Economics Letters 121 (2013) 504–507

Contents lists available at ScienceDirect

Economics Letters

journal homepage: www.elsevier.com/locate/ecolet

Nonlinear effects of government debt on private consumption: Evidence from OECD countries

Dooyeon Cho [a,1], Dong-Eun Rhee [b,*]

[a] Department of Economics, Kookmin University, Seoul 136-702, Republic of Korea

[b] Department of International Economy, Korea Institute for International Economic Policy (KIEP), Seoul 137-747, Republic of Korea

HIGHLIGHTS

- This paper analyzes nonlinear effects of government debt on private consumption in 16 OECD countries.
- We employ the panel smooth transition regression model to estimate the time-varying coefficient of government debt.
- The estimated threshold level of regime switching depending on the debt level is close to those in previous studies.
- A higher level of government debt appears to crowd out more private consumption.
- The degree of crowding out effects has deteriorated since the global financial crisis.

ARTICLE INFO

Article history:
Received 23 August 2013
Received in revised form
9 October 2013
Accepted 10 October 2013
Available online 18 October 2013

JEL classification:
C23
E21
E62
H63

Keywords:
Consumption
Government debt
Nonlinearity
Panel smooth transition regression error correction model

ABSTRACT

This paper investigates nonlinear effects of government debt on private consumption. The estimated consumption function shows smooth regime switching depending on the debt-to-GDP ratio, and a higher level of government debt crowds out private consumption to a greater extent.

1. Introduction

The effectiveness of fiscal policy has long been a central issue in macroeconomics. Moreover, since the recent global financial crisis, the magnitude of fiscal multipliers during the crisis has provoked a heated debate among academic economists and policymakers alike. Reinhart and Rogoff (2010) find a negative relationship between government debt and economic growth for the countries in which the level of public debt is in excess of 90% of their GDP. Corsetti et al. (2012) and Ilzetzki et al. (2013) explore fiscal multipliers using the panel VAR model, and both studies find that a country with a higher level of government debt has a smaller fiscal multiplier. Berben and Brosens (2007) also estimate a traditional consumption function with government debt using the linear autoregressive distributed lag (ARDL) model, and they find a nonlinear relationship between private consumption and government debt. They divide the entire panel data sample set into three subsamples depending on the debt level, and conclude that government debt has a positive impact on private consumption when the debt-to-GDP ratio is below 55% but a negative impact when the ratio exceeds 75%.

This paper investigates nonlinear effects of fiscal policy on private consumption levels using the panel smooth transition regression (PSTR) error correction model. While the aforementioned

* Corresponding author. Tel.: +82 2 3460 1151; fax: +82 2 3460 1212.
E-mail addresses: dcho@kookmin.ac.kr (D. Cho), derhee@kiep.go.kr (D.-E. Rhee).
[1] Tel.: +82 2 910 5617; fax: +82 2 910 4519.

0165-1765/$ – see front matter
http://dx.doi.org/10.1016/j.econlet.2013.10.013

studies divide the sample in an exogenous and arbitrary manner, this study considers nonlinearity of the consumption function endogenously, exploiting the empirical advantage of the PSTR error correction model. Focusing on a panel data set of 16 OECD countries over the period 1983–2011, this study finds that government debt crowds out private consumption to a greater extent as the debt-to-GDP ratio rises. The threshold level of regime switching as regards the debt-to-GDP ratio is found to be 83.7%, which is interestingly close to the values reported in Berben and Brosens (2007) and Reinhart and Rogoff (2010). The results of this paper suggest that an increase in government debt reduces private consumption in most advanced economies whose debt exceeded the threshold level of government debt after the global financial crisis. Overall, this finding appears to support the necessity of fiscal consolidation in advanced economies with a high level of government debt.

The remainder of the paper is organized as follows. In Section 2, we introduce the panel nonlinear error correction model and describe the estimation procedure. In Section 3, we describe the data and present the empirical results, which we then interpret. In Section 4, we conclude.

2. The panel nonlinear error correction model

We employ the PSTR model with fixed individual effects, introduced by González et al. (2005). The model generalizes the panel threshold regression (PTR) model developed by Hansen (1999), allowing the regression coefficients to change smoothly and gradually between two regimes. The PSTR error correction model with two regimes is given by

$$\begin{aligned}\Delta c_{it} &= \mu_i + \phi_{01} q_{i,t-1} + \beta_{01}\Delta y^d_{it} + \theta_{01}\Delta w^e_{it} + \delta_{01}\Delta g_{it} \\ &\quad + \left[\phi_{11} q_{i,t-1} + \beta_{11}\Delta y^d_{it} + \theta_{11}\Delta w^e_{it} + \delta_{11}\Delta g_{it}\right] \\ &\quad \times G(z_{it};\gamma,c) + u_{it}, \end{aligned} \tag{1}$$

