This paper takes 31 provinces panel data from 2007-2012 as samples to investigate the dynamic relationship between fiscal expenditure and traffic sector growth in China. We divide the 31 provinces into the east china and in west china to examine the diversity. From the empirical results, we found that dynamic effect of government expenditure on traffic sector growth was significantly positive both in the east china and the west china in long-term. It is stronger positive in the west china than in the east china. We conclude that the effect of fiscal spending on traffic sector growth in two different economic systems exist obvious differences. The difference is that the effect of the same government spending on traffic sector growth in developing regions is greater than developed regions. It indicates that the same fiscal spending on traffic sector growth in the western is superior to the east. The last, the short-term effects of local government expenditures on traffic sector growth are very obvious, especially to short-term output impact of the western region is very big. This result also suggests that the economic foundation in the western is weak and insufficient development.

In view of the analysis in this paper, we consider that the influence of local government spending on traffic economic growth is difference between the east and the west. However, it shows that public spending influence in the western region is great than the eastern region. In the future, it will be important that strengthen the western region traffic fiscal spending, and improve the efficiency of the transportation spending.

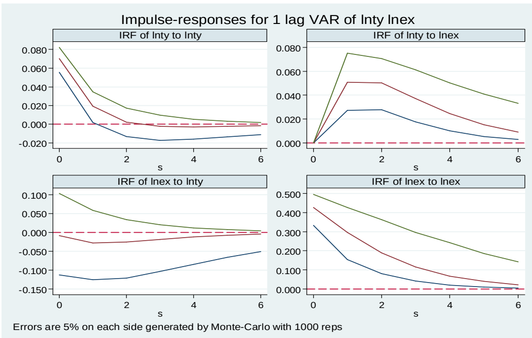

Figure 1. Impulse-responses in east china

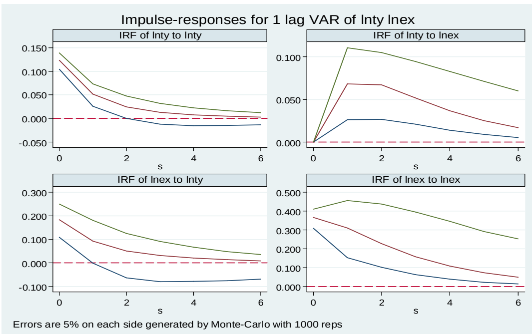

Figure 2. Impulse-responses in west china

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