2. TRANSITIONAL BEHAVIOR OF GOVERNMENT DEBT RATIO ON GROWTH: THE CASE OF OECD COUNTRIES

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Abstract

We revisit how the government debt ratio and real GDP growth relationship varies with indebted levels and two macroeconomic control variables, unemployment rate and inflation rate, in a balanced panel of 19 OECD countries over the period 1993-2007, after the signing of the EU Treaty in Maastricht on February 7, 1992. The empirical results indicate that there is one threshold value of 97.82%, which divides our sample into two regimes. The mean of the real GDP growth rates in the left regime is 1.16% higher than that in the right regime. The significantly positive marginal effects of government debt ratio on real GDP growth in both left and right regimes are consistent with the stimulus view (Eisner, 1992). Neither "debt overhang" nor "debt irrelevance" exists in these OECD countries. Our findings also show that there is a significantly negative marginal effect of unemployment rate on real GDP growth in the left regime, but significantly positive in the right regime. This positive nexus between the unemployment rate and real GDP growth in the right regime is inconsistent with Okun's Law. Meanwhile, there is a significantly negative impact of inflation rate on real GDP growth in the left regime, but non-significantly negative in the right regime. The transitional behavior from the right to the left regime in Belgium in 2006 and in Canada in 1998 is good example for the highly indebted countries, such as Italy and Japan. Therefore, our empirical findings have important implications for fiscal policymakers, not only in these OECD countries but also in the rest of world.

Keywords: real GDP growth, government debt ratio, unemployment rate, inflation rate, debt overhang, debt irrelevance, stimulus view, Okun's Law, panel Smooth Transition Regression model, OECD countries

JEL Classification: C4, E6, H3, H6

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1. Introduction

Government debt may facilitate or deter economic growth, depending on the level of debt. When economic growth is slow or when the private sector does not have incentives to invest, the government may need to pursue fiscal and/or monetary policy to stimulate the economy and may resort to debt financing. On the other hand, when economic growth is normal or above the long-term trend, an increase in government debt may be detrimental to real GDP growth. This is because an increase in debt may push interest rates upward and reduce private investment.

Over the past 20 years, a great deal of literature has been dedicated to investigate the relationship between government debt level and economic growth. There are three major different views of the impact of government debt on economic growth. The stimulus view (Eisner, 1992) argues that if deficits and debt are measured correctly, higher deficits and debt will stimulate employment, consumption, investment, and then economic growth. The crowding-out view (Friedman, 1977, 1985) maintains that higher deficits and debt will reduce economic growth due to rising interest rates and lower investment and capital formation. The Ricardian view (Barro, 1989) holds that deficits and debt do not have any impact on economic growth because the decrease in future income and consumption due to more tax burdens will offset the increase in current government spending. Based on these different views, it should be a nonlinear relationship between government debt ratio and real GDP growth rate. Moreover, most of the existing literature dealing with Okun's law tends to focus on the lack of robustness of the Okun's coefficient, without questioning the linear nature of the relationship. Our approach involves the use of the PSTR model to take account of the asymmetry of Okun's coefficient.

This paper intends to examine the possible nonlinear relationship between government debt ratio and real GDP growth in a balanced panel of 19 OECD countries over the period of 1993-2007. We apply the panel smooth transition regression (PSTR) model developed by Gonzalez *et al*. (2005) to investigate whether there is a nonlinear relationship between government debt ratio and real GDP growth. The rest of paper is organized as follows: Section 2 demonstrates the data and variables; Section 3 introduces the panel smooth transition (PSTR) model while Section 4 shows the empirical results. Finally, Section 5 offers some conclusions.

2. Data and variables

We use a balanced panel of 19 OECD countries observed for the years 1993–2007 from the online statistical database of OECD.Stat. The countries used in this study are: Australia, Austria, Belgium, Canada, Demark, Finland, France, Germany, Hungary, Iceland, Italy, Japan, the Netherlands, Norway, Spain, Sweden, Switzerland, the United Kingdom, and the United States. Annual real GDP growth rate (**RGDPGRit**), one-year lagged general government debt (**DEBTit-1**), annual unemployment rate as a percentage of civilian labor force (**UNEMPit**), and inflation rate as GDP deflator in percentage (**INFLATIONit**) are collected over the period of 1993-2007.