for $i = 1,\ldots,N$, and $t = 1,\ldots,T$, where N and T denote the cross section and time dimensions of the panel data set, respectively[2]; μ_i is the fixed individual effect; and the error term u_{it} is independently and identically distributed. $q_{it} = c_{it} - \hat{\omega}_i - \hat{\alpha}_1 y^d_{it} - \hat{\alpha}_2 w^e_{it} - \hat{\alpha}_3 g_{it}$,[3] where c_{it} is per capita private consumption, y^d_{it} is per capita disposable income, w^e_{it} is equity wealth, and g_{it} is per capita government debt. This consumption function is similar to those in Ludwig and Sløk (2004) and Berben and Brosens (2007) in that it considers wealth effects from equity. All the variables listed above are in logarithms and real terms. Following Granger and Teräsvirta (1993) and Teräsvirta (1994), the transition function is chosen to be the logistic function

$$G(z_{it};\gamma,c) = (1+\exp(-\gamma(z_{it}-c)))^{-1} \quad \text{with } \gamma > 0, \tag{2}$$

where z_{it} is the transition variable, γ is a slope parameter, and c is a location parameter. The restriction on the slope parameter ($\gamma > 0$) is an identifying restriction. The logistic function is bounded between 0 and 1, depending on the transition variable z_{it} for individual i at time t. The values taken by the transition variable z_{it} and transition parameter γ determine the speed of reversion between the two regimes.[4] The parameter c can be interpreted as the threshold between two regimes corresponding to $G(z_{it};\gamma,c) = 0$ and $G(z_{it};\gamma,c) = 1$, in the sense that the logistic function changes monotonically from 0 to 1 as z_{it} increases, while $G(c;\gamma,c) = 0.5$. Estimating the coefficients in the PSTR error correction model involves eliminating the individual effects μ_i in Eq. (1) by removing individual-specific means and then applying nonlinear least squares (NLS) to the transformed data.

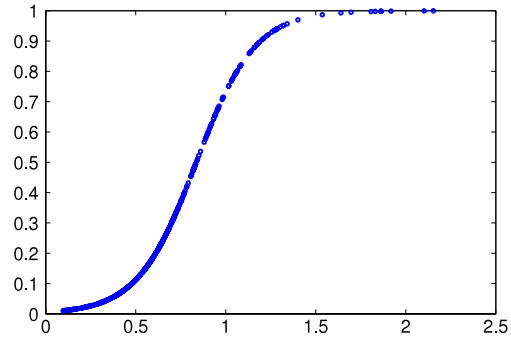

Fig. 1. Estimated transition function over the transition variable. The plot shows the values of $\hat{G}(z_{it};\gamma,c)$ against the debt-to-GDP ratio (d_{it}). Each circle represents one single observation.

3. Empirical analysis

3.1. Data

The data on 16 OECD countries are used in this analysis: Australia, Belgium, Canada, Denmark, Finland, France, Germany, Italy, Ireland, Japan, Netherlands, Norway, Spain, Sweden, the United Kingdom, and the United States. We collect annual data during the period 1983–2011.[5] The debt-to-GDP ratios are taken from the IMF's historical public debt database, and we restore the government debt levels by multiplying by the GDP. The series for stock prices are the MSCI Global Equity indices from the Bloomberg database. We also collect data on GDP, consumption, disposable income, CPI, and population from the OECD database. We calculate the real per capita series by deflating each series using the CPI and total population.

3.2. Results from the PSTR error correction model

We consider the PSTR error correction model for which the transition variable is the debt-to-GDP ratio. For the transition variable, we first test the linear specification of the debt-to-GDP ratio against a specification with threshold effects. When the linearity hypothesis is rejected, we estimate the PSTR error correction model to capture all the nonlinearity or, equally, all the coefficients' heterogeneity. The result of the linearity test is reported in Table 1. For the specification of the transition variable, we calculate the statistic for the likelihood ratio (LR) test. The linearity test clearly leads to the rejection of the null hypothesis of linearity in the model, indicating that the debt-to-GDP ratio (d_{it}) is an appropriate transition variable.

Table 1 gives the parameter estimates from the PSTR error correction model. The estimated slope parameter γ is relatively small, implying that the transition function cannot be reduced to the PTR model. The estimated threshold level c of regime switching as regards the debt-to-GDP ratio is 83.7%. Fig. 1 displays the transition function over the transition variable, which is the debt-to-GDP

[2] We allow for an unbalanced panel.

[3] $\hat{\omega}_i$ is the estimated long-run fixed effect, and $\hat{\alpha}_1, \hat{\alpha}_2, \hat{\alpha}_3$ are the coefficients from the linear cointegrating relationship between private consumption and the explanatory variables.

[4] Lower values of the transition parameter γ imply slower transitions.

[5] We conduct tests on stationarity and cointegration as in Berben and Brosens (2007). Similarly, all variables are $I(1)$ except for stock prices based on Im et al. (2003)'s t-bar and Choi (2001)'s Fisher-type panel unit root tests. We also use Pedroni (1999)'s tests for cointegration, and the results indicate a cointegrating relationship among the variables. Details of the test results can be obtained from the authors on request.