We choose real GDP growth rate as dependent variable. One-year lagged government debt ratio is used as transition and independent variables. Both unemployment rate and inflation rate as control variables. As we mentioned in Section 1, government debt ratio is presumed to have various influences upon real GDP growth conditional on control variables, unemployment and inflation rates.

Table 1 and Table 2 show all variables longitudinal descriptive statistics for each year and cross-sectional descriptive statistics for each country. From Table 1, we found that means of real GDP growth rate ranged from 0.46% in 1993 to 3.89% in 2000. Means of one-year lagged government debt ratios peaked at 74.95% in 1997 and plunged to 63.73% in 1993. The means of unemployment rates ranged between a maximum of 8.94% in 1993 and a minimum of 5.44% in 2007. The means of inflation rates have the highest and lowest values of 3.71% in 1995 and 1.88% in 1999. From Table 2, we find that Iceland and Japan have the highest and lowest means of real GDP growth, with values of 3.95% and 1.29%, respectively. Japan and Australia have the highest and lowest mean one-year lagged government debt ratios at 122.98% and 27.51%. Interesting is that we find Spain and Iceland have the highest and lowest mean unemployment rates of 13.23% and 3.33%, respectively. Hungary and Japan have the highest and lowest means of inflation rates of 11.76% and -0.74%, respectively.

3. Methodology

3.1 Panel Smooth Transition Regression (PSTR) Model

The PSTR model is the most recent extension of smooth transition regression (STR) modeling to panel data with heterogeneity across the panel members and over time. The simplest PSTR model with two extreme regimes and a single transition function can be defined as:

$$y_{it} = \mu_i + \beta_0' x_{it} + \beta_1' x_{it} g(q_{it}; \gamma, c) + \varepsilon_{it}. \quad (1)$$

where: $i = 1,\ldots\ldots, N, t = 1,\ldots\ldots, T,$ and N and T stand for the cross-section and time dimensions of the panel, separately. The dependent variable y_{it} is a scalar; μ_i represents the fixed individual effect; x_{it} is a k-dimensional vector of time-varying exogenous variables; ε_{it} is the residual term. The transition function $g(q_{it}; \gamma, c)$ is a continuous function of the observable variable q_{it}. The transition function is normalized to be bounded between 0 and 1; these extreme values are associated with regression coefficients β_0' and $\beta_0' + \beta_1'$. The value of q_{it} determines the value of $g(q_{it};\gamma,c)$ and, thus, the effective regression coefficients $\beta_0' + \beta_1' g(q_{it};\gamma,c)$ for individual *i* at time *t*.

Following Granger and Terasvirta (1993), Terasvirta (1994), and Jansen and Terasvirta (1996), the present study formulates the transition function as follows:

$$g(q_{it};\gamma,c)=\left(1+\exp\left(-\gamma\prod_{j=1}^{m}(q_{it}-c_j)\right)\right)^{-1} \quad with \quad \gamma>0 \quad and \quad c_1\le\cdots\le c_m \tag{2}$$

where: $c=(c_1,...,c_m)'$ is an *m*-dimensional vector of location parameters and the slope parameter γ determines the smoothness of the transitions. In general, it is sufficient to consider m = 1 or m = 2, as these values allow for commonly encountered types of variation in the parameters. In the case of m = 1, the model specifies that the two extreme regimes are associated with low and high values of q_{it} and that there is a single monotonic transition of the coefficients from β_0' to $\beta_0'+\beta_1'$ as q_{it} increases, such that the change is centered around c_1. In the case of m = 2, the transition function has its minimum at $(c_1+c_2)/2$ and reaches the value 1 both at low and high values of q_{it}. When γ approaches infinity, the PSTR model reduces to a three-regime panel threshold regression (PTR) model, whose outer regimes are identical to each other but different from the middle regime.

The multi-level PSTR model is a generalization of the PSTR model that allows for more than two different regimes; it can be formulated as

$$y_{it}=\mu_i+\beta_0'x_{it}+\sum_{j=1}^{r}\beta_j'x_{it}g_j\left(q_{it}^{j};\gamma_j,c_j\right)+\varepsilon_{it} \tag{3}$$

where: the transition functions $g_j(q_{it}^{j};\gamma_j,c_j),\ j=1,\cdots,r$ depend on the slope parameters γ_j and on location parameters c_j. If r = 1, $q_{it}^{j}=q_{it}$, and $\gamma_j\to\infty$ for all $j=1,\cdots,r$, the transition function becomes an indicator function, with I[A]=1 when event A occurs, and I[A]=0 otherwise; then the model in (3) becomes a PTR model with r + 1 regimes. Consequently, the multi-level PSTR model can be viewed as a generalization of the multiple regime panel threshold model (PTR) in Hansen (1999).

3.2 Building Panel Smooth Transition Regression model

The PSTR model building procedure consists of specification, estimation and evaluation stages. Specification includes tests for homogeneity, and selection of the transition variable q_{it}. If the tests fail to show homogeneity, specification includes determination of the appropriate form of the transition function; the form is dictated by the value of m in (2). A nonlinear least square method is used for parameter estimation. At the evaluation stage, the estimated model is subject to misspecification tests to check whether it provides an adequate description of the data. The null hypotheses to be tested at this stage include parameter constancy, absence of

remaining heterogeneity and absence of autocorrelation in the errors. Finally, the number of regimes in the panel must be specified, which means that a value must be assigned to r in equation (3).

4. Empirical results

4.1 Homogeneity test

We begin modeling the transitional behavior of government debt on real GDP growth by estimating a homogenous panel data model for real GDP growth ***(RGDPGRit) with one-year lagged government debt ratio (DEBTit-1)***, unemployment rate (***UNEMPit)*** and inflation rate (***INFLATIONit***) as regressors with one-year lagged government debt ratio (***DEBTit-1***) as threshold variable in our PSTR model. Gonzalez's (2005) panel smooth transition regression model requires that all the variables in the model must be stationary in order to avoid spurious regressions. Before further estimations of the panel smooth transition regression, we have to show the stationary characteristics on all the variables. Table 3 shows the rejection of the panel unit root test of all variables either with intercept and trend or without trend in Fisher ADF Choi Z-stat panel unit root tests. Next, we apply the LM test of homogeneity of the coefficients of these regressors. Table 4 shows the result of homogeneity test of the coefficients of regressors for m=1 and 2 on real GDP growth (**$RGDPGR_{it}$**). Homogeneity is rejected for m=1 and 2 at 5% level.

4.2 Parameter constancy test

An alternative to parameter constancy is that the parameters in (1) change smoothly over time. The model under the alternative may be called the Time Varying Panel Smooth Transition Regression (TV-PSTR) model. Table 5 shows the results of no remaining heterogeneity tests (or parameter constancy test). The null hypothesis of $r = 1$ is not rejected at 1% significance level for m=1.

4.3 Determining the number of regimes

Next, we apply the sequence of tests to determine the order m of the transition function. We proceed with estimating the following PSTR model:

$$RGDPGR_{it} = \mu_{it} + \beta_0'\left(DEBT_{it-1} + UNEMP_{it} + INFLATION_{t}\right) + \sum_{j=1}^{r} \beta_1' g\left(DEBT_{it-1}^{j}; \gamma_j, c_j\right)\left(DEBT_{it-1} + UNEMP_{it} + INFLATION_{t}\right) + \varepsilon_{it} \quad (4)$$

The tests of parameter constancy and of no remaining heterogeneity can be generalized to serve as misspecification tests in an additive PSTR model of the form (3) for any value of r. Table 5 and Table 6 show the test results of no remaining heterogeneity and determination of number of regimes. Both the Akaike information criterion (AIC) and Schwartz's Bayesian information criterion (BIC) show that m=1 and r=1 is the optimal combination of our threshold function based on the transition variable of one-year lagged government debt ratio **($DEBT_{it-1}$).**

4.4 Parameter estimate

Parameter estimates appear in Tables 7, together with conventional standard errors and heteroskedasticity-consistent standard errors. From Table 7, we observe that one-year lagged government debt ratio is positively related to the real GDP growth in the first regime, but negatively in the second regime. The unemployment rate is negatively related to the real GDP growth in the first regime, but positively in the second regime. The inflation rate is negatively related to the real GDP growth both in two regimes. From Table 8, a 1% increase in the government debt ratio is associated with an incremental real GDP growth of 0.056% in the left regime and 0.0291% in the right regime. This evidence only supports the stimulus view (Eisner, 1992). Meanwhile, a 1% increase in the unemployment rate leads to a decremental 0.2388% in real GDP growth in the left regime and an incremental 0.0814% in the right regime. A 1% increase in the inflation rate is associated with a decremental real GDP growth of 0.117% in the left regime and a decremental 0.4387% in the right regime. Our findings indicate that one-year lagged government debt ratio owns more explanatory power on the real GDP growth in these OECD countries. The empirical result indicates that one threshold value of one-year lagged government debt ratio is 97.82%. Figure 1 indicates the scattered chart which shows the logistic relationship between transition function and one-year lagged government ratio. Table 9 shows the longitudinal descriptive statistics for two regimes. Mean of real GDP growth rates is 1.16% higher in the left regime. Mean of one-year lagged government debt ratios in the left regime is 66% lower. Mean of unemployment rates is 1.19% lower in the left regime. And mean of inflation rates is 1.31 higher in the left regime. To conclude, the difference of one-year government debt ratio almost dominates the difference in real GDP growth rates between two regimes in this area.

4.5 Transitional behavior across two regimes

Countries in the left regime with the government debt ratio close to 97.82% are more likely to make the transition to the right regime. Similarly, countries in the right regime with the government debt ratio near 97.82% are more likely to pass to the left regime. Transitions across two regimes are relatively infrequent after the signing of the EU Treaty in Maastricht on February 7, 1992 with the debt ratio limit at 60%. Our goal is to investigate the transitional behavior across two regimes and to understand how transition contributes to the real GDP growth. Table 10 shows the variables descriptive statistics across two regimes. Due to the continuous rise in debt ratio, Canada in 1995 and Japan in 1998 transited from the left regime to the right regime. Canada in 1998 and Belgium in 2006 shifted to the left regime by cutting down their debt ratios, unemployment rates, and inflation rates.

5. Conclusions

In this paper, we develop a nonlinear panel smooth transition regression (PSTR) model, which incorporates heterogeneity by allowing regression coefficients to vary as a function of an exogenous variable and fluctuate between a limited numbers, often two, of extreme regimes. The PSTR model allows coefficients to change smoothly

when moving from one regime to another. As the transition variable is individual-specific and time-varying, the regression coefficients for each of the individuals in the panel are changing over time.

Using a nonlinear PSTR model, we observe the significantly positive relationship between one-year lagged government debt ratio and real GDP growth, higher in the left regime and lower in the right regime, for 19 OECD countries over the period 1993-2007. The empirical results indicate that there is one threshold value of 97.82%. The significantly positive marginal effects of government debt ratio on real GDP growth in both left and right regimes are only consistent with the stimulus view (Eisner, 1992). Our findings also show that there is a significantly negative marginal effect of unemployment rate on real GDP growth in the left regime, but significantly positive in the right regime. The positive nexus between the unemployment rate and real GDP growth in the right regime is inconsistent with the Okun's Law. Meanwhile, the impact from the inflation rate on real GDP growth in the left regime is significantly negative, but non-significantly negative in the right regime.

The transitional behavior from the right to the left regime in Belgium in 2006 and in Canada in 1998 is good example for the highly indebted countries, such as Italy and Japan. Therefore, our empirical findings have important implications for fiscal policymakers not only in these OECD countries but also in the rest of world.

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Table 1

Longitudinal descriptive statistics for each year

Variables	Real GDP growth rate, %				1-year lagged debt per GDP ratio, %				Unemployment rate, %				Inflation rate, %			
Year	Mean	Max.	Min.	Std.	Mean	Max.	Min.	Std.	Mean	Max.	Min.	Std.	Mean	Max.	Min.	Std.
1993	0.46	4.10	(2.10)	1.69	63.73	136.50	27.40	28.38	8.94	18.30	2.50	4.01	3.35	21.30	0.50	4.50
1994	3.32	5.50	1.10	1.23	71.03	140.60	30.60	28.22	8.87	19.50	2.90	4.19	2.80	19.50	(0.20)	4.17
1995	2.53	4.20	0.10	1.16	72.08	137.70	37.30	26.92	8.35	18.40	3.10	3.90	3.71	26.70	(0.50)	5.75
1996	2.47	5.10	0.60	1.35	74.69	135.30	40.90	25.48	8.24	17.80	3.40	3.87	2.73	21.20	(0.60)	4.71
1997	3.51	6.10	1.60	1.35	74.95	133.40	36.50	26.27	7.82	16.70	3.40	3.64	2.47	18.50	(0.30)	4.01
1998	3.34	6.30	(2.00)	1.83	73.11	130.30	32.00	26.23	7.21	15.00	2.70	3.45	1.92	12.60	(0.80)	2.96
1999	3.32	5.50	(0.10)	1.43	72.75	132.60	30.80	27.45	6.54	12.50	2.00	3.04	1.88	8.40	(1.30)	2.25
2000	3.89	5.20	1.90	0.83	69.81	127.00	28.00	28.53	5.92	11.10	2.30	2.64	3.22	15.70	(1.70)	3.87
2001	1.92	4.10	0.20	1.21	66.71	135.40	25.00	28.71	5.74	10.40	2.20	2.43	2.84	8.60	(1.20)	2.39
2002	1.48	4.10	0.00	1.19	65.91	143.70	22.20	30.18	6.14	11.10	2.80	2.33	2.27	7.80	(1.80)	2.23
2003	1.59	4.20	(0.20)	1.33	66.76	152.30	20.10	30.71	6.43	11.10	3.40	2.21	2.06	5.80	(1.60)	1.66
2004	3.17	7.70	1.20	1.40	67.04	158.00	18.80	30.76	6.42	10.60	3.10	2.16	2.17	5.30	(1.10)	1.61
2005	2.72	7.50	0.60	1.44	67.19	165.50	17.00	32.10	6.35	10.60	2.60	2.16	2.44	8.70	(1.20)	2.08
2006	3.24	4.90	1.80	0.80	66.63	175.30	16.70	34.91	5.94	9.80	2.90	2.12	2.87	9.00	(0.90)	2.42
2007	2.81	4.50	1.10	0.94	64.62	171.90	16.10	34.10	5.44	8.40	2.30	1.99	2.70	5.70	(0.70)	1.42
ALL	2.65	7.70	(2.10)	1.56	69.13	175.30	16.10	28.88	6.96	19.50	2.00	3.18	2.63	26.70	(1.80)	3.28

Table 2

Cross-sectional descriptive statistics for each country

Variables	Real GDP growth rate, %				1-year lagged debt per GDP ratio, %				Unemployment rate, %				Inflation rate, %			
Country	Mean	Max.	Min.	Std.	Mean	Max.	Min.	Std.	Mean	Max.	Min.	Std.	Mean	Max.	Min.	Std.
Australia	3.77	5.20	1.90	0.83	27.51	41.90	16.10	9.08	6.96	10.60	4.40	1.78	2.73	4.90	0.10	1.54
Austria	2.27	3.70	0.30	1.13	68.38	73.20	57.40	4.23	4.25	5.20	3.60	0.46	1.47	2.70	(0.30)	0.86
Belgium	2.13	3.70	(1.00)	1.30	118.43	140.60	91.20	16.60	8.44	9.80	6.60	0.99	1.88	4.00	0.40	0.88
Canada	3.26	5.50	1.60	1.23	86.96	101.70	68.00	11.44	8.10	11.40	6.00	1.58	2.05	4.10	(0.40)	1.21
Denmark	2.27	5.50	(0.10)	1.47	63.18	85.00	37.40	14.33	5.49	9.50	3.80	1.53	1.93	3.00	0.70	0.63
Finland	3.49	6.10	(0.90)	1.74	54.78	65.90	44.30	7.29	11.08	16.80	6.90	3.25	1.75	4.80	(0.40)	1.43
France	2.01	3.90	(0.90)	1.17	65.50	76.00	43.90	8.52	9.93	11.60	8.30	1.23	1.59	2.50	0.00	0.67
Germany	1.49	3.20	(0.80)	1.19	59.25	71.10	40.90	8.77	8.71	10.60	7.50	0.92	1.13	3.70	(0.70)	1.05
Hungary	3.36	5.20	(0.60)	1.72	71.69	92.00	59.70	11.52	7.96	12.10	5.70	2.04	11.76	26.70	2.20	7.70
Iceland	3.95	7.70	0.10	2.29	44.96	58.90	25.40	9.78	3.33	5.30	2.00	1.10	3.96	9.00	0.60	2.38
Italy	1.43	3.70	(0.90)	1.11	121.17	132.60	106.90	6.48	9.44	11.40	6.20	1.72	2.95	5.00	1.70	1.02
Japan	1.29	2.90	(2.00)	1.35	122.98	175.30	67.90	37.53	4.11	5.40	2.50	0.89	(0.74)	0.60	(1.70)	0.75
Netherlands	2.73	4.70	0.10	1.39	73.96	96.70	54.20	14.51	4.36	6.80	2.20	1.48	2.33	5.10	0.70	1.16
Norway	3.14	5.40	1.00	1.35	40.06	60.90	30.80	9.13	4.25	6.60	2.60	1.12	4.08	15.70	(1.80)	4.45
Spain	3.24	5.00	(1.00)	1.42	62.77	76.00	46.60	9.49	13.23	19.50	8.30	3.96	3.73	4.90	2.40	0.76
Sweden	2.81	4.60	(2.10)	1.75	70.57	84.40	52.50	10.98	7.31	9.90	4.90	1.74	1.77	3.70	0.20	1.02
Switzerland	1.65	3.60	(0.20)	1.30	51.10	57.90	38.40	5.59	3.67	4.40	2.60	0.60	0.87	2.40	(0.10)	0.70
U.K.	2.99	4.30	2.10	0.65	46.15	52.50	39.00	4.50	6.36	10.20	4.70	1.78	2.51	3.60	1.20	0.62
U.S.A.	3.07	4.50	0.80	1.10	64.12	71.90	55.20	5.81	5.19	6.90	4.00	0.80	2.21	3.30	1.10	0.62
ALL	2.65	7.70	(2.10)	1.56	69.13	175.30	16.10	28.88	6.96	19.50	2.00	3.18	2.63	26.70	(1.80)	3.28

Table 3

Results of Fisher ADF Choi Z-stat panel unit root tests

Variables	With intercept& trend		Without trend	
RGDPGRit	-5.25***	0.0000	-1.69**	0.0455
DEBTit-1	-3.00***	0.0013	-1.33*	0.0916
UNEMPit	-2.30**	0.0107	-4.30***	0.0000
INFLATIONit	-3.22***	0.0006	-1.92**	0.0273

*Note:***, **, and * reject H_0: Unit Root at 1%, 5%, and 10% level of significance.*

Table 4

Results of homogeneity tests

H_0: linear model against H_1: PSTR model with at least one threshold variable r=1				
Statistics	m=1		m=2	
Wald tests (LM)	11.657***	(0.009)	13.761**	(0.032)
Fisher tests (LMF)	3.739**	(0.012)	2.198**	(0.044)
LRT tests (LRT)	11.902***	(0.000)	14.104***	(0.000)

*Note: probability values are in parentheses. ** and *** stand for 5% and 1% significant level.*

Table 5

Results of no remaining heterogeneity tests

H_0: PSTR with r = 1 against H_1: PSTR with at least r = 2				
Statistics	m=1		m=2	
Wald tests (LM)	7.873**	(0.049)	10.333	(0.111)
Fisher tests (LMF)	2.434*	(0.065)	1.593	(0.150)
LRT tests (LRT)	7.984**	(0.049)	10.525	(0.111)

*Note: probability values are in parentheses. * and ** stand for 10% and 5% significant level.*

Table 6

Determination of number of regimes

Statistics	m=1	m=2
No. of threshold r(m)	1(1)	1(2)
RSS	421.48	418.11
AIC	0.4795	0.4821
BIC	0.5820	0.5975

Table 7

Parameter estimation results of one-threshold PSTR model

Variables	Coefficient estimate	SE of Heteroskedasticity	T-ststistics
$\beta_0' = [DEBT_{it-1}\ UNEMP_{it}\ INFLATION_{it}]$	0.0560***	0.0096	5.8049
	-0.2338***	0.0536	-4.3635
	-0.1170***	0.0380	-3.0755
$\beta_1' = [DEBT_{it-1}\ UNEMP_{it}\ INFLATION_{it}]$	-0.0369***	0.0079	-4.6675
	0.3179**	0.1241	2.5624
	-0.3613	0.2815	-1.2832
c	97.8158		
γ	2.1568		
RSS	421.48		
AIC	0.4795		
BIC	0.5820		

*Note: ** and *** stand for 5% and 1% significant level.*

Table 8

The marginal effects of regressors on real GDP growth

Variables	Left Regime	Right Regime
DEBTit-1	0.0560	0.0291
UNEMPit	-0.2338	0.0814
INFLATIONit	-0.1170	-0.4387

Table 9

The longitudinal descriptive statistics for two regimes

Regimes	Left regime					Right regime					Difference			
Year	Coun-tries	RGDPGR	DEBT_1	UNEMP	INFLA-TION	Coun-tries	RGDPGR	DEBT_1	UNEMP	INFLA-TION	RGDPGR	DEBT_1	UNEMP	INFLA-TION
1993	17	0.62	56.91	8.91	3.28	2	(0.95)	121.70	9.20	3.95	1.57	(64.79)	(0.29)	(0.67)
1994	17	3.39	64.28	8.71	2.79	2	2.70	128.40	10.20	2.85	0.69	(64.12)	(1.49)	(0.06)
1995	16	2.51	63.31	8.02	3.87	3	2.67	118.87	10.13	2.83	(0.16)	(55.55)	(2.11)	1.04
1996	16	2.69	66.24	7.88	2.81	3	1.30	119.80	10.13	2.30	1.39	(53.56)	(2.25)	0.51
1997	16	3.56	66.25	7.44	2.63	3	3.20	121.33	9.83	1.63	0.36	(55.08)	(2.39)	1.00
1998	16	3.89	64.39	7.01	1.98	3	0.37	119.60	8.27	1.57	3.53	(55.21)	(1.25)	0.41
1999	16	3.64	63.34	6.26	2.18	3	1.60	122.90	8.07	0.30	2.04	(59.56)	(1.81)	1.88
2000	16	3.98	59.59	5.68	3.70	3	3.43	124.30	7.23	0.67	0.55	(64.71)	(1.56)	3.03
2001	16	2.10	56.06	5.53	3.14	3	0.93	123.50	6.90	1.27	1.17	(67.44)	(1.38)	1.87
2002	16	1.61	54.74	5.94	2.47	3	0.77	125.43	7.20	1.23	0.85	(70.69)	(1.26)	1.24
2003	16	1.74	55.53	6.26	2.26	3	0.80	126.67	7.33	1.03	0.94	(71.14)	(1.08)	1.22
2004	16	3.31	55.97	6.29	2.33	3	2.40	126.10	7.07	1.30	0.91	(70.13)	(0.77)	1.03
2005	16	2.96	55.96	6.26	2.69	3	1.43	127.13	6.87	1.10	1.52	(71.18)	(0.61)	1.59
2006	17	3.38	57.10	6.00	3.16	2	2.10	147.60	5.45	0.40	1.28	(90.50)	0.55	2.76
2007	17	2.93	55.22	5.48	2.92	2	1.80	144.50	5.05	0.80	1.13	(89.28)	0.43	2.12
ALL	244	2.82	59.64	6.79	2.82	41	1.66	125.64	7.97	1.50	1.16	(66.00)	(1.19)	1.31

Table 10

The variable descriptive statistics across two regimes

Direction	Year	Country	RGDPGR	DEBT_1	UNEMP	INFLATION	△RGDPGR	△DEBT_1	△UNEMP	△INFLATION
Left to Right	1995	Canada	2.80	98.00	9.50	2.30	(2.00)	1.70	(0.90)	1.20
Left to Right	1998	Japan	(2.00)	100.50	4.10	0.00	(3.60)	6.50	0.70	(0.60)
	ALL		0.40	99.25	6.80	1.15	(2.80)	4.10	(0.10)	0.30
Right to Left	1998	Canada	4.10	96.30	8.30	(0.40)	(0.10)	(5.40)	(0.80)	(1.60)
Right to Left	2006	Belgium	3.00	95.70	8.30	2.30	1.20	(2.90)	(0.20)	(0.10)
	ALL		3.55	96.00	8.30	0.95	0.55	(4.15)	(0.50)	(0.85)

Figure 1

Government debt ratio and transition function